Department of Education | College, Career and Technical Education

# Advanced Ecology and Conservation

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| **Primary Career Cluster:** | Energy and Sustainable Resources |
| **Course Contact:** | CTE.Standards@tn.gov |
| **Course Code:** | C33H17 |
| **Recommended Prerequisite:** | Conservation Strategies |
| **Credit:** | 1 |
| **Grade Level:** | 11 |
| **Elective Focus-Graduation Requirement:** | This course satisfies one of three credits required for an elective focus when taken in conjunction with other Ecological Research and Conservation courses. |
| **Program Of Study (POS) Concentrator:** | This course satisfies one out of two required courses to meet the Perkins V concentrator definition when taken in sequence in an approved program of study. |
| **Program of Study Sequence:** | This is the third course in the *Ecological Research and Conservation* program of study. |
| **Aligned Student Organization:** | Skills USA: http://www.skillsusatn.org/ |
| **Coordinating Work-Based Learning (WBL):** | 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. |
| **Tennessee Promoted 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):** | 014, 015, 016, 017, 048, 081, 126, 127, 128, 129, 150, 210, 211, 212, 414, 415, 416, 417, 418, 448, 926, 927, 928, 929, 950 |
| **Required Teacher Certifications:** | None |
| **Required Teacher Training:** | None |
| **Teacher Resources:** | 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 careers and life. In pursuit of ensuring every student in Tennessee achieves this level of success, we begin with rigorous course standards that 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 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 the 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 contests highlighting job demonstration, interviewing skills, community service activities, extemporaneous speaking, and job interviews.
- Participate in leadership activities such as the National Leadership and Skills Conference, National Week of Service, and 21st Century Skills.

### 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 1.1-1.4** | Invite an industry professional to speak about environmental policies and the impacts on conservation efforts.
- **Standards 3.1-4.3** | Invite an industry partner to discuss ecotourism and the technical and employability skills required to be effective and successful.
- **Standards 6.1-6.4** | Take an industry tour to learn the components and operations of land use planning.
- **Standards 9.1-9.5** | Research the future of conservation and the implications of advancement. Present to an advisory board or industry panel.

## Course Description

*Advanced Ecology and Conservation* is the third course in the Ecological Research and Conservation program of study. This course delves into conservation's scientific, ethical, and social dimensions, exploring the roles of individuals, communities, governments, non-governmental organizations (NGOs), and international bodies in addressing global environmental challenges. Students will examine current conservation efforts, technological innovations, the role of ecotourism, and the importance of environmental policies in shaping sustainable practices. As part of the course, students will critically engage with the future of conservation, exploring emerging trends and potential solutions to biodiversity loss and environmental change.

## Course Standards

### 1. Environmental Policies

1.1 Environmental Policies and Laws: Critically analyze and explain **major environmental policies, laws, and regulations** at local, state, national, and international levels, with emphasis on Tennessee's regulatory frameworks, such as the Tennessee Clean Water Act and policies that regulate the use of natural resources like the Tennessee Valley Authority (TVA) management. Investigate the impact of their role in balancing ecological sustainability, conservation, and economic development in Tennessee's diverse ecosystems.

1.2 Policy Advocacy Plan: Plan, develop, and present a sophisticated **policy advocacy plan** targeting a pressing conservation issue in Tennessee. Utilize scientific research, data, and policy analysis to construct persuasive arguments and engage key stakeholders in advancing conservation goals.

1.3 Communication Strategies: Create and implement **effective communication strategies for advocating conservation policies**. Develop a multi-platform outreach campaign that incorporates social media, public speaking, and local media to raise awareness of critical environmental issues such as water quality, habitat fragmentation, or invasive species control.

1.4 Role of Public Participation: Investigate the intersection of **public participation and conservation** in Tennessee, exploring how community-based conservation programs have successfully engaged citizens in environmental decision-making. Design outreach programs tailored to Tennessee's communities, integrating local knowledge and values into conservation strategies.

### 2. Environmental Ethics

2.1 Ethical Considerations: Research and evaluate **ethical frameworks in ecological and conservation and research**, particularly focusing on balancing biodiversity preservation with the needs of the local communities. Explain how these considerations affect environmental protection strategies. Discuss the implications of research ethics, such as informed consent and community engagement in ecological and conservation research.

2.2 Impact of Environmental Policies: Conduct a thorough analysis of the **social, economic, and environmental impacts of specific environmental policies**. Assess how these policies balance ecological preservation with the needs of local economies reliant on industries such as agriculture, forestry, and tourism.

2.3 Global and Local Environmental Governance: Evaluate **the role of Tennessee's state and local government within the framework of global environmental governance,** particularly how national and international organizations (e.g., National Wildlife Federation) influence local policy decisions. Evaluate how different governance systems address global challenges such as environmental change, biodiversity loss, and pollution.

2.4 Case Studies: Critically analyze and explain **case studies in conservation** that involve ethical dilemmas, evaluating the conflicting values, interests, and perspectives of various stakeholders. Explore how ethical considerations, such as the rights of local communities, the value of biodiversity, and the balance between conservation and development impact decision-making and the outcomes of conservation efforts. Apply ethical frameworks to propose solutions that address both ecological and social concerns, fostering a deeper understanding of the complexities involved in conservation decision-making.

## 3. Environmental Change and Conservation

3.1 Environmental Change: Analyze the **effects and implications of environmental change on biodiversity, ecosystems, and the services they provide** (e.g., habitat loss, species migration, ocean acidification). Propose region-specific strategies for environmental adaptation in conservation.

3.2 Relationship of Biotic and Abiotic Factors within Habitats, Ecosystems, and Biomes: Evaluate the **effects of fluctuations in abiotic factors on local ecosystems and local biomes**; measure the concentration of dissolved substances such as dissolved oxygen, chlorides, and nitrates and describe their impacts on an ecosystem; use models to predict how the introduction of an invasive species may alter the food chain and affect existing populations in an ecosystem; and predict changes that may occur in an ecosystem if genetic diversity is increased or decreased.

3.3 Interrelationships among the Resources within the Local Environmental System: Investigate the **use and conservation of both renewable and nonrenewable resources** as they pertain to sustainability. Investigate how changes in limiting resources such as water, food, and energy affect local ecosystems. Analyze the **economic significance and interdependence of resources within the local environmental system**. Evaluate the impact of waste management methods such as reduction, reuse, recycling, upcycling, and composting on resource availability in the local environment.

3.4 Natural Environmental Changes: Analyze and describe how **natural events such as tectonic movement, volcanic events, fires, tornadoes, hurricanes, flooding, and tsunamis affect natural populations**. Investigate how regional changes in the environment may have global effects. Create a diagram about how natural processes such as succession and feedback loops can restore habitats and ecosystems. Investigate how temperature inversions have short-term

and long-term effects, including El Nino and La Nina oscillations, ice cap and glacial melting, and changes in ocean surface temperatures. Analyze the impact of changing climate patterns on ice caps, glaciers, ocean currents, and surface temperatures.

## 4. Ecotourism

4.1 Ecotourism Principles: Define **ecotourism and explore its core principles**, including sustainability, environmental stewardship, and community involvement. Examine how ecotourism differs from traditional tourism and the role it plays in promoting environmental conservation and supporting local communities.

4.2 Environmental and Socioeconomic Impacts of Ecotourism: Analyze the **environmental, social, and economic impacts of ecotourism on local communities and ecosystems**. Evaluate both strengths and opportunities, considering factors such as biodiversity conservation, waste management, and local employment opportunities.

4.3 Sustainable Ecotourism Projects: Research **ecotourism principles and impact analysis**. Create a model to describe **sustainable ecotourism**. Integrate conservation goals with community involvement, ensuring that the tourism experience benefits the environment and the local community. Explore the potential for ecolodges, guided tours, and educational programs to generate revenue for conservation efforts while minimizing environmental impact and benefiting local communities.

## 5. Technology in Conservation

5.1 Role of Technology in Conservation: Investigate **how emerging technology is being used to address conservation challenges**. Examine various technological innovations, including remote sensing, geographic information systems (GIS), drones, and artificial intelligence (AI), to monitor ecosystems, protect wildlife, and manage natural resources. Examine the potential and limitations of these technologies in the context of Tennessee's unique environmental issues.

5.2 Impact of Technology on Conservation Efforts: Analyze **the impacts of technological innovations in conservation**. Evaluate how these technologies have improved conservation outcomes (e.g., wildlife tracking, habitat mapping, restoration, data analysis) while considering potential risks, such as data privacy issues and technological dependence. Critically assess whether technology alone can address the complexities of conservation or if it should be integrated with other conservation strategies.

5.3 Technology-Based Conservation Project: Design a hypothetical **conservation project that incorporates one or more technological innovations**. Apply understanding of technology to develop a strategy for addressing a specific conservation issue, such as habitat destruction, poaching, or species monitoring. Propose strategies for effectively using these technologies to address a specific environmental issue in Tennessee.

## 6. Land Use Planning and Conservation

6.1 Land Use and Its Role in Conservation: Research and explain **the principles of land use planning** and how it intersects with conservation efforts. Examine the role of land use planning in managing natural resources, protecting biodiversity, and ensuring sustainable development. Analyze the various types of land uses (e.g., urban, agricultural, industrial, recreational) and evaluate their potential impacts on ecosystems and communities.

6.2 Impacts of Land Use on Ecosystems and Biodiversity: Analyze **how different land use practices affect ecosystems**, wildlife, and biodiversity. Investigate the consequences of land conversion (e.g., deforestation, urban sprawl, agricultural expansion) and examine how land use planning can mitigate negative impacts, such as habitat fragmentation and pollution. Propose sustainable land-use policies that integrate ecological and socio-economic goals.

6.3 Integrating Sustainable Development and Conservation: Investigate **the concept of sustainable development and its role in land use planning**. Examine how conservation objectives can be incorporated into development projects, ensuring that economic, social, and experimental needs are met without compromising the ability of future generations to meet their needs. Develop strategies for managing urban, industrial, and agricultural growth while protecting critical ecosystems, ensuring biodiversity conservation, and promoting the sustainable use of natural resources.

6.4 Evaluating Land Use Policies and Conservation Strategies: Evaluate **land use policies, regulations, and conservation strategies** at local, state, national, or global levels. Assess how well these policies address conservation objectives, such as protecting ecosystems, reducing habitat loss, and promoting sustainable resource use.

## 7. Role of Non-Governmental Organizations (NGOs) in Conservation

7.1 Understanding the Role of NGOs in Global Conservation Efforts: Analyze and explain **the foundational role of non-governmental organizations** (NGOs) in global conservation efforts. Investigate the role of Tennessee-based NGOs in advancing state and regional conservation goals, such as the Tennessee Wildlife Federation. Explain the mission, structure, and scope of NGOs, as well as their involvement in environmental protection, policy advocacy, and sustainable development on local, national, and international levels.

7.2 Analyzing Conservation Strategies Used by NGOs: Investigate **the different strategies used by NGOs to achieve conservation goals**, such as advocacy, research, direct action, policy lobbying, education, and partnerships. Evaluate the effectiveness of these strategies in addressing global and local environmental challenges.

7.3 Impact and Success of NGO-led Conservation: Research and evaluate **the effectiveness of NGO-led conservation projects** by analyzing outcomes, assessing the impact on biodiversity and local communities, and identifying areas for improvement. Examine the role of

partnerships and collaborations between NGOs, governments, businesses, and local communities in achieving long-term conservation success.

## 8. International Conservation Efforts

8.1 The Global Scope of Conservation Challenges: Research **the global conservation challenges facing biodiversity, ecosystems, and natural resources**. Examine issues such as environmental changes, habitat destruction, overexploitation of resources, and threats to endangered species.

8.2 International Agreements: Investigate **key international agreements, treaties, and initiatives aimed at promoting global conservation**. Examine international agreements and assess the goals, mechanisms, and effectiveness of these agreements in protecting global biodiversity and fostering sustainable development.

8.3 International Organizations in Conservation: Investigate **the role of international organizations in promoting conservation**, including the United Nations Environment Programme (UNEP), the World Wildlife Fund (WWF), and the International Union for Conservation of Nature (IUCN). Examine how these organizations support conservation efforts through research, funding, advocacy, and partnerships.

8.4 Evaluating the Impact of Global Conservation Projects: Research and evaluate **specific global conservation projects that involve international cooperation** and assess their outcomes. Examine case studies where countries, NGOs, and international organizations have worked together to address pressing conservation issues. Assess the outcomes of these projects and determine the factors that contribute to their success or failure.

8.5 Global versus State Conservation Efforts: Research **Tennessee's role in global conservation efforts** through its participation in international agreements and the actions of local organizations. Evaluate and communicate how global efforts can inform local conservation strategies in Tennessee.

## 9. Future of Conservation

9.1 Emerging Threats to Biodiversity and Ecosystems: Analyze **emerging and future threats to biodiversity and ecosystems**, including the impacts of environmental change, invasive species, habitat fragmentation, and human population growth. Explore how these threats are likely to shape the future of conservation and discuss the importance of proactive strategies to mitigate these risks.

9.2 Sustainable Practices and Their Future Role in Conservation: Investigate and draw conclusions about **the future role of sustainable conservation practices**, focusing on areas like sustainable agriculture, green infrastructure, and eco-friendly energy solutions. Examine how these practices contribute to biodiversity conservation, ecosystem services, and the reduction

of environmental impact, and discuss their scalability for the future. Examine the role of sustainable practices in promoting long-term conservation goals in Tennessee.

9.3 Economic Models and Policies: Investigate **future economic models and policies** that can support sustainable resources while promoting biodiversity conservation. Propose policies and economic incentives to promote conservation without sacrificing economic growth.

9.4 Future Global Conservation Governance: Analyze **the future of global conservation governance**, examining how international agreements, national policies, and local governance structures might evolve to address future environmental challenges. Research and explain the role of global partnerships, indigenous knowledge, and local communities in shaping conservation policies and actions in the coming decades. Explore the potential role of Tennessee in shaping national and global conservation policies through collaborative efforts with international, national, and state organizations and local stakeholders.

## Standards Alignment Notes

*References to other standards include:

- 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.