

BERKELEY HEIGHTS PUBLIC SCHOOLS
BERKELEY HEIGHTS, NEW JERSEY

**GOVERNOR LIVINGSTON HIGH SCHOOL
SCIENCE DEPARTMENT**

ENVIRONMENTAL SCIENCE

#SCY1240

Curriculum Guide

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This curriculum may be modified through varying techniques,
strategies, and materials, as per an individual student's
Individualized Educational Plan (IEP).

Approved by the Berkeley Heights Board of Education
at the regular meeting held on 12/5/19.

VISION STATEMENT

The science curriculum aims to provide students with authentic and enriching experiences that enhance critical thinking and problem solving skills. Students gain a deeper understanding and appreciation of science and are exposed to real-world technologies. Students are challenged to analyze and evaluate data, construct new ideas, develop arguments and explanations, and apply concepts through engineering tasks.

To achieve this, the curriculum guides are based on the model science curriculum developed by the New Jersey Department of Education and are aligned to the Next Generation Science Standards. The Next Generation Science Standards were created based on the work done by the National Research Council and summarized in their publication, *A Framework for K-12 Science Education (NRC, 2011)*. The work shifts the focus of science education towards the development of overarching enduring concepts and emphasizes the process of science. The standards are no longer isolated components but rather a three dimensional approach to teaching that focuses equally on ***Disciplinary Core Ideas, Science and Engineering Practices***, and ***Crosscutting Concepts***.

Disciplinary Core Ideas have the power to focus K–12 science curriculum, instruction, and assessments on the most important aspects of science. These core ideas:

- Have broad importance across multiple sciences or engineering disciplines or be a key organizing concept of a single discipline;
- Provide a key tool for understanding or investigating more complex ideas and solving problems;
- Relate to the interests and life experiences of students or be connected to societal or personal concerns that require scientific or technological knowledge;
- Are teachable and learnable over multiple grades at increasing levels of depth and sophistication.

The ***Science and Engineering Practices*** describe behaviors that scientists engage in as they investigate and build models about the natural world. Additionally, they emphasize the key set of engineering practices that engineers use as they design and build models and systems. Scientific investigation requires not only skill but also knowledge that is specific to each practice.

Crosscutting Concepts have application across all domains of science. As such, they are a way of linking the different domains of science. They include patterns; cause and effect; scale, proportion, and quantity; systems and system models; energy and matter; structure and function; and stability and change. These concepts need to be made explicit for students because they provide an organizational schema for interrelating knowledge from various science fields into a coherent and scientifically based view of the world (NSTA, 2014).

Throughout the curriculum, engineering tasks have been embedded, which engage students in the design cycle, encourage the development of 21st century skills, and incorporate college and career ready practices.

MISSION STATEMENT

The goal of this course in Environmental Science is to aid students in developing an understanding of the basic principles underlying ecological events, interdependencies, and interactions, while also acquiring the skills needed to make informed decisions on scientific and environmental issues. Students should develop an appreciation for the ecosystems and all they contain, by learning about processes and interrelationships.

Topics included in the course are:

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| Sustainability & Global Development | Populations, Cities, & Waste |
| Biodiversity & Ecology | Land, Water, & Food Resources |
| Environmental Systems & the Living World | Air Pollution & Climate Change |
| Energy Resources & Consumption | Water Pollution & Human Health |

The course also introduces the students to the social and political aspects of the sciences. The students are challenged to think about issues concerning the environmental health of the world and some of their potential problems. They are expected to address past and current issues and their impact on society, technology, and the global community. In addition, students will come to understand how environmental scientists work and how science relates to their daily lives. They will formulate questions about nature, use the scientific practices to work through problems, evaluate information, use technologies appropriately, substantiate personal and ethical ideas related to environmental issues, and apply knowledge to assess real world problems.

The course has the following themes:

1. Science is a process.
2. Energy conversions underlie all ecological processes.
3. The Earth itself is one interconnected system.
4. Humans alter natural systems.
5. Environmental problems have a cultural and social context.
6. Human survival depends on developing practices that will achieve sustainable systems.

Outdoor field work is an important component of the Environmental Science course. As much as possible, students will spend lab periods outside on the GL campus. In so doing, they will gain hands-on experience in conducting research such as biodiversity surveys, sampling soil, and environmental conditions monitoring. In addition, this course may include field trips to multiple locations within and around Berkeley Heights, to gain a deeper understanding of how they fit into our ecosystem. Stops may include the wastewater treatment plant, the waste transfer station, a farm, and Watchung Reservation.

Field and lab work will enable students to:

- Critically observe environmental systems;
- Develop and conduct well-designed experiments;
- Utilize appropriate techniques and instrumentation;
- Analyze and interpret data, including appropriate statistical and graphical presentations;
- Think analytically and apply concepts to the solution of environmental problems;
- Make conclusions and evaluate their quality and validity;
- Propose further questions for study; and
- Communicate accurately and meaningfully about observations and conclusions.

Environmental Science is intended for students in Grades 11 and 12, with at least three (3) years of science successfully completed prior to enrollment. Six credits (6) are given for this full year course with a lab, upon completion with a passing grade. The Next Generation Science Standards (NGSS) are integrated throughout the curriculum.

COURSE PROFICIENCIES
COURSE OBJECTIVES

1. To encourage students to think about the complexity of our ecosystems and the various factors which influence their behavior.
2. To provide career orientation for biological, chemical, physical, and geological environmental science, with laboratory activities and research where appropriate.
3. To generate a greater student awareness of the workings of the environment, by studying the history and various branches of environmental science.
4. To increase student awareness of the theories about the origins of Earth and plate tectonics, as they relate to the present conditions of the biosphere and future evolutions of the earth.
5. To develop students' appreciation for the roles that abiotic factors fill in the process of sustaining life on Earth.
6. To increase student comprehension of the significance of pollution as a biological and chemical agent.
7. To foster a greater appreciation in students, for the interdependence of chemical and physical aspects as the basis for changes in the environment.
8. To provide opportunities for students to use models and manipulatives while explaining the structure and behavior of the ecosystems under varying conditions.
9. To increase student awareness of the vastness of resources available from the environment today and in the future.
10. To facilitate student development of insights into the complex interactions among the aquatic and terrestrial environments with the atmosphere.
11. To expose students to information about the vulnerability of biomes and ecosystems due to human and natural effects.
12. To further students' functional knowledge of the various forms of life and their interactions with the environment.
13. To guide students, to describe and understand the interrelationships of the biotic and abiotic factors in varied ecosystems.
14. To promote student awareness on how human interactions with the environment can upset the delicate balance and cause ecological issues or concerns.
15. To create opportunities for students to analyze and critique issues related to the environment in research, technology, public policy, and the discoveries reported in the news.
16. To stimulate student interest, by blending current information and research with basic principles, to form an integrated introduction to the sciences of the environment.
17. To increase familiarity with laboratory materials and protective equipment, so they may be used in a safe, prescribed manner.
18. To instruct students, on the correct use of scientific equipment, available technologies, and instruments related to environmental science and to demonstrate the skills of the scientific research method, through practice in scientific investigations.

STUDENT PROFICIENCIES

1. Demonstrate an adequate knowledge of major biological concepts and processes.
2. Demonstrate the application of biological principles in their lives.
3. Value the diversity of life and its relationship to human endeavors.
4. Recognize and accept individual responsibility, for local human activities and their impact on the global environment.
5. Think critically (e.g., recognize the difference between opinion and fact).
6. Use appropriate procedural skills for scientific inquiry and problem-solving.
7. Solve problems cooperatively and creatively.
8. Select and use appropriate instrumentation to design and conduct investigations.
9. Explain how the results of experimentation led to further investigations.
10. Site examples of how science and technology have solved practical problems.
11. Use computer spreadsheets, graphing, and database programs to assist in quantitative analysis.
12. Use models to explain structure and behavior.
13. Predict how human activity or natural phenomena may affect the balance of life on earth.
14. Discuss scientific hypotheses concerning the origin of life and the theories of evolution.
15. Utilize computer programs and other new technologies in investigations to collect, organize, and interpret scientific data.
16. Assess, critique, and justify the accuracy, relevance, and appropriateness of the Internet and other information sources.
17. Identify the relationship of organisms to their environment.
18. Recognize the role of genetics in today's changing world.
19. Identify career opportunities within the sphere of environmental science.
20. Measure the role of the ecosystems and how they have changed, on Earth and in human history.
21. Review the different types of research technologies - aquatic and terrestrial and their functions.
22. Explain uses of equipment for measurement, monitoring, and research.
23. Analyze the roles of historical explorations and discoveries and their impact on the understanding of the biosphere.
24. Extrapolate the importance of technological advances in the field of environmental science.
25. Evaluate the importance of properties of water and other molecules, as well as energy in ecological processes and the maintaining of proper conditions and balance.
26. Appraise the adaptations of aquatic invertebrates and compare them to their habitat conditions.
27. Describe the niches of large organisms such as birds, reptiles, fish, and mammals.
28. Understand the variability of ecosystems and their components.
29. Determine which human interactions with the environment may cause negative impacts.

30. Comprehend how various types of pollution can affect biotic and abiotic factors, within the biosphere.
31. Distinguish the different types of biomes as sources of many types of resources.
32. Utilize the scientific method and available technologies, in planning and implementing safe scientific experiments.

METHODS OF EVALUATION

Methods of evaluation that may be used in Environmental Science include, but are not limited to:

1. Class participation.
2. Homework assignments.
3. Individual and cooperative learning assignments.
4. Laboratory practical examinations/demonstrations.
5. Laboratory reports.
6. Notebooks.
7. Oral and written reports.
8. Group and individual projects.
9. Proper use of scientific equipment.
10. Quizzes (announced and unannounced).
11. Unit and comprehensive tests (traditional and alternative).
12. Final examinations (unless exempt according to school guidelines).
13. Performance assessments.
14. Transfer tasks.
15. Learning-based projects.

MODIFICATIONS & ACCOMMODATIONS

Modifications and Accommodations for Special Education students, students with 504s, English Language Learners and Gifted and Talented students may include but are not limited to the following:

Special Education

- Individualized Education Plans (IEPs)
- Exemplars of varied performance levels
- Multimedia presentations
- Sheltered instruction
- Consultation with ESL teachers
- Manipulatives
- Tiered/Scaffolded Lessons
- Mnemonic devices
- Visual aids
- Modeling
- Guided note-taking
- Study Guides
- Modified homework
- Differentiated pre-typed class notes and example problems
- Use of the special education teacher to re-instruct in flexible small groups for the struggling learner
- Manipulatives
- Flipped Instruction
- Word banks
- Reduced choice on assessments
- Preferential seating
- Choice activities
- Modified time requirements
- Modified notes
- Modified lesson, assessment and study guide format
- Provide an enriched curriculum and activities
- Independent projects
- Contracts/behavior support plans
- Open-ended responses
- Project-based learning
- Group activities

- Guided Notes
- Functional learning incorporated into each lesson
- Exploration Activities
- Assessment read aloud
- Small group assessments
- Organizational Support
- Oral questioning assessments to supplement written response
- Pre-writing Structural Supports for extended writing tasks
- Ongoing teacher feedback as part of the writing process
- Interactive Study Guides
- Multi-sensory approach to instruction
- Written and spoken step-by-step directions
- Content-focused assessment (not grading for spelling/grammar)
- Graphic organizers
- Non-verbal cues to begin task/remain on task/refocus
- Individual monitoring for understanding/reinforced instruction
- Printed copies of class readings for application of Active Reading Strategies

Gifted & Talented

- Provide one-to-one teacher support
- Curriculum Compacting
- Advanced problems to extend the critical thinking skills of the advanced learner
- Supplemental reading material for independent study
- Elevated questioning techniques using Webb's Depth of Knowledge matrix
- Curriculum Compacting
- Flexible grouping
- Tiered assignments
- Topic selection by interest
- Manipulatives
- Tiered Lessons
- Flipped Instruction
- Multimedia Presentations
- Open-ended responses
- Project-based learning
- Group activities
- Guided Notes
- Conclusions and analysis of exploratory activities
- Career based learning incorporated into each lesson
- Exploration Activities

- Student choice

ELLs

- Exemplars of varied performance levels
- Multimedia presentations
- Sheltered instruction
- Consultation with ESL teachers
- Manipulatives
- Tiered/Scaffolded Lessons
- Mnemonic devices
- Visual aids
- Modeling
- Guided note-taking
- Study Guides
- Modified homework
- Differentiated pre-typed class notes and example problems
- Individualized instruction plans
- Manipulatives
- Flipped Instruction
- Words banks
- Reduced choice on assessments
- Preferential seating
- Choice activities
- Modified time requirements
- Modified notes
- Modify lesson, assessment and study guide format
- Provide an enriched curriculum and activities
- Contracts/management plans
- Open-ended responses
- Project-based learning
- Group activities
- Guided Notes
- Exploration Activities
- Assessment read aloud
- Small group assessments
- Oral questioning assessments to supplement written response
- Pre-writing Structural Supports for extended writing tasks
- Ongoing teacher feedback as part of the writing process
- Interactive Study Guides

- Multi-sensory approach to instruction
- Written and spoken step-by-step directions
- Graphic organizers
- Non-verbal cues to begin task/remain on task/refocus
- Individual monitoring for understanding/reinforced instruction
- Printed copies of class readings for application of Active Reading Strategies

504s

- Exemplars of varied performance levels
- Multimedia presentations
- Sheltered instruction
- Tiered/Scaffolded Lessons
- Mnemonic devices
- Visual aids
- Modeling
- Guided note-taking
- Study Guides
- Differentiated pre-typed class notes and example problems
- Manipulatives
- Words banks
- Reduced choice on assessments
- Preferential seating
- Modified time requirements
- Modified notes
- Modify lesson, assessment and study guide format
- Modified homework
- Independent projects
- Contracts/management plans
- Open-ended responses
- Project-based learning
- Group activities
- Guided Notes
- Exploration Activities
- Assessment read aloud
- Small group assessments
- Organizational Support
- Oral questioning assessments to supplement written response
- Pre-writing Structural Supports for extended writing tasks
- Ongoing teacher feedback as part of the writing process
- Interactive Study Guides
- Multi-sensory approach to instruction
- Written and spoken step-by-step directions
- Content-focused assessment (not grading for spelling/grammar)
- Graphic organizers

- Non-verbal cues to begin task/remain on task/refocus
- Individual monitoring for understanding/reinforced instruction
- Printed copies of class readings for application of Active Reading Strategies

Students at Risk of Failure

- Exemplars of varied performance levels
- Multimedia presentations
- Tiered/Scaffolded Lessons
- Modeling
- Guided note-taking
- Study Guides
- Differentiated pre-typed class notes and example problems
- Individualized instruction plans
- Words banks
- Reduced choice on assessments
- Preferential seating
- Choice activities
- Modified time requirements
- Modified notes
- Modified lesson, assessment and study guide format
- Modified homework
- Provide an enriched curriculum and activities
- Contracts/management plans
- Open-ended responses
- Project-based learning
- Group activities
- Guided Notes
- Exploration Activities
- Assessment read aloud
- Small group assessments
- Oral questioning assessments to supplement written response
- Pre-writing Structural Supports for extended writing tasks
- Ongoing teacher feedback as part of the writing process
- Interactive Study Guides
- Multi-sensory approach to instruction
- Written and spoken step-by-step directions
- Graphic organizers
- Non-verbal cues to begin task/remain on task/refocus
- Individual monitoring for understanding/reinforced instruction
- Printed copies of class readings for application of Active Reading Strategies

SCOPE AND SEQUENCE
COURSE OUTLINE/STUDENT OBJECTIVES

The student will be able to:

| Standards | Course Outline/ Student Objectives |
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| <p>Standards: HS-ESS3-6: Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. . HS-LS2-7: Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*</p> <p>Technology: 8.1.12.A.3; 8.1.12.C.1; 8.2.12.C.4; 8.2.12.C.5; 8.2.12.B.2; B.2.12.B.5 21st Century: CRP2; CRP4; CRP8; 9.2.12.C.7; 9.3.ST.2; 9.3.ST-ET.2; 9.3.ST-ET.3; 9.3.ST-SM.1; 9.3.ST-SM.2 Cross-Curricular: RST.11-12.7; RST.11-12.8; RST.11-12.2; WHST.9-12.2; MP.2; MP.4; N-Q.A.1; N-Q.A.2; N-Q.A.3; S-ID.A.1; S-IC.B.6</p> | <p>I. Introduction To Environmental Science (4 weeks)</p> <ul style="list-style-type: none"> A. Discuss in Groups the Meaning of the Term “Environment” B. Read and Analyze Excerpts from “Eyes Wide Open: Going Behind the Environmental Headlines” (Taking Sides”, p.134) and "Is Global Warming a Catastrophe That Warrants Immediate Action?" C. Develop Rational for Participating in Environmental Science Studies D. Review Key Concepts and Processes in Science and Research <ul style="list-style-type: none"> 1. Discuss why science is both an area of study and a process in which to be engaged 2. Develop a framework for the experimental study of the environment <ul style="list-style-type: none"> a) make observations b) develop and state a hypothesis c) design experiments to test the hypothesis d) develop targeted predictions based on hypothesis and models e) represent results in meaningful ways 3. Demonstrate an understanding of this framework by designing an experiment 4. Demonstrate how to measure and/or calculate temperature, density, and volume 5. Discuss the relationship between temperature, density, and volume and the impact that these physical quantities have on the environment E. Develop and/or Review Fundamental Scientific Skills by: <ul style="list-style-type: none"> 1. Interpreting sample data tables and graphs 2. Analyzing maps including: <ul style="list-style-type: none"> a) geographic b) Political c) resource d) Population e) gross domestic product 3. Creating models and diagrams to explain scientific phenomenon F. Develop and/or Review Fundamental Math Skills as They Relate to Scientific Contexts by: <ul style="list-style-type: none"> 1. Breaking down and solving word problems. |

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| | <ul style="list-style-type: none"> 2. Calculating percent increase/decrease 3. Representing results using significant digits and exponential notation G. Read Environmental Science, Chapter 1, "Environmental Problems, Their Causes, and Sustainability" H. Use Information from the Reading to Identify the Major Themes Unique to Environmental Science <ul style="list-style-type: none"> 1. Energy conversions underlie all ecological processes 2. The Earth itself is one interconnected system 3. Humans alter natural systems 4. Environmental problems have a cultural and social context 5. Human survival depends on developing practices that will achieve sustainable systems I. Develop the Relationship between Biodiversity and Evolution by Engaging in a Study of GL's Oak Population <ul style="list-style-type: none"> 1. "Classifying Oaks with DNA" 2. "Biology Inquiries" J. Use Data from the Labs to Modify the Definition of "Environment" <ul style="list-style-type: none"> 1. Include the interconnected nature of all living and nonliving things 2. Relate this to the concept of a feed-back loop K. Breakdown the Concept of Sustainability <ul style="list-style-type: none"> 1. Tour the inner workings of the school 2. Identify ways that the school does and does not exhibit sustainability |
| <p>Standards: <u>HS-ESS2-6:</u> Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere <u>HS-ESS2-7:</u> Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth <u>HS-LS2-4:</u> Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. <u>HS-ESS1-5:</u> Evaluate evidence of the past and</p> | <ul style="list-style-type: none"> II. Interdependence Of Earth's Systems (8 weeks) <ul style="list-style-type: none"> A. Energy and Matter <ul style="list-style-type: none"> 1. Discuss the fundamental forms of mechanical energy <ul style="list-style-type: none"> a) Potential b) Kinetic 2. Examine how energy moves through an environment, by looking at models of the following biological phenomenon <ul style="list-style-type: none"> a) photosynthesis and cellular respiration b) food webs and trophic levels c) ecological pyramids 3. Examine how matter moves through an environment, by looking at models of the following natural biogeochemical cycles <ul style="list-style-type: none"> a) Matter b) Carbon c) Nitrogen d) Phosphorous e) Sulfur |

current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.

Technology: 8.1.12.A.3;
8.1.12.C.1; 8.2.12.C.4;
8.2.12.C.5; 8.2.12.B.2;
B.2.12.B.5

21st Century: CRP2; CRP4;
CRP8; 9.2.12.C.7; 9.3.ST.2;
9.3.ST-ET.2; 9.3.ST-ET.3;
9.3.ST-SM.1; 9.3.ST-SM.2

Cross-Curricular:
RST.11-12.1; RST.11-12.2;
WHST.9-12.1; SL.11-12.5;
MP.2; MP.4; N-Q.A.1;
N-Q.A.2; N-Q.A.3

- f) Water
 - 4. Compare and contrast these models and develop an argument to support the claim that “all matter and energy are conserved”
 - 5. Identify ways that other thermodynamic principles appear in these models
- B. The Earth
- 1. Writing exercise – What is your "oikos"- How much do you need to know about the place where you live, and why? (See Taking Sides p.23)
 - 2. Examine models of the Earth and identify the major components that compose it
 - a) Geosphere
 - b) Atmosphere
 - c) Hydrosphere
 - d) Biosphere
 - 3. Investigate biomes maps and engage in the “World’s Biome Activity”
 - 4. Break into small groups to research one of the processes that occur in the four Earth spheres and develop a presentation to explain this to classmates
 - a) nitrogen fixation
 - b) Ammonification
 - c) Nitrification
 - d) Assimilation
 - e) Denitrification
 - f) carbon sink
 - g) Transpiration
 - h) Infiltration
 - i) Percolation
 - 5. Turnkey their knowledge of their assigned process to their classmates
 - 6. Read Environmental Science, Chapter 2, "Science, Matter, and Energy"
 - 7. Conduct the “History of a Carbon Atom” lab investigation (Biology Inquiries pp.168 & 170)
- C. Geosphere
- 1. Use the Mobile Earth History App to:
 - a) observe how plate tectonics has changed the Earth
 - b) identify different plate boundaries and the effect they have to the lithosphere
 - (1) convergent boundary
 - (2) divergent boundary
 - (3) transform boundary
 - c) Develop the concept of a geologic time scale
 - 2. Identify observable evidence that plates continue to shift and affect the Earth
 - a) Earthquakes
 - b) Volcanoes
 - 3. Investigate these phenomena and explain how

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| | <p>they occur</p> <ol style="list-style-type: none"> 4. Examine the Earth/Sun relationship and explain how/why the following occur <ol style="list-style-type: none"> a) Seasons b) solar intensity <p>D. Atmosphere/Hydrosphere</p> <ol style="list-style-type: none"> 1. Determine the relationship between the atmosphere and hydrosphere <ol style="list-style-type: none"> a) examine the composition and structure of each system b) explain the interactions between the atmosphere and the oceans in creating <ol style="list-style-type: none"> (1) Weather (2) Climate c) compare and contrast the impact that the Coriolis Effect has on the atmosphere and hydrosphere d) identify atmospheric and hydrosphere anomalies, such as the El Niño Southern Oscillation, and the effects they have on these systems 2. Develop an understanding of the importance of ozone to planet survival <ol style="list-style-type: none"> a) construct and utilize Schoenbein paper, to identify the presence of ozone and its formation b) discuss the causes and effect of ozone depletion and determine strategies for reducing this phenomenon c) research relevant laws and treaties that were developed, including the Montreal Protocol, and examine how and why these were successful or unsuccessful 3. Develop an understanding of the relationship between the greenhouse effect and climate <ol style="list-style-type: none"> a) construct a "greenhouse in a jar" to study the effects of global warming and the greenhouse effect b) identify greenhouse gasses c) develop a mechanism that explains the greenhouse effect d) perform a lab on "Specific Heat and Climate" (Molnar p.35) e) read Environmental Science, Chapter 5, "Climate and Biodiversity" f) discuss the impacts and consequences of global warming g) suggest possible ways to reduce climate change h) discuss relevant laws, treaties, and conferences on global climate change such as the Kyoto Protocol <p>E. Biosphere</p> |
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| | <ol style="list-style-type: none"> 1. Investigate the fundamental structure and function of an ecosystem <ol style="list-style-type: none"> a) read Environmental Science, Chapter 3, "Ecosystems: What Are They and How Do They Work?" b) conduct the "Using a Microscope" (soil analysis), and "Microhabitats" labs (Roa p.188) c) examine the ecosystems around the high school and determine the: <ol style="list-style-type: none"> (1) biological populations and communities (2) ecological niches (3) relationships and interactions among species (4) Keystone species (5) species diversity and edge effects d) apply these concepts to ecosystems around the world and examine why they differ from the ecosystem around the high school 2. Investigate the importance of ecosystems diversity <ol style="list-style-type: none"> a) conduct a study of the property surrounding the high school, to construct the concept of biodiversity b) extend this knowledge by performing the Shannon Weiner Diversity Index Primary Productivity Lab and develop an understanding of the following: <ol style="list-style-type: none"> (1) species richness (2) species evenness (3) species diversity (4) genetic diversity (5) ecological diversity c) watch the video "Biodiversity Researcher" d) read Environmental Science, Chapter 4, "Evolution and Biodiversity" e) conduct the experiment "The Lost World" Biology Inquiries p.143 – skull classification 3. Discuss ecosystem services <ol style="list-style-type: none"> a) read "Do Ecosystem Services Have Economic Value?" (Taking Sides, p.40) and respond to the essential question b) create an argument for or against ecosystem services and debate with classmates 4. Investigate natural ecosystem change and explain the effect it has on local and global populations <ol style="list-style-type: none"> a) review the concept of climate shift b) discuss species movement |
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| | <ul style="list-style-type: none"> c) examine ecological succession by reading "Investigating Forest Succession" (Biology Inquires p.178) d) perform the "Carrying Capacity" lab e) read Environmental Science, Chapter 6, "Community and Population Ecology" <p>5. Contrast natural ecosystem changes to those that are caused due to human interference</p> <ul style="list-style-type: none"> a) watch the video "Yellowstone Wolves" b) conduct the "Longitudinal Studies" lab (Roa p.199) c) conduct the Gypsy Moth lab (AP Central), to develop an understanding of the effect of invasive species d) research relevant laws and treaties that work to reduce or reverse this affect e) read Environmental Science, Chapter 8, "Sustaining Biodiversity: The Ecosystem Approach" and Chapter 9, "Sustaining Biodiversity: The Species Approach" <p>6. Investigate the phenomenon of populations and endangered species</p> <ul style="list-style-type: none"> a) conduct the "Endangered Species I - What's Happening?" (Roa p.221) and "Endangered Species II- Who Cares?" (Roa p.233) lab activities <ul style="list-style-type: none"> (1) examine the Endangered Species Act (ESA) (2) discuss the impact of this legislation b) compare this to other initiatives such as the Convention on International Trade in Endangered Species (CITES) c) explain solutions that are currently being attempted and the associated pros/cons <ul style="list-style-type: none"> (1) habitat protection (2) captive breeding d) conduct the "Investigating Plant Growth - re. possible pollutants ("Biology Inquiries" p.45) <p>7. Examine issues associated with extinction</p> <ul style="list-style-type: none"> a) read the prologue and chapter 1 of The Sixth Extinction: An Unnatural History by Elizabeth Kolbert, Picador, 2014 b) develop an understanding of the types/causes of extinction <ul style="list-style-type: none"> (1) Mass (2) Background (3) Anthropogenic <p>F. Engage in the Following Case Studies</p> <ul style="list-style-type: none"> 1. "Consider the Issues" (Biology Inquiries p.269) 2. "Debating Biological/Societal Topics" (p.275) |
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| <p>Standards: <u>HS-ESS2-2:</u> Analyze geoscience data to make the claim that one change to Earth’s surface can create feedbacks that cause changes to other Earth systems. <u>HS-LS2-2:</u> Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.</p> <p>Technology: 8.1.12.A.3; 8.1.12.C.1; 8.2.12.C.4; 8.2.12.C.5; 8.2.12.B.2; B.2.12.B.5 21st Century: CRP2; CRP4; CRP8; 9.2.12.C.7; 9.3.ST.2; 9.3.ST-ET.2; 9.3.ST-ET.3; 9.3.ST-SM.1; 9.3.ST-SM.2 Cross-Curricular: RST.11-12.1; RST.11-12.2; WHST.9-12.1; SL.11-12.5; MP.2; MP.4; N-Q.A.1; N-Q.A.2; N-Q.A.3</p> | <p>III. Human Population Dynamics (3 Weeks)</p> <p>A. Read "Do We Have a Population Problem?" (Taking Sides,p.242)</p> <ol style="list-style-type: none"> 1. Explain why increases in population pose such a global problem 2. Identify impacts of population growth on the environment and other humans <ol style="list-style-type: none"> a) Hunger b) disease c) resource use d) habitat destruction e) standard of living 3. Relate to the carrying capacity lab from the previous unit <p>B. Conduct the “Ecological Footprint” Lab</p> <ol style="list-style-type: none"> 1. Discuss the ramifications of the data 2. Draw conclusions about the impact of a whole population <p>C. Discuss Human History and Examine Global Distribution of the Human Population</p> <p>D. Create a “Timeline” That Compares the Earth to a Human Scale</p> <p>E. Observe Population Maps, Charts of World Population, and Data Available from the United States Census Bureau for the U.S. and World</p> <ol style="list-style-type: none"> 1. Explain how the population rate has changed over time 2. Hypothesize why this may have occurred <p>F. Conduct the "Population - More Is Less" Lab (Roa p.2) and Discuss the Implication It Has for Us</p> <p>G. Observe the “Population Clock”, Explain What It Shows, and What It Means for Us</p> <p>H. Propose Possible Solutions for Our Over-Population Issue and Identify the Associated Pros/Cons of This Solution</p> <p>I. Compare and Contrast Your Solution to Those That Others Have Developed</p> <p>J. Read Environmental Science, Chapter 7, "Applying Population Ecology: Human Population and Urbanization"</p> |
| <p>Standards: <u>HS-ESS3-1:</u> Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. <u>HS-ESS3-3:</u> Create a computational simulation to illustrate the relationships among management of natural resources, the</p> | <p>IV. Renewable And Nonrenewable Resources: Matter (6 Weeks)</p> <p>A. Investigate Water as a Fundamental Resource</p> <ol style="list-style-type: none"> 1. Conduct the "Water' We Going to Do?" lab (Roa p.270) 2. Examine the global water resources and uses <ol style="list-style-type: none"> a) agricultural b) Industrial c) domestic use 3. Discuss issues that exist with the utilization of water <ol style="list-style-type: none"> a) conduct the "Saltwater Intrusion" lab (Roa p.210) b) conduct the Dissolved Oxygen lab (AP Central) |

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| <p>sustainability of human populations, and biodiversity.</p> <p>Technology: 8.1.12.A.3; 8.1.12.C.1; 8.2.12.C.4; 8.2.12.C.5; 8.2.12.B.2; B.2.12.B.5</p> <p>21st Century: CRP2; CRP4; CRP8; 9.2.12.C.7; 9.3.ST.2; 9.3.ST-ET.2; 9.3.ST-ET.3; 9.3.ST-SM.1; 9.3.ST-SM.2</p> <p>Cross-Curricular: RST.11-12.1; RST.11-12.2; RST.11-12.7; RST.11-12.8; WHST.9-12.2; MP.2; MP.4; N-Q.A.1; N-Q.A.2; N-Q.A.3</p> | <ul style="list-style-type: none"> c) compare the findings of these experiments to problems occurring on the global scale <ol style="list-style-type: none"> 4. Examine the USGS current water data for the nation <ul style="list-style-type: none"> a) identify patterns that may exist b) explain the ramification of these patterns 5. Trace the “path” of water, as its diverted into and out of a home <ul style="list-style-type: none"> a) conduct the "Runoff Research" lab (Roa p.162) b) perform the Watershed Assessment lab (AP Central) 6. Explain how water can be reused and identify the processes needed to make it safe 7. Compare the following laws/regulations on drinking water <ul style="list-style-type: none"> a) EPA National Primary Drinking Water Regulations b) Clean Water Act c) Safe Drinking Water Act 8. Read the first half of Environmental Science, Chapter 11, "Water and Water Pollution" <p>B. Investigate Food and Agricultural Products as Fundamental Resources</p> <ol style="list-style-type: none"> 1. Read Environmental Science, Chapter 10, "Food, Soil, and Pest Management" 2. Review the rock cycle and explain the formation of different types of soil 3. Investigate the physical and chemical properties of different types of soil <ul style="list-style-type: none"> a) physical properties – texture, porosity, water-holding capacity, compaction b) chemical properties – organic content, fertility, pH, salinity 4. Conduct the "Soil Analysis" (Molnar p.67) and "Soil Compaction" lab (Roa p.126) 5. Explain why these differences are significant for farming and agriculture 6. Discuss the issues associated with feeding a growing population <ul style="list-style-type: none"> a) read "Can Organic Farming Feed the World?" (Taking Sides p.274) b) Read "Food – What Food?" (Roa p.18) 7. Research means of controlling pests and debate whether “the ends justify the means” 8. Read "Does Commercial Fishing Have a Future?" (Taking Sides p.257) 9. Perform the “Tragedy of the Common” activity 10. Identify fishing techniques and issues associated with overfishing 11. Explain how relevant laws and treaties have helped to slow the process of overfishing |
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| | <p>C. Investigate Land as a Fundamental Resource</p> <ol style="list-style-type: none"> 1. Conduct the “Habitats – The Choice is Yours” lab (Roa p.176.) to develop an understanding of the following Issues <ol style="list-style-type: none"> a) Overgrazing b) Deforestation c) Desertification d) forest fires 2. Research ways in which agencies are working to protect against this issues <ol style="list-style-type: none"> a) tree plantations b) forest and rangeland management c) land conservation d) national parks/forests/rangelands 3. Explain way that these methods are productive and unproductive 4. Identify other way that humans use land <ol style="list-style-type: none"> a) perform the "Land Use Changes in Your Area" activity (Molnar p.18) b) discuss the effects that transportation have on the land c) explain how urbanization make impact watersheds and land erosion 5. Discuss sustainable land-use strategies currently being utilized 6. Conduct the “Copper Extraction” lab (Molnar p.59) or “Surface Mining” lab (Roa p.102) 7. Explain the direct and indirect effects that mining has on the land 8. Compare environmental effect of surface mining versus strip mining 9. Read Environmental Science, Chapter 12, "Geology and Nonrenewable Mineral Resources" 10. Reading - "Should North America's Landscape Be Restored to Its Pre-human State?" (Taking Sides, p.66) 11. Review preservation initiatives and complete the “Natural Areas” (Molnar p.47) project <ol style="list-style-type: none"> a) National Park Service b) National Wildlife Refuges c) National Wilderness Preservation Areas d) National Environmental Policy Act e) Clean Air Act/Clean Water Act 12. Complete the “Multiple Use or Multiple Abuse?” (Roa pg.149) project 13. Identify possible soil issues that may occur due to building, mining, deforestation, and over farming |
| <p>Standards: HS-ESS3-2: Evaluate competing design solutions for developing, managing, and utilizing energy and</p> | <p>V. Renewable And Non-Renewable Resources: Energy (6 weeks)</p> <ol style="list-style-type: none"> A. Read Environmental Science, Chapter 13, "Energy" B. Perform a Home Energy Audit (AP Central) C. Conduct the “Hidden Energy Uses” Lab (Roa p.347) and Link This to Product Life Cycle |

mineral resources based on cost-benefit ratios.*
HS-ESS3-3: Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

Technology: 8.1.12.A.3;
8.1.12.C.1; 8.2.12.C.4;
8.2.12.C.5; 8.2.12.B.2;
B.2.12.B.5

21st Century: CRP2; CRP4;
CRP8; 9.2.12.C.7; 9.3.ST.2;
9.3.ST-ET.2; 9.3.ST-ET.3;
9.3.ST-SM.1; 9.3.ST-SM.2

Cross-Curricular:
RST.11-12.7; RST.11-12.8;
RST.11-12.2; WHST.9-12.2;
MP.2; MP.4; N-Q.A.1;
N-Q.A.2; N-Q.A.3

- D. Investigate Fossil Fuels as a Means of Energy
 - 1. Examine the formation of fossil fuels and create a model for how they are created and extracted
 - 2. Identify the current uses of fossil fuels and the relative amounts of each fuel source
 - 3. Read the article "Is Shale Gas the Solution to Our Energy Woes?" (Taking Sides p.165)
 - 4. Discuss ways that fossil fuel usage has been made "cleaner"
 - 5. Investigate synfuels and explain how they could be used
 - 6. Discuss the environmental advantages/disadvantages of sources
 - a) read the article "Should We Drill for Offshore Oil?" (Taking Sides, p.148)
 - b) conduct the "Oil Spill" lab (Roa p.244)
- E. Investigate Nuclear Energy as a Means of Energy
 - 1. Read the article "Is It Time to Revive Nuclear Power?" (Taking Sides p.222)
 - 2. Create a model for the nuclear fission process
 - 3. Identify the environmental advantages/disadvantages of using nuclear power
 - 4. Research historic nuclear disasters and analyze why they occurred.
 - a) Three Mile Island
 - b) Chernobyl
 - c) Fukushima Daiichi
 - 5. Debate whether nuclear power could ever be considered a safe energy source
 - a) radiation and human health
 - b) radioactive wastes
 - c) nuclear fusion
- F. Investigate Renewal Resources as a Means of Energy
 - 1. Discuss the pros/cons of hydroelectric power
 - 2. Conduct the "Watershed Investigation" (Biology Inquiries p.259)
 - 3. Research the impact of hydroelectric power on the
 - a) Aral Sea
 - b) James Bay
 - c) Colorado River
 - d) Three Gorges
 - 4. Compare and contrast these methods of hydroelectric power generation, to those found in small-scale hydroelectric plants
 - 5. Explain the similarities and differences between hydroelectric and ocean waves/tidal energy
 - 6. Discuss the ways that solar energy can be harnessed
 - 7. Conduct the "Solar House" lab (AP Central)
 - 8. Identify the pros/cons of solar energy and explain whether you believe that this method is an effective energy source

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| | <ul style="list-style-type: none"> 9. Experiment with a hydrogen fuel cell and develop a model for how it works 10. Discuss whether cars should use hydrogen fuel cells and justify this response 11. Research other types of renewable energy <ul style="list-style-type: none"> a) Biomass b) Biodiesel c) Biogas d) wind energy e) Geothermal G. Read the Article "Is Renewable Energy Really Green?" (Taking Sides p.179) H. Compare and Contrast the Environmental Advantages/ Disadvantages of Each Renewable Energy Source I. Investigate Energy Conservation as an Approach to Solving Energy Consumption Issues <ul style="list-style-type: none"> 1. Complete the "Watts' the Cost?" (Roa p.357) and "Conserve a Watt" (Roa p.371) activities 2. Develop a plan for increasing your family's energy efficiency 3. Perform the "We 'Auto' Drive Less" (Roa p.27) investigation <ul style="list-style-type: none"> a) hybrid electric vehicles b) mass transit 4. Read the CAFÉ standards and explain their impact 5. Compare local generation and centralized (grid) generation of energy and explain which method is more efficient and which is more environmentally friendly. J. Complete the "Energy Alternatives" (Roa p.451) Project |
| <p>Standards: HS-ESS2-5: Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.</p> <p>Technology: 8.1.12.A.3; 8.1.12.C.1; 8.2.12.C.4; 8.2.12.C.5; 8.2.12.B.2; B.2.12.B.5</p> <p>21st Century: CRP2; CRP4; CRP8; 9.2.12.C.7; 9.3.ST.2; 9.3.ST-ET.2; 9.3.ST-ET.3; 9.3.ST-SM.1; 9.3.ST-SM.2</p> <p>Cross-Curricular: RST.11-12.1; RST.11-12.2; WHST.9-12.1; MP.2; MP.4; N-Q.A.1; N-Q.A.2; N-Q.A.3</p> | <p>VI. Environmental Quality (6 Weeks)</p> <ul style="list-style-type: none"> A. Examine and Describe the Different Types of Pollution <ul style="list-style-type: none"> 1. Air pollution 2. Noise pollution 3. Light pollution 4. Water pollution 5. Solid waste 6. Pollutants across air, land, and water B. Read the Second Half of Environmental Science, Chapter 11, "Water and Water Pollution" C. Read Environmental Science, Chapter 15, "Air Pollution, Climate Change, and Ozone Depletion" D. Conduct the "Why Recycle?" (Roa p.114) and the "Energy and Recycling" (Molnar p.63) Experiments <ul style="list-style-type: none"> 1. Determine the effects that different types of pollution have on the environment 2. Explain why conservation initiatives such as these are important 3. Contrast the costs and benefits in engaging in these initiatives E. Watch an Excerpt from the Video "Plastic Bag and Plastic Paradise" |

- F. Read Environmental Science, Chapter 16, "Solid and Hazardous Waste"
- G. Read the Article "Should the Superfund Tax Be Reinstated?" (Taking Sides p.327)
 - 1. Discuss economic impacts this may have
 - a) cost-benefits analysis
 - b) Externalities
 - c) marginal costs
 - 2. Explain how this relates to sustainability
- H. Read the Article "Should the United States Reprocess Spent Nuclear Fuel?" (Taking Sides p.343)
 - 1. Identify impacts on the environment and human health
 - a) hazards to human health
 - b) hazardous chemicals in the environment
 - 2. Develop an argument for one of the two sides and debate the topic with classmates
- I. Predict and Discuss How Safe Your State, Town, Neighborhood, and Home Are and Explain What Evidence You Used to Make This Prediction
- J. Conduct an Inventory of "Toxic Sites in Your Neighborhood" (Molnar p.20)
- K. Perform the Following Analysis of the Local Environment
 - 1. "Toxics in the Home" (Roa p.41)
 - 2. "Water Treatment" (Roa p.258)
 - 3. "Detecting Air Pollution" (Roa p.284)
 - 4. Monitoring Air Quality (AP Central)
 - 5. "Acidic Precipitation" (Roa p.296)
- L. Read the Article "Do Environmental Hormone Mimics Pose a Potentially Serious Health Threat?" (Taking Sides p.309)
 - 1. Discuss the ramifications of this article
 - 2. Compare findings to what is outlined in the SafeDrinking Water Act
- M. Revisit the Prediction on the Safety of the State, Town, Neighborhood, and Home and Draw Conclusions about Whether Data Exists to Support or Refute This Prediction
- N. Read Environmental Science, Chapter 14, "Environmental Hazards and Human Health"
- O. Read Several Excerpts from "Tom's River"
- P. Discuss Hazardous Waste Processing and Associated Regulatory Laws/Acts
 - 1. Comprehensive Environmental Response
 - 2. Compensation and Reliability Act (CERCLA)
 - 3. (Superfund)
 - 4. Resource Conservation and Recovery Act (RCRA)
 - 5. Clean Air Act
 - 6. US Food and Drug Administration
- Q. Analyze the Impact of Other Ecological Disasters on Both Environmental and Human Health
 - 1. Cuyahoga River Fire
 - 2. Lake Erie
 - 3. Exxon Valdez
 - 4. Deepwater Horizon

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| | <p>R. Perform the “Life Cycle Analysis” and “What Have We Done Right?” Projects</p> |
| <p>Standards: HS-ESS3-5: Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate.</p> <p>Technology: 8.1.12.A.3; 8.1.12.C.1; 8.2.12.C.4; 8.2.12.C.5; 8.2.12.B.2; B.2.12.B.5</p> <p>21st Century: CRP2; CRP4; CRP8; 9.2.12.C.7; 9.3.ST.2; 9.3.ST-ET.2; 9.3.ST-ET.3; 9.3.ST-SM.1; 9.3.ST-SM.2</p> <p>Cross-Curricular: RST.11-12.1; RST.11-12.2; RST.11-12.7; RST.11-12.8; WHST.9-12.2; MP.2; MP.4; N-Q.A.1; N-Q.A.2; N-Q.A.3</p> | <p>VII. Environment And Society (6 Weeks)</p> <p>A. Design a “Global Warming” Experiment (Roa p.308) to Review the Phenomenon and Its Global Effects</p> <p>B. Examine Data on “Global Warming and Atmospheric CO₂”(Molnar p.10) to Determine Whether a Correlation Exists between the Two</p> <ol style="list-style-type: none"> 1. Discuss cause and effect relationships 2. Identify economic forces 3. Develop the concept of global economics and explain the impact it has on globalization <p>C. Conduct the “Tragedy of the Commons” Simulation</p> <ol style="list-style-type: none"> 1. Develop a cost-benefit analysis 2. Predict the impact this might have on a global scale 3. Discuss real-life scenarios where this is occurring <p>D. Conduct the "Wants and Needs" Lab (Roa p.52)</p> <ol style="list-style-type: none"> 1. Examine global wealth and identify patterns <ol style="list-style-type: none"> a) underlying causes b) consumer culture c) wealth gap 2. Discuss the impact of a wealthy minority on global decisions <p>E. Perform the "What is the Price Open Space" Activity (Roa p.137)</p> <p>F. Investigate the Effects That Political Entities and Initiative Have on the Environment</p> <ol style="list-style-type: none"> 1. Read Environmental Science, Chapter 17, "Environmental Economics, Politics, and Worldviews" 2. Identify key environmental legislation from the past 50 years and discuss the historical and environmental impact they have had 3. Conduct a case study on one of the pieces of legislation and share their analysis with their classmates <ol style="list-style-type: none"> a) National Environmental Policy Act (NEPA) b) Environmental Impact Statement (EIS) c) Environmental Protection Agency (EPA) d) Clean Water Act (CWA) e) Safe Drinking Water Act (SDWA) f) Clean Air Act g) Comprehensive Environmental Response h) Compensation and Reliability Act (CERCLA) i) Resource Conservation and Recovery Act (RCRA) j) Endangered Species Act (ESA) k) Convention on International Trade in |

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| | <p style="text-align: center;">Endangered Species (CITES) l) Montreal Protocol/Kyoto Protocol</p> |
| <p>Standards: HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. HS-ETS1-3: Evaluate a solution to a complex real-world problem-based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.</p> <p>Technology: 8.1.12.A.3; 8.1.12.C.1; 8.2.12.C.4; 8.2.12.C.5; 8.2.12.B.2; B.2.12.B.5</p> <p>21st Century: CRP2; CRP4; CRP8; 9.2.12.C.7; 9.3.ST.2; 9.3.ST-ET.2; 9.3.ST-ET.3; 9.3.ST-SM.1; 9.3.ST-SM.2</p> <p>Cross-Curricular: RST.11-12.1; RST.11-12.2; RST.11-12.7; RST.11-12.8; WHST.9-12.2; MP.2; MP.4; N-Q.A.1; N-Q.A.2; N-Q.A.3</p> | <p>VIII. Environmental Projects And Initiatives (Ongoing)</p> <p>A. BHEF Grant Writing – see also:</p> <ol style="list-style-type: none"> 1. "Think Globally, Act Locally" (Roa p.75) and "Do It" (Roa p.87) 2. President's Environmental Youth Awards (PEYA) 3. National Energy Education Development Program <p>B. "Local Environmental Investigations" (Roa p.480)</p> <p>C. Hydrogen Fuel Cell Car Competition</p> <p>D. Current Event Presentations – "What's Happening?" (Roa p.64)</p> <ol style="list-style-type: none"> 1. What have we done wrong? 2. What have we done right? |

SUGGESTED AUDIO VISUAL/COMPUTER AIDS

Videos:

[Plastic Paradise](#)

[Revenge of the Electric Car](#)

Websites

[Audit website, The College Board, 2010.](#)

[AP Environmental Science Course Homewebsite, The College Board, 2015.](#)

[AP Environmental Science for AP Studentswebsite, The College Board, 2015.](#)

[AP Environmental Science Special Focus: Ecology by The College Board, 2008.](#)

[AP Environmental Science Special Focus: Energy and Climate Change by The College Board, 2007.](#)

[AP Environmental Science Teacher's Guide by Dean Goodwin, The College Board, 2003.](#)

[Earth & Sky – radio series](#)

[Environmental Literacy Council](#)

[Environmental Science Course Description by The College Board, 2013.](#)

[Environmental Science Course Overview by The College Board, 2014.](#)

[National Environmental Education Foundation \(NEEF\)](#)

[North American Association for Environmental Education \(NASEE\) and EELinked Networks](#)

[State Education and Environment Roundtable \(SEER\)](#)

[US Environmental Protection Agency \(EPA\) Office of Environmental Education](#)

[Earth Exploration Toolbook: Step-by-Step Guides for Investigating Earth System Data](#)

SUGGESTED MATERIALS

Easton, Thomas A. *Taking Sides: Clashing Views on Environmental Issues*. 15th ed. Columbus, OH: McGraw-Hill, 2013.

Fagin, Daniel. *Toms River: A Story of Science and Salvation*. New York, NY: Bantam Books, 2013.

Fleischman, Paul. *Eyes Wide Open: Going Behind the Environmental Headlines*. Somerville, MA: Candlewick Press, 2013.

Kolbert, Elizabeth. *The Sixth Extinction: An Unnatural History*. New York, NY: Picador Publishing, 2014.

Miller, Tyler G. *Environmental Science*. 12th ed. Chicago, IL: Cengage Learning Inc., 2008.

Reading and Note Packets - including updated textbook chapters, news articles, case studies, etc.

Evans, Gayle. *AP Environmental Science Crash Course*. Piscataway, NJ: Research & Education Association, 2012.

Koba, Susan, and Anne Tweed. *Hard-to-Teach Biology Concepts*. 2nd ed. Designing Instruction Aligned to the NGSS. Arlington, VA: NSTA Press, 2014.

Molnar, William. *Laboratory Investigations for AP Environmental Science*. Saddlebrook, NJ: Peoples Education, 2005.

Roa, Michael. *Environmental Science Activities Kit*. 2nd ed. San Francisco, CA: Jossey-Bass, 2009.

Rockett, C. Lee, and Kenneth J. Van Dellen. *Laboratory Manual for Miller's Living in the Environment, Environmental Science, and Sustaining the Earth*. Belmont, CA: Wadsworth Publishing Company, 1993.

Shields, Martin. *Biology Inquiries: Standards-Based Labs, Assessments, and Discussion Lessons*. San Francisco, CA: Jossey-Bass Publishing, 2006.