**Shelby County Schools Science Vision**

Shelby County Schools' vision of science education is to ensure that from early childhood to the end of the 12th grade, all students have heightened curiosity and an increased wonder of science; possess sufficient knowledge of science and engineering to engage in discussions; are able to learn and apply scientific and technological information in their everyday lives; and have the skills such as critical thinking, problem solving, and communication to enter careers of their choice, while having access to connections to science, engineering, and technology.

To achieve this, Shelby County Schools has employed The Tennessee Academic Standards for Science to craft a meaningful curriculum that is innovative and provide a myriad of learning opportunities that extend beyond mastery of basic scientific principles.

**Introduction**

In 2014, the Shelby County Schools Board of Education adopted a set of ambitious, yet attainable goals for school and student performance. The District is committed to these goals, as further described in our strategic plan, Destination 2025. In order to achieve these ambitious goals, we must collectively work to provide our students with high quality standards aligned instruction. The Tennessee Academic Standards for Science provide a common set of expectations for what students will know and be able to do at the end of each grade, can be located in the Tennessee Science Standards Reference. Tennessee Academic Standards for Science are rooted in the knowledge and skills that students need to succeed in post-secondary study or careers. While the academic standards establish desired learning outcomes, the curriculum provides instructional planning designed to help students reach these outcomes. The curriculum maps contain components to ensure that instruction focuses students toward college and career readiness. Educators will use this guide and the standards as a roadmap for curriculum and instruction. The sequence of learning is strategically positioned so that necessary foundational skills are spiraled in order to facilitate student mastery of the standards.

Our collective goal is to ensure our students graduate ready for college and career. Being College and Career Ready entails, many aspects of teaching and learning. We want our students to apply their scientific learning in the classroom and beyond. These valuable experiences include students being facilitators of their own learning through problem solving and thinking critically. The Science and Engineering Practices are valuable tools used by students to engage in understanding how scientific knowledge develops. These practices rest on important "processes and proficiencies" with longstanding importance in science education. The science maps contain components to ensure that instruction focuses students toward understanding how science and engineering can contribute to meeting many of the major challenges that confront society today. The maps are centered around five basic components: the Tennessee Academic Standards for Science, Science and Engineering Practices, Disciplinary Core Ideas, Crosscutting Concepts, and Phenomena.

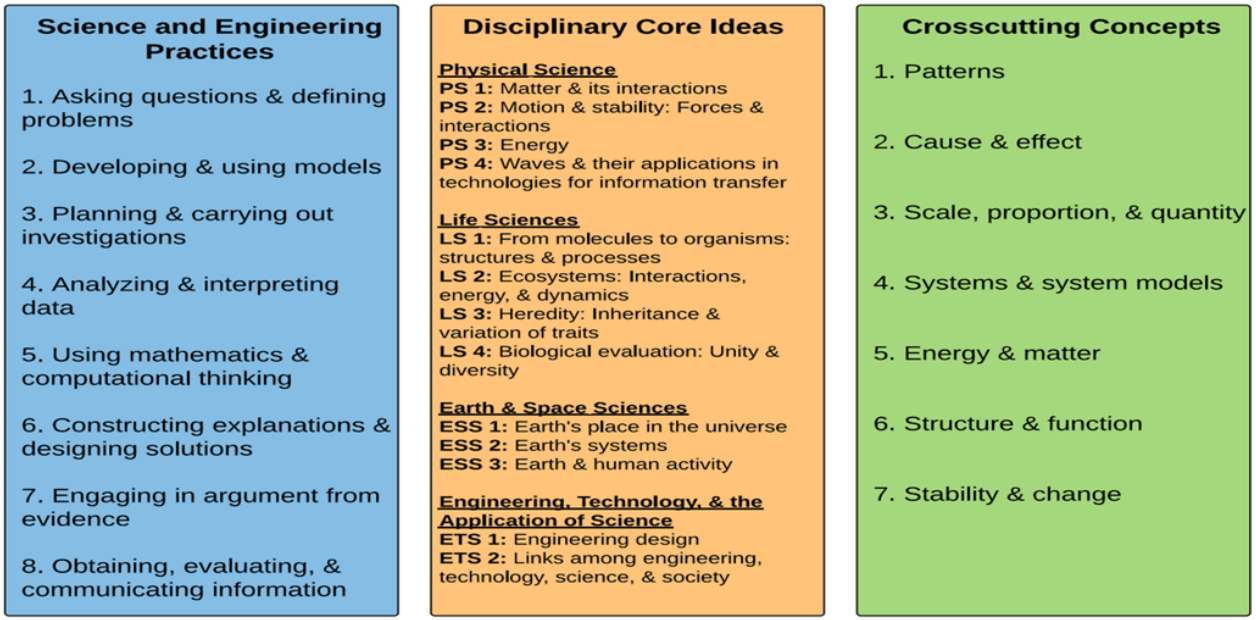
*The Tennessee Academic Standards for Science were developed using the National Research Council's 2012 publication, A Framework for K-12 Science Education as their foundation. The framework presents a new model for science instruction that is a stark contrast to what has come to be the norm in science classrooms. Thinking about science*

*had become memorizing concepts and solving mathematical formulae. Practicing science had become prescribed lab situations with predetermined outcomes. The framework proposes a three-dimensional approach to science education that capitalizes on a child's natural curiosity. The Science Framework for K-12 Science Education* provides the blueprint for developing the effective science practices. The *Framework* expresses a vision in science education that requires students to operate at the nexus of three dimensions of learning: Science and Engineering Practices, Crosscutting Concepts, and Disciplinary Core Ideas. The *Framework* identified a small number of disciplinary core ideas that all students should learn with increasing depth and sophistication, from Kindergarten through grade twelve. Key to the vision expressed in the *Framework* is for students to learn these disciplinary core ideas in the context of science and engineering practices. The importance of combining Science and Engineering Practices, Crosscutting Concepts and Disciplinary Core Ideas is stated in the *Framework* as follows:

*Standards and performance expectations that are aligned to the framework must take into account that students cannot fully understand scientific and engineering ideas without engaging in the practices of inquiry and the discourses by which such ideas are developed and refined. At the same time, they cannot learn or show competence in practices except in the context of specific content. (NRC Framework, 2012, p. 218)*

To develop the skills and dispositions to use scientific and engineering practices needed to further their learning and to solve problems, students need to experience instruction in which they use multiple practices in developing a particular core idea and apply each practice in the context of multiple core ideas. We use the term "practices" instead of a term such as "skills" to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice. Students in grades K-12 should engage in all eight practices over each grade band**.** Crosscutting concepts have application across all domains of science. As such, they are a way of linking the different domains of science. Crosscutting concepts have value because they provide students with connections and intellectual tools that are related across the differing areas of disciplinary content and can enrich their application of practices and their understanding of core ideas. There are seven crosscutting concepts that bridge disciplinary boundaries, uniting core ideas throughout the fields of science and engineering. Their purpose is to help students deepen their understanding of the disciplinary core ideas and develop a coherent and scientifically based view of the world.

The map is meant to support effective planning and instruction to rigorous standards. It is *not* meant to replace teacher planning, prescribe pacing or instructional practice. In fact, our goal is not to merely "cover the curriculum," but rather to "uncover" it by developing students' deep understanding of the content and mastery of the standards. Teachers who are knowledgeable about and intentionally align the learning target (standards and objectives), topic, text(s), task, and needs (and assessment) of the learners are best-positioned to make decisions about how to support student learning toward such mastery. Teachers are therefore expected--with the support of their colleagues, coaches, leaders, and other support providers--to exercise their professional judgment aligned to our shared vision of effective instruction, the Teacher Effectiveness Measure (TEM) and related best practices. However, while the framework allows for flexibility and encourages each teacher/teacher team to make it their own, our expectations for student learning are non-negotiable. We must ensure all of our children have access to rigor—high-quality teaching and learning to grade level specific standards, including purposeful support of literacy and language learning across the content areas.




**Learning Progression**

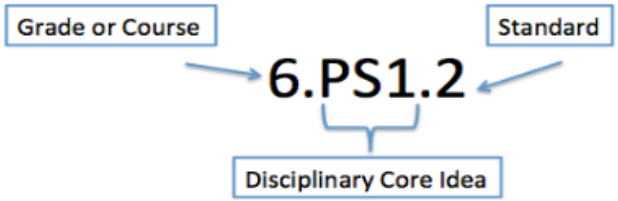
At the end of the elementary science experience, students can observe and measure phenomena using appropriate tools. They are able to organize objects and ideas into broad concepts first by single properties and later by multiple properties. They can create and interpret graphs and models that explain phenomena. Students can keep notebooks to record sequential observations and identify simple patterns. They are able to design and conduct investigations, analyze results, and communicate the results to others. Students will carry their curiosity, interest and enjoyment of the scientific world view, scientific inquiry, and the scientific enterprise into middle school.

At the end of the middle school science experience, students can discover relationships by making observations and by the systematic gathering of data. They can identify relevant evidence and valid arguments. Their focus has shifted from the general to the specific and from the simple to the complex. They use scientific information to make wise decision related to conservation of the natural world. They recognize that there are both negative and positive implications to new technologies.

As an SCS graduate, former students should be literate in science, understand key science ideas, aware that science and technology are interdependent human enterprises with strengths and limitations, familiar with the natural world and recognizes both its diversity and unity, and able to apply scientific knowledge and ways of thinking for individual and social purposes.

**Structure of the Standards**

- Grade Level/Course Overview: An overview that describes that specific content and themes for each grade level or high school course.
- Disciplinary Core Idea: Scientific and foundational ideas that permeate all grades and connect common themes that bridge scientific disciplines.
- Standard: Statements of what students can do to demonstrate knowledge of the conceptual understanding. Each performance indicator includes a specific science and engineering practice paired with the content knowledge and skills that students should demonstrate to meet the grade level or high school course standards.




**Purpose of Science Curriculum Maps**

This map is a guide to help teachers and their support providers (e.g., coaches, leaders) on their path to effective, college and career ready (CCR) aligned instruction and our pursuit of Destination 2025. It is a resource for organizing instruction around the Tennessee Academic Standards for Science, which defines what to teach and what students need to learn at each grade level. The map is designed to reinforce the grade/course-specific standards and content (scope) and provides *suggested* sequencing, pacing, time frames, and aligned resources. Our hope is that by curating and organizing a variety of standards-aligned resources, teachers will be able to spend less time wondering what to teach and searching for quality materials (though they may both select from and/or supplement those included here) and have more time to plan, teach, assess, and reflect with colleagues to continuously improve practice and best meet the needs of their students.

The map is meant to support effective planning and instruction to rigorous standards. It is *not* meant to replace teacher planning, prescribe pacing or instructional practice. In fact, our goal is not to merely "cover the curriculum," but rather to "uncover" it by developing students' deep understanding of the content and mastery of the standards. Teachers who are knowledgeable about and intentionally align the learning target (standards and objectives), topic, text(s), task, and needs (and assessment) of the learners are best-positioned to make decisions about how to support student learning toward such mastery. Teachers are therefore expected--with the support of their colleagues, coaches, leaders, and other support providers--to exercise their professional judgment aligned to our shared vision of effective instruction, the Teacher Effectiveness Measure (TEM) and related best practices. However, while the framework allows for flexibility and encourages each teacher/teacher team to make it their own, our expectations for student learning are non-negotiable. We must ensure all of our children have access to rigor—high-quality teaching and learning to grade level specific standards, including purposeful support of literacy and language learning across the content areas.

| Environmental Science Quarter 2 Curriculum Map<br>Curriculum Map Feedback Survey | | | | | |
|---|---|---|---|---|---|
| **Quarter 1** | | **Quarter 2** | | **Quarter 3** | **Quarter 4** |
| Unit 1<br>Ecology | Unit 2<br>Biodiversity | Unit 3<br>Biodiversity | Unit 4<br>Earth's Systems | Unit 5<br>Earth and Human Activity I | Unit 6<br>Earth and Human Activity II |
| 6 weeks | 3 weeks | 3 Weeks | 6 weeks | 9 weeks | 9 weeks |

**UNIT 3: Biodiversity [3 weeks]**

**Overarching Question(s)**

What is biodiversity, how do humans affect it, and how does it affect humans?

| Unit | Lesson Length | Essential Question | Vocabulary |
|---|---|---|---|
| Unit 3<br>Biodiversity | **Length [8 days]** | **Essential Questions**<br>• What causes extinction and what are its impacts?<br>• What role do humans play in the loss of species and ecosystem services?<br>• How can we sustain wild species and ecosystem services? | Endangered Species, Threatening Species, Bioprospector, Habitat Fragmentation, Bioaccumulation, Biomagnification, Endangered Species Act, Seed Bank, Botanical Garden, Arboretum, Egg Pulling, Captive Breeding |

| Standards and Related Background Information | Instructional Focus | Instructional Resources |
|---|---|---|
| **DCI**<br>EVSC.LS4: Biological Change: Unity and Diversity<br><br>**Standard**<br>EVSC.LS4.3 Evaluate the impact of habitat fragmentation and destruction, invasive species, overharvesting, pollution, and climate change on biodiversity (genetic, species, and ecosystem).<br>EVSC.LS4.4 Engage in argument from scientific evidence critiquing effectiveness of the Endangered Species Act. Give specific examples to support your argument. | **Learning Outcomes**<br><br>• Describe the causes of extinction and its part in Earth's history.<br>• Understand how species may be classified as endangered or threatened.<br>• Describe how extinction threatens Earth's natural capital.<br>• Describe how human population growth and activities lead to habitat fragmentation and increase wild species extinctions.<br>• Understand how invasive species disrupt ecosystems.<br>• Discuss examples of pollution and their effects.<br>• Explain how overexploitation threatens wild species.<br>• Understand how international treaties and national laws protect species and ecosystems. | **Curricular Resources**<br>Engage<br><br>Explore<br><br>Explain<br><br>Elaborate<br><br>Evaluate<br><br>**Lessons**<br><br>**Environmental Science: Sustaining Your World – Chapter 7** |

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| **Explanation**<br>Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). Biological extinction, being irreversible, is a critical factor in reducing the planet's natural capital. 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. These problems have the potential to cause a major wave of biological extinctions—as many species or populations of a given species, unable to survive in changed environments, die out—and the effects may be harmful to humans and other living things.<br><br>**Misconceptions**<br>Students can read and discuss this article on The Endangered Species Act. The article discusses the many misconceptions about the Endangered Species Act.<br><br>https://www.nwf.org/~/media/PDFs/ Wildlife /esamythsfacts.ashx<br><br>**Science and Engineering Practices** | **Phenomenon**<br><br>**Ocean Predator's Travel Patterns in the Pacific Ocean**<br>**Environmental Science: Sustaining Your World, Page 181 – Question 5**<br><br>**View the following picture.**<br>http://oceantracks.org/images/stories/landing/OT_Map_multi.JPG<br><br>Using an interactive map and data analysis tools, students can explore and quantify patterns in animal tracks by taking measurements, such as speed and diving depth, to support hypotheses about marine animal behavior. The interface then supports students in relating these behaviors to fluctuations and trends in physical oceanographic variables, such as sea surface temperature and ocean currents, using environmental data from Earth-orbiting-satellites and ocean drifter buoys. These interface features allow students to engage in investigations with the data that model those currently being conducted by scientists to understand the broad-scale effects of changes in climate and other human activities on these important top predators in ocean ecosystems. | **Environmental Science: Sustaining Your World, Page 214 – Question 6**<br><br>**Environmental Science: Sustaining Your World, Page 225 – Question 5**<br><br>**Environmental Science: Sustaining Your World, Page 232 – Question 5**<br><br>**Environmental Science: Sustaining Your World – Stem Activity, Page 235**<br><br>**Videos**<br><br>**Extinction of Species**<br>https://youtu.be/jphrpR9ffKA<br><br>**Human Population Growth and Extinction**<br>https://vimeo.com/35224206<br><br>**What Role Do Humans Play in the Extinction of Species?**<br>http://prezi.com/6ddlj5kkaeig/?utm_campaign=share&utm_medium=copy&rc=ex0share<br><br>**Act now to save wildlife: 5 actions that make a difference**<br>http://www.worldbank.org/en/news/feature/2017/11/28/act-now-to-save-wildlife-5-actions-that-make-a-difference<br><br>**Activities/Performance Tasks**<br><br>**Endangered Species Activity Book**<br>https://tpwd.texas.gov/publications/pwdpubs/media/pwd_bk_w7000_0023.pdf<br><br>**Extinction Project**<br>http://oceans1.csusb.edu/360/Extinction%20Project.pdf |

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| 7. Engaging in argument from evidence<br>8. Obtaining, evaluating, and communicating information<br><br>**Cross-Cutting Concepts**<br><br>2. Cause and effect<br>7. Stability and change<br><br>**Activities/Performance Tasks** | | **Population Ecology Virtual Lab**<br>http://virtualbiologylab.org/population-ecology/<br>**Additional Resources:**<br>**ACT & SAT**<br>TN ACT Information & Resources<br>SAT Connections<br>SAT Practice from Khan Academy<br><br>Related Resources:<br>http://oceantracks.org/ |

| Environmental Science Quarter 2 Curriculum Map | | | | | |
|---|---|---|---|---|---|
| **Quarter 1** | | **Quarter 2** | | **Quarter 3** | **Quarter 3** |
| Unit 1<br>Ecology | Unit 2<br>Biodiversity | Unit 3<br>Biodiversity | Unit 4<br>Earth's Systems | Unit 5<br>Earth and Human Activity I | Unit 6<br>Earth and Human Activity II |
| 6 weeks | 3 weeks | 3 Weeks | 6 weeks | 9 weeks | 9 weeks |

**UNIT 3: Biodiversity [3 weeks]**

Overarching Question(s)

What is biodiversity, how do humans affect it, and how does it affect humans?

| Unit | Lesson Length | Essential Question | Vocabulary |
|---|---|---|---|
| Unit 3<br>Earth's Systems | [8 days] | **Essential Questions**<br>• How are our ecological footprints affecting Earth?<br>• What can we do to minimalize adverse human effects on local ecosystems? | Ecosystem, Natural Resource, Inexhaustible Resource, Renewable Resource, Nonrenewable Resource, Ecological Footprint |

| Standards and Related Background Information | Instructional Focus | Instructional Resources |
|---|---|---|
| **DCI**<br>EVSC.ETS3: Applications of Science<br>EVSC.LS2: Ecosystems: Interactions, Energy, and Dynamics<br><br>**Standard**<br>EVSC.ETS3.1 Plan and carry out an investigation of a local ecosystem to assess human impacts. Based on your findings, design and evaluate a solution to minimize impacts.<br>**Explanation**<br>Ecosystems are complex, interactive systems that include both biological communities (biotic) and physical (abiotic) components of the environment. As with individual organisms, a hierarchal structure exists; groups of the same organisms (species) form populations, different populations | **Learning Outcomes**<br><br>• Describe the concept of sustainability and its significance to environmental science.<br>• Understand the link between ecosystem services and natural resources.<br>• Recognize some major environmental problems that lead to natural capital degradation.<br>• Describe the purpose of the ecological footprint.<br>• Assess how ecosystems can be affected by the human population.<br><br>**Phenomenon**<br><br>**Threatened and Endangered Species of Tennessee**<br><br>**View the following article.**<br>https://www.fws.gov/southeast/pdf/workbook/educators-guide-to-the-threatened-and-endangered-species-and-ecosystems-of-tennessee-river-ecosystems.pdf | Curricular Resources<br>Engage<br><br>Explore<br><br>Explain<br><br>Elaborate<br><br>Evaluate<br><br>**Lessons**<br><br>**Environmental Science: Sustaining Your World – Page 24**<br><br>**Environmental Science: Sustaining Your World – Chapter 8**<br><br>**Threatened and endangered species of Tennessee** |

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| interact to form communities, communities live within an ecosystem, and all of the ecosystems on Earth make up the biosphere. Organisms grow, reproduce, and perpetuate their species by obtaining necessary resources through interdependent relationships with other organisms and the physical environment. These same interactions can facilitate or restrain growth and enhance or limit the size of populations, maintaining the balance between available resources and those who consume them.<br><br>**Misconceptions**<br>Students may think varying the population size of a species may not affect an ecosystem because some organisms are not important, instead of thinking all organisms are important within an ecosystem. Varying a species' population size may not affect all other species equally, but it will affect the ecosystem as a whole.<br>**Science and Engineering Practices**<br><br>3. Planning and carrying out investigations<br>6. Constructing explanations and designing solutions<br><br>**Cross-Cutting Concepts**<br><br>2. Cause and effect<br>4. Systems and System Models<br>5. Energy and matter<br>6. Structure and function | The students will read and discuss the a-fore mentioned article on river ecosystems in Tennessee. Have students develop questions from the text and create an assessment from the article. | https://www.fws.gov/southeast/pdf/workbook/educators-guide-to-the-threatened-and-endangered-species-and-ecosystems-of-tennessee-background-info.pdf<br><br>**Wolf River Conservancy**<br>https://wolfriver.org/ecology<br><br>**Activities/Performance Tasks**<br><br>**Investigating Local Ecosystems**<br>**http://sciencenetlinks.com/lessons/investigating-local-ecosystems/**<br><br>**Local Ecosystem Brainstorm**<br>http://wyobio.org/files/7114/1885/4255/MiddleSchool_Lesson1.pdf<br><br>**EXPLORE THE ECOSYSTEM**<br>http://eu.montana.edu/climb/lessons/exploring/docs/exploringecosystems_lesson1.pdf<br><br>**HOW HEALTHY IS YOUR ECOSYSTEM?**<br>https://www.siemensstemday.com/downloads?path=activity/How%20Healthy%20Is%20Your%20Ecosystem.pdf&fid=346<br><br>**Additional Resources:**<br>**ACT & SAT**<br>TN ACT Information & Resources<br>SAT Connections<br>SAT Practice from Khan Academy<br><br>**Resources 1-3**<br>**Demos: Acid "rain" using BTB and effects on plants**<br><br>**Lab: Dissolving sea shells in acidic vinegar solutions**<br><br>**Article: "Acid Pollution in Rain Decreased with Emissions, Long-Term Study Shows"** |

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| 7. Stability and Change | | |

| Environmental Science Quarter 2 Curriculum Map | | | | | |
|---|---|---|---|---|---|
| **Quarter 1** | | **Quarter 2** | | **Quarter 3** | **Quarter 4** |
| Unit 1<br>Ecology | Unit 2<br>Biodiversity | Unit 3<br>Biodiversity | Unit 4<br>Earth's Systems | Unit 5<br>Earth and Human Activity I | Unit 6<br>Earth and Human Activity II |
| 6 weeks | 3 weeks | 3 Weeks | 6 weeks | 9 weeks | 9 weeks |

**UNIT 4: Earth's Systems [3 weeks]**

Overarching Question(s)

How do the properties and movements of water shape Earth's surface and affect its systems?
**Note: Information in this unit is limited in the text. Other resources have been included to supplement the lessons.

| Unit | Lesson Length | Essential Question | Vocabulary |
|---|---|---|---|
| Unit 3<br>Earth's Systems | Weeks | **Essential Questions**<br>• What is a rock and what is it made of?<br>• How are rocks classified?<br>• What is the rock cycle, and how is it connected to weathering and soil formation? | Rock, Rock Cycle, Igneous Rock, Metamorphic Rock, Sedimentary Rock, Sediment, Foliated, Nonfoliated, Extrusive, Intrusive, Lava, Mechanical Weathering, Chemical Weathering, Soil Weathering, Weathering, Leaching, Oxidation |

| Standards and Related Background Information | Instructional Focus | Instructional Resources |
|---|---|---|
| **DCI**<br>EVSC.ESS2: Earth's Systems<br><br>**Standard**<br>EVSC.ESS2.6 Develop a model to explain soil formation and the flow of matter in the rock cycle.<br><br>**Explanation**<br>Earth scientists use the structure, sequence, and properties of rocks, sediments, and fossils, as well as the locations of current and past ocean basins, lakes, and rivers, to reconstruct events in Earth's planetary history. For example, rock layers show the sequence of | **Learning Outcomes**<br>• Distinguish between a rock and a mineral.<br>• Describe the rock cycle and some changes that a rock could undergo.<br>• Describe how weathering affects Earth's surface.<br><br>**Phenomenon**<br><br>**Statues damaged or weathered over time (due to acid rain)**<br>View the following picture.<br><br>http://acidrain2014.weebly.com/uploads/2/1/9/9/21998504/303315599.jpg<br><br>Statues made of organic rocks, like limestone or marble, have changed over time. The change usually occurs over decades and | Curricular Resources<br>Engage<br><br>Explore<br><br>Explain<br><br>Elaborate<br><br>Evaluate<br><br>**Lessons**<br><br>**Glencoe Earth Science: Chapter 4 - Rocks**<br>http://www.obscience.org/uploads/3/7/8/8/37884705/rock_cycle_textbook.pdf |

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| geological events, and the presence and amount of radioactive elements in rocks make it possible to determine their ages.<br>Radioactive decay lifetimes and isotopic content in rocks provide a way of dating rock formations and thereby fixing the scale of geological time. Continental rocks, which can be older than 4 billion years, are generally much older than rocks on the ocean floor, which are less than 200 million years old. Tectonic processes continually generate new ocean seafloor at ridges and destroy old seafloor at trenches. Although active geological 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.<br><br>**Misconceptions**<br>When students start their investigation into rocks, they may have the impression that rocks are static, meaning that a rock can be igneous, metamorphic, or sedimentary and once it formed it will always be in that form. Students need to recognize that rocks change over time. A metamorphic rock may | affects things only in locations exposed to outside elements. Also, the problem is worsened in highly populated, urban areas where pollution may be an issue.<br><br>This will be used to provide interest and engagement during the "Water Cycle" instructional sequence. It could also be used in a "Climate Change" unit or when learning about sustainability and human impacts. First students will be provided with a series of before-and-after images to show how statues have changed over time. These images will be used to facilitate questions and discussion of their observations. Students will then do or watch a lab activity showing how gases from pollution can dissolve into water or rain (Resource #1). Then they try causing a similar change to shells (seashells or eggshells) using an acidic liquid (vinegar, HCl, or solution from the water cycle lab). This can be a teacher-led activity, or students can be asked to design their own investigation provided the materials and lab question (Resource #2). Eventually, students will be told that all these processes are related and will be asked how to begin constructing an explanation. Then students can read about and learn the process of acid rain, its causes and effects, and/or a related current event (Resource #3). | Page 93 – Questions 1-6<br>Page 115 – Questions 24-26<br>**Glencoe Earth Science: Chapter 7 – Weathering and Soil**<br>https://www.iss.k12.nc.us/cms/lib4/NC01000579/Centricity/Domain/2016/012%20Weathering%20and%20Soil.pdf<br><br>Page 187 – Questions 1-6<br>Page 194 – Questions 1-6<br>Page 205 – Questions 15 – 21<br><br>**Lab Activity: Page 200-201 – Weathering Chalk<br><br>**CK12 Earth Science**<br>https://www.ck12.org/c/earth-science/rocks/<br><br>**Environmental Science: Sustaining Your World – Page 362-363**<br><br>**Videos**<br><br>**Rock Cycle**<br>https://www.youtube.com/watch?time_continue=9&v=pm6cCg_Do6k<br><br>**3 Types of Rocks and the Rock Cycle: Igneous, Sedimentary, Metamorphic**<br>https://www.youtube.com/watch?v=EGK1KkLjdQY<br><br>**Science - How was soil formed from rocks (3D animation )? – English**<br>https://www.youtube.com/watch?v=Fx8r3o2gsLk<br><br>**How Soil Formation is Controlled by the Weathering of Rock**<br>https://www.youtube.com/watch?v=x7pmsCL6Ytc<br><br>**Activities/Performance Tasks**<br>https://www.ck12.org/c/earth-science/rocks/<br><br>**The Rock Cycle Game** |

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| change into an igneous rock, or a sedimentary rock can change into a metamorphic rock. As students work through this lesson on the rock cycle, emphasize the fact that rocks change over time into different types of rocks. For example, any rock can be melted to produce an igneous rock, any rock can be weathered to produce a sedimentary rock and any rock (even a metamorphic rock) can be subjected to heat and pressure and changed as a result.<br>Students may also have a misconception about the length of time over which the rock cycle operates. Some students may think that the rock cycle takes place in the span of decades or hundreds of years. Emphasize to students that the rock cycle has been in operation for millions of years. There is no ending point to the rock cycle. It does take millions of years for a rock to change into a different type of rock.<br><br>**Science and Engineering Practices**<br><br>2. Developing and using models<br><br>**Cross-Cutting Concepts**<br><br>4. Systems and System Models | | https://www.geology.arkansas.gov/pdf/RockCycleGame.pdf<br><br>**The Crayon Rock Cycle Lab**<br>Simulate the rock cycle using crayons! Students bring in old crayons and use them in groups to watch the different changes that rocks go through as they move through the rock cycle. Have them make observations and answer questions on each of the steps.<br>Go to: https://serc.carleton.edu/sp/mnstep/activities/34972.html<br>**Additional Resources:**<br>**ACT & SAT**<br>TN ACT Information & Resources<br>SAT Connections<br>SAT Practice from Khan Academy<br><br>Resources:<br>https://www.theguardian.com/global/2015/may/11/water-weirdest-liquid-planet-scientists-h2o-ice-firefighters<br><br>https://www.sciencealert.com/mpemba-effect-warm-water-cooling-faster-than-cold-water-new-explanation<br><br>**Resources 1-3**<br>**Demos: Acid "rain" using BTB and effects on plants**<br><br>**Lab: Dissolving sea shells in acidic vinegar solutions**<br><br>**Article: "Acid Pollution in Rain Decreased with Emissions, Long-Term Study Shows"** |

| Quarter 1 | | Quarter 2 | | Quarter 3 | Quarter 4 |
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| 6 weeks | 3 weeks | 3 weeks | 6 weeks | 9 weeks | 9 weeks |

**UNIT 4: Earth's Systems [3 weeks]**

Overarching Question(s)

How do the properties and movements of water shape Earth's surface and affect its systems?

**Note: Information in this unit is limited in the text. Other resources have been included to supplement the lessons.

| Unit, Lesson | Lesson Length | Essential Question | Vocabulary |
|---|---|---|---|
| Unit 3<br>Earth's Systems | [3 Weeks] | **Essential Questions**<br>• How does water affect the Earth's surface?<br>• Where does water come from and where does it go?<br>• Why is water important?<br>• How does water move around the globe and how do physical and human features make an impact on that movement?<br>• How do topography, the water cycle and watersheds all interact? | Runoff, Erosion, Deposition, Groundwater, Permeable, Impermeable, Aquifer, Water Table, Spring, Geyser, Cave |

| Standards and Related Background Information | Instructional Focus | Instructional Resources |
|---|---|---|
| **DCI**<br>EVSC.ESS2: Earth's Systems<br><br>**Standard**<br>EVSC.ESS2.5 Plan and carry out an investigation examining the chemical and physical properties of water and the impact of water on Earth's topography. Analyze data and share findings.<br><br>**Explanation**<br>Earth is often called the water planet because of the abundance of liquid water on its surface and because water's unique combination of physical and chemical properties is central to | **Learning Outcomes**<br>• Describe the main elements of the water cycle.<br>• Be able to describe how topography, the water cycle, and watersheds all interact<br>• Describe how humans can impact water and water movement within a watershed.<br><br>**Phenomenon**<br>**Sinkholes**<br><br>View the following image.<br><br>https://dr282zn36sxxg.cloudfront.net/datastreams/f-d%3A3e9fb3305adee20c99d29e207a079be974128a717a44ee1b08b032ef%2BIMAGE_THUMB_POSTCARD_TINY%2BIMAGE_THUMB_POSTCARD_TINY.1 | Curricular Resources<br>Engage<br><br>Explore<br><br>Explain<br><br>Elaborate<br><br>Evaluate<br><br>**Lessons**<br><br>**Glencoe Earth Science: Chapter 8 – Erosional Forces**<br>https://www.iss.k12.nc.us/cms/lib4/NC01000579/Centricity/Domain/2016/011%20Erosional%20Forces.pdf |

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| Earth's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy as it changes state; to transmit sunlight; to expand upon freezing; to dissolve and transport many materials; and to lower the viscosities and freezing points of the material when mixed with fluid rocks in the mantle. Each of these properties plays a role in how water affects other Earth systems (e.g., ice expansion contributes to rock erosion,<br>ocean thermal capacity contributes to moderating temperature variations).<br><br>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.<br><br>**Misconceptions**<br>Even once students understand the concepts of weathering and erosion, they tend to have difficulty conceptualizing the long time frames needed for these processes to occur. Many science lessons focus on the negative aspects of erosion (soil loss, ecosystem destruction, sediment buildup in water sources) and lead | Sometimes the ground open ups and swallows cars, buildings or even people. This usually happens at features called sinkholes.<br><br>Resources:<br><br>https://www.ck12.org/c/earth-science/erosion-by-groundwater/rwa/Sinkholes/?referrer=concept_details<br><br>**The Mbemba Effect**<br><br>The Mpemba effect is a process in which hot water can freeze faster than cold water. The phenomenon is temperature-dependent. There is disagreement about the parameters required to produce the effect and about its theoretical basis.<br><br>The Mpemba effect is named after Erasto Batholomeo Mpemba (b.1950) who discovered it in 1963. There were preceding ancient accounts of similar phenomena but lacking sufficient detail to attempt verification.<br><br>Resources:<br><br>https://www.theguardian.com/global/2015/may/11/water-weirdest-liquid-planet-scientists-h2o-ice-firefighters<br><br>https://www.sciencealert.com/mpemba-effect-warm-water-cooling-faster-than-cold-water-new-explanation | Page 233 – Questions 17-30<br><br>**Glencoe Earth Science: Chapter 9 – Water Erosion and Deposition**<br>https://www.iss.k12.nc.us/cms/lib4/NC01000579/Centricity/Domain/2016/014%20Water%20Erosion%20and%20Deposition.pdf<br><br>Page 265 – Questions 21-32<br><br>**The Physical and Chemical Properties of Water**<br>https://www.embibe.com/study/physical-and-chemical-properties-of-water-concept?entity_code=KTSB11<br><br>**Impact of Hydrological Cycle on Earth's Surface Processes**<br>https://www.ukessays.com/essays/geography/impact-hydrological-cycle-earths-surface-3403.php<br><br>**Videos**<br><br>**How Rivers and Streams Affect the Earth's Surface**<br>https://study.com/academy/lesson/how-rivers-and-streams-affect-the-earths-surface.html<br><br>**ESS2C - The Role of Water in Earth's Surface Processes**<br>https://www.youtube.com/watch?v=f-LCGejNIhI<br><br>**The Water Cycle**<br>https://www.youtube.com/watch?v=al-do-HGuIk<br><br>**Activities/Performance Tasks**<br><br>**Understanding Topographic Maps, Watersheds, and the Water Cycle**<br>https://www.pdx.edu/geography-education/sites/www.pdx.edu.geography- |

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| students to believe that erosion is always bad. However, teachers should stress that erosion does have positive aspects as well. Delta areas, like the Mississippi and the Nile, were created by the deposition of eroded sediments carried downriver. Without erosion, these rich, fertile farming areas would not exist.<br><br>**Science and Engineering Practices**<br><br>3. Planning and carrying out investigations<br>4. Analyzing and interpreting data<br><br>**Cross-Cutting Concepts**<br><br>5. Energy and Matter | | education/files/UnderstandingTopographicMapsWatershedsandtheWaterCycle%20%28Lauriel%20Amoroso%29.pdf<br><br>**Water Speed and Erosion**<br>Glencoe Earth Science: Chapter 9 – Water Erosion and Deposition, Page 260<br>https://www.iss.k12.nc.us/cms/lib4/NC01000579/Centricity/Domain/2016/014%20Water%20Erosion%20and%20Deposition.pdf<br><br>**Additional Resources:**<br>**ACT & SAT**<br>TN ACT Information & Resources<br>SAT Connections<br>SAT Practice from Khan Academy<br><br>**Related Resources:**<br>http://earthwatch.org/portals/0/downloads/education/lesson-plans/go_fish.pdf<br><br>http://sepuplhs.org/high/sgi/teachers/fishery_sim.html<br><br>https://www.youtube.com/watch?v=eVJ7Prt5OdA |

| Quarter 1 | | Quarter 2 | | Quarter 3 | Quarter 4 |
|---|---|---|---|---|---|
| Unit 1<br>Ecology | Unit 2<br>Biodiversity | Unit 3<br>Biodiversity | Unit 4<br>Earth's Systems | Unit 5<br>Earth and Human Activity I | Unit 6<br>Earth and Human Activity II |
| 6 weeks | 3 weeks | 3 weeks | 6 weeks | 9 weeks | 9 weeks |

**UNIT 4: Earth's Systems [3 weeks]**

Overarching Question(s)

How do the properties and movements of water shape Earth's surface and affect its systems?

**Note: Information in this unit is limited in the text. Other resources have been included to supplement the lessons.

| Unit, Lesson | Lesson Length | Essential Question | Vocabulary |
|---|---|---|---|
| Unit 2<br>Biodiversity | weeks | **Essential Questions**<br>• What are tectonic plates and what causes them to move?<br>• Which natural processes occur as a result of tectonic plate movement?<br>• What are three primary types of plate boundaries and what landforms do they cause?<br>• How are the rock cycle and tectonic action related? | Continent, Continental Drift, Pangaea, Seafloor, Seafloor Spreading, Converge, Diverge, Transform, Plate Tectonics, Plate, Lithosphere, Asthenosphere, Convection Current |

| Standards and Related Background Information | Instructional Focus | Instructional Resources |
|---|---|---|
| **DCI**<br>EVSC.ESS2: Earth's Systems<br>**Standard**<br>EVSC.ESS2.1 Research the development of the theory of plate tectonics. Use the theory to construct an explanation for how changes in Earth's crust cause mountain formation, volcanoes, earthquakes, and tsunamis. Provide evidence to support the explanation using information pertaining to plate boundary types (divergent, convergent, transform).<br>**Explanation**<br>Plate tectonics is the unifying theory that explains the past and current movements | **Learning Outcomes**<br>• Describe the hypothesis of continental drift<br>• Identify evidence supporting continental drift.<br>• Explain seafloor spreading.<br>• Recognize how age and magnetic clues support seafloor spreading.<br>• Compare and contrast different types of plate boundaries.<br>• Explain how heat inside of Earth causes plate tectonics.<br>• Recognize features caused by plate tectonics.<br><br>**Phenomenon**<br>**Plate Tectonics**<br><br>View the following picture. | Curricular Resources<br>Engage<br><br>Explore<br><br>Explain<br><br>Elaborate<br><br>Evaluate<br><br>**Lessons**<br><br>**Glencoe Earth Science: Chapter 10**<br>https://www.iss.k12.nc.us/cms/lib4/NC01000579/Centricity/Domain/2016/005%20Plate%20Tectonics.pdf |

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| of the rocks at Earth's surface and provides a coherent account of its geological history. This theory is supported by multiple evidence streams—for example, the consistent patterns of earthquake locations, evidence of ocean floor spreading over time given by tracking magnetic patterns in undersea rocks and coordinating them with changes to Earth's magnetic axis data, the warping of the land under loads (such as lakes and ice sheets), which show that the solid mantle's rocks can bend and even flow.<br>The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection.<br><br>**Misconceptions**<br>Students may confuse the concepts of tectonic plates, Earth's crust, continents, and lithosphere; for instance, students may mistakenly assume that each continent is a tectonic plate, and that the boundaries for the plate are always the edges of the continent.<br><br>Many students mistakenly assume that the mantle is liquid, and that it is always the direct source for volcanism, rather than a magma chamber.<br><br>Students may mistakenly assume that only continents move. | https://upload.wikimedia.org/wikipedia/commons/9/95/Palaeontinidae_Distribution_(Late_Jurassic).jpg<br><br>Time-lapse video of the movement of plates on Earth 400 million years ago to 250 million years into the future.<br><br>This phenomenon is an anchor phenomenon as it will be revisited throughout a lesson series on plate tectonics. Students observe the phenomenon, then engage in investigative phenomena and lessons that will support student reasoning and validate student evidence. Resources for this anchor phenomenon can be extensive and tailored to teacher preference. Students can read an article on tectonic movement as well as explore real time data from USGS. In addition, an activity plotting earthquake and volcano data leads to definition of plate boundaries.<br><br>**Related Resources:**<br><br>http://earthwatch.org/portals/0/downloads/education/lesson-plans/go_fish.pdf<br><br>http://sepuplhs.org/high/sgi/teachers/fishery_sim.html<br><br>https://www.youtube.com/watch?v=eVJ7Prt5OdA | Page 295 – Questions 15-25<br><br>**Environmental Science: Sustaining Your World, Page 369**<br><br>**CK12 Earth Science**<br>https://www.ck12.org/c/earth-science/<br><br>**Videos**<br><br>**Plate Tectonics**<br>https://www.youtube.com/watch?v=RA2-Vc4PIOY<br><br>**Bill Nye Plate Tectonics, Volcanoes and Earthquakes**<br>https://www.youtube.com/watch?v=1PVMs2NSdmc<br><br>**Plate Boundaries & Tectonic Plates**<br>https://www.youtube.com/watch?v=Xzpk9110Lyw<br><br>**Activities/Performance Tasks**<br><br>**Graham Cracker Plate Tectonics Lab**<br>https://www.paulding.k12.ga.us/cms/lib/GA01903603/Centricity/Domain/2517/GrahamCrackerPlateTectonicsLab.docx.pdf<br><br>**World Map of Plate Boundaries**<br>https://ceetep.oregonstate.edu/sites/ceetep.oregonstate.edu/files/7-world_map_of_plate_boundaries.pdf<br><br>**Predicting Tectonic Activity**<br>Glencoe Earth Science: Chapter 10, Page 290<br>https://www.iss.k12.nc.us/cms/lib4/NC01000579/Centricity/Domain/2016/005%20Plate%20Tectonics.pdf<br><br>**Did That Mountain Just Get Bigger?** |

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| Students may mistakenly assume that ocean ridges are due to vertical uplift or convergent plate boundaries, rather than divergent plates.<br><br>Many students have heard of Pangea and mistakenly assume that Earth started with this single supercontinent, and that the present oceans only began as Pangea broke apart.<br><br>Students may mistakenly assume that oceans create oceanic crust (rather than being closer to other way round).<br><br>Students may mistakenly confuse a plate boundary with the plate itself; for example, they may say that a plate has to be divergent or convergent.<br><br>**Science and Engineering Practices**<br>2. Developing and using models<br>5. Using mathematics and computational thinking<br>7. Engaging in argument from evidence<br><br>**Cross-Cutting Concepts**<br>2. Cause and effect<br>4. Systems and System Models<br>5. Energy and matter<br>6. Structure and Function<br>7. Stability and Change | | https://www.ck12.org/c/earth-science/earths-tectonic-plates/rwa/Did-That-Mountain-Just-Get-Bigger/?referrer=concept_details<br>**Additional Resources:**<br>**ACT & SAT**<br>TN ACT Information & Resources<br>SAT Connections<br>SAT Practice from Khan Academy<br>**Resources:**<br><br>**Tectonic Plate Movement**<br><br>**Real time earthquake data**<br><br>**Mapping Earthquakes and Volcanoes** |

| Quarter 1 | | Quarter 2 | | Quarter 3 | Quarter 4 |
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| Unit 1<br>Ecology | Unit 2<br>Biodiversity | Unit 3<br>Biodiversity | Unit 4<br>Earth's Systems | Unit 5<br>Earth and Human Activity I | Unit 6<br>Earth and Human Activity II |
| 6 weeks | 3 weeks | 3 weeks | 6 weeks | 9 weeks | 9 weeks |

**UNIT 4: Earth's Systems [6 weeks]**

Overarching Question(s)

How do the properties and movements of water shape Earth's surface and affect its systems?

**Note: Information in this unit is limited in the text. Other resources have been included to supplement the lessons.

| Unit, Lesson | Lesson Length | Essential Question | Vocabulary |
|---|---|---|---|
| Unit 2<br>Biodiversity | | **Essential Questions**<br>• What is the composition of the atmosphere and how do the elements/molecules of the atmosphere interact with each other and with the other spheres of the earth?<br>• Why is this interaction important to life on Earth?<br>• What are some of the natural/human activities that may affect our atmosphere and what effect might they have?<br>• Why is the health of the atmosphere a global concern and how do we address the problems? | Atmosphere, Troposphere, Ionosphere, Ozone Layer, Ultraviolet Radiation, Chlorofluorocarbon, Radiation, Conduction, Convection, Hydrosphere, Condensation, Coriolis Effect, Jet Stream, Sea Breeze |

| Standards and Related Background Information | Instructional Focus | Instructional Resources |
|---|---|---|
| **DCI**<br>EVSC.ESS2: Earth's Systems<br><br>**Standard**<br>EVSC.ESS2.3 Analyze the composition of the Earth's atmosphere. Obtain information and use graphs to observe patterns regarding stability and change within the Earth's atmospheric composition (O2, N2, CO2, etc.) over geologic time.<br><br>**Explanation** | **Learning Outcomes**<br><br>• Identify the gases in Earth's atmosphere.<br>• Describe the structure of Earth's atmosphere.<br>• Explain what causes air pressure.<br>• Describe what happens to the energy Earth receives from the Sun.<br>• Compare and contrast radiation, conduction, and convection.<br>• Explain the water cycle.<br>• Explain why different latitudes on Earth receive different amounts of solar energy.<br>• Describe the Coriolis effect. | Curricular Resources<br>Engage<br><br>Explore<br><br>Explain<br><br>Elaborate<br><br>Evaluate<br><br>**Lessons**<br><br>**Glencoe Earth Science: Chapter 15** |

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| The properties and conditions of Earth and its atmosphere affect the environments and conditions within which life emerged and evolved—for example, the range of frequencies of light that penetrate the atmosphere to Earth's surface. Organisms continually evolve to new and often more complex forms as they adapt to new environments. The evolution and proliferation of living things have changed the makeup of Earth's geosphere, hydrosphere, and atmosphere over geological time. Plants, algae, and microorganisms produced most of the oxygen (i.e., the O2) in the atmosphere through photosynthesis, and they enabled the formation of fossil fuels and types of sedimentary rocks. Microbes also changed the chemistry of Earth's surface, and they continue to play a critical role in nutrient cycling (e.g., of nitrogen) in most ecosystems.<br><br>**Misconceptions**<br>Examples of common misconceptions pertaining to the atmosphere include the following:<br><br>A common misconception is that land plants generate most of the oxygen in the atmosphere. People do not understand the capacity of the ocean to generate oxygen into the atmosphere for the planet. Research indicates that 75 percent of respondents incorrectly identify forests as generating more oxygen than oceans, when in fact oceans | • Locate doldrums, trade winds, prevailing westerlies, polar easterlies, and jet streams.<br><br>**Phenomenon**<br>**Saharan Air Layer**<br><br>View the following picture.<br><br>https://images.washingtonpost.com/?url=https://img.washingtonpost.com/news/speaking-of-science/wp-content/uploads/sites/36/2016/05/dustanimation_1.gif&op=noop<br><br>The phenomenon known as the Saharan Air Layer brings several hundred million tons of dust to the Americas each year. It helps build beaches in the Caribbean and carries nutrients that fertilize the Amazon rainforest. The dust is also thought to help suppress hurricanes along the coast. It has been happening for thousands of years, but in the past few decades, scientists have become concerned about the effects of this dust on coral reef ecosystems in the Caribbean. Studies have linked the dust plumes to toxic "red tides" — huge algae blooms that poison fish and trigger skin and breathing problems in people. There's also some evidence suggesting that African microbes may be hitching rides on the dust and poisoning corals on the other side of the sea.<br><br>Related Resources:<br><br>http://nationalgeographic.org/activity/earths-changing-climates/<br><br>http://nationalgeographic.org/encyclopedia/climate-change/<br><br>http://authoring.concord.org/sequences/47/activities/278?show_index=true | https://www.canyonspringshighschool.org/ourpages/auto/2015/11/6/54748438/ES%20Unit%205.pdf<br><br>Page 458 – Questions 11-15<br>Page 459 – Questions 17-20<br><br>**Environmental Science: Sustaining Your World, Pages 69-71, Page 525**<br>**CK12 Earth Science**<br>https://www.ck12.org/c/earth-science/<br><br>**Videos**<br><br>**Earth's Atmosphere: Composition, Climate & Weather**<br>https://www.space.com/17683-earth-atmosphere.html<br><br>**Composition of the Atmosphere**<br>https://www.youtube.com/watch?v=n_HlWovib3Y<br><br>**The Coriolis Effect**<br>https://www.youtube.com/watch?v=i2mec3vgeaI<br><br>**Energy from the Sun and Earth**<br>https://www.youtube.com/watch?v=zsVkfxjaezk<br><br>**Heat Transfer: Conduction, Convection, Radiation**<br>https://www.youtube.com/watch?v=U3ee3rSg7xs<br><br>**Activities/Performance Tasks**<br><br>**Glencoe Earth Science: Chapter 15**<br>https://www.canyonspringshighschool.org/ourpages/auto/2015/11/6/54748438/ES%20Unit%205.pdf<br><br>Problem Solving Activity – How Does Altitude Air Pressure?<br>Page 438 |

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| generate 70 percent of the planet's oxygen supply.<br><br>Most people falsely believe that direct sunlight heats the atmosphere. People do not understand the differences or contributions of the three kinds of heat transfer mechanisms—conduction, convection, and radiation—and how they apply to warming the atmosphere. Many, therefore, do not appreciate that the atmosphere is heated from the ground up, even though the original energy comes from the sun.<br><br>Another common misconception is that greenhouse gases make up a major portion of the atmosphere. In fact, the major constituents in the atmosphere are nitrogen and oxygen, which compose 99 percent by volume. Gases like water vapor and carbon dioxide, which are present in minute amounts, receive much of the public's attention because they operate as greenhouse gases that absorb radiation.<br><br>**Science and Engineering Practices**<br>4. Analyzing and interpreting data<br>8. Obtaining, evaluating, and communicating information<br>**Cross-Cutting Concepts**<br>1.Patterns<br>7. Stability and Change | | Mini Lab – Determining If Air Has Mass<br>Page 439<br>Mini Lab – Modeling Heat Transfer Page 445<br><br>**Layers of the Atmosphere**<br>https://www.haystack.mit.edu/edu/pcr/climate_CHANGE/Earth's%20Atmosphere/Graphing%20Layers%20of%20Atmosphere.pdf<br><br>**Earth's Atmosphere**<br>https://www.ppps.org/cms/lib04/MI01000504/Centricity/Domain/231/Activity%2064%20Weather%20Amosphere.pdf<br><br>**Additional Resources:**<br>**ACT & SAT**<br>TN ACT Information & Resources<br>SAT Connections<br>SAT Practice from Khan Academy<br>**Resources:**<br>**Washington Post: Speaking of Science** |

| Environmental Science Quarter 2 Curriculum Map | | | |
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| Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 |

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| Unit 1<br>Ecology | Unit 2<br>Biodiversity | Unit 3<br>Biodiversity | Unit 4<br>Earth's Systems | Unit 5<br>Earth and Human Activity I | Unit 6<br>Earth and Human Activity II |
| 6 weeks | 3 weeks | 3 weeks | 6 weeks | 9 weeks | 9 weeks |

**UNIT 4: Earth's Systems [6 weeks]**

Overarching Question(s)

How do the properties and movements of water shape Earth's surface and affect its systems?

**Note: Information in this unit is limited in the text. Other resources have been included to supplement the lessons.

| Unit, Lesson | Lesson Length | Essential Question | Vocabulary |
|---|---|---|---|
| Unit 2<br>Biodiversity | | **Essential Questions**<br>● What factors influence the climate of an area?<br>● What is climate? How does it differ from weather?<br>● What are current climate conditions dependent on?<br>● How has climate changed in the past?<br>● What natural and anthropogenic factors cause climate change?<br>● Is our climate changing? How are extreme events, such as droughts, floods, wildfires, heat waves, and hurricanes related to climate variability and change?<br>● What evidence do we have that global climate change has occurred?<br>● What contributes to climate change in the United States?<br>● What contributes to climate change in the world?<br>● How has climate changed over time on Earth? | Weather, Humidity, Relative Humidity, Dew Point, Fog, Precipitation, Air Mass, Front, Tornado, Hurricane, Blizzard, Climate, Tropics, Polar Zone, Temperate Zone, Adaptation, Hibernation, Season, El Nino, Greenhouse Effect, Global Warming, Deforestation |
| Standards and Related Background Information | | Instructional Focus | Instructional Resources |

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| **DCI**<br>EVSC.ESS2: Earth's Systems<br>**Standard**<br>EVSC.ESS2.4 Differentiate weather and climate and analyze and interpret data examining naturally occurring patterns pertaining to each.<br>**Explanation**<br>Weather, which varies from day to day and seasonally throughout the year, is the condition of the atmosphere at a given place and time. Climate is longer term and location sensitive; it is the range of a region's weather over 1 year or many years, and, because it depends on latitude and geography, it varies from place to place. Weather and climate are shaped by complex interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions can drive changes that occur over multiple time scales—from days, weeks, and months for weather to years, decades, centuries, and beyond—for climate.<br>The foundation for Earth's global climate system 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 reradiation into space. Climate change can occur when certain parts of Earth's systems are altered. Geological evidence indicates that past climate changes were either sudden changes caused by alterations in the atmosphere; longer term changes (e.g., ice ages) due to variations in solar | **Learning Outcomes**<br><br>• Describe what determines climate.<br>• Differentiate between weather and climate.<br>• Explain how latitude, oceans, and other factors affect climate of a region.<br>• Explain how organisms adapt to particular climates.<br>• Explain possible causes of climatic change.<br><br>**Phenomenon**<br>**Climate Change**<br><br>View the following picture.<br><br>http://rack.1.mshcdn.com/media/ZgkyMDE2LzA1LzEwLzVhL0VkSGF3a2luc1ZpLmYxNmQ4LmpwZwpwCXRodW1iCTk1MHg1MzQjCmUJanBn/4cec154d/8c7/EdHawkinsVisualization.jpg<br><br>Human activities, including CO2 emissions, deforestation and other forms of land cover change, exert substantial pressures on the Earth's climate system. Changes in climate that have already begun will likely unfold over decades to centuries and will be shaped by the decisions of future generations.<br><br>**Earth's Changing Climate**<br><br>View the following picture.<br>http://media.education.nationalgeographic.com/assets/photos/116/58c/11658cbf-0c13-413a-96a5-3a98ca978b20.jpg<br><br>Climate is the long-term pattern of weather in a particular area. Weather can change from hour to hour, day to day, month to month or even from year to year. For periods of 30 years or more, however, distinct weather patterns occur. A desert might experience a rainy week, but over the long term, the region receives very little rainfall. It has a dry climate. Because climates are mostly constant, living things can adapt to them. Polar bears have adapted to stay warm in | Curricular Resources<br>Engage<br><br>Explore<br><br>Explain<br><br>Elaborate<br><br>Evaluate<br><br>**Lessons**<br><br>**Environmental Science: Sustaining Your World, Section 6.1**<br><br>**Glencoe Earth Science: Chapters 16 and 17**<br>https://www.canyonspringshighschool.org/ourpages/auto/2015/11/6/54748438/ES%20Unit%205.pdf<br><br>Page 488-489, Questions 11-22<br>Page 518-519, Questions 11-21<br><br>**Weather and Climate Blackline Masters**<br>https://ec.gc.ca/meteoaloeil-skywatchers/664F561F-3A85-4475-809C-04F3EB893BE8/student%20activity%20booklet_e.pdf<br><br>**What is the Difference Between Weather and Climate**<br>https://www.bookstore.ksre.ksu.edu/pubs/MF3197.pdf<br><br>**Climate Vs. Weather**<br>http://gcoos.tamu.edu/wp-content/uploads/2017/06/Climate_vs_Weather_5-8.pdf<br><br>**CK12 Earth Science**<br>https://www.ck12.org/c/earth-science/<br><br>**Videos** |

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| output, Earth's orbit, or the orientation of its axis; or even more gradual atmospheric changes due to plants and other organisms that captured carbon dioxide and released oxygen. The time scales of these changes varied from a few to millions of years. Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus, affect climate.<br>**Misconceptions**<br>Some students may think that weather is not a science; they may think that meteorologists just guess the forecast. There are many misconceptions about clouds, what they are and how they form, and why it rains. Students may not know the difference between weather and climate and may think they are the same thing. Many people confuse the concept of global warming with the ozone hole. While the depletion of ozone is a small factor in climate change, it is a problem that is more related to CFCs and scientists believe that we have made measurable steps in "fixing" the ozone hole. Many people mistakenly assume that the infrared radiation from the Sun is what is responsible for warming the Earth, or that the Sun sends heat directly through space to Earth. Instead, the visible and infrared sunlight are absorbed by the Earth's surface. Most people are unaware of the relationships between the Sun's energy, winds, currents, and hurricanes. | polar climates, while cacti have evolved to hold onto water in dry climates. The enormous variety of life on Earth results in large part from the variety of climates that exist. Climates do change, however—they just change very slowly, over hundreds or even thousands of years. As climates change, organisms that live in the area must adapt, relocate, or risk going extinct. | **Weather and Climate**<br>https://video.nationalgeographic.com/video/climate-weather-sci<br><br>**Weather vs. Climate**<br>https://www.youtube.com/watch?v=SosJzEn1G0s<br><br>**What are El Niño and La Niña?**<br>https://oceanservice.noaa.gov/facts/ninonina.html<br><br>**Effects on Climate Playlist**<br>https://www.youtube.com/playlist?list=PLOE0-QYfoFlKyWrinfoSTTnHAKn_qfk4P<br><br>**World Geography Unit 1 Lesson 5 World Climate Patterns**<br>https://www.youtube.com/watch?v=AO_lv8zc1Uk<br><br>**Activities/Performance Tasks**<br><br>**Weather and Climate**<br>http://www.brandywineschools.org/cms/lib04/DE01000691/Centricity/Domain/1648/Weather%20and%20Climate%20Part%201%20Packet.docx<br><br>**WEATHER AND CLIMATE: WHAT'S THE DIFFERENCE?**<br>https://www3.epa.gov/climatechange//kids/documents/weather-climate.pdf<br>(*Note: For this activity copy and paste the link.)<br><br>**It's All in The Name**<br>https://www.nwf.org/~/media/PDFs/Eco-schools/Hurricane%20Sandy/LESSON%208__Grades5-8_Weather%20V%20Climate.ashx<br><br>**Glencoe Earth Science: Chapters 16 and 17** |

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| **Science and Engineering Practices**<br>4. Analyzing and interpreting data<br>8. Obtaining, evaluating, and communicating information<br>**Cross-Cutting Concepts**<br>1.Patterns<br>7. Stability and Change | | https://www.canyonspringshighschool.org/ourpages/auto/2015/11/6/54748438/ES%20Unit%205.pdf<br><br>The Greenhouse Effect, Page 511<br>Microclimates, Page 512<br><br>**Additional Resources:**<br>**ACT & SAT**<br>TN ACT Information & Resources<br>SAT Connections<br>SAT Practice from Khan Academy<br>**Resources:**<br>**Washington Post: Speaking of Science**<br>**Resources:**<br>**Climate Data for Students (NASA/UNH)**<br><br>**World Meteorological Organization for Youth**<br><br>**World Meteorological Organization - Climate** |

| Environmental Science Quarter 2 Curriculum Map | | | | | |
|---|---|---|---|---|---|
| Quarter 1 | | Quarter 2 | | Quarter 3 | Quarter 4 |
| Unit 1<br>Ecology | Unit 2<br>Biodiversity | Unit 3<br>Biodiversity | Unit 4<br>Earth's Systems | Unit 5<br>Earth and Human Activity I | Unit 6<br>Earth and Human Activity II |
| 6 weeks | 3 weeks | 3 weeks | 6 weeks | 9 weeks | 9 weeks |

**UNIT 4: Earth's Systems [6 weeks]**

Overarching Question(s)

How do the properties and movements of water shape Earth's surface and affect its systems?

**Note: Information in this unit is limited in the text. Other resources have been included to supplement the lessons.

| Unit, Lesson | Lesson Length | Essential Question | Vocabulary |
|---|---|---|---|
| Unit 2<br>Biodiversity | | **Essential Questions**<br>• How does the position of the earth in the solar system affect the cycles of day and night?<br>• How does the position and tilt of the earth's axis in the solar system affect seasonal cycles?<br>• How does the moon's orbit around the earth change our perception of the moon's surface? | Seasons, Orbit, Sphere, Axis, Rotation, Revolution, Ellipse, Solstice, Equinox, Moon Phase, New Moon, Waxing, Full Moon, Waning, Solar Eclipse, Lunar Eclipse, Maria |

| Standards and Related Background Information | Instructional Focus | Instructional Resources |
|---|---|---|
| **DCI**<br>EVSC.ESS2: Earth's Systems<br><br>**Standard**<br>EVSC.ESS2.2 Considering Earth's position within our solar system, use a model to demonstrate the causes of day length, seasons, and climate.<br>**Explanation**<br>The solar system consists of the sun and a collection of objects of varying sizes and conditions—including planets and their moons—that are held in orbit around the sun by its gravitational pull | **Learning Outcomes**<br><br>• Examine Earth's physical characteristics.<br>• Identify phases of the moon and their cause.<br>• Differentiate between rotation and revolution.<br>• Discuss what causes seasons to change.<br><br>**Phenomenon**<br>**Mercury Transit Across the Sun**<br><br>View the following picture.<br><br>http://pop.h-cdn.co/assets/16/19/1462886335-trantop.gif | Curricular Resources<br>Engage<br><br>Explore<br><br>Explain<br><br>Elaborate<br><br>Evaluate<br><br>**Lessons**<br><br>**Glencoe Earth Science: Chapter 23** |

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| on them. This system appears to have formed from a disk of dust and gas, drawn together by gravity. Earth and the moon, sun, and planets have predictable patterns of movement. These patterns, which are explainable by gravitational forces and conservation laws, in turn explain many large-scale phenomena observed on Earth.<br><br>Planetary motions around the sun can be predicted using Kepler's three empirical laws, which can be explained based on Newton's theory of gravity. These orbits may also change somewhat due to the gravitational effects from, or collisions with, other bodies. Gradual changes in the shape of Earth's orbit around the sun (over hundreds of thousands of years), together with the tilt of the planet's spin axis (or axis of rotation), have altered the intensity and distribution of sunlight falling on Earth. These phenomena cause cycles of climate change, including the relatively recent cycles of ice ages.<br><br>**Misconceptions**<br>There are several misconceptions about the solar system. The polar regions' extremes in lengths of the seasons and day and night are an intriguing introduction to misunderstood scientific concepts. Research has long documented that people of all ages – elementary school children, college students, and adults – cannot explain the cause of day and night or seasons. While the prevalence of these misconceptions, as | Mercury's orbit passed in front of the sun for the first time since 2012 and the last time until 2019. Captured on video over eight hours, these videos give us an idea of the scale and size of objects in our solar system.<br><br>**Satellite Blocks our Star**<br><br>View the following picture.<br><br>http://maxpixel.freegreatpicture.com/static/photo/1x/Background-Eclipse-Wallpaper-Twilight-Sun-Moon-1492818.jpg | http://www.obscience.org/uploads/3/7/8/8/37884705/sun-earth-moon.pdf<br><br>Page 685, Questions 16-24<br><br>**Motions of the Earth**<br>http://www.ucolick.org/~bolte/AY5_2015/Lecture2_AY5.pdf<br><br>**Reasons for the Seasons**<br>http://www.taylor.k12.ky.us/userfiles/1321/Classes/7389/Reasons%20for%20the%20Seasons%20Worksheets.doc<br><br>**What Causes Day and Night**<br>http://www.dentonisd.org/cms/lib/tx21000245/centricity/domain/4802/dayandnight.pdf<br><br>**What Causes Day and Night**<br>https://www.asd5.org/cms/lib/WA01001311/Centricity/Domain/278/day%20and%20night%20reading.pdf<br>**CK12 Earth Science**<br>https://www.ck12.org/c/earth-science/<br><br>**Videos**<br><br>**Seasons and the Sun**<br>https://www.youtube.com/watch?v=b25g4nZTHvM<br><br>**What Causes Day and Night?**<br>https://www.youtube.com/watch?v=Ujv_k6JknRQ<br><br>**Everything You Need to Know About Earth's Orbit and Climate Change**<br>https://www.mnn.com/earth-matters/climate-weather/stories/everything-you-need-to-know-about-earths-orbit-and-climate-cha<br><br>**How Earth's Tilt Causes Seasons** |

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| well as the complexity of the subject, makes it unlikely that students will leave elementary school with a complete and correct understanding, it is important to assess, target, and challenge these misconceptions even in the early years.<br><br>The following resources can be used to analyze and dispel these misconceptions.<br>https://beyondpenguins.ehe.osu.edu/issue/polar-patterns-day-night-and-seasons/common-misconceptions-about-day-and-night-seasons<br><br>https://amazing-space.stsci.edu/resource_page/160/solar_system/type<br><br>http://mentalfloss.com/article/67873/10-misconceptions-about-space<br><br>https://www.scc.losrios.edu/pag/astronomy/44-common-misconceptions-about-astronomy/<br><br>**Science and Engineering Practices**<br>4. Analyzing and interpreting data<br>8. Obtaining, evaluating, and communicating information<br>**Cross-Cutting Concepts**<br>1.Patterns<br>7. Stability and Change | | https://www.khanacademy.org/science/cosmology-and-astronomy/earth-history-topic/earth-title-topic/v/how-earth-s-tilt-causes-seasons<br><br>**Activities/Performance Tasks**<br><br>**Reasons for the Seasons on Earth**<br>https://museumsvictoria.com.au/media/1862/the-seasons-seasons-activities.pdf<br><br>**Modeling the Seasons**<br>https://www.exploratorium.edu/chaco/HTML/tg-seasons.pdf<br><br>**Seasons Scavenger Hunt**<br>https://www.g-pisd.org/uploaded/_G-P_Junior_High_School/Staff_Directory/Christopher_Kasner/Seasons_Scavenger_Hunt.doc<br><br>**Popular Mechanics**<br><br>**Additional Resources:**<br>**ACT & SAT**<br>TN ACT Information & Resources<br>SAT Connections<br>SAT Practice from Khan Academy<br>**Resources:**<br>**Washington Post: Speaking of Science**<br>**Resources:**<br>**Climate Data for Students (NASA/UNH)**<br><br>**World Meteorological Organization for Youth**<br><br>**World Meteorological Organization - Climate** |

Curriculum and Instruction- Science

**RESOURCE TOOLKIT**

**Quarter 2** **Environmental Science**

| **Textbook Resources** | **DCIs and Standards** | **Websites/Videos** | **Additional Resources** |
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| **Will add quarter 2 textbook resources** | **DCI**<br><br>Biological Change: Unity and Diversity<br><br>Applications of Science<br><br>Ecosystems: Interactions, Energy, and Dynamics<br><br>Earth's Systems<br><br>**Standard**<br><br>EVSC.ETS3:<br><br>EVSC.LS4:<br><br>EVSC.LS2:<br><br>EVSC.ESS2.6<br><br>EVSC.ESS2: | **Earth's Atmosphere: Composition, Climate & Weather**<br><br>https://www.space.com/17683-earth-atmosphere.html<br><br>**Composition of the Atmosphere**<br><br>https://www.youtube.com/watch?v=n_HlWovib3Y<br><br>**The Coriolis Effect**<br><br>https://www.youtube.com/watch?v=i2mec3vgeaI<br><br>**Energy from the Sun and Earth**<br><br>https://www.youtube.com/watch?v=zsVkfxjaezk<br><br>**Heat Transfer: Conduction, Convection, Radiation**<br><br>https://www.youtube.com/watch?v=U3ee3rSg7xs<br><br>**Earth's Atmosphere: Composition, Climate & Weather** | **ACT & SAT**<br>TN ACT Information & Resources<br>ACT College & Career Readiness Mathematics Standards<br>SAT Connections<br>SAT Practice from Khan Academy<br>Khan Academy<br>Illuminations (NCTM)<br>Discovery Education<br>The Futures Channel<br>The TeachingChannel<br>Teachertube.com |

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| | | https://www.space.com/17683-earth-atmosphere.html<br><br>**Composition of the Atmosphere**<br>https://www.youtube.com/watch?v=n_HlWovib3Y<br><br>**The Coriolis Effect**<br>https://www.youtube.com/watch?v=i2mec3vgeaI<br><br>**Energy from the Sun and Earth**<br>https://www.youtube.com/watch?v=zsVkfxjaezk<br><br>**Heat Transfer: Conduction, Convection, Radiation**<br>https://www.youtube.com/watch?v=U3ee3rSg7xs<br><br>**Weather and Climate**<br>https://video.nationalgeographic.com/video/climate-weather-sci<br><br>**Weather vs. Climate**<br>https://www.youtube.com/watch?v=SosJzEn1G0s<br><br>**What are El Niño and La Niña?**<br>https://oceanservice.noaa.gov/facts/ninonina.html<br><br>**Effects on Climate Playlist**<br>https://www.youtube.com/playlist?list=PLOE0-QYfoFlKyWrinfoSTTnHAKn_qfk4P<br><br>**World Geography Unit 1 Lesson 5 World Climate Patterns** | |

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| | | https://www.youtube.com/watch?v=AO_lv8zc1Uk<br><br>**Activities/Performance Tasks**<br><br>**Ecological Succession Activity**<br><br>http://hereausclasses.weebly.com/uploads/1/3/0/9/13099600/ecological_succession_reading_and_activity.doc<br><br>**The Ups and Downs of Populations**<br><br>http://science4inquiry.com/LessonPlans/LifeScience/Populations_MS/UpsDownsPopulationsMSFinal.pdf<br><br>**Population and Limiting Factor Lab**<br><br>http://blogs.fcps.net/mrswoods/files/2015/08/Population-Limiting-Factors-Owl-Mouse-LAB.pdf<br><br>http://earthwatch.org/portals/0/downloads/education/lesson-plans/go_fish.pdf<br><br>http://sepuplhs.org/high/sgi/teachers/fishery_sim.html<br><br>https://www.youtube.com/watch?v=eVJ7Prt5OdA<br><br>**National Geographic – Weather and Climate**<br><br>https://video.nationalgeographic.com/video/climate-weather-sci<br><br>**Weather vs. Climate: What's the difference?**<br><br>https://youtu.be/SosJzEn1G0s<br><br>**Five Factors that Affect Climate**<br><br>https://youtu.be/E7DLLxrrBV8<br><br>**Factors that Affect Climate**<br><br>https://youtu.be/rcVee8qVWZI<br><br>**Terrestrial Ecosystems**<br><br>https://youtu.be/LXF9VW5G0xU<br><br>**Marine Ecosystems** | |

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| | | https://youtu.be/se_sj0nL3Xk<br><br>**The Basics of Freshwater**<br><br>https://youtu.be/oaQCiwzjnCM<br><br>**<u>Activities/Performance Tasks</u>**<br><br>**Weather Scope Activities**<br><br>http://www.k12science.org/curriculum/weatherproj2/en/activities.shtml<br><br>**Ecosystems & Energy in Ecosystems**<br><br>http://www.esc3.net/cms/lib/TX00001506/Centricity/Domain/14/NEISDEnviron.%20Systems%201st%20Nine%20Weeks%20Group%201.pdf<br><br>**Crafting an Aquatic Ecosystem**<br><br>https://www.fws.gov/columbiariver/ANS/Activities/Activity_3.pdf<br><br>http://nationalgeographic.org/activity/earths-changing-climates/<br><br>http://nationalgeographic.org/encyclopedia/climate-change/<br><br>http://authoring.concord.org/sequences/47/activities/278?show_index=true | |


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