

Colorado CTE Course – Scope and Sequence

Course Name	AP Environmental Science		Course Details Course Requirements Recommended Prerequisites	Level 4 course of Energy pathway	
Course Description SCED #: 03207	The AP Environmental Science course is designed to engage students with the scientific principles, concepts, and methodologies required to understand the interrelationships within the natural world. The course requires that students identify and analyze natural and human-made environmental problems, evaluate the relative risks associated with these problems, and examine alternative solutions for resolving or preventing them. Environmental science is interdisciplinary, embracing topics from geology, biology, environmental studies, environmental science, chemistry, and geography.				
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. A complete guide to the course can be found here: AP Environmental Course and Exam Description				
Total Number of Periods Total Number of Minutes Total Number of Hours	130 5850 98	Schedule calculation based on 130 calendar days of two 90-day semesters. Scope and sequence allows for additional time for guest speakers, student presentations, field trips, remediation, or other content topics.			
Unit Number, Title and Brief Description	# Class Periods (assumes 45 minute periods)	CTE or Academic Standard Alignment	Competency / Performance Indicator	Outcome / Measurement	CTSO Integration
Unit 1: The Living World: Ecosystems	~14–15	The first unit sets the foundation for the course by examining the Earth as a system with interdependent components, processes, and relationships. Students will examine the distribution of resources in ecosystems and its influences on species interactions. There is a global distribution of terrestrial and aquatic biomes—regional ecosystems—that each have	● Ecosystems are the result of biotic and abiotic interactions. ● Energy can be converted from one form to another.	● Describe the global distribution and principal environmental aspects of terrestrial biomes ● Describe the global distribution and principal environmental aspects of aquatic biomes ● Explain the steps and reservoir interactions in the carbon cycle.	

		specific environmental features based on their shared climate. This distribution is dynamic, and it has changed due to global climate change. Each ecosystem relies on biogeochemical cycles for survival. These cycles facilitate the acquisition and transfer of energy into usable forms, and they can be altered by human activities. In subsequent units, students will apply their understanding of ecosystems to the living world and examine the importance of biodiversity <i>SCIENCE: SC.HS.2.4</i> <i>SC.HS.2.5</i>		● Explain the steps and reservoir interactions in the nitrogen cycle. ● Explain the steps and reservoir interactions in the phosphorus cycle ● Explain the steps and reservoir interactions in the hydrologic cycle. ● Explain how solar energy is acquired and transferred by living organisms. ● Explain how energy flows and matter cycles through trophic levels. ● Determine how the energy decreases as it flows through ecosystems. ● Describe food chains and food webs, and their constituent members by trophic level	
Unit 2: The Living World: Biodiversity	~11–12	Biodiversity, which includes genetic, species, and habitat diversity, is critically important to ecosystems. Biodiversity in ecosystems is	● Ecosystems have structure and diversity that change over time.	● Explain levels of biodiversity and their importance to ecosystems.	

		a key component to sustaining life within the living world. Natural and human disruptions have short- and long-term impacts on ecosystems. Ecological succession can occur in terrestrial and aquatic ecosystems in both developed and developing areas. Organisms within ecosystems must adapt to the changes created by these disruptions. In subsequent units, students will examine in greater detail how populations change over time <u>SCIENCE: SC.HS.2.4</u>		• Describe ecosystem services • Describe the results of human disruptions to ecosystem services. • Describe island biogeography • Describe the role of island biogeography in evolution • Describe ecological tolerance • Explain how natural disruptions, both short and long-term, impact an ecosystem. • Describe how organisms adapt to their environment • Describe ecological succession • Describe the effect of ecological succession on ecosystems	
Unit 3: Populations	~12–13	Populations within ecosystems change over time in response to a variety of factors. This unit examines the relationship between the	• Populations change over time in reaction to a variety of factors	• Identify differences between generalist and specialist species.	

		type of species and the changes in a habitat over time. Specialist species are advantaged by habitats that remain constant, while generalist species tend to be advantaged by habitats that are changing. Different reproductive patterns, including those exhibited by K- and r-selected species, also impact changes to population. Population growth is limited by environmental factors, especially by the availability of resources and space. In subsequent units, students will explore how increases in populations affect earth systems and resources, land and water use, and energy resources <i>SCIENCE: SC.HS.2.4</i>	Human populations change in reaction to a variety of factors, including social and cultural factors	- Identify differences between K- and r-selected species. - Explain survivorship curves. - Describe carrying capacity - Describe the impact of carrying capacity on ecosystems. - Explain how resource availability affects population growth. - Explain age structure diagrams. - Explain factors that affect total fertility rate in human populations. - Explain how human populations experience growth and decline. - Define the demographic transition.	
Unit 4: Earth Systems and Resources	~11–12	This unit explores earth systems and its resources that support life. Geological changes that occur to earth systems at convergent and divergent boundaries can result in the creation of	- Earth's systems interact, resulting in a state of balance over time - Most of the Earth's atmospheric processes are driven	Describe the geological changes and events that occur at convergent, divergent, and	

		mountains, island arcs, earthquakes, volcanoes, and seafloor spreading. Soils are a resource, formed when parent material is weathered, transported, and deposited. The atmosphere is another resource, composed of certain percentages of major gases. Climate is influenced by the sun's energy, Earth's geography, and the movement of air and water. In subsequent units, students will examine how humans use natural resources and the impact on the environment <u>SCIENCE: SC.HS.3.3</u>	by input of energy from the sun	transform plate boundaries. ● Describe the characteristics and formation of soil. ● Describe similarities and differences between properties of different soil types. ● Describe the structure and composition of the Earth's atmosphere. ● Explain how environmental factors can result in atmospheric circulation ● Describe the characteristics of a watershed. ● Explain how the sun's energy affects the Earth's surface. ● Describe how the Earth's geography affects weather and climate. ● Describe the environmental changes and effects that result from El Niño or La Niña events (El	
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				Niño–Southern Oscillation)	
Unit 5: Land and Water Use	~18–19	This unit explores human activities that disrupt ecosystems both positively and negatively and the methods employed to reduce impact. It examines human use of natural resources through many means, including mining and clearcutting, and the impacts on the environment. Agricultural practices in particular can cause environmental disruption. For example, one of the largest uses of freshwater is for irrigation. Every irrigation method employed for agriculture has its own benefits and drawbacks. In subsequent units, students will examine different types of energy resources, the consumption of these resources, and the impact on the environment. <u>SCIENCE: SC.HS.2.13</u>	• When humans use natural resources, they alter natural systems • Humans can mitigate their impact on land and water resources through sustainable use.	• Explain the concept of the tragedy of the commons. • Describe the effect of clearcutting on forests • Describe changes in agricultural practices • Describe agricultural practices that cause environmental damage. • Describe different methods of irrigation. • Describe the benefits and drawbacks of different methods of irrigation. • Describe the benefits and drawbacks of different methods of pest control. • Identify different methods of meat production • Describe the benefits and	

				drawbacks of different methods of meat production. ● Describe causes of and problems related to overfishing. ● Describe natural resource extraction through mining. ● Describe ecological and economic impacts of natural resource extraction through mining. ● Describe the effects of urbanization on the environment. ● Explain the variables measured in an ecological footprint. ● Explain the concept of sustainability ● Describe methods for mitigating problems related to urban runoff ● Describe integrated pest management	
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				• Describe the benefits and drawbacks of integrated pest management (IPM). • Describe sustainable agricultural and food production practices. • Describe the benefits and drawbacks of aquaculture. • Describe methods for mitigating human impact on forests.	
Unit 6: Energy Resources and Consumption	~16–17	This unit examines human use of renewable and nonrenewable sources of energy and its impact on the environment. Energy consumption differs throughout the world and the availability of natural energy resources depends on the region's geologic history. Subsequent units will examine the impact of human activity on the atmosphere, land, and water <u>SCIENCE: SC.HS.3.9</u>	• Humans use energy from a variety of sources, resulting in positive and negative consequences.	• Identify differences between nonrenewable and renewable energy sources. • Describe trends in energy consumption. • Identify types of fuels and their uses. • Identify types of fuels and their uses. • Describe the use and methods of fossil fuels in power generation.	

				● Describe the effects of fossil fuels on the environment. ● Describe the use of nuclear energy in power generation. ● Describe the effects of the use of nuclear energy on the environment. ● Describe the effects of the use of biomass in power generation on the environment. ● Describe the use of solar energy in power generation. ● Describe the effects of the use of solar energy in power generation on the environment. ● Describe the use of hydroelectricity in power generation. ● Describe the effects of the use of hydroelectricity in power generation on the environment. ● Describe the effects of the use	
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				of hydroelectricity in power generation on the environment. • Describe the effects of the use of geothermal energy in power generation on the environment • Describe the use of hydrogen fuel cells in power generation. • Describe the effects of the use of hydrogen fuel cells in power generation on the environment • Describe the use of wind energy in power generation. • Describe the effects of the use of wind energy in power generation on the environment. • Describe methods for conserving energy.	
Unit 7: Atmospheric Pollution	~11–12	Air pollution has many sources and effects, both indoors and outdoors. Air is a natural resource that covers the Earth and crosses many	• Human activities have physical, chemical, and biological	• Identify the sources and effects of air pollutants.	

		system boundaries. Human activities affect the quality of the air both indoors and outdoors. Through legislation, the Clean Air Act regulates the emission of air pollutants that affect human health. The gases and particulates in the atmosphere come from both natural and human sources; once air pollution sources are identified, methods can be used to reduce it. Subsequent units will focus on pollution's impacts to land and water.	consequences for the atmosphere	● Identify the sources and effects of air pollutants. ● Describe natural sources of CO₂ and particulates ● Identify indoor air pollutants. ● Describe the effects of indoor air pollutants ● Explain how air pollutants can be reduced at the source. ● Explain how air pollutants can be reduced at the source. ● Describe the effects of acid deposition on the environment ● Describe human activities that result in noise pollution and its effects	
Unit 8: Aquatic and Terrestrial Pollution	~19–20	Pollution created by human activities directly impacts ecosystems in the air, on land, and in water. The source of pollution can sometimes be easy to identify, but other times the source is diffused. There are many human health issues	● Human activities, including the use of resources, have physical, chemical, and biological consequences for ecosystems ● Pollutants can have both direct and	● Identify differences between point and nonpoint sources of pollution. ● Describe the impacts of human activities on aquatic ecosystems.	

		that can be linked to pollution. Legislation has been created to reduce discharges of pollution in water and regulate drinking water. Increases in waste cause global concerns for organisms that live on land and in water. In the final unit, students will explore how local and regional human activities can have a global impact <u>SCIENCE: SC.HS.3.6</u>	indirect impacts on the health of organisms, including humans	● Describe endocrine disruptors ● Describe the effects of endocrine disruptors on ecosystems. ● Describe the effects of endocrine disruptors on ecosystems. ● Describe the effects of endocrine disruptors on ecosystems. ● Describe the effects of thermal pollution on aquatic ecosystems. ● Describe the effects of thermal pollution on aquatic ecosystems. ● Describe the effects of thermal pollution on aquatic ecosystems. ● Describe the effects of thermal pollution on aquatic ecosystems.	
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				• Describe solid waste disposal methods • Describe solid waste disposal methods • Describe changes to current practices that could reduce the amount of generated waste and their associated benefits and drawbacks • Describe best practices in sewage treatment. • Define lethal dose 50% (LD50) • Evaluate dose response curves • Identify sources of human health issues that are linked to pollution • Explain human pathogens and their cycling through the environment. •	
Unit 9: Global Change	~19–20	A central aspect of environmental science is to understand the global impact of local and regional human activities. Humans can	• Local and regional human activities can have impacts at the global level	• Local and regional human activities can have impacts at the global level	

		mitigate their impact through sustainable use of resources. Human activities can cause ozone depletion in the stratosphere and increases in the greenhouse gases in the atmosphere. Increases in greenhouse gases can cause human health and environmental problems. These environmental problems include global climate change, ocean warming, and endangered species. Overall, this course provides an opportunity to examine the interrelationships among the natural world and challenges students to evaluate and propose solutions to a variety of environmental problems <i>SCIENCE: SC.HS.3.7</i> <i>SC.HS.3.10</i> <i>SC.HS.3.11</i> <i>SC.HS.3.12</i>	• The health of a species is closely tied to its ecosystem, and minor environmental changes can have a large impact	• Describe chemicals used to substitute for chlorofluorocarbons (CFCs) • Identify the greenhouse gases. • Identify the sources and potency of the greenhouse gases. • Identify the threats to human health and the environment posed by an increase in greenhouse gases • Explain how changes in climate, both short- and longterm, impact ecosystem • Explain the causes and effects of ocean warming • Explain the causes and effects of ocean acidification. • Explain the causes and effects of ocean acidification. • Explain how species become endangered and strategies to combat the problem	
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				● Explain how human activities affect biodiversity and strategies to combat the problem.	
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Academic Standards Alignment

Colorado CTE courses are required to integrate academic and essential skills into course content. The following academic standards have been identified as aligned to this course and should be integrated throughout instruction.

[CO CTE Academic Standards Resources \(Rubrics, integration strategies, etc\)](#)

[CDE Colorado Academic Standards Online \(Online standards lookup tool\)](#)

Standard 1: Oral Expression and Listening

- Prepared Graduate 1: Collaborate effectively as group members or leaders who listen actively and respectfully; pose thoughtful questions, acknowledge the ideas of others; and contribute ideas to further the group’s attainment of an objective.
 - Students collaborate to investigate environmental issues, evaluate sustainability strategies, analyze human impacts on ecosystems, and develop solutions to local and global environmental challenges.

Standard 2: Reading for All Purposes

- Prepared Graduate 4: Read a wide range of informational texts to build knowledge and to better understand the human experience.
 - Students analyze scientific and technical texts related to ecosystem interactions, biodiversity, climate change, natural resources, geological processes, ocean acidification, sustainability, and environmental management to develop environmental literacy and scientific understanding.
- Prepared Graduate 5: Understand how language functions in different contexts, command a variety of word-learning strategies to assist comprehension, and make effective choices for meaning or style when writing and speaking.
 - Students develop and apply specialized vocabulary related to ecology, biodiversity, climate science, geoscience, sustainability, natural resource management, environmental policy, and ecosystem interactions.

Standard 3: Writing and Composition

- Prepared Graduate 6: Craft arguments using techniques specific to the genre.
 - Students construct evidence-based arguments regarding climate change, biodiversity conservation, natural resource management, sustainability practices, and environmental policy using scientific data and environmental evidence.

- Prepared Graduate 7: Craft informational/explanatory texts using techniques specific to the genre.
 - Students develop scientific explanations, environmental analyses, sustainability evaluations, and technical reports that communicate findings related to ecosystems, climate systems, biodiversity, and human-environment interactions.

Standard 4: Research Inquiry and Design

- Prepared Graduate 10: Gather information from a variety of sources; analyze and evaluate its quality and relevance; and use it ethically to answer complex questions.
 - Students investigate ecosystem dynamics, biodiversity loss, climate change, ocean acidification, natural resource use, geological hazards, and sustainability practices by gathering and evaluating scientific data, environmental evidence, and research findings to address complex environmental challenges.

Note: *Mathematics and Science standards will be added in the future. Visit the [Colorado Academic Standards](#) page for the most current version.*