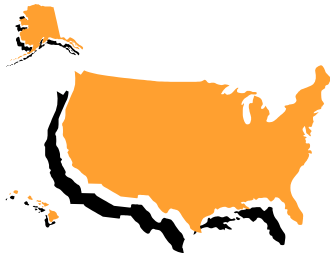
Lesson 2 - Caves of the United States

Lesson Overview:
Students will become familiar with some of the longest caves in the United States.

Objectives:
Students will be able to:

1. Identify at least one of the longest caves in the United States.
2. Create a map of where some of the longest caves in the United States are located.
3. Explain the difference between a "show cave" and a "wild cave".



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
- Technology Operations and Concepts

Duration of Lesson/Time Requirement: 40 minutes

Materials Required:
100" piece of string or yarn

Classroom Technology:
Computer with Internet connection and projection capabilities and/or SMART Board
Several classroom computers with Internet connection for student use
NSS Geo2 Committee on Long and Deep Caves (http://www.caverbob.com/)
Google Earth (http://www.google.com/earth/index.html)

Set-Up
Download Google Earth (http://www.google.com/earth/index.html) to a classroom computer with an Internet connection and projection capabilities if it is not on the computer already. Google Earth is a free program that combines maps and geographic information with satellite and aerial photography. It allows users to travel through a virtual globe and view satellite imagery, maps, terrain, 3D buildings, and much more. With Google Earth's rich, geographical content, teachers and students are able to experience a more realistic view of the world. Google Earth is available on the Internet for free as well as for purchase in more advanced versions. Schools may use the free version of Google Earth and Google has created a "Google

Earth for Educators" site (http://sitescontent.google.com/google-earth-for-educators/Home) to provide helpful information including tutorials and tips on using Google Earth in the K-12 classroom.

Procedure:

Introduction

Tell the class that they are going to spend time becoming more familiar with some of the caves in the United States. Explain that cavers (also called spelunkers) survey and map caves as they explore them. The length of a cave changes as more passages are discovered. Every inch, foot or mile of passage is added together to determine the total length of a cave. Hold up a 100 inch long piece of string. Tell the students that each inch of the string represents 1 mile of explored passage in a cave. Explain that if a cave is listed as being 100 miles long this does not mean that it is a 100 mile long tunnel. Hold one end of the piece of string in one hand and the other end of the string in the other hand and pull it tightly to illustrate a 100 mile long tunnel. Tell the students that if a cave is listed as being 100 miles long this means that passages usually go in many different directions. Some passages in caves may be miles in length while some may only extend for a few feet in length. Gather up the piece of string and hold it in the palm of one hand to illustrate this.

Activity #1

Assign each student or small group of students a number. Explain to the students that their number will correspond to one of the longest caves found in the United States. If there are 30 students in the class they will be looking at the 30 longest caves in the USA. If the students are in small groups, each group can be assigned several caves to investigate.

Display/project the list of the longest caves found in the United States located on the website http://caverbob.com/. Tell the students that this is the official list of the longest and deepest caves in the world according to the National Speleological Society (NSS). Explain to the students that the NSS is a non-profit membership organization dedicated to the scientific study of caves, the protection of caves, and the promotion of responsible cave exploration and fellowship among people interested in caves. Tell the students that they are to visit the website and look at the *USA Long Cave List*. They should record the following information about the cave that corresponds with their assigned number:

1. **Cave Name**
   Note: Several of the cave names have abbreviations listed next to them in parentheses. N.P. = National Park; N.M. = National Monument; C.C.N.P. = Carlsbad Caverns National Park; and C.G.N.H.P. = Cumberland Gap National Historical Park. Information in parentheses also includes other names that the cave is known by and other characteristics of the cave (e.g. if it is a lava tube instead of a solution cave).
2. **Location of Cave (County & State)**
   Note: Two caves on the USA Long Cave List have multiple counties listed for their location. These have been abbreviated. Mammoth Cave is located in Edmonson (Ed.), Hart, and Barren (Bar.) counties in Kentucky. The Friar's Hole Cave System is located in Greenbrier (Green.) and Pocahontas (Pocoho.) counties in West Virginia.

3. **Length (in miles)**
4. **Depth (in feet)**

The information recorded by each group can be displayed for the entire class to view. Options to display this information include:

1. Having a large piece of paper or poster board in the classroom where each individual or small group can write down the information about their cave in the order in which they are ranked.
2. Give each individual or small group a piece of paper where they can write down the information they found out about their cave and decorate as time allows. These can then be displayed in order of cave rank throughout the classroom.
3. Use the "Caves of the United States" SMART Board lesson and have each student or small group record the information about their cave in order of rank on the tables provided.

Once students have recorded the information about their assigned cave tell them that they will now use Google Earth to find out the location of the cave in relation to the location of their school.

*If Internet access is not available to complete this activity please make a copy of the USA Long Cave List from the website http://caverbob.com/. The information for each of the longest caves in the United States can be printed or copied onto pieces of paper and these can be handed out randomly to the students.

Activity #2

Ask the students to raise their hands if they have ever heard of or used Google Earth. Explain that Google Earth allows people the opportunity to explore the world's geography and view satellite imagery, maps, terrain, 3D buildings, galaxies in outer space, and the depths of the ocean.

Project Google Earth on a large screen for the class to see. Demonstrate how to find a location and create a "placemark" or have the students view the tutorial on how to create a placemark (http://earth.google.com/support/bin/static.py?hl=en&page=guide.cs&guide=22364&topic=22367&answer=148142).

Tell the students that you would like them to locate and create a placemark for their school and for their assigned cave. Write the words "show cave" and "wild cave" for the students to view. Ask the students if they know what the difference is. Explain that some caves are considered "show caves" and some are considered "wild caves". Show caves are those that are open to the public for tours while wild caves are those that are open to mapping and research. In order to protect many of the "wild caves" in the United States their exact locations are kept a secret. Because of this, some groups will have to type in the county and state their cave is located in instead of the name of the cave. Some of the caves may have multiple counties listed for their location. Students only need to enter one county to get the general location of these caves.

Tell the students that once they have located their cave they may go back to the website http://caverbob.com to look up some of the other long caves in the United States. As time allows they may use Google Earth to locate and placemark them also.

Wrap-Up/Conclusion

As an educator you can wrap-up and conclude this lesson in a variety of ways.

1. As each student or small group successfully locates their assigned cave, have them come to one computer that is set on Google Earth and placemark the cave. Once all of the caves have been placemarked on the same Google Earth program, project this image for the entire class to view.
2. After each student or small group has located their assigned cave, project the pre-made "big picture" of the longest caves in the United States for the entire class to view.
3. Use the "Caves of the United States" SMART Board lesson to project a map of the United States for the entire class to view. Have each student or small group come up to the SMART Board and mark the location of their assigned cave.
4. Display a map of the United States (paper copy) for the class to view. Have each student or small group place a sticker, post-it note or thumbtack where their assigned cave is located.

Once all of the caves have been located have some of the students share the information they learned about their cave. Ask questions such as:

- What was the name of your cave?
- What is the current length of the cave?
- Where is your cave located?

Ask the students why they think the caves are located where they are. Do they know how caves are formed? What are caves made of? Is there a certain rock type that is best for cave formation? Tell the students that in the next lesson they will investigate what types of rocks are found in the areas where the longest caves of the United States are located.