Natural Resource Management

Primary Career Cluster:	Agriculture, Food, & Natural Resources
Course Contact:	CTE.Standards@tn.gov
Course Code(s):	C18H28
Prerequisite(s):	*Plant and Soil Science* (C18H15)
Credit:	1
Grade Level:	12
Elective Focus - Graduation Requirements:	This course satisfies one of three credits required for an elective focus when taken in conjunction with other Agriculture, Food, and Natural Resources courses.
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 fourth and final course in the *Environmental and Natural Resources Management* 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 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/educators/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/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. 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

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 1.1-1.3** | Invite a guest speaker to talk about the impact and employment opportunities within the plant and soil science industry.
- **Standards 2.1-3.2 |** Have the students work with a soil scientist on a real project.
- **Standards 4.1-7.1** | Have the students conduct projects in conjunction with and evaluated by a park ranger or natural resource manager.

Course Description

Environmental and Natural Resource Management is an applied course for students interested in learning more about becoming good stewards of our environment and natural resources. This course covers major types of natural resources and their management, public policy, and the role of public education in managing resources, as well as careers, leadership, and history of the industry. Upon completion of this course, proficient students will be prepared for further study and careers as an environmental scientist, conservationist, forester, or wildlife manager.

Course Standards

1. **Occupational Awareness & Safety**

   1.1 Safety: Review common laboratory **safety procedures for tool and equipment operation in the natural resource management 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.

   1.2 Record Keeping: Investigate opportunities to expand and diversify a Supervised Agricultural Experience (SAE) program in the area of natural resource management. Demonstrate the ability to **prepare basic personal and business records** to complete employment, taxes, and SAE related applications, including resume, budgets, income statements, balance sheets, cash flow statements, profit and loss statements, and equity statements.

   1.3 Employment trends: Investigate **occupation trends in forestry and natural resource management**. Compare and contrast the knowledge, skills, and abilities necessary for employment, as well as the typical level of education required.

2. **Managing Water Resources**

   2.1 Essential uses: Research the **physical and chemical properties of fresh and salt water**. Create a chart or graph depicting the **essential uses of water**, differentiating the amount of water available for human use from that which is inaccessible to humans.

   2.2 Supply quantity and quality: Research major issues with water **quantity and quality impacting global water supply** using government reports and news media. Distinguish between **point source and non-point source pollution**. Debate benefits and costs of various management strategies that have been implemented to solve water quality and quantity issues by creating a rubric that can be used to judge each technique, citing specific textual evidence.

   2.3 Available water sources: Evaluate **water sources and uses in the local community**. Compare and contrast how various water uses (such as agricultural, industrial, power-plant cooling, recreational, and public) impact overall water quality and quantity. Describe how legal issues and water costs impact consumption.

3. **Managing Mineral Resources**

   3.1 <u>Distribution of mineral resources</u>: Research the global **distribution of mineral resources**. Compare the **distribution of various minerals to the regions of the world with the highest demand and/or usage**. Investigate current and projected rates of depletion and assess the extent to which reasoning and evidence presented by news media on the consequences of the depletion of readily available reserves support claims or recommendations for management of resources.

   3.2 <u>Benefits of minerals</u>: Compare and contrast the c**ost and benefits of extracting minerals and fossil fuels to the impact on the environment, economic, forest, wildlife, and aquatic species**. Evaluate current extracting methods used for minerals and fossil fuels to prepare a presentation, citing specific textural evidence, to recommend the best environmental and social sustainably method of extracting mineral or fossil fuel and returning or improving the ecosystems back to the present state.

4. **Managing Plant and Animal Resources**

   4.1 <u>Plant resources</u>: Apply concepts of scientific taxonomy and industry-specific terminology to **distinguish different species and types of plants** (such as trees, grasses, legumes, food crops). Compare and contrast common plant species used in the management of environmental and natural resources by classification, care, and use.

   4.2 <u>Aquatic Resources</u>: Outline the **impact that aquatic resources** such as fish and wildlife has on ecosystem stability, genetic reserves, and medicinal, agricultural, aesthetic, recreational, and industrial uses.

   4.3 <u>Best management practices</u>: Investigate r**esearch-based practices in forestry, wildlife management and conservation** used by governmental agencies and non-profit organizations **dedicated to wildlife preservation and natural resource conservation**. Justify at least one such practice (including but not limited to carrying capacity, population control, disease control, habitat management, and forest managment), and make recommendations for improving a local practice or improving an issue.

   4.4 <u>Non-native species:</u> Research the **accidental or intentional introduction of exotic species** into an environment. Describe the **environmental and economic impact associated with their introduction**, including the management and eradication of exotic plant and animal species.

   4.5 <u>Laws and regulations:</u> Research, discuss, and evaluate the **effects of fish and game laws and their enforcement on maintaining sustainable wildlife populations**. Complete and pass student certification program(s) for appropriate fish and game certification (i.e. Hunter Education, National Archery in the Schools Program (NASP), Boating Safety, and/or ATV Safety). Compare and contrast specific case studies describing both successful and failed legislation. Analyze how ecological principles are used to inform game management regulation by investigating environmental challenges a specific law is meant to address. Describe unique issues that arise in managing migratory species.

5. Managing Land Resources

5.1 <u>Public lands</u>: Defend the need for **public, state, and federal lands and forest resources, including but not limited to forests, resource areas, wildlife refuges, parks, and wilderness preservation areas**, developing claim(s) and counterclaim(s) with valid reasoning and evidence. Describe the increasing pressures being placed on the agencies managing these lands to open them for various forms of development.

5.2 <u>State parks</u>: Explain the **importance and impact of state park systems**, and justify the use of tax dollars to support them. Differentiate between state parks and state natural areas, their uses, and the ways each are managed.

5.3 <u>State Forests</u>: Compare and contrast various **forest management methods** for monitoring ecosystems, harvesting and planting trees, protecting forests from pathogens and insects, managing fire, managing wildlife, and implementing sustainable forestry practices. Draw conclusions about important silviculture practices after evaluating case studies of recent natural disturbances, such as large wildfires or tornados .

5.4 <u>Stewardship Plans</u>: Describe, in detail, the thirteen components required in developing an **environmental forestry stewardship plan**, including how the components relate to, and impact, one another. Develop, edit, and revise an environmental forestry stewardship plan for a specific plot of land with peer reviews.

5.5 <u>Rangeland:</u> Describe the **characteristics of rangeland vegetation**, the concept of carrying capacity, and the consequences of overgrazing. Outline specific strategies and management practices to maintain the general quality of the world's rangelands.

5.6 <u>Conservation Issues</u>: Given a real-world **conservation issue dealing with the usage of privately or publicly owned land**, identify and recommend at least two possible mitigation options to present to the land owner or government body. For example:
    a. Develop a wetland mitigation plan for a corporate construction project.
    b. Explore the development of a private land conservations easement.
    c. Recommend mitigation plans for a road /bridge construction project to minimize harm to a specific ecosystem.

6. Impact of Technology on the Management of Natural Resources

6.1 <u>Impact of using technology</u>: Research the application of g**eographic information systems (GIS) and global positioning systems (GPS), including GIS software, GPS receivers, data acquisition**, spatial analysis of data, and, data from small Unmanned Aircraft Systems (sUAS) to solve problems and increase efficiency in the management of natural resources. Explain the process of how GIS, GPS, and sUAS are used in the environment and natural resource industry.

6.2 <u>Precision agriculture</u>: Compare and contrast the **types and functions of precision and advanced technologies (such as GIS, GPS, and small unmanned aircraft systems) available to the agriculture industry**. Citing technical data and academic research, debate the legal, ethical, and economic impact of using emerging technologies to improve efficiency

and efficacy within the environment and natural resource industry by making a claim about the implications of technology use, developing it with reasoning and evidence from the text.

7. **Policy and Governance**

   7.1 <u>Policy and Regulations</u>: Compare and contrast Tennessee **policies and regulations pertaining to natural resource preservation and management with those of the federal government and international organizations** such as the World Wildlife Fund (WWF). Articulate the United States' responsibility to cooperate with the global community to solve issues related to natural resource quality and quantity.

   7.2 <u>Legal Issues</u>: Compare and contrast **federal and state laws as protecting rights of private property, forest, or conservation area landowners.** Discuss how these laws protect landowners in respect to property rights, boundary disputes, easements, right-of-ways, encroachments, theft, and liability.

Standards Alignment Notes
References to other standards include:
- SAE for All: [Evolving the Essentials](#): All Agriculture students are encouraged to participate in a Supervised Agricultural Experience (SAE) 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 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](#)
  - o 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.