



# NATURAL/ ENVIRONMENTAL RESOURCES

#01063

## Description

This course provides an opportunity for students to increase awareness of the close ties among living organisms. Natural and environmental concerns with the interrelationships of living organisms and the world around us. Leadership development and supervised agricultural experience programs are also an integral part of this course.

Grade 9-12

½ or 1 credit

Max Credit = 1

<b>Standard 1</b>	<b>AGRICULTURE, FOOD, &amp; NATURAL RESOURCES (AFNR) CLUSTER SKILLS</b>	
<b>Topic 1.1</b>	<i>Analyze how issues, trends, technologies, and public policies impact systems in the Agriculture, Food, &amp; Natural Resources Career Cluster.</i>	
	<b>Student Competencies</b>	
	1.1.1	<b>RESEARCH, EXAMINE, AND DISCUSS ISSUES AND TRENDS THAT IMPACT AFNR SYSTEMS ON LOCAL, STATE, NATIONAL, AND GLOBAL LEVELS.</b>
	1.1.1.1	Examine historical and current data to identify issues impacting AFNR systems.
	1.1.1.2	Research and summarize trends impacting AFNR systems.
	1.1.1.3	Analyze and summarize AFNR issues and their impact on local, state, national, and global levels.
	1.1.3	<b>IDENTIFY PUBLIC POLICIES AND EXAMINE THEIR IMPACT ON AFNR SYSTEMS.</b>
	1.1.3.1	Summarize public policies affecting AFNR systems.
	1.1.3.2	Identify influential historical and current public policies that impact AFNR systems.
<b>Topic 1.2</b>	<i>Evaluate the nature and scope of the Agriculture, Food, &amp; Natural Resources Career Cluster and the role of agriculture, food, and natural resources (AFNR) in society and the economy.</i>	
	<b>Student Competencies</b>	
	1.2.2	<b>EXAMINE THE COMPONENTS OF THE AFNR SYSTEMS AND ASSESS THEIR IMPACT ON THE LOCAL, STATE, NATIONAL, AND GLOBAL SOCIETY AND ECONOMY.</b>
	1.2.2.1	Identify and summarize the components within AFNR systems (e.g., Animal Systems: health, nutrition, genetics, etc.; Natural Resources Systems: soil, water, etc.).
	1.2.2.2	Define and summarize societies on local, state, national, and global levels and describe how they relate to AFNR systems.
	1.2.2.3	Examine and summarize the components of the agricultural economy (e.g., environmental, crops, livestock, etc.).
	1.2.2.4	Assess components within AFNR systems and analyze relationships between systems.
	1.2.2.5	Assess how people within societies on local, state, national, and global levels interact with AFNR systems on daily, monthly, or yearly basis.
	1.2.2.6	Assess the economic impact of an AFNR system on a local, state, national, and global level.
<b>Topic 1.3</b>	<i>Examine and summarize the importance of health, safety, and environmental management systems in AFNR workplaces.</i>	
	<b>Student Competencies</b>	
	1.3.1	<b>IDENTIFY AND EXPLAIN THE IMPLICATIONS OF REQUIRED REGULATIONS TO MAINTAIN AND IMPROVE SAFETY, HEALTH, AND ENVIRONMENTAL MANAGEMENT SYSTEMS.</b>
	1.3.1.1	Research and explain the implications of regulatory, safety, and health standards on AFNR systems (e.g., SDS, bioterrorism, etc.)

	1.3.1.2	Summarize the importance of safety, health, and environmental management in the workplace.
	1.3.1.3	Execute health, safety, and environmental procedures to comply with regulatory and safety standards.
	1.3.1.4	Analyze existing required regulations within an AFNR workplace.
	1.3.2	<b>DEVELOP AND IMPLEMENT A PLAN TO MAINTAIN AND IMPROVE HEALTH, SAFETY, AND ENVIRONMENTAL COMPLIANCE AND PERFORMANCE.</b>
	1.3.2.1	Research and identify components required in health and safety performance plans.
	1.3.2.2	Examine and categorize examples of environmental compliance plans from AFNR workplace.
	1.3.2.3	Analyze the effectiveness of health and safety performance plans of an AFNR workplace.
	1.3.2.4	Develop plans to improve environmental compliance and performance within an AFNR system.
<b>Topic 1.4</b>	<b><i>Demonstrate stewardship of natural resources in AFNR activities.</i></b>	
	<b>Student Competencies</b>	
	1.4.1	<b>IDENTIFY AND IMPLEMENT PRACTICES TO STEWARD NATURAL RESOURCES IN DIFFERENT AFNR SYSTEMS.</b>
	1.4.1.1	Define stewardship of natural resources and distinguish how it connects to AFNR systems.
	1.4.1.2	Read and interpret the definition of sustainability and summarize how it relates to AFNR activities.
	1.4.1.3	Analyze available practices to steward natural resources in AFNR systems (e.g., wildlife and land conservation, soil and water practices, ecosystem management, etc.).
	1.4.1.4	Analyze and assess sustainability practices that can be applied in AFNR systems (e.g., energy efficiency, recycle/reuse/repurpose, green resources, etc.).
	1.4.1.5	Devise strategies for stewarding natural resources at home and within community.
	1.4.1.6	Evaluate sustainability policies and plans and prepare summary of potential improvements for AFNR businesses or organizations.
	1.4.2	<b>ASSESS AND EXPLAIN THE NATURAL RESOURCE RELATED TRENDS, TECHNOLOGIES, AND POLICIES THAT IMPACT AFNR SYSTEMS.</b>
	1.4.2.1	Research and examine historical and current natural resources trends and technologies.
	1.4.2.2	Research and summarize influential historical and current natural resources policies that impact AFNR systems.
	1.4.2.3	Analyze natural resources trends and technologies and explain how they impact AFNR systems (e.g., climate change, green technologies, water resources, etc.).
	1.4.2.4	Create and defend a hypothetical natural resources policy that will impact current AFNR systems (e.g., for water resources, land use, air quality, etc.).
	1.4.2.5	Defend or challenge natural resources trends and technologies based upon an assessment of their impact on AFNR systems.
	1.4.2.6	Design and implement strategies for implementing a new natural resources policy that will positively impact AFNR systems.

<b>Topic 1.5</b>	<i>Describe career opportunities and means to achieve those opportunities in each of the Agriculture, Food, &amp; Natural Resources career pathways.</i>	
	<b>Student Competencies</b>	
	1.5.1	<b>EVALUATE AND IMPLEMENT THE STEPS AND REQUIREMENTS TO PURSUE A CAREER OPPORTUNITY IN EACH OF THE AFNR CAREER PATHWAYS (E.G., GOALS, DEGREES, CERTIFICATIONS, RESUMES, COVER LETTER, PORTFOLIOS, INTERVIEWS, ETC.).</b>
	1.5.1.1	Identify and summarize the steps to pursue a career in an AFNR pathway (e.g., self-assessment, set goals, etc.).
	1.5.1.2	Examine the educational, training, and experiential requirements to pursue a career in an AFNR pathway (e.g., degrees, certifications, training, internships, etc.).
	1.5.1.3	Research and summarize specific tools (e.g., resumes, portfolios, cover letters, etc.) and processes (e.g., interviews, applications, etc.) needed to pursue a career in an AFNR pathway.
	1.5.1.4	Create a personal plan outlining goals and steps to obtain a career in an AFNR pathway.
	1.5.1.5	Analyze personal skillset and create a plan for obtaining the required education, training, and experiences to obtain a career in an AFNR pathway.
	1.5.1.6	Assess personal goals, experiences, education, and skillsets and organize them to produce the appropriate tools and develop the skills to effectively communicate about one's qualifications for an AFNR career.
	1.5.2	<b>EXAMINE AND CHOOSE CAREER OPPORTUNITIES THAT ARE MATCHED TO PERSONAL SKILLS, TALENTS, AND CAREER GOALS IN AN AFNR PATHWAY OF INTEREST.</b>
	1.5.2.1	Examine and categorize careers in each of the AFNR pathways.
	1.5.2.2	Research and describe careers in each of the AFNR pathways and choose potential careers connecting to personal interests and skills.
	1.5.2.3	Assess personal skills and align them with potential career opportunities in AFNR pathways.
	1.5.2.4	Assemble and analyze examples of careers and related statistics on a local, state, national, and global level.
<b>Topic 1.6</b>	<i>Analyze the interaction among AFNR systems in the production, processing, and management of food, fiber, and fuel and the sustainable use of natural resources.</i>	
	<b>Student Competencies</b>	
	1.6.1	<b>EXAMINE AND EXPLAIN FOUNDATIONAL CYCLES AND SYSTEMS OF AFNR.</b>
	1.6.1.1	Research and explain the foundational cycles in AFNR (e.g., water cycle, nutrient cycle, carbon cycle, etc.).
	1.6.1.2	Examine and describe examples of systems within AFNR (e.g., sustainability, gate-to-plate, etc.).
	1.6.1.3	Analyze and explain how foundational cycles affect production, processing, and management of food, fiber, and fuel.
	1.6.1.4	Analyze AFNR systems and determine their impact on producing and processing food, fiber, and fuel.

	1.6.2	<b>ANALYZE AND EXPLAIN THE CONNECTION AND RELATIONSHIPS BETWEEN DIFFERENT AFNR SYSTEMS ON A NATIONAL AND GLOBAL LEVEL.</b>
	1.6.2.1	Summarize how AFNR systems connect and relate on a national and global level (e.g., soil, water, economic, etc.).
	1.6.2.2	Examine and summarize changes that happen in AFNR systems on a national and global level (e.g., using less irrigation water, reduction of inputs, etc.).
	1.6.2.3	Analyze differences between AFNR systems on a national and global scale.
	1.6.2.4	Analyze the connections and relationships impacted when there is a change in an AFNR system on a national and global level.

<b>Standard 5</b>	<b>ENVIRONMENTAL SERVICE SYSTEMS</b>	
<b>Topic 5.1</b>	<i>Use analytical procedures and instruments to manage environmental service systems.</i>	
	<b>Student Competencies</b>	
	5.1.1	<b>ANALYZE AND INTERPRET LABORATORY AND FIELD SAMPLES IN ENVIRONMENTAL SERVICE SYSTEMS.</b>
	5.1.1.1	Identify sample types and sampling techniques used to collect laboratory and field data.
	5.1.1.2	Identify methods of statistical analysis commonly used in research (e.g., mean, standard deviation, standard error, error bars, etc.).
	5.1.1.3	Determine the appropriate sampling techniques needed to generate data.
	5.1.1.4	Summarize the purpose of statistical analysis methods commonly used in environmental service systems research and explain examples of their use in practice.
	5.1.2	<b>PROPERLY UTILIZE SCIENTIFIC INSTRUMENTS IN ENVIRONMENTAL MONITORING SITUATIONS (E.G., LABORATORY EQUIPMENT, ENVIRONMENTAL MONITORING INSTRUMENTS, ETC.).</b>
	5.1.2.1	Identify basic laboratory equipment and explain their uses.
	5.1.2.2	Identify basic environmental monitoring instruments and explain their uses.
	5.1.2.3	Demonstrate the proper use and maintenance of basic laboratory equipment.
	5.1.2.4	Demonstrate the proper use and maintenance of environmental monitoring instruments.

<b>Topic 5.2</b>	<b><i>Evaluate the impact of public policies and regulations on environmental service system operations.</i></b>	
	<b>Student Competencies</b>	
	<b>5.2.1</b>	<b>INTERPRET AND EVALUATE THE IMPACT OF LAWS, AGENCIES, POLICIES, AND PRACTICES AFFECTING ENVIRONMENTAL SERVICE SYSTEMS.</b>
	5.2.1.1	Distinguish between the types of laws associated with environmental service systems.
	5.2.1.2	Distinguish between the types of government agencies (i.e., local, state, and federal) associated with environmental service systems.
	5.2.1.3	Research policies, practices and initiatives common in business and advocacy groups associated with environmental service systems (e.g., zero-waste, LEED-certified, locally-grown, etc.).
	5.2.1.4	Analyze the structure of laws associated with environmental service systems.
	5.2.1.5	Analyze the specific purpose of government agencies associated with environmental service systems.
	5.2.1.6	Assess the intent, feasibility, and effectiveness of policies, practices, and initiatives common in business and advocacy groups associated with environmental service systems.
	<b>5.2.2</b>	<b>COMPARE AND CONTRAST THE IMPACT OF CURRENT TRENDS ON REGULATION OF ENVIRONMENTAL SERVICE SYSTEMS (E.G., CLIMATE CHANGE, POPULATION GROWTH, INTERNATIONAL TRADE, ETC.).</b>
	5.2.2.1	Research and categorize the purpose, implementation, and impact of greenhouse gas emission policies (e.g., cap-and-trade, emission offsetting, zero-emissions, carbon-neutrality, carbon sequestration, etc.).
	5.2.2.2	Research the impact of environmental service systems regulations on international trade.
	5.2.2.3	Examine and summarize the impact that population growth has on environmental service systems.
	5.2.2.4	Research current policies related to fracking and shale oil gas.
	5.2.2.5	Assess the effectiveness and impact of greenhouse gas emissions policies.
	5.2.2.6	Analyze how environmental service systems regulations can both negatively and positively affect international trade.
	5.2.2.7	Analyze the correlation between increased population size and the need for regulation of environmental service systems.
	5.2.2.8	Assess whether current policies related to fracking and shale oil gas sufficiently address the needs of environmental service systems.
	<b>5.2.3</b>	<b>EXAMINE AND SUMMARIZE THE IMPACT OF PUBLIC PERCEPTIONS AND SOCIAL MOVEMENTS ON THE REGULATION OF ENVIRONMENTAL SERVICE SYSTEMS.</b>
	5.2.3.1	Research and summarize how the perception and regulation of environmental service systems has changed over time.
	5.2.3.2	Examine how social views and movements (e.g., zero-waste philosophy, carbon footprints, recycling, etc.) have affected the implementation and need for regulation of environmental service systems.

	5.2.3.3	Analyze and summarize specific changes to perceptions and regulations of environmental service systems and their impact on reducing the ecological, economical, and sociological impact.
	5.2.3.4	Assess the effectiveness of specific social movements related to regulation of environmental service systems.
<b>Topic 5.3</b>	<i>Develop proposed solutions to environmental issues, problems, and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry, and ecology.</i>	
	<b>Student Competencies</b>	
	5.3.1	<b>APPLY METEOROLOGY PRINCIPLES TO ENVIRONMENTAL SERVICE SYSTEMS.</b>
	5.3.1.1	Distinguish between the different components and structural layers of the earth's atmosphere.
	5.3.1.2	Analyze how meteorological conditions influence air quality.
	5.3.1.3	Research climate change and summarize evidence that climate change is occurring.
	5.3.1.4	Examine and summarize factors that affect the earth's balance of energy.
	5.3.1.5	Differentiate how components of the atmosphere (e.g., weather systems and patterns, structure of the atmosphere, etc.) affect environmental service systems.
	5.3.1.6	Analyze and articulate the relationship between meteorological conditions, air quality, and air pollutants.
	5.3.1.7	Assess the environmental, economic, and social consequences of climate change.
	5.3.1.8	Analyze the basics of the greenhouse effect and describe how the greenhouse effect alters the earth's balance of energy.
	5.3.2	<b>APPLY SOIL SCIENCE AND HYDROLOGY PRINCIPLES TO ENVIRONMENTAL SERVICE SYSTEMS.</b>
	5.3.2.1	Differentiate and distinguish land uses, capability factors, and land capability classes.
	5.3.2.2	Research and describe the process of soil formation through weathering.
	5.3.2.3	Examine and explain how the physical qualities of the soil influence the infiltration and percolation of water.
	5.3.2.4	Summarize environmental hazards associated with groundwater supplies.
	5.3.2.5	Research and summarize hydrogeology and differentiate between groundwater and surface water.
	5.3.2.6	Research and describe how groundwater and surface water interactions affect the existence of wetlands.
	5.3.2.7	Use a soil survey to determine the land capability classes for different parcels of land in an area.
	5.3.2.8	Differentiate rock types and relate the chemical composition of mineral matter in soils to the parent material.
	5.3.2.9	Assess the physical qualities of the soil that determine its potential for filtration of groundwater supplies and likelihood for flooding.
	5.3.2.10	Assess the effectiveness of precautions taken to prevent or reduce contamination of groundwater supplies.

	5.3.2.11	Analyze how interactions between groundwater and surface water affect flow and availability of water.
	5.3.2.12	Analyze the importance of the roles played by wetlands in regards to water availability, prevention of flooding, and other factors.
	<b>5.3.3</b>	<b>APPLY CHEMISTRY PRINCIPLES TO ENVIRONMENTAL SERVICE SYSTEMS.</b>
	5.3.3.1	Examine and summarize how chemistry affects soil structure and function (e.g., pH, cation-exchange capacity, filtration capability, flooding likelihood, etc.).
	5.3.3.2	Examine and summarize how chemistry affects water quality and function (e.g., oxygen saturation, pH, biomagnification, etc.).
	5.3.3.3	Examine and summarize how chemistry affects air quality and function (e.g., heat retention, formation of smog and acid rain, etc.).
	5.3.3.4	Examine and summarize the relationship between water and soil chemistry and the formation of different kinds of wetlands (e.g., fens, peat bogs, potholes, etc.).
	5.3.3.5	Analyze the soil chemistry of a sample.
	5.3.3.6	Analyze the water chemistry of a sample.
	5.3.3.7	Analyze how components of atmospheric chemistry (e.g., air chemical components, heat, moisture, etc.) affect air quality.
	5.3.3.8	Assess how different kinds of wetlands are formed based on the different kinds of soil and water chemistry present in each case.
	<b>5.3.4</b>	<b>APPLY MICROBIOLOGY PRINCIPLES TO ENVIRONMENTAL SERVICE SYSTEMS.</b>
	5.3.4.1	Describe the microbial biodiversity found in soil and summarize the contribution of microbial biodiversity to the physical and chemical characteristics of soil.
	5.3.4.2	Research and describe how microbial populations in an ecosystem affect carbon cycling.
	5.3.4.3	Examine and explain the role that microbes play in wastewater treatment.
	5.3.4.4	Research the purposes of bioassay tests and describe potential applications for environmental service systems.
	5.3.4.5	Assess how the activities of microorganisms in soil affect environmental service systems and ecosystem biodiversity.
	5.3.4.6	Analyze the microbial populations present in an area and assess how carbon cycling is affected.
	5.3.4.7	Assess the impact of wastewater treatment on environmental service systems.
	5.3.4.8	Analyze procedures for a bioassay test.
	<b>5.3.5</b>	<b>APPLY ECOLOGY PRINCIPLES TO ENVIRONMENTAL SERVICE SYSTEMS.</b>
	5.3.5.1	Research the role that biodiversity plays in environmental service systems and how biodiversity can be measured.
	5.3.5.2	Examine and explain the role played by habitats on environmental service systems.
	5.3.5.3	Research and explain how carrying capacities relate to environmental service systems (e.g., waste processing, rate or production of pollution, disease, etc.).



	5.3.5.4	Examine and describe how ecological interactions can be used to assess environmental service systems (i.e., macroinvertebrates and/or amphibians as bioindicators).
	5.3.5.5	Calculate the amount of biodiversity in a given area using an appropriate method (e.g., quadrat assessment, transect measurements, etc.).
	5.3.5.6	Assess the impact of the current rate of habitat loss on environmental service systems.
	5.3.5.7	Assess and describe the impact of a population exceeding its carrying capacity on environmental service systems.
	5.3.5.8	Evaluate the benefits and drawbacks of using bioindicator species in environmental service systems.
<b>Topic 5.4</b>	<b><i>Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management, and energy conservation).</i></b>	
	<b>Student Competencies</b>	
	5.4.1	<b>USE POLLUTION CONTROL MEASURES TO MAINTAIN A SAFE FACILITY AND ENVIRONMENT.</b>
	5.4.1.1	Identify and distinguish types of pollution and distinguish between point source and nonpoint source pollution.
	5.4.1.2	Research ways in which pollution can be managed and prevented and propose solutions to meet the needs of local systems.
	5.4.1.3	Interpret the conditions necessary for waste to be labeled as hazardous.
	5.4.1.4	Assess how industrial and nonindustrial pollution has damaged the environment.
	5.4.1.5	Conduct tests to determine the presence and extent of pollution.
	5.4.1.6	Classify examples of pollution as hazardous or nonhazardous.
	5.4.2	<b>MANAGE SAFE DISPOSAL OF ALL CATEGORIES OF SOLID WASTE IN ENVIRONMENTAL SERVICE SYSTEMS.</b>
	5.4.2.1	Compare and contrast different types of solid waste and options for treating solid waste.
	5.4.2.2	Examine and describe the components of disposing waste in sanitary landfills.
	5.4.2.3	Research and summarize the benefits and processes of composting.
	5.4.2.4	Examine and describe the importance and potential impact of recycling.
	5.4.2.5	Analyze environmental hazards created by different types of solid waste, solid waste accumulation, and solid waste disposal.
	5.4.2.6	Analyze and document basic sanitary landfill operating procedures and design.
	5.4.2.7	Apply scientific principles to explain the benefits and processes of composting.
	5.4.2.8	Analyze and document different recycling methods and classify materials that can be recycled.
	5.4.3	<b>APPLY TECHNIQUES TO ENSURE A SAFE SUPPLY OF DRINKING WATER AND ADEQUATE TREATMENT OF WASTEWATER ACCORDING TO APPLICABLE RULES AND REGULATIONS.</b>
	5.4.3.1	Categorize chemical and physical properties of drinking water.
	5.4.3.2	Research methods commonly used to treat wastewater and septic waste.
	5.4.3.3	Analyze and document all steps in the public drinking water treatment process according to applicable standards.

	5.4.3.4	Analyze and document the steps necessary to ensure that wastewater and septic waste can be safely released into the environment.
5.4.4	<b>COMPARE AND CONTRAST THE IMPACT OF CONVENTIONAL AND ALTERNATIVE ENERGY SOURCES ON THE ENVIRONMENT AND OPERATION OF ENVIRONMENTAL SERVICE SYSTEMS.</b>	
	5.4.4.1	Research conventional energy sources and list conservation measures to reduce the impact on environmental service systems.
	5.4.4.2	Research alternative energy sources and describe the motivations for seeking alternatives to conventional energy sources as they relate to environmental monitoring.
	5.4.4.3	Examine the factors that affect energy consumption and describe how these factors are related to environmental monitoring.
	5.4.4.4	Research the impact on environmental service systems that occur because of energy consumption.
	5.4.4.5	Examine and explain how energy consumption and the carbon cycle relate to environmental monitoring.
	5.4.4.6	Research and describe the purpose and applications of life cycle assessments to environmental service systems.
	5.4.4.7	Assess the advantages and disadvantages of conventional energy sources in regards to environmental service systems.
	5.4.4.8	Identify advantages and disadvantages of alternative energy sources as they pertain to environmental service systems.
	5.4.4.9	Analyze and document the main categories of energy consumption.
	5.4.4.10	Analyze and document the most significant impacts that energy consumption has on environmental monitoring.
	5.4.4.11	Calculate the impact of the carbon cycle imbalance (due to energy consumption) and assess how this imbalance affects environmental service systems.
	5.4.4.12	Interpret a life cycle assessment and explain how it can be utilized in environmental service systems to assess the potential ecological impact of an energy source.
<b>Topic 5.5</b>	<b><i>Use tools, equipment, machinery, &amp; technology common to tasks in environmental service systems.</i></b>	
	<b>Student Competencies</b>	
5.5.1	<b>USE TECHNOLOGICAL AND MATHEMATICAL TOOLS TO MAP LAND, FACILITIES AND INFRASTRUCTURE FOR ENVIRONMENTAL SERVICE SYSTEMS.</b>	
	5.5.1.1	Examine the importance and describe applications of surveying and mapping for environmental service systems.
	5.5.1.2	Research the methods in which GIS can be used in environmental service systems (e.g., tracing of point pollution, control of the spread of invasive species, etc.).
	5.5.1.3	Research how advancements in technology (e.g., unmanned aerial vehicles and drones, genetic modification, fracking, alternative energy, etc.) have changed environmental service systems.

	5.5.1.4	Apply surveying and mapping principles to a situation involving environmental service systems and identify and explain the use of equipment for surveying and mapping.
	5.5.1.5	Apply GIS skills to a situation specific to environmental service systems.
	5.5.1.6	Analyze and document examples of utilization of breaking technology in environmental service systems.
	<b>5.5.2</b>	<b>PERFORM ASSESSMENTS OF ENVIRONMENTAL CONDITIONS USING EQUIPMENT, MACHINERY, AND TECHNOLOGY.</b>
	5.5.2.1	Research and summarize methods used to determine water quality (e.g., dissolved oxygen, chemical tests, macroinvertebrates, etc.) and determine if a source of water has been contaminated.
	5.5.2.2	Research and summarize methods and tools used to measure soil health and determine if an area of land has been contaminated (e.g., soil probes, core monolith, soil fertility tests, etc.).
	5.5.2.3	Research and summarize methods and tools used to determine air quality and determine if pollution is present (e.g., CO2 probe, particulate matter sampler, etc.).
	5.5.2.4	Research and summarize methods used to determine ecological health and determine if an ecosystem is threatened (e.g., quadrat analysis, bioindicators, mark-recapture, etc.).
	5.5.2.5	Assess different measurements of water quality to determine their effectiveness and limitations.
	5.5.2.6	Assess different measurements of soil quality (e.g., soil horizons, soil texture, organic matter, soil respiration, etc.) to determine their effectiveness and limitations.
	5.5.2.7	Assess different measurements of air quality (e.g., ozone, carbon monoxide, particulate matter, etc.) to determine their effectiveness and limitations.
	5.5.2.8	Assess different measurements of assessing ecological health (e.g., quadrat biodiversity assessments, transect surveys, population counts, detection of disease, and invasive species, etc.) to determine their effectiveness and limitations.

Standard 7	<b>NATURAL RESOURCE SYSTEMS</b>	
<b>Topic 7.1</b>	<i>Plan and conduct natural resource management activities that apply logical, reasoned, and scientifically based solutions to natural resource issues and goals.</i>	
<b>Student Competencies</b>		
7.1.1	<b>APPLY METHODS OF CLASSIFICATION TO EXAMINE NATURAL RESOURCE AVAILABILITY AND ECOSYSTEM FUNCTION IN A PARTICULAR REGION.</b>	
	7.1.1.1	Summarize and classify the different kinds of natural resources using common classification schemes (e.g., living vs. non-living, renewable vs. nonrenewable, native vs. introduced, etc.).
	7.1.1.2	Summarize the components that comprise all ecosystems.
	7.1.1.3	Summarize and classify different kinds of living species based on evolutionary traits.
	7.1.1.4	Assess the characteristics of a natural resource to determine its classification.
	7.1.1.5	Analyze the interdependence of organisms within an ecosystem (e.g., food webs, niches, impact of keystone species, etc.) and assess the dependence of organisms on nonliving components (climate, geography, energy flow, nutrient cycling, etc.).
	7.1.1.6	Analyze how biodiversity develops through evolution, natural selection, and adaptation; explain the importance of biodiversity to ecosystem function and availability of natural resources.
	7.1.2	<b>CLASSIFY DIFFERENT TYPES OF NATURAL RESOURCES IN ORDER TO ENABLE PROTECTION, CONSERVATION, ENHANCEMENT, AND MANAGEMENT IN A PARTICULAR GEOGRAPHICAL REGION.</b>
	7.1.2.1	Research and examine the characteristics used to identify trees and woody plants.
	7.1.2.2	Research and examine the characteristics used to identify herbaceous plants.
	7.1.2.3	Research and examine the characteristics used to identify wildlife and insects.
	7.1.2.4	Research and examine the characteristics used to identify aquatic species.
	7.1.2.5	Research and examine the characteristics used to identify non-living resources (e.g., soil types, climate, geography, etc.).
	7.1.2.6	Research the purpose and value of resource inventories and population studies.
	7.1.2.7	Apply identification techniques to determine the species of a tree or woody plant.
	7.1.2.8	Apply identification techniques to determine the species of an herbaceous plant.
	7.1.2.9	Apply identification techniques to determine the species of wildlife or insect.
	7.1.2.10	Apply identification techniques to determine the species of an aquatic organism.
	7.1.2.11	Apply identification techniques to determine the types of non-living resources in an area.
	7.1.2.12	Apply procedures for conducting resource inventories and population studies.
	7.1.3	<b>APPLY ECOLOGICAL CONCEPTS AND PRINCIPLES TO ATMOSPHERIC NATURAL RESOURCE SYSTEMS.</b>
	7.1.3.1	Classify different kinds of biogeochemical cycles and the role they play in natural resources systems.

	7.1.3.2	Research and summarize how climate factors influence natural resource systems.
	7.1.3.3	Assess the role that the atmosphere plays in the regulation of biogeochemical cycles.
	7.1.3.4	Analyze the impact that climate has on natural resources and debate how this impact has changed due to human activity.
	7.1.4	<b>APPLY ECOLOGICAL CONCEPTS AND PRINCIPLES TO AQUATIC NATURAL RESOURCE SYSTEMS.</b>
	7.1.4.1	Summarize the roles and properties of watersheds.
	7.1.4.2	Examine and describe the importance of groundwater and surface water to natural resources.
	7.1.4.3	Compare and contrast riparian zones and riparian buffers based on their function.
	7.1.4.4	Assess the function of watersheds and their effect on natural resources.
	7.1.4.5	Analyze how different classifications of ground and surface water affect ecosystem function.
	7.1.4.6	Assess techniques used in the creation, enhancement, and management of riparian zones and riparian buffers.
	7.1.5	<b>APPLY ECOLOGICAL CONCEPTS AND PRINCIPLES TO TERRESTRIAL NATURAL RESOURCE SYSTEMS.</b>
	7.1.5.1	Research and describe the stages of ecological succession.
	7.1.5.2	Compare and contrast the impact of habitat disturbances and habitat resilience.
	7.1.5.3	Compare and contrast techniques associated with sustainable forestry (e.g., timber stand improvement, diversity improvement, reforestation, etc.).
	7.1.5.4	Compare and contrast techniques associated with soil management (e.g., soil survey and interpretation, erosion control, etc.).
	7.1.5.5	Analyze and summarize examples of stages of succession.
	7.1.5.6	Analyze and summarize examples of habitat disturbances and habitat resilience.
	7.1.5.7	Analyze a forest in order to determine which forestry techniques would improve that habitat.
	7.1.5.8	Analyze a plot of land in order to determine which soil management techniques would be most applicable.
	7.1.6	<b>APPLY ECOLOGICAL CONCEPTS AND PRINCIPLES TO LIVING ORGANISMS IN NATURAL RESOURCE SYSTEMS.</b>
	7.1.6.1	Differentiate between population ecology, population density, and population dispersion and describe the importance of these concepts to natural resource systems.
	7.1.6.2	Research and summarize examples of invasive species.
	7.1.6.3	Analyze the factors that influence population density and population dispersion in natural resource systems.

	7.1.6.4	Analyze factors that influence the establishment and spread of invasive species and determine the appropriate steps to prevent or minimize the impact of invasive species.
<b>Topic 7.2</b>	<b>Analyze the interrelationships between natural resources and humans.</b>	
	<b>Student Competencies</b>	
	7.2.1	<b>EXAMINE &amp; INTERPRET THE PURPOSE, ENFORCEMENT, IMPACT, &amp; EFFECTIVENESS OF LAWS &amp; AGENCIES RELATED TO NATURAL RESOURCE MANAGEMENT, PROTECTION, ENHANCEMENT, &amp; IMPROVEMENT (E.G., WATER REGULATIONS, GAME LAWS, HISTORIC PRESERVATION LAWS, ENVIRONMENTAL POLICY, ETC.).</b>
	7.2.1.1	Distinguish between the types of laws associated with natural resources systems.
	7.2.1.2	Distinguish between the types of agencies associated with natural resources systems.
	7.2.1.3	Analyze the structure of laws associated with natural resources systems.
	7.2.1.4	Analyze the specific purpose of agencies associated with natural resources systems.
	7.2.2	<b>ASSESS THE IMPACT OF HUMAN ACTIVITIES ON THE AVAILABILITY OF NATURAL RESOURCES.</b>
	7.2.2.1	Summarize the relationship between natural resources, ecosystems, and human activity.
	7.2.2.2	Categorize the primary causes of extinction of living species due to human activity (e.g., overharvesting, habitat loss, invasive species, pollution, etc.).
	7.2.2.3	Examine and describe the manner in which modern lifestyles are related to the depletion of natural resources.
	7.2.2.4	Assess and explain how different kinds of human activity affect the use and availability of natural resources (i.e., agriculture, industry, transportation, etc.).
	7.2.2.5	Assess causes of extinction and describe how those causes related to loss of biodiversity.
	7.2.2.6	Identify solutions to improve the sustainability of modern lifestyles.
	7.2.3	<b>ANALYZE HOW MODERN PERCEPTIONS OF NATURAL RESOURCE MANAGEMENT, PROTECTION, ENHANCEMENT, &amp; IMPROVEMENT CHANGE &amp; DEVELOP OVER TIME.</b>
	7.2.3.1	Summarize and categorize the different social considerations in regards to the use of natural resources (e.g., public vs. private, laws and regulations, economics, green technology, etc.).
	7.2.3.2	Research and assess how historical figures played a prominent role in shaping how natural resources are viewed and used today (e.g., Aldo Leopold, Teddy Roosevelt, John Muir, Rachel Carson, Gaylord Nelson, etc.).
	7.2.3.3	Research how technology has affected the use and views of natural resources.
	7.2.3.4	Analyze how social considerations can affect the use and sustainability of natural resources.
	7.2.3.5	Examine and describe the relationship between current trends in natural resource systems and historical figures that played a prominent role in shaping how natural resources are viewed and used today.

	7.2.3.6	Analyze & document how some technological advancements changed how natural resources were used and viewed (e.g., Industrial Revolution, fossil fuels, green technology, etc.).
	7.2.4	<b>EXAMINE AND EXPLAIN HOW ECONOMICS AFFECTS THE USE OF NATURAL RESOURCES.</b>
	7.2.4.1	Compare and contrast how the economic value of a natural resource affects its availability.
	7.2.4.2	Research the impact of the use of natural resources on local, state and national economies (e.g., outdoor recreation, energy production, preservation, etc.).
	7.2.4.3	Compare and contrast the economic impact of green technology and alternative energy.
	7.2.4.4	Assess whether economic value increases or decreases the conservation, protection, improvement, and enhancement of natural resources.
	7.2.4.5	Assess the importance of the use of natural resources on local, state, and national economies.
	7.2.4.6	Analyze and document how the adoption of green technology and/or alternative energy affected a local, state, or national economy.
	7.2.5	<b>COMMUNICATE INFORMATION TO THE PUBLIC REGARDING TOPICS RELATED TO THE MANAGEMENT, PROTECTION, ENHANCEMENT, AND IMPROVEMENT OF NATURAL RESOURCES.</b>
	7.2.5.1	Examine and describe ways in which a message regarding natural resources may be communicated to the public through standard media sources (e.g., press, radio, TV, public appearances, etc.).
	7.2.5.2	Research and summarize how social media and the Internet have changed how people perceive and utilize natural resources (e.g., greater awareness of conservation issues, calls to action, etc.).
	7.2.5.3	Examine and describe how communication can be used to influence behavior, call people to action, and instill a sense of civic behavior related to the conservation, management, enhancement, and improvement of natural resources.
	7.2.5.4	Assess the effectiveness of different methods for communicating natural resource messages.
	7.2.5.5	Assess how to most effectively communicate a message about the conservation, management, enhancement, and improvement of natural resources via social media and the Internet.
	7.2.5.6	Analyze and summarize examples of how communication can be used to influence behavior, call people to action, and instill a sense of civic behavior related to the conservation, management, enhancement, and improvement of natural resources.
<b>Topic 7.3</b>	<b><i>Develop plans to ensure sustainable production and processing of natural resources.</i></b>	
	<b>Student Competencies</b>	
	7.3.1	<b>SUSTAINABLY PRODUCE, HARVEST, PROCESS, AND USE NATURAL RESOURCE PRODUCTS (E.G., FOREST PRODUCTS, WILDLIFE, MINERALS, FOSSIL FUELS, SHALE OIL, ALTERNATIVE ENERGY, RECREATION, AQUATIC SPECIES, ETC.).</b>
	7.3.1.1	Summarize forest harvesting methods.
	7.3.1.2	Research and describe methods by which wildlife can be sustainably harvested (e.g., controlled harvests, hunting licenses, regulations, etc.).

	7.3.1.3	Compare and contrast the costs and benefits (e.g., impacts on environment, economic, wildlife, etc.) of mineral extraction to a local, state, and/or national economy.
	7.3.1.4	Compare and contrast the costs and benefits (e.g., impacts on environment, economic, wildlife, etc.) of fossil fuels to a local, state, and/or national economy.
	7.3.1.5	Compare and contrast the costs and benefits (e.g., environmental impacts, etc.) of shale oil from fracking to a local, state, and/or national economy.
	7.3.1.6	Compare and contrast the costs and benefits (e.g., environmental impacts, etc.) of alternative sources of energy (e.g., hydroelectric, solar, wind, biofuels, geothermal, etc.).
	7.3.1.7	Research and summarize how recreational uses of natural resources can be changed to improve sustainability.
	7.3.1.8	Categorize aquatic species used for commercial and recreational purposes.
	7.3.1.9	Assess harvesting methods in regards to their economic value, environmental impact, and other factors.
	7.3.1.10	Assess and apply techniques used to harvest wildlife in regards to sustainability, practicality, and other factors.
	7.3.1.11	Assess the economic impact of mineral extraction in regards to the costs and benefits to a local, state, and/or national economy.
	7.3.1.12	Assess the economic impact of fossil fuel extraction in regards to the costs and benefits to a local, state, and/or national economy.
	7.3.1.13	Assess the economic impact of shale oil extraction (i.e., fracking) in regards to the costs and benefits to a local, state, and/or national economy.
	7.3.1.14	Assess and evaluate factors that affect the economic, environmental, and social sustainability in regards to the use of alternative sources of energy.
	7.3.1.15	Assess different options for improving the sustainability of outdoor recreation based on its impact on natural resources and likelihood of acceptance.
	7.3.1.16	Analyze and apply techniques used to acquire aquatic species for their environmental, economic, and social sustainability.
	7.3.2	<b>DEMONSTRATE CARTOGRAPHIC SKILLS, TOOLS, AND TECHNOLOGIES TO AID IN DEVELOPING, IMPLEMENTING, AND EVALUATING NATURAL RESOURCE MANAGEMENT PLANS.</b>
	7.3.2.1	Summarize how to use maps and technologies to identify directions and land features, calculate actual distance, and determine the elevations of points.
	7.3.2.2	Summarize how GIS can be used to manage, conserve, improve, and enhance the natural resources of an area.
	7.3.2.3	Apply cartographic skills and tools and technologies (e.g., land surveys, geographic coordinate systems, etc.) to locate natural resources.
	7.3.2.4	Analyze an area's resources using GIS technologies.



<b>Topic 7.4</b>	<i>Use GIS data for a given area to devise a management plan for the management, conservation, improvement, and enhancement of its natural resources.</i>	
	<b>Student Competencies</b>	
	7.4.1	<b>DEMONSTRATE NATURAL RESOURCE PROTECTION, MAINTENANCE, ENHANCEMENT, AND IMPROVEMENT TECHNIQUES.</b>
	7.4.1.1	Identify and categorize different kinds of streams.
	7.4.1.2	Identify and categorize characteristics of a healthy forest.
	7.4.1.3	Identify and categorize characteristics of a healthy wildlife habitat.
	7.4.1.4	Identify and categorize characteristics of healthy rangeland.
	7.4.1.5	Identify and categorize characteristics of natural resources that make them desirable for recreational purposes.
	7.4.1.6	Identify and categorize characteristics of healthy marine and coastal natural resources.
	7.4.1.7	Assess and explain indicators of the biological health of a stream.
	7.4.1.8	Assess and apply the methods used to improve a forest stand.
	7.4.1.9	Assess and apply methods of wildlife habitat improvement.
	7.4.1.10	Assess and apply methods of rangeland improvement.
	7.4.1.11	Assess and apply management techniques for improving outdoor recreation opportunities.
	7.4.1.12	Assess and apply methods to improve marine and coastal natural resources.
	7.4.2	<b>DIAGNOSE PLANT AND WILDLIFE DISEASES AND FOLLOW PROTOCOLS TO PREVENT THEIR SPREAD.</b>
	7.4.2.1	Classify causes of diseases in plants and the correct authorities to whom some diseases should be reported.
	7.4.2.2	Classify causes of diseases in wildlife and aquatic species and determine the correct authorities to whom some diseases should be reported.
	7.4.2.3	Analyze a plant disease based on its symptoms, identify if the disease needs to be reported to authorities, and determine to which authorities it should be reported.
	7.4.2.4	Analyze a wildlife or aquatic species disease based on its symptoms, identify if the disease needs to be reported to authorities, and determine to which authorities it should be reported.
	7.4.3	<b>PREVENT OR MANAGE INTRODUCTION OF ECOLOGICALLY HARMFUL SPECIES IN A PARTICULAR REGION.</b>
	7.4.3.1	Categorize harmful and beneficial insects, as well as signs of insect damage to natural resources.
	7.4.3.2	Identify and classify invasive species common to a particular region.
	7.4.3.3	Research and summarize strategies and benefits of preventing the introduction of harmful species to a particular region.
	7.4.3.4	Analyze signs of insect infestation, identify if it needs to be reported to authorities, and determine to which authorities it should be reported.

	7.4.3.5	Analyze signs of the spread of invasive species, identify if it needs to be reported to authorities, and determine to which authorities it should be reported.
	7.4.3.6	Assess and implement a plan for preventing the spread of harmful species for its effectiveness.
7.4.4	<b>MANAGE FIRES IN NATURAL RESOURCE SYSTEMS.</b>	
	7.4.4.1	Differentiate between desirable and undesirable fires and research the role fire plays in a healthy ecosystem.
	7.4.4.2	Research and summarize how fire management techniques have evolved.
	7.4.4.3	Assess and apply techniques used to fight wildfires, manage prescribed fires, and ensure human safety.
	7.4.4.4	Assess the effectiveness of techniques previously & currently used to prevent harmful fires.

## Career Ready Practices (CRP)

### FFA & SUPERVISED AGRICULTURAL EXPERIENCE

CRP 1	<b>Act as a responsible and contributing citizen and employee.</b>
CRP 2	<b>Apply appropriate academic and technical skills.</b>
CRP 3	<b>Attend to personal health and financial well-being.</b>
CRP 4	<b>Communicate clearly, effectively, and with reason.</b>
CRP 5	<b>Consider the environmental, social, and economic impacts of decisions.</b>
CRP 6	<b>Demonstrate creativity and innovation.</b>
CRP 7	<b>Employ valid and reliable research strategies.</b>
CRP 8	<b>Utilize critical thinking to make sense of problems and persevere in solving them.</b>
CRP 9	<b>Model integrity, ethical leadership, and effective management.</b>
CRP 10	<b>Plan education and career path aligned to personal goals.</b>
CRP 11	<b>Use technology to enhance productivity.</b>
CRP 12	<b>Work productively in teams while using cultural/global competence.</b>