

# Forestry Management, Advanced

8044 36 weeks

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## Acknowledgments

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## Course Description

**Suggested Grade Level:** 12

This course offers students instruction in forestry ecology, map interpretation, and timber management practices. Additionally, students will investigate ways to protect and preserve forested land, including pest identification and management, identification of common tree diseases, and forest fire prevention.

*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

**Template material omitted:** General material used to introduce the task list has been omitted.

For the indicated course(s):

- Tasks/competencies designated by plus icons (⊕) in the left-hand column(s) are essential
- Tasks/competencies designated by empty-circle icons (○) are optional
- Tasks/competencies designated by minus icons (⊖) are omitted
- Tasks marked with an asterisk (\*) are sensitive.

8044	Tasks/Competencies
⊕	Identify the role of supervised agricultural experiences (SAEs) in agricultural education.
⊕	Participate in an SAE.

<input checked="" type="radio"/>	Identify the benefits and responsibilities of FFA membership.
<input checked="" type="radio"/>	Describe leadership characteristics and opportunities as they relate to agriculture and FFA.
<input type="radio"/>	Apply for an FFA degree and/or an agricultural proficiency award.
<input checked="" type="radio"/>	Define <i>forest ecology</i> .
<input checked="" type="radio"/>	Analyze forest ecosystems.
<input checked="" type="radio"/>	Explain principles and processes of ecological succession.
<input checked="" type="radio"/>	Analyze site factors that influence species diversity.
<input checked="" type="radio"/>	Describe ecological concepts of shade tolerance and species competition.
<input checked="" type="radio"/>	Identify forest soil characteristics.
<input checked="" type="radio"/>	Test soil samples.
<input checked="" type="radio"/>	Differentiate among the forest types of North America.
<input checked="" type="radio"/>	Describe the relationship between living organisms and the environment.
<input checked="" type="radio"/>	Describe the hydrological cycle and its effect on streams and watersheds.
<input checked="" type="radio"/>	Describe how land use and other human activities affect soil, water, and vegetative resources.
<input checked="" type="radio"/>	Identify the roles of government, industry, and private forestry agencies.
<input checked="" type="radio"/>	Interpret topographic maps, relief maps, aerial photography, and virtual soil maps.
<input checked="" type="radio"/>	Locate landmarks on a topographic map, a relief map, and in an aerial photograph.
<input checked="" type="radio"/>	Determine slope and distance.
<input checked="" type="radio"/>	Determine distance and slope with a topographic map.
<input checked="" type="radio"/>	Perform map-reading operations.
<input checked="" type="radio"/>	Determine land use from aerial photography and satellite images.
<input checked="" type="radio"/>	Conduct a land navigation exercise.
<input checked="" type="radio"/>	Research mapping programs and geographic information systems (GIS).
<input checked="" type="radio"/>	Compare aerial photography, satellite data, and LiDAR in identifying forest groups.
<input checked="" type="radio"/>	Create a map of a local forest area in Virginia.
<input checked="" type="radio"/>	Explain silvicultural systems used in forest management.

<input checked="" type="radio"/>	Develop a plan for management of a forest.
<input checked="" type="radio"/>	Explain nutrient requirements for growth of immature and mature forest systems.
<input checked="" type="radio"/>	Develop a plan for a prescribed burn.
<input checked="" type="radio"/>	Plant forest seedlings.
<input checked="" type="radio"/>	Compare methods of forest regeneration.
<input checked="" type="radio"/>	Develop a plan for artificial regeneration.
<input checked="" type="radio"/>	Identify forest products and their markets.
<input checked="" type="radio"/>	Examine the influence of global markets on the import and export of forest products.
<input checked="" type="radio"/>	Measure forest products
<input checked="" type="radio"/>	Calculate the total volume and value of pulpwood in standing trees.
<input checked="" type="radio"/>	Calculate the volume board feet (VBF) and value of sawtimber/saw logs in standing trees.
<input checked="" type="radio"/>	Explain the effects of forestry best-management practices on watershed conditions.
<input checked="" type="radio"/>	Explain the laws pertaining to forestry and water quality.
<input checked="" type="radio"/>	Outline the essential steps of a harvest plan.
<input checked="" type="radio"/>	Describe the advantages and disadvantages of various forest harvesting methods.
<input checked="" type="radio"/>	Comply with federal, state, and local safety and legal requirements in the operation of all equipment and tools.
<input type="radio"/>	Operate machinery and equipment.
<input type="radio"/>	Maintain equipment and machinery according to manufacturer recommendations.
<input checked="" type="radio"/>	Identify the parts of a chain saw.
<input checked="" type="radio"/>	Explain procedures for felling trees.
<input checked="" type="radio"/>	Explain bucking and limbing techniques to ensure worker safety.
<input checked="" type="radio"/>	Outline procedures for supervising the loading and unloading of logs.
<input checked="" type="radio"/>	Describe sawmill safety, equipment operation, and first-aid procedures.
<input checked="" type="radio"/>	Describe general sawmill operation activities.
<input type="radio"/>	Demonstrate the ability to operate processing equipment.

<input type="radio"/>	Demonstrate the ability to operate carriage.
<input checked="" type="radio"/>	Define terms used in lumber grading.
<input checked="" type="radio"/>	Identify boards as hardwood or softwood.
<input checked="" type="radio"/>	List reasons for grading lumber.
<input type="radio"/>	Identify grades used for hardwood and softwood lumber.
<input type="radio"/>	List steps to follow when evaluating lumber.
<input checked="" type="radio"/>	Identify insects, diseases, and animal pests common to area forests.
<input checked="" type="radio"/>	Identify tree diseases caused by organic pathogens, environmental conditions, and insects.
<input checked="" type="radio"/>	Identify disease and pest cycles in tree species.
<input checked="" type="radio"/>	Define <i>invasive species</i> .
<input checked="" type="radio"/>	Explain climate effects that produce fires.
<input checked="" type="radio"/>	Explain the development of a forest wildfire.
<input checked="" type="radio"/>	Describe forest wildfire-fighting techniques and fire-control measures.
<input type="radio"/>	Describe the location of a forest fire.
<input checked="" type="radio"/>	Explain a fire safety program.
<input checked="" type="radio"/>	Prepare publicity for preventing forest fires.
<input checked="" type="radio"/>	Develop a forest-fire prevention plan.
<input checked="" type="radio"/>	Discuss economic principles in forestry management.

Legend: Essential Non-essential Omitted

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**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).**

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## 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 Skills and FFA Membership

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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?

## Viewing the Forest as a Community (Ecology)

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### Task Number 44

#### Define *forest ecology*.

#### Definition

Definition should include

- an explanation that *ecology* is derived from the Greek word *eco*, meaning home
- the concept of the forest as a living community of plants and animals
- the 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 45

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

## Task Number 46

### Explain principles and processes of ecological succession.

#### Definition

Explanation should include

- types of ecological succession
  - primary
  - secondary
  - abandoned field
- definition of *climax* and *climax vegetation*
- forest stratification
  - forest layers
  - effects on forest resources
  - species diversity.

## Process/Skill Questions

- How does ecological succession affect the landscape and forest ecosystem over time?
- Why is succession important to forest ecosystems?
- What effects does forest stratification play in species diversity?

## **Task Number 47**

### **Analyze site factors that influence species diversity.**

#### **Definition**

Analysis should include

- climate
  - temperature
  - moisture
  - wind
  - light
  - other weather conditions
- physiographic factors
  - topography
  - slope/aspect
  - soil factors
- biological factors
  - beneficial species and influences
  - adverse species and influences
- effects on site index.

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

- What controls the distribution and growth of trees and other forest plants?
- Why do plant and animal species in forests differ in various geographic regions?
- What influence does site index have on a forested region?

## **Task Number 48**

### **Describe ecological concepts of shade tolerance and species competition.**

#### **Definition**

Description should include

- factors influencing competition
  - growing space
  - soil moisture
  - soil nutrients
- effects of competition

- definition of a *shade-tolerant tree*
- tolerance classification for common Virginia tree species
- dominance classifications
  - dominant
  - co-dominant
  - intermediate
  - suppressed.

### **Process/Skill Questions**

- How does competition and shade tolerance affect ecosystem diversity?
- What effect may competition have on native species and forest health?
- What are the effects of dominance on growth rates of trees?

## **Task Number 49**

### **Identify forest soil characteristics.**

#### **Definition**

Identification should include

- horizons of an undisturbed soil profile
- depth and texture of topsoil and subsoil
- water-retention capacity and moisture conditions of soil horizons
- nutrients (e.g., leaching, availability)
- soil acidity and alkalinity
- organisms in the soil.

### **Process/Skill Questions**

- How do soil conditions affect species diversity and establishment within a forest?
- How do soils contribute to nutrient and biological cycles within a forest ecosystem?
- How do biological factors within the soil influence forest conditions and species diversity?

## **Task Number 50**

### **Test soil samples.**

#### **Definition**

Testing should include

- identifying physical and chemical properties of soil
- collecting soil samples representative of an area
- analyze soil survey data
- determining land classes based on soil classification standards

- determining appropriate conservation management practices based on soil properties and characteristics.

### **Process/Skill Questions**

- What are the physical properties of soil?
- What are the chemical properties of soil?
- Why is the pH of soil important when making decisions regarding best management practices (BMP) and sustainability?

## **Task Number 51**

### **Differentiate among the forest types of North America.**

#### **Definition**

Differentiation should include

- forest types, such as
  - pine
  - pine hardwood
  - mixed hardwood
  - bottomland hardwood
  - cove hardwood
- influencing factors, such as
  - soil and moisture conditions
  - past treatment
  - clearing and later abandonment
  - wildlife influences
  - forest fire
  - insects and diseases
- effect of forest type on forest usage.

### **Process/Skill Questions**

- How does forest type affect forest productivity and timber harvest?
- How do differences among forest types influence other ecosystem components?

## **Task Number 52**

### **Describe the relationship between living organisms and the environment.**

#### **Definition**

Description should include

- forest influences on ecosystem cycles

- water
- nutrients/soil
- beneficial and adverse biological influences on tree growth
  - commensalism
  - symbiosis
  - parasitism
- relationships between trees and living organisms
  - feeding relationships (food chains and webs)
  - energy transfer among organisms
  - habitat
  - recreational.

### **Process/Skill Questions**

- What would be the effects of removing trees from ecosystems?
- Why are interactions among living organisms necessary to healthy environments?
- Why are trees essential to food and energy flow within forest communities?

## **Task Number 53**

### **Describe the hydrological cycle and its effect on streams and watersheds.**

#### **Definition**

Description should include

- major steps of the hydrologic cycle
- role of transpiration
- forest dependence on water
  - growth
  - reproduction
  - disease/pest cycles
- benefits of forest to water systems
  - water filtration
  - erosion control
  - riparian zones
  - water quality.

### **Process/Skill Questions**

- How might our water resources be different without the benefits trees provide?
- What effects would diminished water resources have on forest ecosystems?
- What effect might the rate of transpiration have on other steps in the hydrologic cycle?

## **Task Number 54**

# **Describe how land use and other human activities affect soil, water, and vegetative resources.**

## **Definition**

Description should include

- factors driving human use of forest ecosystems
  - economic
  - social/political
  - environmental
  - cultural
- negative human influences on forest resources
  - resource depletion/destruction
  - pollution
  - loss of biodiversity
  - reduction of productivity
  - changes in species composition
- conservation efforts
- laws and regulations influencing human activity.

## **Process/Skill Questions**

- How have human influences and activities within forests changed over the years?
- How can humans exert a more positive effect on forest resources?
- What roles do laws and regulations play in influencing human use within forests?

## **Task Number 55**

# **Identify the roles of government, industry, and private forestry agencies.**

## **Definition**

Identification should include

- governmental regulations for forest use
  - current laws and regulations
  - historical changes in laws and regulations
- basic processes for creating laws and regulations
  - local
  - state
  - federal
- social and economic pressures influencing forest ecosystem use
- benefits to forest preservation
- conservation influences on law and regulation formation.

## Process/Skill Questions

- How can governmental and industrial influences ensure environmental sustainability of forest and forest resources?
- How have the environmental roles of government and industry agencies changed over time?
- How might forests be different without regulation?

# Interpreting Maps, Aerial Photographs, and Satellite Imagery

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## Task Number 56

**Interpret topographic maps, relief maps, aerial photography, and virtual soil maps.**

### Definition

Interpretation should include

- type of information illustrated by each map type
- symbols and other elements of each map type
- differences among the map types.

## Process/Skill Questions

- What are the major differences between a topographic map and a relief map?
- How are virtual soil maps created?
- What recent developments have improved aerial photography?

## Task Number 57

**Locate landmarks on a topographic map, a relief map, and in an aerial photograph.**

### Definition

Locations should include

- major waterways (e.g., rivers, streams, lakes)
- landforms (e.g., saddles, ridges, peaks)
- fabricated structures (e.g., power lines, water tanks, buildings).

Teacher resource: [Topographical Map Symbols](#), United States Geological Survey (USGS)

### **Process/Skill Questions**

- How are peaks denoted on topographic maps?
- How is the direction of flowing water illustrated on a topographic map?
- How are contour lines valuable in identifying landmarks and other structures?
- Why are symbols used on topographic maps?
- Why is there a standard set of symbols?
- How are topographic map revisions shown?

## **Task Number 58**

### **Determine slope and distance.**

#### **Definition**

Determination should include the use of forestry tools and equipment, such as clinometers, GPS, transit levels, chains, and laser range finders.

Teacher resource: [Virginia FFA Association](#)

### **Process/Skill Questions**

- What equipment are most accurate for determining slope?
  - What equipment are most accurate for determining distance?
  - What equipment would be practical for various forestry activities?
- 

## **Task Number 59**

### **Determine distance and slope with a topographic map.**

#### **Definition**

Determination should include using map scale and ruler or planimeter and interpreting contour lines for 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?

## **Task Number 60**

## **Perform map-reading operations.**

### **Definition**

Performance should include

- identifying map title
- identifying area delineated
- identifying area description
- identifying north arrow
- identifying map location key
- identifying map legend
- using linear measurements to calculate the area of a tract of land
- interpreting legal land descriptions
- locating a land area, using a legal land description
- reviewing and interpreting aerial maps and photos
- interpreting topographic maps
- interpreting terms, symbols, and scales used on soil and topographic maps.

### **Process/Skill Questions**

- Why are the north arrow and the location key important?
- What types of projects would require a stand map?
- What information is included in the area description?

## **Task Number 61**

### **Determine land use from aerial photography and satellite images.**

#### **Definition**

Determination should include identifying land features (e.g., agricultural, forestry, industrial, residential, and other common land uses).

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

- What are the discernible features of each land use?
- How does land use affect the topography of an area?
- How does topography affect land use?

## **Task Number 62**

### **Conduct a land navigation exercise.**

#### **Definition**

Conducting should include using a map in concert with a compass and/or GPS.

### **Process/Skill Questions**

- What are the differences between using a compass and GPS?
- What are possible advantages/disadvantages of using a compass and GPS?

## **Task Number 63**

### **Research mapping programs and geographic information systems (GIS).**

#### **Definition**

Research should include current mapping programs and software.

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

### **Process/Skill Questions**

- What is the accuracy, advantages, and disadvantages of each program or system?
- How do the monetary costs of each system compare?
- Which systems are best for forestry applications?

## **Task Number 64**

### **Compare aerial photography, satellite data, and LiDAR in identifying forest groups.**

#### **Definition**

Comparison should include

- aerial photography
  - can be viewed without electronics
  - can take measurements
  - must have sequenced photos
  - unmanned aerial vehicles (UAV)
- satellite data
  - no pilot needed
  - can be layered with other data on a computer
  - can take measurements
- LiDAR
  - can take measurements
  - digital elevation model
  - can collect tree canopy and sub-stratum data.

## Process/Skill Questions

- What is the definition of *photogrammetry*?
- What weather factors can affect aerial photography? Satellite data?
- What instrument is used when looking at aerial photos?

## Task Number 65

### Create a map of a local forest area in Virginia.

#### Definition

Creation should include

- contour lines
- map symbols
- map colors.

#### Process/Skill Questions

- What is a *legend* on a map?
  - What is the symbol for a depression?
  - How can a GPS help map an area?
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## Managing the Forest (Silviculture)

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## Task Number 66

### Explain silvicultural systems used in forest management.

#### Definition

Explanation should include

- describing a program of treatments integrating specific harvesting, regeneration, and stand-tending methods to achieve a predictable yield of benefits from the stand over time
- describing the principle methods of regeneration and desired age structure to maximize the production of timber crops
- describing non-timber objectives, such as watershed health, wildlife production, ecological considerations, and other resource objectives

- describing the production of planned harvests of forest products over the long term that accommodates biological, ecological, and economic concerns to ensure sustainability of resources; provides for regeneration and planned seral stage development; and effectively uses growing space and productivity to produce desired goods, services, and conditions.

Teacher resource: [What is a Silvicultural System?](#), USDA

### Process/Skill Questions

- Why is it important to consider specific harvesting, regeneration, and stand-tending methods to achieve a predictable yield of benefits?
- What non-timber objectives should one consider when managing a forest or timber stand?
- What ecological considerations should one examine when managing a forest or timber stand?

## Task Number 67

### Develop a plan for management of a forest.

#### Definition

Development should include a plan (e.g., recreational, wildlife, timber, revenue, aesthetic) based on considerations such as

- site evaluation
- composition of the stand
- forest types
- forest age
- age distribution of trees
- growth rate
- size
- types of trees
- quality of the site
- products available
- reproduction rate
- landowner objectives
- inventory
  - tree species
  - height
  - diameter
  - health
  - quality of timber
  - management recommendations for landowner
- cost and profit analysis.

### Process/Skill Questions

- Who develops the forest management plan?

- What forestry tools are used for determining size in a stand analysis?
- How is growth rate determined?
- What are the dominant species in the area?
- What other species are available to meet plan objectives?
- What sizes of timber are present (e.g., sapling, pulpwood, sawtimber)?

## **Task Number 68**

### **Explain nutrient requirements for growth of immature and mature forest systems.**

#### **Definition**

Explanation should include

- site quality and growth requirements for immature and mature trees
- reproduction requirements for immature and mature trees.

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

- How does tree growth affect nutrient requirements?
- How do respiration and photosynthesis reactions change as the tree ages?
- How long does it take a white oak to reach sexual maturity?

## **Task Number 69**

### **Develop a plan for a prescribed burn.**

#### **Definition**

Development should include

- reason for burn (e.g., site preparation, pest control, regeneration of a specific species)
- authorizations
- maps
- description of desirable burning conditions
- precautions
- ignition methods
- weather analysis
- fire breaks
- fire tools (e.g., weather kit, Pulaski axe, drip torch)
- adherence to Virginia's Burn Law.

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

- What harvest cuttings use a controlled burn for reforestation?
- How does weather affect a prescribed burn?

- How does a prescribed burn affect the forest?
- What types of forests are dependent on fire?

# Regenerating the Forest

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## Task Number 70

### Plant forest seedlings.

#### Definition

Planting should include

- determining tree species to be planted
- preparing the site for tree reproduction
- following instructions for using tools (e.g., hand shovel, mattock, hoe, planting bar)
- inserting seedling
- firming soil around seedling.

#### Process/Skill Questions

- What are some local sources for obtaining seedlings?
- How should seedlings be transported prior to planting?

## Task Number 71

### Compare methods of forest regeneration.

#### Definition

Comparison should include methods of reproduction that are

- natural
- artificial.

#### Process/Skill Questions

- What three conditions must be achieved for successful natural reproduction?
- What are the advantages and disadvantages of natural methods of reproduction?
- What are the two activities required in any reproduction method?

## Task Number 72

## **Develop a plan for artificial regeneration.**

### **Definition**

Plan should include

- site preparation
- selection of planting stock
- consideration of the planting season
- use of tools
- care of planting stock
- planting procedures
- use of tree shelters where needed
- spacing of trees
- consideration of survival rate.

### **Process/Skill Questions**

- When is the best time to plant?
- Where should bundles be stored?
- How far should trees be spaced for planting?
- How many trees need to be left for reforestation in a seed tree cutting?

## **Measuring and Marketing Forest Products**

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### **Task Number 73**

## **Identify forest products and their markets.**

### **Definition**

Identification should include

- sawtimber
- pulpwood
- crossties
- posts
- veneer
- piling
- cooperage
- biomass.

### **Process/Skill Questions**

- What are some of the by-products left in the woods after a logging operation?
- What are some of the markets available locally?
- How is biomass marketed in Virginia?

## **Task Number 74**

### **Examine the influence of global markets on the import and export of forest products.**

#### **Definition**

Examination should focus on variation in demand for forest products and a decrease in the number of acres that are available to grow quality timber.

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

- How can management techniques grow more trees on less land?
- Which species of trees are more suited for quick rotations?
- Where are some of the world's largest timber-producing forests?

## **Task Number 75**

### **Measure forest products**

#### **Definition**

Measurement should include choosing the appropriate method for the given forest product (e.g., sawtimber, carbon, chip and saw, pulpwood).

Teacher Resource: [Measuring Standing Trees and Logs](#), Virginia Tech

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

- What are the methods used for calculating timber value?
  - What are the methods used for calculating board foot volume of standing trees?
  - What are the methods used to calculate volume cubic feet of pulpwood in standing trees?
- 

## **Task Number 76**

### **Calculate the total volume and value of pulpwood in standing trees.**

#### **Definition**

Calculation should include

- estimating the number of five-foot pulpwood bolts in a tree using a Biltmore stick from 66 feet away
- estimating the cubic feet/cords of pulpwood in a tree using a pulpwood scale.

Teacher Resource: [Forestry Career Development Events](#), FFA

### Process/Skill Questions

- What is the volume cubic feet of pulpwood in a tree with a diameter at breast height (DBH) of 10 and 3.5 pulpwood sticks?
- 

## Task Number 77

### Calculate the volume board feet (VBF) and value of sawtimber/saw logs in standing trees.

#### Definition

Calculation should include determining volume board feet of lumber

- measuring the DBH of a tree using a Biltmore stick (*DBH* is defined as the diameter of the tree taken 4.5 feet up the trunk on the uphill side)
- estimating the number of 16-foot logs in a tree using a Biltmore stick (estimate tree height at the point where the trunk narrows to 8 inches or where the tree contains too many defects—large limbs, knots, hollow spots, etc.—to be commercially valuable from 66 feet away. Tree lengths are reported in 16-foot lengths, so a tree that is 32 feet tall would have two 16-foot sections or logs)
- estimating the board feet in a tree using an International, Doyle, or Scribner Log Rule to calculate the board footage contained in the standing timber. DBH numbers run down the left column while the number of 16-foot logs runs across the top
- investigating market price for the tree species.

Teacher Resource: [Forestry Career Development Events](#), FFA

### Process/Skill Questions

- Why is a knowledge of tree identification important to determining the value of standing timber?
  - What is the acreage of a rectangular tract of land 900 yards in width and 8,000 feet in length?
  - Why is it sometimes advantageous not to harvest?
  - What is the VBF of lumber in a tree with a 16-inch DBH and 3.5 16-foot logs? What is the value of the tree if the market value for standing red oak is \$850 dollars per thousand board feet?
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# Using Forestry Best Management Practices (BMP) to Harvest Timber Products

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## Task Number 78

**Explain the effects of forestry best-management practices on watershed conditions.**

### Definition

Explanation should include

- erosion from clearing and roads
- protection of residual trees in streamside management zones (SMZs)
- preservation of riparian areas or SMZs.

Teacher resource: [Virginia's Forestry Best Management Practices for Water Quality](#), Virginia Department of Forestry

### Process/Skill Questions

- What measures can be taken to limit erosion on roads and cleared areas?
- What is an SMZ, and why is it important?

## Task Number 79

**Explain the laws pertaining to forestry and water quality.**

### Definition

Explanation should include

- National Environmental Policy Act, 1969
- Clean Water Act, 1972
- Chesapeake Bay Preservation Act, 1988.

### Process/Skill Questions

- How does the Clean Water Act affect planning a harvesting operation?
- Why are regulations important for environmental protection?

## **Task Number 80**

### **Outline the essential steps of a harvest plan.**

#### **Definition**

Outline should include

- landowner objectives
- harvest method to be used
- BMP
  - protecting the water and soil resources
  - closing out roads and restricting access
  - reseeding roads and logging decks
- environmental effects
- regeneration methods.

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

- Why are landowner objectives important to harvest planning?
- What are different harvesting methods?
- What are BMP, and why are they important?
- What can be done to limit erosion on areas with exposed soil?
- Why is regeneration important to pre-harvest planning?
- Whose job is it to manage harvesting operations?
- What percentage of Virginia's forestland is privately owned?
- What role does the Virginia Department of Forestry play in harvest operations?

## **Task Number 81**

### **Describe the advantages and disadvantages of various forest harvesting methods.**

#### **Definition**

Description should include advantages and disadvantages for methods including, but not limited to,

- clear-cut
- seed tree
- shelterwood
- selection
- sanitation
- salvage.

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

- How is lightning a problem with the seed-tree method of harvesting?

- When is clear-cutting the only practical method?
- Why must caution be used in selecting trees for single-tree selection?
- What is the Virginia Seed Tree Law for clear-cutting?

## **Task Number 82**

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

#### **Definition**

Compliance should include

- meeting OSHA requirements
- wearing personal protective equipment (PPE)
- using safety guards on equipment
- maintaining proper distance around equipment in operation.

#### **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 83**

### **Operate machinery and equipment.**

#### **Definition**

Operating machinery and equipment should include

- following all safety procedures, guidelines, and manufacturer's recommendations to include completing written safety tests, parts identification tests, and performance tests for all machinery and equipment
- identifying and eliminating hazards in the workplace
- observing color-coded warnings in work areas and on equipment and machinery
- identifying safe and effective fire-extinguishing techniques.

Teacher resources:

[National Safe Tractor and Machinery Operation Program \(NSTMOP\)](#), Penn State Extension

[Laboratory Safety Resources](#), Virginia Tech

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

- Why is it important to follow all suggested safety guidelines and manufacturer's recommendations when using machinery and equipment?
- Why is it important to have owner's manuals readily available?
- What is *NSTMOP*?

## **Task Number 84**

### **Maintain equipment and machinery according to manufacturer recommendations.**

#### **Definition**

Maintenance should include

- determining and performing preventative maintenance measures
- maintaining and servicing small gasoline engines using the operator's manual
- keeping records of equipment servicing
- adhering to required procedures for disposing of waste products
- adhering to required procedures for handling flammable and non-restricted chemicals
- storing equipment and machinery according to manufacturer recommendations
- performing minor welding repairs using arc welding and oxy-acetylene equipment.

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

- What methods are used to store gasoline?
- What are the required procedures for handling and storing flammable substances?
- Why should one use the operator's manual to use troubleshooting methods for equipment and machinery repair?

## **Task Number 85**

### **Identify the parts of a chain saw.**

#### **Definition**

Identification should include

- bar
- chain
- chain brake
- throttle
- choke
- power switch
- starter
- safety features.

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

- How is a chainsaw turned off?
- Which way do the teeth face on the chain when properly mounted?
- When should the choke be applied?

## Task Number 86

### Explain procedures for felling trees.

#### Definition

Explanation should include

- maintaining situational awareness
  - analyzing the felling job
  - checking the base of the tree
  - examining the surrounding terrain
  - examining the immediate work area
  - considering climber and ground crew safety precautions
- felling problem trees or snags first
- undercutting all trees exceeding five inches (127 mm) in DBH before making a backcut
- inspecting tree for a dead top, loose bark, limbs, and other debris leaning or hanging into it
- using a hatchet or axe, sounding completely around the trunk of any large trees to check for rot
- observing for other trees and tops that may fall in an undetermined direction when hit by a falling tree
- undercutting and back cutting all trees at a safe standing height
- never trusting holding wood in partly rotted trees
- never making any side cuts or corner cuts in hollow trees or trees with heart rot unless an adequate hinge can be maintained
- making the proper face/undercut with the opening large enough to control the tree nearly to the ground
- making the downhill or off cut first
- beginning the backcut by inserting wedges into the kerf as soon as practical
- continuing to cut until the desired amount of wood holds the tree
- ensuring that sloping/horizontal cuts do not cross one another
- never leaving a tree partially cut (i.e., always finishing the felling job before leaving with the exception that where hazards are unusually significant, leave trees standing, ribbon the area with hazard tape, or a suitable substitute, and notify the immediate supervisor)
- never climbing a lodged tree
- notifying nearby workers and the immediate supervisor of the hazard
- pulling the lodged tree down by tractor, winch, or other mechanical means whenever possible
- before returning to work on the felled tree, checking all snags and adjacent trees for broken limbs, log chunks, loose bark, and overhead hazards.

Teacher resource: [Health and Safety Code Handbook](#), United States Department of Agriculture Forest Service

#### Process/Skill Questions

- Why should a hinge be used when felling a tree?
- What purpose does a wedge serve?
- What hazards can occur when felling a tree?

- Why should some trees be limbed or topped before they are felled?
- What safety hazards are faced when limbing and topping trees?
- What is the job of the ground crew when limbing and topping trees?

## Task Number 87

### Explain bucking and limbing techniques to ensure worker safety.

#### Definition

Explanation should include

- determining if spotters or observers are needed
- considering obscured vision factors
- considering weather factors
- planning escape routes
- considering roadways, trails, firelines, and overhead power lines
- considering nearby workers
- considering felling, bucking, and limbing hazards
  - considering overhead hazards
  - evaluating guide bar length
  - describing footing
  - describing felling, bucking, and limbing area and escape routes
  - anticipating tree, log, and limb behavior
- planning bucking cut considerations
  - slope
  - tension
  - compression
- locating areas of tension in the log
  - inspecting the log for all binds, pivot points and skids
  - using wedges when bucking
- preventing the chain from contacting the ground.

Teacher Resource: [Health and Safety Code Handbook](#), United States Department of Agriculture Forest Service

#### Process/Skill Questions

- How does a sawyer avoid pinching the bar?
- Why should the chain not meet the ground?

## Task Number 88

### Outline procedures for supervising the loading and unloading of logs.

#### Definition

Outline should include

- safety precautions
- load binding
- efficiency
- clearing debris from decks.

### **Process/Skill Questions**

- Why is hauling timber sometimes the most dangerous aspect of timber harvesting?
- What methods can be used for loading trucks?

## **Processing Timber Products and Grading Lumber**

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### **Task Number 89**

**Describe sawmill safety, equipment operation, and first-aid procedures.**

#### **Definition**

Description should include

- safety glasses
- hearing protection
- steel-toe footwear
- debarker
- head rig
- edger
- trimmer.

### **Process/Skill Questions**

- What types of injuries are common in a sawmill?
- What safety rules apply to workers? How do those rules differ for visitors?
- What training is needed to operate equipment?
- What type of first-aid training is needed?

### **Task Number 90**

**Describe general sawmill operation activities.**

#### **Definition**

Description should include

- sawyer
- edger
- decker
- trimmer
- piler
- debarker.

### **Process/Skill Questions**

- What steps turn a log into a board?
- What is the layout of a basic sawmill?
- What process does a log undergo outside the mill?

## **Task Number 91**

### **Demonstrate the ability to operate processing equipment.**

#### **Definition**

Demonstration should include using safety precautions when operating equipment such as

- head rig
- edger
- trimmer.

### **Process/Skill Questions**

- What are the different types of head rigs?
  - What safety equipment is needed when operating processing equipment?
- 

## **Task Number 92**

### **Demonstrate the ability to operate carriage.**

#### **Definition**

Demonstration should include

- log-holding mechanism
- log-moving mechanism
- lateral indexing mechanism
- knees
- bolsters
- dogs.

## Process/Skill Questions

- How do the knees, bolsters, and dogs operate?
  - What does the carriage do?
  - What piece of equipment is the carriage a part of?
- 

## Task Number 93

### Define terms used in lumber grading.

#### Definition

Definitions may include

- *check*
- *clear face*
- *knots*
- *scale stick*
- *shake*
- *split*
- *surface measure*
- *wane.*

## Process/Skill Questions

- Why is lumber grading important?
- What are the differences between hardwood grading and softwood grading?
- How much training is required before becoming a lumber grader?

## Task Number 94

### Identify boards as hardwood or softwood.

#### Definition

Identification should include the characteristics of hardwood and softwood and the species classified as such.

## Process/Skill Questions

- For what uses is softwood best suited? Hardwood?
- How is sawmill equipment adjusted for processing softwood? Hardwood?

## Task Number 95

## List reasons for grading lumber.

### Definition

List should include reasons such as

- yard lumber
- structural lumber
- factory/shop lumber.

### Process/Skill Questions

- Why is softwood classified into three grades?
- Why does lumber have a grade?
- How do lumber grades affect the buyer, producer, and middle vendor?

## Task Number 96

### Identify grades used for hardwood and softwood lumber.

#### Definition

Identification should include

- standard grades
- grade combinations
- select grades
- common grades
- firsts
- seconds
- select
- No. 1 common
- No. 2 common, sound, wormy
- No. 3A
- No. 3B.

### Process/Skill Questions

- What are the standard hardwood grades?
- How is hardwood graded?
- What is the basis for pine grades?

## Task Number 97

### List steps to follow when evaluating lumber.

## Definition

List should include the steps for examining the sample for its characteristics and assigning a grade to the lumber.

## Process/Skill Questions

- Whose job is it to evaluate lumber?
- How can lumber be evaluated before it is harvested?
- What does lumber's grade mean to the consumer?

# Protecting the Forest

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## Task Number 98

**Identify insects, diseases, and animal pests common to area forests.**

### Definition

Identification should include, but is not limited to,

- Asian long-horned beetle
- chestnut blight
- Dutch elm disease
- emerald ash borer
- gypsy moth
- hemlock woolly adelgid
- southern pine beetle
- white pine blister rust
- white pine weevil.

### Process/Skill Questions

- How do insects, diseases, and pests affect the quality of timber?
- How will the emerald ash borer play a role in the changing of forests?
- How will the presence of the hemlock woolly adelgid affect the ecosystem?
- How has chestnut blight changed the Virginia forest?

## Task Number 99

**Identify tree diseases caused by organic pathogens, environmental conditions, and insects.**

## Definition

Identification should include diseases brought about by

- acid precipitation
- air pollution
- drought
- livestock
- nutrient deficiencies
- rodents
- whitetail deer.

*Notable diseases include Dutch elm disease and beech bark disease.*

## Process/Skill Questions

- How can livestock damage the forest?
- What can be done to prevent livestock damage?
- What are the economic effects of insects, diseases, and animal pests?
- How can deer overpopulation affect the forest?

## Task Number 100

### Identify disease and pest cycles in tree species.

#### Definition

Identification should include

- effects of various diseases and pests on different species of trees
- specific stage at which forests should be treated for disease and pest factors that define a specific infestation.

#### Process/Skill Questions

- When should a forest be sprayed for the gypsy moth?
- What role do pheromones play in treatment?
- What influences disease resistance in tree species?

## Task Number 101

### Define *invasive species*.

#### Definition

Definition should include the concept that an invasive species is one that is introduced to an area where it has no natural predator and threatens local wildlife. Invasive species are usually non-native, but some native organisms that overpopulate can be considered invasive. Examples may include

- emerald ash borer
- gypsy moth
- kudzu
- multiflora rose
- thousand cankers disease
- tree-of-heaven.

### **Process/Skill Questions**

- How can invasive species be controlled?
- How are invasive species introduced?
- How do invasive species affect the ecosystem?

## **Task Number 102**

### **Explain climate effects that produce fires.**

#### **Definition**

Explanation should include

- humidity
- drought
- lightning
- precipitation
- wind.

### **Process/Skill Questions**

- How do time of day and humidity contribute to fires?
- Where in the United States are winds of great concern?

## **Task Number 103**

### **Explain the development of a forest wildfire.**

#### **Definition**

Explanation should include

- fire triangle
- ground fire
- crown fire

- surface fire
- duration
- intensity
- rate of spread
- spotting
- topography
- firebreaks.

### **Process/Skill Questions**

- What type of fire is most destructive in a Virginia forest? How does this differ in the western United States?
- What is the primary cause of wildfires in Virginia?
- How does topography play a role in the development of forest fires?
- How does the time of year affect the forest's ability to regenerate?
- How does a fire affect water quality?

## **Task Number 104**

### **Describe forest wildfire-fighting techniques and fire-control measures.**

#### **Definition**

Description should include

- indirect attack
- direct attack
- equipment used
  - Pulaski axe
  - drip torch
  - fire rake
- backfire
- fireline
- mopping up
- suppression
- prescribed burning
- National Interagency Fire Center
- local fire departments
- cost analysis
- public safety.

### **Process/Skill Questions**

- What is the last equipment generally used on a fire?
- How is the rate of spread calculated?
- How are decisions made to fight a fire or let the fire burn?

## **Task Number 105**

## **Describe the location of a forest fire.**

### **Definition**

Description should include the use of U.S. Forest Service terminology and

- latitude
- longitude
- duration
- intensity
- rate of spread
- fire breaks.

### **Process/Skill Questions**

- Why are latitude and longitude used to locate a fire?
- How has GPS increased the accuracy of locating a fire compared to the old method of triangulation?

## **Task Number 106**

## **Explain a fire safety program.**

### **Definition**

Explanation should include measures taken to prevent fires, such as

- identification of target audience
- understanding of issue to be addressed (kids playing with matches, leaves in gutters)
- knowledge of fire triangle and fire causes
- practical uses of fire as a tool
- emergency service responses to fires and firefighting strategies.

### **Process/Skill Questions**

- What are reasons for fire starts in Virginia?
- How have programs like Smokey the Bear influenced society's attitude toward fire, specifically in contrast to fire uses 100 years ago?
- How is fire response handled in your community?

## **Task Number 107**

## **Prepare publicity for preventing forest fires.**

### **Definition**

Preparation should include

- marketing techniques (e.g., media, brochures)
- programs, such as Keep America Green and Smokey the Bear.

### **Process/Skill Questions**

- How does the audience's age influence the publicity?

## **Task Number 108**

### **Develop a forest-fire prevention plan.**

#### **Definition**

Development should include

- assessment of factors that influence fire behavior (e.g., fuel, weather, topography)
- vegetation (fuel) management strategies
- assessment of emergency response and support
- local laws and agencies.

### **Process/Skill Questions**

- What are steps that an individual homeowner can take to prepare for a wildfire?
- What are some local laws that are used to prevent fires?
- How can landscaping influence fire behavior?

## **Task Number 109**

### **Discuss economic principles in forestry management.**

#### **Definition**

Discussion should include

- using a model forest operation with possible calculation of profit/loss, cost of operation, taxes, depreciation, marketing product, and stumpage cost
- keeping records
- completing basic financial documents
- explaining the use of banking procedures.

Teacher resource: [National FFA Forestry Handbook](#)

### **Process/Skill Questions**

- What practices or processes have affected timber sales and or markets in your region?
- What are some important forest pests? Why is it important to control them?
- What are the positive and negative aspects of genetically modified trees?

- What are some issues that urban foresters face?
- What forestry BMP are used in your state, and why?
- How does watershed restoration affect communities? What role can forest management play in watershed restoration?
- What is *forest fragmentation*, and what are the strategies used to prevent it?
- What is the Sustainable Forestry Initiative (SFI) and Forest Stewardship Council (FSC), and what do they have in common?
- How do laws protect endangered species? Why should we be concerned about saving them?
- What is *woody biomass*? What are the positives and negatives of producing woody biomass?

## SOL Correlation by Task

39	Identify the role of supervised agricultural experiences (SAEs) in agricultural education.	English: 12.3, 12.5
40	Participate in an SAE.	English: 12.5, 12.8
41	Identify the benefits and responsibilities of FFA membership.	English: 12.5, 12.6, 12.7, 12.8
42	Describe leadership characteristics and opportunities as they relate to agriculture and FFA.	English: 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: 12.5
44	Define <i>forest ecology</i> .	English: 12.3  Science: BIO.8
45	Analyze forest ecosystems.	English: 12.5  Science: BIO.8
46	Explain principles and processes of ecological succession.	English: 12.5  Science: BIO.8
47	Analyze site factors that influence species diversity.	English: 12.5  Science: BIO.8, ES.2, ES.8, ES.11
48	Describe ecological concepts of shade tolerance and species competition.	English: 12.5  Science: BIO.8
49	Identify forest soil characteristics.	English: 12.5  Science: ES.8
50	Test soil samples.	English: 12.5  Mathematics: PS.1*, PS.2*, PS.3*, PS.4*, PS.7*, PS.8*, PS.10*  Science: ES.8

51	Differentiate among the forest types of North America.	English: 12.5
52	Describe the relationship between living organisms and the environment.	English: 12.5 Science: BIO.8
53	Describe the hydrological cycle and its effect on streams and watersheds.	English: 12.5 Science: ES.8
54	Describe how land use and other human activities affect soil, water, and vegetative resources.	English: 12.5 History and Social Science: GOVT.7, GOVT.8, GOVT.12, VUS.14, WG.17, WHII.14 Science: BIO.8, ES.2
55	Identify the roles of government, industry, and private forestry agencies.	English: 12.5 History and Social Science: GOVT.7, GOVT.8, GOVT.9, GOVT.12, VUS.13, VUS.14, WG.17, WHII.14
56	Interpret topographic maps, relief maps, aerial photography, and virtual soil maps.	English: 12.5 Science: ES.1
57	Locate landmarks on a topographic map, a relief map, and in an aerial photograph.	English: 12.5 Science: ES.1
58	Determine slope and distance.	
59	Determine distance and slope with a topographic map.	Science: ES.1
60	Perform map-reading operations.	English: 12.5 History and Social Science: VUS.1, WG.1, WHI.1, WHII.1 Science: ES.1
61	Determine land use from aerial photography and satellite images.	English: 12.5 History and Social Science: GOVT.12, VUS.14, WG.17, WHII.14
62	Conduct a land navigation exercise.	History and Social Science: GOVT.12, VUS.14, WG.17, WHII.14
63	Research mapping programs and geographic information systems (GIS).	English: 12.5, 12.8 History and Social Science: GOVT.12, VUS.14, WG.17, WHII.14
64	Compare aerial photography, satellite data, and LiDAR in identifying forest groups.	English: 12.5
65	Create a map of a local forest area in Virginia.	
66	Explain silvicultural systems used in forest management.	English: 12.5

67	Develop a plan for management of a forest.	English: 12.1, 12.6 History and Social Science: GOVT.7, GOVT.8, GOVT.9, GOVT.12
68	Explain nutrient requirements for growth of immature and mature forest systems.	English: 12.5
69	Develop a plan for a prescribed burn.	English: 12.1, 12.5 History and Social Science: GOVT.7, GOVT.8, GOVT.9, GOVT.12
70	Plant forest seedlings.	English: 12.5
71	Compare methods of forest regeneration.	English: 12.5
72	Develop a plan for artificial regeneration.	English: 12.1
73	Identify forest products and their markets.	English: 12.5
74	Examine the influence of global markets on the import and export of forest products.	English: 12.5 History and Social Science: GOVT.9, GOVT.12, VUS.14, WG.17, WHII.14
75	Measure forest products	
76	Calculate the total volume and value of pulpwood in standing trees.	
77	Calculate the volume board feet (VBF) and value of sawtimber/saw logs in standing trees.	
78	Explain the effects of forestry best-management practices on watershed conditions.	English: 12.5
79	Explain the laws pertaining to forestry and water quality.	English: 12.5, 12.8 History and Social Science: GOVT.7, GOVT.8, GOVT.9
80	Outline the essential steps of a harvest plan.	English: 12.6, 12.7
81	Describe the advantages and disadvantages of various forest harvesting methods.	English: 12.5
82	Comply with federal, state, and local safety and legal requirements in the operation of all equipment and tools.	English: 12.5 History and Social Science: GOVT.7, GOVT.8, GOVT.9, GOVT.12
83	Operate machinery and equipment.	English: 12.5 History and Social Science: GOVT.7, GOVT.8, GOVT.9, GOVT.12
84	Maintain equipment and machinery according to manufacturer recommendations.	English: 12.5
85	Identify the parts of a chain saw.	English: 12.5
86	Explain procedures for felling trees.	English: 12.5
87	Explain bucking and limbing techniques to ensure worker safety.	English: 12.5
88	Outline procedures for supervising the loading and unloading of logs.	English: 12.6, 12.7

89	Describe sawmill safety, equipment operation, and first-aid procedures.	English: 12.5
90	Describe general sawmill operation activities.	English: 12.5
91	Demonstrate the ability to operate processing equipment.	
92	Demonstrate the ability to operate carriage.	
93	Define terms used in lumber grading.	English: 12.3, 12.5
94	Identify boards as hardwood or softwood.	English: 12.5
95	List reasons for grading lumber.	English: 12.6
96	Identify grades used for hardwood and softwood lumber.	English: 12.5
97	List steps to follow when evaluating lumber.	English: 12.6
98	Identify insects, diseases, and animal pests common to area forests.	English: 12.5
99	Identify tree diseases caused by organic pathogens, environmental conditions, and insects.	English: 12.5
100	Identify disease and pest cycles in tree species.	English: 12.5
101	Define <i>invasive species</i> .	English: 12.3, 12.5
102	Explain climate effects that produce fires.	English: 12.5
103	Explain the development of a forest wildfire.	English: 12.5
104	Describe forest wildfire-fighting techniques and fire-control measures.	English: 12.5  History and Social Science: GOVT.7, GOVT.8, GOVT.9, GOVT.12
105	Describe the location of a forest fire.	English: 12.5
106	Explain a fire safety program.	English: 12.5
107	Prepare publicity for preventing forest fires.	English: 12.1, 12.2  History and Social Science: GOVT.7, GOVT.8, GOVT.9, GOVT.12
108	Develop a forest-fire prevention plan.	English: 12.1
109	Discuss economic principles in forestry management.	English: 12.1  History and Social Science: GOVT.7, GOVT.8, GOVT.9, GOVT.12, GOVT.14

## 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 (8042/36 weeks)
- Introduction to Natural Resources and Ecology Systems (8040/36 weeks)
- Operating the Farm Business (8014/36 weeks)
- Outdoor Recreation, Parks, and Tourism Systems Management (8043/36 weeks)

<b>Career Cluster: Agriculture, Food and Natural Resources</b>	
<b>Pathway</b>	<b>Occupations</b>
<b>Agribusiness Systems</b>	<b>Agricultural Products Sales Representative</b>
<b>Environmental Service Systems</b>	<b>Environmental Compliance Inspector Environmental Sampling and Analysis Technician Secondary School Teacher Toxicologist Water Conservationist</b>
<b>Food Products and Processing Systems</b>	<b>Biochemist Food Scientist</b>
<b>Natural Resources Systems</b>	<b>Ecologist Fish and Game Officer Forest Manager, Forester Forest Technician</b>

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

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