

Environmental Science – Unit 4

Environmental Science Unit 4- Water, Air, and Land Resources

Unit Overview: This unit is composed of five chapters- *Water, Air, Atmosphere and Climate Change, Land, and Food and Agriculture*. These chapters describe the distribution of Earth's resources and explain the cycles associated with their interaction with each other. Students will study about the distribution of water resources, the relationship between groundwater and surface water, global water use, how water is treated for consumption, how dams and water diversion projects are used to manage freshwater resources and water conservation. Additionally, students will study how pollution such as smog affects land and the atmosphere. This pollution affects the Earth in several ways. Finally, students will learn about agriculture and learn major causes of malnutrition and famine

Essential Questions:

Chapter 11- Water

- Can you describe the distribution of Earth's water resources?
- How is water treated so that it can be used for drinking?
- How are dams and water diversion projects used to manage resources?
- What are the different types of water pollution?
- Can you describe six major laws designed to improve water quality in the United States?

Chapter 12- Air

- Can you list and give the source of five primary air pollutants?
- How does thermal inversion trap air pollution?
- What three long term and three short term effects of air pollution on human health?
- What is the cause of acid precipitation? How does acid precipitation affect ecosystems?

Chapter 13- Atmosphere and Climate Change

- How is climate defined? Why do different parts of the Earth have different climates?
- What is the ozone shield? Can you explain how the ozone layer shields the Earth from the sun's harmful radiation?
- Explain why the Earth's atmosphere is like glass in a greenhouse.
- Can you describe why the levels of carbon dioxide content of the atmosphere is increasing?

Chapter 14- Land

- How do humans use land?
- What is the difference between urban and rural land?
- Can you describe the urban crisis? Can you explain what people are doing to deal with it?
- What are the benefits of preserving farmland?

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Chapter 15-Food and Agriculture

- Identify major causes of malnutrition. How is poverty a major cause of malnutrition?
- Can you describe the differences between traditional and modern agricultural techniques?
- What are the benefits and the environmental impacts of pesticide use?
- How does overharvesting affect the supply of aquatic organisms used for food?

Living Environment Core Curriculum- MST Standards

Key Idea 7: Human decisions and activities have had a profound impact on the physical and living environment.

7.1- Describe the range of interrelationships of humans with the living and nonliving environment

7.2-Explain the impact of technological development and growth in the human population on the living and nonliving environment.

7.3-Explain how individual choices and societal actions can contribute to improving the environment.

Earth Science Core Curriculum- MST Standards

Key Idea 1: The Earth and celestial phenomena can be described by principles of relative motion and perspective.

1.1 Explain complex phenomena, such as tides, variations in day length, solar insolation, apparent motion of the planets, and annual traverse of the constellations.

1.2 Describe current theories about the origin of the universe and solar system.

Key Idea 2: Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

2.1 Use the concepts of density and heat energy to explain observations of weather patterns, seasonal changes, and the movements of Earth's plates.

2.2 Explain how incoming solar radiation, ocean currents, and land masses affect weather and climate.

New York State Science Learning Standards Performance Expectations

HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of 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.

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

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.

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

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

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Environmental Science Content	NYSSLS Disciplinary Core Ideas	Additional Resources	Project Based Resources and Activities - Version 1 Scaffolded with Supports	Project Based Resources and Activities - Version 2
<p>Chapter 11-Water</p> <p>Section 1-Water Resources</p> <ul style="list-style-type: none"> Describe the distribution of Earth’s water sources Explain why freshwater is one of Earth’s limited resources Describe the distribution of Earth’s surface water Describe the relationship between groundwater and surface water in a watershed <p>Section 2- Water Use and Management</p> <ul style="list-style-type: none"> Explain how water is treated so that it can be used for drinking Identify how water is used in homes, industry, and in agriculture Describe how dams and water diversion projects are used to manage freshwater resources Identify five ways that water can be conserved <p>Section 3- Water Pollution</p> <ul style="list-style-type: none"> Compare point-source pollution with nonpoint-source pollution Classify water pollutants by five types Explain why groundwater pollutants is so difficult to clean up Describe the major sources of ocean pollution and explain the effects of pollution on ecosystems 	<ul style="list-style-type: none"> 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. The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts 	<p>Text Resource <i>Environmental Science – Holt Chapter 11 - pp. 269 - 293</i></p> <p>Student Resources Earth Wheel iQuest – In this NASA interactive, students learn about water and how water moves through Earth’s systems.</p> <p>United States Geological Survey (USGS) Current Water Data for U.S.- National Water Information Data updated every 4 hours for water usage rates across the United States.</p> <p>Buffalo Niagara Water Keeper Water Quality – An interactive map that explores water quality in the Niagara River Watershed.</p> <p>Buffalo Niagara Waterkeeper Fish Consumption – Material on this page includes information regarding local fish consumption and the effects of pollution. Public Health information is included.</p> <p>BP Oil Spill Revisited – Video showing remnants on the 2010 BP oil rig explosion in the Gulf of Mexico.</p> <p>Gulf of Mexico Oil Spill Interactive – Students trace the path of the oil through time and space. Detailed information and pictures of the oil spill are integrated.</p> <p>Teacher Resources Aquatic Wild Activity Resources - Access to Aquatic Wild resources including Step with STEM, WILD work, student pages and additional resources.</p>	<p>Environmental News Summary Students research and summarize a current event article. Environmental News Summary Student Resource Unit 4</p> <p>Harriet Tubman – The Unsung Naturalist* Students read and process a research article about Harriet Tubman and her knowledge about the environment. Completing this piece is a reading/student comprehension activity on the subject of wetlands and climate change.</p> <p>Harriet Tubman – The Unsung Naturalist Teacher Resource</p> <p>Harriet Tubman – The Unsung Naturalist – Student Resource</p>	<p>Environmental News Summary Students research and summarize two current event articles. Environmental News Summary Student Resource Unit 4</p> <p>Harriet Tubman – The Unsung Naturalist* Students read and process a research article about Harriet Tubman and her knowledge about the environment. Completing this piece is a reading/student comprehension activity on the subject of wetlands and climate change.</p> <p>Harriet Tubman – The Unsung Naturalist Teacher Resource</p> <p>Harriet Tubman – The Unsung Naturalist – Student Resource</p>

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		<p>Z Space Activity (code) Exploring Beach and river erosion (E412) Explore how wave height and time affect beach erosion. Add jetties, breakwaters and beach grass to impact beach erosion. Explore how time affects river erosion. Change land uses to impact river erosion. Teacher Resource pdf Student Resource pdf</p>		
<p>Chapter 12 -Air Section 1-What Causes Air Pollution?</p> <ul style="list-style-type: none"> Name the five primary pollutants and give resources for each Name the two major sources for air pollution in urban areas Describe the way in which smog forms Explain the way in which a thermal inversion traps air pollution <p>Section 2- Air, Noise, and Light Pollution</p> <ul style="list-style-type: none"> Describe three short term effects and three long term effects of air pollution on human health 	<ul style="list-style-type: none"> Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. 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. The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts 	<p>Text Resource <i>Environmental Science – Holt</i> Chapter 12 - pp. 303 - 309</p>		

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Chapter 13- Atmosphere and Climate Change

Section 1- Climate and Climate Change

- Explain the difference between weather and climate
- Identify four factors that determine climate
- Explain why different parts of the Earth have different climates
- Explain what causes the seasons

Section 2- The Ozone Shield

- Explain how the ozone layer shields the Earth from much of the sun's harmful radiation
- Explain how chlorofluorocarbons damage the ozone layer
- Describe the damaging effects of ultraviolet radiation
- Explain why the threat to the ozone layer is still continuing today

Section 3- Global Warming

- Explain why Earth's atmosphere is like a glass in a greenhouse
- Explain why the carbon dioxide content of the atmosphere is increasing
- Identify one possible explanation for the increase in average global temperature
- Describe what a warmer Earth might be like

- Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These phenomena cause a cycle of ice ages and other gradual climate changes.
- The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles.
- 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.
- Concepts of density and heat energy can be used to explain observations of weather patterns
- 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.
- Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and

Text Resource

Environmental Science – Holt
Chapter 13 - pp. 327 - 345

Teacher Resources

[NEED – Climate Web](#) – Students visualize climate as a system with many components, functions, and connections.

[Climate Web Teacher Resource](#)

[Climate Web Student Resource](#)

[Climate Web Hang Tags](#)

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	<p>by the ways in which these gases are absorbed by the ocean and biosphere.</p>			
<p>Chapter 14- Land Section 1- How We Use Land</p> <ul style="list-style-type: none"> Distinguish between urban and rural land Describe three major ways in which humans use land <p>Section 2- Urban Land Use</p> <ul style="list-style-type: none"> Describe the urban crisis and explain what people are doing to combat the crisis Explain how urban sprawl affects the environment Explain how open spaces provide urban areas with environmental benefits Describe how people use geographic information system as a tool for land-use planning <p>Section 3- Land Management and Conservation</p> <ul style="list-style-type: none"> Explain the benefits of preserving farmland Describe the environmental effects of deforestation 	<ul style="list-style-type: none"> Earth’s systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. 	<p>Text Resource <i>Environmental Science – Holt Chapter 14 - pp. 355 - 367</i></p> <p>Student Resources National Geographic Pollution – Images and information pertaining to land, water, and air pollution. Included are ways to reduce pollution.</p>	<p>Conservation Lab Students explore ways that habitat loss due to human development impacts a population of endangered butterflies. Exploration of scientific concepts is in context to the local environment. Conservation Lab Graphic Organizer for Persuasive Letter</p> <p>Connecting Environmental Resources to Historically Rich Spaces* - Students read and analyze text concerning Broderick Park, The Niagara River Corridor, and gulls that over winter along the Niagara River.</p> <p>Connecting Environmental Resources to Historically Rich Spaces – Teacher Resources</p> <p>Connecting Environmental Resources to Historically Rich Spaces – Student Resources</p>	<p>Conservation Lab Students explore ways that habitat loss due to human development impacts a population of endangered butterflies. Exploration of scientific concepts is in context to the local environment. Conservation Lab</p> <p>Connecting Environmental Resources to Historically Rich Spaces* - Students read and analyze text concerning Broderick Park, The Niagara River Corridor, and gulls that over winter along the Niagara River.</p> <p>Connecting Environmental Resources to Historically Rich Spaces – Teacher Resources</p> <p>Connecting Environmental Resources to Historically Rich Spaces – Student Resources</p>
<p>Chapter 15- Food and Agriculture Section 1- Feeding the World</p> <ul style="list-style-type: none"> Identify the major causes of malnutrition Explain how poverty is a major cause of malnutrition Explain the importance of the green revolution <p>Section 2- Crops and Soil</p> <ul style="list-style-type: none"> Distinguish between traditional and modern agriculture techniques Describe fertile soil Describe the need for soil conservation 	<ul style="list-style-type: none"> Earth’s systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. 	<p>Text Resource <i>Environmental Science – Holt Chapter 15 - pp. 379 - 399</i></p> <p>Teacher Resources Biography of Cesar Chavez* This biography of Cesar Chavez, from N.J. The Amistad Commission highlights his work as a political activist. Cesar Chavez devoted his life to the interests of farm workers, founding the National Farm Workers Association (NFWA).</p>		

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<ul style="list-style-type: none"> Explain the benefits and environmental impacts of pesticide use Explain what is involved in integrated pest management <p>Section 3- Animals and Agriculture</p> <ul style="list-style-type: none"> Explain how overharvesting affects the supply of aquatic organisms used for food Describe the current role of aquaculture in providing seafood Describe the importance of livestock in providing food and other products 	<ul style="list-style-type: none"> When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. Advances in biotechnology have allowed organisms to be modified genetically 	<p>Activist Farmers Tell the Food System that Black Lives Matter*</p> <p>This article is about Sul Fire Farms and their programs that focus on fighting racism and injustice in the food system.</p>		
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Unit 4 Evidence of Learning	Ticket Out • Think-Pair-Share • Formative Assessment • Weekly Quiz • Unit Test • Homework • Review Questions				
Unit 4 Materials	No extra materials required for this unit.				
Unit 4 Vocabulary	<p>Chapter 11</p> aquifer artificial eutrophication biomagnification dam desalination groundwater nonpoint-source pollution pathogen permeability point-source pollution porosity potable recharge zone reservoir river system surface water thermal pollution wastewater water pollution watershed	<p>Chapter 12</p> air pollution pH primary pollutant secondary pollutant smog temperature inversion	<p>Chapter 13</p> chlorofluorocarbons (CFCs) climate El Nino global warming greenhouse gases Kyoto Protocol La Nina latitude ozone hole ozone layer polar stratospheric clouds	<p>Chapter 14</p> deforestation ecosystem services geographic information systems (GIS) heat island infrastructure land-use planning overgrazing reforestation rural urban urban sprawl urbanization	<p>Chapter 15</p> aquaculture arable land biological pest control compost desertification diet domesticated erosion famine genetic engineering livestock malnutrition overharvesting pesticide ruminant salinization topsoil yield

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<p>English Language Learners (ELL) Enhancements</p> <p>To access hyperlinked material, you must be logged into your BPS Google Drive</p>	<p><u>Listening</u></p> <ul style="list-style-type: none"> ● <u>Cross- Linguistic Practices:</u> Gives students opportunities to make connections between what they hear and their home language (For example, allow students to listen to a passage and identify cognates.) ● <u>Build background knowledge</u> ● <u>Activating Prior Knowledge</u> Activating prior knowledge means both eliciting from students what they already know and building initial knowledge that they need in order to access upcoming content ● <u>Activating Prior Knowledge</u> ● <u>Visuals</u> - GIFs, pictures- will assist students in understanding what they are listening to. Use visual thinking strategies to set the lens for learning. ● Video to review or introduce a topic – use closed captioning to help students see the words and pronunciations while they listen to the content. ● <u>Word stretching / Vowel stretching</u> when instructing allows student to listen closely to the pronunciation of the word ● <u>Performance Level Descriptors</u> This document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of listening. 	<p><u>Speaking</u></p> <ul style="list-style-type: none"> ● <u>Sentence Frames</u> - to begin a sentence - such as <i>The water cycle is...</i> or <i>I think that water cycle is...</i> ● <u>Academic Conversation Starters:</u> Have a visual of a list of academic sentence starters that students can refer to in a discussion. Examples include- I expect ___ to happen. My data shows that... This helps students have a more science focused dialogue. ● <u>Choral Reading</u> - To build fluency, self-confidence and motivation with reading/speaking ● Create movement to go with the word. Movement can be a motivating factor, as well as a kinesthetic tool for conceptualizing the rhythm and flow of fluent reading while triggering brain function for optimal learning ● <u>Performance Level Descriptors</u> This document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of speaking. 	<p><u>Reading</u></p> <ul style="list-style-type: none"> ● <u>Supplementary Text</u> to help reinforce concepts. If necessarily, use lower Lexile levels to ensure comprehension. ● <u>Visual Aids</u> - Pictures or models to support vocabulary words and concepts ● Video to review or introduce a topic - use closed captioning to help students read along while they listen to the content ● <u>4 Square / Frayer models</u> to help students gain a deeper understanding of vocabulary. ● <u>Highlighting</u> important text to assist students in answering questions after the reading. ● <u>Chunking</u>-Break reading of text into chunks or paragraphs ● <u>Performance Level Descriptors</u> This document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of reading. ● <u>Vocabulary Morphology-</u> Morphology relates to the segmenting of words into affixes (prefixes and suffixes) and roots or base words, and the origins of words. Understanding that words connected by meaning can be connected by spelling can be critical to expanding a student’s vocabulary. 	<p><u>Writing</u></p> <ul style="list-style-type: none"> ● <u>Sentence Frames</u> - to begin a sentence- such as <i>Biodiversity is...</i> or <i>An example of competition is....</i> ● <u>Cloze passages</u> with word banks ● <u>Word banks</u> ● <u>Graphic Organizers</u> to help break down the writing process and organize thoughts ● <u>Standards-based sentence stems</u> ● <u>Performance Level Descriptors</u> This document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of writing. 	<p><u>Instructional Accommodations (depending on the student’s needs)</u></p> <ul style="list-style-type: none"> ● <u>Extended time</u> for tests in class, projects and assignments ● <u>Directions read.</u> Broken down as necessary ● <u>Model</u> how to complete the activity in the lesson ● <u>Oral simplification</u> of directions or questions ● <u>Translated version</u> of test when available. Student may have both version English and native language version ● Use of approved bilingual glossaries from NYS in each subject
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<p>Special Education Modifications</p> <p>Special Education students must have accommodations as per Individual Educational Plan (IEP)</p>	<p><u>Instructional</u></p> <ul style="list-style-type: none"> ● Pre-teach vocabulary ● Use picture vocabulary ● Scaffold Depth of Knowledge questions ● Provide copy of notes/notes in “cloze” form ● Use of Think, Pair, and Share strategy to help process information ● Scaffold written assignments with the use of graphic organizers ● Allow for multiple ways to respond (verbal, written, response board) ● Provide model of performance task ● Modify informational text to fit the needs of the students ● Provide a digital or paper interactive notebook ● Present complex tasks in multiple ways ● Provide mnemonic strategies for Environmental Science concepts 	<p><u>Technology:</u></p> <ul style="list-style-type: none"> ● Audio reading of text ● Text to type functions ● Videos to clarify/visualize Environmental Science concepts ● Record class lecture/discussions and make accessible to student ● Nearpod- interactive presentations of notes ● Playposit - show a video clip about the topic and add your own questions for them to answer as they watch ● Allow students to type answers in chat on Teams <p><u>Other:</u></p> <ul style="list-style-type: none"> ● Arrange seating for maximum engagement and minimum distraction 	<p><u>In Class Assessments</u></p> <ul style="list-style-type: none"> ● Provide review packet or review sheet of concepts covered on the test ● Practice similar questions prior to the test ● Provide multiple options for projects ● Give a timeline of when things are due and remind them of the process often. ● Use of timer in class ● Break all complex tasks into chunks
<p>Step Up to Writing</p> <p>Step Up to Writing materials can be found in BPS Science K-12 Schoology Folder 9-12 Resources Environmental Science Environmental Science Curriculum Materials Step Up to Writing materials</p>	<p><u>SUTW Strategies</u></p> <ul style="list-style-type: none"> ● Informal Outline ● Color-Coding – Informative/Explanatory Text ● Two-column notes ● I-V-F Topic Sentence progressing to Four Step Summary Paragraph ● CUPS – Capitalization, Usage, Punctuation, Spelling ● Transitions 		
<p>Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom</p>	<ul style="list-style-type: none"> ● Materials, resources, and/or discussions address diverse cultural backgrounds and real-world applications ● Artifacts (posters, charts, etc.) in the science classroom are representative of the cultures of the student population ● All students are given an opportunity to engage in science discourse ● Teacher demonstrates high expectations for all students <p>CLRT resources which align to Science content are denoted with a *</p>		