Community Forestry and Tree Management

8048/36 weeks

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Acknowledgments

- Joel Koci, Associate Extension Specialist of Agriculture and Natural Resources, Virginia State University, Petersburg
- William Mays, Instructor, Amherst County High School, Amherst County Public Schools
Course Description

Suggested Grade Level: 11 or 12

While exploring the community forestry and tree management industry, students will learn the value, benefit, costs, and risks associated with trees and forests in urban, suburban, and rural communities. Course content will include the ecology and biology of trees in human-driven systems and their management and conservation. Students will participate in supervised agricultural experiences (SAEs), leadership opportunities, and will investigate career opportunities and postsecondary options.

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

- 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.

<table>
<thead>
<tr>
<th>Task No.</th>
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<tbody>
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<td>Exploring Leadership Skills through FFA</td>
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<td>Identify native and nonnative tree species.</td>
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<td>Explain the anatomy of trees.</td>
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<td>Explain the physiology of trees.</td>
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<td>Determine the age and growth rate of a tree.</td>
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<td>Examining Environmental Factors that Influence Tree Growth</td>
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<td>Explain the genetic characteristics of tree species that are able to thrive in urban areas.</td>
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<td>⊕</td>
<td>Describe the desirable and undesirable characteristics of trees for specific urban landscape types.</td>
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<td>Task No.</td>
<td>Exploring Management of Trees in Urbanized Areas</td>
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<td>Compare the site characteristics of various urbanized areas where trees grow.</td>
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<td>Create a landscape plan that incorporates trees.</td>
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<td>Evaluate a landscape plan that incorporates trees.</td>
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<td>Evaluate a land development plan that may affect trees and other natural resources.</td>
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<td>Interpret community forestry plans.</td>
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<td>64</td>
<td>Comply with federal, state, and local safety and legal requirements in the operation of all tools, machinery, and equipment.</td>
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<td>Operate machinery and equipment.</td>
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<td>Maintain equipment and machinery according to manufacturer recommendations.</td>
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<td>Identify the parts of a chain saw.</td>
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<td>Explain procedures for felling trees.</td>
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<td>73</td>
<td>Interpret safety data sheets (SDS).</td>
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<td>77</td>
<td>Describe common maintenance and risk management strategies used to mitigate tree nuisances and hazards.</td>
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<td>Investigating Tree Disorders</td>
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<td>Identify types of tree disorders.</td>
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<td>Identify types of tree stressors.</td>
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<td>Describe the consequences of acute and chronic tree stressors.</td>
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<td>84</td>
<td>Diagnose tree disorders.</td>
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<td>Exploring Pests and Diseases</td>
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<td>Identify tree pathogens that serve as disease agents in Virginia's common trees.</td>
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<td>86</td>
<td>Identify signs and symptoms of tree disease.</td>
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<td>Explain how tree diseases are transmitted.</td>
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<td>88</td>
<td>Explain the importance of sanitation in preventing tree diseases and disease management.</td>
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<td>89</td>
<td>Identify categories of pests.</td>
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<td>Describe conditions that encourage pest infestation.</td>
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<tr>
<td>91</td>
<td>Identify signs and symptoms of an insect infestation.</td>
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<td>92</td>
<td>Evaluate pest damage to trees in urban forests, and how this affects ecosystem services.</td>
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<td>93</td>
<td>Explain IPM.</td>
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<td>94</td>
<td>Explain management concerns related to non-insect pests.</td>
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<td>95</td>
<td>Identify career opportunities in community forestry and tree management.</td>
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<tr>
<td>96</td>
<td>Research postsecondary education requirements for careers related to community forestry and tree management.</td>
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</table>

### Exploring Leadership Skills through FFA

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](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).

#### 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  
  o career exploration and planning  
  o personal financial planning and management  
  o workplace safety  
  o employability skills for college and career readiness  
  o agricultural literacy  
• researching the Immersion SAE  
  o entrepreneurship/ownership  
  o placement/internships  
  o research (experimental, analytical, invention)  
  o school business enterprises  
  o 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 (https://thecouncil.ffa.org/sae-resources/).

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?

AFNR Standards CRP.02.02  
CRP.0203

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:
- [Supervised Agricultural Experience (SAE), National Council for Agricultural Education](https://thecouncil.ffa.org/sae/).
- [The Agricultural Experience Tracker](https://www.theaet.com/).

**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?

**AFNR Standards**
CRP.02.02
CRP.02.03

**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?

AFNR Standards CRP.09.01

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?

AFNR Standards CRP.09.01

Task Number 43 (Optional)
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
  ([https://www.ffa.org/participate/awards/proficiencies/](https://www.ffa.org/participate/awards/proficiencies/)).

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?

Exploring Community Forestry and Its Benefits

Task Number 44
Define terms related to community forestry.
**Definition**
Defining terms should include
- tree
- arboriculture
- arborist
- dendrology
- silviculture
- ecosystem
- ecosystem services
- forestry
- green infrastructure
- greenspace
- urban forest
- urban forestry and urban forester
- food forests
- urban orchards
- natural areas
- community (rural, suburban, urban)
- cost-benefit analysis.

**Process/Skill Questions**
- How do woody plants compare with herbaceous plants?
- How does dendrology compare with arboriculture?
- How are arboriculture and silviculture different from each other?
- Why are ecosystems important to urban forestry?
- How does an urban forest influence a community?

**Task Number 45**
**Compare aspects of the rural-urban continuum.**

**Definition**
Comparison should include development, mindsets, infrastructure, and economic needs and goals in areas that are
- rural
- suburban
- urban.

Comparison should also include the natural resource related trends, technologies and policies that affect AFNR systems.
Process/Skill Questions
- What is urbanization?
- How does the loss of the canopy affect urban citizens?
- How does development affect trees and forests?

AFNR Standards NRS.02.02

Task Number 46
Identify stakeholders of community forestry and tree management.

Definition
Identification should include, but not be limited to,
- professionals
  - civil engineers
  - electrical contractors
  - utility contractors
  - landscape architects and designers
- clients
  - residential property owners
  - commercial property owners
  - municipal clients
- citizens.

Process/Skill Questions
- How would various professions view the economics of community forestry and tree management?
- What is the economic benefit of various ecological approaches?
- What are outcomes (positive and negative) of various development approaches?
- How does the work of various professionals impact the urban forest? What are common points of interest and common points of conflict among these professionals?

AFNR Standards NRS.02.03

Task Number 47
Identify trade-offs involved when managing trees and forests.
Definition
Identification should include the concept that all management decisions include costs such as

- purchase
- inspection
- maintenance
- pest management
- removal and disposal
- potential damage to structures and infrastructure
- potential harm to people.

Process/Skill Questions
- What are some indirect costs associated with managing trees and forests?
- Why is inspection important?

Task Number 48
Explain the value of trees.

Definition
Explanation should include key ecosystem services provided by forest ecosystems and explore how urban forests can enhance the ecosystem service benefits for the local community to include

- defining *ecosystem services*
- listing environmental service benefits
  - water cycle management
  - air filtration/air quality improvement
  - temperature regulation
  - soil health
  - carbon sequestration
  - nutrient cycling
  - primary production
  - erosion control
  - habitat for wildlife
  - food production
  - extreme weather mitigation
  - disease resistance
  - storm water management
  - noise reduction
  - windbreaks
  - climate adaptation and resilience
• social service benefits
  o aesthetic value
  o health benefits
    ▪ stress reduction
    ▪ asthma reduction
    ▪ improvements in mental health
    ▪ improvements in immune system function
    ▪ quicker recovery times
    ▪ encouragement of healthier lifestyles
    ▪ improvements in nutrition (food forests)
  o sense of community
  o improved relationships
  o inspirational (e.g., art, literature)
  o spiritual values
  o ecotourism
  o crime reduction
  o environmental justice and equity
  o traffic calming
  o opportunities for recreation, education, and urban agriculture
  o psychological importance of green space.

Process/Skill Questions
• Why is it important to consider the ornamental value as well as the functional purpose of trees in the urban forest landscape?
• How can wildlife enhance the aesthetic value of an urban forest community?
• Why do trees bring aesthetic value to an urban forest community?
• How does public perception influence aesthetics in an urban forest community?
• How do trees mitigate effects of climate change?
• What species of trees are most tolerant of urban air pollution?
• How do trees affect carbon sequestration?
• How can the use of trees change the effects of wind?
• How do trees reduce urban storm-water runoff?
• Why should tree characteristics be considered when planning storm-water management and erosion control?
• How can trees reduce crime?
• What are some ways trees can foster vibrant community life?
• What effect can trees have on traffic patterns?
• What role can trees play in helping people form relationships?
• What educational opportunities can trees provide for a community?
• What human health issues can be improved through the use of trees in the landscape?
• How do urban forest communities promote healthier lifestyles?
• How can trees improve mental health?
Task Number 49
Explain the economic value of trees.

Definition
Explanation should include
• increases in
  o property value
  o environmental services
  o community member satisfaction and retention
  o commerce
  o commercial development
  o job opportunities
• decreases in costs associated with
  o utilities
  o stormwater management
  o pollution control
  o healthcare.

Process/Skill Questions
• How can having a well-planned urban forest community increase commerce?
• What are ways that trees can affect living costs for people?
• What job opportunities may be created by the presence of an urban forest?
• How can trees affect healthcare costs?
• Why do well-planned urban forest communities help attract and retain employees?

Classifying and Identifying Trees

Task Number 50
Describe the ways trees are classified and named.

Definition
Description should include scientific classification
- based on taxonomy
  - gross morphology
  - genetics,
  - cytology,
  - ecology,
  - behavior,
  - phylogenic (ecology, evolutionary)
- using popular classifications, such as
  - pteridophytes
  - gymnosperms
  - angiosperms
  - conifers
  - deciduous
- using a dichotomous key.

**Process/Skill Questions**
- What are the differences between gymnosperms and angiosperms?
- What are the differences between evergreen and deciduous trees?
- How is a dichotomous key used to identify a plant?
- How are scientific names developed?
- Why are scientific names used?
- What does a scientific name tell about a tree?
- Where in Virginia might one encounter a palm?
- What is a tree? What makes a tree unique from other plant life?

**AFNR Standards**
- PS.02.01
- NRS.01.01
- NRS.01.02

**Task Number 51**
**Identify native and nonnative tree species.**

**Definition**
Identification should include differentiation among
- anatomical characteristics of species (e.g., leaf, bark, bud)
- ecoregion
- forest cover type
- potential natural vegetation
- naturalized
- invasive.
Teacher Resources:

- **Native Plants**, Virginia Department of Conservation and Recreation [https://www.dcr.virginia.gov/natural-heritage/nativeplants].
- Williams, Dan D., and Bill J. Lott. *FFA Georgia State and National Tree Lists*. 2012.
- *FFA Georgia State and National Tree Lists*, by Bill J. Lott and Dan D. Williams (2012)
- **Native Plants**, Virginia Department of Conservation and Recreation [https://www.dcr.virginia.gov/natural-heritage/nativeplants].
- *Silvics of North America*, Handbook #654, volume one and two, U.S. Forest Service, P. O. Box 2417, 12th and Independence Avenue SW, Washington, DC 20013

Process/Skill Questions

- How do environmental factors influence species location?
- What characteristics are used to identify trees?
- How is leaf size affected by the tree’s environment?
- How are simple leaves distinguished from compound leaves?
- What are trade-offs between native and nonnative plants?
- How do invasive plants affect native ecosystems?

**AFNR Standards**

NRS.01.02

NRS.04.03
Explaining Tree Biology

Task Number 52
Explain the anatomy of trees.

Definition
Explanation should include
- leaves
- twigs and branches
- trunk
- buds
- roots
- outer bark
- xylem
- phloem
- heartwood
- sapwood
- cambium
- fruits and seeds
- flowers.

Process/Skill Questions
- What is the purpose of the xylem and phloem?
- What are the functions of the trunk?
- What are the functions of the root system?
- What are the functions of the leaves?

AFNR Standards NRS.01.02
PS.02.02

Task Number 53
Explain the physiology of trees.

Definition
Explanation should include
- definitions
  - photosynthesis
  - cellular respiration
  - transpiration
o translocation
o growth
o sugars
o water
o nutrients
o chlorophyll
o hormones
o enzymes
o mycorrhizae
o environmental factors

- chemical formulas for photosynthesis and cellular respiration
- relationships among photosynthesis, cellular respiration, transpiration, translocation, and growth
- defense processes of trees (e.g., compartmentalization of decay, wound closure, pest-deterring chemicals).

**Process/Skill Questions**
- What are the functions of primary and secondary meristematic cells?
- How do trees grow in diameter and height?
- What is the process of photosynthesis?
- What occurs during respiration?

**AFNR Standards**
NRS.01.02
PS.02.02
PS.02.03

**Task Number 54**
**Determine the age and growth rate of a tree.**

**Definition**
Explanation should include
- growth of xylem and phloem and their aging into rings
- environmental effects on ring growth
- methods for counting rings
- identification of twig nodes and internodes.

**Process/Skill Questions**
- How are the rings in the trunk created?
- What is indicative of a drought?
- Why is the ability to determine the age of a tree significant?
- How is an increment borer used?
- What does the color of the annual rings indicate about the environment?
• What does the length of twig internodes indicate about tree growth and vitality?

AFNR Standards PS.02.02

Examining Environmental Factors that Influence Tree Growth

Task Number 55
Explain the environmental factors that influence tree growth.

Definition
Explanation should include the following factors:
• Aspect (i.e., direction of slope face)
• Climate zone/hardiness zone
• Competition
• Human activity (e.g., disturbance, pollution)
• Light
• Nutrient availability
• Pest prevalence
• Soils
• Topography
• Water availability

Process/Skill Questions
• How might soil compaction be prevented or remediated?
• How does soil compaction affect tree health?
• How does aspect affect water availability?
• What species will thrive in the Appalachian Plateau? Valley and Ridge? Blue Ridge Mountains? Piedmont? Coastal Plain?
• How can buying tree stock from a reputable dealer, using the ANSI Z60 standards, help with future tree performance?
• How can surrounding structures create a microclimate?
• Why might the soil in an industrial area need to be amended prior to planting?

AFNR Standards PS.01.01

Task Number 56
Explain site factors affecting the establishment of trees in a developed area.

**Definition**
Explanation should include
- growing space for the crown and roots
- soil characteristics
- water availability
- sunlight
- microclimate
- proximity to traffic
- space restrictions
- resource availability
- tree risk
- debris
- access
- utility conflicts
- pollution.

**Process/Skill Questions**
- How do planting characteristics vary between a developed area and an open area?
- What are the most common limitations of trees in urban environments?
- What soil conditions and depth are required for growing trees?
- What are problems associated with establishing trees near solid structures?
- What is the relationship between tree uses and site selection?
- What species should be avoided adjacent to a fishpond? Why?
- What technologies and/or techniques are available to provide extra room for tree roots?

**AFNR Standards** PS.03.02

**Task Number 57**
Explain the genetic characteristics of tree species that are able to thrive in urban areas.

**Definition**
Explanation should include
- defining *cultivar*
- describing environmental conditions
  - hardiness zone
  - tolerance of urban stressors
- soil moisture
- reduced soil volume
- poor soils
- soil compaction
- soil drainage characteristic
- root space
- sun/shade
- salt
- pH
- heat
- drought
- structural factors
  - limitations to above-ground space
  - overhead wires
  - proximity to buildings
- limitations to below-ground space
  - utilities
  - rooting volume
- identifying microclimate factors
  - re-reflected heat load
  - frost pocket
  - wind funneling
- listing insect/disease factors
- evaluating irrigation levels
- determining effect on air pollution
- describing growth and ornamental characteristics
- identifying transplant issues
- determining resistance to storm damage and injury
- identifying management issues
  - potential hazards and nuisances
  - maintenance requirements
- determining aesthetic value.

**Process/Skill Questions**
- What is the difference between a forest tree and an urban tree?
- What are some maintenance issues of trees?
- What are three site characteristics that influence species selection?
- What trees are ideal for various urban environments (e.g., parking lots, parks, streets)?
- What are some site characteristics that might prohibit the planting of large trees?

**AFNR Standards** NRS.04.01
Task Number 58
Describe the desirable and undesirable characteristics of trees for specific urban landscape types.

Definition
Description should include
- defoliation
- fruit
- clearance requirements
- growth rates
- moisture requirements
- flowering
- scent
- rooting area
- hardiness
- allelopathy
- pest susceptibility
- invasiveness
- pollen
- potential conflicts with the environment (e.g., a magnolia’s seed pods might cause a fall hazard).

Process/Skill Questions
- How are maintenance concerns different for a park and for a street?
- What trees require high levels of maintenance?
- What trees have showy flowers, fruit, or fall color?
- What are some undesirable characteristics of trees that might exclude them from urban areas?

AFNR Standards NRS.02.02

Exploring Management of Trees in Urbanized Areas

Task Number 59
Compare the site characteristics of various urbanized areas where trees grow.
**Definition**
Comparison should include
- forest patch settings
- park settings
- street settings
- residential settings
- commercial settings.

**Process/Skill Questions**
- Which species can tolerate park settings? Residential settings? Commercial settings?
- What characteristics of trees should be considered when selecting them for parks? Residential settings? Commercial settings?
- How does soil differ in landscapes around buildings and in parks?
- What characteristics of trees should be considered when selecting trees for streetscapes?

**AFNR Standards** NRS.04.01

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**Task Number 60**

**Create a landscape plan that incorporates trees.**

**Definition**
Creation should include consideration of
- landowner or client objectives
- how intended site use activities affect trees and vice versa
- site conditions (e.g., soil, structural factors)
- bed patterns
- properly integrating plant types with similar growth requirements and maintenance needs
- construction materials
- safety and construction-method requirements
- walks and paths
- trees to maximize winter sun energy, minimize summer heat, design windbreaks, and frame a view
- visual screens
- food forests
- ecosystem services.

**Process/Skill Questions**
- Why is soil an important consideration in a landscape plan?
- How would the landscape plan affect water flow through that landscape?

**AFNR Standards** NRS.03.02
Task Number 61
Evaluate a landscape plan that incorporates trees.

Definition
Evaluation should include consideration of
  • design costs
  • maintenance considerations
  • management requirements
  • potential risks/hazards
  • environmental effects of the design.

Process/Skill Questions
  • Why should newly planted trees be staked?
  • What types of barriers can urban trees be used for?
  • What should one consider when selecting trees for a landscape plan?
  • How might landscape affect microclimate?

AFNR Standards  NRS.03.02
NRS.04.01
PS.04.01
PS.04.02

Task Number 62
Evaluate a land development plan that may affect trees and other natural resources.

Definition
Evaluation should include consideration of
  • trees to maximize winter sun energy, minimize summer heat, create windbreaks, and frame a view
  • erosion and sedimentation regulations
  • tree preservation
  • species diversity
  • environmental services
  • soil volumes
- canopy coverage
- visual screens
- code and zoning requirements.

**Process/Skill Questions**
- What is the 30-20-10 rule?
- What are the most challenging code requirements, and how can they be met?
- What types of environmental services can trees provide to a community development?
- Why is it important to consider erosion and sedimentation regulations?

**AFNR Standards**
NRS.03.02
NRS.04.01
PS.04.01
PS.04.02

**Task Number 63**
**Interpret community forestry plans.**

**Definition**
Interpretation should include
- the planning process
- consideration of ordinances, policies, and plans
  - designating responsibilities
  - developing comprehensive management plans
  - resolving conflicts between trees and structures
  - establishing planting and maintenance plans
  - clarifying public nuisances
  - establishing conservation procedures
- tree inventories
- tree boards
- Tree City, USA.

**Teacher Resources:**
- Tree City, USA ([https://www.arborday.org/programs/treecityusa/](https://www.arborday.org/programs/treecityusa/)).

**Process/Skill Questions**
- What are the purposes of a tree ordinance?
- What are the benefits of having tree ordinances in urban areas?
• What are some reasons to establish a tree ordinance in a community?
• What federal regulations affect development plans?
• What differences exist between ordinances for trees in forests and trees in built environments?
• What is Tree City, USA, and its importance?

AFNR Standards NRS.02.02
NRS.04.01
PS.04.01
PS.04.02

Examining Tree Care Safety

Task Number 64
Describe safety considerations for tree care.

Definition
Description should include
• unique workplace hazards for tree care
  o electrical hazards
  o fall hazards
  o overhead hazards – falling objects
  o asphyxia
  o caught-in or pulled-in
• personal protective equipment (PPE)
• use of tools, equipment, and machinery

Teacher Resource:
• ANSI Z133 2017 Revision Overview, Tree Care Industry Association (TCIA)

Process/Skill Questions
• What are examples of specialized PPE used when performing tree care?
• What are unique workplace hazards for tree care?

AFNR Standards CS.03.03
CS.03.04

Task Number 65
Comply with federal, state, and local safety and legal requirements in the operation of all tools, machinery, and equipment.

Definition
Compliance should include
- meeting Occupational Safety and Health Administration (OSHA) requirements
- wearing PPE
- using safety guards on equipment
- lockout/tagout requirements
- maintaining proper distance around equipment in operation.

Teacher Resources:
- Electrical Hazard Awareness Program (EHAP), Tree Care Industry Association (TCIA) (https://www.tcia.org/TCIA/Education_Events/Education/TCIA_Credentialing_Programs/Electrical_Hazards_Awareness_Program/Electrical_Hazards_Awareness_Program.aspx).

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?
- Why should safety guards never be altered or removed?

AFNR Standards PST.01.02
PST.02.02
CS.03.03
CS.03.04

Task Number 66
Operate machinery and equipment.
Definition
Operating machinery and equipment should include following all safety procedures, instructor guidelines, and manufacturer’s recommendations to include completing

- all written safety tests, parts identification tests, and performance tests for all tools, machinery, and equipment, and achieving 100 percent on every test
- 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.

Process/Skill Questions
- Why is it important to follow all suggested safety guidelines and manufacturer recommendations when using tools, machinery, and equipment?
- Why is it important to have owner’s manuals readily available?

AFNR Standards PST.01.02
PST.02.01
PST.02.02
CS.03.03
CS.03.04

Task Number 67
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
- disposing of waste products
- handling flammable and non-restricted chemicals
- storing equipment and machinery
- 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 68
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 69
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
o examining the immediate work area

o considering climber and ground crew safety precautions

- felling problem trees or snags first
- undercutting all trees exceeding five inches (127 mm) in diameter-at-breast-height (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 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:

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?

AFNR Standards PST.01.02
Task Number 70
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 cuts
  - 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:

Process/Skill Questions
- How does a sawyer avoid pinching the bar?
- Why should the chain not meet the ground?
- What is kick back?
Task Number 71
Outline procedures for supervising the loading and unloading of logs.

Definition
Outline should include
- safety precautions
- proper rigging for crane loading
- load binding
- efficiency
- clearing debris from decks
- awareness of hazards, including electrical hazards.

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

Task Number 72
Interpret pesticide labels.

Definition
Interpretation should include
- reading labels thoroughly and identifying
  - manufacturer
  - trade name
  - active ingredients
  - type of pesticide
  - signal words
  - formulation
  - U.S. Environmental Protection Agency (EPA) registration number
  - storage and disposal precautions
  - hazard statement
  - directions for use
  - net contents
• describing worker protection procedures under the Worker Protection Standard (WPS) regulations
• explaining the “label is the law” principle
• explaining types of toxicity and toxicity statements
• explaining safe practices while handling pesticides
• following personal protection procedures according to the directions on pesticide labels.

Process/Skill Questions
• What information can be found on a pesticide label?
• What do the different toxicity statements indicate?
• What safety measures must be followed when handling pesticides?

AFNR Standards PS.03.03

Task Number 73
Interpret safety data sheets (SDS).

Definition
Interpretation should include
• reading the SDS and categorizing information
• identifying key components in the layout of the SDS
• locating the SDS for all pesticides used.

Process/Skill Questions
• Where are SDS located in school?
• What critical information can be found on the SDS?
• Why is it important to be able to quickly locate the SDS?
• Who should have access to the SDS?

AFNR Standards PS.03.03

Maintaining and Caring for Trees

Task Number 74
Explain the benefits of tree maintenance.

Definition
Explanation should include the benefits to both trees and humans, such as the following:
- Greater tree survivorship and longevity
- Reduced hazards and conflicts
- Reduced long-term costs
- Reduced vulnerability to storm damage
- Reduced disruptions in storm events
- Reduced vulnerability to pests
- Improved ecological function
- Improved amenity
- Improved value

Explanation should also include an awareness of the benefits of the Tree Care Industry Association’s (TCIA) [ANSI A300](https://www.tcia.org/TCIA/Build_Your_Business/A300_Standards/A300_Standards.aspx) and [ANSI Z133](https://www.tcia.org/tcia/News/Business/ANSI_Z133_2017_Revision_Overview.aspx) standards.

**Process/Skill Questions**
- Why do trees in urban areas require maintenance?
- What are the basic objectives of tree maintenance?
- How does proper tree maintenance promote overall tree health?
- When does a tree require maintenance?
- What are the proper pruning techniques for trees?
- How can an integrated pest management (IPM) plan improve the overall health of a forest?
- When would it be appropriate to use growth-regulation practices?
- What is the cost of failing to maintain trees?

**AFNR Standards**
- NRS.02.05
- NRS.03.01
- NRS.04.01

**Task Number 75**
**Identify conditions that signal a need for tree care.**

**Definition**
Identification should include
- hazard and conflict recognition
- condition and vitality assessment
  - lightning strike
  - ice damage
  - wind damage
signs and symptoms of insect damage or disease
- deadwood in the branches
- girdling roots
- age of tree
- poor structure
- included bark
- co-dominant leaders
- mechanical damage
- cavities
- cankers
- sun scald.

**Process/Skill Questions**

- What are the branch and trunk defects that indicate the need for maintenance?
- What are health and vitality characteristics that indicate the need for maintenance?
- What are symptoms of soil deficiencies?
- What are the characteristics of a tree that has been struck by lightning?
- What are characteristics of disease and insect damage?
- How would a tree-care professional respond to co-dominant leaders?
- What are some methods to reduce the risk of mechanical damage to young trees?
- How can the structure of a young tree be improved to encourage the type of growth desired in a mature tree?

**AFNR Standards** NRS.04.01

**Task Number 76**
**Describe various types of tree care.**

**Definition**
Description should include
- lightning protection systems
- cabling and bracing
- pruning
- root pruning
- soil management
- fertilization
- watering
- integrated vegetation management
- an awareness of TCIA’s ANSI A300 ([https://www.tcia.org/TCIA/Build_Your_Business/A300_Standards/A300_Standards.aspx](https://www.tcia.org/TCIA/Build_Your_Business/A300_Standards/A300_Standards.aspx)) standards.
Process/Skill Questions

- What symptom would indicate the need for root pruning?
- What is a lightning protection system?
- When would cabling and bracing have to be used?
- Why is it important to not seal tree wounds?
- What is the importance of ANSI A300 standards?

AFNR Standards NRS.04.01
PS.01.03

Task Number 77
Describe common maintenance and risk management strategies used to mitigate tree nuisances and hazards.

Definition
Description should include
- damage to structures and property by fallen trees
- damage to utilities by fallen trees
- fire caused by trees across power lines
- blocked roads
- damage caused by residual risk.

Process/Skill Questions

- What liabilities exist with having trees in the urban area?
- How can storm damage be minimized?
- How can damage to utilities be minimized?
- Why is obtaining the Tree Risk Assessment Qualification (TRAQ) beneficial to an arborist and to the arborist’s employer?

AFNR Standards NRS.04.01

Describing the Removal and Utilization of Trees

Task Number 78
Describe tree removal.
Definition
Description should include
- reasons
- methods
- equipment
- safety considerations.

Process/Skill Questions
- What are some methods for tree removal?
- Why might a landowner want a tree removed?
- What safety considerations are specific to tree removal?
- How does one determine what method and equipment to use for a tree removal?

AFNR Standards NRS.03.01

Task Number 79
Identify suitability of trees for post-removal utilization.

Definition
Identification should include
- defects (e.g., rot)
- foreign objects (e.g., metals)
- species.

Process/Skill Questions
- When can a defect in wood be beneficial for its utilization?

AFNR Standards NRS.03.01

Task Number 80
Explain how urban trees can be used after removal.

Definition
Explanation should include options for upcycling such as
- biofuel
- wood chips
- compost
- biochar
material for artisans to create wood products.

**Process/Skill Questions**
- What are common challenges involved with using trees that have been removed from an urban setting?

**AFNR Standards** NRS.03.01

## Investigating Tree Disorders

**Task Number 81**
Identify types of tree disorders.

**Definition**
Identification should include disorders caused by
- **abiotic factors**
  - weather
  - nutrient deficiencies
  - unfavorable soil properties
    - pH
    - fertility imbalances
    - moisture extremes
    - temperature extremes
    - chemical toxicity
- **human factors** (e.g., pollution, injury)
- **biotic factors**
  - pests
  - competition
  - allelopathy.

**Process/Skill Questions**
- What is the difference between a biotic factor and an abiotic factor?
- What are examples of human-caused tree disorders?

**AFNR Standards** NRS.04.02
NRS.04.03
PS.03.02
Task Number 82
Identify types of tree stressors.

**Definition**
Identification should include
- **acute stressors**
  - lightning strike
  - chemical poisoning
  - storm damage
  - frost/freeze damage
  - vandalism
  - equipment damage
- **chronic stressors**
  - soil compaction
  - root damage
  - soil infertility
  - air pollution
  - drought and lack of soil moisture.

**Process/Skill Questions**
- What is the difference between acute and chronic tree stressors?
- Which of these stressors are unique to the urban environment?
- What are the risk factors for trees in certain settings?

**AFNR Standards**
NRS.04.02
NRS.04.03
PS.03.02

Task Number 83
Describe the consequences of acute and chronic tree stressors.

**Definition**
Description should include
- poor survivorship (i.e., high mortality)
- less foliage
- diminished flower and fruit production
- reduced growth rate
- aesthetic deterioration
- reduced ecosystem services.

**Process/Skill Questions**
- How might an herbicide application stress trees?
- How might tree stressors reduce ecosystem services trees provide?

**AFNR Standards**
NRS.04.02
NRS.04.03
PS.03.02

**Task Number 84**
**Diagnose tree disorders.**

**Definition**
Diagnosis may include
- soil sampling
- a review of climate data
- determination of growth rate
- field observation of signs and symptoms
  - precipitation
  - soil pH levels
  - leaf chlorosis
  - leaf scorching
  - crown or branch dieback
  - bark injury
  - insect activity
  - wet or sticky substances oozing from the bark
  - stunting of growth
  - circling and girdling roots
  - cankers
- lab examination of plant or soil samples.

**Process/Skill Questions**
- How does soil pH relate to the development of tree disorders?
- How does soil compaction occur and affect tree development?
- What types of useful information should be collected to assist with diagnosing tree disorders?

**AFNR Standards**
NRS.04.02
NRS.04.03
Exploring Pests and Diseases

Task Number 85
Identify tree pathogens that serve as disease agents in Virginia's common trees.

Definition
Identification of pathogens should include
- viral
- fungal
- bacterial
- parasitic plants
- viroids
- nematodes.

Teacher Resources:
- Arbor Day Foundation (https://www.arborday.org/).

Process/Skill Questions
- What pathogen is responsible for Dutch elm disease?
- What pathogen causes dogwood anthracnose?
- What pathogen causes chestnut blight?
- What is being done in Virginia to combat disease concerns?
- What factors should be considered when determining tree disease management in urban settings?

AFNR Standards NRS.04.02
NRS.04.03
PS.03.02

Task Number 86
Identify signs and symptoms of tree disease.
Definition
Identification should include
- abnormal swelling
- cankers
- dieback
- stunted leaves
- flagging
- discoloration
- fungal fruiting bodies
- rot.

Process/Skill Questions
- What are some signs and symptoms of tree diseases?
- How can symptoms be used to identify diseases?
- What are the causes of Dutch elm disease?
- How does the American forest industry address widespread disease, such as Dutch elm disease and others?

AFNR Standards
NRS.04.02
NRS.04.03
PS.03.02

Task Number 87
Explain how tree diseases are transmitted.

Definition
Explanation should include
- wind
- water
- animal vectors
- poor sanitation
- propagation
- root grafting.

Process/Skill Questions
- What factors help determine whether a tree will be infected with a disease?
- What are some ways that pathogens can be transmitted?
- How can the transmission of pathogens be reduced?
- What are some ways to reduce the risk of animal vectors?
- Which vectors are difficult to control under most urban forestry conditions?
• What sanitation concerns surround a forested area that could affect disease transmission?

**AFNR Standards** NRS.04.02
NRS.04.03
PS.03.02

**Task Number 88**
**Explain the importance of sanitation in preventing tree diseases and disease management.**

**Definition**
Explanation should include
• definition of sanitation
• effects of unsanitary tools and equipment
• effects of contaminated debris
• use of fungicides
• proper pruning
• weed control.

**Process/Skill Questions**
• What risks are presented by tools that have not been sterilized?
• How should tools and equipment be sanitized?
• How can weeds and volunteer plants help establish pathogen populations?

**AFNR Standards** NRS.04.02
NRS.04.03
PS.03.02

**Task Number 89**
**Identify categories of pests.**

**Definition**
Identification should include
• vertebrates
  • mammals
  • birds
• invertebrates
  • insects
  • mites
worms

plants.

**Process/Skill Questions**
- What damage is caused by spotted lanternfly?
- What damage is caused by the emerald ash borer?
- What damage is caused by the southern pine beetle?
- What are examples of the damage caused by mammalian pests?
- What damage is caused by the gypsy moth?
- How can plants be considered pests in the urban forest?

**AFNR Standards**
NRS.04.02
NRS.04.03
PS.03.02

**Task Number 90**
**Describe conditions that encourage pest infestation.**

**Definition**
Description should include
- lack of biodiversity
- lack of crown
- injury
- soil disturbance
- age
- drought
- urban heat island
- water quality
- chemical and environmental factors
- genetic factors
- plant stress.

**Process/Skill Questions**
- How does a lack of biodiversity (monoculture) encourage insect infestation?
- How does injury to a tree encourage insect infestation?
- How do water and soil quality encourage insect infestation?
- How does the use of native species prevent insect infestation?
- How does the protection of the soil prevent insect infestation?
- How does the age of a tree affect its level of infestation?

**AFNR Standards**
NRS.04.02
NRS.04.03
Task Number 91
Identify signs and symptoms of an insect infestation.

Definition
Identification should include
- boring
- leaf mining
- sucking
- chewing
- tenting
- frass.

Process/Skill Questions
- What does leaf miner damage look like?
- How can one identify insect chewing damage?
- What are the signs of sucking insect infestation?
- How are boreholes from insects different from those created by other pests?
- How can one distinguish between signs of sucking insects and damage caused by nutrient deficiencies?

AFNR Standards
NRS.04.02
NRS.04.03
PS.03.02

Task Number 92
Evaluate pest damage to trees in urban forests, and how this affects ecosystem services.

Definition
Evaluation should include
- aesthetic
- economic
- environmental
- temporal.

Process/Skill Questions
- What can a pest do to a tree?
• How do pests affect the beauty of an urban forest?
• How do pests affect the ecological function of an urban forest?
• How do pests affect the economic value of an urban forest?
• What are some examples of secondary effects or damage caused by pests?
• How can pests change the dynamics of an urban forest?

**AFNR Standards** NRS.04.02
NRS.04.03

**Task Number 93**
**Explain IPM.**

**Definition**
Explanation should include
- field scouting
- counts
- action thresholds
- spray records
- field mapping
- biological controls
- mechanical controls
- chemical controls
- cultural controls
- related advances in biotechnology
- environmental and economic benefits.

**Process/Skill Questions**
- What is the purpose of IPM?
- What are the advantages of IPM?
- Why are threshold levels important?
- What are ways that IPM can be used to control pests?
- What are examples of biological control agents used for insect infestations?

**AFNR Standards** NRS.04.02
NRS.04.03
PS.03.02
PS.03.03

**Task Number 94**
**Explain management concerns related to non-insect pests.**
Definition
Explanation should include

- types of non-insect pests, such as
  - deer
  - rabbit
  - pigs
  - plants
- types of damage
- control methods
- regulatory agency oversight
- legal restrictions (e.g., federal, state, local).

Process/Skill Questions
- What are the various programs employed by the Virginia Department of Game and Inland Fisheries to control damage-causing pests, such as deer?
- What are some social effects of managing non-insect pests?
- What are some economic effects of deer population management?
- What are the methods used to control nuisance rabbit populations?
- How can IPM be used on non-insect pests?
- What are the benefits of sterilization of feral hog populations?

AFNR Standards NRS.04.02

Exploring Careers in Community Forestry and Tree Management

Task Number 95
Identify career opportunities in community forestry and tree management.

Definition
Identification should include occupations within

- municipal tree care
- commercial tree care
- utility tree care.

Teacher Resources:
Process/Skill Questions

- What occupations might incorporate tree management?
- What does a consulting arborist do?

AFNR Standards CS.05.01
CS.05.02

Task Number 96
Research postsecondary education requirements for careers related to community forestry and tree management.

Definition
Research should include
- industry certifications
- postsecondary options
- job training
- the importance and role of professional organizations.

Teacher Resources:

- Outside Careers, Tree Care Industry Association (TCIA) (https://outsidecareers.org/).

Process/Skill Questions

- What are three postsecondary options related to community forestry and tree management?
- What are some industry certification related to community forestry and tree management?

AFNR Standards CS.05.01
CS.05.02
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<td>Identify the role of supervised agricultural experiences (SAEs) in agricultural education.</td>
<td>English: 11.3, 11.5, 11.8, 12.3, 12.5, 12.8</td>
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<td>Participate in an SAE.</td>
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<tr>
<td>42</td>
<td>Describe leadership characteristics and opportunities as they relate to agriculture and FFA.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>43</td>
<td>Apply for an FFA degree and/or an agricultural proficiency award.</td>
<td>English: 11.5, 11.8, 12.5, 12.8</td>
</tr>
<tr>
<td></td>
<td><strong>Exploring Community Forestry and Its Benefits</strong></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Define terms related to community forestry.</td>
<td>English: 11.3, 11.5, 12.3, 12.5</td>
</tr>
<tr>
<td>45</td>
<td>Compare aspects of the rural-urban continuum.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>46</td>
<td>Identify stakeholders of community forestry and tree management.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>47</td>
<td>Identify trade-offs involved when managing trees and forests.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>48</td>
<td>Explain the value of trees.</td>
<td>English: 11.3, 11.5, 11.6, 11.7, 12.3, 12.5, 12.6, 12.7 Science: BIO.8</td>
</tr>
<tr>
<td>49</td>
<td>Explain the economic value of trees.</td>
<td>English: 11.5, 12.5 Science: BIO.8</td>
</tr>
<tr>
<td></td>
<td><strong>Classifying and Identifying Trees</strong></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Describe the ways trees are classified and named.</td>
<td>English: 11.5, 12.5 Science: BIO.4, BIO.6</td>
</tr>
<tr>
<td>51</td>
<td>Identify native and nonnative tree species.</td>
<td>English: 11.5, 11.8, 12.5, 12.8 Science: BIO.4, BIO.6, BIO.8</td>
</tr>
<tr>
<td></td>
<td><strong>Explaining Tree Biology</strong></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Explain the anatomy of trees.</td>
<td>English: 11.5, 12.5 Science: BIO.4</td>
</tr>
<tr>
<td>53</td>
<td>Explain the physiology of trees.</td>
<td>English: 11.3, 11.5, 12.3, 12.5 Science: BIO.2</td>
</tr>
<tr>
<td>54</td>
<td>Determine the age and growth rate of a tree.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>Task No.</td>
<td>Task</td>
<td>SOL Correlations</td>
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</tr>
<tr>
<td></td>
<td><strong>Examining Environmental Factors that Influence Tree Growth</strong></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>Explain the environmental factors that influence tree growth.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>56</td>
<td>Explain site factors affecting the establishment of trees in a developed area.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>57</td>
<td>Explain the genetic characteristics of tree species that are able to thrive in urban areas.</td>
<td>English: 11.3, 11.5, 11.6, 11.7, 12.3, 12.5, 12.6, 12.7 Science: BIO.7</td>
</tr>
<tr>
<td>58</td>
<td>Describe the desirable and undesirable characteristics of trees for specific urban landscape types.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td></td>
<td><strong>Exploring Management of Trees in Urbanized Areas</strong></td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>Compare the site characteristics of various urbanized areas where trees grow.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>60</td>
<td>Create a landscape plan that incorporates trees.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>61</td>
<td>Evaluate a landscape plan that incorporates trees.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>62</td>
<td>Evaluate a land development plan that may affect trees and other natural resources.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>63</td>
<td>Interpret community forestry plans.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td></td>
<td><strong>Examining Tree Care Safety</strong></td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Describe safety considerations for tree care.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>65</td>
<td>Comply with federal, state, and local safety and legal requirements in the operation of all tools, machinery, and equipment.</td>
<td>English: 11.5, 11.8, 12.5, 12.8 History and Social Science: VUS 8, 14; GOVT 7, 8, 9</td>
</tr>
<tr>
<td>66</td>
<td>Operate machinery and equipment.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>67</td>
<td>Maintain equipment and machinery according to manufacturer recommendations.</td>
<td>English: 11.5, 11.6, 11.7, 12.5, 12.6, 12.7</td>
</tr>
<tr>
<td>68</td>
<td>Identify the parts of a chain saw.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>69</td>
<td>Explain procedures for felling trees.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>70</td>
<td>Explain bucking and limbing techniques to ensure worker safety.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>71</td>
<td>Outline procedures for supervising the loading and unloading of logs.</td>
<td>English: 11.5, 11.6, 11.7, 12.5, 12.6, 12.7</td>
</tr>
<tr>
<td>72</td>
<td>Interpret pesticide labels.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>73</td>
<td>Interpret safety data sheets (SDS).</td>
<td>English: 11.5, 12.5 Science: CH.1</td>
</tr>
<tr>
<td></td>
<td><strong>Maintaining and Caring for Trees</strong></td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>Explain the benefits of tree maintenance.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>Task No.</td>
<td>Task</td>
<td>SOL Correlations</td>
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<tr>
<td>75</td>
<td>Identify conditions that signal a need for tree care.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>76</td>
<td>Describe various types of tree care.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>77</td>
<td>Describe common maintenance and risk management strategies used to mitigate tree nuisances and hazards.</td>
<td>English: 11.5, 12.5</td>
</tr>
</tbody>
</table>

### Describing the Removal and Utilization of Trees

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Task</th>
<th>SOL Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>78</td>
<td>Describe tree removal.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>79</td>
<td>Identify suitability of trees for post-removal utilization.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>80</td>
<td>Explain how urban trees can be used after removal.</td>
<td>English: 11.5, 12.5</td>
</tr>
</tbody>
</table>

### Investigating Tree Disorders

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Task</th>
<th>SOL Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>81</td>
<td>Identify types of tree disorders.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>82</td>
<td>Identify types of tree stressors.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>83</td>
<td>Describe the consequences of acute and chronic tree stressors.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>84</td>
<td>Diagnose tree disorders.</td>
<td>English: 11.5, 12.5</td>
</tr>
</tbody>
</table>

### Exploring Pests and Diseases

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Task</th>
<th>SOL Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>85</td>
<td>Identify tree pathogens that serve as disease agents in Virginia's common trees.</td>
<td>English: 11.5, 12.5  Science: BIO.4, BIO.8</td>
</tr>
<tr>
<td>86</td>
<td>Identify signs and symptoms of tree disease.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>87</td>
<td>Explain how tree diseases are transmitted.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>88</td>
<td>Explain the importance of sanitation in preventing tree diseases and disease management.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>89</td>
<td>Identify categories of pests.</td>
<td>English: 11.5, 12.5  Science: BIO.4</td>
</tr>
<tr>
<td>90</td>
<td>Describe conditions that encourage pest infestation.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>91</td>
<td>Identify signs and symptoms of an insect infestation.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>92</td>
<td>Evaluate pest damage to trees in urban forests, and how this affects ecosystem services.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>93</td>
<td>Explain IPM.</td>
<td>English: 11.5, 12.5</td>
</tr>
<tr>
<td>94</td>
<td>Explain management concerns related to non-insect pests.</td>
<td>English: 11.5, 12.5</td>
</tr>
</tbody>
</table>

### Exploring Careers in Community Forestry and Tree Management

<table>
<thead>
<tr>
<th>Task No.</th>
<th>Task</th>
<th>SOL Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td>95</td>
<td>Identify career opportunities in community forestry and tree management.</td>
<td>English: 11.5, 11.8, 12.5, 12.8</td>
</tr>
<tr>
<td>96</td>
<td>Research postsecondary education requirements for careers related to community forestry and tree management.</td>
<td>English: 11.5, 11.8, 12.5, 12.8</td>
</tr>
</tbody>
</table>

### Teacher Resources

[ Agricultural Experience Tracker (https://www.theaet.com/) ](https://www.theaet.com/)


Arbor Day Foundation (https://www.arborday.org/).


Careers in Arboriculture, Tree Care Industry Association (TCIA) (http://www.tcia.org/TCIA/TCIA/Contact/Careers_in_Arboriculture.aspx).

Chainsaw Usage and Safety Training, Husqvarna USA (https://www.youtube.com/playlist?list=PL0VcazyXHqErUd8ib-OKs6sZkfGFQ5shu).


Electrical Hazards Awareness Program, Tree Care Industry Association (TCIA). (https://www.tcia.org/TCIA/Education_Events/Education/TCIA_Credentialing_Programs/Electrical_Hazards_Awareness_Program/Electrical_Hazards_Awareness_Program.aspx).

FFA Agricultural Proficiency Awards, National FFA Organization (https://wwwffa.org/participate/awards/proficiencies/).


Outside Careers, Tree Care Industry Association (TCIA) (https://outsidecareers.org/).


Supervised Agriculture Experience (SAE), National Council for Agricultural Education (https://thecouncil.ffa.org/sae/).


Tree City USA, Arbor Day Foundation (https://www.arborday.org/programs/treecityusa/).


Williams, Dan D., and Lott, Bill J. FFA Georgia State and National Tree Lists. 2012.
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
- Horticulture/Landscaping Assessment
- Landscape Management Certification Examination
- National Career Readiness Certificate Assessment
- Natural Resources Systems Assessment
- Urban Forestry Certification Test
- Workplace Readiness Skills for the Commonwealth Examination
- Certified Commercial Pesticide Applicator Examination
- Certified Grounds Technician Test
- Certified Private Applicator Examination
- Certified Registered Technician Pesticide Applicator Examination
- Chesapeake Bay Landscape Professional, Associate (CBLP-A) Examination
- Ecology Conservation Management 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)
- Applied Agricultural Concepts (8072/18 weeks)
- Applied Agricultural Concepts (8073/36 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)
- Forestry Management, Advanced (8044/36 weeks)
- Introduction to Natural Resources and Ecology Systems (8040/36 weeks)
- Outdoor Recreation, Parks, and Tourism Systems Management (8043/36 weeks)

Career Clusters, Pathways, and Occupations
<table>
<thead>
<tr>
<th>Career Cluster: Agriculture, Food and Natural Resources</th>
<th>Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pathway</strong></td>
<td><strong>Occupations</strong></td>
</tr>
<tr>
<td>Environmental Service Systems</td>
<td>Agricultural Products Sales Representative</td>
</tr>
<tr>
<td></td>
<td>Environmental Compliance Inspector</td>
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<tr>
<td></td>
<td>Environmental Sampling and Analysis Technician</td>
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<td></td>
<td>Hazardous Materials Handler</td>
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<td></td>
<td>Recycling Coordinator</td>
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<td></td>
<td>Secondary School Teacher</td>
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<tr>
<td></td>
<td>Toxicologist</td>
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<tr>
<td></td>
<td>Turf Farmer</td>
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<tr>
<td></td>
<td>Water Conservationist</td>
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<tr>
<td>Natural Resources Systems</td>
<td>Ecologist</td>
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<td></td>
<td>Forest Manager, Forester</td>
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<tr>
<td></td>
<td>Forest Technician</td>
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<tr>
<td></td>
<td>Geological Technician</td>
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<tr>
<td></td>
<td>Logging Equipment Operator</td>
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<td></td>
<td>Microbiologist</td>
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<td>Outdoor Recreation Guide</td>
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<td>Park Manager</td>
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<td></td>
<td>Park Technician</td>
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<tr>
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<td>Range Technician</td>
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<td></td>
<td>Wildlife Manager</td>
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<tr>
<td>Plant Systems</td>
<td>Agricultural Products Sales Representative</td>
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<td></td>
<td>Botanist</td>
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<td></td>
<td>Certified Crop Advisor</td>
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<td>Crop Grower</td>
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<td>Custom Harvester</td>
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<td></td>
<td>Forest Geneticist</td>
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<td></td>
<td>Golf Course Superintendent</td>
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<td>Machine Setter, Operator</td>
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<td></td>
<td>Ornamental Horticulturist</td>
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<td></td>
<td>Plant Breeder/ Geneticist</td>
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<td>Secondary School Teacher</td>
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<tr>
<td></td>
<td>Soil and Plant Scientist</td>
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<td></td>
<td>Tree Surgeon</td>
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<td></td>
<td>Turf Farmer</td>
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