**ROCK CYCLE COOKIES**

**BACKGROUND FOR PEER PRESENTERS**

Summary (adapted from the Canadian Geoscience Education Network): Rocks are forming today in a great tectonic ‘kitchen’ below southwestern BC and western Washington. Fueled by heat from the earth’s interior and collision between continental North America and the undersliding Juan de Fuca plate, this kitchen produces three rock types along with earthquakes and rising mountains. Sediment eroded from mountains accumulates in basins such as the Strait of Georgia, Strait of Juan de Fuca, and Puget Sound and cements into ***sedimentary rocks***. Plates sliding over and past one another deform deep crustal rocks into new ***metamorphic rocks.*** Melted rocks cool to form bodies of ***igneous rocks***. Where these rocks melt, they release water as steam, building pressure that pushes them to the surface where they form volcanoes. Ongoing uplift and erosion of mountains over time bring deeply buried rocks to the surface. To be eroded once again.

**MATERIALS**

**For you:** computer and projector or other audio/visual device, [Untamed Science Rock Cycle video](https://untamedscience.com/blog/rock-types/) ,the [Geology of British Columbia video,](https://www.youtube.com/watch?v=PgEO-4qPyUc) and the weblink for [New Lands Along an Old Coast: Building the Pacific Northwest](http://www.burkemuseum.org/geo_history_wa/New%20Lands%20Along%20an%20Old%20Coast%20v.2.7.htm), if you haven’t shown these yet. Set up the computer and projector and open each of the video links you want to show to have them ready at the click of your mouse.

**For the class:** Oven access

**For each Explore Team:**

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| **“Sediments”** | **Weathering, erosion, sedimentation, and melting equipment** |
| ½ c softened butter or coconut oil (clay)¼ c brown sugar (dirt)¼ c white sugar (sand)1 egg or ½ c applesauce (meltwater)1 t vanilla (dirty meltwater)½ t salt (salt)½ t baking soda (ancient phytoplankton and seashells)1 c flour (silt/glacial flour)\*may substitute with gluten-free flour¼ c chocolate chips (basalt)¼ c white chocolate chips (granite)¼ c butterscotch chips (rhyolite)1 c dark chocolate chips | 1 Large ice cube or block (Cordilleron ice sheet)Large, clear glass mixing bowl (Salish Sea basin)Measuring cups and spoonsWooden or plastic mixing spoon (turbulence) Hand-held fan or blow dryer (wind weathering)Rubber or silicone scraper (mechanical weathering)Paper plate or cardboard sheet, folded in half (mountains)Cookie tray (Juan de Fuca plate)Sillicone tray liner or parchment paper (optional)Spatula (tectonic plate)Oven set to 375°F (190°C) (subduction)Oven mits or hot pads |

**INSTRUCTIONS TO GIVE YOUR PEERS**

1. Tell students that we are going to model the formation of the 3 types of rock with cookies. Show them the [Untamed Science Rock Cycle video.](https://untamedscience.com/blog/rock-types/)

2. Have them model weathering and erosion by moving ingredients into a clear bowl one at a time as one Team member reads the story.

3. They will model the formation of sedimentary, metamorphic, and igneous rock as the rock cycle gets more delicious with every step.

**STUDENT WORKSHEETS**

**Activity!** Rock Cycle Cookies

Did you know that rocks are always changing? Let’s model their changes with cookies!

Take turns telling the story of the formation of the rocks of the Salish Sea with each of the following steps, placing the ingredients one at a time onto a paper plate to be “eroded” into the glass bowl.

*Option*: make up your own erosion events for each layer of sediments in the sedimentary rock.

**Read:** *Snows piled high and glaciers grew. Their heavy weight made them move downhill, scouring the Georgia Depression, scraping rock from mountains and grinding it into silt and clay as they went*

1. Scrape the “clay” (butter or coconut oil) into the bottom of the bowl with a “glacier” (ice cube or block), then smooth it evenly on the bottom.

**Read:** *Freezing temperatures turned water in the mountain peaks to ice, which cracked stones that the glaciers ground to dirt, sand, and silt, and then bulldozed into the lowlands.*

2. Scrape the “dirt”(brown sugar) into a layer on top of the butter, using the ice.

**Read:** *Winds blew these sands into the lowlands and temperatures started to rise.*

3. Blow the “sand” (white sugar) into a layer on top of the brown sugar, using a fan or hair dryer.

**Read:** *Glaciers receded, melting back north and eastward, leaving great piles of sand and gravel, called glacial till. Dirty meltwaters filled the basin that would become the Salish Sea.*

4. Pour in the egg or applesauce. Add the vanilla.

**Read:** *Salts stored in rock dissolved and washed downhill into the basin, adding salt to the newly-forming sea.*

5. Sprinkle the salt into the bowl.

**Read:** *Heavy rains and streams weathered ancient seashells from the top of the mountains that used to be under the ocean and eroded them into the new sea below.*

6. Pour a tablespoon of warm water into the baking soda, stir, and sprinkle it into the bowl.

**Read:** *Temperatures dropped and glaciers returned, grinding stone into powder, then melting away again, delivering glacial flour into the newly-forming sea.*

7. Pile the flour onto the paper plate mountains and push it into the bowl with the ice block.

**Read:** *The layers of sediments reacted with minerals in the water and hardened over time, like cement. This became* ***sedimentary rock****.*

8. Place a tray onto the flour and press the layers of “sediments” together.

**Read:** *The Juan de Fuca plate slid beneath the N. American plate, causing earthquakes that broke up mountainsides into boulders. Some tumbled into the sea. This shaking broke up the sedimentary rock and mixed the sea.*

9. Pour in the chocolate chip boulders and mix all ingredients together.

10. Place the silicone or parchment paper onto the cookie sheet and pour 1 c. of dark chocolate chips into a pile in the center. Spread the “sediment” dough evenly over the cookie sheet, covering the pile of chocolate chips.

**Read:** *The rock of the Juan de Fuca plate was heated as it slid into Earth’s oven in the process of subduction.*

11. Slide the sheet into the “subduction zone” (oven). Bake at 375°F for about 10 minutes. 2-3 Teams can “subduct” at a time, if there is just one oven.

\*This is a good time to do the rock cycle dance and get some wiggles out.

Read: The sedimentary rock went deep into the earth where extreme heat and pressure twisted, compressed, and deformed it, making it into ***metamorphic rock.***

12. Remove cookies from oven and while still hot, press, move, and smear the cookie. Watch how the chips stretch and smear, like the sedimentary rocks, limestone turning to marble, or shale turning into slate.

**Read:** The subduction melted a great chamber of magma, releasing steam and building pressure. The pressure could not be contained, made its way to the surface, pushing up mountains on its way and exploded in a volcanic eruption.

13. Poke a hole into the cookie over the mound of chocolate chips and press down, letting the lava squirt and ooze over the surface of the cookie.

**Read:** The lava hardened, becoming ***igneous rock.***

14. Allow the cookies to cool and the chocolate: lava: to harden.

Read: Earthquakes caused by moving plates continued to break up the Earth’s crust in this part of the Ring of Fire.

15. Slide a spatula beneath the parchment paper or silicone sheet and lift to break up the hard cookie into pieces.

Continue making up your story as you enjoy “weathering and eroding” your cookies in your mouths! The rock cycle never ends…and never tasted so good 😊.