Colorado Environmental Science Course Scope and Sequence

Course Name	**Introduction to Agriculture & Environmental Systems**	**Course Details** **Course = 0.50 Carnegie Unit Credit**	This is one of two level 1 course options to begin the Environmental Science pathway.
Course Description	Students will complete hands-on activities, projects, and problems that simulate actual concepts and situations found in the environmental science field, allowing students to build content knowledge and technical skills. Students will investigate areas of environmental science including ecosystem management, sustainable agriculture, energy choices, and pollution.		
Note:	This is a suggested scope and sequence for the course content. The content will work with any textbook or instructional resource. If locally adapted, make sure all essential knowledge and skills are covered.		
SCED Identification #		Schedule calculation based on 60% of a semester instructional time. Scope and sequence allows for additional time for guest speakers, student presentations, field trips, remediation, or other content topics.	

All courses taught in an approved CTE program must include Essential Skills embedded into the course content. The Essential Skills Framework for this course can be found at **https://www.cde.state.co.us/standardsandinstruction/essentialskills**

Unit Number, Title and Brief Description	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration
1. Biodiversity	ESS.3.0 Develop proposed solutions to environmental issues, problems, and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry, and ecology HS-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. HS-LS2-7 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* HS-LS4-6 Create or revise a simulation to test a solution to	ESS.03.04 Apply microbiology principles to environmental service systems *RST.11.-12.1* *WHST.9-10.2* *WHST.11-12.2* *WHST. 9-10.5* *WHST.9-10.9* *WHST.11-12.9* *MA.HS.F-BF.A* ESS.03.05 Apply ecology principles to environmental services systems. *RST.9-10.8* *RST.11-12.1* *RST.11-12.7* *RST.11-12.8* *WHST.9-10.2* *WHST.11-12.2*	ESS.03.04.01.a Describe the microbial biodiversity found in soil and summarize the contribution of microbial biodiversity to the physical and chemical characteristics of soil. ESS.03.04.01.b Assess how activities of microorganisms in soil affect environmental service systems and ecosystem biodiversity. ESS.03.05.01.a Research the role that biodiversity plays in environmental service systems and how biodiversity can be measured. ESS.03.05.01.b Calculate the amount of biodiversity in a given area using an appropriate method (e.g. quadrat assessment, transect measurement, etc) ESS.03.05.02.a Examine and explain the role played by habitats on environmental service systems.	

	mitigate adverse impacts of human activity on biodiversity.* HS-ESS3-3.Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity. ESS.02 Evaluate the impact of public policies and regulations on environmental service systems.	*WHST.9-10.9* *WHST.11-12.9* *MA.HS.N.Q.A* ESS.02.01 Interpret and evaluate the impact of laws, agencies, policies, and practices affecting environmental service systems.	ESS.03.05.02.b. Assess the impact of the current rate of habitat loss on environmental service systems. ESS.02.01.01.a Distinguish between the types of laws associated with environmental service systems. ESS.02.01.01.b Analyze the structure associated with environmental service systems ESS.02.01.02.a Distinguish between the types of government agencies (i.e. local, state, and federal) associated with environmental service systems. ESS.02.01.02.b Analyze the specific purpose of government agencies associated with environmental service systems.	
2. Energy	ESS.04 Demonstrate the operation of environmental service system (e.g. pollution control, water treatment, wastewater treatment, solid waste management, and energy conservation) HS-LS2-3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions	ESS4.04 Compare and contrast the impact of conventional and alternative energy sources on the environment and operation of environmental service systems. *RST.11-12.1* *RST.11-12.8* *WHST.9-10.5* *WHST.11-12.5* *WHST.9-10.7* *WHST11-12.7* *RST11-12.2* *RST.11-12.9* *WHST.11-12.9*	ESS.04.04.01.a Research conventional energy sources and list conservation measures to reduce the impact on environmental service systems. ESS.04.04.01.b Assess the advantages and disadvantages of conventional energy sources in regards to environmental service systems. ESS.04.04.02a Research alternative energy sources and describe the motivations for seeking alternatives to conventional energy sources as they relate to environmental monitoring.	

	ESS.02 Evaluate the impact of public policies and regulations on environmental service systems.	*MA.HS.N.Q.A* ESS.02.01 Interpret and evaluate the impact of laws, agencies, policies, and practices affecting environmental service systems.	ESS.04.04.02.b Identify advantages and disadvantages of alternative energy sources as they pertain to environmental service systems. ESS.04.04.03.a Examine the factors that affect energy consumption and describe how these factors are related to environmental monitoring. ESS.04.04.03.b Analyze and document the main categories of energy consumption. ESS.04.04.04.a Research the impact on environmental service systems that occurs because of energy consumption. ESS.04.04.04.b Analyze and document the most significant impacts that energy consumption has on environmental monitoring. ESS.02.01.01.a Distinguish between the types of laws associated with environmental service systems. ESS.02.01.01.b Analyze the structure associated with environmental service systems ESS.02.01.02.a Distinguish between the types of government agencies (i.e. local, state, and federal) associated with environmental service systems. ESS.02.01.02.b Analyze the specific purpose of government agencies associated with environmental service systems.	
3. Agricultural Systems	AG. 01 Analyze how issues, trends, technologies, and public policies impact systems in the AFNR career cluster. BS.01 Assess factors that have influenced the evolution of biotechnology in agriculture (e.g.	AG1.5 Explain the impact of sustainability on AFNR activities and practices. AG 1.6 Recognize the historical, social, cultural, and potential applications of biotechnology of AFNR activities.		

	historical events, societal trends, ethical and legal implications, etc) NR.03 Develop plans to ensure sustainable production and processing of natural resources. Ag. 04 Demonstrate stewardship of natural resources in AFNR activities. PL.03 Propagate, culture, and harvest plants and plant products based on current industry standards. ESS.02 Evaluate the impact of public policies and regulations on environmental service systems.	BS.01.02 Evaluate the scope and implications of regulatory agencies on applications of biotechnology in agriculture and protection of public interests (e.g. health, safety, environmental issues, etc) NRS.03.01 Plan for the production, harvesting, processing, and/or use of natural resources in a responsible and sustainable manner. Ag.04.01 Demonstrate evidence of interest and concern for natural resource stewardship. Ag.04.02 Explain the environmental considerations of decision making in AFNR management PL.03.08 Apply principles and practices of sustainable agriculture plant production. ESS.02.01 Interpret and evaluate the impact of laws, agencies, policies, and practices affecting environmental service systems.	ESS.02.01.01.a Distinguish between the types of laws associated with environmental service systems. ESS.02.01.01.b Analyze the structure associated with environmental service systems ESS.02.01.02.a Distinguish between the types of government agencies (i.e. local, state, and federal) associated with environmental service systems. ESS.02.01.02.b Analyze the specific purpose of government agencies associated with environmental service systems.	
4. Pollution	ESS.4.0 Demonstrate the operation of environmental service systems (e.g. pollution control, water treatment, wastewater treatment, solid waste management, and energy conservation)	ESS.4.01 Use pollution control measures to maintain a safe facility and environment.	ESS.04.01.01.a Identify and distinguish types of pollution and distinguish between point source and nonpoint source pollution.	

	ESS.02 Evaluate the impact of public policies and regulations on environmental service systems.	ESS.02.01 Interpret and evaluate the impact of laws, agencies, policies, and practices affecting environmental service systems.	ESS.04.01.01.b Assess how industrial and nonindustrial pollution has damaged the environment. ESS.04.01.02.a Research ways in which pollution can be managed and prevented and propose solutions to meet the needs of local systems. ESS.04.01.02.b Conduct tests to determine the presence and extent of pollution. ESS.02.01.01.a Distinguish between the types of laws associated with environmental service systems. ESS.02.01.01.b Analyze the structure associated with environmental service systems ESS.02.01.02.a Distinguish between the types of government agencies (i.e. local, state, and federal) associated with environmental service systems. ESS.02.01.02.b Analyze the specific purpose of government agencies associated with environmental service systems.	
5. Issue Analysis	ESS.2.0 Evaluate the impact of public policies and regulations on environmental service system operations. HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.	ESS. 2.02 Compare and contrast the impact of current trends on regulation of environmental service systems (e.g. climate change, population growth, international trade, etc.)	ESS.02.02.01.a Research and categorize the purpose, implementation, and impact of greenhouse gas emission policies (e.g. cap-and-trade, emission offsetting, zero-emissions, carbon-neutrality, carbon sequestration, etc) ESS.02.02.01.b Assess the effectiveness and impact of greenhouse gas emission policies. ESS.02.02.02.a Research the impact of environmental service systems regulations on international trade. ESS.02.02.02.b Analyze how environmental service systems regulations can both negatively and positively affect international trade.	

	ESS.02 Evaluate the impact of public policies and regulations on environmental service systems.	ESS.02.01 Interpret and evaluate the impact of laws, agencies, policies, and practices affecting environmental service systems.	ESS.02.02.03.a Examine and summarize the impact that population growth has on environmental service systems. ESS.02.02.03.b Analyze the correlation between increased population size and the need for regulation of environmental service systems. ESS.02.02.04.a Research current policies related to fracking and shale oil gas. ESS.02.02.04.b Assess whether current policies related to fracking and shale oil gas sufficiently address the needs of environmental service systems. ESS.02.01.01.a Distinguish between the types of laws associated with environmental service systems. ESS.02.01.01.b Analyze the structure associated with environmental service systems ESS.02.01.02.a Distinguish between the types of government agencies (i.e. local, state, and federal) associated with environmental service systems. ESS.02.01.02.b Analyze the specific purpose of government agencies associated with environmental service systems.	
6. ESI Research	AG. 01 analyze how issues, trends, technologies, and public policies impact systems in the AFNR career cluster. ES.01 Use analytical procedures and instruments to manage environmental service systems. NR.01 Plan and conduct natural resource management activities that apply logical, reasoned, and scientifically based solutions to natural resource issues and goals.	AG01.02 Describe current issues impacting AFNR activities. AG.01.03 Identify, organize alternatives, and evaluate public policy issues related to AFNR. ESS 01.02 Analyze and interpret results of sample measurements. NRS 01.05. Execute natural resource strategies and activities applying specific knowledge from the study of ecology and wildlife.		

	NRS.02 Plan and analyze interrelationships between natural resources and humans needed to manage natural resource systems.	NRS.02.01 Examine natural resource topics using science concepts, processes, and research techniques.		

CAS Academic Standards Alignment: Online Version: https://www.cde.state.co.us/apps/standards/**;** Download version: https://www.cde.state.co.us/apps/standards/

Reading, Writing, and Communicating: Science & Technical Subjects

- RST11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinction the author makes and to any gaps or inconsistencies in the account.
- RST11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem.
- RST9-10.8 Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
- RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- RST11-12.9 Synthesize information from a range of sources (e.g. texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
- WHST9-10.2/11-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
- WHST9-10.5/11-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- WHST9-10.7/11-12.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- WHST9-10.9/11-12.9 Draw evidence from informational texts to support analysis, reflection, and research.

Math:

- MA.HS.F-BF.A Building Functions: Build a function that models a relationship between two quantities.
- MA.HS.N-Q.A – Quantities: Reason quantitatively and use units to solve problems..

Essential Skills:

<u>Problem Solver:</u>

- Critical Thinking and Analysis: The ability to apply a deliberate process of identifying problems, gathering information, and weighing possible solutions, including: making choices rooted in understanding patterns, cause-and-effect relationships, and the impacts that a decision can have on the individual and others.
- Creativity and innovation: the ability to demonstrate curiosity and imagination through experimenting with new and emerging ideas.

Community Member:

- Social Awareness: the ability to understand the perspectives of, empathize with, feel compassion for, and recognize strengths in others, including those from diverse backgrounds, cultures, and contexts and how they affect social interactions.
- Civic Engagement: The ability to develop and apply knowledge, skills, and habits gained from experiences – within communities of diverse perspectives – to address issues, affect change, and/or solve problems.
- Global and cultural awareness: the ability to collaborate with individuals from diverse backgrounds and/or cultures to address national and global issues, and to develop complex, appropriate, and workable solutions.

Communicator:

- Interpersonal communication: the ability to establish and maintain healthy and supportive relationships, including: the capacity to communicate clearly by successfully conveying information and feelings, listening actively, setting boundaries, negotiating conflict constructively, and seeking or offering support and help when needed.

Empowered Individual:

- Self-Awareness: the ability to understand one's own emotions, thoughts, and values, and how personal actions and emotions influence behavior across contexts, including: the capacity to recognize one's strength and limitations with a well-grounded sense of confidence and purpose.
- Career Awareness: The ability to apply the knowledge and understanding of how one's dreams, experiences, and interests translate into career fulfillment and lifelong pursuits in local, regional, national, and global career pathways and opportunities.