
*The Mission of the Chardon Local Schools is High Achievement
for All Students, Where Learning is Our Most Important Work.*

Science Course of Study:
AP ENVIRONMENTAL SCIENCE

Revised March 2022



AP Environmental Science Course of Study

Committee Members: Rebecca Schneider

Description: 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.

Strand: AP Environmental Science

<p>Learning Standards: Unit 1 The living World</p> <p>1.1 - Introduction to Ecosystems</p> <ul style="list-style-type: none">- Explain how the availability of resources influences species interactions. <p>1.2 Terrestrial Biomes</p> <ul style="list-style-type: none">- Describe the global distribution and principal environmental aspects of terrestrial biomes. <p>1.3 Aquatic Biomes</p> <ul style="list-style-type: none">- Describe the global distribution and principal environmental aspects of aquatic biomes. <p>1.4 The Carbon Cycle</p> <ul style="list-style-type: none">- Explain the steps and reservoir interactions in the carbon cycle. <p>1.5 The Nitrogen Cycle</p> <ul style="list-style-type: none">- Explain the steps and reservoir interactions in the nitrogen cycle. <p>1.6 The Phosphorus Cycle</p> <ul style="list-style-type: none">- Explain the steps and reservoir interactions in the phosphorus cycle. <p>1.7 The Hydrologic Cycle (Water)</p> <ul style="list-style-type: none">- Explain the steps and reservoir interactions in the hydrologic cycle. <p>1.8 Primary Productivity</p> <ul style="list-style-type: none">- Explain how solar energy is acquired and transferred by living organisms. <p>1.9 Trophic Levels</p> <ul style="list-style-type: none">- Explain how energy flows and matter cycles through trophic levels. <p>1.10 Energy Flow and the 10% rule</p>	<p>How Taught?</p> <p>Teaching activities may include, but are not limited to:</p> <ul style="list-style-type: none">● Students closely read select passages from documents to analyze text structure, development, and consequent meanings.● Teacher provides direct instruction, give feedback, and model critical thinking● Small group and class discussions.● Pogil Activities● Cooperative learning groups● Students to define, use, and connect to content area and based vocabulary● Students analyze video content related to standards that provide a broader global perspective of content.● Design and conduct lab-based investigations that connect content to real-life experiences.● Inquiry Labs● Analysis of lab results, with focus on sources of error and how experimental designs may be improved.● White boarding● AP classroom Activities● Small group problem sets followed by sharing on white boards.● Investigating alternative approaches to problem solving.● Using technology and mathematics to improve investigations and communications.
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<ul style="list-style-type: none"> - Determine how the energy decreases as it flows through ecosystems. <p>1.11 Food Chains and Food Webs</p> <ul style="list-style-type: none"> - Describe food chains and food webs, and their constituent members by trophic level. 	<ul style="list-style-type: none"> ● Utilize data to impact instruction
<p>Materials: Materials (may include but not limited to):</p> <ul style="list-style-type: none"> ● Textbook ● Microscopes ● Basic Environmental Science Lab Supplies ● On-line Simulations i.e. Gizmos ● Poster paper ● Glue ● Scissors ● Markers ● Colored Pencils ● Tape ● Misc craft supplies ● Models ● Specimens ● Chromebook ● Water and Soil Test kits ● Outdoor Field Equipment ● Videos related to topics ● Gradecam ● Applicable Chromebooks apps 	<p>How Assessed? Assessments may include, but are not limited to:</p> <ul style="list-style-type: none"> ● Pre-Assessments (pre-tests, observation, questioning, diagnostics) ● Formative Assessments (entry/exit slips, mini analysis assignments, group work, discussions, homework/classwork, self and peer evaluations, checklists, guided notes, observations, quizzes, conferences, rubrics, lesson review questions, lab reports) ● Summative Assessments (formal essays, using rubrics; tests/exams, project, evaluation, demonstration, lab practicals) <p>How Re-Taught? Re-teaching activities may include, but are not limited to:</p> <ul style="list-style-type: none"> ● descriptive feedback on original task/assessment ● student examples of expectations ● modeling ● student self assessments ● manipulatives ● presenting the information again in a different way ● review sessions ● graphic organizers ● small-group instruction ● practice activities ● computer tutorials / programs ● peer tutoring ● breaking down concept into smaller components ● games and hands-on activities ● cooperative learning ● Universal Design for Learning principles offering students opportunities to experience and engage material in new and different ways

Learning Standards: Unit 2: The Living World:
Biodiversity

2.1 Introduction to Biodiversity

- Explain levels of biodiversity and their importance to ecosystems.

2.2 Ecosystem Services

- Describe ecosystem services.
- Describe the results of human disruptions to ecosystem services.

2.3 Island Biogeography

- Describe Island Biogeography
- Describe the role of island biogeography in evolution

2.4 Ecological Tolerance

- Describe Ecological Tolerance

2.5 Natural Disruptions to Ecosystems

- Explain how natural disruptions, both short- and long-term, impact an ecosystem

2.6 Adaptations

- Describe how organisms adapt to their environment

2.7 Ecological Succession

- Describe ecological succession
- Describe the effect of ecological Succession on ecosystems

How Taught?

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- Pogil Activities
- Cooperative learning groups
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- Students analyze video content related to standards that provide a broader global perspective of content.
- Design and conduct lab-based investigations that connect content to real-life experiences.
- Inquiry Labs
- Analysis of lab results, with focus on sources of error and how experimental designs may be improved.
- White boarding
- AP classroom Activities
- Small group problem sets followed by sharing on white boards.
- Investigating alternative approaches to problem solving.
- Using technology and mathematics to improve investigations and communications.
- Utilize data to impact instruction

Materials (may include but not limited to):

- Textbook
- Microscopes
- Basic Environmental Science Lab Supplies
- On-line Simulations i.e. Gizmos
- Poster paper
- Glue
- Scissors
- Markers
- Colored Pencils
- Tape

How Assessed?

Assessments may include, but are not limited to:

- Pre-Assessments (pre-tests, observation, questioning, diagnostics)
- Formative Assessments (entry/exit slips, mini analysis assignments, group work, discussions, homework/classwork, self and peer evaluations, checklists, guided notes, observations, quizzes,

<ul style="list-style-type: none"> ● Misc craft supplies ● Models ● Specimens ● Chromebook ● Water and Soil Test kits ● Outdoor Field Equipment ● Videos related to topics ● Gradecam ● Applicable Chromebooks apps 	<p>conferences, rubrics, lesson review questions, lab reports)</p> <ul style="list-style-type: none"> ● Summative Assessments (formal essays, using rubrics; tests/exams, project, evaluation, demonstration, lab practicals) <hr/> <p>How Re-Taught? Re-teaching activities may include, but are not limited to:</p> <ul style="list-style-type: none"> ● descriptive feedback on original task/assessment ● student examples of expectations ● modeling ● student self assessments ● manipulatives ● presenting the information again in a different way ● review sessions ● graphic organizers ● small-group instruction ● practice activities ● computer tutorials / programs ● peer tutoring ● breaking down concept into smaller components ● games and hands-on activities ● cooperative learning ● Universal Design for Learning principles offering students opportunities to experience and engage material in new and different ways
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<p>Learning Standards: Unit 3: Populations</p> <p>3.1 Generalist and specialist species</p> <ul style="list-style-type: none"> - Identify differences between generalist and specialist species. <p>3.2 K-selected and r-selected species</p> <ul style="list-style-type: none"> - Identify differences between K- and r-selected species. <p>3.3 Survivorship Curves</p> <ul style="list-style-type: none"> - Explain survivorship curves <p>3.4 Carrying Capacity</p> <ul style="list-style-type: none"> - Describe carrying capacity. - Describe the impact of carrying capacity on ecosystems. <p>3.5 Population growth and resource availability</p> <ul style="list-style-type: none"> - Explain how resource availability affects 	<p>How Taught? Teaching activities may include, but are not limited to:</p> <ul style="list-style-type: none"> ● Students closely read select passages from documents to analyze text structure, development, and consequent meanings. ● Teacher provides direct instruction, give feedback, and model critical thinking ● Small group and class discussions. ● Pogil Activities ● Cooperative learning groups ● Students to define, use, and connect to content area and based vocabulary
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<p>population growth.</p> <p>3.6 Age Structure Diagrams</p> <ul style="list-style-type: none"> - Explain Age group structure diagrams <p>3.7 Total fertility rate</p> <ul style="list-style-type: none"> - Explain factors that affect total fertility rate in human populations. <p>3.8 Human Population Dynamics</p> <ul style="list-style-type: none"> - Explain how human populations experience growth and decline <p>3.9 Demographic Transition</p> <ul style="list-style-type: none"> - Define the demographic transition 	<ul style="list-style-type: none"> ● Students analyze video content related to standards that provide a broader global perspective of content. ● Design and conduct lab-based investigations that connect content to real-life experiences. ● Inquiry Labs ● Analysis of lab results, with focus on sources of error and how experimental designs may be improved. ● White boarding ● AP classroom Activities ● Small group problem sets followed by sharing on white boards. ● Investigating alternative approaches to problem solving. ● Using technology and mathematics to improve investigations and communications. ● Utilize data to impact instruction
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- graphic organizers
- small-group instruction
- practice activities
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- peer tutoring
- breaking down concept into smaller components
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Learning Standards: Unit 4: Earth Systems and Resources

4.1 Plate Tectonics

- Describe the geological changes and events that occur at convergent, divergent and transform plate boundaries

4.2 Soil Formation and Erosion

- Describe the characteristics and formation of soil

4.3 Soil Composition and properties

- Describe similarities and differences between properties of different soil types

4.4 Earth's Atmosphere

- Describe the structure and composition of the Earth's atmosphere

4.5 Global Wind Patterns

- Explain how environmental factors can result in atmospheric circulation

4.6 Watersheds

- Describe the characteristics of a watershed

4.7 Solar Radiation and Earth's Seasons

- Explain how the sun's energy affect the Earth's Surface

4.8 Earth's Geography and Climate

- Describe how the Earth's geography affects weather and climate

4.9 El Nino and La Nina

- Describe the environmental changes and effects that result from El Nino or la Nina events (ENSO)

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Learning Standards: Unit 5: Land and water use

5.1 Tragedy of the Commons

- Explain Environmental concepts and processes involved in tragedy of the commons

5.2 Clearcutting

- Describe the environmental concepts and processes in clearcutting and impacts on forests

5.3 The Green Revolution

- Describe the changes that have occurred in agricultural practices

5.4 Impact of Agricultural Practices

- Describe agricultural practices that cause environmental damage

5.5 Irrigation Methods

- Describe Different methods of irrigation
- Describe the benefits and drawbacks of different methods of irrigation

5.6 Pest Control Methods

- Describe the benefits and drawbacks of different methods of pest control

5.7 Meat production Methods

- Identify different methods of meat production
- Describe the benefits and drawbacks of different methods of meat production

5.8 Impacts of overfishing

- Describe causes of and problems related to overfishing

5.9 Impacts of mining

- Describe natural resource extraction through mining
- Describe ecological and economic impacts of natural resource extraction through mining

5.10 Impacts of Urbanization

- Describe the effects of urbanization on the environment

5.11 Ecological Footprints

- Explain the variables measured in an ecological footprint

5.12 Introduction to sustainability

- Explain the concept of sustainability

5.13 Methods to reduce Urban Runoff

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- Describe methods for mitigating problems related to urban runoff
- 5.14 Integrated Pest management
- Describe integrated pest management
 - Describe the benefits and drawback of integrated pest management
- 5.15 Sustainable Agriculture
- Describe sustainable agricultural and food production practices
- 5.16 Aquaculture
- Describe the benefits and drawbacks of aquaculture
- 5.17 Sustainable Forestry
- Describe methods for mitigating human impacts on forests

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- review sessions
- graphic organizers
- small-group instruction

- practice activities
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- peer tutoring
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Learning Standards: Unit 6: Energy Resources and Consumption

- 6.1 Renewable and Nonrenewable Resources
- Identifying differences between nonrenewable and renewable energy sources
- 6.2 Global Energy Consumption
- Describe trends in energy consumption
- 6.3 Fuel types and uses
- Identify types of fuels and their uses
- 6.4 Distribution of Natural Energy Resources
- Identify where natural energy resources occur
- 6.5 Fossil Fuels
- Describe the use and methods of fossil fuels in power generation
 - Describe the effects of fossil fuels on the environment
- 6.6 Nuclear Power
- Describe the use of nuclear energy in power generation
 - Describe the effects of the use of nuclear energy on the environment
- 6.7 Energy from Biomass
- Describe the effects of the use of biomass in the power generation on the environment
- 6.8 Solar Energy
- Describe the use of solar energy in power generation
 - Describe the effects of the use of solar energy in power generation on the environment
- 6.9 Hydroelectric Power
- Describe the use of hydroelectricity in power generation
 - Describe the effects of the use of hydroelectricity

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in power generation on the environment

6.10 Geothermal Energy

- Describe the use of geothermal energy in power generation
- Describe the effects of the use of geothermal energy in power generation on the environment

6.11 Hydrogen Fuel Cell

- Describe the use of hydrogen fuel cells in power generation
- Describe the effect of the use of hydrogen fuel cells in power generation on the environment.

6.12 Wind Energy

- Describe the use of wind energy in power generation
- Describe the effects of the use of wind energy on the environment

6.13 Energy Conservation

- Describe methods for conserving energy

Materials (may include but not limited to):

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- Scissors
- Markers
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Learning Standards: Unit 7: Atmospheric pollution

7.1 Introduction to Air Pollution

- Identify the sources and effects of air pollution

7.2 Photochemical Smog

- Explain the causes and effects of photochemical smog and methods to reduce

7.3 Thermal Inversion

- Describe thermal inversion and its relationship with pollution

7.4 Carbon Dioxide and Particulates

- Describe natural sources of carbon dioxide and particulates

7.5 Indoor Air Pollution

- Identify indoor Air pollutants
- Describe the effects of indoor air pollutants

7.6 Reduction of air Pollutants

- Explain how air pollutants can be reduced at the source

7.7 Acid Rain

- Describe Acid Deposition
- Describe the effects of acid deposition on the environment

7.8 Noise pollution

- Describe human activities that result in noise pollution and its effects

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Learning Standards: Unit 8: Aquatic and Terrestrial Pollution**8.1 Sources of Pollution**

- Identify differences between point and nonpoint sources of pollution

8.2 Human Impacts on Ecosystems

- Describe the impacts of human activities on aquatic ecosystem

How Taught?**Teaching activities may include, but are not limited to:**

- Students closely read select passages from documents to analyze text structure, development, and consequent meanings.
- Teacher provides direct instruction, give feedback, and model critical thinking

8.3 Endocrine Disruptors

- Describe Endocrine disruptors
- Describe the effects of endocrine disruptors on ecosystems

8.4 Human Impacts on wetlands and mangroves

- Describe the impacts of human activity on wetlands and mangroves

8.5 Eutrophication

- Explain the environmental effects of excessive use of fertilizers and detergents on aquatic ecosystems

8.6 Thermal Pollution

- Describe the effects of thermal pollution on aquatic ecosystems

8.7 Persistent Organic Pollutants

- Describe the effect of persistent organic pollutants (POPs) on ecosystems.

8.8 Bioaccumulation and biomagnification

- Describe bioaccumulation and biomagnification
- Describe the effects of bioaccumulation and biomagnification

8.9 Solid Waste disposal

- Describe solid waste disposal methods
- Describe the effects of solid waste disposal methods

8.10 Waste Reduction Methods

- Describe changes to current practices that could reduce the amount of generated waste and their associated benefits and drawbacks.

8.11 Sewage Treatment

- Describe best practices in sewage treatment

8.12 Lethal Dose 50% (LD50)

- Define lethal dose 50% (LD50)

8.13 Dose Response Curve

- Evaluate dose response curves

8.14 Pollution and human health

- Identify sources of human health issues that are linked to pollution

8.15 Pathogens and infectious Disease

- Explain human pathogens and their cycling through the environment

- Small group and class discussions.
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- Cooperative learning groups
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- Using technology and mathematics to improve investigations and communications.
- Utilize data to impact instruction

<p>Materials (may include but not limited to):</p> <ul style="list-style-type: none"> ● Textbook ● Microscopes ● Basic Environmental Science Lab Supplies ● On-line Simulations i.e. Gizmos ● Poster paper ● Glue ● Scissors ● Markers ● Colored Pencils ● Tape ● Misc craft supplies ● Models ● Specimens ● Chromebook ● Water and Soil Test kits ● Outdoor Field Equipment ● Videos related to topics ● Gradecam ● Applicable Chromebooks apps 	<p>How Assessed? Assessments may include, but are not limited to:</p> <ul style="list-style-type: none"> ● Pre-Assessments (pre-tests, observation, questioning, diagnostics) ● Formative Assessments (entry/exit slips, mini analysis assignments, group work, discussions, homework/classwork, self and peer evaluations, checklists, guided notes, observations, quizzes, conferences, rubrics, lesson review questions, lab reports) ● Summative Assessments (formal essays, using rubrics; tests/exams, project, evaluation, demonstration, lab practicals) <p>How Re-Taught? Re-teaching activities may include, but are not limited to:</p> <ul style="list-style-type: none"> ● descriptive feedback on original task/assessment ● student examples of expectations ● modeling ● student self assessments ● manipulatives ● presenting the information again in a different way ● review sessions ● graphic organizers ● small-group instruction ● practice activities ● computer tutorials / programs ● peer tutoring ● breaking down concept into smaller components ● games and hands-on activities ● cooperative learning ● Universal Design for Learning principles offering students opportunities to experience and engage material in new and different ways

<p>Learning Standards: Unit 9: Global Change</p> <p>9.1 Stratospheric Ozone Depletion</p> <ul style="list-style-type: none"> - Explain the importance of stratospheric to life on Earth 	<p>How Taught? Teaching activities may include, but are not limited to:</p>
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- 9.2 Reducing ozone depletion
- Describe chemicals used to substitute for chlorofluorocarbons (CFC's)
- 9.3 The Greenhouse Effect
- Identify the greenhouse gasses
 - Identify the sources and potency of the greenhouse gasses
- 9.4 Increases in the greenhouse gasses
- Identify the threats to human health and the environment posed by an increase in greenhouse gasses
- 9.5 Global Climate Change
- Explain how changes in climate both short- and long- term impact ecosystems
- 9.6 Ocean Warming
- Explain the causes and effects of ocean warming
- 9.7 Ocean Acidification
- Explain the causes and effects of ocean acidification
- 9.8 Invasive Species
- Explain the environmental problems associated with invasive species and strategies to control them
- 9.9 Endangered Species
- Explain how species become endangered and strategies to combat the problem
- 9.10 Human Impacts on Biodiversity
- Explain how human activities affect biodiversity and strategies to combat the problem

- Students closely read select passages from documents to analyze text structure, development, and consequent meanings.
- Teacher provides direct instruction, give feedback, and model critical thinking
- Small group and class discussions.
- Pogil Activities
- Cooperative learning groups
- Students to define, use, and connect to content area and based vocabulary
- Students analyze video content related to standards that provide a broader global perspective of content.
- Design and conduct lab-based investigations that connect content to real-life experiences.
- Inquiry Labs
- Analysis of lab results, with focus on sources of error and how experimental designs may be improved.
- White boarding
- AP classroom Activities
- Small group problem sets followed by sharing on white boards.
- Investigating alternative approaches to problem solving.
- Using technology and mathematics to improve investigations and communications.
- Utilize data to impact instruction

Materials (may include but not limited to):

- Textbook
- Microscopes
- Basic Environmental Science Lab Supplies
- On-line Simulations i.e. Gizmos
- Poster paper
- Glue
- Scissors
- Markers
- Colored Pencils
- Tape
- Misc craft supplies

How Assessed?

Assessments may include, but are not limited to:

- Pre-Assessments (pre-tests, observation, questioning, diagnostics)
- Formative Assessments (entry/exit slips, mini analysis assignments, group work, discussions, homework/classwork, self and peer evaluations, checklists, guided notes, observations, quizzes, conferences, rubrics, lesson review questions, lab reports)

- Models
- Specimens
- Chromebook
- Water and Soil Test kits
- Outdoor Field Equipment
- Videos related to topics
- Gradecam
- Applicable Chromebooks apps

- Summative Assessments (formal essays, using rubrics; tests/exams, project, evaluation, demonstration, lab practicals)

How Re-Taught?

Re-teaching activities may include, but are not limited to:

- descriptive feedback on original task/assessment
- student examples of expectations
- modeling
- student self assessments
- manipulatives
- presenting the information again in a different way
- review sessions
- graphic organizers
- small-group instruction
- practice activities
- computer tutorials / programs
- peer tutoring
- breaking down concept into smaller components
- games and hands-on activities
- cooperative learning
- Universal Design for Learning principles offering students opportunities to experience and engage material in new and different ways