

Lesson 3 – Geo Detectives

Lesson Overview:

Students will use geologic maps to determine what rock type caves are located in.



Objectives:

Students will be able to:

1. Define the term “geology”.
2. Analyze a geologic map.
3. Identify that caves are located in areas of sedimentary rock.

Standards Addressed:

National Science Education Standards: 5th-8th grade

- Content Standard D: Earth and Space Science

International Society for Technology in Education Standards for Students:

- Creativity and Innovation
- Communication and Collaboration
- Research and Information Fluency
- Critical thinking, Problem Solving, and Decision Making
- Technology Operations and Concepts

Duration of Lesson/Time Requirement: 40 minutes

Materials Required:

Map of longest caves in the United States (from Lesson #2)

Images of geologic maps:

<http://pubs.usgs.gov/atlas/geologic/>

<http://www.nature.nps.gov/geology/usgsnps/gmap/gmap1.html>

Classroom Technology:

Computer with Internet connection and projection capabilities and/or SMART Board

Several classroom computers with Internet connection for student use

Nationalatlas.gov (<http://www.nationalatlas.gov/>)

Procedure:

Introduction

Display the map of the longest caves in the United States that was created by the students at the end of Lesson #2. Tell the students that as a class they are going to investigate why the longest caves in the United States are located where they are found.

Display/write the word *geology* for the students to see. Ask the students if anyone knows what the word means. Have they ever heard the word before? Have they ever heard words that are

similar? Explain to the students that *geology* is the study of the earth. *Geo* comes from the Greek word meaning “the Earth”. The *ology* suffix comes from the Greek *logos*, meaning “knowledge”. Tell the students that the earth tells amazing stories in its rocks and present day happenings are the key to understanding the past history. As a class they are going to investigate the geology of the areas where the longest caves in the United States are located.

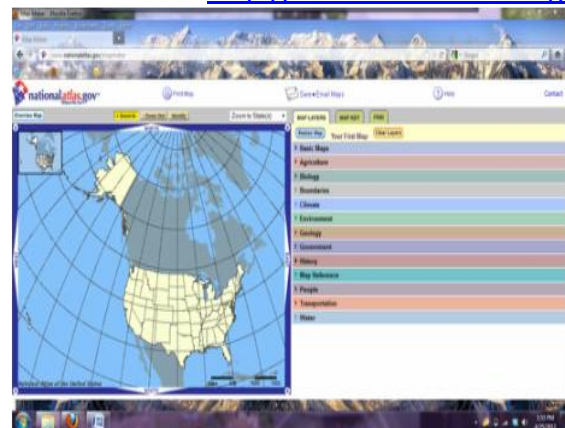
Activity #1

Project/Show the students a geologic map of the United States. Images of geologic maps can be found on the following websites: <http://pubs.usgs.gov/atlas/geologic/> or <http://www.nature.nps.gov/geology/usgsnps/gmap/gmap1.html>. Ask the students if they know what it is. Explain to the students that a geologic map portrays the distribution of rocks, deposits, or other geologic features in a specific area. Each consolidated rock type that can be distinguished by similar characteristics is categorized into a mappable unit, or formation. Unique colors, patterns, and labels are used to differentiate each unit on the map. Colors are chosen by the age of the rocks being described. Labels designate the age and name of the formation or deposit. Geologic maps help people understand the earth on which we walk, and give us a greater appreciation for the geology around us.

Project/display Nationalatlas.gov (<http://www.nationalatlas.gov/>) for the class to view. Explain to the students that the National Atlas of the United States of America was originally published in 1970. It was an oversized, 12 pound, 400-page book containing a collection of 765 maps. Unlike the big bound map collection of 1970, the latest National Atlas includes electronic maps and services that are delivered online. Tell the students that they are going to use Nationalatlas.gov to learn more about the geology of the areas where the longest caves in the United States are located.

Explain to the students that they are to use the Map Maker feature on Nationalatlas.gov to locate the county and state that their assigned cave is located in and investigate the geology of the area. Demonstrate and explain how to use the Map Maker feature on nationalatlas.gov to the students. Assistance on how to use the Map Maker on Nationalatlas.gov can be found at <http://mapserver.nationalatlas.gov/natlas/mapmakerhelp.html>.

On the website <http://www.nationalatlas.gov/> click on “Map Maker”.



In Map Maker:

1. Under “Basic Maps” select:
 - a. Counties
 - b. County names
 - c. Latitude/Longitude (optional)
 - d. States
 - e. State names

2. Under “Geology” select:
 - a. Geologic Map
 - b. Labels (optional)

3. Select “Redraw Map”

4. Select “Zoom to State(s)”

5. Use the drop down menu to select the state that the cave is located in (e.g. South Dakota)

6. Locate the county that the cave is located in by selecting “Zoom In” and clicking on the map (e.g. Custer). Click on North, South, West, East or the arrows in the map corners to move the map.

7. Look at the rock types found in the area the cave is located in.

8. Select “Map Key” to identify the rock types. The students only need to identify if the rock is sedimentary, volcanic (igneous), plutonic, or metamorphic. If students are having a difficult time identifying the rock type by the color they can zoom out and look for the label in order to identify it. Students may also select “Identify” and then click on the place on the map where the cave is located. The type of rock will be listed under the results.



Allow each individual student or small group time to find the location of their assigned cave using Nationalatlas.gov. Tell them to record the type of rock that is found in that area. The students do not have to get too specific. They can use the Geologic Map Key to determine if the rocks are sedimentary, volcanic (igneous), plutonic, or metamorphic.

Wrap-Up/Conclusion

Once each student or small group has determined the rock type where their assigned cave is located, survey the class to find out their results. As an educator you have several options to do this:

1. Write the four rock types for the class to see. Once you say the name of each have the students raise their hands if their cave was located within that type of rock. Record the numbers.
2. Write the four rock types for the class to see. Have each individual student or small group come up and place a tally mark under the rock type found where their cave is located.
3. Have each student or small group record the rock type their cave is located in using the “Geo Detectives” SMART Board lesson.

Once the results are displayed discuss them with the class. Ask the students if there is a certain rock type that is best for cave formation. In what rock type are many of the longest caves in the United States located? Students should come to the conclusion that many caves are found in areas where there are large deposits of sedimentary rock.

Show the students a map of where sedimentary rock is located in the United States (<http://www.nationalatlas.gov/articles/geology/types/sedimentary.html>). Is it similar to where their caves are located? Ask them if they know what sedimentary rock is. How did it form? Why do they think so many caves are found within it? Explain to the students that they will try to answer these questions in the next lesson.