

Applied Environmental Science

Primary Career Cluster:	Agriculture, Food, & Natural Resources
Consultant:	CTEStandards@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/content/tn/education/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/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/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, 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 1-2** | Invite a industry representative to talk about skills needed to enter the workforce or postsecondary opportunities.
- **Standards 3-5** | Have the students to job shadow a local park or recreation manager.
- **Standards 6-12 and 16-19** | Have the students work on projects with an parks and recreation department staff member.
- **Standards 13-15** | Invite a power and energy official to discuss the importance of natural resources on our energy needs.
- **Standards 20-22** | 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.

Program of Study Application

This is the second course in the *Environmental and Natural Resources* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Agriculture, Food, & Natural Resource website at <https://www.tn.gov/education/career-and-technical-education/career-clusters/cte-cluster-agriculture-food-natural-resources.htm> .

Course Standards

Occupational Awareness & Safety

- 1) Use local news media, organizational websites, and real-time labor market information to investigate occupations in environmental science. Compare and contrast the knowledge, skills, and abilities necessary for employment, as well as the typical level of education required.
- 2) Review common laboratory safety procedures for tool and equipment operation in the environmental and natural resources 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.

Studying the Environment

- 3) 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. Research scholarly, peer-reviewed academic journals focused on the biophysical environment and identify leading academic and professional organizations publishing results of environmental research.
- 4) Define the term biome and indicate on a map the major biomes of the world. Develop an annotated graphic that can be used to 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.
- 5) Apply basic business and entrepreneurship principles to plan, set up, operate, or expand an environmental science related Supervised Agricultural Experience (SAE) program. Compare

the components of SMART goals in relation to evaluating the success of the program. Accurately maintain the prescribed activity recordkeeping system and apply proper financial recordkeeping skills as they relate to the SAE program.

Human Impact on the Environment

- 6) Using instructional materials and news media, research the evolving impact of humans on the environment, from primitive societies to contemporary civilizations. Synthesize analysis in an explanatory essay or presentation that highlights specific milestones and events, citing textual evidence of both positive and negative impacts.
- 7) Synthesize census data and other resources to compare U.S. population statistics to those of other countries around the world. Specifically examine growth rate, age structure, life expectancy, and total population, among other key parameters. Analyze the factors that impact population growth, and assess the 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.

Ecosystems

- 8) Research the components of an ecosystem. Synthesize findings by developing a glossary of terms essential to the study of ecosystems, defining at least the following: habitat, niche, producers, consumers, and vertical stratification.
- 9) Compare and contrast grassland, forest, aquatic, and wetland ecosystems including types and species, and explain how biogeochemical cycles and food webs facilitate the flow of energy and the recycling of matter, supplying 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.
- 10) 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 (such as commercial, industrial, and primary residential). Develop a claim about a development issue that impacts a selected ecosphere, supporting the claim with evidence and sound reasoning from research.
- 11) Create a graphic and accompanying text illustrating primary and secondary succession in a selected biome. Include a discussion of the pioneer species for that biome. Compare immature and mature ecosystems and discuss indicators that can be observed to determine maturity and quality of the ecosystem.
- 12) Citing case studies from news media, academic journals or instructional materials, discuss the importance of biodiversity in an ecosystem. Assess how various land uses might impact biodiversity in a given area. Summarize findings in an informational essay on one of the following topics:
 - a. Impact of the intentional or unintentional introduction of non-native species to an ecosystem

- b. Threatened and endangered species
- c. Agricultural Best Management Practices that promote biodiversity

Energy Consumption

- 13) 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.
- 14) Synthesize public data from government agencies and news organizations to compare energy consumption in the United States to the energy consumption of other countries. Create a series of graphs and charts to inform an average citizen about energy use trends and statistics, including the percentage of each resource that comes from domestic and foreign sources. Investigate claims made about the political and economic implications of using foreign energy resources, analyzing author's purpose and assess the extent to which the reasoning and evidence provided support the author's claim.
- 15) Investigate available print and digital tools for conducting an audit of 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.

Managing Ecosystems

- 16) Research 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. For each domain, create a fact sheet outlining common tests and procedures and the kinds of information learned from the analysis of test results. Demonstrate at least one procedure for learning about each domain.
- 17) Assess different measurement of assessing 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 citing evidence from different assessment methods.
- 18) Research sustainability as it applies to ecosystems and natural resources. Explain the importance of ensuring sustainability when developing a management plan for a specific resource or ecosystem. Outline the components of a management plan, and summarize best practices for the management of forest, wetland, aquatic, and grassland ecosystems.
- 19) Describe the evolution of integrated pest management (IPM) strategies through history. Create a brochure that explains the purpose and principles of IPM. Present 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.

Legal and Civic Responsibility

- 20) Citing specific legislation and international conventions and treaties, create a timeline depicting the historical development of environmental regulation at the state, national and global levels. For each regulation represented on the timeline, summarize the intended goals and ultimate impact of that regulation. Include legislation related to air, water, toxic substances, wastes, energy resources, and mandated environmental impact studies.
- 21) 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.
- 22) Choose a current environmental issue and conduct research on environmental and ethical implications for potential solutions, such as but not limited to ecosystem recovery, reforestation, or reclamation. Craft an argumentative essay, developing a claim supporting a specific solution and develop both claim(s) and counterclaim(s) with logical evidence and reasoning.

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.