


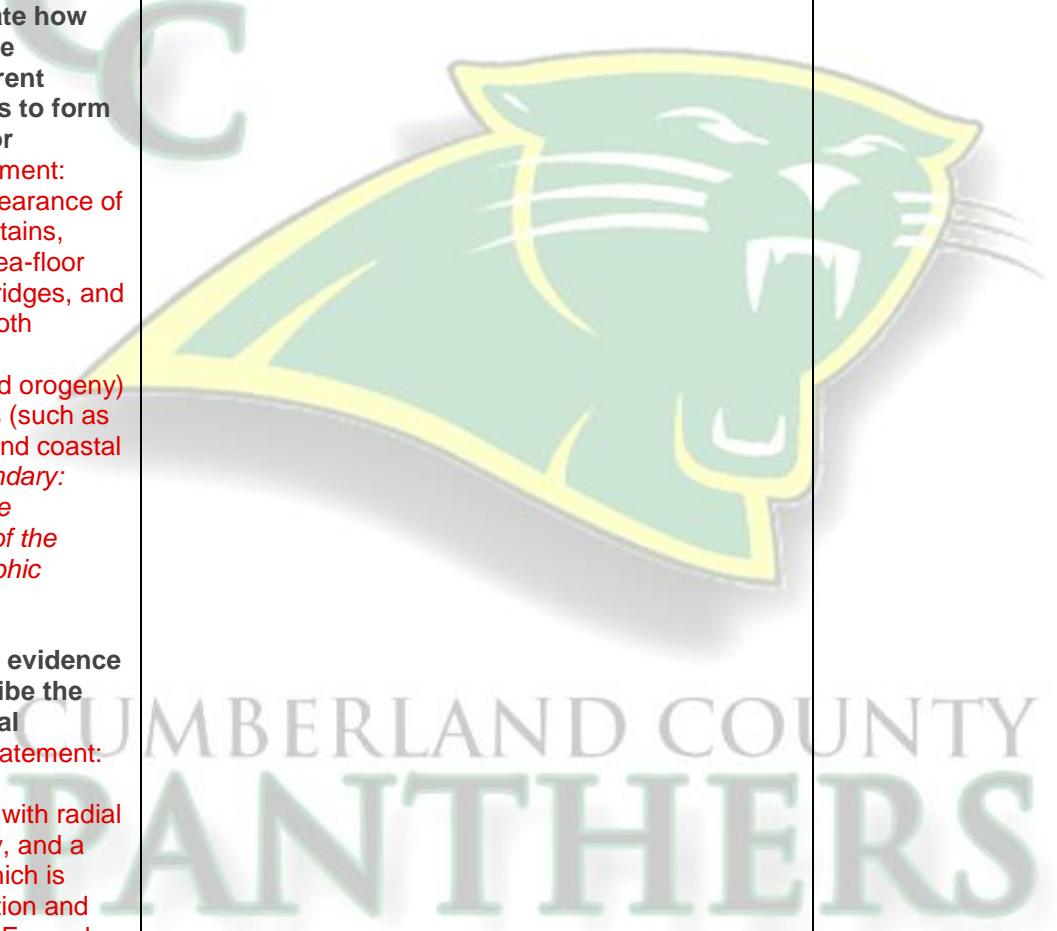
**CUMBERLAND COUNTY SCHOOL DISTRICT
BENCHMARK ASSESSMENT CURRICULUM PACING GUIDE**

School: CCHS	Subject: Earth and Space Science	Grade: 10
Benchmark Assessment 1		
Instructional Timeline: 11 weeks		
Topic(s): Space Science		
Kentucky Core Academic Standards	Learning Targets (I Can Statements)	Key Vocabulary
<p>HS-ESS1-1 Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation. [Clarification Statement: Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the sun's radiation varies due to sudden solar flares ("space weather"), the 11-year sunspot cycle, and non-cyclic variations over centuries.] <i>[Assessment Boundary: Assessment does not include details of the atomic and sub-atomic processes involved with the sun's nuclear fusion.]</i></p> <p>HS-ESS1-2. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. [Clarification Statement: Emphasis is on the astronomical evidence of the red shift of light from galaxies as an indication</p>	<p>1.1 Explain how the sun converts matter into energy via nuclear fusion.</p> <p>1.2 Develop a model to explain how convection, conduction, and radiation transfer energy from the sun's core to the earth.</p> <p>1.3 Compare the radiative, conductive, and atmospheric layers of the sun.</p> <p>1.4 Explain the influence of sunspots and solar flares on earth's magnetic field.</p> <p>2</p> <p>2.1 Identify the visible and non-visible parts of the electromagnetic spectrum.</p> <p>2.2 Explain how scientists use cosmic background radiation and the red shift of light emitted by distant galaxies to estimate the age of the universe.</p> <p>3.1 Describe the composition of a nebula and how the process of the formation of a protostar</p> <p>3.2 Describe the lifecycle of an average star from protostar stage until the white dwarf stage.</p> <p>3.3 Describe the lifecycle of a massive star.</p> <p>3.4 Explain the processes within stars that produce increasingly larger elements.</p> <p>4.1 Compare the models of the universe developed by Ptolemy and Copernicus</p>	<p>Big bang theory Red shift Cosmic background radiation EMS – electromagnetic spectrum Nuclear fusion Radiative zone Convective zone Photosphere Chromosphere Corona Solar flare Sunspots Eccentricity Orbital period Inertia elipse</p>

<p>that the universe is currently expanding, the cosmic microwave background as the remnant radiation from the Big Bang, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases (from the spectra of electromagnetic radiation from stars), which matches that predicted by the Big Bang theory (3/4 hydrogen and 1/4 helium).]</p> <p>HS-ESS1-3. Communicate scientific ideas about the way stars, over their life cycle, produce elements. [Clarification Statement: Emphasis is on the way nucleosynthesis, and therefore the different elements created, varies as a function of the mass of a star and the stage of its lifetime.] [Assessment Boundary: Details of the many different nucleosynthesis pathways for stars of differing masses are not assessed.]</p> <p>HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. [Clarification Statement: Emphasis is on Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as planets and moons.] [Assessment Boundary: Mathematical representations for the gravitational attraction of bodies and Kepler's Laws of orbital motions should not deal with more than two bodies, nor involve calculus.]</p>	<p>4.2 Summarize Kepler's three laws of planetary motion.</p> <p>4.3 Describe how Newton explained Kepler's laws of motion.</p> <p>4.4 Use Kepler's laws to calculate the motion of a planet.</p>	 <p>The logo for Cumberland County Panthers features a stylized panther head in green and yellow. Below the head, the words 'CUMBERLAND COUNTY' and 'PANTHERS' are written in a large, grey, serif font.</p>
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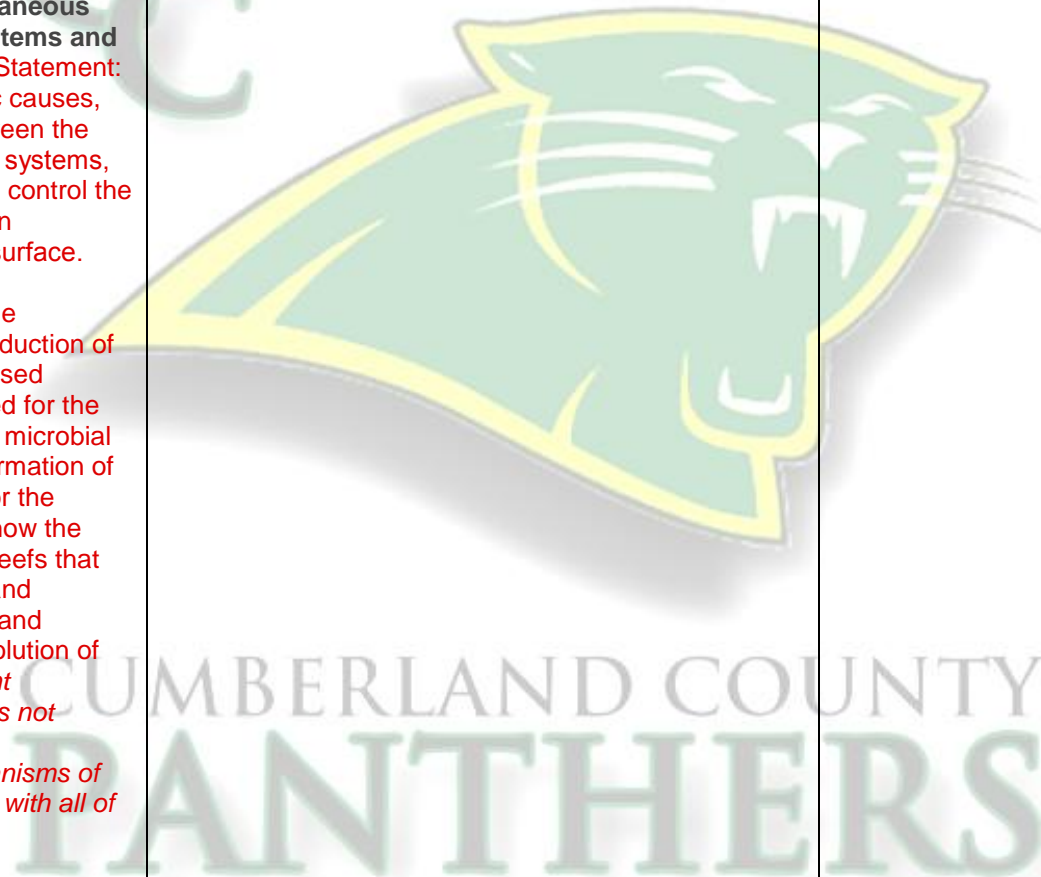
School:	Subject:	Grade:
Benchmark Assessment 2		
Instructional Timeline: 9 weeks		
Topic(s): History of the Earth		
Kentucky Core Academic Standards	Learning Targets (I Can Statements)	Key Vocabulary
<p>HS-ESS1-5 Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. [Clarification Statement: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust increasing with distance away from a central ancient core (a result of past plate interactions).]</p> <p>HS-ESS1-6 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. [Clarification Statement: Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth, which formed along with the rest of the solar system 4.6 billion years ago. Examples of evidence include the absolute ages of ancient materials</p>	<p>5.1 Use paleomagnetism to explain the relative age of oceanic crust.</p> <p>5.2 Determine the age of rock strata using fossil evidence.</p> <p>5.3 Identify unconformities in rock strata and use them to determine relative age of the layers</p> <p>5.4 Calculate the absolute age of geologic features using radiometric dating calculations.</p> <p>5.5 Use models to illustrate the formation of geologic features by plate tectonics.</p> <p>5.6 Explain the nebular hypothesis of the origin of the solar system and earth.</p> <p>6</p> <p>6.1 Describe the structural and compositional layers of earth's interior</p> <p>6.2 Explain how seismic activity is used to determine the interior structure of earth.</p> <p>6.3 Identify the major tectonic plates that make up earth's crust.</p> <p>6.4 Construct a model to show how convection currents in earth's mantle lead to tectonic motion.</p> <p>6.5 Summarize how movement of earth's tectonic plates have influenced climate throughout time</p> <p>7.1 Identify the three main types of rock and explain how each forms.</p> <p>7.2 Summarize the factors that determine whether rock melts.</p> <p>7.3 Describe how the cooling rate of magma and lava affects the texture of rock.</p> <p>7.4 Explain the destructive forces that contribute to</p>	<p>relative age dating</p> <p>uniformitarianism</p> <p>unconformities</p> <p>superposition</p> <p>unconformity</p> <p>absolute age dating</p> <p>radiometric age dating</p> <p>tectonic plates</p> <p>subduction</p> <p>divergence</p> <p>convergence</p> <p>sea-floor spreading</p>

<p>(obtained by radiometric dating of meteorites, moon rocks, and Earth's oldest minerals), the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces.]</p> <p>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. [Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion).] [Assessment Boundary: Assessment does not include memorization of the details of the formation of specific geographic features of Earth's surface.]</p> <p>HS-ESS2-3 Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. [Clarification Statement: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of Earth's three-dimensional structure obtained</p>	<p>the formation of sedimentary rock.</p>	 <p>The background of the right two columns features a large, semi-transparent watermark logo for Cumberland County Panthers. The logo consists of a stylized panther head in profile, facing right, with a yellow outline and a green-to-yellow gradient fill. Below the head, the words "CUMBERLAND COUNTY" and "PANTHERS" are written in a large, grey, serif font, stacked vertically.</p>
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from seismic waves, records of the rate of change of Earth's magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments.]

HS-ESS2-7

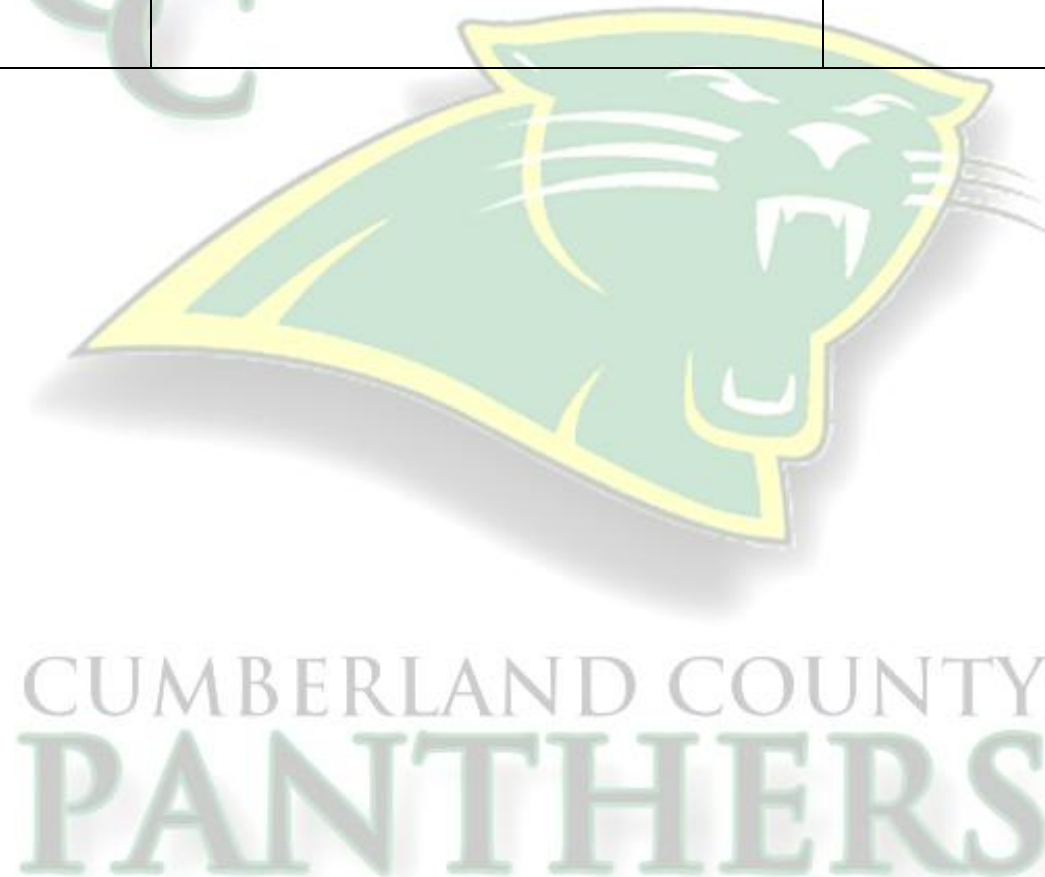
Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. [Clarification Statement: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth's surface. Examples of include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.] [Assessment Boundary: Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth's other systems.]



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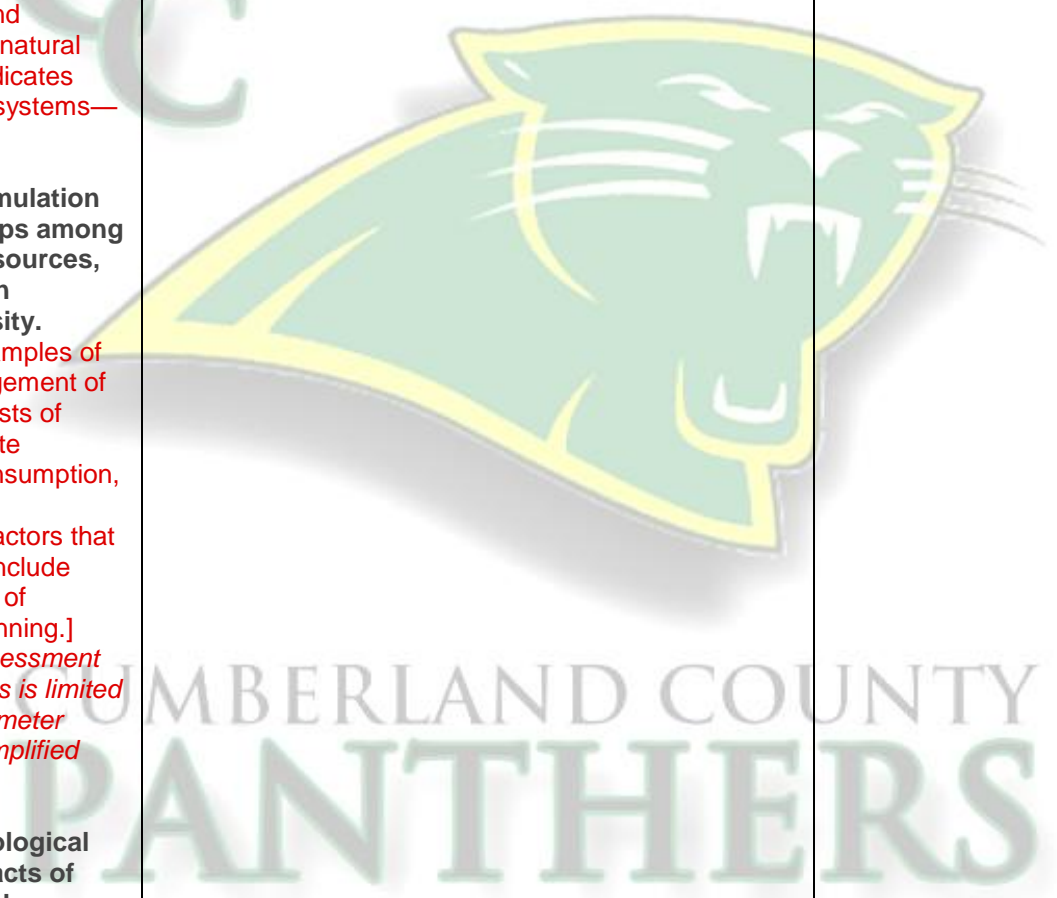
School:	Subject:	Grade:
Benchmark Assessment 3		
Instructional Timeline: 6 weeks		
Topic(s): Weather and Climate		
Kentucky Core Academic Standards	Learning Targets (I Can Statements)	Key Vocabulary
<p>HS-ESS2-4 Use a model to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate. <i>[Clarification Statement: Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth’s orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.]</i> <i>[Assessment Boundary: Assessment of the results of changes in climate is limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.]</i></p> <p>HS-ESS3-5 Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. <i>[Clarification Statement: Examples of evidence, for both data</i></p>	<p>8.1 Identify the major factors used to describe climate.</p> <p>8.2 Use a model to show how the position of earth in relation to the sun affects climate</p> <p>8.3 Explain how latitude determines the amount of solar energy received on Earth</p> <p>8.4 Describe how the different rates at which land and water are heated affect climate.</p> <p>8.5 Explain the effects of topography on climate.</p> <p>8.6 Use a model to show how changes in the tilt of earth’s axis have influenced climate changes in the past.</p> <p>8.7 Explain how solar activity such as solar flares and sunspots correlate with climate change through time.</p> <p>9.1 Graph scientific data to show changes in precipitation patterns over time.</p> <p>9.2 Analyze scientific data to determine the changes to polar ice caps in recent history.</p> <p>9.3 Determine the rate of sea-level rise using scientific data.</p> <p>9.4 Explain how the cycling of carbon between the atmosphere, biosphere, and geosphere has changed in the recent past.</p> <p>9.5 Model the correlation between changes to earth’s temperatures and the increase of carbon in the atmosphere.</p>	<p>Aphelion Perihelion Albedo Latitude Radiation Conduction Convection Topography Carbon cycle Greenhouse effect</p>

<p>and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).] [<i>Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.</i>]</p>		
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School:	Subject:	Grade:
Benchmark Assessment 4		
Instructional Timeline: 9 weeks		
Topic(s): Human Sustainability		
Kentucky Core Academic Standards	Learning Targets (I Can Statements)	Key Vocabulary
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. [Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.]	10.1 Describe why vegetation is used to name a biome 10.2 Explain how temperature and precipitation determine which plants grow in an area 10.3 Explain how latitude and altitude affect which plants grow in a area 10.4 Identify the challenges and advantages to humans provided by each biome. 10.5 Identify the different trophic levels in a biome. 10.6 Explain the importance of biodiversity 11.1 Describe the major environmental effects of hunter-gatherers on natural resources 11.2 Identify the effects on soil quality and other resources caused by the agricultural revolution. 11.3 Explain how the industrial revolution brought about changes in the patterns of use of resources such as minerals and fossil fuels. 12.1 Explain how the essay “The Tragedy of the Commons” relates to the use of natural resources. 12.2 Explain the law of supply and demand 12.3 List the differences in developed and developing countries 12.4 Describe how the size and growth of the human population has change in the last 200 years. 12.5 Make predictions about population trends based o n the age structure of a country.	Biome Latitude Altitude Climate Biodiversity Tropical rain forest Temperate rain forest Temperate deciduous forest Taiga Savanna Temperate grassland Desert Tundra Hunter-gatherers Slash-and-burn Agricultural revolution Industrial revolution Pollution Supply and demand Sustainability Ecological footprint Erosion Demography Demographic transition Exponential growth Carbon footprint
HS-ESS3-2 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit		

<p>ratios.* [Clarification Statement: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). Science knowledge indicates what can happen in natural systems—not what should happen.]</p> <p>HS-ESS3-3 Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. [Clarification Statement: Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.] [Assessment Boundary: Assessment for computational simulations is limited to using provided multi-parameter programs or constructing simplified spreadsheet calculations.]</p> <p>HS-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* [Clarification Statement: Examples of data on the impacts of</p>	<p>12.6 Explain why different countries may be at different stages of the demographic transition.</p> <p>12.7 Compare the population structure of a country and the use of natural resources.</p> <p>12.8 Identify challenges of a growing population to the earth’s systems.</p>	
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human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).]

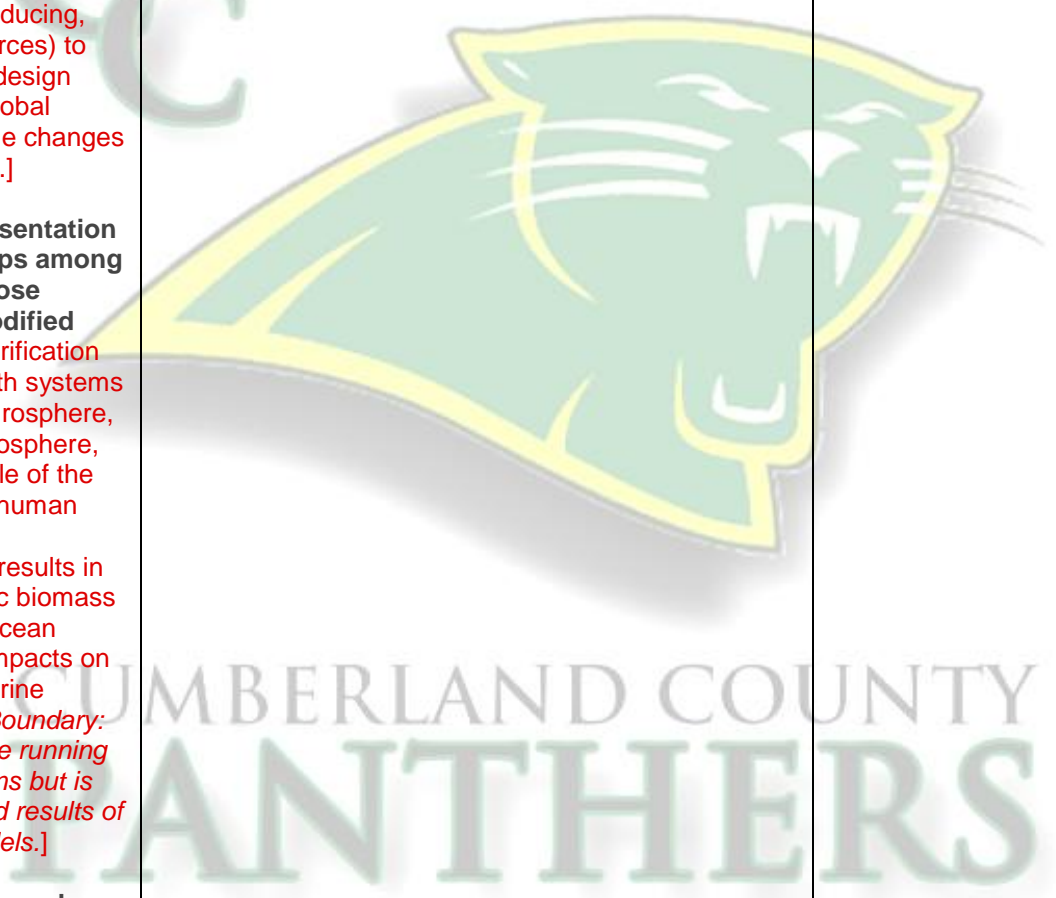
HS-ESS3-6

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

Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from a human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.] [Assessment Boundary: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.]

HS-ESS2-2

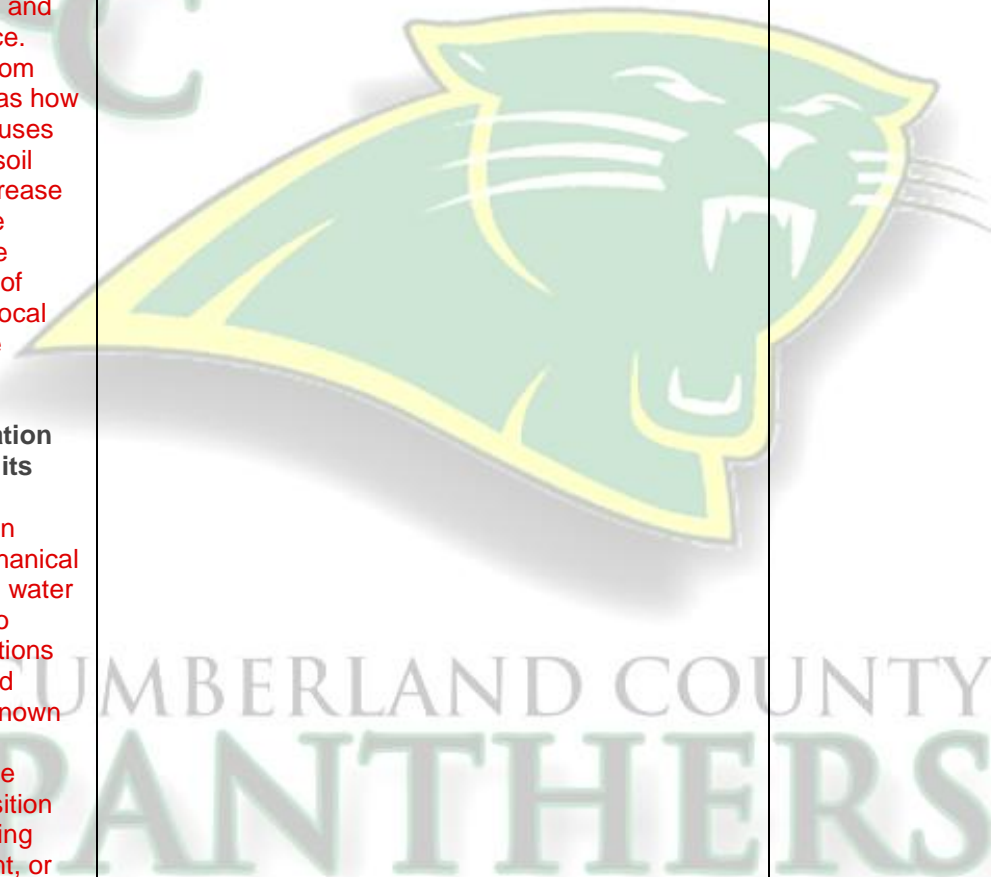
Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that



cause changes to other Earth systems. [Clarification Statement: Examples should include climate feedbacks, such as how an increase in greenhouse gases causes a rise in global temperatures that melts glacial ice, which reduces the amount of sunlight reflected from Earth's surface, increasing surface temperatures and further reducing the amount of ice. Examples could also be taken from other system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.]

HS-ESS2-5

Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. [Clarification Statement: Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include



chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids).]

HS-ESS2-6

Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. [Clarification Statement: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.]

