4th - 8th Grade 4-H PROJECT LESSON PLANS:

4-H Helps YOUth Leap into the 21st Century

Series 2

"Captivating Caves"

LSU AgCenter
Research & Extension

Dear Project Helper,

This lesson, "Captivating Caves," is part of an effort by the 4-H Youth Development Department of the LSU AgCenter to provide teaching activities that are fun as well as educational. We are pleased that you have agreed to work with youth as they learn and grow. You will help them learn scientific concepts that they will use for many years. These lessons address Louisiana Content Standards Science Benchmarks; therefore, what you do with this activity should help strengthen students for LEAP testing. We appreciate your being a part of this effort.

ELA-1-M1: Using knowledge of word meaning and developing basic and technical vocabulary using various strategies (for example, context clues, affixes, etymology, dictionary)

G-1A-E1: Identifying and describing the characteristics and uses of geographic representations, such as various types of maps, globes, graphs, diagrams, photographs and satellite-produced images

G-1B-E1: Describing and comparing the physical characteristics of places, including land forms, bodies of water, soils, vegetation and climate

G-1C-E1: Describing how physical processes help to shape features and patterns on Earth's surface

SI-E-A3: Communicating that observations are made with one's senses

SI-E-B4: Developing explanations by using observations and experiments

4th - 8th Grade

4-H PROJECT LESSON PLANS:

4-H Helps YOUth Leap into the 21st Century

Series 2

Learning Activity:

"Captivating Caves"

Key Concepts:

1. Cave types and formation
2. Visualization
3. Underground Life Forms

How Can Members Apply this Information?

1. Vacations
2. Science field trips or science classes

Getting Ready:

1. Research caves on the Internet by contacting geologists or by taking a guided tour of a show cave.
2. Print pictures of caves from the Internet.
3. Gather all supplies for activities.
4. Duplicate handout on show caves and terms.
5 Enlarge cave formation poster and labels.

What You Need for the Lesson:

1. Pictures of caves
2. Poster of cave formation
3. Poster of Life Form Zones and set of Critter Cards
4. CD or tape player of sounds of nature or of water dripping
5. Gummy worms, plastic fishing worms, plastic spiders, play slime, rice, misting fan, tickets and animal-shaped erasers
6. (Optional) Cave Type Signs and Cave Name/ Location Cards

Track:
Earth Science

Life Skills:
Visualizing Information and Safety

Character Focus:
Caring and Responsibility

Project Skill:
Understanding types of caves, history of formation, underground life forms and the food chain

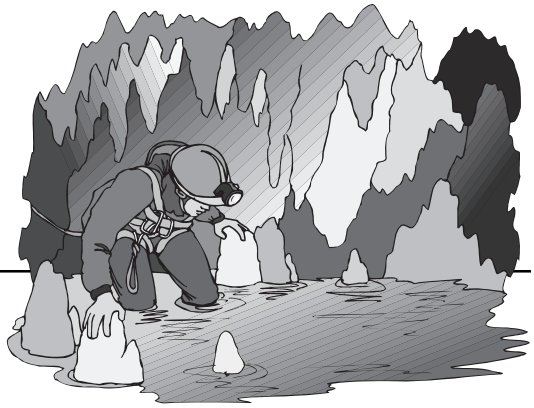
Louisiana Content Standards Benchmarks:
ELA-1-M1; G-1A-E1; G-1B-E1; G-1C-E1; SI-E-A3; SI-E-B4

Delivery Mode:
4-H club meeting, science class, school enrichment and after-school programs

Time Allotted:
30-45 minutes

Minimum Number of Participants:
15 to 20

Background:



Human beings have been exploring caves since the dawn of time. They provided shelter as well as a canvas on which prehistoric man could paint his desires for a good hunt. In more modern times, caves have been used for a variety of purposes: refrigerated food storage during pioneer times, mining and weapons storage during the 1800s, speakeasies and hideouts for moonshine stills during Prohibition, and dance halls during World War II. Cumberland Caverns in Tennessee still contains a large dining hall that is used regularly for parties, receptions and Scout camp-outs.

Tennessee, with more than 8,400 caves, has more discovered caves than any other state. Missouri is home to 10 show caves and countless wild caves. Most states define caves as natural features that can be entered by human beings and that are totally dark at some point along their lengths. However, many states also have additional qualifications, usually pertaining to length or size, as to what constitutes a cave. The deepest cave is the Kazumura - Olaa Cave System (Lava Tube) in Hawaii at 3,614 feet. The longest is Mammoth Cave in Kentucky at 246 feet.

The study of caves is called speleology. Cavers, or people who make it a hobby to explore caves, are often called spelunkers.

Some caves are formed when rainwater absorbs carbon dioxide as it falls through the atmosphere and through soil that has decaying plants. It forms a weak acid called carbonic acid that seeps through cracks and crevices in hard rock and eats away soluble rock like limestone or gypsum. After millions of years, underground passageways, rooms and chambers can be formed. As the acid seeps through limestone, it dissolves the calcium carbonate out of the limestone. This dissolved mineral is dripped into the cave, where it is deposited in the shape of tiny crystals. These crystals are known as calcite, or cave onyx. They can coat the walls or they can build up over time to form stalactites and stalagmites.

Caves are fragile environments. Touching an "active" formation causes growth to cease in that area because dirt or oil from your skin prevents water from reaching the growing formation. Enough touches, and the formation will "die."

There are other types of caves. For example, there are those formed by lava flows, waves beating against a rocky coastline, boulder landslides or water flowing through glaciers.

4th-8th Grade "Captivating Caves"

What You Say:	What You Show or Do:	What Participants Do:
What is a cave? What are some words you would use to describe a cave? Did you know that the United States has a large number of show caves? A show cave is a cave that is open to the public with guided tours. One of the most famous is Mammoth Cave in Kentucky. It is one of the longest systems of caverns, covering 346 miles. Do you know any other famous show caves or caverns? Other nearby states that have show caves are Texas, Alabama, Arkansas, Tennessee and Florida. What is the difference between a show cave and a wild cave? Wild caves are undeveloped caves that are often located in secluded areas. These should be entered only by experienced cavers. Louisiana has a wild cave! Can you name the parish where our only cave is found?	Allow time for discussion and possible responses. Show a map of Louisiana, pointing out Natchitoches Parish. Show pictures of caves.	Define cave. (A cave is a natural cavity or system of passageways either beneath the earth's surface or within a cliff or ledge. It is large enough to permit an individual to enter.) Give words that describe caves (dark, scary, damp, colorful, beautiful, mysterious, glistening). Name famous show caves. (Carlsbad Caverns, New Mexico; Jewel Cave National Monument, South Dakota; and Luray Caverns, Virginia) Guess which Louisiana parish has a wild cave. (Kisatchie National Forest in Natchitoches Parish)

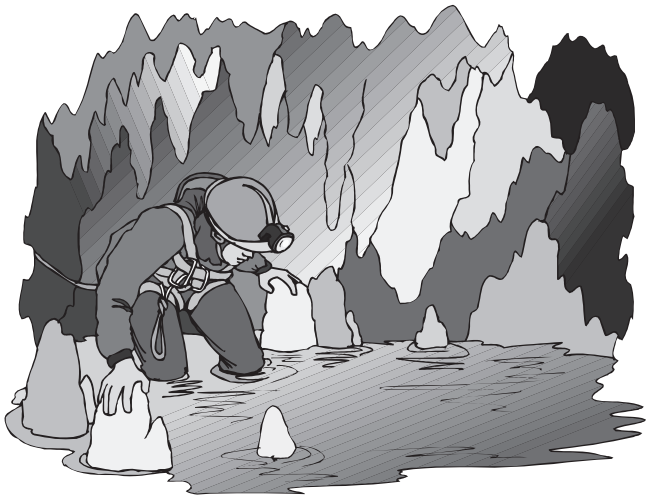
4th-8th Grade "Captivating Caves"

What You Say:	What You Show or Do	What Participants Do:
(Experience) Some caves are formed when rainwater absorbs carbon dioxide as it falls through the atmosphere and through soil that has decaying plants. It forms a weak acid called carbonic acid (like the fizz in soft drinks) that seeps through cracks and crevices in hard rock and eats away soluble rock like limestone or gypsum. After millions of years, underground passageways, rooms and chambers can be formed. Passageways or chambers are formed in three different ways: A. Underground streams. Water enters the cave system through sinkholes and other points on the surface. It travels underground and exits at a spring. B. Quiet water. Sometimes water moves very slowly underground, rather than rushing along in underground streams. Many of the caves formed this way are	Divide group into two teams. Show 2 posters (sprayed with spray adhesive) of the cave formation. Give each team a set of the labels and instruct them to place them in the blank labels on the poster where they belong. Or, call two or three people forward from each team and give each a label to place on their poster. Then call two more people from each team and give each a label. They can move the other label if they think it's in the place their label needs to go. You could give the two teams different labels to place so they wouldn't feel pressured to follow the other's actions. When both teams are finished, go over the posters and discuss the correct placement of labels. Then, ask the "share" questions	Divide into teams and label the parts of the formation of a cave. Answer the "share" questions.

4th-8th Grade "Captivating Caves"

What You Say:	What You Show or Do:	What Participants Do:
Continued: mazes of passages with many interconnections. C. Vertical solution. Water flowing straight down cracks can develop passages almost like elevator shafts, except that the passages are circular or oval. **Stalactites and Stalagmites:** Stalactites are tapering structures that hang like icicles from the roofs of certain caves. Stalagmites are mounds or tapering columns that rise up from the cave floor. The water dripping into the cave is full of the mineral it has dissolved out of the limestone. The mineral begins to form tiny crystals, and these build up into stalactites and stalagmites. Today, you will divide into two teams to see which team can label the parts of the formation of a cave correctly. **(Share)** Which of the passages or chambers was formed by an underground stream (the lowest passageway)? Which were formed by quiet water (the other horizontal chambers)? By vertical solution (the vertical passages formed by the waterfall and the sinkhole)?		

4th-8th Grade "Captivating Caves"

What You Say:	What You Show or Do:	What Participants Do:
Unlike the environment up on the surface that is very changeable, the cave environment is constant. It is a world of darkness, constant temperature and high humidity. Three types of critters can be found in caves: those like brown bats and raccoons that occasionally venture into caves, those like daddy longleg spiders and camel-backed crickets that spend most of their time in caves but go out occasionally, and those like blind shrimp and blind crayfish (crawfish) that spend their entire lifespan inside the cave. The difference between these crawfish and shrimp and those found in Louisiana is that those in caves are blind and do not need their eyes to navigate through the water. Since some of the animals cannot live outside of the caves, what are their food sources? They all depend on sunlight even in the darkest areas of the cave. No green plants grow here because they need light for photosynthesis. Cave animals must depend on occasional floods to wash leaves, twigs and plant debris into the cave. Another food source is the animal droppings from animals that go outside to feed then return to the cave to sleep or raise their young. Only a few animals can directly feed on these droppings to survive. Instead, bacteria and fungi decompose these materials into	Set up two posters sprayed with spray adhesive. Give each team the set of critter cards, and instruct them to place them where they belong. When teams have finished, go over correct placement, giving reasons. 	Place critter cards on poster in three categories.

4th-8th Grade "Captivating Caves"

What You Say:	What You Show or Do:	What Participants Do:
simple foods and nutrients. All animals in the cave system depend on each other for survival. Now, the same teams will place critter cards on these Life Form Zone Posters, deciding to which of the three types each belongs: Entrance Zone that receives some light from the outside and where creatures live out of the cave most of the time (Trogloxenes) Twilight Zone that is located just beyond the Entrance Zone where creatures live inside the cave most of the time (Troglophiles) Dark Zone that is not reached by natural light where creatures live in the cave all of the time (Troglobites)		

4th-8th Grade "Captivating Caves"

What You Say:	What You Show or Do:	What Participants Do:
(Experience) Now that you know a little about caves, are you ready to take an imaginary field trip to a show cave? Close your eyes. You will hear sounds and feel "pretend" objects that will make you think you're inside a cave. **(Share)** What pictures formed in your mind? What sounds did you hear that could be like those in a cave? What did you touch or feel on your skin that is similar to something in a cave? **(Process)** Why is it important to understand how caves are formed and learn what types of living things inhabit them?	Give members tour tickets. Tickets will be used for door prizes at the end of the tour. Example of door prizes could be gummy worms, plastic spiders, animal-shaped erasers, etc. To distinguish the winner, put a sticker on the back of several selected tickets. Have young people close their eyes and silently think of being in a cave environment. Students could place their heads on the desk to help them focus more on the darkness. Use a tape or CD of water sounds to help kids visualize the setting. Have a misting fan (spray bottle fan) to represent humidity. As a tour "guide," give them some visual images of glistening walls covered with crystals, of long stalactites hanging from the ceiling, etc. Caution them to stay back from the rushing underground stream and not to touch the crystal formations. Have them voluntarily feel gak (slimy substance), rice (animal droppings) and plastic fishing worms (critters). Say, however, "DO NOT DISTURB LIVE ANIMALS!!" Collect tickets and hand out door prizes.	Visualize a guided cave tour. Discuss what they visualized in the cave, what they heard and what they felt. Discuss the importance of understanding earth science (Ex.: cave formation). See that the balance of nature means different creatures live in different habitats, but all depend on each other. **NOTE:** Instead of this activity, older youth can take part in a matching game, matching actual caves with the type of cave it represents. Describe the types of caves. You could designate some members as types of caves with signs they hold or hang around their necks. Then give other individuals (or small teams) cards with the names and locations of actual caves. They would have 3 minutes to match. **Solution caves (karst caves) are most likely to be found in carbonic rock formations, such as limestone, gypsum. They form by water running off non-soluble harder rock through the soluble rock. (Linville Caverns, North Carolina)** **Talus caves, or boulder caves, are found at the base of a cliff or slope and are usually the**

4th-8th Grade "Captivating Caves"

What You Say:	What You Show or Do:	What Participants Do:
		Continued: **result of a rockslide. (Pinnacles National Monument, California)** **Crevice caves are usually found where a cliff face has pulled away from the stable rock face, creating a crack or crevice that sometimes widens enough for a person to explore. (Mount Nemo in Canada on Ontario's Niagara Escarpment)** **Sea caves are found generally where waves beat against sandstone areas along a coastline. (Acadia National Park, Maine)** **Lava Caves are tubes that form when molten rock flows away from volcanoes. Cool air causes the rock to harden on the outside and, when all the lava has drained out, the tube becomes a cave. (Thurston in Hawaiian Volcanoes National Park)** **Ice caves are formed by water flowing underneath glaciers of ice. Light passing through the ice makes the caves blue. (Erebus Glacier Tongue, Antarctica)**

4th-8th Grade "Captivating Caves"

What You Say:	What You Show or Do:	What Participants Do:
You need to follow some very important rules if you plan to explore a wild cave. a. Never go alone. b. Take at least three sources of light per person. c. Realize that caves are very fragile and that much damage can be done, even accidentally. d. Go with someone who is familiar with caves. e. Make sure people know where you are and when to expect you back. f. Get the cave owner's permission before entering the cave. g. Do not go into caves when it is raining or when it might rain. Caves can flood quickly. h. Take nothing but pictures; leave nothing but footprints; kill nothing but time. **(Generalize)** Why should you follow rules? How are these rules similar to those you have at home and at school? How can you apply responsibility to this lesson? How can you apply responsibility to school and home? How does caring apply to this lesson? How can you show these character traits at home or school?	Allow time for discussion and response.	Discuss the rules at home and school that keep them safe as well as show responsibility and caring through respectful behavior. (You act responsibly if you do not disturb the fragile structures in a cave just as you do not damage or abuse the things at home or school. You show caring for the creatures inside a cave by allowing them their space just as you do others at home and school.)

4th-8th Grade "Captivating Caves"

What You Say:	What You Show or Do:	What Participants Do:
(Apply) How can you teach others about caves? What age group would you teach? What kind of game or activity would you do with them so they could learn the information in a fun way? Can you tell the group when you plan to do this?	Remind them of the matching and visualization activities. Show them the following Internet site for a virtual cave tour and the stalactite and stalagmite experiment.	Decide on an audience, cave topic and activity to teach. Offer a time frame.

Ways to Help Members Learn More:

1. Visit Web sites such as the virtual cave site at www.goodearthgraphics.com/virtcave.html

2. Make stalactites and stalagmites. You need two plastic glasses, a small plate, three pieces of woolen thread, a spoon and baking soda. Fill the two plastic glasses with very warm water. Dissolve as much baking soda in each one as you possibly can. Place the two plastic glasses in a warm place and put the small plate between them. Twist three strands of woolen thread together. Dip one end of the twisted thread in one plastic glass and the other end in the
second glass. Let the thread hang down in the middle over the plate. Leave the glasses in a warm, dry place for several days. You will see tiny stalactites and stalagmites forming in the center of the wool. (Adapted from http://www.madscience.org/Kids/Experiments/Experiment04/index.htm)

3. Distribute handout of U.S. map with states with show caves and definitions for common geological cave terms.

4. Have students research famous show caves in North America.

5. Take an educational field trip to a nearby show cave.

6. Research how caves are classified, and choose one kind to draw and discuss with group.

7. Research underwater caves and how they differ from underground caves.

Resources:

www.nps.gov/ozar/glossary.htm
www.reachoutmichigan.org/
www.nps.gov/ozar/cavelife.html
http://dwb.unl.edu
www.kdu.com/caveglos.html
www.uppercumberlandcaving.net
http://www.amazingcaves.com/
http://www.madscience.org/Kids/Experiments/Experiment04/index.htm

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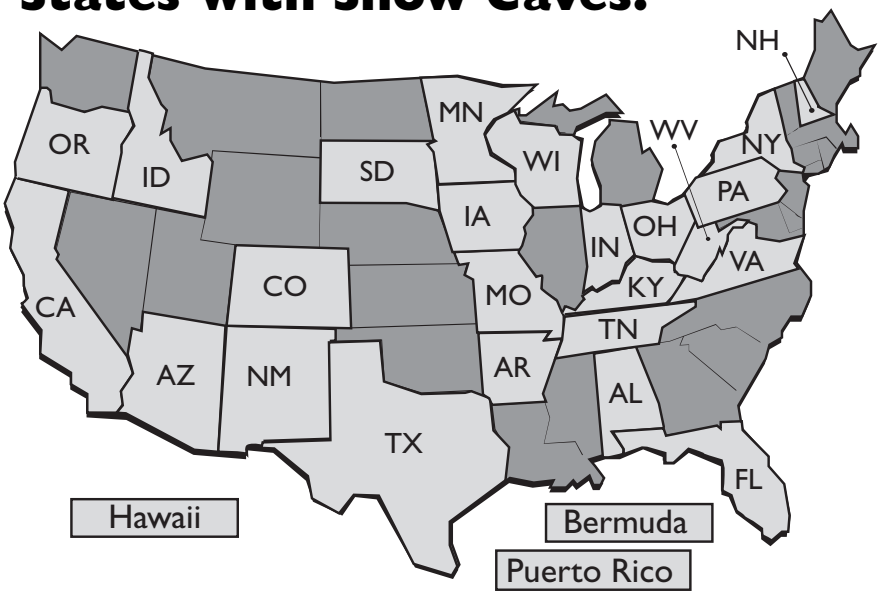
Coordinators:
Terril Faul, State 4-H Leader; Sarah Williams and Debbie Hurlbert, State 4-H Youth Development Faculty; Sara Seals, State 4-H Curriculum Specialist (retired).

Career Options:
Geologist, researcher, biologist, archaeologist, environmentalist, 4-H agent

Acknowledgments:
This lesson plan was reviewed for accuracy by John M. Wakeman, Ph.D., Professor, Biological Sciences, Louisiana Tech University, and Charles F. Cicciarella, Ph.D., Assistant Professor, Department of Health and Exercise Sciences, Louisiana Tech University, and Chair, Human Sciences Section, National Speleological Society. Louisiana Content Standards, published by Louisiana State Department of Education.

Handout:

States With Show Caves:



Common Cave Terms

Cave Formations — are crystalline deposits of calcium carbonate found in caves. They include soda straws, stalactites, stalagmites, columns, cave coral, draperies and flowstone.

Soda Straws — are thin-walled hollow tubes about 1/4 inch in diameter. They form as water drips through their centers and deposits rings of calcite around the rim of the formations.

Stalactites — grow down from the ceiling and form as mineral layers are deposited by water flowing over the outside of soda straws. They form after the centers of the hollow soda straws become plugged.

Stalagmites — grow up from the floor where mineral-laden water drips from above. Stalagmites are often, but not always, found beneath stalactites. They have flat or rounded tops as compared to the carrot-shaped stalactites.

Columns — are formed when stalactites and stalagmites grow together or when one of them grows all the way to the floor or ceiling.

Cave Coral or Popcorn — are irregular clusters or rough knobs of crystalline calcium carbonate. They build up on walls and existing formations or on the floor and walls of pools.

Draperies — form where drops of mineral-laden water trickle down the undersides of inclined ceilings, leaving deposits in lines that fold and curl as if they were drapes or curtains.

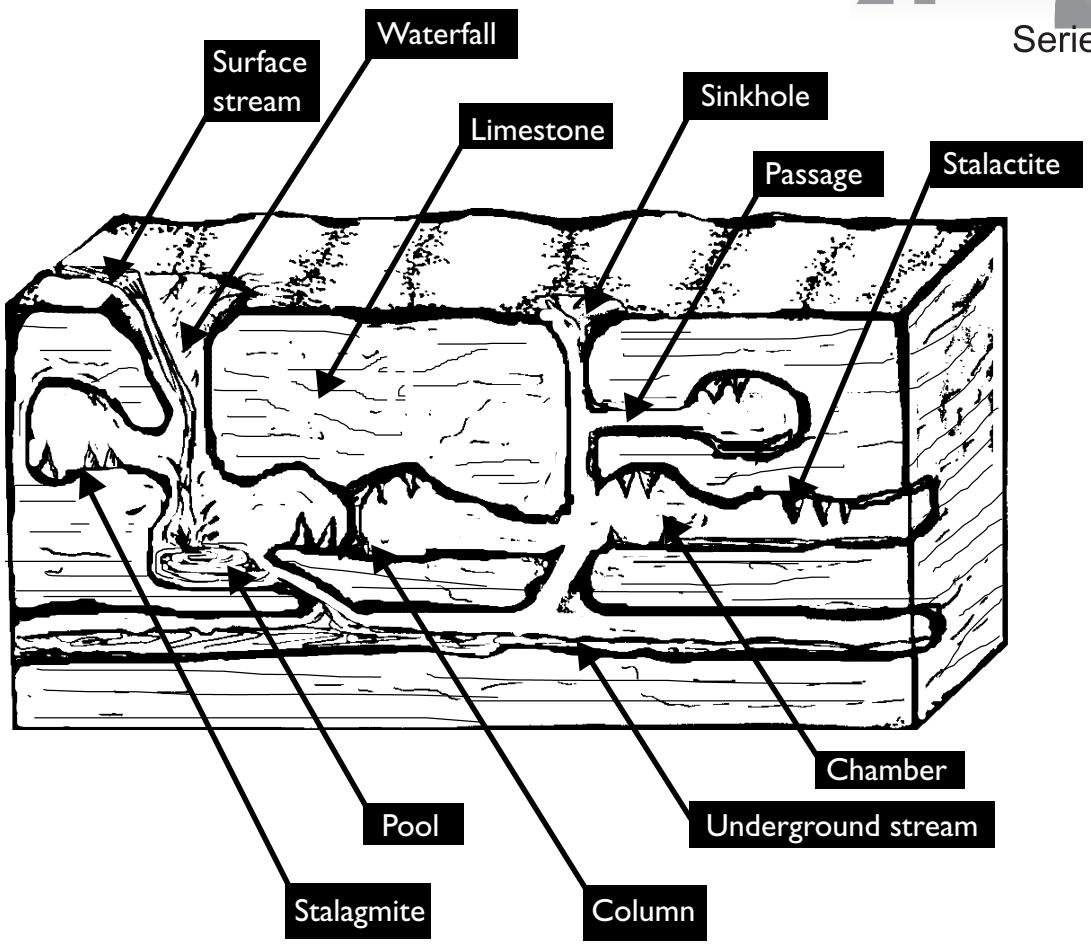
Flowstone —forms where films of water flow over walls, floors and formations, depositing sheets of calcium carbonate like icing.

Commercial or Show Caves — are caves that are open to the public with guided tours. A fee is usually charged.

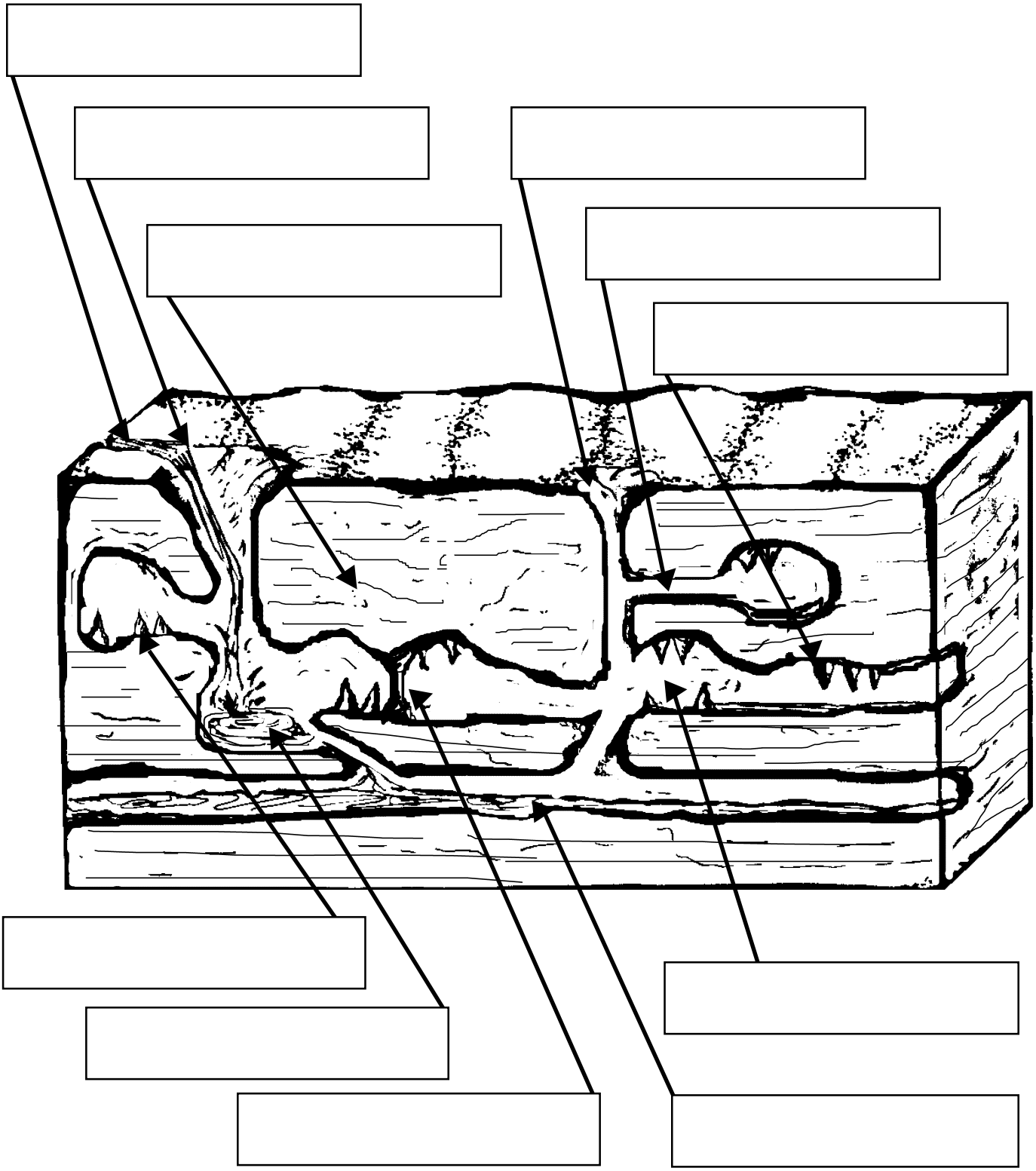
Wild Caves — are undeveloped caves often located in secluded areas. A wild cave should be entered only by experienced cavers. No fee is usually charged, and there are no lights, pathways, etc.

Cave Formation Poster and labels

Key:



Cave Formation



Surface Stream	Chamber	Passage	Pool
Sinkhole	Underground Stream	Limestone	Column
Stalagmite	Stalactite	Waterfall	

Life Forms Poster and Critter Card Sets

Entrance Zone — Out Most of the Time

Twilight Zone — In Most of the Time

Dark Zone — In All of the Time

Entrance Zone — Out Most of the Time

Twilight Zone — In Most of the Time

Dark Zone — In All of the Time

Critter Cards Key

Little Brown Bat

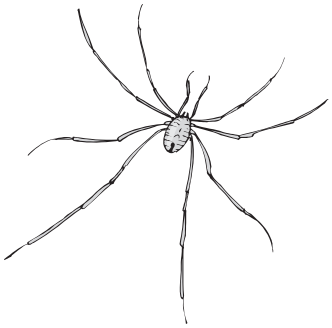
Raccoon

Packrat

Trogloxenes – Animals that visit caves but return to the surface regularly.

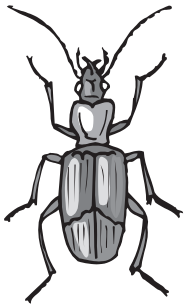
Camel Backed Cave Cricket

Harvestman ("Daddy Longlegs")



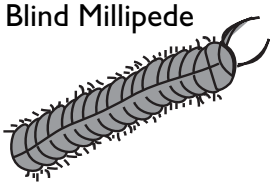
Adult Cave Salamander

Blind Cave Beetle

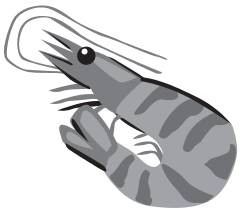


Troglophiles – Animals that can and do live in caves, but are capable of surviving outside.

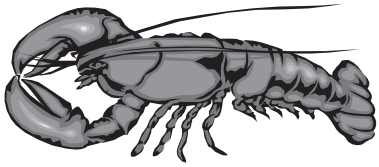
Blind Millipede



Copepod



Blind Shrimp



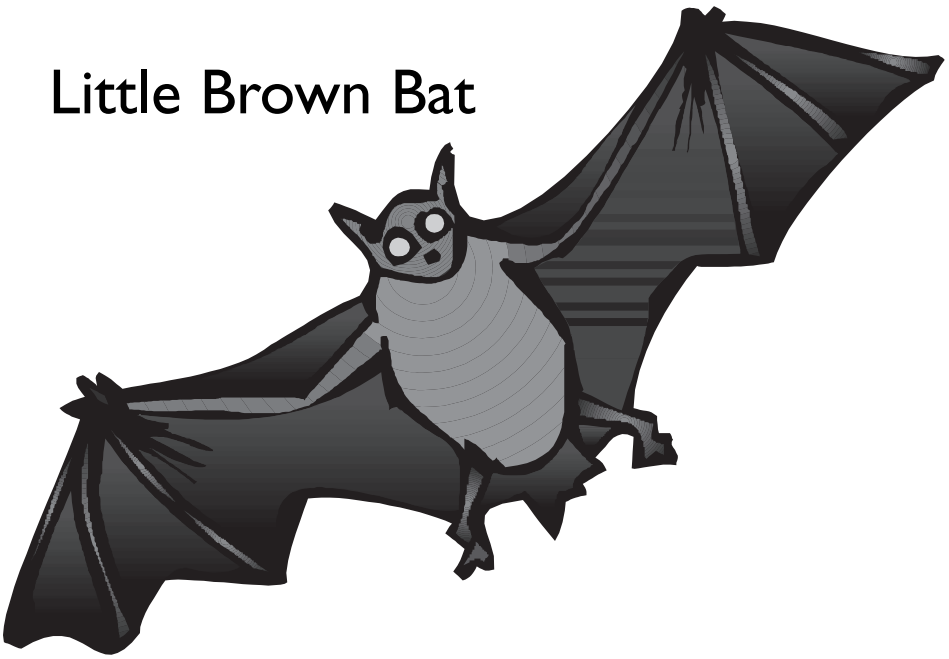
Blind Crayfish

Blind Flatworm

Blind Texas Salamander

Troglobites – Animals that spend their entire lives in caves.

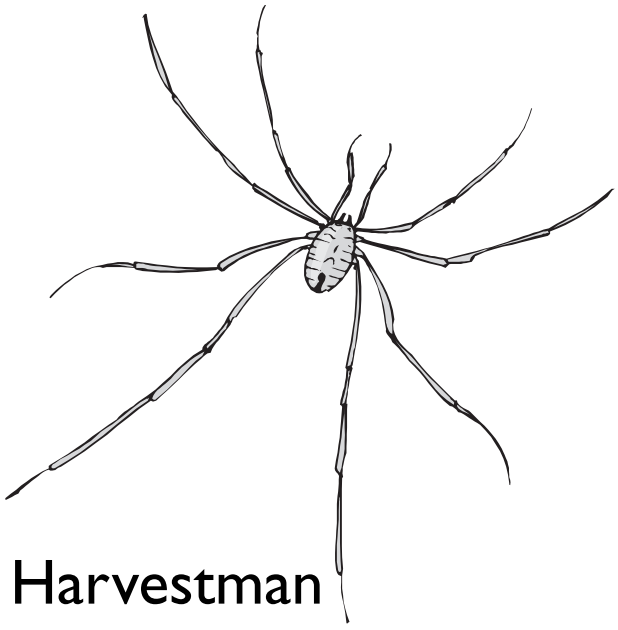
Little Brown Bat



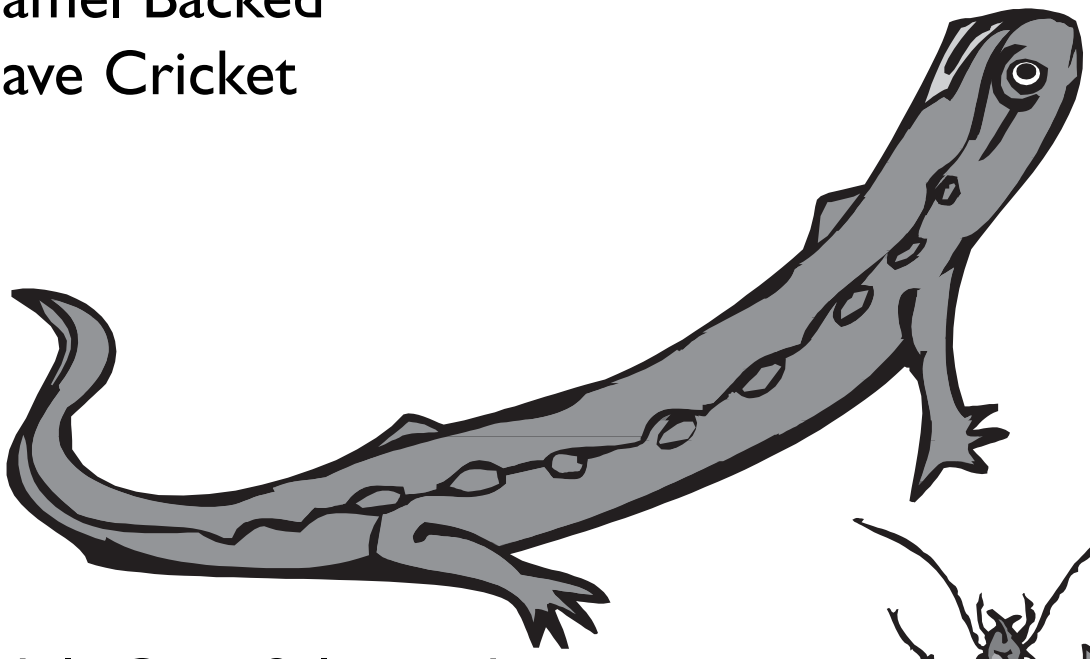
Raccoon

Packrat

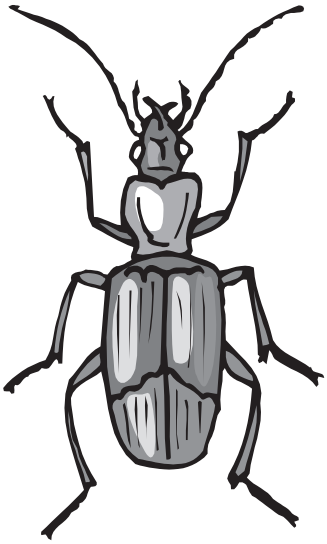
Camel Backed
Cave Cricket



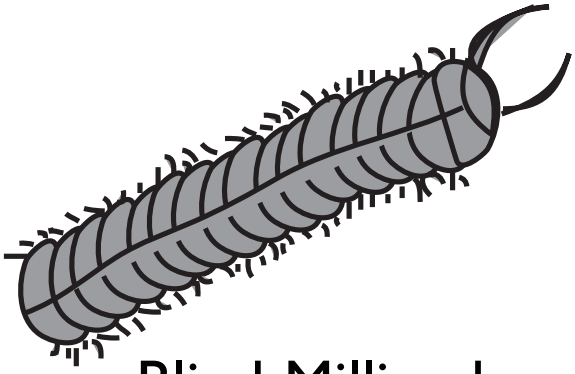
Harvestman
"Daddy Longlegs")



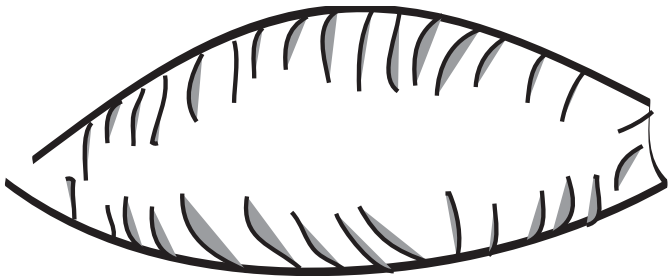
Adult Cave Salamander



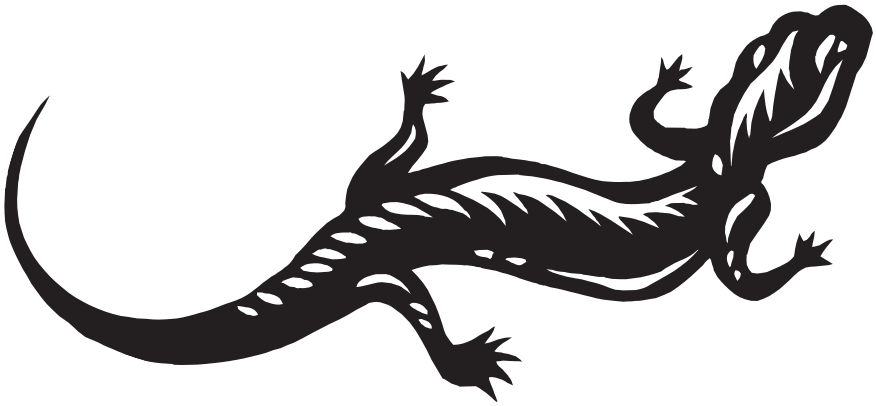
Blind Cave Beetle



Blind Millipede

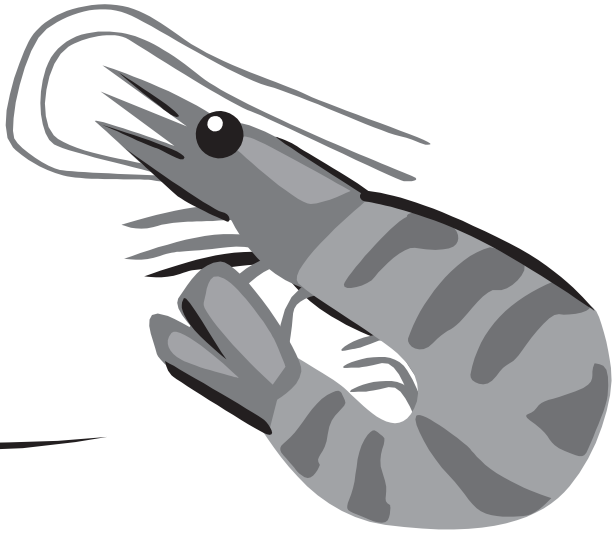


Blind Flatworm

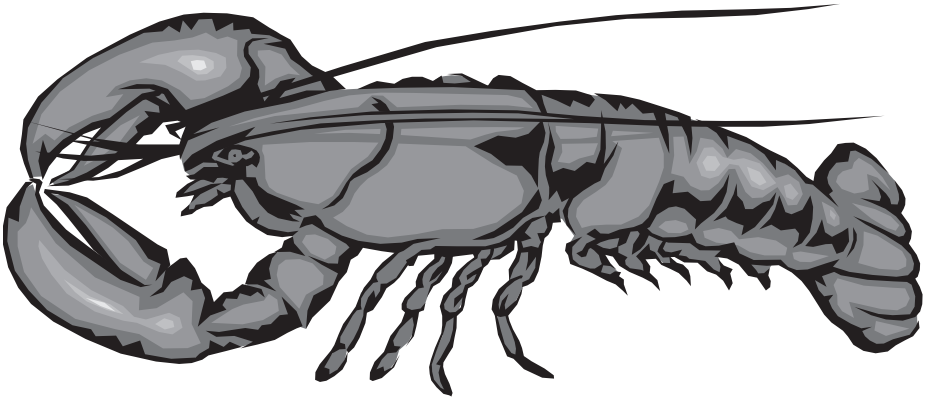


Blind Texas Salamander

Copepod



Blind Shrimp



Blind Crayfish

Solution caves or karst caves

Talus caves or boulder caves

Crevice caves

Sea caves

Lava caves

Ice caves

Linville Caverns, North Carolina

Pinnacles National Monument, California

Mount Nemo in Canada on Ontario's Niagara Escarpment

Acadia National Park, Maine

Thurston in Hawaiian Volcanoes National Park

Erebus Glacier Tongue, Antarctica

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