SAMPLE SYLLABUS #1

AP® Environmental Science

Curricular Requirements

CR1	The students and teacher have access to college-level resources including a recently published (within the last 10 years) college-level textbook and reference materials in print or electronic format.	*See page:* 4
CR2	The course includes the required environmental legislation and policies.	*See page:* 3
CR3	The course is structured to incorporate the big ideas and required content outlined in each of the units described in the AP Course and Exam Description (CED).	*See page:* 4
CR4	The course provides opportunities for students to develop the skills related to Science Practice 1: Concept Application.	*See page:* 12
CR5	The course provides opportunities for students to develop the skills related to Science Practice 2: Visual Representations.	*See pages:* 11, 13
CR6	The course provides opportunities for students to develop the skills related to Science Practice 3: Text Analysis.	*See page:* 11
CR7	The course provides opportunities for students to develop the skills related to Science Practice 4: Scientific Experiments.	*See page:* 15
CR8	The course provides opportunities for students to develop the skills related to Science Practice 5: Data Analysis.	*See pages:* 11, 12
CR9	The course provides opportunities for students to develop the skills related to Science Practice 6: Mathematical Routines.	*See page:* 13
CR10	The course provides opportunities for students to develop the skills related to Science Practice 7: Environmental Solutions.	*See page:* 14
CR11	Students spend a minimum of 25% of instructional time engaged in a wide range of hands-on, inquiry-based laboratory investigations and/or field work to support learning required content and developing science practices throughout the course.	*See pages:* 4, 10
CR12	The course provides opportunities for students to record evidence of their scientific investigations. Evidence can be recorded in lab reports, mini-posters, or another appropriate formal manner for inclusion in lab reports/notebooks (print or digital format).	*See page:* 10

Advanced Placement Environmental Science Sample Syllabus #1

Course Overview

Advanced Placement Environmental Science ("APES") is a college-level environmental science course. This course is taught as a traditional science course, incorporating laboratory activities, virtual activities, short-term projects, long-term studies, field investigations, and the use of technology for gathering data (LabQuest II data probes, including dissolved oxygen, temperature probes, and pH meters as well as data analysis software). Experiences in the laboratory and field and through virtual internet labs will provide students with opportunities to relate classroom concepts to real-world applications of environmental science. Through these experiences, students will be recording data, gathering evidence and presenting it to their peers verbally and in writing in different formats both digitally and via poster sessions. Students will be able to explore specific real-world environmental issues and gain an awareness of the science behind these issues. Students will explore the impact of our growing human population and understand that they have a stake in the future of the environment.

The course follows guidelines established by the College Board with the goal to provide students with scientific principles, concepts, and methodologies required to understand interrelationships in the natural world, to identify and analyze environmental problems both natural and human-made, to evaluate the relative risks associated with these problems, and to examine alternatives for resolving and/or preventing them, including environmental policies and legislation.

APES is interdisciplinary and incorporates a wide variety of topics from many different areas of study. There are several major unifying themes, or big ideas, that cut across the topics within APES. The following big ideas provide the foundation for the structure of the APES course:

- ☐ Big Idea 1: Energy Transfer (ENG)
- ☐ Big Idea 2: Interactions Between Earth Systems (ERT)
- ☐ Big Idea 3: Interactions Between Different Species and the Environment (EIN)
- ☐ Big Idea 4: Sustainability (STB)

In order for students to immerse themselves in the big ideas and content of the APES course, they will apply several major scientific skills and practices that allow them to engage in authentic scientific inquiry. The following scientific processes provide the foundation for the exploration of the APES course:

- ☐ Science Practice 1: Concept Application
- ☐ Science Practice 2: Visual Representations
- ☐ Science Practice 3: Text Analysis
- ☐ Science Practice 4: Scientific Experiments
- ☐ Science Practice 5: Data Analysis
- ☐ Science Practice 6: Mathematical Routines
- ☐ Science Practice 7: Environmental Solutions

Students will understand the big ideas and perform the science skills and practices through deep study of nine major topics indicated by the College Board as the units of study. The units within the APES course with corresponding exam weighting are as follows:

- ☐ Unit 1: The Living World: Ecosystems 6–8%
- ☐ Unit 2: The Living World: Biodiversity 6–8%
- ☐ Unit 3: Populations 10–15%
- ☐ Unit 4: Earth Systems and Resources 10–15%
- ☐ Unit 5: Land and Water Use 10–15%
- ☐ Unit 6: Energy Resources and Consumption 10–15%
- ☐ Unit 7: Atmospheric Pollution 7–10%
- ☐ Unit 8: Aquatic and Terrestrial Pollution 7–10%
- ☐ Unit 9: Global Change 15–20%

Students will also engage with the course material by researching environmental policies and legislation implemented in connection with human interaction with the environment. The study of laws and policies expose students to environmental issues, the debates and negotiations among parties with competing interests that arise in connection with these issues, and the outcomes of those debates and negotiations. The requisite environmental policies and legislation are as follows: **CR2**

CR2
The syllabus must explicitly list each of the policies and legislation from the AP Course and Exam Description.

- ☐ Clean Air Act
- ☐ Clean Water Act
- ☐ Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- ☐ Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
- ☐ Montreal Protocol
- ☐ Kyoto Protocol
- ☐ Endangered Species Act
- ☐ Safe Drinking Water Act (SDWA)
- ☐ Delaney Clause of Food, Drug and Cosmetic Act
- ☐ Resource Conservations and Recovery Act (RCRA)

Student Practice

Throughout each unit, **Topic Questions** will be provided to help students check their understanding. The Topic Questions are especially useful for confirming understanding of difficult or foundational topics before moving on to new content or skills that build upon prior topics. Topic Questions can be assigned before, during, or after a lesson, and as in-class work or homework. Students will get rationales for each **Topic Question** that will help them understand why an answer is correct or incorrect, and their results will reveal misunderstandings to help them target the content and skills needed for additional practice.

At the end of each unit or at key points within a unit, **Personal Progress Checks** will be provided in class or as homework assignments in AP Classroom. Students will get a personal report with feedback on every topic, skill, and question that they can use to chart their progress, and their results will come with rationales that explain every question's answer. One to two class periods are set aside to re-teach skills based on the results of the Personal Progress Checks.

Textbook:

Environmental Science: For the AP Course by Friedland and Relyea (Published by Bedford, freeman & worth, 3rd edition, 2019). CR1

CR1
The syllabus must cite the title, author, and publication date of a college-level textbook. The primary course textbook must be published within the last 10 years.

Supplemental materials:

America's Environmental Report Card: Are We Making the Grade? by Harvey Blatt (Published by the MIT Press, 2nd Edition).

AP Environmental Science Course and Exam Description by AP College Board (Fall 2019)

Enviroliteracy.org at **https://enviroliteracy.org**

HHMI BioInteractive at **https://www.biointeractive.org/home**

Keeping Things Whole (Readings in Environmental Science) by Coulson, Whitfield, and Preston (Published by the Great Books Foundation, 2003)

The Age of Sustainable Development by Jeffrey D. Sachs (Published by the Columbia University Press).

The Habitable Planet: A Systems Approach to Environmental Science by Annenberg Learner (teacher resources and professional development across the curriculum)

Course and Topic Outline

This course will be taught in two semesters with approximately 17 weeks in each. Students attend seven 43-minute classes per week with a minimum of three class periods per week dedicated to laboratory activities, field activities, and long-term study. A minimum of 25% of instructional time is devoted to laboratory investigation and/or fieldwork. CR11 There are nine units in the course, each lasting approximately two to three weeks. Two weeks will be allotted for test preparation, with additional laboratory time and study for the time period after the AP Exam.

CR11
The syllabus must include an explicit statement that at least 25% of instructional time is spent engaged in hands-on, inquiry-based laboratory experiences and/or fieldwork.

** *All alpha and/or numerical codes refer to the* AP Environmental Science Course and Exam Description, *Effective Fall 2019***

Unit 1: The Living World: Ecosystems **2–3 weeks**

Big Idea: Interactions Between Earth Systems (ERT-1): Ecosystems are the result of biotic and abiotic interactions.

Topic CR3	Skill Pairing
1.1 Introduction to Ecosystems	1.A
1.2 Terrestrial Biomes	1.B
1.3 Aquatic Biomes	1.B
1.4 The Carbon Cycle	2.B
1.5 The Nitrogen Cycle	2.B
1.6 The Phosphorus Cycle	2.B
1.7 The Hydrologic (Water) Cycle	2.B

CR3
The syllabus must include an outline of course content by unit title or topic using any organizational approach to demonstrate the inclusion of required course content and associated big ideas. All nine units and all four big ideas must be included.

Big Idea: Energy Transfer (ENG-1): Energy can be converted from one form to another.

Topic	Skill Pairing
1.8 Primary Productivity	1.A
1.9 Trophic Levels	1.B
1.10 Energy Flow and the 10% Rule	6.C
1.11 Food Chains and Food Webs	2.A

- ☐ Complete **Personal Progress Check MCQ** for Unit 1.
- ☐ Complete **Personal Progress Check FRQ** for Unit 1.
- ☐ Take **Unit 1 Test**.

Unit 2: The Living World: Biodiversity — 2–3 weeks

Big Idea: Interactions Between Earth Systems (ERT-2): Ecosystems have structure and diversity that change over time.

Topic	Skill Pairing
2.1 Introduction to Biodiversity	1.A
2.2 Ecosystem Services	1.B
2.3 Island Biogeography	1.A
2.4 Ecological Tolerance	3.A
2.5 Natural Disruptions to Ecosystems	5.A
2.6 Adaptations	5.B
2.7 Ecological Succession	5.C

- ☐ Complete **Personal Progress Check MCQ** for Unit 2.
- ☐ Complete **Personal Progress Check FRQ** for Unit 2.
- ☐ Take **Unit 2 Test**.

Unit 3: Populations — 2 weeks

Big Idea: Interactions Between Earth Systems (ERT-3): Populations change over time in reaction to a variety of factors.

Topic	Skill Pairing
3.1 Generalist and Specialist Species	1.B
3.2 K-Selected r-Selected Species	5.A
3.3 Survivorship Curves	5.C
3.4 Carrying Capacity	5.E
3.5 Population Growth and Resource Availability	6.B

Big Idea: Interactions Between Different Species and the Environment (EIN-1): Human populations change in reaction to a variety of factors, including social and cultural factors.

Topic	Skill Pairing
3.6 Age Structure Diagrams	5.C
3.7 Total Fertility Rate	5.A
3.8 Human Population Dynamics	7.A
3.9 Demographic Transition	1.C

- ☐ Complete **Personal Progress Check MCQ** for Unit 3.
- ☐ Complete **Personal Progress Check FRQ** for Unit 3.
- ☐ Take **Unit 3 Test**.

Unit 4: Earth Systems and Resources — 2–3 weeks

Big Idea: Interactions Between Earth Systems (ERT-4): Earth's systems interact, resulting in state of balance over time.

Topic	Skill Pairing
4.1 Plate Tectonics	2.C
4.2 Soil Formation and Erosion	4.B
4.3 Soil Composition and Properties	4.C
4.4 Earth's Atmosphere	2.A
4.5 Global Wind Patterns	2.B
4.6 Watersheds	1. C

Big Idea: Energy Transfer (ENG-2): Most of the Earth's atmospheric processes are driven by input of energy from the sun.

Topic	Skill Pairing
4.7 Solar Radiation and Earth's Seasons	2.A
4.8 Earth's Geography and Climate	2.B
4.9 El Niño and La Niña	7.A

- ☐ Complete **Personal Progress Check MCQ** for Unit 4.
- ☐ Complete **Personal Progress Check FRQ** for Unit 4.
- ☐ Take **Unit 4 Test**.

Unit 5: Land and Water Use — 2–3 weeks

Big Idea: Interactions Between Different Species and the Environment (EIN-2): When humans use natural resources, they alter natural systems.

Topic	Skill Pairing
5.1 The Tragedy of the Commons	1.B
5.2 Clearcutting	1.A
5.3 The Green Revolution	3.B
5.4 Impacts of Agricultural Practices	1.A
5.5 Irrigation Methods	7.C
5.6 Pest Control Methods	7.E
5.7 Meat Production Methods	5.E
5.8 Impacts of Overfishing	7.B

☐ Complete **Personal Progress Check MCQ Part A** for Unit 5.

Topic	Skill Pairing
5.9 Impacts of Mining	7.E
5.10 Impacts of Urbanization	7.C
5.11 Ecological Footprints	5.E

Big Idea: Sustainability (STB-1) Humans can mitigate their impact on land and water resources through sustainable use.

Topic	Skill Pairing
5.12 Introduction to Sustainability	5.E
5.13 Methods to Reduce Urban Runoff	4.B
5.14 Integrated Pest Management	7.D
5.15 Sustainable Agriculture	7.E
5.16 Aquaculture	7.C
5.17 Sustainable Forestry	7.F

☐ Complete **Personal Progress Check MCQ Part B** for Unit 5.
☐ Complete **Personal Progress Check FRQ** for Unit 5.
☐ Take **Unit 5 Test**.

Unit 6: Energy Resources and Consumption — 2–3 weeks

Big Idea: Energy Transfer (ENG-3): Humans use energy from a variety of sources, resulting in positive and negative consequences.

Topic	Skill Pairing
6.1 Renewable and Nonrenewable Resources	1.C
6.2 Global Energy Consumption	6.C
6.3 Fuel Types and Uses	1.A
6.4 Distribution of Natural Energy Resources	2.B
6.5 Fossil Fuels	7.A
6.6 Nuclear Power	2.B

☐ Complete **Personal Progress Check MCQ Part A** for Unit 6.

Topic	Skill Pairing
6.7 Energy from Biomass	7.B
6.8 Solar Energy	5.C
6.9 Hydroelectric Power	7.F
6.10 Geothermal Energy	1.B
6.11 Hydrogen Fuel Cell	1.C
6.12 Wind Energy	7.B
6.13 Energy Conservation	6.C

☐ Complete **Personal Progress Check MCQ Part B** for Unit 6.
☐ Complete **Personal Progress Check FRQ** for Unit 6.
☐ Take **Unit 6 Test**.

Unit 7: Atmospheric Pollution — 2 weeks

Big Idea: Sustainability (STB-2): Human activities have physical, chemical, and biological consequences for the atmosphere.

Topic	Skill Pairing
7.1 Introduction to Air Pollution	4.E
7.2 Photochemical Smog	5.B
7.3 Thermal Inversion	2.C
7.4 Atmospheric CO2 and Particulates	4.C
7.5 Indoor Air Pollutants	5.C
7.6 Reduction of Air Pollutants	7.D
7.7 Acid Rain	4.B
7.8 Noise Pollution	3.C

- ☐ Complete **Personal Progress Check MCQ** for Unit 7.
- ☐ Complete **Personal Progress Check FRQ** for Unit 7.
- ☐ Take **Unit 7 Test**.

Unit 8: Aquatic and Terrestrial Pollution — 2–3 weeks

Big Idea: Sustainability (STB-3): Human activities, including the use of resources, have physical, chemical, and biological consequences for ecosystems.

Topic	Skill Pairing
8.1 Sources of Pollution	1.A
8.2 Human Impacts on Ecosystems	6.B
8.3 Endocrine Disruptors	1.A
8.4 Human Impacts on Wetlands and Mangroves	7.B
8.5 Eutrophication	2.C
8.6 Thermal Pollution	1.C
8.7 Persistent Organic Pollutants (POPs)	1.B
8.8 Bioaccumulation and Biomagnification	4.A

- ☐ Complete **Personal Progress Check MCQ Part A** for Unit 8.

Topic	Skill Pairing
8.9 Solid Waste Disposal	7.D
8.10 Waste Reduction Methods	6.B
8.11 Sewage Treatment	2.A

Big Idea: Interactions Between Different Species and the Environment (EIN-3): Pollutants can have both direct and indirect impacts on the health of organisms, including humans.

Topic	Skill Pairing
8.12 Lethal Dose 50% (LD50)	6.A
8.13 Dose Response Curve	5.E
8.14 Pollution and Human Health	4.C
8.15 Pathogens and Infectious Diseases	2.B

- ☐ Complete **Personal Progress Check MCQ Part B** for Unit 8.
- ☐ Complete **Personal Progress Check FRQ** for Unit 8.
- ☐ Take **Unit 8 Test**.

Unit 9: Global Change **2–3 weeks**

Big Idea: Sustainability (STB-4): Local and regional human activities can have impacts at the global level.

Topic	Skill Pairing
9.1 Stratospheric Ozone Depletion	1.A
9.2 Reducing Ozone Depletion	7.B
9.3 The Greenhouse Effect	1.B
9.4 Increases in the Greenhouse Gases	2.C
9.5 Global Climate Change	5.D
9.6 Ocean Warming	7.A
9.7 Ocean Acidification	1.C

Big Idea: Interactions Between Different Species and the Environment (EIN-4): The health of a species is closely related to its ecosystem, and minor environmental changes can have a large impact.

Topic	Skill Pairing
9.8 Invasive Species	7.E
9.9 Endangered Species	7.D
9.10 Human Impacts on Biodiversity	7.C

- ☐ Complete **Personal Progress Check MCQ** for Unit 9.
- ☐ Complete **Personal Progress Check FRQ** for Unit 9.
- ☐ Take **Unit 9 Test**.

Labs and Activities

Labs are conducted at least three times per week (exceeding the minimum 25% instructional time as required by the College Board), two 43-minute blocks on the same day and an additional 43-minute block on another day. Some labs require individual research and data gathering and others have groups of 3–4 students work together. Ongoing field studies and long-term projects are incorporated into lab time. **CR11**

Lab and field reports include: Title, Introduction, Problem Statement, Methods, Data, Findings, and Conclusions. Reports are compiled into a lab/field experience notebook. **CR12**

Topics with associated activities are listed below. Some topics are taught via lecture and classroom discussions, which are not listed below.

CR11
The syllabus must include an explicit statement that at least 25% of instructional time is spent engaged in hands-on, inquiry-based laboratory experiences and/or fieldwork.

AND

Lab investigation/field work titles must be listed along with a brief description.

CR12
The syllabus must include the components of the written reports required of students for all laboratory/field investigations.

AND

The syllabus must include an explicit statement that students are required to maintain a lab/field notebook or portfolio (hard copy or electronic) that includes all lab/field reports.

Pre-Unit Introductory Activity

APES Scavenger Hunt

DESCRIPTION:

Students are given one week to obtain a list of items that are associated with all aspects of environmental science (i.e., biotic, abiotic, mutualistic, different energy sources, rocks, items associated with laws, etc.). They present their items with their reasoning explaining the course connections. Opposing teams judge whether or not they fulfilled the requirements. Students then create three different categories to place all items in and write a reflection describing how the three categories they made are interconnected using some of the items they found during the scavenger hunt.

ScrAPESbook

Description:

Students prepare this special scrapbook for APES. The ScrAPESbook contains a weekly article relevant to a topic or topics in APES from a local or national newspaper. Students write a one-page analysis of each article that includes the relevance of the article to the course, the author's claim(s), perspective, and assumptions, and at least one occasion in which the author uses evidence to support a claim. **Science Practice 3: Text Analysis** CR6

CR6
The syllabus must include a brief description of an instructional activity in which students analyze sources of information about environmental issues. Activities must be labeled with the relevant science practice(s).

Unit 1: The Living World: Ecosystems

Terrestrial and Aquatic Biomes Project—Gallery Walk and Discussion

DESCRIPTION:

Students create posters related to terrestrial and aquatic biomes that include information related to land/water type, vegetation, topography, food webs, adaptations, latitude, precipitation, climatograms, ecosystem services, etc. (Requisite information depends on whether the biome is terrestrial or aquatic.) On the day of the gallery walks, students record information from other posters. They then reflect on how the biomes are different or the same, what causes changes, and research how climate change may be affecting the biome, including biome shifts. **Science Practice 2: Visual Representations; Science Practice 5: Data Analysis** CR5 CR8

CR5
The syllabus must include a brief description of an instructional activity in which students analyze visual representations of environmental concepts and processes. Activities must be labeled with the relevant science practice(s).

Carbon Cycle Simulation Game

DESCRIPTION:

Students go to different stations and draw playing cards that determine which station (reservoir) they will go to next. The game has two trials, one preindustrial and the other postindustrial. Students then reflect on their learning by comparing and contrasting the pathway of carbon before and after the Industrial Revolution.

The AP College Board Nitrogen Cycle Game

DESCRIPTION:

Students move to different nitrogen reservoirs by taking part in a simulation that relies on coin tosses and take note of what reservoirs they move to and the reasons that they move to them.

CR8
The syllabus must include a brief description of an instructional activity in which students analyze and interpret quantitative data represented in tables, charts, and graphs. Activities must be labeled with the relevant science practice(s).

Water Cycle Dice Game

DESCRIPTION:

Students move from station to station based upon what the dice at each source say occurs. Students record what happens to them at each station and the reason. Students then compare their journeys with others' and make inferences as to the reasons their journeys were different.

Popcorn Relay Race

DESCRIPTION:

Students take part in a relay race where they run with popcorn and pass the popcorn to their teammates. Some popcorn will be lost during transfer, simulating entropy and the 10% rule.

Creating Food Webs/Chains Activity

DESCRIPTION:

Students are given lists of organisms and create food chains and food webs and provide descriptions of the interactions they drew. Students then hypothesize about the impacts the removal or addition of certain organisms have on their food web.

Unit 2: The Living World: Biodiversity

Survival of the Sweetest Lab

DESCRIPTION:

Students use different-colored Skittles to represent different marine species on a coastline. They simulate the effects of selection on mussels with shells of different thicknesses. Then, students look at the effects of a keystone species (starfish) on the diversity of a shoreline. Not only is the effect of the starfish apparent, but the space on the shoreline is limited, which causes competition, especially after the starfish is removed from the environment. Students will see that a community can change over time.

Biodiversity: Why Is It Important? Simulation

DESCRIPTION:

Students are given different cards designating them as a specific type of tree in a "forest" of students. The first forest of "Douglas fir" gets a disease, and since it is a monoculture type of forest, the entire forest is decimated by the disease. The second forest is more diverse, which allows it to become more resilient to disease. **Science Practice 1: Concept Application** CR4

Brown Bag Surprise

DESCRIPTION:

Students learn about species diversity and species richness by investigating the different types of shells that are found in their bag or "ecosystem." They identify the different "species" of shells that are in their ecosystems and calculate both diversity and richness and determine what they mean to an ecosystem. **Science Practice 5: Data Analysis** CR8

Units 2 and 3 Video Resources

Planet Earth: From Pole to Pole, Series 1, Episode 1 (by BBC)
Racing Extinction (Produced by Fisher Stevens), 2015

CR4
The syllabus must include a brief description of an instructional activity in which students explain environmental concepts, processes, and models presented in written format. Activities must be labeled with the relevant science practice(s).

Unit 3: Populations

Population Studies: Bubble Survivorship Lab

DESCRIPTION:

Students blow bubble "babies" in two trials, one without any interference and the second with parental intervention. Students record their data and make survivorship curves based upon the data. They then make inferences about K-selected and r-selected species. **Science Practice 6: Mathematical Routines** CR9

Power of the Pyramids

DESCRIPTION:

Students calculate age group and gender percentages in populations, create population pyramids in connection with the data they calculated, and then make inferences about population dynamics, including population growth rates. **Science Practice 2: Visual Representations, Science Practice 6: Mathematical Routines** CR5 CR9

CR9
The syllabus must include a brief description of an instructional activity in which students apply quantitative methods to address environmental concepts. Activities must be labeled with the relevant science practice(s).

Unit 3: Video Resources

Don't Panic: The Truth About Population, hosted by Hans Rosling

Unit 4: Earth Systems and Resources

Soil Lab

DESCRIPTION:

Students obtain soil from their surrounding neighborhoods and analyze it to determine if it is suitable for any type of agriculture. They use both physical and chemical tests to determine the type of soil it is. As for the physical tests, they use their data to match it to the soil texture triangle. A formal lab report is submitted discussing whether their hypothesis regarding arable land was supported or unsupported and why.

Seasons Simulation

DESCRIPTION:

Students are given Styrofoam "Earths" and revolve them around the Sun to different seasons, taking note of the Sun's position during each season. They then make inferences related to what happens to the angle of incidence at several locations on Earth and the duration of insolation.

El Niño and La Niña Computer Lab

DESCRIPTION:

Students observe different maps that show sea surface temperatures and water height within the Pacific Ocean. They then make predictions on whether a particular year was an El Niño or La Niña event. Subsequently, students research the effects of El Niño and La Niña on aquatic life and climate.

Unit 5: Land and Water Use

Tragedy of the Commons Activity

DESCRIPTION:

Students engage in an activity in which they go fishing for candy in a bowl representing the ocean. There are several types of fish and each have different monetary values. As students fish, the population replenishes itself at a fixed rate based upon the number of fish left after each turn. Each student fisher needs to provide for themselves and their family. Students decide how they desire to fish over several trials, observe and record how sustainable their choices are, and reflect on what they learned.

Cookie Mining Lab

DESCRIPTION:

Students collaborate to purchase tools and create a strategy to extract ore (chocolate chips) from different types of cookies. They account for the cost of tools and labor, as well as reclamation efforts after ore extraction. They research different mining methods and their effects and make connections to mining operations and the lab.

Ecological Footprint Activity

DESCRIPTION:

Students conduct an ecological footprint activity where they make mathematical calculations to determine how much space on Earth they take up. They then extrapolate their results and determine how much land would be needed if the entire population lived the same lifestyle as themselves. They then research resource use per capita for different countries and make inferences about the reasons for any discrepancies.

Unit 5: Video Resources

End of the Line (Produced by George Duffield), 2009

Unit 6: Energy Resources and Consumption

Renewable Energy Poster Gallery Walk

Nonrenewable Energy Poster Gallery Walk

DESCRIPTION:

Students create posters that provide information including how energy is produced; how waste products are produced; where this type of energy is typically found, used, and/or stored; advantages and disadvantages to this type of energy; and interesting facts (cutting-edge technology, efficiency, popularity, statistics, units of measurement, etc.). Students then conduct a gallery walk of the different energy sources and provide reflections regarding which energy sources should be further pursued in New York State and why. **Science Practice 7: Environmental Solutions** **CR10**

The Great Energy Debate

DESCRIPTION:

Students participate in a debating game regarding energy resources. Each group is assigned a specific energy source. Players attempt to advance their team's energy resource above the others by moving their game piece forward. Students must provide evidence showing that their energy source has an overall advantage. Three student judges hear one group's reasoning about why their energy source is advantageous; then another team can oppose, leaving a rebuttal for the initial team. Judges determine whether the team put forth a viable advantage to using their energy resource.

CR10
The syllabus must include a brief description of an instructional activity in which students propose and justify solutions to environmental problems. Activities must be labeled with the relevant science practice(s).

Unit 6: Video Resources

Gasland (produced by International WOW Company), 2010

Unit 7: Atmospheric Pollution

Air Particulate Lab

DESCRIPTION:

Students take petri dishes with petroleum jelly to various areas out in the environment and indoors. After one week, students bring their petri dishes back and observe the particulates found under a microscope. They also conduct research regarding different types of air pollutants and their effects on organisms and the environment.

Acid Rain and Effect on Soils Lab

DESCRIPTION:

Students conduct research on the causes of acid rain and its negative effects. Students test the effects of different types of soils on rainwater and determine which soil acts as a better buffer for acid and make hypotheses about the reason. **Science Practice 4: Scientific Experiments** CR7

CR7
The syllabus must include a brief description of an instructional activity in which students analyze research studies that test environmental principles. Activities must be labeled with the relevant science practice(s).

Unit 7: Video Resources

An Inconvenient Truth, hosted by Al Gore (Produced by Laurie David), 2006

Unit 8: Aquatic and Terrestrial Pollution

Ward's Wastewater Treatment Lab

DESCRIPTION:

Students engage in an activity in which they pollute water with organic material and let it sit in a container. Thereafter, students use the Ward's materials to follow each step in the wastewater treatment process. Students then make and record observations after each step to arrive at inferences about the effectiveness of each step.

Unit 9: Global Change

Many classes in this unit involve student research on current events and scientific articles, which culminates in class discussion.

Ozone Gumdrop Lab

DESCRIPTION:

Students follow a simulation using gumdrops to symbolize the chemical reactions associated with ozone depletion. All steps are recorded/drawn so that students have a diagram to refer to.

Unit 9: Video Resources

Before the Flood (Produced by Apian Way Productions), 2016
Hot Planet (Produced by BBC), 2009

Additional Overarching Activity

- **A Day in the Life of the Hudson River Activity**

Students take part in a full day of tests and observations at the Hudson River, including observing different types of organisms and indicator species such as the seahorse. Additionally, students provide information to Lamont Doherty Earth Observatory that gets placed in a database along with data from other schools along the Hudson River. Students conduct many tests associated with the Hudson River and compare the data to other locations. Tests include turbidity, salinity, pH, nitrogen, phosphorus, dissolved oxygen, tide height and cycle, wind speed, etc.