

Turfgrass Management

8051 36 weeks

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Course Description

Suggested Grade Level: 10 or 11

Students begin to master the duties and tasks of professionals who establish and maintain turf in public areas such as golf courses; parks; athletic fields; school, industrial, and institutional campuses; and residential lawns.

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

Task Essentials Table

8051	Tasks/Competencies
+	Identify the role of supervised agricultural experiences (SAEs) in agricultural education.
+	Participate in an SAE.
+	Identify the benefits and responsibilities of FFA membership.
+	Describe leadership characteristics and opportunities as they relate to agriculture and FFA.
○	Apply for an FFA degree and/or an agricultural proficiency award.
+	Identify components of the program and course.
+	Follow safety procedures for personal protection.
+	Examine careers in the turfgrass industry.

<input checked="" type="radio"/>	Describe the benefits of turf areas.
<input checked="" type="radio"/>	Describe turf morphology, physiology, and the taxonomy of major turfgrass species.
<input checked="" type="radio"/>	Identify the importance of soil fertility and its physical properties in turf growth and development.
<input checked="" type="radio"/>	Distinguish among turf types.
<input checked="" type="radio"/>	Identify factors that determine turfgrass selection.
<input checked="" type="radio"/>	Identify factors that influence turfgrass seed selection.
<input checked="" type="radio"/>	Identify practices for turf establishment.
<input type="radio"/>	Demonstrate practices for turf establishment.
<input checked="" type="radio"/>	Identify synthetic turf surfaces.
<input checked="" type="radio"/>	Explain why correct mowing practices are important to the quality of turf.
<input checked="" type="radio"/>	Identify the effect of turfgrass on the environment.
<input checked="" type="radio"/>	Identify nutrient management practices.
<input checked="" type="radio"/>	Explain water requirements and irrigation methods.
<input checked="" type="radio"/>	Identify basic pest management practices.
<input checked="" type="radio"/>	Identify alternative management practices for turf areas.
<input checked="" type="radio"/>	Identify tools and equipment used in the turfgrass industry.
<input checked="" type="radio"/>	Select tools and equipment.
<input checked="" type="radio"/>	Identify safety concerns in the turfgrass industry.
<input checked="" type="radio"/>	Apply pre- and post-operational procedures.
<input checked="" type="radio"/>	Demonstrate the safe use of turfgrass equipment.
<input checked="" type="radio"/>	Maintain turfgrass equipment such as a rotary mower, reel mower, sod cutter, tractor, string trimmer, and blower.
<input checked="" type="radio"/>	Compute area, perimeter, volume, and slope for a variety of turfgrass applications.

Legend: Essential Non-essential Omitted

Note: Competencies 39-43 have been added to ensure compliance with federal legislation: National FFA Organization's Federal Charter Amendments Act (Public Law 116-7, <https://www.congress.gov/116/plaws/publ7/PLAW-116publ7.pdf>). All inquiries may be sent to cte@doe.virginia.gov. Students are provided opportunities for leadership, personal growth, and career

success. Instruction is delivered through three major components: classroom and laboratory instruction, supervised agricultural experience (SAE) program, and student leadership (FFA).

Curriculum Framework

Task Number 39

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

Definition

Identification should include

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

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

Process/Skill Questions

- What are examples of SAEs related to this course and in the AFNR industries?
- Where can a copy of the Virginia SAE Record Book be found?
- What is an Immersion SAE?
- How does a placement/internship SAE differ from an ownership/entrepreneurship SAE?
- How does an SAE provide relevant work experience and contribute to the development of critical thinking skills?

- How is the SAE an extended individualized instructional component of a student’s Career Plan of Study?
- How can an SAE be used to provide evidence of student growth and participation in authentic, work-related tasks?
- What are the four types of SAEs?
- What are the advantages of participating in work-based learning experiences and projects?
- How does one choose an appropriate SAE in which to participate?

Task Number 40

Participate in an SAE.

Definition

Participation should include

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

Teacher resources:

[FFA SAE](#)

[The Agricultural Experience Tracker](#)

Process/Skill Questions

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

Exploring Leadership Opportunities through FFA

Task Number 41

Identify the benefits and responsibilities of FFA membership.

Definition

Identification should include

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

Process/Skill Questions

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

Task Number 42

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

Definition

Description should include

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

Process/Skill Questions

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

Task Number 43

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

Definition

Application should include

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

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

Process/Skill Questions

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

Gaining an Overview of the Turfgrass Industry

Task Number 44

Identify components of the program and course.

Definition

Identification should include

- defining basic turf terminology
- reviewing the essential competencies for the program and course
- identifying the opportunities for FFA participation
- identifying the opportunities for SAEs and cooperative education in the program
- locating turfgrass facilities in the local area.

Process/Skill Questions

- What skills do we need to succeed in the field of turfgrass management?
- What are the benefits and responsibilities of FFA participation?
- Why are SAEs an important part of this program?
- What opportunities exist for cooperative education? What knowledge and skills should we expect to learn from participating in cooperative education?

Task Number 45

Follow safety procedures for personal protection.

Definition

Following safety procedures should include

- explaining laboratory safety rules
- completing all applicable safety tests
- using protective clothing and equipment as applicable
- using supplies, chemicals, and equipment in compliance with all safety regulations and industry recommendations
- interpreting labels and safety data sheets (SDS)
- exhibiting safe behavior in the classroom, laboratory, and land lab.

Process/Skill Questions

- What are the requirements related to clothing and equipment for personal protection? Why do these specific requirements exist?
- What skills do we need to demonstrate the safe use of supplies, chemicals, and equipment in the laboratory?
- Compare the employer's and individual employee's responsibilities for safety on the job. How are they alike and different? What are some potential consequences of failure to follow safety rules on the job?
- What are some safety hazards a typical employee might encounter at a turfgrass facility?

Task Number 46

Examine careers in the turfgrass industry.

Definition

Examination of careers should yield

- career areas related to the plant science pathway and turfgrass industry
- entry-level and advanced career positions related to the turfgrass industry
- education/training requirements for career entry.

Many websites offer career exploration resources, including the Virginia Department of Education's [Career Planning Guide](#).

Process/Skill Questions

- What career areas are related to the turfgrass industry?
- What are some entry-level and advanced career positions related to the turfgrass industry?
- What are the education/training requirements for career entry in the turfgrass industry?
- What are the physical demands of jobs in the turfgrass industry?
- What are the working conditions associated with jobs in the turfgrass industry?
- What are the economic considerations related to careers in the turfgrass industry?
- What local, regional, and statewide job opportunities exist in the turfgrass industry?
- How can we gain the necessary education and experience for a career in the turfgrass industry?

Task Number 47

Describe the benefits of turf areas.

Definition

Description should include

- value of landscape
- habitat for wildlife
- open spaces
- recreation/athletics
- healthy lifestyle
- environmental education
- career opportunities
- land reclamation
- air quality
- runoff reduction
- promotion of safety
- temperature regulation
- bioremediation
- carbon sequestration
- noise reduction
- erosion control.

Process/Skill Questions

- What contributions to the environment can be attributed to turfgrass areas?
- How can turfgrass areas be managed to improve the support of wildlife?
- What are the athletic/recreational benefits of turf?
- What role does turfgrass development play in environmental education?

Applying Science to Turf Management

Task Number 48

Describe turf morphology, physiology, and the taxonomy of major turfgrass species.

Definition

Description should include

- defining *morphology*, *physiology*, and *taxonomy* as they relates to turfgrass
- differences between monocot and dicot plants
- processes of photosynthesis and respiration
- the major parts of a turfgrass plant
- functions of the leaves, roots, crown, inflorescence, stolons, and rhizomes.

Process/Skill Questions

- What are the similarities and differences between monocot and dicot plants?
- What are the steps in the processes of photosynthesis and respiration?
- What are the major parts of a plant?
- How is morphology used in the development of improved cultivars?
- Why do turfgrass breeders select for higher shoot density?
- What are the definitions of cultivar and variety with respect to turfgrass types?
- What are the lique, auricles, and collar regions? Why are they important?

Task Number 49

Identify the importance of soil fertility and its physical properties in turf growth and development.

Definition

Identification should include

- determining the soil type

- explaining the effects of soil texture on plant growth and development (e.g., proportion of sand, silt, clay)
- explaining the effects of soil structure on plant growth and development (e.g., granular, platy, blocky, prismatic, columnar, structureless soils)
- classifying soils by texture
- explaining the importance of the physical properties of soil (e.g., horizonation, color, texture, structure, consistence, bulk density)
- explaining the importance of the chemical properties of soil (e.g., cation exchange capacity, pH)
- testing soil for nutrient availability and pH
- explaining the role of pH in turf management
- explaining the importance of soil drainage
- explaining the importance of organic matter
- describing/illustrating a soil profile.

Process/Skill Questions

- How do soil texture and soil structure affect plant growth?
- Why do we classify soils by texture?
- How do we use soil amendments to modify soil compaction and improve drainage or water-holding capacity?
- What are the mechanical methods to improve soil compaction?
- What is the process for testing soil for pH?
- What is the role of pH in turf management?
- What is the purpose of a soil profile?
- How does failure to improve soil prior to planting lead to increased costs in the long run?

Task Number 50

Distinguish among turf types.

Definition

Distinction should include physiological differences between warm-season grasses (e.g., Bermudagrass, St. Augustine grass, Zoysiagrass, Buffalograss, Centipede) and cool-season grasses (e.g., Bluegrass, Tall Fescue, Perennial Ryegrass, Fine Fescue).

Process/Skill Questions

- How do we compare the hardiness of warm-season and cool-season grasses?
- How do we compare grasses for vigor?
- How do we determine variety selection for specified applications in turf grass areas?
- What qualifies a grass as a warm-season grass or a cool-season grass?

Task Number 51

Identify factors that determine turfgrass selection.

Definition

Identification should include suitable types of grass for warm-season, cool-season, and transition zones. Considerations include

- use (e.g., athletic field, commercial setting, residential landscaping, golf course)
- site (i.e., microclimate)
- maintenance needs
- disease resistance
- insect resistance
- thatch production
- rate of establishment
- germination
- performance characteristics of the region
- traffic tolerance
- shade tolerance
- environmental stress tolerance (e.g., drought, moisture, heat, cold).

Resources for selecting turf varieties may include

- National Turf Evaluation Program (NTEP)
- United States Department of Agriculture (USDA) standards for turf quality
- Virginia Cooperative Extension's annual Virginia Turfgrass Variety Recommendations.

Process/Skill Questions

- What is the effect of climate on turfgrass growth?
- What are the ultimate use(s) of our specific turfgrass selection?
- What are the maintenance levels needed for our specific turf uses?
- How do we compare texture of selected turf grasses?
- Which turfgrass type should we choose for heat or cold tolerance?
- Which turfgrass type should we choose for drought and shade tolerance?
- Which turfgrasses should we choose for transition zone growth and use?
- How do we determine cultivar selection for specified applications in turf grass areas?
- How do amount and type of traffic determine turfgrass selection?

Task Number 52

Identify factors that influence turfgrass seed selection.

Definition

Identification should be demonstrated by selecting suitable seed for given situations.

Process/Skill Questions

- How do we distinguish between blends and mixtures?
- What skills do we need to interpret turf labels in terms of quality, purity, and seed certification?

- What are the cost considerations in seed selection?
-

Task Number 53

Identify practices for turf establishment.

Definition

Identification should include

- seeding
- sprigging
- sodding
- plugging
- overseeding
- alternative methods (e.g., hydroseeding, hydrosprigging).

Process/Skill Questions

- What are the advantages and disadvantages in establishing turfgrass by plugging, by sprigs, and by seed?
 - What is the purpose of overseeding turfgrass?
 - How do we calculate the amount of seed, sprigs, or sod for a given area?
 - What are the maintenance practices (e.g., mowing, fertilization, irrigation, pest management) for newly established turfgrasses?
-

Task Number 54

Demonstrate practices for turf establishment.

Definition

Demonstration should include

- seeding
- sprigging
- sodding
- plugging
- overseeding
- alternative methods (e.g., hydroseeding, hydrosprigging).

Process/Skill Questions

- What are the steps to prepare a site for planting?
 - How do we calculate the area for turf establishment?
 - What are the steps to install sod?
-

Task Number 55

Identify synthetic turf surfaces.

Definition

Identification should include

- traditional indoor/outdoor surface
- in-fill systems
- short- and long-fiber systems
- hybrid systems (natural grass-synthetic combination).

Process/Skill Questions

- What are some common indoor uses for synthetic turf?
 - Where are hybrid systems most successfully used?
 - When are in-fill systems most effective?
-

Task Number 56

Explain why correct mowing practices are important to the quality of turf.

Definition

Explanation should be demonstrated by recommending mowing practices for given situations and by considering

- reel vs. rotary mowers
- height selection based on turf species and use
- frequency of mowing.

Process/Skill Questions

- What factors influence when, how, and by what means to mow turfgrass?
- What skills and resources do we need to design or sketch a mowing pattern?
- What is the correct cutting height for turfgrass species and cultivars?

- What factors influence the correct cutting height?
- What are the advantages and disadvantages of different mower types?
- What are the advantages and disadvantages of collecting grass clippings?
- What factors determine the frequency of mowing?

Task Number 57

Identify the effect of turfgrass on the environment.

Definition

Identification should include

- the effect of turfgrass on the air and groundwater
- the role of turfgrass in noise control
- reclamation and conservation practices involving turfgrasses
- the effect of environmental regulations on the turfgrass industry
- the effect of chemical use in the turfgrass industry.

Process/Skill Questions

- How does turfgrass filter and cool the air?
- How does turfgrass purify water through transpiration?
- What is the role of turfgrass as a noise control measure?
- What are the reclamation and conservation practices that use turfgrass?
- How have environmental regulations, including the Chesapeake Bay Act and employee protection measures, affected the turfgrass industry?
- What are the environmental benefits related to responsible chemical use in the turfgrass industry?

Task Number 58

Identify nutrient management practices.

Definition

Identification should include

- listing nutrients necessary for turfgrass growth
- identifying differences between quick-release and slow-release nitrogen sources
- using or describing accepted nutrient management practices in a given situation
- calculating fertilizer rates base on soil samples
- identifying effect of nitrogen (N), phosphorus (P), and potassium (K) on plant growth
- following current nutrient management regulations
- considering effects on water quality.

Process/Skill Questions

- What nutrients are necessary for optimal turfgrass growth and development?
- What are the differences between quick-release and slow-release nitrogen sources?
- How do we calculate the quantity of nutrients in specific fertilizers?
- What is the importance of macronutrients in plant growth? Micronutrients?
- What is the procedure for correcting pH problems?
- What knowledge do we need to interpret soil analysis test results?
- How do we determine the quantity of fertilizer for a specific area, according to test results?
- What are the differences between liquid and granular fertilizers?
- What is the procedure for applying granular fertilizer?

Task Number 59

Explain water requirements and irrigation methods.

Definition

Explanation should include

- how water moves in the soil
- reasons why not all water in the soil is available for plant use
- how to determine when grass needs watering
- manner of water application
- amount of water to apply
- frequency of irrigation
- how to determine moisture requirements of various grasses and plants
- how to determine the best irrigation method
- how chemicals, nutrients, and pesticides can be integrated into the watering cycle of different types of irrigation systems.

Process/Skill Questions

- What are the advantages and disadvantages of irrigation as a means to deliver chemicals, nutrients, and pesticides?
- What is the relationship among water, soil, and plants in terms of effective use of irrigation?
- What factors influence the timing of water application?
- What are the advantages and disadvantages of different types of irrigation systems?

Task Number 60

Identify basic pest management practices.

Definition

Identification should include

- weed, insect, and disease identification
- integrated pest management (IPM)

- safe use of pesticides
- cultural, chemical, biological, and mechanical control.

Process/Skill Questions

- How are insects identified?
- What documentation is available to help with the safe use of pesticides?
- When is chemical control favorable over cultural control?

Task Number 61

Identify alternative management practices for turf areas.

Definition

Identification may include

- low-impact pesticides
- environment-friendly fertilizers
- organics for pest control
- mechanical weed removal
- minimal water use/water conservation
- composting of clippings
- variations in mowing practices
- planting of trees.

Process/Skill Questions

- How effective are low-impact pesticides, relative to conventional products?
- What are the benefits of organic pest control methods?
- How can variation of mowing practices contribute to the success of turf maintenance?

Operating and Maintaining Equipment

Task Number 62

Identify tools and equipment used in the turfgrass industry.

Definition

Identification should include the name and use of selected power tools and equipment.

Process/Skill Questions

- What are the characteristics and uses of equipment service tools?
- What are the characteristics and uses of turf-specific tools?
- What are the identifying characteristics of two- and four-cycle engines?
- How do we identify gear and hydrostatic drive trains?

Task Number 63

Select tools and equipment.

Definition

Selection should include determining the proper tools and equipment for a given application.

Process/Skill Questions

- What factors determine selection of tools and equipment?
 - How do we select equipment based on the application?
 - What do we need to know in order to determine equipment needs based on size and scope of the operation?
 - How do we select models or types of tools and equipment based on cost, availability, and application?
-

Task Number 64

Identify safety concerns in the turfgrass industry.

Definition

Identification should include developing a plan that addresses employee and customer safety and includes potential hazards and solutions, such as

- cuts and amputations
- electrical
- heat and cold stress
- lifting and awkward postures
- noise
- pesticides and chemicals
- slips, trips, and falls.

Process/Skill Questions

- What components should one include in a safety plan for turfgrass employees?
- What criteria should one use to evaluate a demonstration of safety procedures related to equipment operation?
- What hazards might one encounter when grading or preparing soil?
- What hazards might one encounter during turf and landscape maintenance?

- What are some examples of safety hazards in the turfgrass industry?
- What knowledge does one need to locate and interpret SDS (safety data sheets)?
- What are elements of the employees' Right to Know?
- What is the importance of lockout/tagout procedures?
- What knowledge does one need to address customer safety issues associated with specified turfgrass operations?

Task Number 65

Apply pre- and post-operational procedures.

Definition

Application should include preparing equipment for use, following industry-recommended pre-operational and post-operational procedures.

Process/Skill Questions

- What criteria should one use to evaluate equipment condition before use?
- What information does one need in order to keep equipment maintenance and operation records?

Task Number 66

Demonstrate the safe use of turfgrass equipment.

Definition

Demonstration must conform to instructions in the manufacturer's specifications and industry-accepted guidelines for training.

Process/Skill Questions

- What knowledge do we need to interpret an equipment operation manual containing proper operating procedures?
- What are the procedures for starting and stopping turfgrass equipment?
- What is the importance of proper cleaning and storage of equipment?

Task Number 67

Maintain turfgrass equipment such as a rotary mower, reel mower, sod cutter, tractor, string trimmer, and blower.

Definition

Maintenance is demonstrated by performing service and repair procedures on selected equipment according to applicable manuals.

Process/Skill Questions

- What resources do we need to determine proper service procedures? What knowledge do we need to interpret manuals that provide this information?
- What is the procedure for determining type and quality of fluids?
- What factors determine service and maintenance intervals for turfgrass equipment?
- What are some potential consequences of failure to sharpen cutting blades?
- How would we justify decisions to repair or replace a piece of equipment?
- What is the procedure for washing equipment? How do we determine washing requirements?
- What skills and knowledge do we need to perform fundamental repairs on equipment, using a MIG welder?
- What are the steps in troubleshooting turfgrass equipment?

Incorporating Mathematics in the Turfgrass Industry

Task Number 68

Compute area, perimeter, volume, and slope for a variety of turfgrass applications.

Definition

Computation should include

- using current measurement technologies
- calculating and recording area, perimeter, volume, and slope.

Process/Skill Questions

- What are the consequences of inaccurate measurement?
- What information does one need to calculate a turfgrass area? Where can that information be obtained?
- How many square feet are in an acre?

SOL Correlation by Task

39	Identify the role of supervised agricultural experiences (SAEs) in agricultural education.	English: 10.3, 10.5, 11.3, 11.5
40	Participate in an SAE.	English: 10.5, 10.8, 11.5, 11.8

41	Identify the benefits and responsibilities of FFA membership.	English: 10.5, 10.6, 10.7, 10.8, 11.5, 11.6, 11.7, 11.8
42	Describe leadership characteristics and opportunities as they relate to agriculture and FFA.	English: 10.5, 11.5 History and Social Science: VUS.8, VUS.9, VUS.10, VUS.11, WHII.8, WHII.10, WHII.11
43	Apply for an FFA degree and/or an agricultural proficiency award.	English: 10.5, 11.5
44	Identify components of the program and course.	English: 10.5, 11.5
45	Follow safety procedures for personal protection.	English: 10.5, 11.5 Science: CH.1
46	Examine careers in the turfgrass industry.	English: 10.5, 10.8, 11.5, 11.8
47	Describe the benefits of turf areas.	English: 10.5, 11.5 History and Social Science: VUS.14, WG.17, WHII.14
48	Describe turf morphology, physiology, and the taxonomy of major turfgrass species.	English: 10.5, 11.5 Science: BIO.2, BIO.6
49	Identify the importance of soil fertility and its physical properties in turf growth and development.	English: 10.5, 11.5 Science: CH.4, ES.8
50	Distinguish among turf types.	English: 10.5, 11.5
51	Identify factors that determine turfgrass selection.	English: 10.5, 10.8, 11.5, 11.8
52	Identify factors that influence turfgrass seed selection.	
53	Identify practices for turf establishment.	
54	Demonstrate practices for turf establishment.	
55	Identify synthetic turf surfaces.	
56	Explain why correct mowing practices are important to the quality of turf.	English: 10.5, 11.5
57	Identify the effect of turfgrass on the environment.	English: 10.5, 11.5 Science: ES.6, ES.8
58	Identify nutrient management practices.	English: 10.5, 11.5 Science: BIO.8
59	Explain water requirements and irrigation methods.	English: 10.5, 11.5 Science: ES.6, ES.8
60	Identify basic pest management practices.	Science: BIO.4, ES.2
61	Identify alternative management practices for turf areas.	English: 10.5 Science: BIO.8, ES.2, ES.8
62	Identify tools and equipment used in the turfgrass industry.	English: 10.5, 11.5
63	Select tools and equipment.	

64	Identify safety concerns in the turfgrass industry.	English: 10.1, 10.5, 11.1, 11.5 History and Social Science: VUS.8, WHII.8
65	Apply pre- and post-operational procedures.	English: 10.5, 11.5
66	Demonstrate the safe use of turfgrass equipment.	English: 10.5, 11.5 History and Social Science: VUS.8, WHII.8
67	Maintain turfgrass equipment such as a rotary mower, reel mower, sod cutter, tractor, string trimmer, and blower.	English: 10.5, 11.5
68	Compute area, perimeter, volume, and slope for a variety of turfgrass applications.	English: 10.5, 10.8, 11.5, 11.8 Mathematics: A.1, A.4, A.6

FFA Information

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

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

Entrepreneurship Infusion Units

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

Appendix: Credentials, Course Sequences, and Career Cluster Information

Industry Credentials: Only apply to 36-week courses

- Certified Turfgrass Professional Examination
- Chesapeake Bay Landscape Professional, Associate (CBLP-A) Examination
- College and Work Readiness Assessment (CWRA+)
- Customer Service Specialist (CSS) Examination
- Landscape Management Certification Examination
- National Career Readiness Certificate Assessment
- Turfgrass Management Certification Program Examination
- Workplace Readiness Skills for the Commonwealth Examination

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

- Agricultural Business Fundamentals I (8022/36 weeks)
- Agricultural Business Management III (8026/36 weeks)
- Agricultural Business Operations II (8024/36 weeks)
- Applied Agricultural Concepts (8072/18 weeks)
- Applied Agricultural Concepts (8073/36 weeks)
- Horticulture Sciences (8034/36 weeks)
- Introduction to Plant Systems (8007/36 weeks)
- Introduction to Power, Structural, and Technical Systems (8016/36 weeks)
- Landscaping I (8036/36 weeks)
- Landscaping II (8039/36 weeks)
- Turfgrass Management, Advanced (8054/36 weeks)

Career Cluster: Agriculture, Food and Natural Resources	
Pathway	Occupations
Agribusiness Systems	Agricultural Commodity Broker Agricultural Economist Agricultural Loan Officer Agricultural Products Sales Representative Farm Products Purchasing Agent and Buyer Farm, Ranch Manager Farmer/Rancher Feed, Farm Supply Store Sales Manager Sales Manager
Environmental Service Systems	Agricultural Products Sales Representative Environmental Compliance Inspector Environmental Sampling and Analysis Technician Secondary School Teacher Toxicologist Turf Farmer
Plant Systems	Agricultural Products Sales Representative Botanist

Career Cluster: Agriculture, Food and Natural Resources	
Pathway	Occupations
	Certified Crop Advisor Crop Grower Custom Harvester Farm, Ranch Manager Farmer/Rancher Golf Course Superintendent Nursery and Greenhouse Manager Ornamental Horticulturist Plant Breeder/ Geneticist Secondary School Teacher Soil and Plant Scientist Turf Farmer
Power, Structural, and Technical Systems	Agricultural Engineer Agricultural Equipment Operator Agricultural Equipment Parts Manager Agricultural Equipment Parts Salesperson Machinist Parts Manager

Career Cluster: Science, Technology, Engineering and Mathematics	
Pathway	Occupations
Science and Mathematics	Botanist Plant Biologist Plant Breeder and Geneticist Plant Pathologist Research Chemist Secondary School Teacher Technical Writer Toxicologist