

Applied Environmental Science

Primary Career Cluster:	Agriculture, Food, & Natural Resources
Consultant:	CTE.Standards@tn.gov
Course Code(s):	C18H25
Prerequisite(s):	<i>Agriscience</i> (C18H19)
Credit:	1
Grade Level:	10
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 the third 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 second 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/education/educators/career-and-technical-education/work-based-learning.html .
Promoted Tennessee Student Industry Certifications:	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/educators/career-and-technical-education/student-industry-certification.html .
Teacher Endorsement(s):	(048 and 015), (048 and 016), (048 and 017), (048 and 081), (048 and 126), (048 and 127), (048 and 128), (048 and 129), (048 and 151), (048 and 211), (048 and 212), (048 and 213), (048 and 214), (048 and 414), (048 and 415), (048 and 416), (048 and 417), (048 and 418), (048 and 449), (048 and 951) (150 and 015), (150 and 016), (150 and 017), (150 and 081), (150 and 126), (150 and 127), (150 and 128), (150 and 129), (150 and 151), (150 and 211), (150 and 212), (150 and 213), (150 and 214), (150 and 414), (150 and 415), (150 and 416), (150 and 417), (150 and 418), (150 and 449), (150 and 951), (448 and 015), (448 and 016), (448 and 017), (448 and 081), (448 and 126), (448 and 127), (448 and 128), (448 and 129), (448 and 151), (448 and 211), (448 and 212), (448 and 213), (448 and 214), (448 and 414), (448 and 415), (448 and 416), (448 and 417), (448 and 418), (448 and 449), (448 and 951), (950 and 015), (950 and 016), (950 and 017), (950 and 081), (950 and 126), (950 and 127), (950 and 128), (950 and 129), (950 and 151), (950 and 211), (950 and 212), (950 and 213), (950 and 214), (950 and 414), (950 and 415), (950 and 416), (950 and 417), (950 and 418), (950 and 449), (950 and 951)
Required Teacher Certifications/Training:	None
Teacher Resources:	https://www.tn.gov/education/educators/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 and 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, note 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, Employment Skills, Environmental & Natural Resources, and Forestry.

Using Work-Based Learning (WBL) in Your Classroom

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 1.1-1.2** | Invite an industry representative to talk about skills needed to enter the workforce or postsecondary opportunities.
- **Standards 2.1-2.3** | Have students job shadow a local park or recreation manager.
- **Standards 3.1-4.5 and 6.1-6.4** | Have students work on projects with a parks and recreation department staff member.
- **Standards 5.1-5.3** | Invite a power and energy official to discuss the importance of natural resources on our energy needs.
- **Standards 7.1-7.3** | Work on-site with a governmental agency dealing with environmental issues.

Course Description

Applied Environmental Science focuses on the knowledge, information, and skills related to the fundamental science and management of ecosystems as well as careers, leadership, and history of the industry. This course covers principles of environmental impacts, energy consumption, and ecosystem management. Upon completion of this course, proficient students will be prepared for advanced coursework in the *Environmental and Natural Resources* program of study.

Course Standards

1. Occupational Awareness & Safety

- 1.1 Career Exploration: Explore and compare local and regional **career opportunities in the environmental science industry** and evaluate labor data to predict the employment outlook. Describe the knowledge, skills, and abilities necessary for a diverse range of careers in environmental sciences.
- 1.2 Safety: Differentiate **general occupational safety prevention and control standards** as related to environmental and natural resources. Apply concepts of safety procedures to complete safety test with 100 percent accuracy.
 - a. Review common equipment and proper handling of the equipment used in the natural resources field.
 - b. Identify common hazards in the field: poisonous plants and animals.
 - c. Review the standards and procedures of Hunter's Education.
 - d. Review the standards and procedures of Boaters Education.
- 1.3 Business and SAE Recordkeeping: Accurately maintain an active **recordkeeping system** and apply proper **research, accounting, and financial records** as they relate to an environmental and natural resource **supervised agricultural experience (SAE) program**. Demonstrate the ability to summarize records such as findings recommendations, individual enterprise budgets, profit and loss statements, inventory management, and other specific reports by completing SAE and related applications.

2. Studying the Environment

- 2.1 Interaction of Environmental Science: Define the **scope and impact of contemporary environmental science**. Describe the **interdisciplinary nature** of this field and provide examples of how other sciences such as biology, chemistry, earth science, and physics relate to environmental science.
- 2.2 Biomes: Define the term biome and identify the location of the **major biomes of the world and in Tennessee**. Compare and contrast the climates, seasons, soil characteristics, water availability, and other defining features of each biome. Differentiate between biomes within the following categories: aquatic, grasslands, forest, desert, and tundra.

3. Human Impact on the Environment

- 3.1 Human Impact: Evaluate the evolving **impact of humans on the environment**, from primitive societies to contemporary civilizations. Highlight specific milestones and events that had a significant positive and negative impact.
- 3.2 Population Impact: Compare and contrast U.S. **population statistics** to those of other countries around the world, in relation to growth rate, age structure, life expectancy, and total population, among other key parameters. Analyze the factors that impact population growth, and assess the future impact of population growth in the U.S. and the world on the following: availability of natural resources, land usage, waste production and pollution, and global economic health.

4. Ecosystems

- 4.1 Components of Ecosystems: Synthesize the **components of local ecosystems**. Compare and contrast a local to other state ecosystems as related to the following areas: habitat, niche, producers, consumers, and vertical stratification.
- 4.2 Components of an Ecosystem: Compare and contrast **grassland, forest, aquatic, and wetland ecosystems** including types and species, and supply examples of **species that fulfill key roles in each ecosystem**. Illustrate similarities in the **structure and life processes of ecosystems** despite key differences across types of ecosystems. Compare and contrast the ecosystem impacts of the North American model of wildlife management to other global systems.
- 4.3 Inaction of ecosphere components: Analyze how the **abiotic and biotic components of the ecosphere interact with and impact one another**. Apply knowledge of these interactions to determine the suitability of an area for different types of development (e.g., commercial, industrial, primary residential, and urban sprawl). Develop a claim about a development issue that impacts a selected ecosphere, supporting the claim with evidence and sound reasoning from research.
- 4.4 Biome Succession: Determine the significance of **primary and secondary succession in a selected biome**, and the pioneer species for that biome. Evaluate immature and mature ecosystems and discuss indicators that can be observed to determine the maturity and quality of the ecosystem.
- 4.5 Biodiversity: Determine the importance of **biodiversity in an ecosystem**. Assess how various **land uses might impact biodiversity** in a given area. Summarize findings on one of the following topics:
- impact of the intentional or unintentional introduction of non-native species to an ecosystem;
 - threatened and endangered species; and
 - Agricultural Best Management Practices that promote biodiversity.

5. Energy Consumption

- 5.1 Energy Resources: Identify **energy resources** used in the United States and abroad, distinguishing between **renewable and nonrenewable resources**. Research the global distribution of energy resources; determine major resource-rich regions and how they intersect with geopolitical boundaries.
- 5.2 Energy Consumption: Compare **energy consumption** in the United States to the energy consumption of other countries. Explain **energy use trends and statistics**. Investigate the political and economic implications of using foreign energy resources.
- 5.3 Personal Energy Use: Compile and analyze self-collected **data on total energy use**, including transportation, water, and electricity consumption, among others. Create and implement a plan to reduce personal energy use. Compare the usage data after one month of implementing the plan, and discuss key takeaways learned from the project.

6. Managing Ecosystems

- 6.1 Environmental Conditions: Identify standard **methods for monitoring a variety of environmental conditions**, including, but not limited to, air, water, and soil, as well as the biological components of an ecosystem.
- 6.2 Ecosystem Health: Assess the **ecological health** of an ecosystem to determine if the ecosystem is threatened by insects or diseases. Evaluate a habitat to determine its ecological health referencing any threats.
- 6.3 Environmental Management Plan: Explain the importance of **ensuring sustainability** when developing a **management plan** for a **specific resource or ecosystem**. Create a management plan and summarize best practices for each ecosystem: forest, wetland, aquatic, and grassland.
- 6.4 Using Integrated Pest Management: Explain the **history, purpose, and principles of Integrated Pest Management (IPM)**. Identify specific IPM strategies for controlling common home and landscape pests. Create additional informational sheets for large-scale pest control in a variety of natural and human engineered environments.

7. Legal and Civic Responsibility

- 7.1 Historical, legislation and treaties: Identify specific **legislation and international conventions and treaties** to depict the historical development of environmental regulation at the state, national and global levels. Summarize the intended goals and ultimate impact of the regulations include legislation related to air, water, toxic substances, wastes, energy resources, and mandated environmental impact studies.
- 7.2 Enforcing legislation: Describe the role of federal, state, and local governments in **enforcing environmental legislation**. Differentiate between key agencies at each level and justify the need for general regulations of environmental hazards.

7.3 Issues and solutions: Identify current **environmental issues** and research the **environmental and ethical implications for potential solutions**, such as but not limited to ecosystem recovery, reforestation, or reclamation. NOTE: Agricultural Issues career development event format can be used as a guide to master this standard.

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 who are engaging in activities outlined above should be able to demonstrate fluency in Standards ESS.01, .02, .03, .04, .05, .06; NRS.01, .02, .04, and .05 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.