

Colorado CTE Course – Scope and Sequence

Course Name	AP Environmental Science		Course Details Course Requirements Recommended Prerequisites		
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 specific environmental features based on their shared climate. This distribution is dynamic, and it has changed due to global climate change. Each	<ul style="list-style-type: none"> • Ecosystems are the result of biotic and abiotic interactions. • Energy can be converted from one form to another. 	<ul style="list-style-type: none"> • 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. • Explain the steps and reservoir interactions in the nitrogen cycle. 	

		<p>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</p> <p><i>SCIENCE: SC.HS.2.4</i> <i>SC.HS.2.5</i></p>		<ul style="list-style-type: none"> ● 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 	
<p>Unit 2: The Living World: Biodiversity</p>	<p>~11–12</p>	<p>Biodiversity, which includes genetic, species, and habitat diversity, is critically important to ecosystems. Biodiversity in ecosystems is a key component to sustaining life within the living world. Natural and human disruptions have short- and long-term impacts on ecosystems. Ecological</p>	<ul style="list-style-type: none"> ● Ecosystems have structure and diversity that change over time. 	<ul style="list-style-type: none"> ● Explain levels of biodiversity and their importance to ecosystems. ● Describe ecosystem services ● Describe the results of human disruptions to ecosystem services. 	

		<p>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</p> <p><u>SCIENCE: SC.HS.2.4</u></p>		<ul style="list-style-type: none"> ● 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 	
<p>Unit 3: Populations</p>	<p>~12–13</p>	<p>Populations within ecosystems change over time in response to a variety of factors. This unit examines the relationship between the 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,</p>	<ul style="list-style-type: none"> ● Populations change over time in reaction to a variety of factors ● Human populations change in reaction to a variety of factors, including social and cultural factors 	<ul style="list-style-type: none"> ● Identify differences between generalist and specialist species. ● Identify differences between K- and r-selected species. ● Explain survivorship curves. ● Describe carrying capacity ● Describe the impact of carrying 	

		<p>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</p> <p><i>SCIENCE: SC.HS.2.4</i></p>		<p>capacity on ecosystems.</p> <ul style="list-style-type: none"> ● 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. 	
<p>Unit 4: Earth Systems and Resources</p>	<p>~11–12</p>	<p>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 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</p>	<ul style="list-style-type: none"> ● Earth’s systems interact, resulting in a state of balance over time ● Most of the Earth’s atmospheric processes are driven by input of energy from the sun 	<ul style="list-style-type: none"> ● Describe the geological changes and events that occur at convergent, divergent, and transform plate boundaries. ● Describe the characteristics and formation of soil. ● Describe similarities and differences between properties of different soil types. ● Describe the structure and 	

		<p>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></p>		<p>composition of the Earth’s atmosphere.</p> <ul style="list-style-type: none"> ● 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 Niño–Southern Oscillation) 	
<p>Unit 5: Land and Water Use</p>	<p>~18–19</p>	<p>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.</p>	<ul style="list-style-type: none"> ● When humans use natural resources, they alter natural systems ● Humans can mitigate their impact on land and water resources through sustainable use. 	<ul style="list-style-type: none"> ● Explain the concept of the tragedy of the commons. ● Describe the effect of clearcutting on forests ● Describe changes in agricultural practices 	

		<p>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.</p> <p><u>SCIENCE: SC.HS.2.13</u></p>		<ul style="list-style-type: none">● 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	
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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
- 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	<p>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</p> <p><u>SCIENCE: SC.HS.3.9</u></p>	<ul style="list-style-type: none"> ● Humans use energy from a variety of sources, resulting in positive and negative consequences. 	<ul style="list-style-type: none"> ● 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. 	

				<ul style="list-style-type: none">● 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 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	
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				<p>generation on the environment</p> <ul style="list-style-type: none"> ● 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. 	
<p>Unit 7: Atmospheric Pollution</p>	<p>~11–12</p>	<p>Air pollution has many sources and effects, both indoors and outdoors. Air is a natural resource that covers the Earth and crosses many 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.</p>	<ul style="list-style-type: none"> ● Human activities have physical, chemical, and biological consequences for the atmosphere 	<ul style="list-style-type: none"> ● Identify the sources and effects of air pollutants. ● 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 	

				<p>deposition on the environment</p> <ul style="list-style-type: none"> ● Describe human activities that result in noise pollution and its effects 	
<p>Unit 8: Aquatic and Terrestrial Pollution</p>	<p>~19–20</p>	<p>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 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</p> <p><u>SCIENCE: SC.HS.3.6</u></p>	<ul style="list-style-type: none"> ● Human activities, including the use of resources, have physical, chemical, and biological consequences for ecosystems ● Pollutants can have both direct and indirect impacts on the health of organisms, including humans 	<ul style="list-style-type: none"> ● Identify differences between point and nonpoint sources of pollution. ● Describe the impacts of human activities on aquatic ecosystems. ● 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. 	

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| | | | | <ul style="list-style-type: none">● 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 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 | |
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				<p>issues that are linked to pollution</p> <ul style="list-style-type: none"> ● Explain human pathogens and their cycling through the environment. ● 	
<p>Unit 9: Global Change</p>	<p>~19–20</p>	<p>A central aspect of environmental science is to understand the global impact of local and regional human activities. Humans can 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</p> <p>SCIENCE: SC.HS.3.7 SC.HS.3.10 SC.HS.3.11</p>	<ul style="list-style-type: none"> ● Local and regional human activities can have impacts at the global level ● The health of a species is closely tied to its ecosystem, and minor environmental changes can have a large impact 	<ul style="list-style-type: none"> ● Local and regional human activities can have impacts at the global level ● 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 	

		<i>SC.HS.3.12</i>		<ul style="list-style-type: none"> ● 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 ● Explain how human activities affect biodiversity and strategies to combat the problem. 	
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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/>

Science:

- SC.HS.2.4 – Organisms interact with the living and non-living components of the environment to obtain matter and energy.
- SC.HS.2.5 – Matter and energy necessary for life are conserved as they move through ecosystems.
- SC.HS.2.13 – Humans have complex interactions with ecosystems and have the ability to influence biodiversity on the planet.
- SC.HS.3.3 – The rock record resulting from tectonic and other geoscience processes as well as object from the solar system can provide evidence of Earth’s early history and the relative age of major geological formations.
- SC.HS.3.6 – The planet’s dynamics are greatly influenced by water’s unique chemical and physical properties.
- SC.HS.3.7 – The role of radiation from the sun and its interactions with the atmosphere, ocean, and land are the foundation for the global climate system. Global climate models are used to predict future changes, including changes influenced by human behavior and natural factors.
- SC.HS.3.9 – Resource availability has guided the development of human society and use of natural resources has associated costs, risks, and benefits.
- SC.HS.3.10 – Natural hazards and other geological events have shaped the course of human history at local, regional, and global scales.
- SC.HS.3.11 – Sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources, including the development of technologies.

- SC.HS.3.12 – Global climate models used to predict future climate change continues to improve our understanding of the impact of human activities on the global climate system.

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:

- 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.

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.