

Colorado Environmental Science Course Scope and Sequence

<b>Course Name</b>	<b>Geological Sciences</b>	<b>Course Details</b>  <b>Course = 0.50 Carnegie Unit Credit</b>	Level 2 course, second course in the Geological Resources strand.	
<b>Course Description</b>	This course walks students through the basic understanding of geology, from the earth’s internal structures, rock formations through meteorology, mining, fossil fuels, fracking, climate change, and energy resources in regarding to the earth’s resources, reserves, and successfully utilization of those resources through an increase in human activities and use. This course will be a prerequisite for the level 4 course of Geographic Information Systems			
<b>Note:</b>	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 <a href="https://www.cde.state.co.us/standardsandinstruction/essentialskills">https://www.cde.state.co.us/standardsandinstruction/essentialskills</a>				
Unit Number, Title and Brief Description	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration
<b>Mapping</b>	NRES.02 Recognize the importance of navigation and the variety of navigational tools.	NRES.02.01 Understand topographic maps, their features and uses.	<p>NRES.02.01.a Describe the purpose of topographical maps.</p> <p>NRES.02.01.b Identify features of a topographical maps</p> <p>NRES.02.01.c utilize a map for a specific purpose (route an irrigation ditch, determine watershed, plot a route/migration)</p> <p>NRES.02.01.d Create a topographical map of your local area.</p>	
<b>Internal structure of the Earth</b>	ESS.03 Develop proposed solutions to environmental issues, problems, and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry, and ecology	<p>ESS.03.01 Apply meteorology principles to environmental service systems.</p> <p><a href="#">RST.11-12.1</a></p> <p><a href="#">RST.11-12.2</a></p> <p><a href="#">RST.11-12.7</a></p> <p><a href="#">WHST.9-12.7</a></p> <p><a href="#">MA.HS.N.Q.A</a></p>	<p>ESS.03.01.01.a Distinguish between the different components and structural layers of the earth’s atmosphere.</p> <p>ESS.03.01.01.b Differentiate how components of the atmosphere (e.g. weather systems and pattern, structure of the atmosphere, etc) affect environmental service systems.</p> <p>Identify and discuss the importance of the three pillars of the sustainability triangle.</p>	

		<p>Understand the uneven distribution of resources around the earth.</p> <p>Understanding the life cycle components of natural resources in relation to internal structures of the earth and how they reflect positive and negative changes.</p>		
<b>Mines, Ores, &amp; Minerals</b>	NRES.04 Recognize the areas of resource management and understand their importance.	NRES.04.08 Appropriately manage mining and mineral resources.	<p>NRES.04.08.a Identify valuable minerals in your local area and around Colorado.</p> <p>NRES.04.08.b Distinguish methods of mineral (optional inclusion of gems) extraction and reclamation.</p> <p>NRES.04.08.c Analyze the impact of mineral extraction (economic and environmental)</p> <p>NRES.04.08.d Create a reclamation and extraction plan.</p> <p>Research a current problem or challenge in this unit and develop possible solutions for improvement and sustainability.</p>	
<b>Fossil Fuels &amp; Hydraulic Fracturing</b>	NRS.03 Develop plans to ensure sustainable production and processing of natural resources.	<p>NRS.03.01 Sustainably produce, harvest, process, and use natural resources (e.g. forest products, wildlife, minerals, fossil fuels, shale oil, alternative energy, recreation, aquatic species, etc)</p> <p><a href="#">RST.11-12.1</a></p> <p><a href="#">RST.11-12.2</a></p> <p><a href="#">RST.11-12.7</a></p> <p><a href="#">WHST.9-12.7</a></p> <p><a href="#">MA.HS.N.Q.A</a></p>	<p>NRS.03.01.04.a Compare and contrast the costs and benefits (e.g. impacts on environmental, economic, wildlife, etc) of fossil fuels to a local, state, and/or national economy.</p> <p>NRS.03.01.04.b Assess the economic impact of fossil fuel extraction in regards to the costs and benefits to a local, state, and/or national economy.</p> <p>NRS.03.01.04.c Evaluate methods used to extract and process fossil fuels for economic, environmental, and social sustainability.</p> <p>NRS.03.01.05.a Compare and contrast the costs and benefits (e.g. environmental impacts, etc) of shale oil from fracking to a local, state, and/or national economy.</p>	

			<p>NRS.03.01.05.b Assess the economic impact of shale oil extraction (i.e. fracking) in regards to the costs and benefits to a local, state, and/or national economy.</p> <p>NRS.03.01.05.c Evaluate methods used to extract and process shale oil for economic, environmental, and social sustainability.</p>	
<b>Geological Technologies</b>	<p>NRS.03 Develop plans to ensure sustainable production and processing of natural resources.</p> <p>NRES.02 Recognize the importance of navigation and the variety of navigational tools.</p>	<p>NRS.03.02 Demonstrate cartographic skills, tools, and technologies to aid in developing, implementing, and evaluating natural resource management plans</p> <p><i>RST.11-12.1</i>  <i>RST.11-12.2</i>  <i>RST.11-12.7</i>  <i>WHST.9-10.7</i>  <i>WHST.11-12.7</i></p> <p><i>MA.HS.N.Q.A</i></p> <p>NRES.02.03 Describe the functionality of global positioning systems</p>	<p>NRS.03.02.01.a Summarize how to use maps and technologies to identify directions, land features, calculate actual distance and determine the elevation of points.</p> <p>NRS.03.02.01.b Apply cartographic skills, tools, and technologies (e.g. land surveys, geographic coordinate systems, etc) to locate natural resources.</p> <p>NRES.02.03.a Define GPS and identify equipment used in GPS.</p> <p>NRES.02.03.b Plot locations (way points) using GPS.</p> <p>NRES.02.03.c Calculate area using GPS</p> <p>NRES.02.03.d Utilize GPS data in wildlife management case studies.</p> <p>ESS.05.01.01.a Examine the importance and describe applications of surveying and mapping for environmental service systems.</p>	
<b>Energy Resources and impact on Climate Change</b>	<p>ESS.04 Demonstrate the operation of environmental service systems (e.g. pollution control, water treatment, wastewater treatment, solid waste management, and energy conservation)</p>	<p>ESS.04.04 Compare and contrast the impact of conventional and alternative energy sources on the environment and operation of environmental service systems.</p> <p><i>RST.11-12.1</i></p>	<p>ESS.04.04.05.a Examine and explain how energy consumption and the carbon cycle relate to environmental monitoring.</p> <p>ESS.04.04.05.b Calculate the impact of the carbon cycle imbalance (due to energy</p>	

	<p>HS-ESS2-4 Use a model to describe how variations in the flow of energy into and out of the Earth's systems result in changes in climate.</p> <p>HS-ESS3-5 Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.</p>	<p><i>RST.11-12.8</i>  <i>WHST.9-10.5</i>  <i>WHST.11-12.5</i>  <i>WHST.9-10.7</i>  <i>WHST. 11-12.7</i>  <i>RST.11-12.2</i>  <i>RST.11-12.9</i>  <i>WHST.11-12.9</i></p> <p><i>MA.HS.N.Q.A</i></p>	<p>consumption) and assess how this imbalance affects environmental service systems.</p> <p>ESS.04.04.06.a Research and describe the purpose and applications of life cycle assessments to environmental service systems.</p> <p>ESS.04.04.06.b Interpret a life cycle assessment and explain how it can be utilized in environmental service systems to assess the potential ecological impact of an energy source.</p>	
<p><b>Sustainability (project-based)</b></p>	<p>ESS.05 Use tools, equipment, machinery, and technology common to tasks in environmental service systems.</p> <p>SS.HS.2.2 Geographic variables influence interaction of people, places, and environments. (i.e. Water pollution, air pollution, etc)</p>	<p>ESS.05.01. Use technological and mathematical tools to map land, facilities, and infrastructure for environmental service systems.</p> <p>ESS.05.02 Perform assessment of environmental conditions using equipment, machinery, and technology</p> <p>Understand the Sustainability Triangle</p> <p>Essential Question: How do Geographic variables influence interaction of people, places, and environments.</p>	<p>ESS.05.01.01.b Apply surveying and mapping principles to a situation involving environmental service systems and identify and explain the use of equipment for surveying and mapping.</p> <p>ESS.05.01.01.c Demonstrate surveying and cartographic skills to make site measurement in order to address concerns and needs within an environmental service system situation.</p> <p>ESS.05.02.01.a Research and summarize methods used to determine water quality (e.g. dissolved oxygen, chemical tests, macroinvertebrates, etc) and determine if a source of water has been contaminated.</p> <p>ESS.05.02.01.b Assess different measurements of water quality to determine their effectiveness and limitations.</p> <p>ESS.05.02.02.a Research and summarize methods and tools used to measure soil health and determine if an area of land has been contaminated (e.g. soil probes, core monolith, soil fertility tests, etc)</p> <p>ES.05.02.02.b Assess different measurements of soil quality (e.g. soil horizons, soil texture, organic matter, soil respiration, etc) to determine their effectiveness and limitations.</p>	

			<p>ESS.05.02.03.a Research and summarize methods and tools used to determine air quality and determine if pollution is present (e.g. CO2 probe, particulate matter sampler, etc)</p> <p>ESS.05.02.03.b Assess different measurements of air quality (e.g ozone, carbon monoxide, particulate matter, etc) to determine their effectiveness and limitations.</p>	
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**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.
- 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.
- WHST11-12.2 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.

### **Math:**

- MA.HS.N-Q.A – Quantities: Reason quantitatively and use units to solve problems..

### **Essential Skills:**

#### Problem Solver:

- 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.