

# Environmental Science – Unit 1 – An Introduction to Environmental Science

## Environmental Science Unit 1 - An Introduction to Environmental Science

**Unit Overview:** This unit is composed of three chapters- *Science and the Environment*, *Tools of Environmental Science*, and *The Dynamic Earth*. Students will explore the topic of environmental science as an interdisciplinary science. Students will learn how humans have impacted their environment throughout time and how various populations consume resources. They will review the scientific method and explain how scientists use statistics and models to explain observations of natural phenomena. Students will learn how to make decisions through a decision-making model and apply this to hypothetical and real-world scenarios. Finally, students will review the geosphere, atmosphere, hydrosphere and biosphere and explore the conditions that allow us to survive on a constantly changing planet.

### Essential Questions:

#### Chapter 1- Science and the Environment

- What is environmental science? Why is it considered an interdisciplinary field of science?
- How have humans changed their environment over time?
- What is the difference between renewable and nonrenewable resources?
- Describe sustainability.

#### Chapter 2- Tools of Environmental Science

- How do scientists develop explanations of natural phenomena?
- What are the parts of a scientific experiment?
- How does the decision-making model provide a systematic process for making decisions?
- What are the values people consider when making decisions about the environment?

#### Chapter 3- The Dynamic Earth

- Describe the composition and structure of the Earth.
- Explain how tectonic plates can cause earthquakes and volcanoes.
- What are the effects of earthquakes and volcanoes?
- Describe the composition of the Earth's atmosphere.
- What differentiates open and closed systems? Which one is Earth and why?

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## Living Environment Core Curriculum- MST Standards

**Key Idea 2:** Beyond the use of reasoning and consensus, scientific inquiry involves the testing of proposed explanations involving the use of conventional techniques and procedures and usually requiring considerable ingenuity.

**2.1** Devise ways of making observations to test proposed explanations.

**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.

**1.2-**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.

## New York State Science Learning Standards Performance Expectations

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

**HS-ESS2-1.** Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

**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.

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| Environmental Science Content   | NYSSLS<br>Disciplinary Core Ideas  | Additional Resources  | Project Based Resources and Activities - Version 1<br>Scaffolded with Supports   | Project Based Resources and Activities - Version 2   |
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| <p><b>Chapter 1-Science and the Environment</b><br/> <b>Section 1- Understanding our Environment</b></p> <ul style="list-style-type: none"> <li>Define Environmental Science and compare to Ecology</li> <li>List 5 major fields of study that contribute to Environmental Science</li> <li>Describe the major environmental effects of hunter-gatherers, the Agricultural Revolution and the Industrial Revolution</li> <li>Classify environmental problems into three major categories</li> </ul> <p><b>Section 2- The Environment and Society</b></p> <ul style="list-style-type: none"> <li>Describe “The Tragedy of the Commons”</li> <li>Explain the law of supply and demand</li> <li>List three differences between developed and developing countries</li> <li>Explain what sustainability is and describe why it is a goal of environmental science.</li> </ul> | <ul style="list-style-type: none"> <li>Anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species.</li> <li>Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction).</li> <li>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.</li> <li>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</li> </ul> | <p><b>Text Resource</b><br/> <i>Environmental Science</i> – Holt<br/> <b>Chapter 1 - pp. 3-21</b></p> <p><b>Student Resources</b><br/> <a href="#">Global Footprint Network</a> – Students calculate their own ecological footprint by answering questions about their energy consumption and lifestyle.</p> <p><b>Teacher Resources</b><br/> <a href="#">Ecological Footprint: Do we fit on our planet?</a> – This whiteboard animation explains what our ecological footprint is and biocapacity on Earth.</p> <p><a href="#">The Theft from the Sun (Blackfoot Lodge Tales)*</a>- This resource from NJ Amistad Curriculum is a folktale about a man who takes advantage of the sun can be used to introduce human impact.</p> | <p><b>Environmental News Summary</b><br/>           Students research and summarize a current event article.<br/> <a href="#">Environmental News Summary Student Resource Unit 1</a></p> | <p><b>Environmental News Summary</b><br/>           Students research and summarize two current event articles.<br/> <a href="#">Environmental News Summary Student Resource Unit 1</a></p>  |
| <p><b>Chapter 2 -Tools of Environmental Science</b><br/> <b>Section 1- Scientific Methods</b></p> <ul style="list-style-type: none"> <li>List and describe the steps of the experimental method</li> <li>Describe how scientists study subjects in which experiments are not possible</li> <li>Describe the two essential parts of a good experiment</li> </ul> <p><b>Section 3- Making Informed Decisions</b></p> <ul style="list-style-type: none"> <li>Describe three values that people consider when making decisions about the environment</li> </ul>   | <ul style="list-style-type: none"> <li>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</li> <li>Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed.</li> <li>Both physical models and computers can be used in various ways to aid in the</li> </ul>  | <p><b>Text Resource</b><br/> <i>Environmental Science</i> – Holt<br/> <b>Chapter 2 - pp. 31-37; pp.45-49</b></p>  | <p><b>Mystery Box Lab</b> – Students use the steps of the scientific method to determine contents of a mystery box.</p> <p><a href="#">Mystery Boxes</a> – Student Resource</p>          | <p><b>Mystery Box Lab</b> – Students use the steps of the scientific method to determine contents of a mystery box. Students are then tasked with designing their own experiment using the scientific method and the materials provided in the lab.</p> <p><a href="#">Mystery Boxes</a> – Student Resources</p> |

## Environmental Science – Unit 1 – An Introduction to Environmental Science

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| <ul style="list-style-type: none"> <li>Compare short term and long-term consequences of two decisions regarding a hypothetical environment issue</li> </ul>  | <p>engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs.</p>  |   | <p><a href="#">Black Inventors Matter*</a> – Students research a variety of black inventors then complete a graphic organizer with focus on the impact the inventor had on society and importance to science. Follow up analysis questions complete the activity</p>   | <p><a href="#">Black Inventors Matter*</a> – Students research a variety of black inventors then complete a graphic organizer with focus on the impact the inventor had on society and importance to science. Follow up analysis questions complete the activity</p>   |
| <p><b>Chapter 3- The Dynamic Earth</b><br/><b>Section 1- The Geosphere</b></p> <ul style="list-style-type: none"> <li>Describe the composition and structure of the Earth</li> <li>Describe the Earth’s tectonic plates</li> <li>Explain the main cause of earthquakes and their effects</li> <li>Identify the relationship between volcanic eruptions and climate change</li> <li>Describe how wind and water alter the Earth’s surface</li> </ul> <p><b>Section 2- The Atmosphere</b></p> <ul style="list-style-type: none"> <li>Describe the composition of the Earth’s atmosphere.</li> <li>Describe the layers of the Earth’s atmosphere</li> <li>Explain three mechanisms of heat transfer in the Earth’s atmosphere</li> <li>Explain the greenhouse effect</li> </ul> <p><b>Section 3- The Hydrosphere and the Biosphere</b></p> <ul style="list-style-type: none"> <li>Name the three major processes in the water cycle</li> <li>Describe the properties of ocean water</li> <li>Explain how the ocean regulates Earth’s temperature</li> <li>Discuss the factors that confine life to the biosphere</li> </ul> | <ul style="list-style-type: none"> <li>Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth’s surface and provides a framework for understanding its geologic history.</li> <li>Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth’s crust.</li> <li>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.</li> <li>Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.</li> <li>Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen.</li> </ul> | <p><b>Text Resource</b><br/><i>Environmental Science – Holt Chapter 3 - pp. 59-81</i></p> <p><b>Student Resources</b><br/><a href="#">United States Geological Survey (USGS)</a> – Website provides real-time data and information about natural hazards including earthquakes and volcanoes.</p> <p><b>Teacher Resources</b><br/><a href="#">United States Geological Survey Resources for Teachers (USGS)</a> – Collection of resources including lesson plans, activities, multimedia, and background information of a variety of scientific topics involving ecosystems, geography, geology, natural hazards, oceans and coasts, and water.</p> <p><b>NEED Project – Land and Sea Ice</b> – Students describe the effects sea and land ice have on sea level when melted.<br/><a href="#">Land and Sea Ice Teacher Resource</a><br/><a href="#">Land and Sea Ice Student Resource</a></p> | <p><b>Volcanic Eruptions Story Map</b> – Using the “5E” inquiry model (Engage, Explore, Explain, Elaborate, Evaluate) and an online story map, students will study volcanoes and plate tectonics then determine the environmental impact of volcanic ash and aerosols.</p> <p><a href="#">Volcanic Eruptions Story Map Teacher Resource</a></p> <p><a href="#">Volcanic Eruptions Story Map Answer Key</a></p> <p><a href="#">Volcanic Eruptions Story Map Student Resource</a></p> <p><a href="#">Earth Systems Graphic Organizer</a></p> | <p><b>Volcanic Eruptions Story Map</b> – Using the “5E” inquiry model (Engage, Explore, Explain, Elaborate, Evaluate) and an online story map, students will study volcanoes and plate tectonics then determine the environmental impact of volcanic ash and aerosols.</p> <p><a href="#">Volcanic Eruptions Story Map Teacher Resource</a></p> <p><a href="#">Volcanic Eruptions Story Map Answer Key</a></p> <p><a href="#">Volcanic Eruptions Story Map Student Resource</a></p> <p><a href="#">Earth Systems Graphic Organizer</a></p> |
| <p><b>Unit 1 Evidence of Learning</b></p>  | <p>Ticket Out • Think-Pair-Share • Formative Assessment • Weekly Quiz • Unit Test • Homework • Review Questions</p>   |   |  |  |
| <p><b>Unit 1 Materials</b></p>   | <p><b>Mystery Box Lab</b></p> <ul style="list-style-type: none"> <li>Copies of the <b>Mystery Boxes Lab</b>, small boxes/containers, random items, tape</li> </ul>  |   |  |  |

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| <b>Unit 1 Vocabulary</b> | <b>Chapter 1</b><br>agriculture<br>biodiversity<br>ecological footprint<br>ecology<br>Environmental Science<br>law of supply and demand<br>natural resource<br>pollution<br>sustainability | <b>Chapter 2</b><br>control group<br>data correlation<br>decision-making model<br>experiment<br>experimental group<br>hypothesis<br>observation<br>prediction<br>value<br>variable | <b>Chapter 3</b><br>asthenosphere tectonic plate<br>atmosphere<br>biosphere<br>condensation<br>conduction<br>convection<br>core<br>crust<br>evaporation<br>fresh water<br>geosphere<br>greenhouse effect<br>lithosphere<br>mantle<br>ozone<br>precipitation<br>radiation<br>salinity<br>stratosphere<br>troposphere<br>water cycle |
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| <b>English Language Learners (ELL) Enhancements</b><br><br>To access <a href="#">hyperlinked</a> material, you must be logged into your BPS Google Drive | <b>Listening</b> <ul style="list-style-type: none"> <li>● <b><u>Cross- Linguistic Practices:</u></b> 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.)</li> <li>● <b><u>Build background knowledge</u></b></li> <li>● <b><u>Activating Prior Knowledge</u></b><br/>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</li> <li>● <b><u>Activating Prior Knowledge</u></b></li> <li>● <b><u>Visuals</u></b> - GIFs, pictures- will assist students in understanding what they are listening to. Use <b><u>visual</u></b></li> </ul> | <b>Speaking</b> <ul style="list-style-type: none"> <li>● <b><u>Sentence Frames</u></b> To begin a sentence - such as <i>The water cycle is...</i> or <i>I think that water cycle is...</i></li> <li>● <b><u>Academic Conversation Starters:</u></b> 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.</li> <li>● <b><u>Choral Reading</u></b> - To build fluency, self-confidence and</li> </ul> | <b>Reading</b> <ul style="list-style-type: none"> <li>● <b><u>Supplementary Text</u></b> to help reinforce concepts. If necessarily, use lower Lexile levels to ensure comprehension.</li> <li>● <b><u>Visual Aids</u></b> - Pictures or models to support vocabulary words and concepts</li> <li>● Video to review or introduce a topic - use <b><u>closed captioning</u></b> to help students read along while they listen to the content</li> <li>● <b><u>4 Square / Frayer models</u></b> to help students gain a deeper understanding of vocabulary.</li> <li>● <b><u>Highlighting</u></b> -important text to assist students in answering questions after the reading.</li> </ul> | <b>Writing</b> <ul style="list-style-type: none"> <li>● <b><u>Sentence Frames</u></b> - to begin a sentence- such as <i>The water cycle is...</i> or <i>I think that water cycle is...</i></li> <li>● <b><u>Cloze passages</u></b> with word banks</li> <li>● <b><u>Word banks</u></b></li> <li>● <b><u>Graphic Organizers</u></b> to help break down the writing process and organize thoughts</li> <li>● <b><u>Standards-based sentence stems</u></b></li> <li>● <b><u>Performance Level Descriptors</u></b> This document provides teachers with a description of what output they</li> </ul> | <b>Instructional Accommodations (depending on the student's needs)</b> <ul style="list-style-type: none"> <li>● <b><u>Extended time</u></b> for tests in class, projects and assignments</li> <li>● <b><u>Directions read.</u></b> Broken down as necessary</li> <li>● <b><u>Model</u></b> how to complete the activity in the lesson</li> <li>● <b><u>Oral simplification</u></b> of directions or questions</li> <li>● <b><u>Translated version</u></b> of test when available. Student may have both version English and native language version</li> </ul> |
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## Environmental Science – Unit 1 – An Introduction to Environmental Science

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|   | <p><u>thinking strategies</u> to set the lens for learning.</p> <ul style="list-style-type: none"> <li>Video to review or introduce a topic – use <b>closed captioning</b> to help students see the words and pronunciations while they listen to the content.</li> <li><b>Word stretching / Vowel stretching</b> when instructing allows student to listen closely to the pronunciation of the word</li> <li><b>Performance Level Descriptors</b> 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.</li> </ul>   | <p>motivation with <u>reading/speaking</u></p> <ul style="list-style-type: none"> <li>Create <b>movement</b> 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</li> <li><b>Performance Level Descriptors</b> 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.</li> </ul>   | <ul style="list-style-type: none"> <li><b>Chunking</b>-Break reading of text into chunks or paragraphs</li> <li><b>Performance Level Descriptors -</b> 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. <b>Vocabulary Morphology</b>- 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.</li> </ul> | <p>can expect from students based on earned NYSESLAT levels in the modality of writing.</p> <ul style="list-style-type: none"> <li>Use of <b>approved bilingual glossaries</b> from NYS in each subject</li> </ul> |
| <p><b>Special Education Modifications</b></p> <p>Special Education students must have accommodations as per Individual Educational Plan (IEP)</p> | <p><b>Instructional</b></p> <ul style="list-style-type: none"> <li><b>Pre-teach</b> vocabulary</li> <li>Use <b>picture vocabulary</b></li> <li>Scaffold <b>Depth of Knowledge</b> questions</li> <li>Provide copy of notes/<b>notes in “cloze”</b> form</li> <li>Use of <b>Think, Pair, and Share</b> strategy to help process information</li> <li><b>Scaffold</b> written assignments with the use of <b>graphic organizers</b></li> <li>Allow for <b>multiple ways to respond</b> (verbal, written, response board)</li> <li>Provide <b>model of performance task</b></li> <li><b>Modify informational text</b> to fit the needs of the students</li> <li>Provide a digital or paper <b>interactive notebook</b></li> <li>Present complex <b>tasks in multiple ways</b></li> <li>Provide <b>mnemonic strategies</b> for Environmental Science concepts.</li> </ul> | <p><b>Technology:</b></p> <ul style="list-style-type: none"> <li><b>Audio</b> reading of text</li> <li><b>Text to type</b> functions</li> <li><b>Videos</b> to clarify/visualize Environmental Science concepts</li> <li><b>Record class lecture/discussions</b> and make accessible to student</li> <li><b>Nearpod</b>- interactive presentations of notes</li> <li><b>Playposit</b> - show a video clip about the topic and add your own questions for them to answer as they watch</li> <li>Allow students to type answers in chat on <b>Teams</b></li> </ul> <p><b>Other:</b></p> <ul style="list-style-type: none"> <li><b>Arrange seating</b> for maximum engagement and minimum distraction</li> </ul> | <p><b>In Class Assessments</b></p> <ul style="list-style-type: none"> <li>Provide <b>review packet or review sheet</b> of concepts covered on the test</li> <li>Practice similar questions prior to the test</li> <li>Provide <b>multiple options</b> for projects</li> <li>Give a <b>timeline</b> of when things are due and remind them of the process often.</li> <li><b>Use of timer</b> in class</li> <li>Break all complex tasks into chunks</li> </ul>   |  |

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| <p><b>Step Up to Writing</b><br/>                 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><b>SUTW Strategies/Skills</b></u></p> <ul style="list-style-type: none"> <li>● Informal Outline</li> <li>● Color-Coding – Informative/Explanatory Text</li> <li>● Two-column notes</li> <li>● I-V-F Topic Sentence progressing to Four Step Summary Paragraph</li> <li>● CUPS – Capitalization, Usage, Punctuation, Spelling</li> <li>● Transitions</li> </ul>  |
| <p><b>Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom</b></p>   | <ul style="list-style-type: none"> <li>● Materials, resources, and/or discussions address diverse cultural backgrounds and real-world applications</li> <li>● Artifacts (posters, charts, etc.) in the science classroom are representative of the cultures of the student population</li> <li>● All students are given an opportunity to engage in science discourse</li> <li>● Teacher demonstrates high expectations for all students</li> </ul> <p>CLRT resources which align to Science content are denoted with a *</p> |