Elk Rock Island Geology VFE Teacher Guide

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Science Inquiry in the Outdoors Capstone F2023
Added to by:

Purpose of this Guide

The purpose of this guide is to provide a virtual tour of Elk Rock Island, namely its geological composition and variety. After touring the VFE, students will hopefully have a better understanding of the layout, scenery, wildlife, and geology of the island.

Elk Rock Island Overview

Scenes

Scene	Description	Prompts, Key Points/Terms
Scene 5: Entrance 2025	Looking to the northwest, you will see the entirety of Elk Rock Island. The channel between the island and the mainland is composed of exposed volcanic bedrock.	Channel bedrock (if not flooded) ● Describe the texture/ wear patterns ● Compare your observations from here to the other scenes' outcrops and samples Changing water level ● Change the date on the scene to see a high and low tide
Scene 11: Center	The center portion of Elk Rock island shows a little trail with greenery surrounding it. There are numerous species of wildflowers that grow amongst the green. Going north on the trails leads to the the beach, and walking along the beach leads back to crossing across the tide pools.	Wildflower/Plants ● Describe the types of flowers and greenery involved ● Why are the main types of trees long thin ones? Is this due to age or species? ● How seasonal are the blackberries and grapes?
Scene 8: North	The north portion of Elk Rock Island gives you views up the Willamette river, with changing tides and exposed bedrock layers. The north side has a long beach area that is home to a lot of wildlife and interesting basalt layers.	Columnar basalt Contact ● Describe the contact between rock types. What differences do you observe? Similarities? ● Compare/contrast with scene 6; do

		you think these contacts are related? Why or why not? Support with evidence. ●
Scene 6: South	The south side of Elk Rock Island, featuring lava flow(s), a contact between two distinct rock types, amygdaloidal basalt, tide pools	● What outcrop scale (macro) observations do you notice? ● What hand sample (micro) observations do you notice? Basalt ● Try to identify basalt flow(s); do you think these are one flow or separate flows? Why? ● Amygdaloidal basalt hand sample ● Challenge: How would you try to determine flow direction? (see Waters, 1960 in Additional Reading and Resources) Contact ● Zoom in and out ● Compare and contrast what you observe; describe the two different rock types ● What do you think these rock types are? ● What do you think caused this?
Scene 9: East	The east side of Elk Rock Island has a river finger that extends to the south side of the island, the tide changes of the Willamette river can be seen clearly here.	Glitter sand ● Zoom in/out on the macro photo ● Describe the sediment grains (color, size, shape, roundedness)
Scene 7: West	The west side of Elk Rock Island, featuring a view of an outcrop across the river, pillow basalts, lava flow(s), U.S. Coast & Geodetic survey plaque,	Pillow basalts Lava flow ● Compare and contrast the basalt flow here to the flow in Scene 6 ●

<u>Glossary of Terms</u>

1. **Basalt:** Basalt is a type of dark-colored volcanic rock that forms when lava cools quickly on the Earth's surface. It's pretty dense and made mostly of minerals like pyroxene and plagioclase. Think of it as the basic, no-frills rock that makes up a lot of the ocean floor and volcanic islands.

2. **Pillow basalts:** Pillow basalts are a special type of basalt rock that forms underwater, usually when lava erupts on the ocean floor. Since it cools super fast in water, it hardens into these rounded, pillow-shaped blobs, hence the name. If you ever see them, they kind of look like a pile of big, rocky marshmallows or stacked tubes. Geologists love them because they're a clear sign that lava cooled underwater.

3. **Columnar basalt:** Columnar basalt is a cool-looking type of basalt rock that forms long, hexagon-shaped columns, kind of like giant stone popsicle sticks standing next to each other. This happens when a thick lava flow cools slowly and cracks in a super organized way.

4. **Amygdaloidal basalt:** Amygdaloidal basalt is a type of basalt that has little bubble-like holes (called vesicles) that later got filled in with minerals like quartz, calcite, or zeolite. Basically, when the lava was still hot and flowing, gas bubbles got trapped in it. Over time, those empty spaces got filled in with colorful or crystal-like minerals, making the rock look kind of spotty or speckled inside. It's like basalt with built-in gems.

5. **Columbia River Gorge Basalts (CRBs):** The Columbia River Gorge Basalts (CRBs) refer to a massive series of lava flows that happened millions of years ago in the Pacific Northwest, mainly in parts of Washington, Oregon, and Idaho. These weren't just small eruptions either; we're talking about lava that poured out of cracks in the Earth (not a typical volcano), flooding the landscape and eventually stacking up into layers thousands of feet thick. These flows helped carve out the Columbia River Gorge we see today. When people talk about CRBs, they're usually referring to the Columbia River Basalt Group, which is one of the largest basalt flow regions on Earth. It's a big deal in geology and a key part of the region's dramatic scenery.

6. **Phenocryst:** A phenocryst is a fancy geology word for a big, noticeable crystal that forms inside a volcanic rock. It grows while the magma is still underground and cooling slowly, giving the crystal time to get pretty big. Then, when the rest of the lava erupts and cools quickly at the surface, it forms a much finer-grained background around the phenocryst. So if you're looking at a rock and you see a few chunky crystals stuck in a much smoother or finer groundmass, that's a phenocryst. It's like the chocolate chips in a cookie: they stand out from the rest of the mix.

7. **Grain size:** Grain size just means how big the individual particles in a rock or sediment are. It's a big deal in geology and soil science because it affects things like how water flows through soil or how easily rocks break down.
    a. **Sand:** Sand has the biggest grains out of the three, you can usually see and feel them. It feels gritty, like beach sand (because, well, it *is* beach sand).
    b. **Silt:** Silt has smaller grains than sand. You usually can't see the grains with your eyes, but if you rub it between your fingers, it feels kind of soft or floury.
    c. **Clay:** Clay has the tiniest grains, so small that you need a microscope to see them. It feels smooth and sticky when it's wet and gets hard when it dries. Clay can hold water really well, which is why it's used in pottery and also why it can be a pain in the garden.

8. **Contact:** In geology, a contact is basically the boundary where two different types of rocks or layers meet. Think of it like the line where two different pages in Earth's history are glued together. It can be where lava covered older rock, where sediment piled up over time, or where tectonic plates shoved rocks together. So if you're out hiking and see a clear line between, say, dark volcanic rock and lighter sandstone, that's a contact. It tells geologists something big changed at that spot, like a shift in environment, time period, or geologic event.

9. **Vesicle:** A vesicle is a small bubble-shaped hole in volcanic rock. It forms when gas gets trapped in the lava as it's cooling and solidifying. Think of it like bubbles in a loaf of bread, except instead of air in dough, it's volcanic gas in lava.

10. **Bedding:** Bedding is the term geologists use to describe the layers you see in sedimentary rocks. It's like the pages in a book, each layer (or "bed") represents a different period when sediments like sand, mud, or silt were deposited, usually by water, wind, or ice.

11. **Flow direction:** Flow direction in geology is about figuring out which way a fluid, like lava, water, or wind, was moving when it laid down sediments or rocks. For example, with lava flows, geologists look at things like the shape of cooled lava, the alignment of crystals, or the way layers are tilted to tell which way the lava flowed.

12. **River Finger:** A river finger isn't a super common geology term, but it usually refers to a narrow, finger-like extension or branch of a river or stream. It's like a smaller offshoot that stretches out from the main river channel, often reaching into floodplains, wetlands, or valleys.

Additional Reading and Resources

Waters, A. C. (1960). Determining Direction of Flow in Basalts. *American Journal of Science*, *258-A*, 350–366. https://earth.geology.yale.edu/~ajs/1960/ajs_258A_11.pdf/350.pdf

Lake Oswego Geological Quadrangle

https://pubs.oregon.gov/dogami/gms/GMS-059.pdf