

AP Environmental Science

Curriculum/Content Area: Science	Course Length: 2 terms
Course Title: AP Environmental Science	Date last reviewed: 2018
Prerequisites: Biology and Chemistry highly recommended	Board approval date: May 2018
Primary Resource: Living in the Environment, 18th Ed. G. Tyler Miller & Scott F. Spoolman	

Desired Results

Course description and purpose: Advanced Placement Environmental Science is focused on the study of the interrelationships between organisms and their physical surroundings and the effects man has within the worldwide ecosystem. This course provides students with knowledge to evaluate choices that humans have made that have impacted the environment and optimize worldwide living standards. The course emphasizes the development of scientific principles, which allow students to identify and analyze environmental problems and associated risks. Students also examine solutions that can resolve/prevent ecological problems through critical and creative thinking skills.

Enduring Understandings:	Essential Questions:
<ol style="list-style-type: none"> 1. Earth is made of systems that interact to support life on Earth. 2. Organisms interact with each other and with Earth's systems. 3. Growing human population impacts the environment. 4. Humans use and exploit environmental resources. 5. All organisms depend on land and water to survive. 6. Pollution impacts the environment and human health. 7. Earth is undergoing change due to natural causes and impact of humans. 8. Earth and its resources are protected by environmental laws and treaties. 	<ol style="list-style-type: none"> 1. How do Earth's systems interact? 2. Why is it important to conserve water and soil? 3. How do factors such as solar intensity and climate affect atmospheric and oceanic circulation patterns? 4. How do forces inside the Earth affect its topography? 5. How do the nonliving parts of the Earth's systems provide the basic materials to support life? 6. How is an ecosystem structured in terms of biotic and abiotic factors? 7. How is matter and energy conserved in an ecosystem? 8. Why do biological communities change in response to changing environmental conditions? 9. Why do organisms change over time?

10. How do organisms affect one another's survival and environment?
11. How does the environment affect where and how an organism lives?
12. Why is it important to protect biodiversity?
13. How do changes in population size relate to environmental conditions?
14. Why is it difficult to determine carrying capacity for human populations?
15. How do government agencies regulate human population growth?
16. Why is it important to analyze age structure diagrams to predict future population growth?
17. How can we balance our needs for housing and jobs with the needs of the environment?
18. How can we use Earth's resources sustainably?
19. How can we balance our growing demand for food with our need to protect the environment?
20. How will we be able to depend on nonrenewable energy sources for our energy needs in the future?
21. What are the potential uses and limitations of renewable energy sources?
22. Why is it important to develop alternative energy sources?
23. How is the environment impacted by humans energy use?
24. What is the relationship between environmental health and our own health?
25. How can we ensure everyone has clean air to breathe?
26. How does water pollution affect humans and ecosystems?
27. How we best balance our own interests and needs with the health of the environment?
28. How do our choices as consumers and waste producers affect our environment?
29. How can we best balance our own interests and needs with the health of the environment?

	<p>30. How can we reduce our use of ozone depleting products and reduce the emissions of greenhouse gases?</p> <p>31. What are the causes and consequences of a warming Earth?</p> <p>32. Why is it important to protect biodiversity?</p>
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Priority Standards
<p><u>AP Environmental Standards</u></p> <p>AP.Env.1 Science is a process.</p> <ul style="list-style-type: none"> ○ Science is a method of learning more about the world. ○ Science constantly changes the way we understand the world. <p>AP.Env.2 Energy conversions underlie all ecological processes.</p> <ul style="list-style-type: none"> ○ Energy cannot be created; it must come from somewhere. ○ As energy flows through systems, at each step more of it becomes unusable. <p>AP.Env.3 The Earth itself is one interconnected system.</p> <ul style="list-style-type: none"> ○ Natural systems change over time and space. ○ Biogeochemical systems vary in ability to recover from disturbances. <p>AP.Env.4 Humans alter natural systems.</p> <ul style="list-style-type: none"> ○ Humans have had an impact on the environment for millions of years. ○ Technology and population growth have enabled humans to increase both the rate and scale of their impact on the environment. <p>AP.Env.5 Environmental problems have a cultural and social context.</p> <ul style="list-style-type: none"> ○ Understanding the role of cultural, social and economic factors is vital to the development of solutions. <p>AP.Env.6 Human survival depends on developing practices that will achieve sustainable systems.</p> <ul style="list-style-type: none"> ○ A suitable combination of conservation and development is required. ○ Management of common resources is essential

Earth Systems and Resources
<p>Essential Questions:</p> <ol style="list-style-type: none"> 1. How do Earth's systems interact? 2. Why is it important to conserve water and soil? 3. How do factors such as solar intensity and climate affect atmospheric and oceanic circulation patterns? 4. How do forces inside the Earth affect its topography? 5. How do the nonliving parts of the Earth's systems provide the basic materials to support life?

Standards:

AP Environmental Standards

AP.Env.3 The Earth itself is one interconnected system.

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AP.Env.6 Human survival depends on developing practices that will achieve sustainable systems.

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Learning Targets:

Earth Science Concepts

- I can describe the chemical and physical properties of the geosphere. (AP.Env.3)
- I can identify the plate boundaries and describe the action that is occurring at those boundaries.(AP.Env.3)
- I can describe the effects of the movement of crustal plates (i.e. earthquakes, sea floor spreading, mountain building, volcanic eruptions) at a given location on the planet. (AP.Env.3)

The Atmosphere

- I can describe the composition and properties of each layer of the atmosphere. (AP.Env.3)
- I can explain climate and weather patterns in a particular region are affected by factors, such as proximity to large bodies of water or ice/ocean currents, latitude, altitude, prevailing wind currents, and amount of solar radiation. (AP.Env.3)
- I can describe how global wind and ocean currents are produced on the Earth surface. (AP.Env.3)

Global Water Resources and Use

- I can summarize water availability and use. (AP.Env.3, AP.Env.4)
- I can discuss how fresh water can be both renewable and limited. (AP.Env.3, AP.Env.4)
- I can explain how most groundwater is accessed. (AP.Env.3, AP.Env.4)
- I can relate the causes of surface water depletion to their effects. (AP.Env.3, AP.Env.4)
- I can explain the major causes and effects of groundwater depletion. (AP.Env.3,

AP.Env.4)

- I can describe strategies for addressing water depletion. (AP.Env.5, AP.Env.6)

Soil and Soil Dynamics

- I can describe components of soil. (AP.Env.3)
- I can explain the processes by which soil forms. (AP.Env.3)
- I can describe the horizons that make up a soil profile. (AP.Env.3)
- I can list characteristics of soil. (AP.Env.3)
- I can describe some practices that can lead to soil erosion and some that can prevent it. (AP.Env.3, AP.Env.4, AP.Env.5, AP.Env.6)
- I can explain the ways we use and abuse soils. (AP.Env.4)
- I can explain strategies for soil conservation. (AP.Env.6)

Assessment Evidence:

Performance Assessment Options

May include, but are not limited to the following:

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Other assessment options

May include, but are not limited to the following:

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The Living World

Essential Questions:

1. How is an ecosystem structured in terms of biotic and abiotic factors?
2. How is matter and energy conserved in an ecosystem?
3. Why do biological communities change in response to changing environmental conditions?
4. Why do organisms change over time?
5. How do organisms affect one another's survival and environment?
6. How does the environment affect where and how an organism an organism lives?
7. Why is it important to protect biodiversity?

Standards:

AP Environmental Standards

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AP.Env.3 The Earth itself is one interconnected system.

- Natural systems change over time and space.
- Biogeochemical systems vary in ability to recover from disturbances.

AP.Env.4 Humans alter natural systems.

- Humans have had an impact on the environment for millions of years.
- Technology and population growth have enabled humans to increase both the rate and scale of their impact on the environment.

Learning Targets:

Ecosystem Structure

- I can discuss how species interactions shape biological communities. (AP.Env.3)
- I can summarize how community properties affect species and populations. (AP.Env.3)
- I can recognize the characteristics of some major terrestrial biomes as well as the factors that determine their distribution. (AP.Env.3)
- I can compare the characteristics and biological importance of major aquatic ecosystems. (AP.Env.3)
- I can describe the different levels of organization. (AP.Env.3)
- I can discuss how an organism's habitat relates to its survival. (AP.Env.3)

Energy Flow

- I can understand how living organisms capture energy and create organic compounds. (AP.Env.2)
- I can define species, populations, communities, and ecosystems, and summarize the ecological significance of trophic levels. (AP.Env.2, AP.Env.3)
- I can describe how net primary production varies among biomes. (AP.Env.2)
- I can explain the effect of inefficient energy transfer on community structure. (AP.Env.2)
- I can describe how feeding relationships can have both direct and indirect effects on community members. (AP.Env.2, AP.Env.3)

Ecosystem Diversity

- I can describe how evolution produces species diversity. (AP.Env.3)
- I can summarize how community properties affect species and populations. (AP.Env.3)
- I can describe the primary mechanisms of biological evolution. (AP.Env.3)
- I can list the major causes of loss of biodiversity. (AP.Env.1, AP.Env.3, AP.Env.4)

Natural Ecosystem Change

- I can discuss how species interactions shape biological communities. (AP.Env.3)
- I can explain why communities are dynamic. (AP.Env.3)
- I can describe what happens to a community after a disturbance. (AP.Env.3)

Biogeochemical Cycles

- I can compare the ways that water, carbon, nitrogen, sulfur and phosphorus cycle within ecosystems. (AP.Env.3)
- I can explain how the law of conservation of matter applies to the behavior of nutrients

in the environment. (AP.Env.3)

Assessment Evidence:

Performance Assessment Options

May include, but are not limited to the following:

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Other assessment options

May include, but are not limited to the following:

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Population Dynamics

Essential Questions:

1. How do changes in population size relate to environmental conditions?
2. Why is it difficult to determine carrying capacity for human populations?
3. How do government agencies regulate human population growth?
4. Why is it important to analyze age structure diagrams to predict future population growth?

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Learning Targets:

Human Population Dynamics

- I can explain the usefulness of tracking population size. (AP.Env.4)
- I can describe the factors that influence a population's growth rate. (AP.Env.4)
- I can explain how limiting factors and biotic potential affect population growth. (AP.Env.4)
- I can identify characteristics of human population that are studied by demographers. (AP.Env.5)
- I can summarize the BIDE factors that increase or decrease populations. (AP.Env.5)
- I can explain recent trend in population growth. (AP.Env.5)
- I can explain what age structure diagrams tell about a population. (AP.Env.5)
- I can describe how a demographic transition can lead to stable population size.

(AP.Env.5)

- I can describe how technological advances have contributed to human population growth. (AP.Env.4)

Human Population Size

- I can trace the history of human population growth. (AP.Env.5)
- I can describe total fertility rates and replacement fertility. (AP.Env.5)
- I can relate how social, economic, and religious beliefs affect population growth rates.(AP.Env.5)
- I can discuss strategies employed by governments to curb or promote growth. (AP.Env.5)

Impact of Human Population Growth

- I can relate human population growth with resource use and availability. (AP.Env.4, AP. Env.5,AP.Env.6)
- I can describe how humans impact their environments. (AP.Env.4, AP. Env.5,AP.Env.6)
- I can describe why population growth affects quality of life. (AP.Env.4, AP. Env.5)
- I can describe the impact of increased human population on habitat destruction. (AP.Env.4, AP. Env.5, AP.Env.6)

Assessment Evidence:

Performance Assessment Options

May include, but are not limited to the following:

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Other assessment options

May include, but are not limited to the following:

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Land and Water Use

Essential Questions/Topics of Study:

1. How can we balance our needs for housing and jobs with the needs of the environment?
2. How can we use Earth's resources sustainably?
3. How can we balance our growing demand for food with our need to protect the environment?

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Learning Targets:

Agriculture

- I can describe the methods of organic and sustainable agriculture. (AP.Env.4)
- I can explain the ways we use and abuse soils. (AP.Env.4)
- I can explain several strategies for soil conservation. (AP.Env.6)
- I can identify different types of pest control. (AP.Env.4)
- I can list and discuss the environmental effects of pesticides. (AP.Env.4)
- I can explain the importance of pollinators to agriculture. (AP.Env.3)
- I can explain the importance of industrial agriculture and the Green Revolution. (AP.Env.4, AP.Env.5)

Forestry

- I can discuss the types and uses of the world's forests. (AP.Env.4)
- I can list some of the ecological and economical values of forest resources. (AP.Env.4, AP.Env.5)
- I can describe the costs and benefits of the different methods of timber harvesting. (AP.Env.5)
- I can discuss the potential effects of fire suppression on an ecosystem and on future fires. (AP.Env.3, AP.Env.4)
- I can explain how consumer demand is important to sustainable forestry. (AP.Env.5)
- I can how restoring forests has benefits. (AP.Env.6)

Rangelands

- I can describe the location and state of grazing lands around the world. (AP.Env.4, AP.Env.5)
- I can discuss the current levels of deforestation in the United States and in developing nations. (AP.Env.4, AP.Env.5)
- I can differentiate between land cover and land use, and describe how people affect both. (AP.Env.4)
- I can summarize plans to restore prairies. (AP.Env.6)

Other Land Use

- I can explain how and where urbanization occurs. (AP.Env.5)
- I can describe the environmental impacts of urbanization. (AP.Env.4)
- I can describe the contributors to sprawl and its patterns. (AP.Env.5)
- I can explain the importance of open space to a livable city. (AP.Env.5)
- I can discuss the progress towards sustainability in some cities have made and its importance to the world. (AP.Env.5)
- I can understand urban challenges in the developing world and the developed world. (AP.Env.5)
- I can summarize the types and locations of public lands. (AP.Env.5)

Mining

- I can describe how minerals form. (AP.Env.3)
- I can identify the types of resources that are mined. (AP.Env.3)
- I can describe different methods used for mining. (AP.Env.4)
- I can describe the negative impact of mining on the environment and society. (AP.Env.5)
- I can explain how mining is regulated. (AP.Env.5)
- I can describe ways that mineral use can become more responsible. (AP.Env.1, AP.Env.6)

Fishing

- I can describe different fishing techniques. (AP.Env.4)
- I can discuss the consequences of overfishing on aquatic ecosystems. (AP.Env.4)
- I can discuss the benefits the Clean Water Act has had on aquatic ecosystems. (AP.Env.6)
- I can compare approaches to restoring wetlands and streams. (AP.Env.6)

Global Economics

- I can describe the recent trends in human population and resource consumption. (AP.Env.4, AP.Env.5)
- I can analyze economic worldviews. (AP.Env.5)
- I can describe the Tragedy of the Commons. (AP.Env.4, AP.Env.5, AP.Env.6)
- I can describe some major environmental laws. (AP.Env.5, AP.Env.6)
- I can explain the purposes of international treaties and conventions (AP.Env.5, AP.Env.6)

Assessment Evidence:

Performance Assessment Options

May include, but are not limited to the following:

Other assessment options

May include, but are not limited to the following:

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Energy Resources and Consumption

Essential Questions:

1. How will we be able to depend on nonrenewable energy sources for our energy needs in the future?
2. What are the potential uses and limitations of renewable energy sources?
3. Why is it important to develop alternative energy sources?
4. How is the environment impacted by humans energy use?

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AP.Env.5 Environmental problems have a cultural and social context.

- Understanding the role of cultural, social and economic factors is vital to the development of solutions.

AP.Env.6 Human survival depends on developing practices that will achieve sustainable systems.

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Learning Targets:

Energy Concepts

- I can define different forms of energy. (AP.Env.2)
- I can solve energy conversion problems. (AP.Env.2)
- I can explain the Laws of Thermodynamics. (AP.Env.2)

Energy Consumption

- I can describe how our energy use has varied over time. (AP, Env.2, AP.Env.3)
- I can describe how human society currently uses energy resources. (AP, Env.2,

AP.Env.3)

- I can describe the future demand for energy. (AP, Env.2, AP.Env.3)

Fossil Fuel Resources and Use

- I can explain how fossil fuels are formed. (AP, Env.2, AP.Env.3)
- I can describe the uses of coal and how it is removed from the ground. (AP, Env.2, AP.Env.3)
- I can describe the benefits and disadvantages of using coal. (AP, Env.2, AP.Env.3)
- I can describe the uses of oil and how it is extracted. (AP, Env.2, AP.Env.3)
- I can explain the consequences and rewards of using oil. (AP, Env.2, AP.Env.3)
- I can explain the characteristics and uses of natural gas. (AP, Env.2, AP.Env.3)
- I can illustrate the advantages and disadvantages of natural gas. (AP, Env.2, AP.Env.3)

Nuclear Energy

- I can contrast nuclear fusion with nuclear fission, and explain the issues related to nuclear fission. (AP, Env.2, AP.Env.3)
- I can describe how a nuclear power plant generates electricity. (AP, Env.2, AP.Env.3)
- I can identify the advantages and disadvantages of nuclear power. (AP, Env.2, AP.Env.3)
- I can summarize the potential risk of nuclear power. (AP, Env.2, AP.Env.3)
- I can evaluate the problems of radioactive wastes. (AP, Env.2, AP.Env.3)

Hydroelectric Power

- I can explain how river water can be used to generate electricity. (AP, Env.2, AP.Env.3)
- I can identify benefits and costs of hydropower. (AP, Env.2, AP.Env.3)
- I can illustrate the benefits and problems of dams and diversions. (AP, Env.2, AP.Env.3)

Energy Conversations

- I can explain how conservation can help us meet our energy needs. (AP, Env.2, AP.Env.3)
- I can describe methods of energy conservation. (AP, Env.2, AP.Env.3)
- I can explain CAFE standards. (AP, Env.2, AP.Env.3)
- I can understand energy efficiency standards. (AP, Env.2, AP.Env.3)

Renewable Energy

- I can explain the benefits and current status of renewable energy resources. (AP, Env.2, AP.Env.3)
- I can describe techniques for using solar energy to heat buildings and generate electricity. (AP, Env.2, AP.Env.3)
- I can discuss the differences between active and passive solar energy. (AP, Env.2,

AP.Env.3)

- I can analyze the benefits and cost solar energy. (AP, Env.2, AP.Env.3)
- I can explain how wind energy can be used to produce electricity. (AP, Env.2, AP.Env.3)
- I can analyze the benefits and costs of wind energy. (AP, Env.2, AP.Env.3)
- I can describe how a hydrogen fuel can be produced. (AP, Env.2, AP.Env.3)
- I can discuss the potential of fuels cells. (AP, Env.2, AP.Env.3)
- I can explain the way fuel cells work and how they are used. (AP, Env.2, AP.Env.3)
- I can explain how we get energy from biomass and how it is used. (AP, Env.2, AP.Env.3)
- I can describe how energy from the ocean can generate electricity. (AP, Env.2, AP.Env.3)

Assessment Evidence:

Performance Assessment Options

May include, but are not limited to the following:

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Other assessment options

May include, but are not limited to the following:

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Pollution

Essential Questions/Topics of Study:

1. What is the relationship between environmental health and our own health?
2. How can we ensure everyone has clean air to breathe?
3. How does water pollution affect humans and ecosystems?
4. How we best balance our own interests and needs with the health of the environment?
5. How do our choices as consumers and waste producers affect our environment?

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Learning Targets:

Air Pollution

- I can identify natural sources of air pollution. (AP Env. 3)
- I can discuss human caused air pollution. (AP Env. 4)
- I can explain how climate topography and atmospheric processes affect air quality. (AP Env. 3)
- I can compare the effects of air pollution. (Ap Env. 4, AP Env. 5)
- I can evaluate air pollution control. (AP Env. 5, AP Env. 6)
- I can summarize current air conditions and future prospects. (AP Env. 5, AP Env. 6)

Noise Pollution

- I can identify sources of noise pollution. (AP Env. 4)
- I can describe the effects of noise pollution.(AP Env. 4)
- I can describe control measures for noise pollution. (AP Env. 6)

Water Pollution

- I can define water pollution. (AP Env. 4)
- I can describe the types and effects of water pollutants. (AP Env. 4)
- I can investigate water quality today. (AP Env. 6)
- I can explain water pollution control. (AP Env. 6)
- I can summarize water legislation. (AP Env. 6)

Solid Waste

- I can identify the components of solid waste.(AP Env. 4)
- I can describe how wastes have been and are being disposed of or treated. (AP Env. 4, AP Env. 6)
- I can identify how we might shrink the waste system. (AP Env. 6)

Hazards to Human Health

- I can describe health and disease and how global disease burden is now changing. (AP Env. 6)
- I can list the types of environmental health hazards. (AP.Env.4, AP.Env.5)
- I can discuss how chemical hazards affect human health. (AP.Env.4, AP.Env.5)
- I can compare and contrast epidemiology and toxicology. (AP.Env.4, AP.Env.5)
- I can explain why emerging diseases are important to monitor and control. (AP.Env.4, AP.Env.5)
- I can characterize mechanisms for minimizing toxic effects. (AP.Env.4, AP.Env.5)
- I can explain ways we measure and describe toxicity. (AP.Env.4, AP.Env.5)
- I can evaluate risk assessment and acceptance. (AP.Env.4, AP.Env.5)
- I can describe the reasons why individuals respond differently to the same

environmental hazards. (AP Env. 4, AP Env. 5)

Hazardous Chemicals in the Environment

- I can describe some of the sources of hazardous waste. (AP.Env.4, AP.Env.5)
- I can investigate hazardous and toxic wastes. (AP.Env.4, AP.Env.5)
- I can explain what makes chemicals hazardous. (AP.Env.4, AP.Env.5)
- I can discuss where chemical hazards can be found in the environment. (AP.Env.4)
- I can describe current methods for hazardous waste disposal. (AP.Env.6)
- I can list some indoor chemical hazards. (AP.Env.4)
- I can describe biomagnification. (AP.Env.3, AP.Env.4)
- I can identify agencies that regulate hazardous waste. (AP.Env.5, AP.Env.6)

Economic Impacts

- I can explain the relationship between economics and the environment. (AP.Env.5)
- I can analyze economic worldviews. (AP.Env.5)
- I can scrutinize population, technology, and scarcity. (AP.Env.5)
- I can summarize how market mechanisms can reduce pollution. (AP.Env.5, AP.Env.6)
- I can describe ways that economies are working toward sustainability. (AP.Env.5, AP.Env.6)

Assessment Evidence:

Performance Assessment Options

May include, but are not limited to the following:

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Other assessment options

May include, but are not limited to the following:

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Global Change

Essential Questions/Topics of Study:

1. How can we best balance our own interests and needs with the health of the environment?
2. How can we reduce our use of ozone depleting products and reduce the emissions of greenhouse gases?
3. What are the causes and consequences of a warming Earth?
4. Why is it important to protect biodiversity?

Standards:

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Learning Targets:

Stratospheric Ozone

- I can explain how stratospheric ozone is formed. (AP.Env.2, AP.Env.3)
- I can explain how air pollutants cause ozone depletion. (AP.Env.2, AP.Env.4)
- I can describe the effects of ozone depletion. (AP.Env.4)
- I can describe strategies for reducing ozone depletion. (AP.Env.1, AP.Env.5, AP.Env.6)
- I can describe some major environmental laws dealing with ozone depletion (AP.Env.5)
- I can describe international efforts to reduce the ozone hole. (AP.Env.1, AP.Env.5)

Climate Change

- I can identify evidence of global climate change. (AP.Env.3, AP.Env.4, AP.Env.5)
- I can state the probable cause of global climate change. (AP.Env.3, AP.Env.4)
- I can explain how science points toward climate change being human influenced. (AP.Env.4)
- I can list some effects of climate change. (AP.Env.4)
- I can explain how climate change is affecting people now. (AP.Env.5)
- I can predict future effects of climate change on people. (AP.Env.1, AP.Env.5, AP.Env.6)
- I can identify some solutions being developed to slow climate change. (AP.Env.5, AP.Env.6)
- I can list ways to reduce greenhouse gases related to the use and generation of electricity. (AP.Env.5, AP.Env.6)
- I can describe strategies for reducing greenhouse gases. (AP.Env.5, AP.Env.6)
- I can describe some major environmental laws dealing with climate change. (AP.Env.5,

AP.Env.6)

- I can explain how nations are working together to try to address climate change. (AP.Env.1, AP.Env.5, AP.Env.6)

Loss of Biodiversity

- I can differentiate the components of biodiversity. (AP.Env.3)
- I can characterize the threats to biodiversity. (AP.Env.4, AP.Env.5)
- I can scrutinize captive breeding and species survival plans. (AP.Env.6)
- I can summarize the types and locations of nature preserves. (AP.Env.4)
- I can describe strategies for managing whole ecosystems and habitats. (AP.Env.5)
- I can describe some major environmental laws dealing with loss of biodiversity. (AP.Env.5, AP.Env.6)
- I can describe how biodiversity is monitored and explain current biodiversity trends. (AP.Env.4, AP.Env.6)

Assessment Evidence:

Performance Assessment Options

May include, but are not limited to the following:

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Other assessment options

May include, but are not limited to the following:

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