Virginia FFA Guide

Virginia FFA does not discriminate against employees, students, or applicants on the basis of race, color, sex, sexual orientation, disability, age, veteran status, national origin, religion, or political affiliation.

State FFA Junior Forestry

I. Description:

The State level of the Junior Division Forestry Event is held each spring in conjunction with the senior division event. The event is comprised of the first and second place teams from each area competition.

The event contains five parts:

- Tree Identification
- Determination of Tree Value
- Estimation of Board-Foot Volume of Standing Timber
- Equipment Identification
- Map Interpretation

Basic calculators (non-programmable) may be used in the event. The time limit for each event is determined by the forester in charge of setting up the event; however, a minimum of 20 minutes per event is allowed. Extra time is provided for movement from one event to the next.

Date Due: Spring event with date set annually by the Advisory Council

II. OBJECTIVES

- Ability to understand and use forestry terms.
- Ability to promote an understanding of the economic impact of the forest environment and the forest industry to the American economy.
- Ability to recognize sustainability (multiple use) opportunities in the forests.
- Ability to recognize environmental and social factors affecting the management of forests.
- Ability to identify major species of trees of economic importance to the United States andinternationally.
- Ability to identify hand tools, equipment, and their uses in forestry management.
- Ability to recognize and understand approved silviculture practices in the United States.
- Ability to identify forest disorders
- Ability to take a forest inventory.
- Ability to utilize marketing management strategies.
- Ability to recognize safety practices in forest management.

III. Agriculture, Food and Natural Resources (AFNR) Career Cluster Content Standards

With the recommendation of the National FFA Board of Directors, all national FFA programs have incorporated these standards to guide the direction and content of program materials and activities. Refer to Appendix A in this document for a complete list of the measurable activities that participants will carry out in this event. For details about the incorporation of AFNR standards, refer to the Introduction chapter of the National CDE handbook.

IV. EVENT RULES

- The team will consist of four individuals and all four scores will count toward the team score. The team score is comprised of the combined scores of each individual and the team activity in which all team members will participate.

- Participants must come to the event prepared to work in adverse weather conditions. The event will be conducted regardless of weather. Participants should have rain gear, warm clothes and proper footwear. Each participant must provide the following safety equipment, and it must be worn while in the woods or the participant will be disqualified:
    - Closed-Toe Shoes
    - Long Pants

- Students will need to provide their own clipboard, two number two pencils, Biltmore stick, and four-function calculator.

- Participants must follow instructions from event staff for handling materials during the event. Any infraction of this rule will be sufficient to eliminate the team from the event.

- Observers will not be permitted in the event area while the event is in progress.

- Participants will be assigned to group leaders who will escort them to various event-staging sites. Each participant is to stay with his/her assigned group leader throughout the event or until told to change leaders by the event superintendent.

- All participants will be given an identification number by which they will be designated throughout the event.

- Written Materials: All written materials will be furnished for the event. No written materials such as tests, problems and worksheets shall be removed from the event site.

- Any participant in possession of an electronic device such as cell phones in the event area is subject to disqualification.

V. Procedure:

Event I: Tree Identification

1. Twenty-five (25) live specimens, pressed samples, fresh leaf samples and/or standing trees, from the list below will be displayed for participants to identify by common names. A number will designate each specimen.
2. **Time:** Each participant will be allowed 20 minutes to complete this phase.
3. **Scoring:** Five points will be given for each specimen that is correctly identified for a maximum of 100 points.

Specimen

Alder, Red
Ash White
Aspen, Bigtooth
Aspen, Quaking
Baldcypress
Basswood*
Beech, American
Birch, Black
Birch, White
Birch, Yellow*
Cedar, Eastern Red
Cherry, Black (Wild Cherry)
Cottonwood, Eastern
Dogwood
Elm
Fir, Balsam
Fir, Douglas
Hackberry
Hemlock, Eastern
Hemlock, Western
Hickory
Holly
Hornbeam, American
Larch*
Locust, Black (Yellow Locust) Locust, Honey
Maple, Red
Maple, Sugar
Mulberry, Red
Oak, Black
Oak, Chestnut
Oak, Northern Red
Oak, Post
Oak, Scarlet
Oak, Southern Red
Oak, White
Persimmon
Pecan
Pine, EasternWhite
Pine, Loblolly
Pine, Lodgepole
Pine, Longleaf
Pine, Pitch
Pine, Ponderosa
Pine, Red
Pine, Shortleaf
Pine, Virginia
Poplar, Yellow (Tulip Tree)
Redbud
Red Cedar, Western*
Spruce, Red
Spruce, Sitka
Spruce, White*
Sassafras
Sweetgum
Sycamore
Walnut, Black
Willow, Black

Notes:
Highlighted: National FFA Contest only because they are not normally found in Virginia.
Asterisks: New to 2025 list (from Nationals).

Event II: Determination of Tree Values (100 points)

1. The trees with clean, straight trunks of different, but even-inch DBH (Diameter Breast Height) between 10 and 16 inches will be selected. (For purposes of scoring, trees with "break-even" values areavoided.)

2. Each participant will measure each tree and determine its value if sold for lumber and its value if sold as pulpwood.

3. In determining volume of pulpwood, trees will be measured to a top diameter of 4 inches. In determining saw timber, use rules in Event III.

4. In reducing cubic-foot volume to cords, the conversion factor of 90 for a standard cord (4'x4'x8') isused.

5. The prevailing market price (in whole dollars) for lumber per thousand board feet and for pulpwood per standard cord is provided to participant before the event.

6. In calculating cubic-foot volume, calculations are carried three decimal places.

7. Points are awarded as follows:
    a. 5 points for each correct diameter
    b. 5 points for each correct number of 16-foot logs (within 1/2 log of official count)
    c. 5 points for each correct number of 5-foot bolts (within 1 bolt of official count)
    d. 5 points for each tree correctly selected to be cut for saw timber or for pulpwood (participant must mark "should be cut for" correctly before credit can be given for "difference in value") (see score sheet at the end of this event)
    e. 30 points for difference in value if estimate is within 20% of the official estimate; 20 points if within 30%; 10 points if within 40%.

Event III: Estimation of Board-Foot Volume of Standing Timber (100 points)

1. Using the provided tree measurement tools, each participant will measure five pre-numbered trees on a plot for board foot volume. The participant must record the DBH (Diameter Breast Height) to the nearest two-inch (even-inch) class and the merchantable height of each tree height rounded down to the nearest ½ log. Volume tables will be provided at the event.

2. The following minimum diameters and log length will be:

	Minimum Saw Timber
DBH	10 inches
Top Diameter	8 inches DIB
Height	16 feet

3. Merchantable height stops are estimated to the upper point on a tree where it becomes 8 inches in diameter or where a major fork in a tree stem occurs or where a limb has a diameter equal to ½ of the diameter of the tree at that point.

4. Time: Each participant will be allowed 20 minutes to complete this phase.

5. Scoring: Twenty-five points will be given for the correct DBH and five points for the correct height. Fifty points will be given for the correct volume per acre. Ten points will be deducted for each 5 percent deviation (plus or minus) from the correct measured volume. 50 points for difference in value if estimate is within 5% of the official estimate; 40 points if within 10%; 30 points if within 15%, 20 points if within 20% and 10 points with in 25%.

Event IV: Equipment Identification Practicum (100 points)

1. Twenty-five pieces of equipment from the following list will be displayed for participants to identify by technical names.
2. Each piece of equipment will be designated by number.
3. **Time:** Each participant will be allowed 20 minutes to complete this phase.
4. **Scoring:** Four points will be given for each piece of equipment identified correctly for a total of 100 points. All answers must be correct. No partial credit will be given.

Specimen

Abney Level*
Altimeter
Angle Gauge
Ascender
Automatic Level
Axe*
Back-pack Fire Pump
Bark Gauge
Bulldozer
Canthook
Carabiner
Chainsaw
Chainsaw Chaps
Chipper*
Climbing Harness*
Clinometer
Combination Tool
Cruising Vest*
Data Recorder
Delimber*
Densitometer
Diameter Tape
Dot Grid
Drip Torch
Ear Protection
Endloader
Feller Buccher
Felling Wedge
Fiberglass Measuring Tape
Fire Rake
Fire Shelter
Fire Weather Kit
Fire-Swatter
First Aid Kit
Flow/Current Meter
Foot Ascender*
Gas Tank*
GPS Receiver
Hand Compass
Hand Lens/Field Microscope
Harvester*
Hip Chain
Hypo-Hatchet
Increment Borer
Jacob Staff
Log Rule
Logger's Tape
Lopper*
Maul
Peavy
pH Meter
Planimetr
Plant Press
Plastic Flagging
Pole Saw
Pruning Saw
Pulaski Forester Axe
Pulley*
Relaskop
Safety Glasses
Safety Hard Hat
Scale Stick
Secchi Disc
Skidder*
Soil Sampler
Soil Test Kit
Staff Compass
Stereoscope
Stump Grinder*
Tally Book
Tally Meter
Timber Tongs
Tree Caliper
Tree Climbers*
Tree Marking Gun
Tree Planting Hoe or Bar
Tree Skidder
Water Sampler
Water Test Kit
Wedge Prism
Yarder*

*** Will be added to the 2025 state contest.**

Event V: Map Interpretation Practicum (100 points)

1. Participants will be furnished a United States geological survey topographic map with specific points marked for the participant to identify. The participant shall know legal description, recognize topographic map symbols, and understand the meaning of map symbols and size and location of 40 acres or more in asection.

2. Ten points on the map will be clearly marked with a number or arrow pointing to the section, symbol, or area on the map to be identified.

3. Examples:
   (a) What is the legal description of the area boxed?
   (b) What is the item located at this point?
   (c) What is the acreage of the area enclosed?
   (d) In what section is the city of Marshall located?

4. Legal descriptions will be written or described according to thefollowing:
   NW Northwest
   T Township
   SE Southeast
   R Range
   S Section (640 acres)
   1/4 Quarter of a section (160 acres)

5. **Scoring:** Ten questions or problems will be completed. Ten points will be awarded for each correct answer. No partial credit will be given.

VI. SCORING

	Individual	Team
Tree Identification	100	400
Tree Values	100	400
Board-Foot Volume	100	400
Equipment Identification	100	400
Map Interpretation	100	400
Total	**500**	**2000**

VII. TIEBREAKERS

- Tiebreakers for teams will be the 1st, 2nd and 3rd high individuals.
- Tiebreakers for individual scores will be:
    - Tree Identification
    - Equipment Identification
    - Board Foot Volume
    - Tree Values

VIII. AWARDS

Awards will be presented at the contest at the same time results are presented. Awards are presented to teams as well as individuals based upon their rankings.

FORESTRY
CAREER DEVELOPMENT EVENT

What is it?
Participate in this COE to grow your skills in forestry management At the competition, members identify trees and forestry equipment. They also demonstrate their skills measuring board-foot volume of standing trees an determine tree volume.

Career Opponunities
Career Clusters

- Agricultural and Forestry Production
- Management and Financial Specialties
- Marketing, Merchandising and Sales
- Science and Engineering
- Education and Communication

Career opportunities found in the career cluster areas:

- **Agricultural and Forestr y Production-** forest ranger, log grader, lumber mill operator, limber manager, forester, forest fire fighter
- **Managementand Financial Specialties** - logexporter, Chriistmastreefarmmanager
- **Marketing. MerchandisingandSales** - forest productsmerchandiser
- **Science and Engineering** - forestry scientist, resource economist, silviculturisl, dendrologist
- **Education and Communication** - postsecondaryteacher, forestfire control tower communications

Educational Requirements
High School Diploma-lumber mill operator, forestfire fighter, forest fire control tower communications

Bachelor Degree - forest ranger, log grader, timber manager, forest products merchandiser, forester. Christmas tree farm manager. silviculturist, dendrologist

GraduateDegree - forestryscientist, resource economist, postsecondary teacher

SAE Opponunities
Chopping, selling, and delivering firewood, raising Christmas trees and selling them, employment at the U.S. Forest Service

Proficiency Award Areas
Forest Management and Products
Agriculture Sales and/or Services

Cu"icu/um Resources

" The U.S. Department of Interior Geological Survey Topographic Map Information and Symbols Key, Map Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80223.

" David A. Anderson. I.I. Holland and Gary L. Rolfe. *Forests and Forestry,* current edition. Danville, IL: The Interstate Printers Publishers, Inc.

" WM. Harlow, E.S. Harrar, and F.M. White. Textbook of Dendrology, current edition. New York, NY McGraw-Hill Book Company

" B. McManar Collins and Fred M. White. *Elementary Forestry.* Reston, VA: Reston Publishing Company, Inc.

. Si/vies *of Forests of United States,* Handbook #271, U.S. Forest Service, P.O. Box 2417, 12th and Independence Avenue. SW. Washington. DC 20013

. owners Manual - Homelite - Division of Textron, P.O. Box 7047, Charlotte, NC 28217.

- *Forestry Handbook,* current edition, Edited by Karl Wenger for the Society of American Foresters, 5400 Grosvenor Lane, Bethesda, MD 20814.

. Timber Harvesting, current edition, American Pulpwood Association, The Interstate Printers & Publishers, Inc., Danville, IL.

- Chain Saw Manual, current edition, American Pulpwood Association, The Interstate Printers & Publishers, Inc.; Danville, IL

- William G. Camp & Thomas R. Daughtery. Managing Our Natural Resources, current edition,. Albany, N.Y: Delmar Publishers, Inc.

- Virginia Deparment of Forestry. http://www.dof.vlrginia.gov/mgt/trees/index.shtml

" *Forestry Guide for Agriculture Education in Virginia,* CTE Resource Center, current edition.

Junior Forestry
Event I: Tree Identification

Name_____ **School** _____

Tree No.	Species	Correct
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
TOTAL	Points_____x 4 =	

Ash, White Aspen,
Bigtooth
Baldcypress
Basswood
Beech, American
Birch, Black
Birch, White
Cedar, Eastern Red
Cherry, Black (Wild Cherry)
Cottonwood, Eastern
Dogwood
Elm
Fir, Balsam
Fir, Douglas
Hackberry
Hemlock, Eastern
Hickory
Holly
Hornbeam, American
Locust, Black (Yellow)
Locust, Honey
Maple, Red
Maple, Sugar
Mulberry, Red
Oak, Black
Oak, Chestnut
Oak, Northern Red
Oak, Post
Oak, Scarlet
Oak, Southern Red
Oak, White
Persimmon
Pine, Eastern White
Pine, Loblolly
Pine, Longleaf
Pine, Pitch
Pine, Shortleaf
Pine, Virginia
Poplar, Yellow (Tulip Tree)
Redbud
Sassafras
Spruce, Red
Spruce, Sitka
Sweetgum
Sycamore
Walnut, Black
Willow, Black

Virginia FFA 9/1/2023

Junior Forestry
Event II: Determination of Tree Values

Name_____ **School**_____

	Tree No. 1	Tree No. 2
DBH		
	Sawtimber	
Number of 16' logs		
Volume board feet		
Tree value		
	Pulpwood	
Number of 5' bolts		
Volume cubic feet		
Tree value		
Should be cut for		
difference in value		
Score		
TOTAL		

Sawtimber per M. board feet $_____ Pulpwood per cord $_____

DIAMETER BREST HIGH (INCHES)	NUMBER OF 16-FOOT LOGS								
	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5
8	20	27	33	38					
10	38	50	61	69	77				
12	56	77	96	110	124	132	143		
14	82	110	138	160	182	196	211		
16	108	146	183	214	246	269	292		

Tree Scale for Pulpwood

Diameter Breast High (Inches)	Number of Five Foot Bolts											
	1	2	3	4	5	6	7	8	9	10	11	12
	Volume in cubic feet (including bark)											
8			4.09	5.06	6.03	6.99	7.96	8.93	9.89	10.9	11.8	12.8
10				7.66	9.17	10.7	12.2	13.7	15.2	16.7	18.3	19.8
12				10.7	12.9	15.1	17.3	19.5	21.7	23.9	26.1	28.3
14				14.3	17.3	20.3	23.3	26.4	29.4	32.4	35.5	38.5
							30.3	34.2	38.2	42.2	46.2	50.2

Junior Forestry
Event III: Determination of Tree Volume

Name_____ **School** _____

Tree No.	DBH	No. of 16' Logs	Volume Board Feet
1.			
2.			
3.			
4.			
5.			
TOTAL			

TREE SCALE IN BOARD FEET

DIAMETER BREST HIGH (INCHES)	NUMBER OF 16-FOOT LOGS								
	1	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5
8	20	27	33	38					
10	38	50	61	69	77				
12	56	77	96	110	124	132	143		
14	82	110	138	160	182	196	211		
16	108	146	183	214	246	269	292		
18	140	190	240	282	325	356	388		
20	176	240	305	360	414	455	496	528	561
22	216	297	378	446	514	568	621	666	710
24	260	359	458	543	628	690	753	814	875
26	305	422	540	641	742	820	899	972	1046
28	357	496	635	756	877	969	1061	1152	1242
30	413	575	737	878	1020	1128	1235	1346	1458
32	474	661	848	1014	1181	1310	1440	1562	1685
34	538	752	966	1158	1349	1498	1647	1790	1932
36	602	844	1087	1304	1521	1690	1860	2024	2189
38	674	947	1220	1470	1720	1910	2101	2294	2488
40	750	1058	1365	1644	1923	2142	2362	2568	2775

Junior Forestry
Event IV: Equipment Identification

Name_____

School _____

Tree No.	Species	Correct
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		
18.		
19.		
20.		
21.		
22.		
23.		
24.		
25.		
TOTAL	Points_____x 4 =	

Abney Level
Altimeter
Angle Gauge
Ascender
Automatic Level
Axe
Back-pack Fire Pump
Bark Gauge
Bulldozer
Cant hook
Carabiner
Chainsaw
Chainsaw Chaps
Chipper
Climbing Harness
Clinometer
Combination Tool
Cruising Vest
Data Recorder
Delimber
Densitometer
Diameter Tape
Dot Grid
Drip Torch
Ear Protection
End loader
Feller Buncher
Felling Wedge
Fiberglass Measuring Tape
Fire Rake
Fire Shelter
Fire Weather Kit
Fire-Swatter
First Aid Kit
Flow/Current Meter
Foot Ascender
Gas Tank
GPS Receiver
Hand Compass
Hand Lens/Field Microscope
Harvester
Hip Chain
Hypo-Hatchet
Increment Borer
Jacob Staff
Log Rule
Logger's Tape
Lopper
Maul
Peavy
pH Meter
Planimeter
Plant Press
Plastic Flagging
Pole Saw
Pruning Saw
Pulaski Forester Axe
Pulley
Relaskop
Safety Glasses
Safety Hard Hat
Scale Stick
Secchi Disc
Skidder
Soil Sampler
Soil Test Kit
Staff Compass
Stereoscope
Stump Grinder
Tally Book
Tally Meter
Timber Tongs
Tree Caliper
Tree Climbers
Tree Marking Gun
Tree Planting Hoe or Bar
Tree Skidder
Tree Stick
Water Sampler
Water Test Kit
Wedge Prism
Yarder

Junior Forestry
Event V: Map Interpretation

Name_____ **School** _____

Parcel	Description	Score
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Total Score	

Appendix A. AFNR Content Cluster Standards

	Performance Measurement Levels	Event Activities Addressing Measurements	Related Academic Standards
ABS.01.01. Performance Indicator: Apply principles of capitalism in the business environment.			Social Studies: 7b and 7g
	ABS.01.01.01.c. Execute supply-and-demand principles in AFNR businesses.	business management problem/general knowledge exam/team activity/TSI	
ESS.02.01. Performance Indicator: Interpret laws affecting environmental service systems.			Science: F4 Language Arts: 1 and 8 Social Studies: 10c
	PST.01.02.01.b. Classify lubricants by SAE viscosity and API service classifications.	chainsaw practicum/general knowledge exam	
ESS.03.01. Performance Indicator: Apply meteorology principles to environmental service systems.			Science: D2 and F4 Language Arts: 8 Social Studies: 3c
	PST.03.01.01.a. Identify components and systems of internal combustion engines.	chainsaw practicum/general knowledge exam	
	PST.03.01.02.b. Analyze and troubleshoot internal combustion engines.	chainsaw practicum/general knowledge exam	
ESS.03.04. Performance Indicator: Apply best management techniques associated with the properties, classifications and functions of wetlands.			Science: C4 and F3 Social Studies: 3c
	CS.08.03.01.a. Describe the conditions that cause the need for tool maintenance.	chainsaw practicum/general knowledge exam	
ESS.06.02. Performance Indicator: Maintain tools, equipment and machinery in safe working order for tasks in environmental service systems.			
	CS.07.01.01.b. Use appropriate personal protective equipment for a given task.	chainsaw practicum/team event	

NRS.01.01. Performance Indicator: Apply knowledge of natural resource components to the management of natural resource systems.			Math: 5a Science: C4 and F3 Social Studies: 3h
	NRS.04.03.01.a. Identify harmful and beneficial insects and signs of insect damage to natu-	disorders/general knowledge exam	
	ESS.02.01.01.b. Identify the purposes of laws associated with environmental service sys-	general knowledge exam	
NRS.01.02. Performance Indicator: Classify natural re-			Science: F3
	NRS.03.01.02.b. Describe processing of forest products.	general knowledge exam	
NRS.02.01. Performance Indicator: Develop a safety plan for work with natural resources.			Science: F3 and F5 Language Arts: 8
	NRS.04.01.01.b. Describe techniques used to suppress wildfires and manage prescribed	general knowledge exam	
NRS.02.02. Performance Indicator: Demonstrate cartographic skills to aid in developing, implementing and evaluating natural resource management plans.			Math: 4B Science: A3 and F2 Social Studies: 3b
	NRS.04.03.01.c. Describe techniques used to manage pests of natural resources.	general knowledge exam	
NRS.02.03. Performance Indicator: Measure and survey natural resource status to obtain planning data.			Math: 5C Science: A3 and F2 Social Studies: 3h
	PS.01.01.01.a. Explain systems used to classify plants.	general knowledge exam	
NRS.02.04. Performance Indicator: Demonstrate natural resource enhancement techniques.			Science: F3 Social Studies: 3g
	PS.01.02.02.a. Identify the components, the types and the	general knowledge exam	
NRS.02.05. Performance Indicator: Interpret laws related to natural resource management and protection.			Science: F3 Language Arts: 7
	PS.01.02.03.a. Identify the components and the functions	general knowledge exam	

NRS.02.06. Performance Indicator: Apply ecological concepts and principles to natural resource systems.			Science: D2 and F3 Social Studies: 3b, 3f and 3h
	PS.01.02.04.a. Discuss leaf morphology and the functions of leaves.	general knowledge exam	
	PS.01.02.06.b. Identify the major types of fruit.	general knowledge exam	
	PS.01.03.01.a. Explain the basic process of photosynthesis and its importance to life on Earth.	general knowledge exam	
NRS.03.01. Performance Indicator: Produce, harvest, process and use natural resource products.			Science: F3
	PS.01.03.01.c. Explain the light-dependent and light-independent reactions that occur during photosynthesis and apply the knowledge to plant management.	general knowledge exam	
	PS.02.01.01.b. Describe plant responses to light color, intensity and duration.	general knowledge exam	
NRS.04.01. Performance Indicator: Manage fires in natural resource systems.			Science: F5
	PS.02.01.02.b. Determine the optimal air, temperature and water conditions for plant growth.	general knowledge exam	
NRS.04.02. Performance Indicator: Diagnose plant and wildlife diseases and follow protocol to prevent their spread.			Science: F1 and F3 Social Studies: 9d
	PS.03.01.01.a. Explain pollination, cross-pollination and self-pollination of flowering plants.	general knowledge exam	
NRS.04.03. Performance Indicator: Manage insect infestations of natural resources.			Science: C4 and F3
	PS.03.01.02.a. Demonstrate sowing techniques and provide favorable conditions for seed germination.	general knowledge exam	
	CS.06.03.01.a. Demonstrate the importance of safety, health and environmental practices in the workplace.	general knowledge exam/ chainsaw practicum	
PS.01.01. Performance Indicator: Classify agricultural plants according to taxonomy systems.			Science: C3
	CS.07.02.01.a. Inform others how to avoid placing oneself in hazardous work situations.	general knowledge exam/ chainsaw practicum	

PS.01.02. Performance Indicator: Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.			Science: B6, C3 and C5
	PST.02.02.01.a. Identify power unit and equipment controls and instruments, along with their functions.	general knowledge exam/ chainsaw practicum/tool ID	
	ESS.03.01.01.b. Differentiate the types of weather systems and weather patterns.	general knowledge exam/ issues interview	
	ESS.03.04.01.a. Describe the functions of wetlands and differentiate types of wetlands.	general knowledge exam/ issues interview	
	NRS.02.05.01.b. Identify the purposes of laws associated with natural resource systems.	general knowledge exam/ issues interview	
PS.01.03. Performance Indicator: Apply knowledge of plant physiology and energy conversion to plant systems.			Science: B6 and C5
	NRS.02.06.02.a. Describe properties of watersheds and identify the boundaries of local watersheds.	general knowledge exam/ issues interview	
	NRS.02.06.07.b. Discuss factors that influence the establishment and spread of invasive species.	general knowledge exam/ issues interview	
PS.02.01. Performance Indicator: Determine the influence of environmental factors on plant growth.			Science: C6
	ESS.03.01.02.a. Explain how meteorological conditions influence air quality.	general knowledge exam/ issues interview/tree disorders	
	NRS.02.03.01.a. Describe the value of resource inventories and population studies.	general knowledge exam/ team event	
PS.03.01. Performance Indicator: Demonstrate plant propagation techniques.			Science: C2
	CS.07.04.01.c. Apply general workplace safety precautions/ procedures.	general knowledge exam/ team event	
	CS.02.03.01.a. Explore various career interests/options.	issues interview	
PS.03.05. Performance Indicator: Harvest, handle and store crops.			Science: F5
	CS.03.01.01.b. Select the appropriate form of technical and business writing or communication for a specific situation.	issues interview	

PST.01.02. Performance Indicator: Apply physical science			Science: B4
	NRS.01.01.01.c. Research and debate one or more current issues related to the conservation or preservation of natural re-	issues interview/general knowledge exam	
PST.02.02. Performance Indicator: Operate, service and diag-			Science: E2
	NRS.02.02.01.a. Demonstrate how to use maps to identify directions and features, calculate actual distance and determine the elevations of	mapping practicum/general knowledge exam/compass practicum	
PST.03.01. Performance Indicator: Troubleshoot and repair internal combustion engines.			Science: A1 and A4 Language Arts: 3
	NRS.02.01.01.b. Demonstrate safety practices when working	team event	
	ESS.06.02.01.a. Demonstrate proper use and maintenance of	team event/chainsaw practicum	
CS.02.03. Performance Indicator: Professional Growth: Develop awareness and apply skills necessary for achieving ca-			Language Arts: 12 Social Studies: 4a
	NRS.02.04.02.c. Formulate a timber stand improvement plan	team event/TSI	
CS.03.01. Performance Indicator: Communication: Demonstrate oral, written and verbal skills.			Language Arts: 4, 5 and 12
	CS.08.01.02.b. Demonstrate appropriate operation, storage and maintenance techniques	timber cruising/team event	
CS.06.03 Performance Indicator: Provide health, safety and environmental operating guidelines.			Science: F4 and F5 Language Arts: 4
	NRS.01.02.01.c. Conduct a field inventory of trees and other woody plants, and record	Timber cruising/TSI/team event	
CS.07.01. Performance Indicator: Apply safety/health prac-			Science: F1 and F5
	NRS.02.06.08.b. Describe the impact of pollution on natural	Tree disorders/general knowledge exam	

CS.07.02. Performance Indicator: Demonstrate recognized first aid knowledge and procedures to show how they are			Science: F5
	NRS.04.02.01.c. Explain management techniques used to reduce infection and spread of plant diseases in natural resources.	Tree disorders/general knowledge exam	
CS.07.04. Performance Indicator: Assess workplace safety.			Science: F5
	PS.03.05.01.b. Assess the stage of growth to determine crop maturity or salability and demonstrate proper harvesting techniques.	TSI	
CS.08.01. Performance Indicator: Evaluate and select the ap-			
	NRS.03.01.01.b. Determine when to harvest forest products.	TSI	
	NRS.01.01.02.c. Conduct a field study of an ecosystem, and record and document observations of species interactions.	TSI/team event	
CS.08.03. Performance Indicator: Maintain tools for efficient			
	CS.08.01.01.c.Use tools and equipment appropriately to	TSI/timber cruising/team event/compass practicum	

Appendix B: Related Academic Standards

National academic standards for mathematics, science, English language arts and social studies related to this event are reported below. The statements are based on information in reports of the respective associations/organizations in the academic areas. Some adjustment of numbering was done to facilitate the process of alignment with the standards that have been developed in the pathways of the Agriculture, Food and Natural Resources (AFNR) Career Cluster.

The approach was to determine the presence of alignment between the content standards, expectations or thematic strands of the four academic areas and the performance indicators of the AFNR Standards. Supporting statements have been included to clarify content of the respective content standards, expectations or thematic strands. The statements were initially developed independently by the respective organizations and, therefore, are not parallel in wording and presentation. Occasionally minor editing was done to adjust the background or stem of a statement but not the statement itself.

Mathematics

4. Standard and Expectations: Measurement
   4B. Apply appropriate techniques, tools and formulas to determine measurements.
5. Standard and Expectations: Data Analysis and Probability
   5A. Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them.
   5C. Develop and evaluate inferences and predictions that are based on data.

Science

A. Content Standard: Science as an Inquiry
   A1. Identify questions and concepts that guide scientific investigation.
   A3. Use technology and mathematics to improve investigations and communications.
   A4. Formulate and revise scientific explanations and models using logic and evidence.
B. Content Standard: Physical Science
   B4. Motions and forces.
   B6. Interactions of energy and matter.
C. Content Standard: Life Science
   C2. Molecular basis of heredity.
   C3. Biological evolution.
   C4. Interdependence of organisms.
   C5. Matter, energy and organization in living systems.
   C6. Behavior of organisms.
D. Content Standard: Earth and SpaceScience
   D2. Geochemical cycles.
E. Content Standard: Science and Technology
   E2. Understanding about science and technology.

F. Content Standard: Science in Personal and SocialPerspectives
F1. Personal and community health.
F2. Population growth.
F3. Natural resources.
F4. Environmentalquality.
F5. Natural and human-induced hazards.

English Language Arts

1. Students read a wide range of print and non-print texts to build an understanding of texts, of themselves and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works.
3. Students apply a wide range of strategies to comprehend, interpret, evaluate and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics).
4. Students adjust their use of spoken, written and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
5. Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.
7. Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that support their purpose and audience.
8. Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge.
12. Students use spoken, written and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion and the exchange of information).

Social Studies

3. Thematic Strand: People, Places and Environments
   3b. create, interpret, use and synthesize information from various representations of the earth, such as maps, globes and photographs;
   3c. use appropriate resources, data sources and geographic tools such as aerial photographs, satellite images, geographic information systems (GIS), map projects, and cartography to generate, manipulate and interpret information such as atlases, data bases, grid systems, charts, graphs and maps.
   3f. use knowledge of physical system changes such as seasons, climate and weather, and the water cycle to explain geographic phenomena;
   3g. describe and compare how people create places that reflect culture, human needs, government policy and current values and ideals as they design and

build specialized buildings, neighborhoods, shopping centers, urban centers, industrial parks and the like;

3h. examine, interpret and analyze physical and cultural patterns and their interactions, such as land use, settlement patterns, cultural transmission of customs and ideas and ecosystem changes;

3k. propose, compare and evaluate alternative policies for the use of land and other resources in communities, regions, nations and the world.

4. Thematic Strand: Individual Development and Identity

4a. articulate personal connections to time, place and social/cultural systems;

6. Thematic Strand: Power, Authority and Governance

6c. analyze and explain ideas and mechanisms to meet needs and wants of citizens, regulate territory, manage conflict, establish order and security and balance competing conceptions of a just society;

7. Thematic Strand: Production, Distribution and Consumption

7b. analyze the role that supply and demand, prices, incentives and profits play in determining what is produced and distributed in a competitive market system;

7g. compare basic economic systems according to how rules and procedures deal with demand, supply, prices, the role of government, banks, labor and labor unions, savings and investments and capital;

9. Thematic Strand: Global Connections

9d. analyze the causes, consequences and possible solutions to persistent, contemporary and emerging global issues, such as health, security, resource allocation, economic development and environmental quality;

10. Thematic Strand: Civic Ideals and Practices

10c. locate, access, analyze, organize, synthesize, evaluate and apply information about selected public issues—identifying, describing and evaluating multiple points of view;