

# Ecology and Environmental Management

**8045 18 weeks**

**8046 36 weeks**

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## Acknowledgments

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## Course Description

**Suggested Grade Level:** 9 or 10 or 11 or 12

Students develop competencies and skills related to understanding environmental concerns, protecting natural resources and ecosystems, and practicing concepts of sustainability related to agricultural production. Instructional content includes the care, management, and preservation of land, soil, air, water, forests, fish, and wildlife resources for health, economic, and recreational purposes and career opportunities related to ecology and the environment. Students identify and discuss prevalent environmental problems and learn methods and practices used to preserve and use natural resources in a sustainable manner to ensure and maintain ecological health. Teachers incorporate specific environmental concerns and issues common to the local community. This course supports components of biology, chemistry, and incorporates classroom and laboratory activities to emphasize leadership through opportunities in FFA and supervised agricultural experiences (SAEs).

## Task Essentials Table

8045	8046	Tasks/Competencies
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<input checked="" type="radio"/>	<input checked="" type="radio"/>	Identify the role of supervised agricultural experiences (SAEs) in agricultural education.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Participate in an SAE.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Identify the benefits and responsibilities of FFA membership.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Describe leadership characteristics and opportunities as they relate to agriculture and FFA.
<input type="radio"/>	<input type="radio"/>	Apply for an FFA degree and/or an agricultural proficiency award.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Describe occupations in natural resource management and conservation areas including regulatory and non-regulatory services.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Develop a list of local, state, and federal agencies and nonprofit organizations that work with the environment and/or natural resources.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Identify environmental and natural resource management and conservation businesses in the community.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Explain the importance of the environment in sustaining living organisms.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Define basic terminology in ecology and other environmental science.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Explain energy transfer.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Describe the effects of natural events and anthropogenic influences on ecosystems.
<input type="radio"/>	<input checked="" type="radio"/>	Explain principles and processes of ecological succession.
<input type="radio"/>	<input type="radio"/>	Illustrate geometric vs. arithmetic increases in population growth.
<input type="radio"/>	<input checked="" type="radio"/>	Describe the logistics of population growth.
<input type="radio"/>	<input type="radio"/>	Explain the tragedy of the commons.
<input type="radio"/>	<input type="radio"/>	Explain the role of biodiversity in ecosystem stability.
<input type="radio"/>	<input type="radio"/>	Identify the effects of latitude and altitude on species diversity.
<input type="radio"/>	<input type="radio"/>	Explain the process of species differentiation.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Diagram the composition of the atmosphere.
<input type="radio"/>	<input checked="" type="radio"/>	Outline effective methods to control various air pollutants.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Explain the effects of greenhouse gases.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Determine the sources and effects of acid rain.
<input type="radio"/>	<input checked="" type="radio"/>	Analyze the conversation surrounding ozone depletion.

<input type="radio"/>	<input checked="" type="radio"/>	Define <i>noise pollution</i> .
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Research noise restrictions for a locality.
<input type="radio"/>	<input checked="" type="radio"/>	Identify different types of noise pollution and the effect on humans, wildlife, and ecological systems.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Describe the soil-formation process.
<input type="radio"/>	<input type="radio"/>	Classify soils using the soil taxonomy system.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Identify differences in soil profiles.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Investigate soil types.
<input type="radio"/>	<input checked="" type="radio"/>	Interpret data contained in soil maps.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Explain land capability classes.
<input type="radio"/>	<input checked="" type="radio"/>	Explain leaching in soils.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Collect soil samples to analyze for composition.
<input type="radio"/>	<input checked="" type="radio"/>	Interpret soil test results to make nutrient recommendations.
<input type="radio"/>	<input checked="" type="radio"/>	Explain how wind and water erode soil.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Identify common materials used for riparian buffers and vegetative erosion control methods.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Explain the effects of erosion on plants, animals, and their habitats.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Describe crop rotation and no-till agriculture.
<input type="radio"/>	<input type="radio"/>	Explain mechanical erosion controls.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Define characteristics of water.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Define <i>wetlands</i> and uses.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Illustrate the hydrologic cycle.
<input type="radio"/>	<input type="radio"/>	Illustrate components of the riverine system.
<input type="radio"/>	<input type="radio"/>	Identify characteristics of an estuarine system.
<input type="radio"/>	<input type="radio"/>	Describe an aquatic zonation system.
<input type="radio"/>	<input type="radio"/>	Explain the different ways water moves in the oceans and the factors affecting movement.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Explain groundwater and sources of groundwater.

<input type="radio"/>	<input type="radio"/>	Explain the role of frozen water in Earth's systems.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Define <i>water table</i> .
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Explain the Clean Water Act.
<input type="radio"/>	<input checked="" type="radio"/>	Examine the water needs for an agricultural enterprise, school, or home.
<input type="radio"/>	<input checked="" type="radio"/>	Define <i>point</i> and <i>nonpoint source</i> (NPS) pollution.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Identify major water pollutants and their effects on the environment.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Define <i>karst topography</i> .
<input type="radio"/>	<input checked="" type="radio"/>	Analyze water samples for chemical pollutants and biological organisms.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Analyze water quality using the Izaak Walton League of America (IWLA) method.
<input type="radio"/>	<input checked="" type="radio"/>	Explain the effects of water pollution on agricultural production.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Define <i>eutrophication</i> and its relationship to nutrient-rich waters.
<input type="radio"/>	<input type="radio"/>	Report on the effects of polluted water on animals and humans.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Compare methods used to reduce surface and groundwater contamination.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Select best management practices designed to improve water quality.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Identify the characteristics of a watershed.
<input type="radio"/>	<input type="radio"/>	Interpret a flood-hazard analysis.
<input type="radio"/>	<input type="radio"/>	Explain methods of flood control.
<input type="radio"/>	<input type="radio"/>	Compare stream bank protection measures.
<input type="radio"/>	<input checked="" type="radio"/>	Examine environmental agencies: Environmental Protection Agency (EPA), U.S. Department of Agriculture (USDA), Virginia Department of Agriculture and Consumer Services (VDACS), Virginia Department of Environmental Quality (DEQ), Virginia Department of Game and Inland Fisheries (VDGIF), and Virginia Department of Forestry (VDOP).
<input type="radio"/>	<input checked="" type="radio"/>	Identify local, state, national, and global issues concerning agriculture and the environment.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Summarize how agriculture and the environment are related.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Compare sustainability practices and multiple-use management strategies and their uses to protect and maintain Virginia's forest ecosystems.
<input type="radio"/>	<input type="radio"/>	Outline the Virginia Erosion and Sediment Control Law.
<input type="radio"/>	<input type="radio"/>	Define <i>organic farming</i> .

<input checked="" type="radio"/>	<input checked="" type="radio"/>	Assess how technology has influenced pollution problems.
<input type="radio"/>	<input checked="" type="radio"/>	Identify major land uses and their effects on the environment and ecosystems.
<input type="radio"/>	<input checked="" type="radio"/>	Explain zoning classifications and their effects.
<input type="radio"/>	<input type="radio"/>	Classify land zoning according to its uses.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Describe green infrastructure.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Describe the role of hunting and fishing in the management of wildlife.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Identify common game species native to Virginia.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Contrast habitat requirements for various fish and wildlife.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Describe human conflicts with wildlife populations.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Describe the environmental effects of overpopulation of wildlife.
<input type="radio"/>	<input type="radio"/>	Identify local plants or trees that provide food and/or cover for animals and birds.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Explain measurement of the wildlife and fish population.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Explain the difference among extinct, endangered, and threatened species of wildlife.
<input type="radio"/>	<input type="radio"/>	Identify Virginia's threatened and endangered species.
<input type="radio"/>	<input type="radio"/>	Identify diseases and parasites in wildlife.
<input type="radio"/>	<input checked="" type="radio"/>	List methods to improve reintroduction of species to a natural habitat.
<input type="radio"/>	<input type="radio"/>	Describe management practices of freshwater fisheries.
<input type="radio"/>	<input checked="" type="radio"/>	Summarize the aquaculture industry.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Describe the effects of habitat loss.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Explain basic tree structure and growth.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Identify forest trees of Virginia.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Explain invasive species and their effects on native populations.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Differentiate between forest types.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Identify tree diseases and insect pests.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Calculate the value of standing timber.
<input type="radio"/>	<input checked="" type="radio"/>	Identify forest products and uses of harvested trees.

<input type="radio"/>	<input type="radio"/>	Explain why trees are undesirable and selected for removal.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Compare methods of forest harvest and regeneration.
<input type="radio"/>	<input type="radio"/>	Describe factors considered when determining species most appropriate for reforestation.
<input type="radio"/>	<input type="radio"/>	Examine the uses of prescribed burning.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Explain the development and anatomy of a forest wildfire.
<input type="radio"/>	<input type="radio"/>	Develop forest wildfire prevention techniques.
<input type="radio"/>	<input checked="" type="radio"/>	Evaluate forest wildfire fighting techniques.
<input type="radio"/>	<input checked="" type="radio"/>	Explain the use of herbicides in forest management.
<input type="radio"/>	<input checked="" type="radio"/>	Research the Conservation Stewardship Program (CSP) offered through the Virginia Department of Forestry (VDOF).
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Explain how urban forests fit into the urban ecosystem.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Identify the benefits of urban forests.
<input type="radio"/>	<input type="radio"/>	Explain the relationship between urban forests and air and water quality.
<input type="radio"/>	<input type="radio"/>	Identify plant species appropriate to urban development.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Identify best management practices for tree care.
<input type="radio"/>	<input type="radio"/>	Describe unfavorable conditions that urban trees experience.
<input type="radio"/>	<input checked="" type="radio"/>	Calculate the benefits of an urban tree.
<input type="radio"/>	<input checked="" type="radio"/>	Describe techniques for planting and establishing trees.
<input type="radio"/>	<input type="radio"/>	Develop a mulching, pruning, fertilization, and pest control plan for urban plantings.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Describe a topographic map, a relief map, and satellite imagery.
<input type="radio"/>	<input type="radio"/>	Interpret a topographic land map.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Create a topographic land map.
<input type="radio"/>	<input type="radio"/>	Determine percentage slope on a topographic map.
<input type="radio"/>	<input type="radio"/>	Interpret maps for correlation to geographic features.
<input type="radio"/>	<input checked="" type="radio"/>	Identify cardinal directions on maps and in the outdoors.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Use a compass to orient various locations on a map.

<input type="radio"/>	<input type="radio"/>	Use triangulation to estimate unknown location from one or more known locations.
<input type="radio"/>	<input type="radio"/>	Define <i>geographic information system (GIS)</i> .
<input type="radio"/>	<input type="radio"/>	Explain global positioning system (GPS).
<input type="radio"/>	<input type="radio"/>	Explain the processes carried out in a sewage plant.
<input type="radio"/>	<input type="radio"/>	Explain a sewage disposal system.
<input type="radio"/>	<input checked="" type="radio"/>	Outline the systems for hazardous waste disposal.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Identify common methods of waste disposal.
<input type="radio"/>	<input type="radio"/>	Design a landfill.
<input type="radio"/>	<input type="radio"/>	Describe forms of energy usable to humans.
<input type="radio"/>	<input type="radio"/>	Outline energy production trends in the United States and worldwide.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Explain traditional and primary energy sources in use today.
<input checked="" type="radio"/>	<input checked="" type="radio"/>	Describe alternative sources of energy.
<input type="radio"/>	<input type="radio"/>	Evaluate appliances for energy use and conservation.
<input type="radio"/>	<input type="radio"/>	Describe how various energy sources are obtained, processed, distributed, and used.
<input type="radio"/>	<input type="radio"/>	Explain problems associated with the production, processing, distribution, and use of various energy sources.

Legend:  Essential  Non-essential  Omitted

**Note: Competencies 39-43 have been added to ensure compliance with federal legislation: National FFA Organization's Federal Charter Amendments Act (Public Law 116-7, <https://www.congress.gov/116/plaws/publ7/PLAW-116publ7.pdf>). All inquiries may be sent to [cte@doe.virginia.gov](mailto:cte@doe.virginia.gov). Students are provided opportunities for leadership, personal growth, and career success. Instruction is delivered through three major components: classroom and laboratory instruction, supervised agricultural experience (SAE) program, and student leadership (FFA).**

# Curriculum Framework

## Task Number 39

# Identify the role of supervised agricultural experiences (SAEs) in agricultural education.

## Definition

Identification should include

- defining an SAE program as *an opportunity for students to consider multiple careers and occupations in the agriculture, food, and natural resources (AFNR) industries, learn expected workplace behavior, develop specific skills within an industry, and apply academic and occupational skills in the workplace or a simulated workplace environment*
- researching the Foundational SAE
  - career exploration and planning
  - personal financial planning and management
  - workplace safety
  - employability skills for college and career readiness
  - agricultural literacy
- researching the Immersion SAE
  - entrepreneurship/ownership
  - placement/internships
  - research (experimental, analytical, invention)
  - school business enterprises
  - service learning
- developing a plan to participate in an SAE, based on personal and career goals
- researching available awards and degrees, based on SAE participation.

Teacher resource: [SAE Resources](#), National Council for Agricultural Education

## Process/Skill Questions

- What are examples of SAEs related to this course and in the AFNR industries?
- Where can a copy of the Virginia SAE Record Book be found?
- What is an Immersion SAE?
- How does a placement/internship SAE differ from an ownership/entrepreneurship SAE?
- How does an SAE provide relevant work experience and contribute to the development of critical thinking skills?
- How is the SAE an extended individualized instructional component of a student's Career Plan of Study?
- How can an SAE be used to provide evidence of student growth and participation in authentic, work-related tasks?
- What are the four types of SAEs?
- What are the advantages of participating in work-based learning experiences and projects?
- How does one choose an appropriate SAE in which to participate?

## Task Number 40

# Participate in an SAE.

## Definition

Participation should include

- developing, completing, or continuing a plan to participate in an SAE as a work-based learning experience, based on personal and career goals
- documenting experience, connections, positions held, and competencies attained, using the *Virginia SAE Record Book*
- researching available awards and degrees, based on SAE participation.

Teacher resources:

[FFA SAE](#)

[The Agricultural Experience Tracker](#)

## Process/Skill Questions

- What are the advantages of participating in work-based learning experiences and projects?
- How do SAEs help prepare students for the workforce?
- What are some examples of SAEs in AFNR?

# Exploring Leadership Opportunities through FFA

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## Task Number 41

### Identify the benefits and responsibilities of FFA membership.

#### Definition

Identification should include

- benefits
  - listing opportunities to participate in community improvement projects and career development events (CDEs) and leadership development events (LDEs)
  - exploring leadership development opportunities
- responsibilities
  - researching the responsibilities of FFA officers, committees, and members
  - locating resources that guide participation in FFA activities
  - explaining the FFA Creed, Motto, Salute, and mission statement
  - explaining the meaning of the FFA emblem, colors, and symbols
  - explaining significant events and the history of the organization.

## **Process/Skill Questions**

- How does one become an FFA member?
- What is the FFA's mission and how does it accomplish its mission?
- What are the benefits and responsibilities of FFA membership?
- What five FFA activities are available through the local chapter?
- What are some significant events in FFA history? How have these events shaped membership over time?
- What is the FFA program of activities (POA), and how is it used?

## **Task Number 42**

### **Describe leadership characteristics and opportunities as they relate to agriculture and FFA.**

#### **Definition**

Description should include

- examples of successful leaders
- types of leadership
  - autocratic
  - participative
  - laissez-faire
  - servant
  - followership
- positive leadership qualities and traits of successful leaders
- opportunities for participating in leadership activities in FFA
- demonstrating methods for conducting an effective meeting.

## **Process/Skill Questions**

- Who are some successful leaders in the agriculture industry?
- What qualities make a successful leader?
- What are leadership traits?
- What is the difference between positive and negative leadership?

## **Task Number 43**

### **Apply for an FFA degree and/or an agricultural proficiency award.**

#### **Definition**

Application should include

- identifying types of FFA degrees
  - Greenhand

- Chapter
- State
- American
- identifying proficiency award areas
  - entrepreneurship
  - placement
  - combined
  - agriscience research
- exploring CDEs and LDEs related to this course
- identifying all SAE criteria to be eligible for the award
- identifying the type of award
- applying for an FFA award.

Teacher resource: [FFA Agricultural Proficiency Awards](#)

### **Process/Skill Questions**

- Where are the awards and their application criteria located?
- What are the benefits of winning an FFA award?
- What are the benefits and requirements of an FFA degree?
- What FFA awards are available?
- How does the FFA degree program reward FFA members in all phases of leadership, skills, and occupational development?
- What is the highest degree that can be conferred upon an FFA member at the national level?
- What are the requirements for a Greenhand FFA degree?

# **Identifying Careers in Environmental Management**

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## **Task Number 44**

**Describe occupations in natural resource management and conservation areas including regulatory and non-regulatory services.**

### **Definition**

Description should include, but not be limited to

- conservation police officer
- environmental protection specialist
- Natural Resources Conservation Service (NRCS) employee
- Soil and Water Conservation District (SWCD) technician
- research biologist
- field biologist
- forester

- wildlife biologist
- park ranger
- alternative-energy jobs.

### **Process/Skill Questions**

- What academic and/or technical training is required for a career in natural resource management and conservation?
- What is the level of education required for each of these jobs?
- What is the typical salary for each of these jobs?
- What are the working conditions for each of these jobs?
- What is the job description for each of these jobs?
- What are examples of potential local employers?

## **Task Number 45**

### **Develop a list of local, state, and federal agencies and nonprofit organizations that work with the environment and/or natural resources.**

#### **Definition**

Development should include agencies and organizations such as

- Natural Resources Conservation Service (NRCS)
- Virginia Department of Environmental Quality (DEQ)
- Virginia Department of Finance(DOF)
- Virginia Department of Game and Inland Fisheries (DGIF)
- Virginia Department of Conservation and Recreation (DCR)
- Virginia Department of Agriculture and Consumer Services
- Army Corps of Engineers (ACOE)
- Virginia Fish and Wildlife Service (FWS)
- Chesapeake Bay Foundation (CBF)
- United States Environmental Protection Agency (EPA)
- Virginia Department of Forestry (VDOT)
- Virginia Soil and Water Conservation Districts (VASWCD)
- National Oceanic and Atmospheric Administration (NOAA)
- National Park System (NPS)
- United States Fish and Wildlife Service (USFWS)
- The Nature Conservancy.

### **Process/Skill Questions**

- What are the responsibilities of these agencies/organizations?
- What is the best way to reach appropriate individuals within these agencies/organizations?
- How do these organizations work together?
- What resources and/or services do these organizations provide to the public?

## Task Number 46

**Identify environmental and natural resource management and conservation businesses in the community.**

### Definition

Identification should include green technology companies, such as those specializing in

- geothermal
- solar
- wind
- composting
- arboriculture
- stormwater
- water quality
- engineering
- waste management
- permaculture
- organic farming
- indoor farming
- home-energy-audit businesses.

Teacher Resource:

[15 Green Business Ideas for Eco-Minded Entrepreneurs](#)

### Process/Skill Questions

- Why has there been an increase in demand for these kinds of businesses?
- How do these businesses differ among locations?
- What is true cost?
- How do these kinds of businesses address the concept of true cost?

## Developing Basic Environmental Science Concepts

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## Task Number 47

**Explain the importance of the environment in sustaining living organisms.**

### Definition

Explanation should include

- environmental health
- habitat (i.e., requirements for life: food, water, shelter, space).

### **Process/Skill Questions**

- What are factors of environmental health?
- How is a habitat an example of environmental health?
- What are the three basic human needs and sources for food, clothing, and shelter?

## **Task Number 48**

### **Define basic terminology in ecology and other environmental science.**

#### **Definition**

Definitions may include, but are not limited to

- *range of tolerance*
- *carrying capacity (biological and cultural)*
- *ecology*
- *ecosystem*
- *organism*
- *population*
- *community*
- *species*
- *differentiation*
- *biodiversity*
- *fragmentation*
- *systems and cycles*
- *ecological succession.*

### **Process/Skill Questions**

- How are an animal's niche and its range of tolerance related?
- How does population compare with community?
- What is biodiversity, and why is it important?

## **Task Number 49**

### **Explain energy transfer.**

#### **Definition**

Explanation should include

- food web/chain
- process of decomposition
- carbon cycle.

### **Process/Skill Questions**

- How is energy absorbed and transferred in the food web/chain?
- Why is the process of decomposition considered energy transfer?

## **Task Number 50**

### **Describe the effects of natural events and anthropogenic influences on ecosystems.**

#### **Definition**

Description may include, but is not limited to

- natural disasters
- anthropogenic environmental catastrophes
- effects of agricultural practices
- point and non-point-source contamination
- weather.

### **Process/Skill Questions**

- How can a natural disaster be simultaneously a positive and a negative event?
- What are examples of significant catastrophes caused by humans?
- What are some adaptations of forests that help deal with natural disasters (e.g., forest fires)?
- How could one formulate a plan to improve the water quality of a lake being contaminated by an identified source?

## **Task Number 51**

### **Explain principles and processes of ecological succession.**

#### **Definition**

Explanation should include

- primary and secondary succession
- a general successional model for Virginia, with emphasis on pioneer species
- succession as it relates to aquatic systems.

### **Process/Skill Questions**

- What are examples of pioneer species?
- What are the stages of primary and secondary succession?

## **Task Number 52**

### **Illustrate geometric vs. arithmetic increases in population growth.**

#### **Definition**

Illustration should include

- use of the J-Curve to show population growth as exponential
- illustration of typical prey vs. predatory species growth curves.

#### **Process/Skill Questions**

- How would one interpret a J-Curve?
- What is the value of showing population growth in a J-Curve as exponential?

## **Task Number 53**

### **Describe the logistics of population growth.**

#### **Definition**

Description should include factors that increase or decrease population figures.

#### **Process/Skill Questions**

- What factors influence population growth?
- Where is population growth being limited?
- What is the relationship between biological and cultural carrying capacity?
- How can one use biological and cultural carrying capacity to control urban, suburban, and rural populations?
- What is the result of unmanaged population growth?
- What is the boom-bust theory?

## **Task Number 54**

### **Explain the tragedy of the commons.**

#### **Definition**

Explanation should include a summary of the tragedy of the commons and the related concept that everyone is responsible for the good of the whole.

## Process/Skill Questions

- How does the tragedy of the commons relate to sustainable development?
- What are some consequences of the tragedy of the commons?
- What are examples of ways to help prevent the tragedy of the commons?
- What are examples of commons?

## Task Number 55

### Explain the role of biodiversity in ecosystem stability.

#### Definition

Explanation should include

- the definition and types of biodiversity
  - genetic diversity
  - species diversity
  - community or ecosystem diversity
- keystone species
- indicator species.

## Process/Skill Questions

- How are keystone and indicator species related to the carrying capacity of an organism?
- What variables influence the carrying capacity of an ecosystem?

## Task Number 56

### Identify the effects of latitude and altitude on species diversity.

#### Definition

Identification should include factors that relate to

- definition of *biogeography*
- climate
- seasons
- temperature ranges
- weather trends
- geological formations.

## Process/Skill Questions

- How do the various factors affect species diversity within an ecosystem?
- How does the relationship between latitude and altitude influence species diversity?
- Why are there different species at the same latitude but different altitudes?

## **Task Number 57**

### **Explain the process of species differentiation.**

#### **Definition**

Explanation should include a discussion of basic genetics and reproduction.

#### **Process/Skill Questions**

- What is an example of species differentiation?
- What are technological advancements that are being applied to species differentiation?

## **Protecting the Environment—Air and Noise**

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## **Task Number 58**

### **Diagram the composition of the atmosphere.**

#### **Definition**

Diagram should include

- major gases present
- layers of the atmosphere
- variances in the layers depending on location on Earth, seasonal temperatures, and both combined.

#### **Process/Skill Questions**

- What are the percentages of each gas, and does it change? If so, why and/or how?
- How much of any one gas do humans take in with each breath?
- What is the thickness of each layer in the atmosphere during the summer in the southern hemisphere, as opposed to the same layer during the same period in the northern hemisphere?
- What factors affect the layers?
- What are the effects of carbon sequestration on coral reefs?

## **Task Number 59**

### **Outline effective methods to control various air pollutants.**

#### **Definition**

Outline should include

- verifying sources of air pollutants
- summarizing current methods of control
- citing possible methods to control pollutants
- discussing EPA and USDA.

### **Process/Skill Questions**

- How do individuals contribute to pollution?
- How do corporations contribute to pollution?
- What role does agriculture play in pollution issues?
- What difference in viewpoints on climate change is at the crux of the controversy?
- What laws and regulations are in place to control emissions?

## **Task Number 60**

### **Explain the effects of greenhouse gases.**

#### **Definition**

Explanation should include

- sources of greenhouse gases
- the effects of the gases based on their sources.

### **Process/Skill Questions**

- How have the effects of greenhouse gases changed over time?
- What has civilization done to alter greenhouse gases over time?

## **Task Number 61**

### **Determine the sources and effects of acid rain.**

#### **Definition**

Determination should include

- an illustration of acid rain production
- local, national, and global areas where acid rain is more significant
- the correlation of acid rain destruction with the amount of its production
- how quickly Earth can recover when corrective measures are put in place.

### **Process/Skill Questions**

- What is acid rain?

- What does acid rain do?
- How is acid rain destructive to a concentrated area, or are its effects far-reaching? Explain.

## Task Number 62

### Analyze the conversation surrounding ozone depletion.

#### Definition

Analysis should include

- a definition of *ozone depletion*
- views of skeptics on ozone depletion
- local, national, and global statistics on ozone depletion.

#### Process/Skill Questions

- Is ozone depletion a naturally occurring process? Explain.
- What are some of the controversies surrounding ozone depletion?
- In what ways do human activities contribute to ozone depletion?
- What can a society do to slow down the process?
- What is the relationship between ozone depletion and global warming?

## Task Number 63

### Define *noise pollution*.

#### Definition

Definition should include

- EPA's description
- common sources encountered daily
- explanation of decibels.

#### Process/Skill Questions

- What is a decibel?
- How is a decibel determined?
- What are the safe ranges of decibels for humans and other animals?
- What is the long-term effect of being exposed to higher-level decibels?

## Task Number 64

### Research noise restrictions for a locality.

## Definition

Research should include

- the source of the noise (e.g., concert, equipment)
- rationale/policy behind restriction
- how noise level is measured
- how/when violations are enforced.

## Task Number 65

**Identify different types of noise pollution and the effect on humans, wildlife, and ecological systems.**

### Definition

Identification should include

- outdoor /environmental (e.g., machines and transportation systems, motor vehicles, aircraft, and trains)
- indoor (e.g., machines, building activities, music performances, some workplaces).

### Process/Skill Questions

- How are noise levels measured?
- How is loudness (volume) measured?
- How can a comparison of noise levels from household, motor vehicle, agricultural, and industrial sources be made?
- How can high noise levels contribute to health problems?

# Protecting the Environment—Soil

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## Task Number 66

**Describe the soil-formation process.**

### Definition

Description should include a definition of *soil* and the role of

- time
- weathering
- minerals

- organic matter
- pore space
- air
- water.

### **Process/Skill Questions**

- How many years does it take for one inch of soil to form? What factors influence this process?
- What is the role of weathering on rocks and minerals in the soil-formation process?
- How much of the soil is composed of air, how much of water, and how much of minerals?
- What is the composition of organic matter?
- How are the physical and chemical properties of soil related to its fertility?

## **Task Number 67**

### **Classify soils using the soil taxonomy system.**

#### **Definition**

Classification should include

- horizon
- suborder
- alfisol
- aridisol
- entisol
- gelisol
- histosol
- inceptisol
- mollisol
- oxisol
- spodosol
- ultisol
- vertisol.

### **Process/Skill Questions**

- Which soil order is most common in Virginia?
- What are the strengths and weaknesses of each of these orders in terms of soil productivity?

## **Task Number 68**

### **Identify differences in soil profiles.**

#### **Definition**

Identification should include the different horizons, textures, and colorations.

## Process/Skill Questions

- What can the color of a soil tell about that soil?
- What is the Munsell system of color notation?
- Why might two soils within 100 yards of each other have different characteristics?

## Task Number 69

### Investigate soil types.

#### Definition

Investigation should include

- soil descriptions
- soil series profiles
- locations on maps based on a soil survey book or other resources.

Teacher Resource:

[Web Soil Survey](#)

## Process/Skill Questions

- What is the difference in the depth to bedrock between two soil series?
- What is the most common soil type in the county?
- What are the soil characteristics and recommendations for the soil in the local county?

## Task Number 70

### Interpret data contained in soil maps.

#### Definition

Interpretation may include information about

- woodland management
- land capability
- recreational development
- wildlife habitat
- engineering stability.

## Process/Skill Questions

- What are examples of restrictions imposed on construction projects based on soil texture, erosion potential, and land capability?
- What are examples of tree species found on a specific soil series? Why?

## **Task Number 71**

### **Explain land capability classes.**

#### **Definition**

Explanation should include

- type of soil
- erosion hazard
- hydric vs. nonhydric soils
- rooting-zone limitations
- climate
- use of chart in soil survey.

#### **Process/Skill Questions**

- How does slope affect the capability class of a soil?
- What are the different land capability classes?
- How do soil texture, soil depth, permeability, water-holding capacity, and type of clay minerals affect the land use and capability class of a soil?

## **Task Number 72**

### **Explain leaching in soils.**

#### **Definition**

Explanation should include

- definition of *leaching*
- effects of leaching on soil.

#### **Process/Skill Questions**

- How can leaching be detrimental if it is a natural process?
- How does leaching cause groundwater contamination?

## **Task Number 73**

### **Collect soil samples to analyze for composition.**

#### **Definition**

Collection should include

- gathering samples from several areas on a plot of land
- mixing the samples together
- removing such things as twigs, roots
- air drying
- collecting the desired amount of soil for tests from this sample.

### **Process/Skill Questions**

- Why should one analyze a soil sample before any endeavor involving the soil?
- Why should multiple soil samples be taken over a given area and mixed together?
- How can soil be tested on-site?

## **Task Number 74**

### **Interpret soil test results to make nutrient recommendations.**

#### **Definition**

Interpretation should include the levels of nutrients, pH, and other relevant information based upon the future use of the land.

#### **Process/Skill Questions**

- What types of soil amendments could be added to alkaline soils to decrease the pH?
- What types of soil amendments could be added to acidic soils to increase the pH?
- When is it essential to add nutrients to the soil?
- How does the pH of a soil affect plant nutrient uptake and growth?

## **Task Number 75**

### **Explain how wind and water erode soil.**

#### **Definition**

Explanation should include

- types of water and wind erosion
- properties that allow for erosion.

#### **Process/Skill Questions**

- What are some types of water erosion?
- How does wind erode soil?
- What types of soil does wind most commonly affect?
- What are other factors that contribute to erosion?

## **Task Number 76**

### **Identify common materials used for riparian buffers and vegetative erosion control methods.**

#### **Definition**

Identification should include

- grasses
- forbs
- shrubs
- tree species.

#### **Process/Skill Questions**

- What are several examples of native tree species used in buffer strips?
- Why are grasses and forbs an important part of the buffer strip?
- How are grasses, forbs, shrubs, and specific tree species used to protect streams and other bodies of water?
- What is the standard size of a riparian buffer (minimum and average)?
- What are the benefits of a riparian buffer?

## **Task Number 77**

### **Explain the effects of erosion on plants, animals, and their habitats.**

#### **Definition**

Explanation should include

- sedimentation
- land degradation
- airborne dust.

#### **Process/Skill Questions**

- How does sedimentation affect aquatic animals?
- What effect does land degradation have on animals?
- How does intensive rotational grazing improve the soil?
- What are some factors that contribute to soil degradation?
- How does a soil profile influence the types of plants, animals, and/or ecosystems that it supports?

## **Task Number 78**

### **Describe crop rotation and no-till agriculture.**

## Definition

Description should include

- definition of *crop rotation*
- definition of *no-till*
- examples of a crop-rotation plan.

## Process/Skill Questions

- What are the benefits of a no-till system?
- How does crop rotation help improve the soil?
- What crops are commonly used in a rotation?
- What is the definition of a legume?
- What are examples of legumes? Why are legumes used in crop rotation?

## Task Number 79

### Explain mechanical erosion controls.

#### Definition

Explanation may include erosion controls such as

- water bars
- broad-based dips
- grade breaks
- open-top culverts
- outsloping
- road layout design to minimize slope
- hardened stream crossings with geotextiles.

#### Process/Skill Questions

- How do water bars and broad-based dips work?
- What situations require water bars and broad-based dips?
- What methods of soil erosion control best management practices could be used to minimize the potential for erosion on a construction site?

## Protecting the Environment—Water

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## Task Number 80

## Define characteristics of water.

### Definition

Definition may include water as a

- compound consisting of hydrogen and oxygen molecules
- tasteless, colorless, odorless liquid
- necessity for life processes

and should address

- its unique properties (e.g., capillary action, surface tension)
- the role it plays in weather and climate.

### Process/Skill Questions

- Why is water necessary for life processes?
- How do plants use water in photosynthesis and respiration?
- Why do plants need water in photosynthesis?

## Task Number 81

### Define *wetlands* and uses.

#### Definition

Definition should include

- an area that is saturated with enough water to support vegetation that thrives in wet soils
- swamps, bogs, fens, and marshes
- seasonal wetlands
- vernal pools.

Teacher Resource:

[Classification of Wetlands and Deepwater Habitats of the United States](#)

### Process/Skill Questions

- What types of soils are classified as *wet* soils?
- How can wetlands improve water quality?
- Why are wetlands so important to the ecosystems they are a part of?
- What are some wetland ecosystems and their characteristics?

## Task Number 82

## **Illustrate the hydrologic cycle.**

### **Definition**

Illustration should include the movement of water through the water cycle to include

- evaporation
- evapotranspiration
- condensation
- precipitation
- surface run-off
- percolation
- sublimation.

### **Process/Skill Questions**

- What provides the power for the hydrologic cycle?
- What happens to water in the hydrologic cycle? Is water created, recycled, and/or stored?
- How long can it take for water to reach surface sources once it enters an aquifer?

## **Task Number 83**

### **Illustrate components of the riverine system.**

#### **Definition**

Illustration should include the following systems

- marine
- estuarine
- riverine
- lacustrine
- palustrine.

#### **Process/Skill Questions**

- What types of aquatic vegetation can be included in a riverine system?
- What are the features of a riverine system?
- What are the four subsystems of a riverine system? What are their characteristics?
- What types of flora and fauna live in the four subsystems of a riverine system?

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## **Task Number 84**

### **Identify characteristics of an estuarine system.**

## **Definition**

Identification should include characteristics such as

- a semi-enclosed body of coastal water
- connects to the sea
- receives fresh water from more than one river source
- brackish water
- a nursery area for many forms of life.

## **Process/Skill Questions**

- Why do estuaries serve as great nursery areas?
- How many different ecosystems are located within estuarine systems?

## **Task Number 85**

### **Describe an aquatic zonation system.**

#### **Definition**

Description should include

- ocean
- river
- lake
- pond
- estuary.

#### **Process/Skill Questions**

- How are the zones in each of these aquatic systems similar?
- How are the zones in each of these aquatic systems different (e.g., photic vs. aphotic, littoral, neritic, oceanic)?
- What types of organisms (e.g., plankton, animals, plants, bacteria, nekton, benthos) are found in each zone of each aquatic system?
- What would be an example of a food web in each aquatic zone for one of the systems?

## **Task Number 86**

### **Explain the different ways water moves in the oceans and the factors affecting movement.**

#### **Definition**

Explanation may include flow, direction, tides and cycles, and how these are affected by the gravitational pull of the moon, the sun, and weather patterns.

### **Process/Skill Questions**

- How are the movements of ocean waters important to global ecology?
- What is the Coriolis effect?

## **Task Number 87**

### **Explain groundwater and sources of groundwater.**

#### **Definition**

Explanation should include water located below the surface of the earth. Sources may include

- zone of aeration
- zone of saturation
- water table
- aquifer.

### **Process/Skill Questions**

- How does water move below the surface of the earth?
- How long can water remain underground?
- How does the permeability of the materials through which groundwater flows affect the rate of movement into and out of areas of recharge and discharge?
- What is a recharge area and a discharge point?

## **Task Number 88**

### **Explain the role of frozen water in Earth's systems.**

#### **Definition**

Explanation may include glaciers and ice caps as a long-term storage system.

### **Process/Skill Questions**

- How long does water remain in this reservoir of the water cycle?
- What factors may or may not be contributing to water remaining for longer or shorter periods of time in this reservoir of the water cycle?
- What are the implications of the decrease in ice?

## **Task Number 89**

## **Define *water table*.**

### **Definition**

Definition should include the area between the zone of aeration and the zone of saturation where water is readily available within the ground.

### **Process/Skill Questions**

- What causes flooding?
- What is percolation?
- What two zones are above and below the water table?

## **Task Number 90**

### **Explain the Clean Water Act.**

#### **Definition**

Explanation should include

- the federal legislation passed in 1972 designed to monitor point-source pollution in source water as well as allowing for mitigation of wetlands
- the changes in the law over the past 40-plus years.

#### **Process/Skill Questions**

- Why is point-source pollution the easiest to monitor?
- What does mitigation mean?
- What section of the Clean Water Act allows for mitigation?
- What are factors that affect water quality?
- What are some anthropogenic activities that improve and maintain water quality?
- What are examples of industrial activities that degrade water quality, and what are examples of industrial activities that improve water quality?
- What are some soil-conservation practices designed to maintain and/or improve water quality?
- What is the relationship between water quality and watersheds?

## **Task Number 91**

### **Examine the water needs for an agricultural enterprise, school, or home.**

#### **Definition**

Examination should include parameters such as average gallons per minute usage for activities in an agricultural enterprise, a school, or a home. Examples of activities might include

- taking a shower
- washing a load of laundry
- washing hands
- milking 25 head of cattle
- watering 25,000 broilers
- watering 65 cow/calf pairs on ball waterers.

### **Process/Skill Questions**

- How could a person reduce his or her daily water needs?
- Why is it important to be aware of one's daily water usage?

## **Task Number 92**

### **Define *point* and *nonpoint source* (NPS) pollution.**

#### **Definition**

Definition should include

- *Point*: Pollution that is coming from a single, localized, known source
- *Nonpoint*: Pollution that is coming from a collection of diffuse, unknown sources.

### **Process/Skill Questions**

- How can NPS pollution be managed?
- What are some examples of point-source pollution?
- What legislation is in place to monitor point-source pollution in U.S. waterways?

## **Task Number 93**

### **Identify major water pollutants and their effects on the environment.**

#### **Definition**

Identification might include

- leachates—contaminate ground water
- sediments—runoff from the land
- nutrients—promote algal growth and depletes oxygen
- toxins—runoff from land
- E. coli.

### **Process/Skill Questions**

- What management practices reduce sediment runoff?
- Why are sectors in the agricultural industry often blamed for all nutrient pollution?

- Who are the major contributors to nutrient and toxin pollutants?
- How does one define *fracking*?
- How does fracking affect drinking water and irrigation for crops?

## Task Number 94

### Define *karst topography*.

#### Definition

Definition should include

- geography characterized by underground caves, sinkholes, and streams
- the geology that created the limestone and karst topography
- why this topography allows for groundwater to become polluted so easily.

#### Process/Skill Questions

- What does karst topography indicate about the groundwater in Virginia regarding ease of contamination?
- What types of rock are found in Virginia's caves and caverns?
- How were the caves and caverns formed? Why is this important information?

## Task Number 95

### Analyze water samples for chemical pollutants and biological organisms.

#### Definition

Analysis may include

- phosphorus
- nitrates
- dissolved oxygen
- temperature
- pH
- macro invertebrates.

#### Process/Skill Questions

- What can a survey of macro invertebrates tell one about the health of a stream or other body of water?
- How are temperature and dissolved oxygen related?

## Task Number 96

## **Analyze water quality using the Izaak Walton League of America (IWLA) method.**

### **Definition**

Analysis should include

- identification of group one taxa organisms
- identification of group two taxa organisms
- identification of group three taxa organisms.

### **Process/Skill Questions**

- What is the water quality if there is any organism in group one taxa? Explain.
- What is the water quality if there is any organism in group two taxa only? Explain.
- What is the water quality if there is any organism in group three taxa only? Explain.

## **Task Number 97**

### **Explain the effects of water pollution on agricultural production.**

#### **Definition**

Explanation may include

- high salt levels—low water uptake
- high metal levels—high stress, low yields
- excess phosphorus—discoloration
- excess nitrogen—yellowing and weakness.

#### **Process/Skill Questions**

- How do excess levels of some necessary nutrients have a negative effect on crop yields?
- What types of corrective measures and/or management practices could one implement to eliminate or minimize the effects of water pollutants in irrigation water?
- Why is it important to determine whether soils have excessive nutrient levels before irrigating? Explain.

## **Task Number 98**

### **Define *eutrophication* and its relationship to nutrient-rich waters.**

#### **Definition**

Definition should include an excess amount of nutrient that encourages algal blooms that deplete oxygen levels in nutrient-rich bodies of water.

## Process/Skill Questions

- What are some sources of excess nutrients that lead to eutrophic conditions?
- What are some consequences of depleted oxygen levels in bodies of water?
- What effects are revealed downstream as eutrophication occurs? How can these effects be remedied?

## Task Number 99

### Report on the effects of polluted water on animals and humans.

#### Definition

Report may include, but not be limited to, effects of

- chemicals
- nitrates
- human waste
- animal waste
- pharmaceuticals
- leachates
- biotic factors.

#### Process/Skill Questions

- How is water tested for each of these agents?
- What effect does water pollution have on biotic and abiotic factors of an ecosystem?
- How are pharmaceuticals polluting water resources?
- How does infrastructure affect the quality of water in an area?

## Task Number 100

### Compare methods used to reduce surface and groundwater contamination.

#### Definition

Comparison may include management techniques for

- sedimentation
- oil spills
- chemicals/toxins.

#### Process/Skill Questions

- Why are techniques for managing groundwater and surface water different?
- What are some new and/or innovative techniques for cleaning up surface water contamination?

- How is bioremediation used to clean contaminated groundwater?
  - How is chemical remediation used to clean contaminated groundwater?
- 

## **Task Number 101**

### **Select best management practices designed to improve water quality.**

#### **Definition**

Selection might include any of the practices approved for funding in Virginia, such as

- rain gardens
- rain barrels
- porous pavers
- gravel for driveways
- mulching
- hardened crossing
- terracing
- alternate water source
- animal composting facility
- waste storage facility.

#### **Process/Skill Questions**

- How is funding obtained for best management practices in Virginia?
- Who is eligible for funding for best management practices in Virginia?

## **Task Number 102**

### **Identify the characteristics of a watershed.**

#### **Definition**

Identification should include

- definition of *watershed*
- the following geographical locations that drain water from two or more sources:
  - Uplands
  - Valley lands
  - Riparian areas
  - Wetlands
  - Waterways (rivers and lakes)
  - Estuaries

#### **Process/Skill Questions**

- What is the role of a wetland in a watershed?
- How are estuaries affected by low recharge of freshwater sources?

## Task Number 103

### Interpret a flood-hazard analysis.

#### Definition

Interpretation should include a definition of the following as well as the ability to interpret a classification of damages related to each:

- *Flood hazard assessment*
- *Flash flooding*
- *River flooding*
- *Coastal flooding*

#### Process/Skill Questions

- How does a flood-hazard assessment of a land area affect land use for that area?
- What precautions should be taken and what recommendations should be made when developing land in areas designated as flooding regions?
- What preventive measures are in place to protect areas addressed in flood-hazard assessment plans?

## Task Number 104

### Explain methods of flood control.

#### Definition

Explanation should include a definition of

- *dam*
- *dike*
- *riparian buffer zone*
- *streamside management zone*

and include the functions and abilities of each to retain water in certain locations.

#### Process/Skill Questions

- What are the uses for flood-control structures like dams?
- How are dams multifunctional tools for human populations?

## Task Number 105

## **Compare stream bank protection measures.**

### **Definition**

Comparison should include examples of stream bank protection measures, such as

- streamside management zones
- riparian buffer zones
- vegetation
- streamside fencing
- water best management practices.

### **Process/Skill Questions**

- Why are stream bank protection measures important to monitoring and improving water quality?
- How are these protection measures incorporated into land-use practices?
- What agencies assist with the construction and financial assistance of these measures?

## **Investigating Environmental Issues**

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### **Task Number 106**

**Examine environmental agencies: Environmental Protection Agency (EPA), U.S. Department of Agriculture (USDA), Virginia Department of Agriculture and Consumer Services (VDACS), Virginia Department of Environmental Quality (DEQ), Virginia Department of Game and Inland Fisheries (VDGIF), and Virginia Department of Forestry (VDOT).**

### **Definition**

Examination should include

- areas of responsibility for each agency
- watershed protection
- land preservation
- forest restoration
- pesticide safety
- clean air/emissions
- wildlife management including endangered species restoration.

## Process/Skill Questions

- What are the areas of oversight for these government agencies?
  - What effects do the agencies' policies have on agriculture?
- 

## Task Number 107

### Identify local, state, national, and global issues concerning agriculture and the environment.

#### Definition

Identification should include, but not be limited to

- fracking
- climate change
- development
- clean energy technologies
- watershed protection
- Chesapeake Bay legislation.

#### Process/Skill Questions

- How do these issues affect local agriculture?
- How do these issues affect the economy?

## Task Number 108

### Summarize how agriculture and the environment are related.

#### Definition

Summarization should include similarities, differences, and areas of conflict.

#### Process/Skill Questions

- What are the similarities and differences between agriculture and the environment?
- What areas of conflict are there between agriculture and the environment?
- What are potential solutions to these conflicts?

## Task Number 109

# **Compare sustainability practices and multiple-use management strategies and their uses to protect and maintain Virginia’s forest ecosystems.**

## **Definition**

Comparison should include harvest rates, habitat provisions, sustainability, and management practices related to forestry and recreation uses.

## **Process/Skill Questions**

- What is meant by multiple use?
- How could different multiple-use strategies be described?
- How could one seeking to achieve an optimal balance between environmental management, economic development, and social values, meet the needs of society on a sustainable basis?
- How does management of land or forests for more than one purpose preserve and protect against floods, erosion, and provide for recreation and protection of water supplies?
- How can a multiple-use land management system help to achieve optimum yields of products and services from a given area without impairing the productive capacity of the site?
- How does implementing a multiple-use management system help to prolong resource availability and keep forests and land viable for future yields of precious goods and/or services?

## **Task Number 110**

### **Outline the Virginia Erosion and Sediment Control Law.**

#### **Definition**

Outline should include

- activities that are regulated
- regulatory entities (government agencies that regulate and monitor compliance).

#### **Process/Skill Questions**

- What activities are regulated by the Virginia Erosion and Sediment Control Law?
  - What does the law require as related to agricultural management practices regarding the implementation of erosion control methods?
- 

## **Task Number 111**

### **Define *organic farming*.**

## **Definition**

Definition should include

- organic certification
- organic practices
- permissible chemicals
- economic returns.

## **Process/Skill Questions**

- Who sets organic standards?
- Who inspects for organic certification?
- What chemicals can be used for pest control or fertilizer?

## **Task Number 112**

**Assess how technology has influenced pollution problems.**

### **Definition**

Assessment should include specific ways that technology has

- made monitoring air pollution easier
- reduced emissions of hazardous and/or toxic air pollutants.

### **Process/Skill Questions**

- What technological products have helped reduce pollution?
- What products and practices based on technology have created pollution problems?
- The Clean Air Act requires the EPA to regulate hazardous air pollutants from large industrial facilities known as major sources in two phases. What are the sources and what are the two phases?
- What are the maximum achievable control technology standards?

## **Planning and Managing Land Use**

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### **Task Number 113**

**Identify major land uses and their effects on the environment and ecosystems.**

### **Definition**

Identification should include the

- definition of *land use*, including the history of land use
- most common land use classifications in your locality and in the state and who assigns them
- criteria for classifications.

### **Process/Skill Questions**

- What guidelines determine land use?
- What benefits are there to land/property owners in land-use classifications?
- What is the Conservation Reserve Enhancement Program and how does it provide incentives to help preserve ecosystems and critical environmental areas?

## **Task Number 114**

### **Explain zoning classifications and their effects.**

#### **Definition**

Explanation should include

- definition of zoning
- identification of local zoning classifications
- correlation of zoning classifications with specific examples on the local level
- interpretation of how zoning classifications affect society and citizens.

### **Process/Skill Questions**

- What are zoning classifications, and why are they important?
- Do zoning classifications positively or negatively affect a community and its citizens?
- How can classification of land use that limits the activities protect the environment?

## **Task Number 115**

### **Classify land zoning according to its uses.**

#### **Definition**

Classification should include

- the identification of local plots/sites/farms and their zoning
- the primary land-use categories
  - residential
  - commercial
  - industrial
  - recreational
  - institutional

- agricultural
- correlation of the classifications with the physical characteristics of the site.

### **Process/Skill Questions**

- How are zoning classifications determined?
- How can zoning classifications be limiting and encompassing? Explain.

## **Task Number 116**

### **Describe green infrastructure.**

#### **Definition**

Description should include

- green infrastructure at the urban, suburban, neighborhood, and commercial levels
- illustrations of green infrastructure.

### **Process/Skill Questions**

- Why is establishing a green infrastructure important?
- What benefits are created by having a green infrastructure at all levels?
- What effects result from not creating green infrastructures?
- Why would green infrastructures be beneficial at one location but not another (e.g., corporate vs. neighborhood for example)? Explain.

## **Managing Fish and Wildlife**

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### **Task Number 117**

### **Describe the role of hunting and fishing in the management of wildlife.**

#### **Definition**

Description should include

- population dynamics
- population control
- length of season
- bag limits—harvest surveys.

## **Process/Skill Questions**

- How do bag limits help manage wildlife populations?
- How does regulated vs. unregulated hunting affect wildlife populations?
- What inspired the management of hunting and fishing?
- How does a hunting season management affect wildlife populations?
- How does the control of game species affect nongame species?

## **Task Number 118**

### **Identify common game species native to Virginia.**

#### **Definition**

Identification should include any species of wildlife or fish for which seasons or bag limits have been prescribed and which are normally harvested by hunters, trappers, and fishermen, under state or federal laws, codes, and regulations.

#### **Process/Skill Questions**

- What game species are common to Virginia?
- What nongame species are common to Virginia?

## **Task Number 119**

### **Contrast habitat requirements for various fish and wildlife.**

#### **Definition**

Contrast should include

- stage of succession
- water quality
- microclimates
- physiographic regions
- space.

#### **Process/Skill Questions**

- What species would be expected in different areas based on climate, vegetation, and elevation?
- What are the habitat requirements for key species of concern in the local county?

## **Task Number 120**

### **Describe human conflicts with wildlife populations.**

## **Definition**

Description should include

- animal populations that are increasingly comfortable in developed areas
- rabies and other zoonotic diseases
- practices to discourage wildlife conflicts
- cultural carrying capacity.

## **Process/Skill Questions**

- How have animal species adapted to suburban sprawl?
- What can homeowners do to make developed areas less habitable for nuisance wildlife?

## **Task Number 121**

### **Describe the environmental effects of overpopulation of wildlife.**

#### **Definition**

Description should include

- white-tailed deer overpopulation
- nuisance species
- invasive species control.

#### **Process/Skill Questions**

- What are the environmental effects of overpopulation of a wildlife species?
- What species are legally designated as nuisance species in Virginia?

## **Task Number 122**

### **Identify local plants or trees that provide food and/or cover for animals and birds.**

#### **Definition**

Identification should include mast species, both hard and soft, and warm-season grasses.

#### **Process/Skill Questions**

- What plant species provide cover for ground animals?
- What plant species provide hard or soft mast?
- What forbs or grains provide winter food for animals?

## Task Number 123

### Explain measurement of the wildlife and fish population.

#### Definition

Explanation should include techniques and their advantages and limitations:

- Census
- Sampling methods
- Quadrats
- Photography
- Mark and recapture.

#### Process/Skill Questions

- How can one measure the number of wildlife in an area?
- How is a census different from sampling?
- What are some methods of sampling?
- What types of technologies are used to measure wildlife populations?

## Task Number 124

### Explain the difference among extinct, endangered, and threatened species of wildlife.

#### Definition

Explanation should include

- definitions of *extinct*, *endangered*, and *threatened*
- the criteria and process of listing
- examples of each.

#### Process/Skill Questions

- What are the requirements for an animal species to be listed as extinct, endangered, or threatened?
- How are animals removed from the list?
- What population successes have occurred based on being listed?

## Task Number 125

### Identify Virginia's threatened and endangered species.

#### Definition

Identification should

- be based on information on the VDGIF website
- include the reasons species become threatened or endangered
- management methods that will keep species from becoming endangered.

### **Process/Skill Questions**

- What are the criteria for species to become listed or delisted?
- What protections are provided to species on the list?

## **Task Number 126**

### **Identify diseases and parasites in wildlife.**

#### **Definition**

Identification should include

- chronic wasting disease
- white-nose syndrome
- hemorrhagic disease
- blue tongue
- rabies
- worms
- trichinosis.

### **Process/Skill Questions**

- What species are affected by disease?
- What are the current diseases that are affecting wildlife populations in Virginia?
- How can captive-born animals be acclimated before release?
- What laws are in place to help prevent the spread of disease?

## **Task Number 127**

### **List methods to improve reintroduction of species to a natural habitat.**

#### **Definition**

List should include

- methods of translocating wildlife
- methods of habitat restoration
- habitat evaluation.

### **Process/Skill Questions**

- How can captive-born animals be acclimated before release into a natural habitat?
- How is the reintroduction of elk to southwestern Virginia affecting the natural habitat?

## **Task Number 128**

### **Describe management practices of freshwater fisheries.**

#### **Definition**

Description should include

- hatcheries
- stocking
- fishing regulations
- Fish Passage Program.

#### **Process/Skill Questions**

- What streams in Virginia are part of the Fish Passage Program?
- What game fish are managed in Virginia streams?
- What invasive freshwater fish species are a concern to Virginia wildlife biologists?
- Why is it important to restore native fishes and other aquatic species to self-sustaining levels by reconnecting habitat fragmented by barriers?

## **Task Number 129**

### **Summarize the aquaculture industry.**

#### **Definition**

Summarization should include

- primary aquaculture species for food or recreation
- ecological comparisons between wild-caught and farmed-fish practices
- regulations and laws concerning the propagation of native fish species and environmental issues resulting from raising fish in ponds or hatcheries.

#### **Process/Skill Questions**

- How can fish farming benefit fresh and saltwater ecosystems?
- How can fish farming harm ecosystems?
- What aquaculture systems have the lowest environmental effects?
- How could the effluent from an aquaculture facility affect the environment?

## **Task Number 130**

## **Describe the effects of habitat loss.**

### **Definition**

Description should include

- species being reduced by habitat loss
- methods of correcting habitat loss
- effects of habitat fragmentation
- balance between human land use and the restoration of habitats.

### **Process/Skill Questions**

- How have bobwhite quail and eastern cottontail rabbits been affected by habitat loss?
- How does habitat fragmentation affect wildlife species?
- How does habitat fragmentation affect migrating bird populations?

## **Managing Forests and Forestland**

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### **Task Number 131**

## **Explain basic tree structure and growth.**

### **Definition**

Explanation should include

- parts of a tree (roots, trunk, bark, leaves)
- how trees grow (seedling or cuttings)
- definition and identification of:
  - cambium
  - phloem
  - pith
  - sapwood
  - growth rings
  - heartwood.

### **Process/Skill Questions**

- How do trees develop?
- What environmental factors affect how trees grow and reproduce?
- What are the limiting factors of tree structure and growth?

## **Task Number 132**

### **Identify forest trees of Virginia.**

#### **Definition**

Identification should include trees that are native and nonnative to Virginia.

#### **Process/Skill Questions**

- What are the differences among species of softwoods?
- What are the differences among species of hardwoods?

## **Task Number 133**

### **Explain invasive species and their effects on native populations.**

#### **Definition**

Explanation should include

- examples of invasive species and historical justification or examples for introducing them to native populations
- definitions for
  - native species of plants and animals
  - nonnative species of plants and animals
- invasive species of plants and animals.

#### **Process/Skill Questions**

- What are examples of invasive and nonnative species?
- How are they determined to be invasive?
- What factors qualify them as having effects on native populations?

## **Task Number 134**

### **Differentiate between forest types.**

#### **Definition**

Differentiation should include identification of forest types, including

- tropical rainforest
- temperate deciduous and coniferous
- boreal (taiga)

and the common tree species diagnostics of each.

### **Process/Skill Questions**

- What are examples of tropical, deciduous, and coniferous forests? How are the forest types classified?
- What climate and geographical requirements are there for the different forest types?

## **Task Number 135**

### **Identify tree diseases and insect pests.**

#### **Definition**

Identification should include definitions for *disease* and *pest eradication*.

Identification should also include, but not be limited to

- hemlock woolly adelgid
- gypsy moth
- southern pine beetle
- emerald ash borer
- tent caterpillar
- rust
- anthracnose
- powdery mildew.

### **Process/Skill Questions**

- What environmental factors promote pest and disease growth in trees?
- How are infected trees managed?
- What management prevent pest and disease outbreaks?

## **Task Number 136**

### **Calculate the value of standing timber.**

#### **Definition**

Calculation should include use of the following:

- Biltmore stick or log rule to find diameter at breast height (DBH) and standing timber (number of 16-foot logs)
- Clinometer and diameter tape
- Pace chains
- Conversion of board-foot volume of standing timber into market value for sawtimber and volume cubic feet into market value for pulpwood

- Reading a volume table to find board-foot volume of standing timber based on DBH and number of 16-foot logs
- Reading a tree scale for pulpwood to find the volume of cubic feet of timber based on the DBH and the number of 5-foot bolts.

### **Process/Skill Questions**

- How does one calculate a pace?
- What methods would one use to determine the board-foot volume of standing timber?
- How is volume board feet and volume cubic feet converted into market price for sawtimber and pulpwood?

## **Task Number 137**

### **Identify forest products and uses of harvested trees.**

#### **Definition**

Identification should include products made from wood or wood composites and uses of harvested tree products.

#### **Process/Skill Questions**

- How are wood composites made?
- Are wood composites more profitable than felled timber?
- What are the major wood markets?
- What are some products made from harvested trees?

## **Task Number 138**

### **Explain why trees are undesirable and selected for removal.**

#### **Definition**

Explanation should include the

- definition of what an undesirable tree species is
- factors that affect species growth, market needs, site selection, and land management.

#### **Process/Skill Questions**

- How is it determined that a species is undesirable?
- How are undesirable tree species removed from forests?
- What circumstances make undesirable trees desirable in varying management goals?
- What are some reasons for leaving a tree?
- What are some reasons for removing or killing a tree?

## **Task Number 139**

### **Compare methods of forest harvest and regeneration.**

#### **Definition**

Comparison should include the

- definition of forest regeneration and natural succession
- methods and causes of forest succession:
  - primary succession
  - secondary succession
- methods of harvesting and reasons for choosing the harvest method for particular sites and species.

#### **Process/Skill Questions**

- What are the limiting factors of forest succession or regeneration?
- What is the timeline for regeneration of forests?
- How is natural regeneration accomplished?
- How is artificial regeneration accomplished?

## **Task Number 140**

### **Describe factors considered when determining species most appropriate for reforestation.**

#### **Definition**

Description should include an explanation of the

- environmental factors of the area to be replanted
- regeneration and reproduction of planted species
- market for replanted species
- climate and geographical location of the area to be replanted
- landowners' management goals.

#### **Process/Skill Questions**

- How do weather and geographical location affect species development in replanting areas?
- What is the rate of regeneration of species that are replanted?
- How soon after trees are planted can they be harvested?
- How does the market value affect the scope of replanting and managing forests?

## **Task Number 141**

### **Examine the uses of prescribed burning.**

## Definition

Examination should include the

- definition of *prescribed burn*
- dangers, benefits, and hazards of prescribed burns
- times of year for prescribed burns
- factors that affect forest fires:
  - weather
  - fuel sources
  - management resources (fire services)
  - ecological effects of fire on a forest.

## Process/Skill Questions

- Why is fire considered a management tool for forest regeneration and reproduction?
- What species need fire for reproduction? How do they make use of it?
- What major environmental effects does fire have on land use?
- What is the difference between a prescribed burn and a wildfire?

## Task Number 142

### Explain the development and anatomy of a forest wildfire.

#### Definition

Explanation should include

- factors that affect forest fires:
  - weather
  - fuel sources
  - management resources (fire services)
  - ecological effect of fire on a forest.
- that the development of a forest wildfire results from time of year (season), air movement, and topography of landscape
- that the anatomy consists of
  - head as the most active part of fire
  - rear as the slowest-burning part of fire
  - flank as the sides of fire, between the head and the rear
- the fire “triangle” (i.e., fuel, heat, and oxygen).

## Process/Skill Questions

- How does topography affect a forest wildfire?
- What affects fire movement and intensity?
- Why is time of year (season) an important part of fire development?

## Task Number 143

## **Develop forest wildfire prevention techniques.**

### **Definition**

Development should include

- eliminating consumable fuel sources with uses of prescribed burning, land management, and use of thinning cuts
- understanding the National Fire Danger Rating System and educational campaigns like Smokey Bear and Keep America Green.

### **Process/Skill Questions**

- How are educational campaigns both a tool to help and to hurt wildfire prevention?
- Why would prescribed burns and thinning cuts in forests be a tool to prevent wildfires?
- What are the levels of the Fire Danger Rating System?

## **Task Number 144**

## **Evaluate forest wildfire fighting techniques.**

### **Definition**

Evaluation should include an understanding of how fires burn, move, and are influenced by weather and fuel sources. Techniques should include, but not be limited to

- construction of back burns
- use and construction of firelines
- materials and tools used to fight and control fire
- safety factors to fighting fire (human/structural).

### **Process/Skill Questions**

- What is the principle behind constructing a back burn?
- What tools are used to cut through subsoil to control ground fire burns?
- How are climate and topography used when determining how to approach and fight a wildfire?

## **Task Number 145**

## **Explain the use of herbicides in forest management.**

### **Definition**

Explanation should include

- a definition of herbicide

- examples of uses of herbicides in forest management for the control of competing vegetation or invasive species.

### **Process/Skill Questions**

- How are herbicides applied in forests?
- What pests or diseases do herbicides target?
- How are herbicides creating other ecological effects in forests?

## **Task Number 145**

### **Research the Conservation Stewardship Program (CSP) offered through the Virginia Department of Forestry (VDOF).**

#### **Definition**

Research should include lands that qualify, benefits to participants, and resource concerns addressed by the program.

#### **Process/Skill Questions**

- What lands are eligible for the CSP?
- What are some of the benefits to participants?
- What seven resource concerns does CSP address?

## **Task Number 147**

### **Explain how urban forests fit into the urban ecosystem.**

#### **Definition**

Explanation should include the definition of *urban space* and locations of urban forests in a city.

#### **Process/Skill Questions**

- How is an urban forest different from a traditional forest?
- What species might one find in an urban forest?

## **Task Number 148**

### **Identify the benefits of urban forests.**

#### **Definition**

Identification should include

- economic
- environmental
- wildlife
- recreational
- community benefits.

### **Process/Skill Questions**

- For what types of wildlife does an urban forest provide a habitat?
- How does an urban forest improve the community in which it is located?

## **Task Number 149**

**Explain the relationship between urban forests and air and water quality.**

### **Definition**

Explanation should include

- absorbing storm water
- filtering water
- reducing temperature
- filtering air
- changing building energy usage.

### **Process/Skill Questions**

- How can an urban forest change the energy use of a building?
- Why is the absorption of stormwater an important benefit of urban forests?

## **Task Number 150**

**Identify plant species appropriate to urban development.**

### **Definition**

Identification may include

- trees and shrubs
- native and non-native species.

### **Process/Skill Questions**

- What are common characteristics of trees appropriate to urban development?
- What are some native species that can be used in urban environments?

## **Task Number 151**

### **Identify best management practices for tree care.**

#### **Definition**

Identification should be based American National Standards Institute (ANSI) and International Standards of Arboriculture (ISA) and should include

- proper pruning
- tree removal
- fertilizing
- cabling and bracing
- tree preservation
- lightning protection
- insect and disease control
- root zone aeration.

#### **Process/Skill Questions**

- What is the value of trunk injections?
- What are alternatives to spraying pesticides?
- When should trees be sprayed for pests and diseases?
- Why are trees fertilized?
- What are some causes of serious injury to trees?
- How should cavities and wounds be treated?
- When should pruning cuts be painted?
- When and how can trees be reduced in size?
- When and why should trees be topped?
- Why are trees pruned?

## **Task Number 152**

### **Describe unfavorable conditions that urban trees experience.**

#### **Definition**

Description may include

- compacted soils
- limited maintenance
- drought
- pollution
- restricted root space
- reflected heat.

#### **Process/Skill Questions**

- How does a tree react to having limited root space?
- What effect does soil quality have on tree growth?

## **Task Number 153**

### **Calculate the benefits of an urban tree.**

#### **Definition**

Calculation should include the following:

- Trees create aesthetic value by adding beauty to the landscape.
- Trees purify the air, reduce noise, produce oxygen, and reduce heating and cooling needs.
- Trees add financial value to a property.
- Trees contribute to carbon sequestration.

#### **Process/Skill Questions**

- How can a tree reduce one's electricity bill?
- What is carbon sequestration, and how does it help the environment?
- Why is carbon sequestration an ecological and a financial benefit?

## **Task Number 154**

### **Describe techniques for planting and establishing trees.**

#### **Definition**

Description may include the following:

- Planting: Dig a shallow, broad hole, remove the container, plant at the proper height, straighten the tree, fill the hole, stake if needed, and mulch.
- Establishing: Water, prune, and fertilize.

#### **Process/Skill Questions**

- What are the possible consequences of planting a tree in a hole of an inappropriate depth?
- How often do new trees need to be watered?
- Why is pruning important?
- What are the consequences of over-fertilization?
- What are some corrective measures and management practices to remove soluble nutrients?

## **Task Number 155**

## **Develop a mulching, pruning, fertilization, and pest control plan for urban plantings.**

### **Definition**

Development may include a timeline of procedures to complete throughout the year including when to mulch, prune, fertilize, and spray.

### **Process/Skill Questions**

- When is the proper time to mulch?
- What factors affect pest control plans?

## **Understanding Conservation Cartography and Orienteering**

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### **Task Number 156**

## **Describe a topographic map, a relief map, and satellite imagery.**

### **Definition**

Description should include an illustration of the differences among a topographic map, a relief map, an aerial photo, and satellite images from Internet-based applications.

### **Process/Skill Questions**

- What purposes does each map/type of photography serve?
- What type of information does each provide?
- How are they created? Who creates them?
- How often are they updated, if ever?

### **Task Number 157**

## **Interpret a topographic land map.**

### **Definition**

Interpretation should include

- examining a topographic map of a locality, making sure to review the key and scale

- comparing one's knowledge of the locality with what the map shows.

### **Process/Skill Questions**

- What does the key show?
- How is scale defined?
- Is the map accurate with the actual site/locality?
- Why is this information important?
- What things can be learned from a topographic map?

## **Task Number 158**

### **Create a topographic land map.**

#### **Definition**

Creation should include

- the maximum and minimum elevations
- the scale of the map (e.g., 1 inch = 1/2 mile)
- the latitude and longitude of the central point in the lower left or right corner of the map
- a map key
- a compass rose showing cardinal and ordinal directions
- roads, rivers, lakes, mountain peaks and other significant locations
- symbols to make locations easier to find (e.g., label mountain peaks with a triangle, roads with dotted lines, listing symbols in the map key)
- drawing a contour line for the lowest elevation level and trace the shape of the land at that elevation level
- recording the elevation next to the contour line and drawing more contour lines for higher elevation levels, labeling the intervals, ensuring that the maximum elevations are at mountain tops, plateaus and other high points, and determining contour line intervals.

### **Process/Skill Questions**

- Why are topographic maps important, and how are they used?
  - Why is understanding the terrain and changes in elevation important in environmental management?
  - What are some common symbols used to represent features on topographic maps, and how are they depicted?
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## **Task Number 159**

### **Determine percentage slope on a topographic map.**

#### **Definition**

Determination should include applying knowledge of slope and topo maps to calculate the slope of a particular piece of land.

### **Process/Skill Questions**

- How can accuracy of the slope be determined and portrayed?
- Why would this information be needed?
- How can accuracy affect zoning classifications, agricultural and/or forestry industries?

## **Task Number 160**

### **Interpret maps for correlation to geographic features.**

#### **Definition**

Interpretation should include

- use of a key: boundary lines, sinkholes, wells, lakes
- an explanation of maps of local areas using the key
- a comparison of findings to the actual features of the locality
- distinguishing discrete land use areas on an aerial photo.

### **Process/Skill Questions**

- After reviewing maps, how can it be determined whether the findings are accurate?
- What agencies use information regarding interpretation?
- What individuals would find this information helpful?
- What determines when or whether maps are updated or checked for accuracy?

## **Task Number 161**

### **Identify cardinal directions on maps and in the outdoors.**

#### **Definition**

Identification should include

- definition of *cardinal directions*
- explanation of how and where cardinal directions on a map and in the outdoors may be located.

### **Process/Skill Questions**

- What methods can be used to locate/identify cardinal directions?
- Why are cardinal directions important?
- What agencies/groups/individuals would need to know these?
- How would knowing cardinal directions be beneficial to anyone?

## Task Number 162

### Use a compass to orient various locations on a map.

#### Definition

Use should include

- summarizing the main uses of a compass
- labeling the parts of the compass
- manipulating a compass to orient oneself through a given map/course.

#### Process/Skill Questions

- How can knowing the proper use of a compass be helpful?
- Who should always carry a compass?
- Is having a map critical to using a compass?
- When could having a compass both with and without a map be helpful?
- What is an orienteering course? Is a compass needed? Is a map needed?
- What items will disrupt the reading of a compass?

## Task Number 163

### Use triangulation to estimate unknown location from one or more known locations.

#### Definition

Use should include

- definition of *triangulation*
- a compass and a map to triangulate a set location.

#### Process/Skill Questions

- What circumstances would be most conducive to using triangulation?
- Can triangulation be used with only one known point? If so, how?

## Task Number 164

### Define *geographic information system (GIS)*.

#### Definition

Definition should include

- description of a GIS
- purpose of a GIS.

### **Process/Skill Questions**

- Why was the GIS developed?
- What is the history of the GIS?
- Who uses and benefits from a GIS?
- What data can a GIS provide?
- How current is a GIS?

## **Task Number 165**

### **Explain global positioning system (GPS).**

#### **Definition**

Explanation should include a

- definition of *GPS*
- description of how a GPS works
- demonstration of a handheld GPS
- comparison of handheld GPS to mounted/installed GPS units.

#### **Process/Skill Questions**

- What is the history of GPS?
- What was the original purpose/use of GPS?
- What agencies use GPS?
- Which came first: handheld units or large, installed units? Why was this so?
- Who is responsible for creating/updating GPS and maintaining its database?

## **Investigating Waste Management**

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### **Task Number 166**

### **Explain the processes carried out in a sewage plant.**

#### **Definition**

Explanation may include

- primary screening

- primary treatment
- secondary treatment
- tertiary treatment.

### **Process/Skill Questions**

- What is the role of biological agents in the sewage treatment process?
- Why is primary screening necessary?

## **Task Number 167**

### **Explain a sewage disposal system.**

#### **Definition**

Explanation may include

- a home septic system
- a municipal sewage plant.

### **Process/Skill Questions**

- What are the differences and similarities of a home septic system and a municipal sewage plant?
- What percentage of homes in the United States use municipal sewage systems vs. home septic systems? Why is this the case?

## **Task Number 168**

### **Outline the systems for hazardous waste disposal.**

#### **Definition**

Outline may include

- permitting
- treatment
- storage
- disposal
- recordkeeping
- reporting.

### **Process/Skill Questions**

- Who is responsible for keeping records of hazardous waste disposal?
- Where can hazardous waste be disposed?
- What determines whether waste is hazardous?

## **Task Number 169**

### **Identify common methods of waste disposal.**

#### **Definition**

Identification should include

- recycling facility
- landfill
- waste-to-energy incinerator
- composting facility.

#### **Process/Skill Questions**

- What are the current EPA regulations for landfills?
- What is the least financially expensive method for disposing of municipal solid waste?

## **Task Number 170**

### **Design a landfill.**

#### **Definition**

Design should include

- plastic liner
- 12 inches of clay
- gravel
- leachate collection system
- alternating layers of trash and soil
- test wells.

#### **Process/Skill Questions**

- Who regulates and enforces the guidelines for the construction of landfills?
- What is the purpose of test wells?
- What is the largest financial expense in the construction of a landfill?
- How can landfills generate energy?

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## **Managing Energy Resources**

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## Task Number 171

### Describe forms of energy usable to humans.

#### Definition

Description should include

- definition of terms
  - *renewable energy*
  - *nonrenewable energy*
  - *fossil fuel*
- examples of renewable (e.g., solar wind) and nonrenewable (e.g., coal, oil, natural gas) forms of energy.

#### Process/Skill Questions

- What are examples of renewable energy?
- What energy is produced from renewable energy sources?

## Task Number 172

### Outline energy production trends in the United States and worldwide.

#### Definition

Outline should include use of renewable and nonrenewable energy sources and how much the United States consumes compared to the rest of the world.

#### Process/Skill Questions

- What form of energy is most common in the United States?
- What percent of energy produced does the United States consume vs. other countries?

## Task Number 173

### Explain traditional and primary energy sources in use today.

#### Definition

Explanation should include definitions of traditional and primary energy sources and their functions in today's energy markets.

#### Process/Skill Questions

- What are sources of traditional energy?
- What are sources of primary energy?
- What is the benefit of using primary energy over traditional energy?

## **Task Number 174**

### **Describe alternative sources of energy.**

#### **Definition**

Description should include examples such as

- solar
- wind
- micro hydro
- geothermal
- tidal
- nuclear
- biofuels and ethanol
- green technology.

#### **Process/Skill Questions**

- What technologies are available to implement alternative energy sources into everyday life?
- How are alternative energy sources becoming more available to consumers?
- What is the cost associated with producing energy using alternative methods?
- What are the risks of using alternative energy sources?

## **Task Number 175**

### **Evaluate appliances for energy use and conservation.**

#### **Definition**

Evaluation should include energy ratings (e.g., Energy Star) of appliances and their savings (monetary) over the lifetime of the appliance.

#### **Process/Skill Questions**

- Why are appliances now rated for energy efficiency?
- What is the leading cause of energy overuse in the United States?
- How does energy conservation affect the natural, renewable, and nonrenewable resources available?

## **Task Number 176**

## **Describe how various energy sources are obtained, processed, distributed, and used.**

### **Definition**

Description should include processes of energy systems such as

- solar
- wind
- hydroelectric
- geothermal
- biomass
- nuclear
- fossil fuels
- an explanation regarding the distribution of energy systems and their affordability.

### **Process/Skill Questions**

- What are the major sources of energy for the United States? Are they renewable or nonrenewable energy?
- How are emerging technologies in energy production and distribution affecting the long-term cost of energy?
- What are sources and systems used in energy production and distribution?

## **Task Number 177**

## **Explain problems associated with the production, processing, distribution, and use of various energy sources.**

### **Definition**

Explanation should include issues related to the collection and manufacturing of energy and the distribution of energy. Areas of concern associated with energy sources include

- transfer of power within localities
- cost and use of upgraded technologies
- use of limited (nonrenewable) resources in production of energy.

### **Process/Skill Questions**

- Why is the use of nonrenewable resources in the production of energy still popular?
- What forms of energy are economical for consumers?
- How is energy transfer/distribution a problem?
- How are carbon credits used by industries?

## **SOL Correlation by Task**

39	Identify the role of supervised agricultural experiences (SAEs) in agricultural education.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5
40	Participate in an SAE.	English: 9.5, 9.8, 10.5, 10.8, 11.5, 11.8, 12.5, 12.8
41	Identify the benefits and responsibilities of FFA membership.	English: 9.5, 9.6, 9.7, 9.8, 10.5, 10.6, 10.7, 10.8, 11.5, 11.6, 11.7, 11.8, 12.5, 12.6, 12.7, 12.8
42	Describe leadership characteristics and opportunities as they relate to agriculture and FFA.	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: VUS.8, VUS.9, VUS.10, VUS.11, WHIL.8, WHIL.10, WHIL.11
43	Apply for an FFA degree and/or an agricultural proficiency award.	English: 9.5, 10.5, 11.5, 12.5
44	Describe occupations in natural resource management and conservation areas including regulatory and non-regulatory services.	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: WG.4, WG.5
45	Develop a list of local, state, and federal agencies and nonprofit organizations that work with the environment and/or natural resources.	English: 9.5, 9.8, 10.5, 10.8, 11.5, 11.8, 12.5, 12.8  History and Social Science: GOVT.15, GOVT.16
46	Identify environmental and natural resource management and conservation businesses in the community.	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: GOVT.9, GOVT.15, WG.4, WG.16, WG.18
47	Explain the importance of the environment in sustaining living organisms.	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: GOVT.15, VUS.1, WG.2, WHI.1, WHI.2, WHIL.8, WHIL.14
48	Define basic terminology in ecology and other environmental science.	English: 9.3, 10.3, 11.3, 12.3  History and Social Science: WG.1, WG.2  Science: BIO.8
49	Explain energy transfer.	English: 9.5, 10.5, 11.5, 12.5  Science: BIO.2, BIO.8
50	Describe the effects of natural events and anthropogenic influences on ecosystems.	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: WG.2, WG.14, WG.15

51	Explain principles and processes of ecological succession.	English: 9.5, 10.5, 11.5, 12.5 Science: BIO.8
52	Illustrate geometric vs. arithmetic increases in population growth.	History and Social Science: VUS.1, VUS.2, VUS.8, WG.1, WG.14, WG.15, WHI.1, WHII.1, WHII.8 Mathematics: AFDA.1, AFDA.2, AII.5, AII.6, AII.7, MA.2 Science: BIO.8
53	Describe the logistics of population growth.	English: 9.5, 10.5, 11.5, 12.5 History and Social Science: VUS.1, VUS.2, VUS.8, WG.14, WG.15, WG.16, WHI.1, WHII.1, WHII.8 Mathematics: AFDA.1, AII.7, MA.2 Science: BIO.8
54	Explain the tragedy of the commons.	English: 9.5, 10.5, 11.5, 12.5 History and Social Science: WG.17, WG.18 Science: BIO.8
55	Explain the role of biodiversity in ecosystem stability.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5 Science: BIO.8
56	Identify the effects of latitude and altitude on species diversity.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5 History and Social Science: WG.2, WG.4 Science: BIO.8
57	Explain the process of species differentiation.	English: 9.5, 10.5, 11.5, 12.5 Science: BIO.6, BIO.7, BIO.8
58	Diagram the composition of the atmosphere.	Science: ES.6
59	Outline effective methods to control various air pollutants.	English: 9.6, 9.7, 10.6, 10.7, 11.6, 11.7, 12.6, 12.7

		History and Social Science: GOVT.9, GOVT.15
60	Explain the effects of greenhouse gases.	English: 9.5, 10.5, 11.5, 12.5  Science: ES.11
61	Determine the sources and effects of acid rain.	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: WG.2, WG.3, WG.17, WG.18  Science: ES.11
62	Analyze the conversation surrounding ozone depletion.	English: 9.5, 10.5, 11.5, 12.5  Science: ES.11
63	Define <i>noise pollution</i> .	English: 9.3, 10.3, 11.3, 12.3  History and Social Science: GOVT.15
64	Research noise restrictions for a locality.	English: 9.8, 10.8, 11.8, 12.8
65	Identify different types of noise pollution and the effect on humans, wildlife, and ecological systems.	English: 9.5, 10.5, 11.5, 12.5
66	Describe the soil-formation process.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5  Science: ES.8
67	Classify soils using the soil taxonomy system.	English: 9.5, 10.5, 11.5, 12.5  Science: ES.8
68	Identify differences in soil profiles.	English: 9.5, 10.5, 11.5, 12.5  Science: ES.8
69	Investigate soil types.	English: 9.5, 10.5, 11.5, 12.5  Science: ES.8
70	Interpret data contained in soil maps.	English: 9.5, 10.5, 11.5, 12.5  Science: ES.8
71	Explain land capability classes.	English: 9.5, 10.5, 11.5, 12.5
72	Explain leaching in soils.	English: 9.5, 10.5, 11.5, 12.5  Science: ES.8
73	Collect soil samples to analyze for composition.	English: 9.5, 10.5, 11.5, 12.5
74	Interpret soil test results to make nutrient recommendations.	English: 9.5, 10.5, 11.5, 12.5
75	Explain how wind and water erode soil.	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: WG.2

		Science: ES.7
76	Identify common materials used for riparian buffers and vegetative erosion control methods.	English: 9.5, 10.5, 11.5, 12.5
77	Explain the effects of erosion on plants, animals, and their habitats.	English: 9.5, 10.5, 11.5, 12.5 Science: ES.7
78	Describe crop rotation and no-till agriculture.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5
79	Explain mechanical erosion controls.	English: 9.5, 10.5, 11.5, 12.5
80	Define characteristics of water.	English: 9.3, 10.3, 11.3, 12.3 Science: BIO.2, CH.5, ES.12
81	Define <i>wetlands</i> and uses.	English: 9.3, 10.3, 11.3, 12.3 Science: ES.8
82	Illustrate the hydrologic cycle.	Science: ES.8
83	Illustrate components of the riverine system.	
84	Identify characteristics of an estuarine system.	English: 9.5, 10.5, 11.5, 12.5 Science: ES.8
85	Describe an aquatic zonation system.	English: 9.5, 10.5, 11.5, 12.5 Science: ES.10
86	Explain the different ways water moves in the oceans and the factors affecting movement.	English: 9.5, 10.5, 11.5, 12.5 Science: ES.10
87	Explain groundwater and sources of groundwater.	English: 9.5, 10.5, 11.5, 12.5 Science: ES.8
88	Explain the role of frozen water in Earth's systems.	English: 9.5, 10.5, 11.5, 12.5
89	Define <i>water table</i> .	English: 9.3, 10.3, 11.3, 12.3 Science: ES.8
90	Explain the Clean Water Act.	English: 9.5, 10.5, 11.5, 12.5 History and Social Science: GOVT.9, GOVT.15
91	Examine the water needs for an agricultural enterprise, school, or home.	English: 9.5, 10.5, 11.5, 12.5 Mathematics: A.1
92	Define <i>point</i> and <i>nonpoint source</i> (NPS) pollution.	English: 9.3, 10.3, 11.3, 12.3
93	Identify major water pollutants and their effects on the environment.	English: 9.5, 10.5, 11.5, 12.5
94	Define <i>karst topography</i> .	English: 9.3, 10.3, 11.3, 12.3 Science: ES.8
95	Analyze water samples for chemical pollutants and biological organisms.	English: 9.5, 10.5, 11.5, 12.5
96	Analyze water quality using the Izaak Walton League of America (IWLA) method.	English: 9.5, 10.5, 11.5, 12.5

97	Explain the effects of water pollution on agricultural production.	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: WG.2, WG.3
98	Define <i>eutrophication</i> and its relationship to nutrient-rich waters.	English: 9.3, 10.3, 11.3, 12.3
99	Report on the effects of polluted water on animals and humans.	English: 9.1, 10.1, 11.1, 12.1
100	Compare methods used to reduce surface and groundwater contamination.	English: 9.5, 10.5, 11.5, 12.5
101	Select best management practices designed to improve water quality.	English: 9.5, 10.5, 11.5, 12.5
102	Identify the characteristics of a watershed.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5  Science: ES.8
103	Interpret a flood-hazard analysis.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5
104	Explain methods of flood control.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5
105	Compare stream bank protection measures.	English: 9.5, 10.5, 11.5, 12.5
106	Examine environmental agencies: Environmental Protection Agency (EPA), U.S. Department of Agriculture (USDA), Virginia Department of Agriculture and Consumer Services (VDACS), Virginia Department of Environmental Quality (DEQ), Virginia Department of Game and Inland Fisheries (VDGIF), and Virginia Department of Forestry (VDOF).	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: GOVT.9, GOVT.15
107	Identify local, state, national, and global issues concerning agriculture and the environment.	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: GOVT.7, GOVT.8, GOVT.9, WG.16, WG.17
108	Summarize how agriculture and the environment are related.	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: WG.1, WG.2, WG.3
109	Compare sustainability practices and multiple-use management strategies and their uses to protect and maintain Virginia's forest ecosystems.	English: 9.5, 10.5, 11.5, 12.5
110	Outline the Virginia Erosion and Sediment Control Law.	English: 9.6, 9.7, 10.6, 10.7, 11.6, 11.7, 12.6, 12.7
111	Define <i>organic farming</i> .	English: 9.3, 10.3, 11.3, 12.3
112	Assess how technology has influenced pollution problems.	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: WG.1, WG.2, WG.16, WG.17, WG.18
113	Identify major land uses and their effects on the environment and ecosystems.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5

		History and Social Science: WG.2, WG.3, WG.14, WG.18
114	Explain zoning classifications and their effects.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5  History and Social Science: GOVT.9, GOVT.15, WG.18
115	Classify land zoning according to its uses.	English: 9.5, 10.5, 11.5, 12.5
116	Describe green infrastructure.	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: WG.2, WG.16
117	Describe the role of hunting and fishing in the management of wildlife.	English: 9.5, 10.5, 11.5, 12.5  Science: BIO.8
118	Identify common game species native to Virginia.	English: 9.5, 10.5, 11.5, 12.5
119	Contrast habitat requirements for various fish and wildlife.	English: 9.5, 10.5, 11.5, 12.5
120	Describe human conflicts with wildlife populations.	English: 9.5, 10.5, 11.5, 12.5  Science: BIO.8
121	Describe the environmental effects of overpopulation of wildlife.	English: 9.5, 10.5, 11.5, 12.5  Science: BIO.8
122	Identify local plants or trees that provide food and/or cover for animals and birds.	English: 9.5, 10.5, 11.5, 12.5
123	Explain measurement of the wildlife and fish population.	English: 9.5, 10.5, 11.5, 12.5  Mathematics: PS.17, PS.18, PS.19, PS.8*
124	Explain the difference among extinct, endangered, and threatened species of wildlife.	English: 9.5, 10.5, 11.5, 12.5
125	Identify Virginia's threatened and endangered species.	English: 9.5, 10.5, 11.5, 12.5  Science: BIO.8
126	Identify diseases and parasites in wildlife.	English: 9.5, 10.5, 11.5, 12.5  Science: BIO.4
127	List methods to improve reintroduction of species to a natural habitat.	English: 9.5, 9.6, 9.7, 10.5, 10.6, 10.7, 11.5, 11.6, 11.7, 12.5, 12.6, 12.7
128	Describe management practices of freshwater fisheries.	English: 9.5, 10.5, 11.5, 12.5
129	Summarize the aquaculture industry.	English: 9.5, 10.5, 11.5, 12.5
130	Describe the effects of habitat loss.	English: 9.5, 10.5, 11.5, 12.5  Science: BIO.8
131	Explain basic tree structure and growth.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5

132	Identify forest trees of Virginia.	English: 9.5, 10.5, 11.5, 12.5 Science: BIO.8
133	Explain invasive species and their effects on native populations.	English: 9.5, 10.5, 11.5, 12.5 Science: BIO.8
134	Differentiate between forest types.	English: 9.5, 10.5, 11.5, 12.5 History and Social Science: WG.3, WG.4, WG.6, WG.9
135	Identify tree diseases and insect pests.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5
136	Calculate the value of standing timber.	Mathematics: A.1, A.4
137	Identify forest products and uses of harvested trees.	English: 9.5, 10.5, 11.5, 12.5
138	Explain why trees are undesirable and selected for removal.	English: 9.5, 10.5, 11.5, 12.5
139	Compare methods of forest harvest and regeneration.	English: 9.5, 10.5, 11.5, 12.5
140	Describe factors considered when determining species most appropriate for reforestation.	English: 9.5, 10.5, 11.5, 12.5
141	Examine the uses of prescribed burning.	English: 9.5, 10.5, 11.5, 12.5
142	Explain the development and anatomy of a forest wildfire.	English: 9.5, 10.5, 11.5, 12.5
143	Develop forest wildfire prevention techniques.	English: 9.1, 10.1, 11.1, 12.1
144	Evaluate forest wildfire fighting techniques.	English: 9.5, 10.5, 11.5, 12.5
145	Explain the use of herbicides in forest management.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5
146	Research the Conservation Stewardship Program (CSP) offered through the Virginia Department of Forestry (VDOT).	English: 9.8, 10.8, 11.8, 12.8
147	Explain how urban forests fit into the urban ecosystem.	English: 9.5, 10.5, 11.5, 12.5
148	Identify the benefits of urban forests.	English: 9.5, 10.5, 11.5, 12.5
149	Explain the relationship between urban forests and air and water quality.	English: 9.5, 10.5, 11.5, 12.5
150	Identify plant species appropriate to urban development.	English: 9.5, 10.5, 11.5, 12.5
151	Identify best management practices for tree care.	English: 9.5, 10.5, 11.5, 12.5
152	Describe unfavorable conditions that urban trees experience.	English: 9.5, 10.5, 11.5, 12.5
153	Calculate the benefits of an urban tree.	English: 9.5, 10.5, 11.5, 12.5
154	Describe techniques for planting and establishing trees.	English: 9.5, 10.5, 11.5, 12.5
155	Develop a mulching, pruning, fertilization, and pest control plan for urban plantings.	English: 9.5, 10.5, 11.5, 12.5
156	Describe a topographic map, a relief map, and satellite imagery.	English: 9.5, 10.5, 11.5, 12.5 History and Social Science: WG.1, WG.2 Science: ES.1
157	Interpret a topographic land map.	English: 9.5, 10.5, 11.5, 12.5 History and Social Science: WG.1, WG.2 Science: ES.1
158	Create a topographic land map.	

159	Determine percentage slope on a topographic map.	English: 9.5, 10.5, 11.5, 12.5 Mathematics: A.6
160	Interpret maps for correlation to geographic features.	English: 9.5, 10.5, 11.5, 12.5 History and Social Science: WG.1, WG.2
161	Identify cardinal directions on maps and in the outdoors.	English: 9.5, 10.5, 11.5, 12.5 History and Social Science: WG.1
162	Use a compass to orient various locations on a map.	English: 9.5, 10.5, 11.5, 12.5 History and Social Science: WG.1, WG.2, WHII.11
163	Use triangulation to estimate unknown location from one or more known locations.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5 Mathematics: G.5
164	Define <i>geographic information system (GIS)</i> .	English: 9.3, 10.3, 11.3, 12.3 History and Social Science: WG.1, WG.2
165	Explain global positioning system (GPS).	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5 History and Social Science: WG.1, WG.2 Science: ES.1
166	Explain the processes carried out in a sewage plant.	English: 9.5, 10.5, 11.5, 12.5
167	Explain a sewage disposal system.	English: 9.5, 10.5, 11.5, 12.5
168	Outline the systems for hazardous waste disposal.	English: 9.6, 9.7, 10.6, 10.7, 11.6, 11.7, 12.6, 12.7
169	Identify common methods of waste disposal.	English: 9.5, 10.5, 11.5, 12.5
170	Design a landfill.	
171	Describe forms of energy usable to humans.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5 Science: ES.6
172	Outline energy production trends in the United States and worldwide.	English: 9.6, 9.7, 10.6, 10.7, 11.6, 11.7, 12.6, 12.7 History and Social Science: WG.1, WG.17, WG.18
173	Explain traditional and primary energy sources in use today.	English: 9.3, 9.5, 10.3, 10.5, 11.3, 11.5, 12.3, 12.5

		History and Social Science: WG.1, WG.4, WG.17  Science: ES.6
174	Describe alternative sources of energy.	English: 9.5, 10.5, 11.5, 12.5  Science: ES.6
175	Evaluate appliances for energy use and conservation.	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: WG.1, WG.2
176	Describe how various energy sources are obtained, processed, distributed, and used.	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: WG.2, WG.4  Science: ES.6
177	Explain problems associated with the production, processing, distribution, and use of various energy sources.	English: 9.5, 10.5, 11.5, 12.5  History and Social Science: WG.2, WG.4  Science: ES.6

## FFA Information

The National FFA is an organization dedicated to preparing members for leadership and careers in the science, business, and technology of agriculture. Local, state, and national activities and award programs provide opportunities to apply knowledge and skills acquired through agriculture education.

For additional information about the student organization, see the [National FFA website](#) and the [Virginia FFA Association website](#).

## Green Building Infusion Units

*The Green Building Infusion Unit (GBIU)* was designed to encourage teachers to infuse instructional units on green building knowledge and skills into designated CTE courses. The infusion unit is not mandatory, and, as such, the tasks/competencies are marked as *optional*, to be taught at the instructor's discretion.

## Forestry Guide for Agricultural Education in Virginia (2013)

Description: Use this publication in conjunction with many agricultural education courses. Teachers may use all or part of these 12 lesson plans and information may be duplicated for students. (File size: 10MG)

This publication is an updated and revised edition of the 2002 Forestry in Agricultural Education in Virginia and presents to the teacher lesson plans that may be used in conjunction with agricultural education courses. Teachers may use the lesson plans in their entirety or in part, and information may be duplicated for students. A teacher's notes page has been added to the end of each lesson so that the teacher can personalize the lesson plan to his/her own teaching.

[Forestry Guide for Agricultural Education in Virginia \(2013\)](#)

## **Entrepreneurship Infusion Units**

Entrepreneurship Infusion Units may be used to help students achieve additional, focused competencies and enhance the validated tasks/competencies related to identifying and starting a new business venture. Because the unit is a complement to certain designated courses and is not mandatory, all tasks/competencies are marked *optional*.

# Appendix: Credentials, Course Sequences, and Career Cluster Information

## Industry Credentials: Only apply to 36-week courses

- College and Work Readiness Assessment (CWRA+)
- Customer Service Specialist (CSS) Examination
- Ecology Conservation & Management Examination
- National Career Readiness Certificate Assessment
- Natural Resources Systems Assessment
- Workplace Readiness Skills for the Commonwealth Examination

**Concentration sequences:** *A combination of this course and those below, equivalent to two 36-week courses, is a concentration sequence. Students wishing to complete a specialization may take additional courses based on their career pathways. A program completer is a student who has met the requirements for a CTE concentration sequence and all other requirements for high school graduation or an approved alternative education program.*

- Agricultural Business Fundamentals I (8022/36 weeks)
- Agricultural Business Management III (8026/36 weeks)
- Agricultural Business Operations II (8024/36 weeks)
- Applied Agricultural Concepts (8072/18 weeks)
- Applied Agricultural Concepts (8073/36 weeks)
- Biological Applications in Agriculture (8086/36 weeks)
- Biotechnology Applications in Agriculture (8087/36 weeks)
- Biotechnology Foundations in Agricultural and Environmental Science (8085/36 weeks)
- Community Forestry and Tree Management (8048/36 weeks)
- Fisheries and Wildlife Management (8041/36 weeks)
- Forestry Management (8042/36 weeks)
- Forestry Management, Advanced (8044/36 weeks)
- Introduction to Natural Resources and Ecology Systems (8040/36 weeks)
- Introduction to Plant Systems (8007/36 weeks)
- Outdoor Recreation, Parks, and Tourism Systems Management (8043/36 weeks)
- Sustainability and Renewable Technologies (8414/36 weeks)

Career Cluster: Agriculture, Food and Natural Resources	
Pathway	Occupations
Environmental Service Systems	Environmental Compliance Inspector Environmental Sampling and Analysis Technician Hazardous Materials Handler Recycling Coordinator
Plant Systems	Forest Geneticist

<b>Career Cluster: Education and Training</b>	
<b>Pathway</b>	<b>Occupations</b>
Teaching and Training	Secondary School Teacher Training Consultant/Training Specialist

<b>Career Cluster: Government and Public Administration</b>	
<b>Pathway</b>	<b>Occupations</b>
Foreign Service	Diplomatic Courier Foreign Service Worker Interpreter/Translator
Governance	Legislative Aide Legislator Lobbyist
National Security	Combat Specialty Officer Military Enlisted Personnel Military Intelligence Specialist Military Officer Special Forces Personnel
Planning	Actuarial Analyst Economic Development Coordinator Economist Interviewer Urban and Regional Planner
Public Management and Administration	Court Clerk Eligibility Specialist Government Accountant/Auditor Mail Carrier Postal Service Clerk Postmaster/Mail Superintendent
Regulation	Aviation Inspector Compliance Officer Environmental Compliance Inspector Financial Analyst Financial Manager Private Detective, Investigator Transit Vehicle Inspector
Revenue and Taxation	Compliance Officer Financial Analyst Financial Manager Real Estate Appraiser Revenue Agent

<b>Career Cluster: Science, Technology, Engineering and Mathematics</b>	
<b>Pathway</b>	<b>Occupations</b>
Engineering and Technology	Chemical Engineer Environmental Engineer
Science and Mathematics	Environmental Scientist Oceanographer Toxicologist