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Name _____

Date _____

HOW THE SANDIAS FORMED

Part I. Vocabulary Words: Read the defined words. Define any undefined words.

- **Primordial Soup** is a mix of water, minerals, and chemicals that were necessary to form the molecules from which life began.
- **Weathering vs Erosion** [4:15]
- **Tectonic Plates** [4:30] are large pieces of solid rock that make up Earth's outer layer.
- **A Fossil** [6:10] is the preserved remains of ancient plants and animals that lived at least 10,000 years ago. They are often bones, teeth, and shells, but also include prints of skin or tracks.
- **Sedimentary Rock** [6:40] is formed when layers of sand, silt, dead plants, or animal shells are compressed to form rock.
- **Rift** [7:50]

To understand deep time better, write these numbers in standard form (with zeros).

One hundred

One thousand

One million

One billion

Part II. Answer after viewing the video.

What is the Great Unconformity?	How did the mass of granite that makes the Sandias form?
How did the limestone in the Sandias form?	Why are there ocean fossils on the top of the Sandias?

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Part III. Graph the data from the diagram to see the relationship between the elevation of the mountain and the amount of water it receives as rain and snow annually (yearly).

Note: The mountain receives less rain now than it did in 1996 when this diagram was made.

Elevation	Inches of rain
5000 ft	8"
7000 ft	14"
9000 ft	25"
10,000 ft	35"

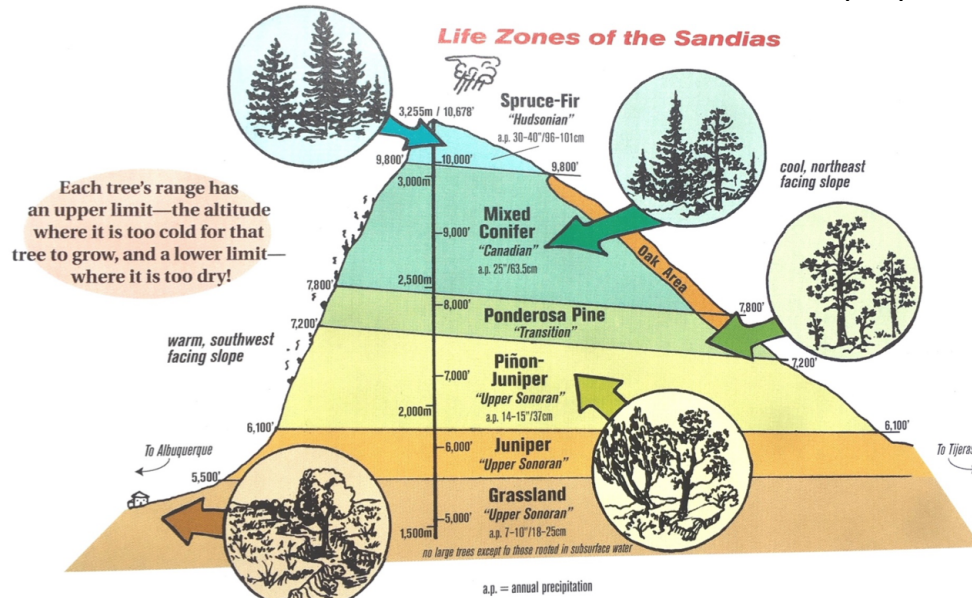
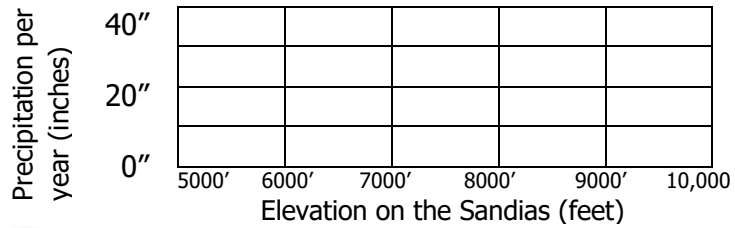
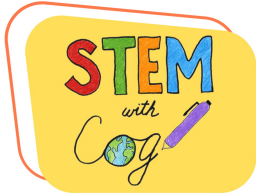


Diagram from Albuquerque's Environmental Story: Toward a Sustainable Community, Hy and Joan Rosner, 3rd ed., 1996.

Part IV. Think Pair Share

Jot down ideas about connections in the Sandias between land, water, air, and living things. Then pair to share your answers and add more ideas. Share with others to even more ideas.

How does the geosphere (rock, soil, and sediments) affect these:		
The Hydrosphere (water and ice)	The Atmosphere (air)	The Biosphere (living things including humans)
How do these Earth systems affect the geosphere?		
Hydrosphere	Atmosphere	Biosphere



HOW THE SANDIAS FORMED

Part I. Vocabulary Words: Read the defined words. Define any undefined words.

- **Primordial soup** is a mix of water, minerals, and chemicals that were necessary to form the molecules from which life began.
- **Weathering vs Erosion** [4:15] Weathering is the process that breaks down ice, commonly done by wind and water (rain, snow, and ice). Erosion is the process that carries the broken rock away.
- **Tectonic Plates** [4:30] are large pieces of solid rock that make up Earth's outer layer.
- **A Fossil** [6:10] is the preserved remains of ancient plants and animals that lived at least 10,000 years ago. They are often bones, teeth, and shells, but also include prints of skin or tracks.
- **Sedimentary Rock** [6:40] is formed when sand, silt, dead plants, or animal shells are compressed to form rock.
- **A Rift** [7:50] is where a tectonic plate is slowly splitting apart.

To understand deep time better, write these numbers in standard form (with zeros).

One hundred 100

One thousand 1,000

One million 1,000,000

One billion 1,000,000,000 THAT'S A LOT OF YEARS!!

Part II. Answer after viewing the video.

What is the Great Unconformity? The great Unconformity is where we are missing over a billion years of rock. We don't know the ecosystems for the years between 1.5 billion year granite and the next layer, 300 million year old limestone.	How did the mass of granite that makes the Sandias form? Magma rose and cooled underground 1.5 billion years ago (bya).
How did the limestone in the Sandias form? The shells of microbes, broken shells of other shelled animals, and mud fell in layers on the bottom of the ocean. This was compressed into rock by the weight of water and more shells, mud, or rock.	Why are there ocean fossils on the top of the Sandias? A mass of granite formed underground 1.5 bya. Over a billion years later, limestone with fossils formed on top of it. When the mountain tilted up, it carried the limestone with it.

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Part III. Graph the data from the diagram to see the relationship between the elevation of the mountain and the amount of water it receives as rain and snow annually (yearly).

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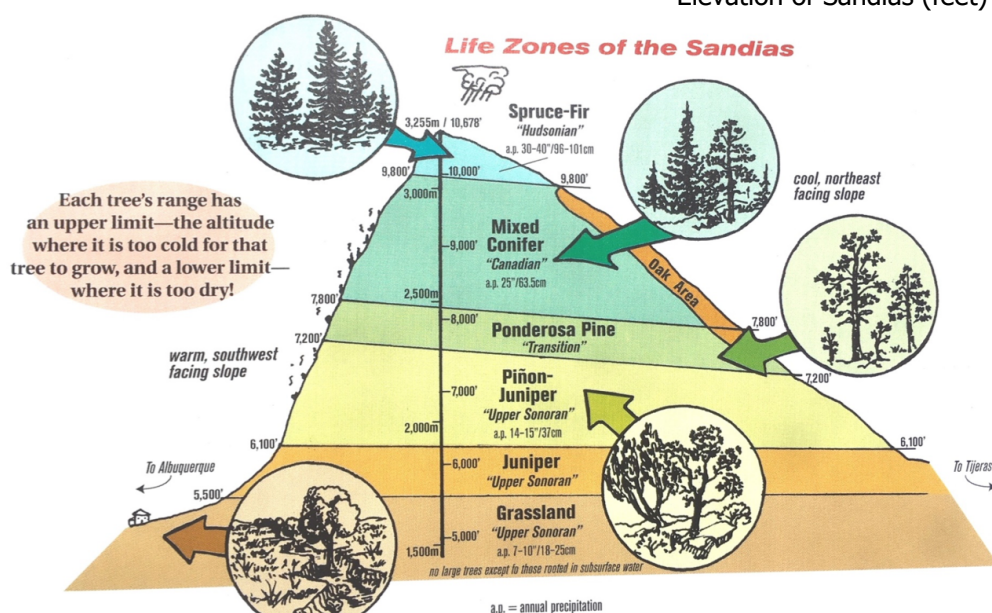
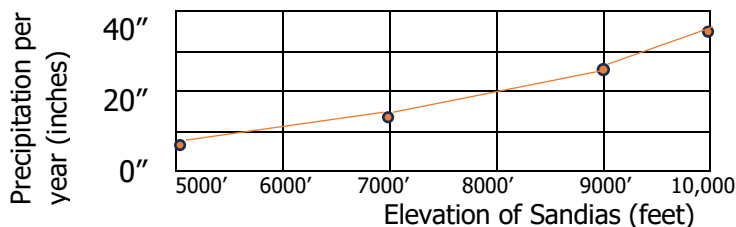


Diagram from Albuquerque's Environmental Story: Toward a Sustainable Community, Hy and Joan Rosner, 3rd ed., 1996.

Part IV. Think Pair Share (Answers will vary.)

Jot down ideas about connections in the Sandias between land, water, air, and living things. Then pair to share your answers and add more ideas. Share with others to even more ideas.

How does the geosphere (rock, soil, and sediments) affect these:		
The Hydrosphere More precipitation higher up you go. Students might not mention snowpack, but you can. The snow captures and holds water for us until spring when it melts and when plants need it.	The Atmosphere Water captured by the mountain makes clouds that shade us and we need lots of shade here in the desert. Wind and weather patterns are greatly affected by the mountain.	The Biosphere The higher up you go on the mountain, the ecosystems change as plants and animals find cooler temperatures, more water.
How do these Earth systems affect the geosphere?		
Hydrosphere Water weathers the rock that we see. Kids won't know this but water and the limestone in the Sandias sometimes form metamorphic limestone.	Atmosphere Winds can weather and erode rock.	Biosphere Plants and animals help turn rock into soil, a complex, living ecosystem made up of microbes, plants, and small animals like insects.

TEACHER RESOURCES

NGSS Standard for Grade 5 Science

ESS2 Earth's Systems: How and why is Earth constantly changing?

By the end of grade 5. Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. Rainfall helps shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. Human activities affect Earth's systems and their interactions at its surface.

National Academies of Sciences, Engineering, and Medicine. 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press. <https://doi.org/10.17226/13165>.

FOR GRADE 5 FIELD TRIP STUDENTS:

- 5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.** [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.]

DIRECTIONS:

BEFORE THE VIDEO: Go over the vocabulary definitions that are given in Part I. Ask students to look for definitions of the undefined words and Part II questions while watching the movie. What other questions do they have about the mountain before watching?

AFTER THE VIDEO: Individually or as a whole group, answer the questions in Part II.

To enrich the video, go to Part III and ask students to graph the amount of precipitation that falls on different parts of the mountain.

In Part IV, ask students to use the graph they made, plus their own observations of the mountains to think about how the four earth systems are connected. Ask them to jot down their ideas. Then pair students to discuss their ideas. If time remains, ask students to share their ideas with the whole class.

What would students like to learn more about?