

Forestry Management

8042 36 weeks

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Course Description

Suggested Grade Level: 11 or 12

This course provides instruction in the management of the forest as a resource and as a business. Students develop knowledge in tree physiology, forest ecology, silviculture, and the management and marketing of forest products. Strong emphasis is placed on developing career skills for the forestry industry.

As noted in [Superintendent's Memo #058-17 \(2-28-2017\)](#), this Career and Technical Education (CTE) course must maintain a maximum pupil-to-teacher ratio of 20 students to one teacher, due to safety regulations. The 2016-2018 biennial budget waiver of the teacher-to-pupil ratio staffing requirement does not apply.

Task Essentials Table

8042	Tasks/Competencies
<input checked="" type="checkbox"/>	Identify the role of supervised agricultural experiences (SAEs) in agricultural education.
<input checked="" type="checkbox"/>	Participate in an SAE.
<input checked="" type="checkbox"/>	Identify the benefits and responsibilities of FFA membership.
<input checked="" type="checkbox"/>	Describe leadership characteristics and opportunities as they relate to agriculture and FFA.
<input type="checkbox"/>	Apply for an FFA degree and/or an agricultural proficiency award.
<input checked="" type="checkbox"/>	Define <i>forest</i> and related terminology.

+	Summarize the history of Virginia’s forests and forest industry.
+	Explain factors that influence forest use and management.
+	Analyze anthropogenic effects on forest ecosystems.
+	Describe responsible use of forest resources.
+	Identify ecosystem services provided by forests.
+	Identify forest products.
+	Explain the importance of collaboration in forest management.
+	Identify the use of common forestry tools and equipment.
+	Conduct a land navigation exercise.
+	Determine the elevation of a given point on a topographic map.
+	Describe current and emerging technology used in forest management.
+	Identify tree species common to Virginia.
+	Identify agencies that assist in protecting and managing forests.
+	Explain the functions of the major parts of the tree.
+	Analyze photosynthesis, respiration, and transpiration.
+	Describe the growth and life processes of trees.
+	Explain the factors that influence tree growth.
+	Define <i>forest ecology</i> .
+	Analyze forest ecosystems.
+	Explain how soil affects which tree species grow on a site.
+	Examine the relationship between the forest and the hydrologic cycle.
+	Analyze the effects of soil alteration on the forest ecosystem.
+	Explain how forest management can affect habitat.
+	Explain the importance of biodiversity.
+	Explore the types and characteristics of Virginia forests.
+	Identify plants and animals found within Virginia forest ecosystems.

<input checked="" type="radio"/>	Examine the forest types of North America.
<input type="radio"/>	Identify trees common to each North American forest type.
<input checked="" type="radio"/>	Examine anthropogenic influences on forests.
<input checked="" type="radio"/>	Describe the changes in demand for forest products.
<input checked="" type="radio"/>	Examine the concept of forest sustainability.
<input checked="" type="radio"/>	Explore trends and threats related to Virginia forests.
<input checked="" type="radio"/>	Compare perspectives, trends, and priorities in Virginia public and private forest management.
<input checked="" type="radio"/>	Identify uses of forests.
<input checked="" type="radio"/>	Explain how management practices for parks and natural areas influence forest ecosystem preservation.
<input checked="" type="radio"/>	Examine agencies governing forests and parklands.
<input type="radio"/>	Compare local, state, and national parks and forests.
<input type="radio"/>	Analyze human interests and values that affect forests and parklands.
<input checked="" type="radio"/>	Identify market opportunities that arise from niche markets for forest products.
<input checked="" type="radio"/>	Identify major industries that require wood and wood by-products.
<input checked="" type="radio"/>	Describe harvesting techniques.
<input checked="" type="radio"/>	Describe harvesting equipment.
<input checked="" type="radio"/>	Identify factors used to determine harvesting techniques.
<input checked="" type="radio"/>	Identify the environmental effects of harvest operations.
<input checked="" type="radio"/>	Examine reforestation principles.
<input checked="" type="radio"/>	Examine factors that limit forest regeneration.
<input checked="" type="radio"/>	Examine the role of fire in forest systems.
<input checked="" type="radio"/>	Explain prescribed burning.
<input checked="" type="radio"/>	Examine the role of biotechnology in forestry.
<input checked="" type="radio"/>	Identify factors that can affect the health of forest systems.
<input checked="" type="radio"/>	Examine the ways pests can be transported from forest to forest.

<input checked="" type="radio"/>	Evaluate symptoms exhibited by trees that are affected by pests and diseases.
<input checked="" type="radio"/>	Identify characteristics of healthy and unhealthy forests.
<input checked="" type="radio"/>	Examine disease and pest control methods.
<input checked="" type="radio"/>	Examine common pests and diseases affecting Virginia forests.
<input checked="" type="radio"/>	Identify invasive species threatening Virginia forests.
<input type="radio"/>	Interpret a financial statement.
<input checked="" type="radio"/>	Evaluate the safety requirements and standards for forest industry employees.
<input checked="" type="radio"/>	Comply with federal, state, and local safety and legal requirements in the operation of all tools and equipment.
<input type="radio"/>	Prepare a complete income and expense budget for a natural resource enterprise.
<input type="radio"/>	Maintain records for a natural resource enterprise.
<input type="radio"/>	Determine personnel requirements.
<input type="radio"/>	Describe training techniques.
<input type="radio"/>	Develop a public relations program for a natural resource enterprise.
<input type="radio"/>	Identify policies and laws related to natural resources management.
<input type="radio"/>	Develop a funding or grant proposal for a forest management project.

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. 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

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?

Introducing Forestry

Task Number 44

Define *forest* and related terminology.

Definition

Definitions should include

- *dendrology*
- *forest*
- *forestry*
- *renewable resources*
- *streamside management zones (SMZ)* (e.g., riparian buffers)
- *silviculture* (e.g., timber stand improvement [TSI])
- *sustainability*
- *water quality*

- *watershed.*

Process/Skill Questions

- What is the difference between silviculture and dendrology?
- How do renewable resources relate to forestry?
- What are the benefits of SMZ to water quality?

Task Number 45

Summarize the history of Virginia's forests and forest industry.

Definition

Summary could include

- analyzing forestry in Virginia throughout history
 - timber harvest and use
 - land clearing for agriculture
 - loss from overcutting following colonization or wars
 - effects of the Civil War
 - abandoned agricultural land during the Great Depression
 - increasing development
 - loss of the American chestnut in the forests
 - use or restriction of wildland fire on species composition and structure
- describing the establishment of state and national forests
- examining conservation efforts.

Process/Skill Questions

- What effect did chestnut blight have on Virginia's forests?
- What were Virginia's forests like before European colonization?
- How did the conservation movement affect Virginia's forests?
- How have historical events affected the local forest?

Task Number 46

Explain factors that influence forest use and management.

Definition

Explanation should include factors such as

- economic
- social
- environmental
- cultural

- political.

Process/Skill Questions

- How do economics affect forest resource management?
- How does public perception influence management decisions?
- What natural events could affect forest resources?

Task Number 47

Analyze anthropogenic effects on forest ecosystems.

Definition

Analysis should include exploring the effects of

- conservation vs. preservation
- the harvesting of forest products
- fire management practices
- recreational use
- fragmentation and parcelization
- agricultural and urban development
- pollution
- mismanagement.

Note: [Leave No Trace](#) can be used as a resource about ethical use of the forest.

Process/Skill Questions

- How do regulations regarding wildlife in the forests affect how people spend time in the forests?
- How can wildlife populations affect forest tree and plant resource value?
- How do wildlife populations affect management decisions?
- How do human influences affect forest organisms?
- How do exotic diseases, insects, mammalian herbivores, and competing vegetation affect genetic diversity?

Task Number 48

Describe responsible use of forest resources.

Definition

Description should include

- sustainable management
- best management practices (BMP)
- multiple-use management.

Process/Skill Questions

- What are user responsibilities for public land?
- What are BMP for water quality?
- How does the economy influence sustainable management?

Task Number 49

Identify ecosystem services provided by forests.

Definition

Identification should include

- recreation
- clean air
- clean water
- control/prevention of soil erosion
- shade, leading to reduction of energy use
- wildlife habitat.

Process/Skill Questions

- What products do you use daily that are derived from forests?
- What products are produced locally that are derived from forests?
- What are some products derived from pulpwood?

Task Number 50

Identify forest products.

Definition

Identification may include

- wood products
 - oriented strand board (OSB)
 - plywood
 - veneer
 - pulp
 - paper
 - timber
 - ties
 - dimensional lumber
 - poles

- pallets
- biomass (e.g., pellets, charcoal, fuel chips)
- flooring
- cooperage
- activated carbon
- shavings for animal bedding
- cross laminated timber (CLT)
- bark
- mulch
- non-timber forest products
 - medicinal (e.g., ginseng, golden seal, black cohosh)
 - edible (e.g., nuts, mushrooms, fruits, maple syrup)
 - decorative (e.g., grapevines, pinecones).

Process/Skill Questions

- What is the definition of *cooperage*?
- What forest products do you use every day?
- What forest products are produced in your county?
- What are the benefits of engineered wood products?
- What are the differences between wood products and non-timber forest products?

Task Number 51

Explain the importance of collaboration in forest management.

Definition

Explanation should include the importance of collaboration among

- landowners
- loggers
- forestry professionals
 - foresters
 - consultants
- forestry organizations
 - Virginia Forestry Association (VFA)
 - Virginia Loggers Association
 - Virginia Forest Products Association (VFPA)
- government agencies
 - state
 - federal
- nonprofit organizations
- forest industries (e.g., paper companies, sawmills).

Process/Skill Questions

- How can input from multiple sources create a sustainable management plan?

- What conflicts may arise from consulting multiple sources?
- What resources are available for developing a sustainable management plan?

Task Number 52

Identify the use of common forestry tools and equipment.

Definition

Identification may include

- altimeter
- fire swatter
- back-pack fire pump
- flow/current meter
- bark gauge
- compass (staff, hand)
- stereoscope
- cant hook
- hand lens/field microscope
- hip chain
- tally meter and book
- chainsaw chaps
- hypo-hatchet
- clinometer
- increment borer
- caliper (tree, Wheeler)
- data recorder
- log rule
- densiometer
- tree-marking gun
- logger's tape, diameter tape, and plastic flagging
- tree-planting hoe or bar
- dot grid
- planimeter
- drip torch
- Biltmore stick
- Pulaski forester axe
- fiberglass measuring tape
- relaskop
- wedge prism
- fire rake.

Teacher Resource: [Virginia FFA Association's Career Development Event Forestry Rules – Senior and Junior](#)

Process/Skill Questions

- What additional personal protective equipment (PPE) should be used when operating a chainsaw?

- How are global positioning system (GPS) receivers used to determine property boundaries?
- What equipment is common to logging operations?

Task Number 53

Conduct a land navigation exercise.

Definition

Conducting should include using a map in concert with a compass.

Process/Skill Questions

- What is a *legal* description?
 - What are some topographic map symbols and their meanings?
 - How does one determine the size and location of a specific area using a topographic map?
-

Task Number 54

Determine the elevation of a given point on a topographic map.

Definition

Demonstration should include using a map scale and ruler or planimeter to determine distance and interpreting contour lines to determine slope.

Process/Skill Questions

- What are common scales used for topographic maps?
- How does map distance relate to ground distance?
- How can latitude and longitude be used to estimate distance?
- How can contour lines be used to determine elevation on a topographic map?

Task Number 55

Describe current and emerging technology used in forest management.

Definition

Description may include

- geographic information systems (GIS) (e.g., INFOREST, Google Earth)

- aerial photography
- global positioning systems (GPS)
- electronic data recorders (EDR)
- laser range finders and hypsometers
- timber cruising software
- light detection and ranging (LIDAR)
- remote access weather stations (RAWS)
- unmanned aerial vehicles (UAV) (e.g., drones).

Teacher resource: [Virginia Department of Forestry InFOREST](#)

Process/Skill Questions

- How does new technology influence forest management?
- How are satellites used in forest management?
- What is the difference between GIS and aerial photos?
- How can GIS be used to manage a forest?

Task Number 56

Identify tree species common to Virginia.

Definition

Identification should include differentiation among

- opposite and alternate leaf placement
- compound and simple leaves
- types of leaf margins
- bark colors and patterns
- flowers and fruits
- twigs and buds.

Teacher resources:

[Forestry Career Development Events \(CDE\)](#), FFA

[State Fair of Virginia Junior Foresters](#), Virginia FFA

[Dominion Energy Envirothon](#), Headwaters Soil and Water Conservation District

Note: In identifying Virginia tree species, students should reference [Common Native Trees of Virginia](#), a publication of the Virginia Department of Forestry.

Process/Skill Questions

- What native trees produce hard mast?
- How do environmental factors influence species location?
- What characteristics are used to identify trees?

Task Number 57

Identify agencies that assist in protecting and managing forests.

Definition

Identification should include

- U.S. Forest Service
- U.S. Department of the Interior
- U.S. Department of Agriculture Natural Resources Conservation Service
- Virginia Department of Forestry
- Virginia Association of Soil and Water Conservation Districts
- conservation organizations (e.g., The Nature Conservancy, Quail Unlimited, Ducks Unlimited)
- Virginia Cooperative Extension
- the forest products industry.

Process/Skill Questions

- Who was the first head of the U.S. Forest Service?
- What are the responsibilities of each of the listed agencies?
- What are some of the laws that the Virginia Department of Forestry enforce?

Examining Tree Physiology

Task Number 58

Explain the functions of the major parts of the tree.

Definition

Explanation should include

- leaves
- branches
- trunk
- buds
- roots
- bark
- xylem
- phloem
- heartwood
- sapwood
- cambium
- fruits
- flowers.

Process/Skill Questions

- How do leaves transpire, and what is the importance of transpiration?
- What purpose do xylem and phloem serve for a tree?
- What function does the bark serve?

Task Number 59

Analyze photosynthesis, respiration, and transpiration.

Definition

Explanation should include

- definitions of *photosynthesis*, *respiration*, and *transpiration*
- chemical formulas for photosynthesis and respiration
- relationships among photosynthesis, respiration, and transpiration.

Process/Skill Questions

- What are the products of photosynthesis?
- What components are necessary for photosynthesis to occur?
- Why is photosynthesis important?
- Why is transpiration important?
- Why is respiration in trees important?

Task Number 60

Describe the growth and life processes of trees.

Definition

Description should include

- flowering
- seed dispersal
- germination
- growth
 - seedling
 - sapling
 - mature tree
- senescence.

Process/Skill Questions

- How are tree rings formed?
- What role does the cambium play in growth?

- What role does photosynthesis play in growth?

Task Number 61

Explain the factors that influence tree growth.

Definition

Explanation should include

- abiotic factors
 - light
 - water availability
 - nutrient availability
 - topography
 - soils
 - aspect (i.e., direction of slope face)
 - climate
 - natural disturbances (e.g., lightning, fire, flood)
- biotic factors
 - competition
 - disease susceptibility
 - anthropogenic (e.g., fire, equipment damage)
 - plants
 - animals
 - fungi
 - bacteria
 - forest pests (e.g., emerald ash borer, southern pine beetle).

Process/Skill Questions

- How does aspect affect water availability in a given location?
- What types of diseases affect tree growth?
- What are ways biotic and abiotic elements influence tree growth?
- What are examples of limiting factors that affect tree growth?
- How do the producer, consumer, and decomposer relationships affect tree growth?

Understanding Forest Ecology

Task Number 62

Define *forest ecology*.

Definition

Definition should include

- explanation that ecology is derived from the Greek word *eco*, meaning home
- concept of the forest as a living community of plants and animals
- role of ecology in forest management.

Process/Skill Questions

- Why is it important to understand the forest as a living community of plants and animals?
- How do various elements of the forest rely on other elements?

Task Number 63

Analyze forest ecosystems.

Definition

Analysis should include

- trees and other plant life
- wildlife and habitat
- soil (nutrients, erosion)
- air
- water
- anthropogenic activity
- succession.

Process/Skill Questions

- What are examples of biotic and abiotic elements that influence each other?
- What are examples of nutrient inputs from biotic elements?
- How do soil attributes affect the food chain?

Task Number 64

Explain how soil affects which tree species grow on a site.

Definition

Explanation should include

- pH
- nutrient availability
- soil classification (e.g., I-VIII)
- soil types (e.g., loam, clay, silt, sand)

- water availability.

Teacher Resource: [Natural Resources Conservation Service - Soils](#)

Process/Skill Questions

- Which species of trees grow best in alkaline, neutral, or acidic soils?
- How does water availability affect the type of species that could grow in a riparian buffer?
- What is the relationship between pH and available nutrients?

Task Number 65

Examine the relationship between the forest and the hydrologic cycle.

Definition

Examination should include forest hydrology and the role of water in determining

- tree height
- species composition
- reproduction
- disease and insect susceptibility
- riparian buffers.

Process/Skill Questions

- How does water stress make trees susceptible to disease?
- How can soil saturation affect tree stability?
- What species of trees can lower the water table?
- What is *forest hydrology*?
- How does water influence forested ecosystems?

Task Number 66

Analyze the effects of soil alteration on the forest ecosystem.

Definition

Analysis should include

- compaction (e.g., livestock, heavy equipment)
- water availability
- nutrient uptake
- decomposition
- erosion
- carbon storage
- carbon emissions

- management of environmental effects
- reclamation options.

Process/Skill Questions

- How can foot traffic affect tree growth?
- How does the use of all-terrain vehicles (ATVs) on forest lands affect erosion?
- What areas of a logging operation have trouble growing trees?
- How can logging affect current and future forest systems?
- How do soils affect the overall health and long-term success of a forest ecosystem?

Task Number 67

Explain how forest management can affect habitat.

Definition

Explanation could include considerations related to

- cover for wildlife travel
- forest diversity maintenance
- forest habitat requirements for native species
- forest management practices that benefit wildlife (e.g., hinge cuts, clear-cut, group selection).

Process/Skill Questions

- How do clear-cuts benefit wildlife, and which types of wildlife benefit?
- What is the benefit of a hinge cut for wild turkeys?
- What is the definition of *habitat requirements*?
- How does carrying capacity affect population?

Task Number 68

Explain the importance of biodiversity.

Definition

Explanation should include the definition and benefits of *biodiversity*.

Process/Skill Questions

- What are the downsides to a monoculture?
- How can forest management affect biodiversity?

Examining Virginia Forest Types

Task Number 69

Explore the types and characteristics of Virginia forests.

Definition

Exploration should include

- determining which species can live and adapt in certain regions
- identifying other factors that can affect which species exist in Virginia forests (e.g., climate, soil)
- identifying the physiographic regions of Virginia
 - Coastal Plain
 - Piedmont
 - Blue Ridge
 - Valley and Ridge
 - Appalachian Plateau
- identifying species composition of forests comprised of
 - pine
 - pine-hardwood
 - mixed hardwood
 - bottomland hardwood
 - cove hardwood.

Process/Skill Questions

- How does the physiographic region affect forest management decisions?
- What species grow in bottomland and hardwood forests?
- What are the differences in climate in the physiographic regions in Virginia and how does this influence tree species' establishment and growth?
- What are some limiting factors for a native forest?
- Which nonnative tree species have been introduced into Virginia forests? Which have been successful? Which have failed?

Task Number 70

Identify plants and animals found within Virginia forest ecosystems.

Definition

Identification may include

- shade-tolerant plant species (e.g., ferns, grasses, shrubs/bushes, vines)
- mammals
- reptiles

- amphibians.

Process/Skill Questions

- How does competition for resources affect native species?
- How do invasive species affect native species?
- What are the habitat requirements for the eastern box turtle?

Comparing Forest Regions of North America

Task Number 71

Examine the forest types of North America.

Definition

Examination should include

- northern forests
- central hardwood forests
- southern forests
- tropical forests
- Rocky Mountain forests
- Pacific Coast forests.

Process/Skill Questions

- How do northern and southern forests differ?
- What wildlife species are specific to each type of forest?
- What causes the Pacific Coast and Rocky Mountain forest types to differ?

Task Number 72

Identify trees common to each North American forest type.

Definition

Identification should include

- northern forests
 - fir
 - birch
 - poplar

- willow
- maple
- ash
- central hardwood forests
 - oak
 - hickory
 - dogwood
 - maple
 - ash
 - poplar
- southern forests
 - pine
 - oak
 - hickory
 - gum
 - sweet
- tropical forests
 - palm
 - mangrove
- Rocky Mountain forests
 - juniper
 - pine
 - oak
 - cottonwood
 - aspen
- Pacific Coast forests
 - sequoia
 - fir
 - cedar
 - pine.

Process/Skill Questions

- Which species of pine are common in the southern forests?
- Why are some trees found in more than one region?
- Which regions are best suited for commercial tree production?
- What is the most important commercial species of tree in Virginia?

Managing Forest Systems

Task Number 73

Examine anthropogenic influences on forests.

Definition

Examination should include

- forest fire suppression or ignition
- managed burn benefits
- hunting and fishing regulations
- logging regulations
- forest-product use
- effects of recreation
- land-use planning and development.

Process/Skill Questions

- How do ATVs affect the soil compaction of a given forest?
- How can hunting and fishing affect species management?
- Whom should one consult to determine whether a controlled burn is best for a plot of land?

Task Number 74

Describe the changes in demand for forest products.

Definition

Description should include the changes in demand across global markets for

- housing
- pallets
- packaging
- paper
- fuel.

Process/Skill Questions

- How can residential planning affect demand for and uses of forest products?
- What are some ways to conserve forest products in packaging?
- How has the use of computers affected paper use?

Task Number 75

Examine the concept of forest sustainability.

Definition

Examination should include

- forest management practices for sustainable production of forest products (e.g., reforestation, protection of water quality)
- long-term planning
 - growth and yield analysis
 - harvest rotation.

Process/Skill Questions

- How should the public be educated about forest products and processes?
- Who has the authority to render final management decisions regarding Virginia's forests?
- How does consumer demand affect forest commodity prices?
- How do landowners' economic objectives (e.g., harvest) determine planning?

Exploring Forest Trends, Threats, and Conditions

Task Number 76

Explore trends and threats related to Virginia forests.

Definition

Exploration should include

- development (i.e., urbanization)
- invasive species
- changing markets for lumber and pulp
- underutilized sustainability programs and policies (e.g., stewardship program, landowner assistance programs)
- land-use change
- social perspectives on forests and harvesting
- vulnerability to climate change
- wildfire
- tax issues.

Teacher resource: [Forest Action Plans, Virginia](#)

Process/Skill Questions

- How do societal perspectives influence a forest manager's decisions?
- Which species can be grown quickly, in short rotations?
- How do invasive species affect native forests?

Task Number 77

Compare perspectives, trends, and priorities in Virginia public and private forest management.

Definition

Comparison should include

- preservation
- conservation
- development
- multiple use
- protection of viewsheds
- protection of watersheds
- personal and commercial demand for wood products
- property rights of landowners (private, state, and federal)
- socially acceptable harvesting.

Process/Skill Questions

- Why should all perspectives be examined?
- Why is multiple use management becoming more popular?
- How can we conserve forestland while keeping up with the demand for forest products?
- What are some ways that people use Virginia's national forests?
- Why are open spaces so important to people and wildlife?
- How is development good and bad for the forest industry?

Task Number 78

Identify uses of forests.

Definition

Identification should include

- consumptive
 - hunting
 - fishing
 - grazing
 - timber harvesting
- non-consumptive
 - hiking
 - camping
 - biking
 - wildlife watching.

Process/Skill Questions

- What are some negative effects on the forest from recreational use?
- What are some types of commercial recreation related to the forest?

Examining the Roles of Parks and Natural Areas

Task Number 79

Explain how management practices for parks and natural areas influence forest ecosystem preservation.

Definition

Explanation should include

- prevention of forest fires
- prescribed burning
- regulations for hunting and fishing
- restrictions on timber harvesting
- the effects of recreation.

Process/Skill Questions

- What organizations are in place to encourage protecting and preserving forest ecosystems?
- How do ATVs affect the soil compaction of a forest?

Task Number 80

Examine agencies governing forests and parklands.

Definition

Examination should include

- U.S. Department of the Interior,
- National Parks Service
- U.S. Department of Agriculture
- U.S. Forest Service
- Virginia Department of Conservation and Recreation
- Virginia Department of Forestry
- Virginia Department of Agriculture and Consumer Services (VDACS)
- Virginia Department of Game and Inland Fisheries (VDGIF)
- local parks and recreation departments.

Process/Skill Questions

- Why do these agencies exist?
- What are the differences in philosophy between the park services and the forest services?
- How can government agencies work together to conserve forested land?

Task Number 81

Compare local, state, and national parks and forests.

Definition

Comparison should focus on

- management policies
- intended uses (e.g., education, recreation)
- preservation.

Process/Skill Questions

- Why is it important that parks be preserved?
- How does one plan for the interaction between visitors and wildlife?
- Why is it important to have national forests?

Task Number 62

Analyze human interests and values that affect forests and parklands.

Definition

Analysis should include

- identification of the demand for forest products
- discussion of the value of inhabited vs. open space
- examination of forest and parkland importance to society
- investigation of ecological and cultural appeal.

Process/Skill Questions

- What can humankind do to demonstrate an appreciation for the value of trees?
- What effect do trees have on humans' overall health?

Marketing Forest Products

Task Number 83

Identify market opportunities that arise from niche markets for forest products.

Definition

Identification could include

- uses for different types of wood (e.g., cedar chests, baseball bats)
- medicines (e.g., aspirin, ginseng).

Process/Skill Questions

- What are the risks associated with specialization in business?
- What are the risks associated with diversification?
- What are some strategies for selling specialty items?

Task Number 84

Identify major industries that require wood and wood by-products.

Definition

Identification should include

- wineries and distilleries
- paper mills
- lumber mills
- biomass-fed power plants
- telephone and power companies
- railroad companies
- mining companies
- shipping industry (e.g., pallets)
- construction and housing industry
- pharmaceutical industry.

Process/Skill Questions

- How can a downturn in the housing industry affect timber prices?
- What wood products do mining and railroad companies use?

Harvesting Forest Products

Task Number 85

Describe harvesting techniques.

Definition

Description should include

- clear-cutting
- group and single-tree selection
- seed-tree harvest
- diameter-limit harvest
- thinning
- shelterwood cutting
- sanitation harvest.

Process/Skill Questions

- How can various harvesting methods affect the soil on the site?
- How can clear-cutting affect wildlife?
- How can high-grading affect the forest for future timber harvests?
- What is the purpose of sanitation cutting?

Task Number 86

Describe harvesting equipment.

Definition

Description may include

- skidder
- harvester/processor
- transportation equipment
- feller buncher
- cable yarder
- helicopter
- forwarder
- loader
- chainsaw
- chipper.

Process/Skill Questions

- What types of equipment are used on steep terrain?
- How can equipment be modified for use on wet soils?
- Which types of equipment have minimal ground impact?

Task Number 87

Identify factors used to determine harvesting techniques.

Definition

Identification should include

- available markets
- landowner objectives
- reforestation plans
- species composition goals
- forest structure goals
- site productivity
- soil moisture
- terrain
- economic value
- social acceptance
- weather
- environmental sensitivity.

Process/Skill Questions

- How can a neighbor's opinion affect harvest decisions?
- Why are a landowner's objectives so important?
- How can economics factor into harvesting decisions?

Task Number 88

Identify the environmental effects of harvest operations.

Definition

Identification should include effects on

- water quality
- forest habitat
- wildlife
- soil

and BMP for mitigating effects.

Process/Skill Questions

- How can clear-cuts be beneficial to wildlife?
- What types of wildlife benefit from select cutting?
- What methods are used to stabilize soils on forest access roads?

Practicing Silviculture

Task Number 89

Examine reforestation principles.

Definition

Examination should include

- reforestation plan
- species to be regenerated
- natural regeneration (e.g., coppice)
- artificial regeneration (e.g., planting pines)
- spacing.

Process/Skill Questions

- What are the advantages of natural regeneration vs. artificial regeneration?
- What are the disadvantages of using the coppice regeneration method?
- What are the advantages of using reforestation practices when it comes to forest management?
- Why should one leave a certain amount of space between replanted trees?
- How can site preparation aid in regeneration?
- How can one control the regeneration of undesirable species?

Task Number 90

Examine factors that limit forest regeneration.

Definition

Examination should include

- lack of desirable seed stock
- lack of strong parent stock
- animal browsing
- light availability
- change in land use
- nutrient availability
- water availability
- advanced regeneration
- competition
- site preparation.

Process/Skill Questions

- How do deer affect forest regeneration?
- How can fire be used to aid forest regeneration?
- What is the definition of *shade tolerance*?

Task Number 91

Examine the role of fire in forest systems.

Definition

Examination should include

- effect on different tree species
- species' adaptations to fire
- site preparation after harvest
- control of undesirable species, including invasive species
- control competition
- return of nutrients to the soil
- reduction of fuel load
- control of pests and diseases
- benefits to wildlife.

Process/Skill Questions

- What effects has the fire prevention campaign had in recent years?
- How can one tell if a fire will harm a tree?
- What are the benefits and disadvantages of wildfires?

Task Number 92

Explain prescribed burning.

Definition

Explanation should include

- prescribed-burn plan development
- site conditions (e.g., topography)
- weather conditions (e.g., wind, humidity)
- types of tools
- prescribed burn frequency
- preparation of fire lines
- measurement of fuel loads
- stripping of head fires
- spotting of head fires

- ring or perimeter fires.

Process/Skill Questions

- Why are fire lines important?
- Why should the backing fire be the first line of fire set in any prescribed burning sequence and be initiated at a firebreak or other barrier at the most leeward edge of the burn area?
- What permits must be obtained to implement a prescribed burn?

Task Number 93

Examine the role of biotechnology in forestry.

Definition

Examination should include

- hybrid seedlings
- genetically selected seedlings
- cloning practices
- grafting practices
- genetically modified organisms (GMOs).

Process/Skill Questions

- What characteristics should one look for when selecting genetic stock for saw timber?
- What are some benefits of using engineered seedlings?
- What are some ways of cloning trees?

Preserving Forest Health

Task Number 94

Identify factors that can affect the health of forest systems.

Definition

Identification should include

- soil and water requirements for different species
- competition
- limiting factors
- pests and diseases.

Process/Skill Questions

- What species did the southern pine beetle affect?
- When did the chestnut blight occur in Virginia? How did this affect Virginia?

Task Number 95

Examine the ways pests can be transported from forest to forest.

Definition

Examination should include transportation by

- disease vectors
- air
- water
- insects
- animals
- anthropogenic means (e.g., firewood movement, vehicles, boots)
- infestation of pests through the soil.

Process/Skill Questions

- What types of infestations have occurred in Virginia's forestry history?
- How has the southern pine beetle played a part in commodity pricing?
- What regulations are in place to prevent future infestations?

Task Number 96

Evaluate symptoms exhibited by trees that are affected by pests and diseases.

Definition

Evaluation could include indicators of infestation, such as

- wilt
- crown dieback
- defoliation
- cankers
- bark loss.

Process/Skill Questions

- What are three infestations that are easily detected?
- Which diseases are treatable?

- What remedies are available for treatable diseases?

Task Number 97

Identify characteristics of healthy and unhealthy forests.

Definition

Identification of a healthy forest may include

- plant diversity
- wildlife diversity
- low susceptibility to disease and insects
- low susceptibility to catastrophic wildfires
- healthier and faster-growing trees.

Identification of an unhealthy forest may include

- lack of plant and wildlife diversity
- slow-growing trees that are more susceptible to insect and disease attack
- higher susceptibility to catastrophic wildfires
- effects of overstocked conditions.

Process/Skill Questions

- What are some of the benefits of forest management?
- Why are plant and wildlife diversity important characteristics of a forest?
- What are some ways to avoid catastrophic wildfires?

Task Number 98

Examine disease and pest control methods.

Definition

Examination should include integrated pest management techniques, such as

- exclusion
- eradication
- sanitation
- protection
- immunization
- plant selection
- genetically modified stock.

Process/Skill Questions

- What is the difference between direct and indirect control measures?
- What diseases are common to Virginia trees?
- How does one identify signs and symptoms of disease in trees?

Task Number 99

Examine common pests and diseases affecting Virginia forests.

Definition

Examination should include

- southern pine bark beetle
- emerald ash borer
- gypsy moth
- chestnut blight
- hemlock woolly adelgid
- cankers
- heart rot
- anthracnose
- oak decline.

Process/Skill Questions

- What are the economic effects of insects and diseases on forest products?
- How has the chestnut blight influenced Virginia's landscape?
- What effect do humans have on the control and spread of insects and diseases?

Task Number 100

Identify invasive species threatening Virginia forests.

Definition

Identification could include

- tree-of-heaven
- Japanese stiltgrass
- multiflora rose
- kudzu
- oriental bittersweet
- autumn olive.

Identification should also include discussing the control of invasive species, using

- herbicides
- manual removal

- burning
- quarantines.

Process/Skill Questions

- How do invasive species affect Virginia forests?
- What are some invasive insects and plants that forest managers have to control?
- What is the process for controlling invasive species?

Managing the Forest Business

Task Number 101

Interpret a financial statement.

Definition

Interpretation should include identifying components of the financial statement and analyzing the information provided by the statement.

Process/Skill Questions

- What is the difference between gross profit and net profit?
- How can one reduce costs or expenditures?
- Where or to whom might one need to send financial statements?

Task Number 102

Evaluate the safety requirements and standards for forest industry employees.

Definition

Evaluation should include

- Occupational Safety and Health Administration (OSHA) standards for logging and forestry
- required personal protective equipment (PPE)
- obtaining and maintaining required certifications prior to applying chemicals and/or pesticides
- adhering to all safety procedures and protocols when using chemicals, operating equipment, and using other supplies in the laboratory and in the field
- composite risk management.

Process/Skill Questions

- What PPE should be used when operating a chainsaw?
- What safety equipment should all forest machinery have?
- Who is responsible for individual safety in the forest?
- Why are there laws regarding safety procedures in the forest management industry?

Task Number 103

Comply with federal, state, and local safety and legal requirements in the operation of all tools and equipment.

Definition

Compliance should include

- meeting OSHA requirements
- wearing all required PPE
- using safety guards on equipment
- using applicable lockout-tagout procedures
- maintaining proper distance around operating equipment.

Process/Skill Questions

- Where can OSHA requirements be found?
- What PPE is required when operating a chainsaw?
- What safety guards are on a chainsaw, and where are they located?

Task Number 104

Prepare a complete income and expense budget for a natural resource enterprise.

Definition

Preparation should include the use of spreadsheet software to develop all components of a forest management budget.

Process/Skill Questions

- What are some examples of software that assist in creating a budget?
- How does a budget fit into a business' overall financial situation?
- What are the components of a budget?

Task Number 105

Maintain records for a natural resource enterprise.

Definition

Records may include

- time management reports (e.g., employee log, daily activities)
- inventory
- equipment maintenance
- equipment depreciation and replacement schedules
- safety and training expenditures
- budget
- fuel and power use
- material use (e.g., pesticide, fertilizer, seed, water)
- weather logs
- timber inventory
- GPS and GIS data
- forest management status reports.

Process/Skill Questions

- How can records be used to improve management decisions?
 - How does the use of different languages affect the making and keeping of records?
-

Task Number 106

Determine personnel requirements.

Definition

Determination should include issues associated with a culturally diverse work force, as well as the following elements of human resource management:

- Hiring
- Training
- Communication
- Work schedules
- Safety
- Evaluation
- Promotion
- Termination of employment
- Examination of annual work plan to address staffing requirements and limitations

Process/Skill Questions

- What is the employer's responsibility for training and retraining employees?

- What measures should an employer take to ensure employee safety?
- What criteria do employers use to evaluate employees?

Task Number 107

Describe training techniques.

Definition

Description should include the opportunities for training through industry and extension and the responsibilities and legal requirements of the trainer and trainee.

Process/Skill Questions

- Where can an employer find information on forest management training programs and events?
- Who is responsible for the training of the employee?
- How is training paid for?

Task Number 108

Develop a public relations program for a natural resource enterprise.

Definition

Development should include the following objectives:

- Establish a positive image of the business.
- Promote the product/service to a target audience.
- Develop a database of contacts within the community and the industry.
- Select promotional activities such as advertising, public relations, and sales marketing.

Process/Skill Questions

- What are the advantages and disadvantages of the various promotional methods?
- What role does communication play in a public relations program?
- How does a forest management business interact with the local community?

Task Number 109

Identify policies and laws related to natural resources management.

Definition

Identification should include

- National Environmental Policy Act

- National Forest Management Act of 1976
- Clean Water Act
- Endangered Species Act
- labor laws
- court decisions related to spotted owl and red-cockaded woodpecker habitat loss
- resources that describe policies and laws regarding specific management practices.

Process/Skill Questions

- Where can one find resources that describe policies and laws regarding specific management practices?
- What agencies play a role in creating policies and laws related to natural resources management?
- Who is responsible for enforcing natural resources management policies and laws?
- How does the Clean Water Act affect loggers?
- What effects can these laws have on jobs?

Task Number 110

Develop a funding or grant proposal for a forest management project.

Definition

Development should include

- project title and description
- background
- justification
- expense matrix
- project timeline
- deliverables schedule.

Process/Skill Questions

- What are some sources for forest management grants?
- What types of projects are typically eligible for grants?
- How are expenses determined?

SOL Correlation by Task

39	Identify the role of supervised agricultural experiences (SAEs) in agricultural education.	English: 11.3, 11.5, 12.3, 12.5
40	Participate in an SAE.	English: 11.5, 11.8, 12.5, 12.8
41	Identify the benefits and responsibilities of FFA membership.	English: 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: 11.5, 12.5 History and Social Science: VUS.8, VUS.9, VUS.10, VUS.11, WHI1.8, WHI1.10, WHI1.11

43	Apply for an FFA degree and/or an agricultural proficiency award.	English: 11.5, 12.5
44	Define <i>forest</i> and related terminology.	English: 11.3, 12.3
45	Summarize the history of Virginia's forests and forest industry.	English: 11.5, 12.5 History and Social Science: GOVT.8, GOVT.12, GOVT.14, GOVT.15, VUS.7, VUS.13, VUS.14
46	Explain factors that influence forest use and management.	English: 11.5, 12.5 History and Social Science: GOVT.7, GOVT.8, GOVT.9, GOVT.12, GOVT.14, GOVT.15
47	Analyze anthropogenic effects on forest ecosystems.	English: 11.5, 12.5 History and Social Science: GOVT.9
48	Describe responsible use of forest resources.	English: 11.5, 12.5
49	Identify ecosystem services provided by forests.	English: 11.5, 12.5 Science: BIO.8
50	Identify forest products.	English: 11.5, 12.5
51	Explain the importance of collaboration in forest management.	English: 11.5, 12.5 History and Social Science: GOVT.8, GOVT.9
52	Identify the use of common forestry tools and equipment.	English: 11.5, 12.5 History and Social Science: GOVT.8, GOVT.9
53	Conduct a land navigation exercise.	
54	Determine the elevation of a given point on a topographic map.	Science: ES.1
55	Describe current and emerging technology used in forest management.	English: 11.5, 12.5 History and Social Science: GOVT.8, GOVT.9
56	Identify tree species common to Virginia.	English: 11.5, 12.5 History and Social Science: GOVT.8, GOVT.9
57	Identify agencies that assist in protecting and managing forests.	English: 11.5, 12.5 History and Social Science: GOVT.7, GOVT.8, GOVT.9
58	Explain the functions of the major parts of the tree.	English: 11.5, 12.5 Science: BIO.4
59	Analyze photosynthesis, respiration, and transpiration.	English: 11.3, 11.5, 12.3, 12.5 Science: BIO.2
60	Describe the growth and life processes of trees.	English: 11.5, 12.5
61	Explain the factors that influence tree growth.	English: 11.5, 12.5 Science: BIO.8

62	Define <i>forest ecology</i> .	English: 11.3, 12.3 Science: BIO.8
63	Analyze forest ecosystems.	English: 11.5 Science: BIO.8, ES.8
64	Explain how soil affects which tree species grow on a site.	English: 11.5 Science: BIO.8, ES.8
65	Examine the relationship between the forest and the hydrologic cycle.	English: 11.5, 12.5
66	Analyze the effects of soil alteration on the forest ecosystem.	English: 11.5, 12.5
67	Explain how forest management can affect habitat.	English: 11.5, 12.5
68	Explain the importance of biodiversity.	English: 11.5, 12.5 Science: BIO.8
69	Explore the types and characteristics of Virginia forests.	English: 11.5, 12.5
70	Identify plants and animals found within Virginia forest ecosystems.	English: 11.5, 12.5
71	Examine the forest types of North America.	English: 11.5, 12.5
72	Identify trees common to each North American forest type.	English: 11.5, 12.5
73	Examine anthropogenic influences on forests.	English: 11.5, 12.5
74	Describe the changes in demand for forest products.	English: 11.5, 12.5
75	Examine the concept of forest sustainability.	English: 11.5, 12.5
76	Explore trends and threats related to Virginia forests.	English: 11.5, 12.5
77	Compare perspectives, trends, and priorities in Virginia public and private forest management.	English: 11.5, 12.5 History and Social Science: GOVT.8, GOVT.9
78	Identify uses of forests.	English: 11.5, 12.5
79	Explain how management practices for parks and natural areas influence forest ecosystem preservation.	English: 11.5, 12.5 History and Social Science: GOVT.7, GOVT.8, GOVT.9
80	Examine agencies governing forests and parklands.	English: 11.5, 12.5 History and Social Science: GOVT.7, GOVT.8, GOVT.9
81	Compare local, state, and national parks and forests.	English: 11.5, 12.5 History and Social Science: GOVT.7, GOVT.8, GOVT.9
82	Analyze human interests and values that affect forests and parklands.	English: 11.5, 12.5
83	Identify market opportunities that arise from niche markets for forest products.	English: 11.5, 12.5

84	Identify major industries that require wood and wood by-products.	English: 11.5, 12.5
85	Describe harvesting techniques.	English: 11.5, 12.5
86	Describe harvesting equipment.	English: 11.5, 12.5
87	Identify factors used to determine harvesting techniques.	English: 11.5, 12.5
88	Identify the environmental effects of harvest operations.	English: 11.5, 12.5 History and Social Science: GOVT.7, GOVT.8, GOVT.9
89	Examine reforestation principles.	English: 11.5, 12.5
90	Examine factors that limit forest regeneration.	English: 11.5, 12.5
91	Examine the role of fire in forest systems.	English: 11.5, 12.5
92	Explain prescribed burning.	English: 11.5, 12.5
93	Examine the role of biotechnology in forestry.	English: 11.5, 12.5 History and Social Science: GOVT.12, VUS.14, WG.17, WHII.14
94	Identify factors that can affect the health of forest systems.	English: 11.5, 12.5
95	Examine the ways pests can be transported from forest to forest.	English: 11.5, 12.5
96	Evaluate symptoms exhibited by trees that are affected by pests and diseases.	English: 11.5, 12.5
97	Identify characteristics of healthy and unhealthy forests.	English: 11.5, 12.5
98	Examine disease and pest control methods.	English: 11.5, 12.5
99	Examine common pests and diseases affecting Virginia forests.	English: 11.5, 12.5
100	Identify invasive species threatening Virginia forests.	English: 11.5, 12.5
101	Interpret a financial statement.	English: 11.5, 12.5
102	Evaluate the safety requirements and standards for forest industry employees.	English: 11.5, 12.5 History and Social Science: GOVT.7, GOVT.8, GOVT.9
103	Comply with federal, state, and local safety and legal requirements in the operation of all tools and equipment.	History and Social Science: GOVT.7, GOVT.8, GOVT.9
104	Prepare a complete income and expense budget for a natural resource enterprise.	English: 11.2, 11.5, 11.6, 11.7, 12.2, 12.5, 12.6, 12.7
105	Maintain records for a natural resource enterprise.	
106	Determine personnel requirements.	English: 11.5, 12.5
107	Describe training techniques.	English: 11.5, 12.5
108	Develop a public relations program for a natural resource enterprise.	English: 11.1, 11.5, 12.1 Mathematics: COM.2, COM.7, COM.8, COM.10, COM.11
109	Identify policies and laws related to natural resources management.	English: 11.5, 12.5

		History and Social Science: GOVT.7, GOVT.8, GOVT.9
110	Develop a funding or grant proposal for a forest management project.	English: 11.1, 12.1

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.

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.”

Laboratory Safety Resources

[Laboratory Safety Resources](#)

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
- Forest Products and Processing Assessment
- 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)
- Ecology and Environmental Management (8045/18 weeks)
- Ecology and Environmental Management (8046/36 weeks)
- Fisheries and Wildlife Management (8041/36 weeks)
- Forestry Management, Advanced (8044/36 weeks)
- Introduction to Natural Resources and Ecology Systems (8040/36 weeks)
- Introduction to Plant Systems (8007/36 weeks)
- Operating the Farm Business (8014/36 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 Secondary School Teacher Water Conservationist
Food Products and Processing Systems	Biochemist
Natural Resources Systems	Ecologist Fish and Game Officer Forest Manager, Forester Forest Technician

Career Cluster: Agriculture, Food and Natural Resources	
Pathway	Occupations
	Geological Technician Logging Equipment Operator Outdoor Recreation Guide Park Manager Park Technician Range Technician Wildlife Manager
Plant Systems	Botanist Crop Grower Custom Harvester Forest Geneticist Plant Breeder/ Geneticist Secondary School Teacher Soil and Plant Scientist Tree Surgeon
Power, Structural, and Technical Systems	Agricultural Equipment Operator

Career Cluster: Science, Technology, Engineering and Mathematics	
Pathway	Occupations
Engineering and Technology	Agricultural Engineer Environmental Engineer
Science and Mathematics	Biologist Botanist Ecologist Environmental Scientist Hydrologist Microbiologists Plant Biologist Plant Breeder and Geneticist Plant Pathologist Toxicologist