



Contributing Teacher Ranger Teacher: Shevaun Adams- Valentine Rural High School, Valentine, NE

Subject: Geology

Grades: 3rd – 5th

Piece of Cake: An Introduction to the Geology of the Niobrara

Description: This lesson focuses on the geologic formations present in the Niobrara River Valley.

Background

Formation Sediment Types Typical Fossils Environment ¹

Ash Hollow [topmost layer]– sandstone, gray calcareous, inter-bedded with less consolidated sand and volcanic ash lentils; overlain by thinner bedded calcareous sandstone, younger deep cuts filled with unconsolidated sand.

Valentine [upper middle layer]- sand, pale olive, friable, cross-stratified; sandstone pale olive, argillaceous; volcanic ash, light gray; sand and gravel, cross-stratified. (Many fossils found in this layer, because it is very soft and erodes easily.)

Rosebud – [lower middle layer] siltstone and silty-sandstone, pinkish gray to a brown, minor olive colors; to stratified; tuffaceous; includes local channels seasonally arid filled with reworked siltstone and sandy environment. Siltstone gravels, with silts filling pore spaces between grains, pale pink and some light olive colors, massive to grossly cross-stratified.

Pierre Shale [bottommost layer- not visible for most of the recreationally floated stretch] – shale, black, gray and brown, thinly laminated; chalk shaley, light gray, laminated; clays (volcanic ash).

¹*Geologic Framework of the Niobrara Drainage Basin & Adjacent Areas in S.D. Generally East of the 100th meridian West Longitude and West of the Missouri River.* – Robert F. Diffendal, Jr., and M.R. Voorhies, UNL. Research Symposium Environmental and Natural Resources of the Niobrara River Basin 1993.

Activity

If possible, take a trip to visit the Niobrara National Scenic River to observe the rock layers. You can also obtain pictures from the National Park Service that show the different formations present in the cliffs. You may also be able to borrow samples of the rock formations from the park. Contact information can be found on the page header.

Ask students to examine the rock layers and how each one relates to the others. Then bake the tasty treat below and enjoy.



Extensions

It would be very easy to incorporate fossils into this lesson. Contact Sandi Kinzer or Adrienne Johnson at the Niobrara National Scenic River Office if you would like a program about the fossils of the Niobrara River Valley. The phone # is 402-376-1901.

Incorporating fossils into the Geologic Cheesecake:

- Hide “fossils” in the Cool Whip (Valentine layer) and bring popsicle sticks, small toothbrushes, etc. to use as “tools” to clean off the fossils the students find. Examples: gummy bears, colored chocolate chips, peanuts, raisins, etc.
- Create a graph on the board of the cheesecake and mark which quadrant has the most of each type of fossil.
- Have students think of possible reasons why fossils might be found “clumped” together in the Valentine layer of rock.



Recipe

Ingredients

- 15 Oreos
- ¼ pound (1 stick) of melted butter or oleo
- ¼ cup of sugar
- 1 tsp of coconut extract (optional)
- 3 (8 ounce) bars of softened cream cheese
- ¾ cup of sugar
- ¼ cup of cocoa powder
- 1 tsp of vanilla extract
- 2 TBS of amaretto flavoring or pure almond extract (it's brown)
- 2 eggs
- Large container of Cool Whip
- Toffee Bar – finely chopped

For the Crust [Pierre Shale]: Make your Oreos into cookie crumbs by using a food processor or simply place in a plastic bag and crush. Combine Oreos, melted butter, ¼ c. sugar, and coconut extract in a bowl and mix. Spread mixture in the bottom of a 9" spring-form pan and up 1 ½ inch on the side. Place in freezer to harden.

For the Filling [Rosebud]: Preheat oven to 350 F. Using an electric mixer; blend cream cheese on low speed in a mixing bowl. Use a spatula to scrape sides of bowl. Add in the sugar and cocoa powder slowly, and continue to beat until creamy. Add in vanilla and amaretto extract and mix until blended. Add in eggs one at a time and continue to mix at lowest speed until eggs are incorporated in the batter.

Pour the mixture into the crust and smooth out with spatula. Bake for 1 hour or until center jiggles.

Remove from oven and let cool. Place in refrigerator and allow to set before removing sides.

Cover with Cool Whip [Valentine] and then sprinkle the toffee bar [Ash Hollow] over the top.

ENJOY!

Note: Chocolate can be eliminated and golden Oreos may be substituted for the crust. Adjust recipe as needed for allergy concerns.

Recipe modified from www.uky.edu/KGS/education/cookbook.htm