



Plant and Soil Science

Primary Career Cluster:	Agriculture, Food, & Natural Resources
Consultant:	CTE.Standards@tn.gov
Course Code(s):	C18H15
Prerequisite(s):	<i>Applied Environmental Science</i> (C18H25)
Credit:	1
Grade Level:	11
Elective Focus - Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture, Food, & Natural Resources courses. In addition, this course satisfies one lab science credit requirement for graduation.
POS Concentrator:	This course satisfies one out of two required courses to meet the Perkins V concentrator definition, when taken in sequence in the approved program of study.
Programs of Study and Sequence:	This is the third course in the <i>Environmental and Natural Resources Management</i> program of study.
Aligned Student Organization(s):	FFA: http://www.tnffa.org
Coordinating Work-Based Learning:	All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) program. In addition, teachers who hold an active WBL certificate may offer placement for credit when the requirements of the state board's WBL Framework and the Department's WBL Policy Guide are met. For information, visit https://www.tn.gov/content/tn/education/career-and-technical-education/work-based-learning.html
Promoted Tennessee Student Industry Credentials:	Credentials are aligned with postsecondary and employment opportunities and with the competencies and skills that students acquire through their selected program of study. For a listing of promoted student industry credentials, visit https://www.tn.gov/education/career-and-technical-education/student-industry-certification.html
Teacher Endorsement(s):	048, 150, 448, and 950
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.html Best for All Central: https://bestforall.tnedu.gov/

Course at a Glance

CTE courses provide students with an opportunity to develop specific academic, technical, and 21st century skills necessary to be successful in career and in life. In pursuit of ensuring every student in Tennessee achieves this level of success, we begin with rigorous course standards which feed into intentionally designed programs of study.

Students engage in industry relevant content through general education integration and experiences such as career & technical student organizations (CTSO) and work-based learning (WBL). Through these experiences, students are immersed with industry standard content and technology, solve industry-based problems, meaningfully interact with industry professionals and use/produce industry specific, informational texts.

Using a Career and Technical Student Organization (CTSO) in Your Classroom

CTSOs are a great resource to put classroom learning into real-life experiences for your students through classroom, regional, state, and national competitions, and leadership opportunities. Below are CTSO connections for this course. This is not an exhaustive list.

- Participate in CTSO Fall Leadership Conference to engage with peers by demonstrating logical thought processes and developing industry specific skills that involve teamwork and project management.
- Participate in FFA career and leadership events (CDE/LDE) that align with this course including Agriscience Fair, Agricultural Communications, Agricultural Issues, Agronomy, Extemporaneous Speaking, Environmental & Natural Resources, Land Judging and Evaluation, and Prepared Public Speaking.

Using Work-based Learning (WBL) in Your Classroom (Need to update)

Sustained and coordinated activities that relate to the course content are the key to successful work-based learning. Possible activities for this course include the following. This is not an exhaustive list.

- **Standards 1.1.1-4** | Invite a guest speaker to talk about the impact and employment opportunities within the plant and soil science industry.
- **Standards 2.1-2.3** | Have the students work with a soil scientist on a real project.
- **Standards 3.1-3.4** | Have the students conduct a nutrient recommendation based on a soil sample that will be evaluated by a plant scientist.
- **Standards 4.1-4.7** | Have students work with a soil surveyor on multiple soil use projects.

Course Description

Plant and Soil Science is an applied-knowledge course focusing on the science and management of plants and soils, with special attention given to current agricultural practices that support the healthy and sustainable cultivation of major crops. Upon completion of this course, proficient students will have been exposed to a range of careers associated with the science and management of plants and soils and will have developed the essential skills and knowledge to be successful in science- or agriculture-related occupations.

Course Standards

1. History and Importance

- 1.1. History of Soil Conservation: Determine the **role of plants and soil in maintaining environmental quality**. Trace the **history of soil conservation** in the United States including specific historical events that promoted the development of soil conservation methodologies and regulations.
- 1.2. Legal Requirement to Maintain Freshwater: Describe current **land management practices** for rural, suburban, and urban settings to **protect and ensure the quality and quantity of fresh water supply**. Review specific best management practices (BMPs) from production agriculture, forestry, manufacturing, and municipality to identify existing practices governed by local laws and agency policy. Discuss the pros and cons for these required practices.
- 1.3. Requirements and Employment Trends: Investigate **occupation trends within plant and soil sciences**. Compare and contrast the **knowledge, skills, and abilities necessary for employment**, as well as the typical level of education required.
- 1.4. Laboratory Safety: Review common **laboratory safety procedures for tool and equipment operation in plant and soil science laboratories**, including but not limited to accident prevention and control procedures. Demonstrate the ability to follow safety and operational procedures in a lab setting and complete a safety test with 100 percent accuracy.

2. Soil Science

- 2.1. Soil Formation: Differentiate between the **biological, geological, chemical, and physical factors and processes involved in soil formation**.
- 2.2. Components for Classifying Soils: Communicate the **methods for classifying soils**. Describe **procedures for using each method**. Demonstrate the ability for collecting samples and analyzing the following: soil pH, texture, permeability, water holding capacity, slope, chemical analyses, and soil organisms.
- 2.3. Soil Judging and Classification: Explain the components of a **soil profile**. Conduct a basic **soil analysis and available water holding capacity** of different soil types. Synthesize

findings to recommend appropriate agricultural, recreational, conservational, and/or aesthetic uses of specific land areas using valid reasoning and citing specific evidence gathered in analyses.

3. Plant Science and Nutrition

- 3.1. Plant Science: Compare and contrast the **anatomy and physiology of monocot and dicot plants** used for crop production.
- 3.2. Parts and Function of Plant Cells: Depict the **parts and the functions of plant cells**. Identify the structures and describe the **functions of plant cell organelles**.
- 3.3. Essential Nutrients for Plant Growth: Assess the importance of the **16 (sixteen) nutrients essential to plant growth and development**. Identify nutritional deficiencies and disorders, distinguish among signs of nutrient deficiency in plants, make recommendations for appropriate treatments, and prescribe preventative control measures for major agriculture crops, including corn, soybean, cotton, tobacco, hay, pasture, and forest.
- 3.4. Fertilizers: Investigate the use of **fertilizers as a source of essential plant nutrients**. Compare and contrast the use of **organic and chemical fertilizers**, assessing claims made by producers and consumers of fertilizer products. Calculate fertilizer formulations and perform various methods of fertilizer application for crops, such as erosion controlling crops.

4. Agricultural Practices and Environmental Issues

- 4.1. Agricultural Practices: Research, compare, and contrast **traditional, sustainable, and organic agriculture methods and practices**. Describe how each method aligns to a specific goal, including but not limited to the following: soil fertility and texture maintenance, adequate soil moisture maintenance, erosion prevention, pollution prevention, and weed, insect, and disease management. Assess the costs and benefits of specific methods and practices.
- 4.2. Pollution and Containment Controls: Identify major agriculture-related **pollutants and isolate practices that contribute to pollution in both urban and traditional agricultural production environments**. Recommend **best practices to reduce pollution** for watering procedures, runoff containment, pest control, and chemical use and disposal in both domestic (home) and agricultural production settings.
- 4.3. Landscape Practices: Compare and contrast alternative **methods for maintaining home landscapes using sustainable and/or organic products that will reduce pollution and soil erosion and conserve water and energy**. Justify the need for specific practices to maintain a healthy home landscape, developing claim(s) and counterclaim(s) with reasoning and evidence.

- 4.4. Soil Improvement Methods. Research the use of **compost and mulch in improving and rebuilding soils**. Describe the various **compost methods, including field crop composting, commercial composting, backyard compost piles, vermicomposting, and bokashi**. Compare the inputs, time investment, quality, and quantity of compost prepared by each method.
- 4.5. Site Selection: Determine characteristics important in **selecting a site for optimal growth of plants and crops in rural, suburban, and urban settings**. Describe the factors that influence the economics of crop production in each setting.

Standards Alignment Notes

References to other standards include:

- SAE: [Supervised Agricultural Experience](#): All Agriculture students are encouraged to participate in a Supervised Agricultural Experience program to practice and demonstrate the knowledge and skills learned in their agriculture courses.
- AFNR: [National Agriculture, Food, & Natural Resources \(AFNR\) Career Cluster Content Standards](#): Students engaged in activities outlined above should be able to demonstrate fluency in Standard PS at the conclusion of the course.
- P21: Partnership for 21st Century Skills [Framework for 21st Century Learning](#)
 - Note: While not all standards are specifically aligned, teachers will find the framework helpful for setting expectations for student behavior in their classroom and practicing specific career readiness skills.