

**East Penn School District**  
Curriculum and Instruction

**Curriculum for: Geology of National Parks**

**Course(s): Geology of the National Parks**

**Grades: 10-12**

**Department: Science**

**Length of Period (average minutes): 42**

**Periods per cycle: 6**

**Length of Course (yrs): 0.5**

**Type of offering: elective**

**Credit(s) awarded: 0.5 4.0/4.0**

**Developed by: Michael Mihalik**

**ADOPTED: 2018**

Enduring Understandings	Essential Questions	Knowledge	Skills	Standards
<ul style="list-style-type: none"> <li>The national parks have played a huge role historically in tourism and conservation in the United States.</li> <li>Human time and geological time are worlds apart.</li> </ul>	<ul style="list-style-type: none"> <li>Where and how do humans fit in on Earth?</li> <li>What is inside the Earth?</li> <li>Why do we have national parks?</li> </ul>	<ul style="list-style-type: none"> <li>Basic geology and recreation our national parks have to offer</li> <li>People, especially minorities, that were helpful in establishing conservation and our national parks</li> <li>The relationship between business and conservation</li> <li>Why people do/do not go to national parks and the role geology plays in those personal choices</li> <li>The layers of the Earth and major characteristics</li> <li>The relationship between Earth's systems and life on Earth</li> </ul>	<ul style="list-style-type: none"> <li>Using seismic wave data to create a model/graph of Earth's interior</li> <li>Constructing an argument about the simultaneous coevolution of Earth's systems and life on Earth</li> <li>Placing major Earth events on a timeline that students can relate to</li> <li>Identifying the locations of national parks and regions/landforms across the United States looking for geographical patterns</li> </ul>	<p>NGSS Standards:</p> <ul style="list-style-type: none"> <li>HS-ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection</li> <li>HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.</li> </ul>
<ul style="list-style-type: none"> <li>What we see on Earth's surface is usually created by forces that we cannot see.</li> <li>Plate tectonics and associated events create natural disasters and beauty</li> </ul>	<ul style="list-style-type: none"> <li>What would the Earth be like without plate tectonics?</li> <li>How do actions inside the Earth affect mountains on Earth's surface?</li> </ul>	<ul style="list-style-type: none"> <li>The supporting evidence for Continental Drift</li> <li>The differences between continental drift and plate tectonics</li> <li>The movements, characteristics, and</li> </ul>	<ul style="list-style-type: none"> <li>Analyzing geoscience data in the form of earthquake locations to recognize plate boundaries, but also forecast areas of danger</li> </ul>	<p>NGSS Standards:</p> <ul style="list-style-type: none"> <li>HS-ESS1-5. Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of</li> </ul>

	<ul style="list-style-type: none"> <li>• Why is plate tectonics prolonged and also sudden?</li> </ul>	<p>examples of various plate boundaries</p> <ul style="list-style-type: none"> <li>• The differences between plutonic and volcanic igneous rocks</li> <li>• The sequences of events that triggered various historic eruptions</li> <li>• How the features of Crater Lake, Mt. Rainier, and Lassen Volcanic relate to plate tectonics</li> <li>• Why the Cascades look the way that they do</li> <li>• How mountains on our West Coast dictate weather patterns</li> </ul>	<ul style="list-style-type: none"> <li>• Calculating the age of crustal rocks and rate/direction of plate movement</li> <li>• Explaining how plate tectonics have influenced human life</li> <li>• Explaining how changes inside the Earth affect Earth's surface</li> <li>• Identifying and understanding the risk with volcanic hazards</li> <li>• Identifying igneous rocks and differentiating volcanic from plutonic, and mafic from felsic</li> <li>• Using contour lines to see elevation on a topographic map</li> </ul>	<p>crustal rocks.</p> <ul style="list-style-type: none"> <li>• HS-ESS2-2. 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.</li> <li>• HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.</li> </ul>
<ul style="list-style-type: none"> <li>• Animals and fear can change landscapes.</li> <li>• Not all volcanoes look the same.</li> </ul>	<ul style="list-style-type: none"> <li>• Why should we protect predators?</li> <li>• How do actions inside the Earth affect water features on Earth's surface?</li> <li>• What should tourists know</li> </ul>	<ul style="list-style-type: none"> <li>• What previous Yellowstone eruptions did so that predictions can be made about future eruption impacts</li> <li>• Yellowstone, and other volcanoes, have climatic effects</li> <li>• How hot spots are</li> </ul>	<ul style="list-style-type: none"> <li>• Predicting how Yellowstone eruptions can affect climate and people</li> <li>• Modeling the plumbing system of Yellowstone's geothermal features</li> <li>• Using the VEI scale to classify volcanoes</li> </ul>	<p>NGSS Standards:</p> <ul style="list-style-type: none"> <li>• HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.</li> </ul>

	<p>about Yellowstone?</p>	<p>different than other volcanoes</p> <ul style="list-style-type: none"> <li>● Not all mountains are volcanoes</li> <li>● Yellowstone’s snowfall impacts the geothermal features</li> <li>● Yellowstone’s hot spot shows itself through geothermal features at the surface</li> <li>● Wolves change the behavior of rivers</li> </ul>	<ul style="list-style-type: none"> <li>● Classifying different types of volcanic rocks seen in Yellowstone</li> <li>● Explaining the formation of the Grand Tetons using fault-block terminology</li> <li>● Identifying erosional and depositional landforms in landscapes</li> <li>● Linking changes in wildlife populations to changes in the landscape</li> </ul>	
<ul style="list-style-type: none"> <li>● Current rock formations reveal relative age.</li> <li>● Water is the most important force in the arid Southwest</li> </ul>	<ul style="list-style-type: none"> <li>● How does the interaction of Earth, air, and water shape the Southwest?</li> <li>● What do rocks tell us?</li> <li>● How do rocks change?</li> </ul>	<ul style="list-style-type: none"> <li>● The various aspects of the rock cycle and ways that sedimentary rocks are formed</li> <li>● The differences between weathering and erosion The factors affecting rate of weathering</li> <li>● Why the Grand Canyon is so “grand”</li> <li>● Past oceans/seas play a significant role in the geology of the southwest</li> <li>● How the appearance of rocks change throughout time</li> </ul>	<ul style="list-style-type: none"> <li>● Planning and conducting an investigation to show the effect that water has on weather and erosion</li> <li>● Applying the principle of superposition to relatively date rocks</li> <li>● Identifying and classifying minerals by using a variety of tests</li> <li>● Identifying sedimentary rocks</li> <li>● Recognizing and explaining various</li> </ul>	<p>NGSS Standards:</p> <ul style="list-style-type: none"> <li>● HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.</li> <li>● HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.</li> <li>● HS-ESS2-2. Analyze</li> </ul>

		<ul style="list-style-type: none"> <li>• The power of flash flooding</li> <li>• How Zion Canyon and its features formed</li> <li>• How hoodoos, arches, fins, and balanced rocks formed</li> <li>• Where oil shales can be found and how oil is extracted</li> </ul>	<p>types of weathering and erosion</p> <ul style="list-style-type: none"> <li>• Describing the ways that water breaks and transports rock</li> </ul>	<p>geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems</p>
<ul style="list-style-type: none"> <li>• Glaciers have their own life cycle and it is critical to the lives of all living things on Earth.</li> <li>• Climate change can be seen in landscape changes.</li> </ul>	<p>How does the use of resources affect humans and our environment? How do landscapes change over time? How does the Earth and its features move?</p>	<ul style="list-style-type: none"> <li>• Why gold exists, where and how it can be found, and how it has impacted human history</li> <li>• Renewable and nonrenewable resources in Alaska</li> <li>• Formation of Alaska's Aleutian, Alaska, and Chugach Ranges</li> <li>• The relationship between mountains and weather (orographic effect)</li> <li>• The formation of glacial ice and the different types of glaciers and ice sheets that can form</li> <li>• Erosional and depositional landforms created by glaciers</li> <li>• Warning signs and impacts of climate</li> </ul>	<ul style="list-style-type: none"> <li>• Using repeat photography to investigate changes in landscapes</li> <li>• Calculate glacial movement (loss by using recessional moraine deposits, rates of advancing, and overall glacier budget)</li> <li>• Recognizing the difference between glacial and river valleys</li> <li>• Differentiating the different types of moraines left by glaciers</li> <li>• Identifying the different animals of Alaska's national parks and explaining how they affect or are affected by the</li> </ul>	<p>NGSS Standards:</p> <ul style="list-style-type: none"> <li>• HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.</li> <li>• HS-ESS2-6: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.</li> </ul>

		change	geology	
<ul style="list-style-type: none"> <li>Water forces human response and new challenges will continue to occur on Earth.</li> </ul>	<ul style="list-style-type: none"> <li>How has geology become recreational?</li> <li>Why does water quality matter?</li> <li>How has water affected humans throughout history?</li> <li>How has water shaped our planet?</li> </ul>	<ul style="list-style-type: none"> <li>The impacts of water quality on human health and environmental sustainability</li> <li>How water affect homes (wells, flooding, septic, etc...), including specific zones in the ground</li> <li>The distribution and quantity of freshwater on Earth</li> <li>The parts of the hydrosphere and movements within the water cycle</li> <li>Porosity and permeability and factors controlling each</li> <li>The erosional and depositional landforms created at a coastline</li> <li>Different types of flooding and causes for each</li> </ul>	<ul style="list-style-type: none"> <li>Conducting a study that shows how land-use decisions will affect groundwater and surface water</li> <li>Explaining in detail how landforms affect weather</li> <li>Calculating streamflow dynamics (stream speed, discharge, size/shape of the stream)</li> <li>Identifying different parts of a floodplain</li> <li>Creating solutions to minimize the chances of flooding</li> </ul>	<p>NGSS Standards:</p> <ul style="list-style-type: none"> <li>HS-ESS3-2 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.</li> <li>HS-ESS2-5. plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.</li> <li>HE-ESS3-4. Evaluate or refine a technological solution that reduces impacts on human activities on natural systems.</li> </ul>

**Materials and Resources:** Internet resources