Washington Township School District

The mission of the Washington Township Public Schools *is to provide a safe, positive, and progressive educational environment that provides opportunity for all students to attain the knowledge and skills specified in the NJ Learning Standards at all grade levels, so as to ensure their full participation in an ever-changing world as responsible, self-directed and civic-minded citizens.*

Course Title:	**Advanced Placement Environmental Science**
Grade Level(s):	**11-12**

Duration:	*Full Year:*	**x**	*Semester:*		*Marking Period:*	
Course Description:	This course investigates how humans interact with the natural world. Study first begins with the three main natural systems: Rock, Air and Water. Then the living part of the natural world (plants and animals) is studied. Once the base knowledge of how these systems work is attained, human interaction can be analyzed. Specifically, humans' actions in the following areas are examined and their effect on the natural world determined: Population Dynamics, Energy Usage and Pollution. Another goal of the course is to have students look beyond their immediate sphere of influence and view the world as a whole. Most environmental issues are ones that span the globe, and therefore should be approached from a world-wide perspective. Case study, laboratory investigations and current event analysis are used throughout the course to develop student analyzation and concept application skills, as opposed to encouraging them to simply memorize content.					
Grading Procedures:	Tests - 50%, Quizzes 20%, Lab 25%, Discussion – 5%					
Primary Resources:	**Living in the Environment 18th , Miller and Spoolman, Cengage Online resources to accompany text, Next Generation Science Standards at www.nextgenscience.org/ , New Jersey Student Learning Standards (NJSLS)**					

Washington Township Principles for Effective Teaching and Learning

- Implementing a standards-based curriculum
- Facilitating a learner-centered environment
- Using academic target language and providing comprehensible instruction
- Adapting and using age-appropriate authentic materials
- Providing performance-based assessment experiences
- Infusing 21st century skills for College and Career Readiness in a global society

Designed by:	Costa Tsoukalis

Under the Direction of:	Dr. Patricia Hughes

Written: July 2017

Revised: _____

BOE Approval: _____

Unit Title: Unit 1 – What is Environmental Science?

Unit Description: This unit covers elements of the scientific method, the history and interdisciplinary nature of the Environmental Science. Students will acquire an understanding of what exactly the broad topic of Environmental Science encompasses. The ethical and moral aspect of decisions impacting Environmental Science will also be discussed.

Unit Duration: 3 weeks

Desired Results

Standard(s):
HS-ESS3-1. 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.

Indicators: ESS3.A: Natural Resources
Resource availability has guided the development of human society.

Understandings:
Students will understand that…

- The history of environmental science, conservation and preservation
- The interconnection between environmental problems and other world problems
- The principles of ethics and the difference between ethical and scientific view points

Essential Question:

1. Should environmental science topics be approached ethically or scientifically?

Assessment Evidence

Performance Tasks:
Students will be able to…

- To discuss environmental science in an educated well informed manner
- Debate, with evidence and factual support, the difference between the ethical approach and scientific approach to environmental problems

Other Evidence:

- Class Participation
- Teacher Observation
- Debate Participation
- Quiz Chapter 1
- Article Reading/Discussion: Current topic of environmental Science
- Tragedy of Common Activity

Benchmarks:

Unit 1 Test

Learning Plan

Learning Activities:
Lectures**,** Class discussions, Debates, Class Assignments (available through nglsync.cengage.com) that coincide with Chapters 1 and 2, Tragedy of Commons Activity designed by instructor, Advanced Placement Environmental Science Test Preparation

Lecture Topics:
- Lab Safety
- Ethics of science
- Scientific Method
- History of Environmental Science
- Conservation vs. Preservation

Textbook:
- Miller: Chapter 1 pages 2-27
- Miller: Chapter 2, pages 58-49

Laboratory Exercises:
- Tragedy Commons (overuse of public resources)

Nglsync:
- Selected based of relevance of class discussions and current topics in environmental science

Class Discussions:
- Current Event Article relevant to unit topics

Debate:
- Issues from *Taking Sides* text aligned to current issues in the environmental science world

AP Test Prep:
- Select examples and discussion relevant to unit topics
- Examples from Test Preparation Book relevant to unit topics

Resources:

- Textbook: *Living in the Environment* 18th ed. by Miller and Spoolman - Chapters 1, 2
- *Taking Sides: Clashing Views on Environmental Issues* 16th ed. edited by Easton – Issues
- *Fast Track to a 5: Preparing for the AP Environmental Science Examination* 2012 by Hong and Lionberger
- Cengage online resources and classroom at nglsync.cengage.com
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information)

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): HS-ESS3-1. 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.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Explain how humans try to change and manipulate nature. • Demonstrate a knowledge of the consequences of humans attempts to harness nature, such as, floods, fires and other natural disasters.
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: environment, sustainability, ecology, environmentalism, resource, pollution, footprint, stewardship, ethics, hypothesis, theory, scientific law, negative feedback loop, positive feedback loop • Describe difference between environmental science and environmentalism
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	• Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings. • Structure the learning around explaining or solving a medical or anatomy field related issue.
Struggling Learners	• Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). • Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
English Language Learners (See http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf)	• Provide ELL students with multiple literacy strategies as needed; (for example, alternate response, advance notes, extended time, teacher modeling, simplification of written and verbal instruction, frequent breaks, eDictionaries).
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered

	• Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections

Indicators:
Connections to other DCIs in this grade-band:

- None

Common Core State Standards Connections: ELA /Literacy

- **RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

Common Core State Standards Connections: Mathematics

- **MP.2** Reason abstractly and quantitatively.
- **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling.
- **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Integration of 21st Century Skills

Indicators: Appropriate and contemporary technologies will be used throughout unit to enhance student's preparedness for entry into the globalized 21st century society. Problem solving skills will be approached using the scientific method and general engineering practices.

Science and Engineering Practices:

- Developing and Using Models
- Planning and Carrying Out Investigations
- Plan and Conduct an Investigation
- Constructing Explanations and Designing Solutions

Cross Cutting Concepts:

- System and System Models
- Structure and Function
- Stability and Change

Connections to Science of Nature:

- Scientific Investigations Use a Variety of Methods. Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

Unit Title: Unit 2 – Earth Systems and Resources

Unit Description: This unit covers the three main systems that make up the Earth: Rocks, Air and Water. Students will learn how these three-interconnected systems function to keep the Earth healthy. Students will also learn what part of these systems humans value as resources.

Unit Duration: 5 weeks

Desired Results

Standard(s):
HS-ESS1-5. Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
HS-ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
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.
HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

Indicators: ESS1.C: The History of Planet Earth
Continental rocks, which can be older than 4 billion years, are generally much older than the rocks of the ocean floor, which are less than 200 million years old.

Although active geologic processes, such as plate tectonics and erosion, have destroyed or altered most of the very early rock record on Earth, other objects in the solar system, such as lunar rocks, asteroids, and meteorites, have changed little over billions of years. Studying these objects can provide information about Earth's formation and early history. Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior.

The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space.

Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks.

Understandings:
Students will understand that…

- The timeline of Earth's history and the application of geological time scale in its constructing
- The ways in which volcanic eruptions, plate tectonics, rock cycles and soil formation alter the physical world
- The differences in soil types
- The causes and effects of erosion on ecosystems and the mechanisms involved in slowing or stopping the process
- The atmospheric history of Earth, explaining the origin, evolution, composition and structure of the atmosphere

Essential Questions:

1. What are the three major rock types and soil types?
2. What are the major geological hazards?
3. How is the atmosphere structured and what role does this play in climate?
4. What are the normal forces that drive climate change?
5. How do humans affect global climate change?
6. How is water used throughout the world?

- The mechanisms that cause diverse weather conditions and changing climates on the planet
- The opposing sides on the debate about global climate change
- The hydrologic cycle and the role it plays in delivering freshwater to Earth
- The agricultural, industrial and domestic water usage demands of the world
- The following element cycles: Nitrogen, Phosphorous, Carbon, Sulfur and Oxygen

Assessment Evidence

Performance Tasks:
Students will be able to…

- Use geological time scale to construct a timeline of Earth's history
- Explain the systems of volcanoes, plate tectonics
- Show the evolution of Earth's atmospheric structure and composition from its historical state to the current state
- Diagram the changes and reason for changes that have taken place in the Earth's atmosphere
- Debate, with evidence and factual support, the opposing sides of global change
- Diagram the hydrologic cycle
- Analyze the disparity between distributions of water resources
- Describe changes seen on Earth in terms erosion
- Diagram the nutrient cycles: Nitrogen, Phosphorous, Carbon, Sulfur and Oxygen
- The sources and sinks of energy and how these energy conversions take place
- The energy changes that take place in both quality and quantity as energy is transferred through ecosystems

Other Evidence:

- Class Participation
- Teacher Observation
- Debate Participation
- Quiz Chapter 3
- Article Reading/Discussion: Current topic of Environmental Science, Climate Change
- Geology Lab
- Weather Lab

Benchmark:

Unit 2 Test

Learning Plan

Learning Activities:
Lectures**,** Class discussions, Debates, Class Assignments (available through nglsync.cengage.com) that coincide with Chapters 3, Geology Lab, Weather Lab

Lecture Topics:

- Atmosphere Layers
- Weather vs. Climate
- Global Warming Effect
- Ozone Layer

- Water storage
- Water Model

Textbook:
- Miller: Chapter 3 pages 50-75

Laboratory Exercises:
- Geology Lab – models of plate tectonics and rock cycles
- Weather Lab – collection of general weather data

Nglsync:
- Selected based on relevance of class discussions and current topics in environmental science

Class Discussions:
- Current Event Article relevant to unit topics
- Apple Demonstration – use an apple to demonstrate the usable soil on Earth

Debate:
- Issues from *Taking Sides* text chosen to align with current topics in the environmental science world

AP Test Prep:
- Select examples and discussion relevant to unit topics
- Examples from Test Preparation Book relevant to unit topics

Resources:

- Textbook: *Living in the Environment* 18th ed. by Miller and Spoolman – Chapters 3
- *Taking Sides: Clashing Views on Environmental Issues* 16th ed. edited by Easton – Issues
- *Fast Track to a 5: Preparing for the AP Environmental Science Examination* 2012 by Hong and Lionberger
- Cengage online resources and classroom at nglsync.cengage.com
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information)

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): HS-ESS1-5. Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Model how plate tectonics move land masses around the Earth, changing its surface over time**.** • Estimate structure and age of rocks, relative to other samples
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: lithosphere • Describe the concept of plate tectonics
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): HS-ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Use a model to show how new material upwells from the core of Earth to create new rock. • Demonstrate that rock structure is dependent upon age
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: geosphere, upwell, crystallization • Explain that warm substances rise in both the atmosphere and core of Earth
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): 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.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Develop a model showing how the Sun's energy enters the Earth's system • Construct a model of how global warming works to keep the Earth habitable
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: atmosphere, troposphere, trophic level, food web • Describe the interactions between different species in terms of energy
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • To find evidence in their environment of erosion caused by water. • Explain and give example of the difference between chemical and physical erosion.
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: hydrosphere, aquifers, groundwater • Explain how flowing water can cause erosion
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Create a working model of the carbon, nitrogen, sulfur and phosphorus cycle. • Analyze human changes to these cycles
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: nutrient cycle, sequestered, photosynthesis, respiration • List the different forms carbon has in the environment
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	• Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings. • Structure the learning around explaining or solving a medical or anatomy field related issue.
Struggling Learners	• Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). • Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
English Language Learners (See http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf)	• Provide ELL students with multiple literacy strategies as needed; (for example, alternate response, advance notes, extended time, teacher modeling, simplification of written and verbal instruction, frequent breaks, eDictionaries).

Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections

Indicators:

Connections to other DCIs in this grade-band:

- **Physical Science: HS.PS1.A** (HS-ESS2-5),(HS-ESS2-6); **HS.PS1.B** (HS-ESS2-5),(HS-ESS2-6); **HS.PS2.B, HS.PS3.A** (HS-ESS2- 4); **HS.PS3.B** (HS-ESS2-4),(HS-ESS2-5); **HS.PS3.D** (HS-ESS2-6)
- **Life Science: HS.LS1.C** (HS-ESS2-6) **HS.LS2.B** (HS-ESS2-6); **HS.LS2.C** (HS-ESS2-4)
- **Earth Science: HS.ESS1.C** (HS-ESS2-4); **HS.ESS3.C** (HS-ESS2-4),(HS-ESS2-5),(HS-ESS2-6); **HS.ESS3.D** (HS-ESS2-4),(HS-ESS2-6)

Common Core State Standards Connections: ELA /Literacy

- **RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

Common Core State Standards Connections: Mathematics

- **MP.2** Reason abstractly and quantitatively.
- **MP.4** Model with mathematics.
- **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling.
- **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- **HSA-SSE.A.1** Interpret expressions that represent a quantity in terms of its context.
- **HSA-CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- **HSA-CED.A.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Integration of 21st Century Skills

Indicators: Appropriate and contemporary technologies will be used throughout unit to enhance student's preparedness for entry into the globalized 21st century society. Problem solving skills will be approached using the scientific method and general engineering practices.

Science and Engineering Practices:

- Developing and Using Models
- Planning and Carrying Out Investigations
- Plan and Conduct an Investigation
- Constructing Explanations and Designing Solutions

Cross Cutting Concepts:

- System and System Models
- Structure and Function
- Stability and Change

Connections to Science of Nature:

- Scientific Investigations Use a Variety of Methods. Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

Unit Title: Unit 3 – Living World

Unit Description: This unit covers the biotic portion of the natural world. Plants and animals, and how they grow, interact and change; energy and nutrient usage is also explored.

Unit Duration: 5 weeks

Desired Results

Standard(s):
HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

Indicators: LS4.C: Adaptation
Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species.

Understandings:
Students will understand that…

- The key factors which dictate the structure of an ecosystem
- The differences between the major biomes
- That energy flows through an ecosystem to all trophic levels
- The process of natural selection and its explanation of the vast biodiversity on Earth
- The importance of genetic diversity in maintaining species integrity
- The adaptive features that have contributed to the success of various plants and animals
- The adaptations flora and fauna have acquired on Earth
- The stages of succession including representative flora, fauna and abiotic factors
- The difference between natural and anthropogenic causes

Essential Questions:

1. How do the elements necessary for life cycle through an ecosystem?
2. Where is energy stored in an ecosystem and how does flora and fauna access it?
3. How do organisms in a community interact with each other?
4. What processes forces change within an ecosystem?
5. Why is ecosystem productivity and biomass an important measure of a community?
6. What are the major biomes of the world?
7. What is biodiversity and why is it important to the stability of an ecosystem?

Assessment Evidence

Performance Tasks:
Students will be able to…

- Define the major parts of an ecosystem
- Describe the major biomes of the world
- Diagram the flow of energy through an ecosystem
- Show the energy changes in an ecosystem
- Identify example of natural selection and the biodiversity created
- Debate, with evidence and factual support, the opposing sides to placing economic value to an ecosystem's resources
- Debate, with evidence and factual support, the opposing sides to protecting biodiversity
- Identify specific adaptations made by certain flora and fauna

Other Evidence:

- Class Participation
- Teacher Observation
- Debate Participation
- Quiz Chapter 4 and 5
- Article Reading/Discussion: Current topic of environmental Science
- Bean Natural selection lab

• Diagram the stages of succession • Differentiaite between natural and anthropogenic causes of extinction	

Benchmark:

Unit 3 Test

Learning Plan

Learning Activities:
Lectures, Class discussions, Debates, Class Assignments (available through nglsync.cengage.com) that coincide with Chapters 4, 5, 7, 8, Natural Selection Lab

Lecture Topics:
- Nutrient cycles
- Energy Transfers
- Natural selection
- Communities and Species
- Biodiversity

Textbook:
- Miller: Chapter 4 pages 76-99
- Miller: Chapter 5 pages 100-119
- Miller: Chapter 7 pages 142-165
- Miller: Chapter 8 pages 166-187

Laboratory Exercises:
- Natural Selection Lab – demo of natural selection with beans

Nglsync:
- Selected based of relevance of class discussions and current topics in environmental science

Class Discussions:
- Current Event Article relevant to unit topics

Debate:
- Issues from *Taking Sides* text chosen chosen to align with current topics in the environmental science world

AP Test Prep:
- Select examples and discussion relevant to unit topics
- Examples from Test Preparation Book relevant to unit topics

Resources:

- Textbook: *Living in the Environment* 18th ed. by Miller and Spoolman - Chapters 4, 5, 7, 8
- *Taking Sides: Clashing Views on Environmental Issues* 16th ed. edited by Easton – Issues
- *Fast Track to a 5: Preparing for the AP Environmental Science Examination* 2012 by Hong and Lionberger
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Standard(s): HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Demonstrate how the environment shapes the biota in an ecosystem. Students will use the concepts of natural selection and adaption to explain how species are designed to live in their environment.
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: natural selection, adaptation, biome, biodiversity, evolution, niche, generalist, specialist, invasive species, competition, succession, population, community
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
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Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction

	• Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections

Indicators:

Connections to other DCIs in this grade-band:

- Physical Science: None
- Life Science: **HS.LS2.A (**HS-LS4-5) **HS.LS2.D** (HS-LS4-5) **HS.LS3.B** (HS-LS4-5)
- Earth Science: **HS.ESS2.E** (HS-LS4-5); **HS.ESS3.A** (HS-LS4-5)

Common Core State Standards Connections: ELA /Literacy

- **SL.11-12.5** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
- **RST .11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

Common Core State Standards Connections: Mathematics

- **MP.2** Reason abstractly and quantitatively.
- **MP.4** Model with mathematics.
- **HSN-Q.A.1** Use units to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling.
- **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Integration of 21st Century Skills

Indicators: Appropriate and contemporary technologies will be used throughout unit to enhance student's preparedness for entry into the globalized 21st century society. Problem solving skills will be approached using the scientific method and general engineering practices.

Science and Engineering Practices:

- Developing and Using Models
- Planning and Carrying Out Investigations
- Plan and Conduct an Investigation
- Constructing Explanations and Designing Solutions

Cross Cutting Concepts:

- System and System Models
- Structure and Function
- Stability and Change

Connections to Science of Nature:

- Scientific Investigations Use a Variety of Methods. Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

Unit Title: Unit 4 - Populations

Unit Description: This unit analyzes how populations, both natural and human, grow over time. Students will use the concept of carrying capacity to predict how populations will grow. With respect to human populations: birth rate, death rate, immigration, emigration, health care and women's rights will be discussed. The effect of these forces on populations dynamics will be assessed.

Unit Duration: 4 weeks

Desired Results

Standard(s):
HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.

Indicators: LS2.A: Interdependent Relationships in Ecosystems

Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem.

Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus, sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.

Understandings:
Students will understand that…

- The concept of exponential growth and the various effects it has on individual populations and the environment
- The different models available for describing the growth of a population
- The idea of carrying capacity in relation to population growth
- The concept of carrying capacity and its influences the size of a population
- The influences abiotic and biotic factors have on a population
- The role of birth rates and death rates on human population
- The distribution and utilization of resources among human populations
- The different cultural ideals and economical influences that effect human population dynamics

Essential Questions:

1. How do populations tend to grow?
2. What tools do scientists use to track the growth of a population?
3. How does the carrying capacity of an environment control population growth?
4. What are some other factors that control population growth?
5. How do cultural and economic differences in human populations dictate birth rates, population distribution and resources consumption?

Assessment Evidence

Performance Tasks:
Students will be able to…

- Graph exponential growth
- Manipulate models of population growth
- Define and graph carrying capacity

Other Evidence:

- Class Participation
- Teacher Observation
- Debate Participation
- Quiz Chapter 5, 6

• Identify factors that affect population growth • Analyze trends in birth and death rate of human population • Debate, with evidence and factual support, the opposing sides of concern over falling birth rates • Identify cultural differences in the usage and distribution of resources • Identify the economic disparities that lead to uneven resources distribution	• Article Reading/Discussion: Current topic of environmental Science • Population Dynamics with Vernier • Human Survival charts • Population Dynamic Models for Growth and Disease

Benchmark:

Unit 4 Test

Learning Plan

Learning Activities:
Lectures, Class discussions, Debates, Class Assignments (available through nglsync.cengage.com) that coincide with Chapters 5 and 6, Population Dynamic lab, Human Survival charts, Habitable Planet Population Exercises https://www.learner.org/courses/envsci/unit/text.php?unit=5&secNum=0

Lecture Topics:
- Population growth – logistic vs. exponential
- Natural populations
- Density Dependent factors vs. Density Independent factors
- Human Populations
- Survivorship curves
- Disease

Textbook:
- Miller: Chapter 5 pages 100-119
- Miller: Chapter 6 pages 120-141

Laboratory Exercises:
- Population Dynamics with Vernier – mathematical models of population growth
- Human Survival Charts – use of cemetery data to show how human life expectancy has changed
- Habitable plant exercises – models of human growth of time, and effected baby disease

Nglsync:
- Selected based of relevance of class discussions and current topics in environmental science

Class Discussions:
- Current Event Article relevant to unit topics

Debate:
- Issues from *Taking Sides* text chosen to align with current topics in the environmental science world

AP Test Prep:
- Select examples and discussion relevant to unit topics
- Examples from Test Preparation Book relevant to unit topics

Resources:

- Textbook: *Living in the Environment* 18th ed. by Miller and Spoolman - Chapters 5, 6
- *Taking Sides: Clashing Views on Environmental Issues* 16th ed. edited by Easton – Issues

- *Fast Track to a 5: Preparing for the AP Environmental Science* Examination 2012 by Hong and Lionberger
- Cengage online resources and classroom at nglsync.cengage.com
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information)

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Graphically show how a population grows and shrinks depending on the carrying capacity of an ecosystem • Explain factors that can alter the carrying capacity of a population
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: carrying capacity, overshoot, dieback • Realize that population grow to fit their environment
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Explain how plants and animals acting on their ecosystem can alter it, which ultimately changes the carrying capacity of the ecosystem. Humans will be used as an example species
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: range of tolerance, limiting factor, cultural carrying capacity, death rate, birth rate, age structure • Recognize that an ecosystem shapes the size of a population
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	• Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings. • Structure the learning around explaining or solving a medical or anatomy field related issue.
Struggling Learners	• Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). • Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.

	• Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
English Language Learners (See http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf)	• Provide ELL students with multiple literacy strategies as needed; (for example, alternate response, advance notes, extended time, teacher modeling, simplification of written and verbal instruction, frequent breaks, eDictionaries).
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections

Indicators:

Connections to other DCIs in this grade-band:

- Earth Science: **HS.ESS2.D** (HS-LS4-6); **HS.ESS2.E** (HS-LS2-6)

Common Core State Standards Connections: ELA /Literacy

- **RST.9-10.8** Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.
- **RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- **RST.11-12.7** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- **RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
- **WHST.9-12.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Common Core State Standards Connections: Mathematics

- **MP.2** Reason abstractly and quantitatively.
- **MP.4** Model with mathematics.
- **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling.
- **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
- **HSS-ID.A.1** Represent data with plots on the real number line.
- **HSS-IC.A.1** Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
- **HSS-IC.B.6** Evaluate reports based on data.

Integration of 21st Century Skills

Indicators: Appropriate and contemporary technologies will be used throughout unit to enhance student's preparedness for entry into the globalized 21st century society. Problem solving skills will be approached using the scientific method and general engineering practices.

Science and Engineering Practices:

- Developing and Using Models
- Planning and Carrying Out Investigations
- Plan and Conduct an Investigation
- Constructing Explanations and Designing Solutions

Cross Cutting Concepts:

- System and System Models
- Structure and Function
- Stability and Change

Connections to Science of Nature:

- Scientific Investigations Use a Variety of Methods. Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

Unit Title: Unit 5 – Land and Water Use

Unit Description: This unit considers how humans use water and soil resources specifically during the act of farming. Creating food for the world demands an abundance of water and soil resources. This unit studies how food production can increase, while lessening the impact on soil and water resources. Mining is also examined as another way that soil is destroyed.

Unit Duration: 4 weeks

Desired Results

Standard(s):

HS-ESS3-3. Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.

Indicators: ESS3.C: Human Impacts on Earth Systems

The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources.

Understandings:
Students will understand that…

- The uses of freshwater for agriculture, industry and domestic use
- The effect of over-utilizing oceans for fisheries and industry
- The differences in minerals found on Earth, including location, composition and value
- The idea that biodiversity and genetic diversity influences the number of agricultural products available for human use
- The various uses of land, including residential, commercial, forestry, agricultural and recreational
- The relevant environmental laws and regulations

Essential Questions:

1. What are the uses of freshwater throughout the world?
2. What effect does human over use of natural resources have?
3. What are the different minerals found on Earth?
4. What are some of the environmental laws that have been established to limit the usage of resources?
5. What are some factors that limit the amount of resources human have at their disposal?
6. What are the various ways land and water resources are used by humans?

Assessment Evidence

Performance Tasks:
Students will be able to…

- Identify and explain freshwater
- Identify and explain effects of over utilizing the oceans
- Debate, with evidence and factual support, the opposing sides of using marine reserves
- Identify and explain the factors which effect agriculture production
- Debate, with evidence and factual support, the opposing sides of using genetic modifications in agriculture
- List land uses
- List and explain relevant environmental law

Other Evidence:

- Class Participation
- Teacher Observation
- Debate Participation
- Quiz Chapter 12, 13
- Article Reading/Discussion: Current topic of environmental Science
- Cookie Mining Activities
- Organic vs. Traditional Food Lab
- Video: Food Inc

Benchmarks:

Unit 5 Test

Mid-term exam

Learning Plan

Learning Activities:
Lectures, Class discussions, Debates, Class Assignments (available through nglsync.cengage.com) that coincide with Chapters 12 and 13, Video, Cookie Mining activity, Organic vs. Traditional food

Lecture Topics:

- Apple demonstration/Available soil
- Soil cores
- Mining
- Hunger and Food Production
- Conventional vs. Organic farming
- Pesticides
- Genetically Modified Organism (GMO) crops

Textbook:

- Miller: Chapter 12 pages 276-315
- Miller: Chapter 13 pages 316-347

Laboratory Exercises:

- Cookie Mining – demonstration of mining techniques and soil reclamation
- Organic Food Lab – compare pesticide amounts on organic grown food vs. conventional grown food

Nglsync:

- Selected based of relevance of class discussions and current topics in environmental science

Class Discussions:

- Current Event Article relevant to unit topics

Debate:

- Issues from *Taking Sides* text chosen chosen to align with current topics in the environmental science world

AP Test Prep:

- Select examples and discussion relevant to unit topics
- Examples from Test Prep Book relevant to unit topics

Resources:

- Textbook: *Living in the Environment* 18th ed. by Miller and Spoolman - Chapters 12, 13
- *Taking Sides: Clashing Views on Environmental Issues* 16th ed. edited by Easton – Issues
- *Fast Track to a 5: Preparing for the AP Environmental Science Examination* 2012 by Hong and Lionberger
- Cengage online resources and classroom at nglsync.cengage.com
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information)

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): HS-ESS3-3. Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Discuss and suggest methods to grow food to feed global population without destroying soil and water.
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: food security, hunger, nutrition, famine, aquaculture, topsoil, desertification, GMO
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	• Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings. • Structure the learning around explaining or solving a medical or anatomy field related issue.
Struggling Learners	• Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). • Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
English Language Learners (See http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf)	• Provide ELL students with multiple literacy strategies as needed; (for example, alternate response, advance notes, extended time, teacher modeling, simplification of written and verbal instruction, frequent breaks, eDictionaries).
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction • Variation of size: adapting the number of items the student is expected to complete

	• Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections

Indicators:

Connections to other DCIs in this grade-band:

- Physical Science: **HS.PS1.B** (HS-ESS3-3)
- Life Science: **HS.LS2.A** (HS-ESS3-3) **HS.LS2.B** (HS-ESS3-3) **HS.LS2.C** (HS-ESS3-3) **HS.LS4.D** (HS-ESS3-3)
- Earth Science: **HS.ESS2.A** (HS-ESS3-3) **HS.ESS2.E** (HS-ESS3-3)

Common Core State Standards Connections: ELA /Literacy

- None

Common Core State Standards Connections: Mathematics

- **MP.2** Reason abstractly and quantitatively.
- **MP.4** Model with mathematics.

Integration of 21st Century Skills

Indicators: Appropriate and contemporary technologies will be used throughout unit to enhance student's preparedness for entry into the globalized 21st century society. Problem solving skills will be approached using the scientific method and general engineering practices.

Science and Engineering Practices:

- Developing and Using Models
- Planning and Carrying Out Investigations
- Plan and Conduct an Investigation
- Constructing Explanations and Designing Solutions

Cross Cutting Concepts:

- System and System Models
- Structure and Function
- Stability and Change

Connections to Science of Nature:

- Scientific Investigations Use a Variety of Methods. Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

Unit Title: Unit 6 – Energy Resources and Consumption

Unit Description: This unit examines the different resources humans use to generate power. Non-renewable and renewable energy will be contrasted. Power generation and distribution will also be considered, as well as discussion regarding energy usage and the need and methods, including policy change, for reduction of energy use.

Unit Duration: 4 weeks

Desired Results

Standard:

HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

Indicators: ESS3.A: Natural Resources

All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors.

Understandings:
Students will understand that…

- How current energy sources are responsible for environmental degradation
- How current mechanisms and energy sources supply human energy needs
- How alternative energy sources differ from the ones currently in use
- How alternative energy sources can reduce pollution and environmental degradation

Essential Questions:

1. What are the problems that have been caused by current energy sources?
2. How do humans currently use energy and can this method be maintained indefinitely?
3. What are the different alternative energy sources?
4. How can alternative energy sources reduce pollution?

Assessment Evidence

Performance Tasks:
Students will be able to…

- Identify and explain the current sources of energy used by humans
- Identify current environmental problems caused by energy usage
- Diagram the transition from raw energy sources to usable energy
- Debate, with evidence and factual support, whether to drill for oil in the Arctic National Wildlife Refuge
- Identify and explain alternative energy sources
- Debate, with evidence and factual support, the pros and cons of nuclear energy
- Identify the benefits of alternative energy sources
- Debate, with evidence and factual support, the ability of hydrogen fuel cells

Other Evidence:

- Class Participation
- Teacher Observation
- Debate Participation
- Quiz Chapter 14, 15
- Article Reading/Discussion: Current topic of Environmental Science
- Energy Usage Models
- Video: Chernobyl 10 Years later

Benchmark:

Unit 6 Test

Learning Plan

Learning Activities:

Lectures, Class discussions, Debates, Class Assignments (available through nglsync.cengage.com) that coincide with Chapters 14, 15 and 16, Video, Energy Models from Habitable Planet https://www.learner.org/courses/envsci/unit/text.php?unit=10&secNum=0)

Lecture Topics:

- Oil/Natural Gas/Coal
- Nuclear Power
- Fracking
- Alternative Energies
- Conservation of Energy
- Green Design

Textbook:

- Miller: Chapter 14 pages 348-371
- Miller: Chapter 15 pages 372-399
- Miller: Chapter 16 pages 400-439

Laboratory Exercises:

- Energy Models – graphic models on energy use now and in future

Nglsync:

- Selected based of relevance of class discussions and current topics in environmental science

Class Discussions:

- Current Event Article relevant to unit topics

Debate:

- Issues from *Taking Sides* text chosen to align with current topics in the environmental science world

AP Test Prep:

- Select examples and discussion relevant to unit topics
- Examples from Test Prep Book relevant to unit topics

Resources:

- Textbook: *Living in the Environment* 18th ed. by Miller and Spoolman - Chapters 14, 15, 16
- *Taking Sides: Clashing Views on Environmental* Issues 16th ed. edited by Easton – Issues
- *Fast Track to a 5: Preparing for the AP Environmental Science Examination* 2012 by Hong and Lionberger
- Cengage online resources and classroom at nglsync.cengage.com
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information)

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Develop a plan to assess the most accurate cost to mineral and energy resources. Then with an eye toward sustainability, make decision about how to generate power for an ever-growing world.
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: turbine, mountain top removal, strip mining, liquified petroleum gas, petroleum, fission, fusion, renewable energy, cogeneration • Realize that most current power supplies are finite
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	• Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings. • Structure the learning around explaining or solving a medical or anatomy field related issue.
Struggling Learners	• Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). • Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
English Language Learners (See http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf)	• Provide ELL students with multiple literacy strategies as needed; (for example, alternate response, advance notes, extended time, teacher modeling, simplification of written and verbal instruction, frequent breaks, eDictionaries).
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	• Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections

Indicators:

Connections to other DCIs in this grade-band:

- Physical Science: **HS.PS3.B** (HS-ESS3-2) **HS.PS3.D** (HS-ESS3-2)
- Life Science: **HS.LS2.A** (HS-ESS3-2) **HS.LS2.B** (HS-ESS3-2) **HS.LS4.D** (HS-ESS3-2)
- Earth Science: **HS.ESS2.A** (HS-ESS3-2)

Common Core State Standards Connections: ELA /Literacy

- **RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- **RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

Common Core State Standards Connections: Mathematics

- **MP.2** Reason abstractly and quantitatively.

Integration of 21st Century Skills

Indicators: Appropriate and contemporary technologies will be used throughout unit to enhance student's preparedness for entry into the globalized 21st century society. Problem solving skills will be approached using the scientific method and general engineering practices.

Science and Engineering Practices:

- Developing and Using Models
- Planning and Carrying Out Investigations
- Plan and Conduct an Investigation
- Constructing Explanations and Designing Solutions

Cross Cutting Concepts:

- System and System Models
- Structure and Function
- Stability and Change

Connections to Science of Nature:

- Scientific Investigations Use a Variety of Methods. Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

Unit Title: Unit 7 - Pollution

Unit Description: This unit explores how humans pollute the natural world. Students will develop a general plan to reduce pollution, but not effect a standard of living. Air, solid, water and toxic pollution will be considered. A large focus will be on human waste and the proper treatment of human waste.

Unit Duration: 4 weeks

Desired Results

Standard(s):

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Indicators: ESS3.C: Human Impacts on Earth Systems

Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation.

Understandings:
Students will understand that…

- How the major pollutants interact and effect biotic and abiotic aspects of the environment
- How to measure pollutants using units such as ppm, pH and micrograms
- How point and non-point sources of pollution differ
- How point and non-point sources of pollution effect aquatic systems, vegetation, wildlife health and structures
- How current disposal methods of solid wastes differ
- How chemical and biological agents may cause acute and chronic health affects
- How economic costs of pollution and remediation effect regulation and policy

Essential Questions:

1. What are the major types of pollution?
2. How are pollutants measured?
3. What is the difference between point and nonpoint?
4. What are the effects of pollution, either point or nonpoint?
5. What are the different types of solid wastes and how are they disposed?
6. What are the effects that pollution has on human populations?

Assessment Evidence

Performance Tasks:
Students will be able to…

- Identify the major type of pollutants
- Debate, with evidence and factual support, the effectiveness of superfund program
- Debate, with evidence and factual support, whether or not there should be a worldwide DDT ban.
- Explain the effects of the major pollutants
- Measure pollutants in relevant units
- Identify and classify the different sources of pollution
- Identify the type of solid wastes
- Debate, with evidence and factual support, whether or not nuclear fuel should be reprocessed
- Identify and explain the different effects pollution has on human populations
- Debate, with evidence and factual support, the health effect of hormone mimics

Other Evidence:

- Class Participation
- Teacher Observation
- Debate Participation
- Quiz Chapter 17, 18
- Article Reading/Discussion: Current topic in Environmental Science
- LD50 Lab
- Love Canal Video

Benchmark:

Unit 7 Test

Learning Plan

Learning Activities:
Lectures, Class discussions, Debates, Class Assignments (available through nglsync.cengage.com) that coincide with Chapters 17, 18, 20 and 21, Video, Lethal Dose 50 Lab

Lecture Topics:

- Air Pollution types
- Particulate matter
- Indoor air Quality
- Water pollution types
- Solid waste
- Toxic waste
- Superfund

Textbook:

- Miller: Chapter 17 pages 440-471
- Miller: Chapter 18 pages 472-503
- Miller: Chapter 20 pages 542-573
- Miller: Chapter 21 pages 574-603

Laboratory Exercises:

- Lethal Dose 50 (LD50) Lab – show how LD50 is calculated

Nglsync:

- Selected based of relevance of class discussions and current topics in environmental science

Class Discussions:

- Current Event Article relevant to unit topics

Debate:

- Issues from *Taking Sides* text chosen chosen to align with current topics in the environmental science world

AP Test Prep:

- Select examples and discussion relevant to unit topics
- Examples from Test Preparation Book relevant to unit topics

Resources:

- Textbook: *Living in the Environment* 18th ed. by Miller and Spoolman - Chapters 17, 18, 20, 21
- *Taking Sides: Clashing Views on Environmental Issues* 16th ed. edited by Easton – Issues
- *Fast Track to a 5: Preparing for the AP Environmental Science Examination* 2012 by Hong and Lionberger
- Cengage online resources and classroom at nglsync.cengage.com
- Technology: Teacher 2 in 1 Device, Short Throw Projector, Student Laptops
- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information)

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Analyze human behave to identify and suggest alternatives to pollution sources. They must use evidence and best current technology so that their alternative solutions are as realistic as possible.
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: toxic, dangerous, particulate, carcinogen, teratogens, chronic, acute, toxicity, oxides, smog, dissolved oxygen, biochemical oxygen demand, runoff, eutrophication • Every human activity creates waste that is put into nature
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Unit Modifications for Special Population Students	
Advanced Learners	• Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings. • Structure the learning around explaining or solving a medical or anatomy field related issue.
Struggling Learners	• Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). • Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. • Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
English Language Learners (See http://www.state.nj.us/education/modelcurriculum/ela/ELLSupport.pdf)	• Provide ELL students with multiple literacy strategies as needed; (for example, alternate response, advance notes, extended time, teacher modeling, simplification of written and verbal instruction, frequent breaks, eDictionaries).
Learners with an IEP	Each special education student has in Individualized Educational Plan (IEP) that details the specific accommodations, modifications, services, and support needed to level the playing field. This will enable that student to access the curriculum to the greatest extent possible in the least restrictive environment. These include: • Variation of time: adapting the time allotted for learning, task completion, or testing • Variation of input: adapting the way instruction is delivered • Variation of output: adapting how a student can respond to instruction

	• Variation of size: adapting the number of items the student is expected to complete • Modifying the content, process or product Additional resources are outlined to facilitate appropriate behavior and increase student engagement. The most frequently used modifications and accommodations can be viewed here. Teachers are encouraged to use the Understanding by Design Learning Guidelines (UDL). These guidelines offer a set of concrete suggestions that can be applied to any discipline to ensure that all learners can access and participate in learning opportunities. The framework can be viewed here www.udlguidelines.cast.org
Learners with a 504	• Refer to page four in the Parent and Educator Guide to Section 504 to assist in the development of appropriate plans.

Interdisciplinary Connections

Indicators:

Connections to other DCIs in this grade-band:

- Life Science: **HS.LS2.C** (HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6); **HS.LS4.D** (HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6);

Common Core State Standards Connections: ELA /Literacy

- **RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- **RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

Common Core State Standards Connections: Mathematics

- **MP.2** Reason abstractly and quantitatively.
- **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
- **HSN-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling.
- **HSN-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Integration of 21st Century Skills

Indicators: Appropriate and contemporary technologies will be used throughout unit to enhance student's preparedness for entry into the globalized 21st century society. Problem solving skills will be approached using the scientific method and general engineering practices.

Science and Engineering Practices:

- Developing and Using Models
- Planning and Carrying Out Investigations
- Plan and Conduct an Investigation
- Constructing Explanations and Designing Solutions

Cross Cutting Concepts:

- System and System Models
- Structure and Function
- Stability and Change

Connections to Science of Nature:

- Scientific Investigations Use a Variety of Methods. Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.

Unit Title: Unit 8 - Global Changes

Unit Description: This unit is a culmination of the entire course. Students will develop plans to potentially solve world environmental problems. Students must use supporting evidence and scientific data to substantiate their claims. The solutions must be economically, socially and culturally conceivable.

Unit Duration: 9 weeks – Majority (6 weeks) is completed after Advanced Placement Exam

Desired Results

Standard(s):

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-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Indicators: ESS3.D: Global Climate Change

Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts.

Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities.

Understandings:
Students will understand that…

- How pollutants are influencing global ocean temperature, sea level, currents and marine life
- How current human-influenced biotic changes on Earth include: loss of biodiversity, introduced exotics and habitat destruction
- How human induced global changes of the atmosphere are causing global warming and increased ultraviolet radiation
- How human induced global changes of the oceans include increasing sea levels, long term climate change and impacts on El Nino
- How cultural and aesthetic principles play a part in environmental decisions

Essential Questions:

1. What are some ways that humans have changed the environment?
2. Why have humans continued to pollute, even though the pollution has adverse effects on the environment?
3. Is there a way to stop or reverse the negative changes humans have caused to the environment?

Assessment Evidence

Performance Tasks:
Students will be able to…

- Identify pollutant influences on oceans
- Identify human induced changes on Earth
- Identify human induced changes in the atmosphere
- Identify human induced changes in the ocean
- Identity and appreciate different cultural and aesthetic reason for human induced changes
- Debate, with evidence and factual support, if biodiversity is overprotected

Other Evidence:

- Class Participation
- Teacher Observation
- Debate Participation
- Quiz Chapter 22, 23
- Article Reading/Discussion: Current topic of Environmental Science

Benchmarks:

Unit 8 Test

Independent Student Research Project – follow the scientific method to investigate and Environmental science topic. They will collect data, present findings and write a report.

Final Exam if needed
Advanced Placement Environmental Science Test

Learning Plan

Learning Activities:
Lectures, Class discussions, Debates, Class Assignments (available through nglsync.cengage.com) that coincide with Chapters 9, 10, 22, 23, 24, Independent Student Research Project

Lecture Topics:

- Economic value of natural services
- Environmental law
- Sustainability

Textbook:

- Miller: Chapter 9 pages 188-215
- Miller: Chapter 10 pages 216-245
- Miller: Chapter 22 pages 604-629
- Miller: Chapter 23 pages 630-656
- Miller: Chapter 24 pages 656-681
- Miller: Chapter 25 pages 682-703

Laboratory Exercises:

- Independent Student Research Project (large portion of time) - follow the scientific method to investigate and Environmental science topic. They will collect data, present findings and write a report.

Nglsync:

- Selected based of relevance of class discussions and current topics in environmental science

Class Discussions:

- Current Event Article relevant to unit topics

Debate:

- Issues from *Taking Sides* text chosen chosen to align with current topics in the environmental science world

AP Test Prep:

- Select examples and discussion relevant to unit topics
- Examples from Test Prep Book relevant to unit topics

Resources:

- Textbook: *Living in the Environment* 18th ed. by Miller and Spoolman - Chapters 9, 10, 22, 23, 24, 25
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- Other Resources: PowerPoint Presentations (instructor created), supplemental readings and handouts (inclusive of current and emerging research related information)

Unit Learning Goal and Scale *(Level 2.0 reflects a minimal level of proficiency)*	
Standard(s): 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.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Make accurate data driven predictions about the future of our environment. They will also be able to suggest global remedies for these problems, especially global climate change**.**
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: sustainability • Recognize that environmental problems are global problems
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

Standard(s): 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.	
4.0	**Students will be able to:** • In addition to score 3.0 performance, the student demonstrates in-depth inferences and applications that go beyond what was taught.
3.0	**Students will be able to:** • Take all the information gained throughout the year apply it to a self-guide research project. They will identify an environmental problem, design a way to investigate it, present the data they find and suggest a realistic solution to the problem.
2.0	**Students will be able to:** • Recognize and recall specific vocabulary: urbanization, sprawl, smart growth, green design, economics, subsidies, gross domestic product, per captitia • Recognize that environmental solutions must be viable economically, socially and culturally.
1.0	**With help, partial success at level 2.0 content and level 3.0 content:**
0.0	**Even with help, no success**

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- Physical Science: **HS.PS3.B** (HS-ESS3-5) **HS.PS3.D** (HS-ESS3-5)
- Earth Science: **HS.ESS2.A** (HS-ESS3-6) **HS.ESS2.D** (HS-ESS3-5

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- **RST.11-12.7** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- **RST.11-12.8** Evaluate the hypotheses, data, analysis, and corroborating or challenging conclusions with other sources of information.

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- **MP.2** Reason abstractly and quantitatively.
- **MP.4** Model with mathematics.
- **HSN-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
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