

LEVEL: Grades K-3

SUBJECTS: Art, Geography, Science.

PROCESS: Through factual information and construction of a bat cave diorama, students learn how the Forest Service has implemented procedures to protect bats while protecting humans from possibly dangerous situations.

OBJECTIVES: The student will:

1. Describe how environmentalists and government personnel (United States Forest Service Agents) offer protection and safe shelter for bats.
2. Describe where bats live and find safe shelter.
3. Discuss the importance of not disturbing hibernating bats.
4. Locate areas in the United States where bats live.
5. Draw a picture of a bat cave with grates in the front.
6. Construct a bat cave diorama.

TIMEFRAME: Discussion - 45 minutes; diorama activity - two days, 45 minutes per day. Daily observation (10-15 minutes) for cave stalagmite development.

SKILLS: Analyzing, applying, constructing media, demonstrating, describing, discussing, drawing, inferring, listening, locating, mapping, measuring.

MATERIALS: 8 1/2" X 11" white paper, rulers, markers or crayons, photo of bats and bat cave or mine. Materials to construct bat safe mine for each group: shoebox or similar box, black construction paper, string, glue, 5-oz. clear plastic tumblers, three pieces of yarn six inches long, epsom salts, measuring cup, spoon, water, hot plate or stove, punch for holes in box, colored dye, metal pan (large enough for ten cups of liquid).

VOCABULARY: Bat grate, cave, colony, concentration, dense, diorama, ecologist, environment, evening, grate, great, guano, hibernating, mine, protection, roost, stalactite, stalagmite, ton.



GREAT BAT GRATES

OVERVIEW: Bats sleep during the day. They fly, hunt, and feed at night. Bats need a safe daytime location in which to sleep and a safe place to give birth to a baby (pup). Bats sleep in a variety of places including caves, mines, trees, under bridges, in attics, in abandoned buildings and vehicles, in hollow trees, and under rock ledges. They sleep hanging upside down by their toes.

During winter, bats hibernate. They store food in their bodies throughout the winter for energy and to keep up their strength. If a bat is disturbed during the winter, strength might be lost and it might die.

The U.S. Forest Service knows it's important to protect bats, especially since bats eat insects that annoy people and ruin farmers' crops. When mines are no longer being used in some parts of the country, Forest Service personnel sometimes install bat-safe grates on

mine openings to keep humans from trespassing and to protect animals from a possibly dangerous area. These grates allow bats to come and go but the strong grate keeps others away. The bat remains safe inside, undisturbed by large animals (including humans).

PROCEDURE:

PRE-ACTIVITY:

Locate, show, and discuss pictures of bats.

ACTIVITY:

1. Read students the following story, pausing to ask questions along the way:

Bats sleep by roosting during the day in dark, cool, safe, quiet places. Caves are ideal places for bats to roost. One of the places Mexican Free Tail bats live is in the Bracken Cave in Texas. The cave is 600 feet long. These bats are the single largest colony of bats in the world. There are from 20,000,000 to 40,000,000 Mexican Free Tail

bats living in Bracken Cave. It is the largest group of warm-blooded mammals on earth.

Ask:

-Where do bats like to live? (*Caves and mines.*)

-Why do bats choose these places to live? (*Safe, cool, spots to hang or roost, dark, rarely disturbed.*)

Locate Texas on a United States map. Ask:

-How far is Texas from where you live?

Bats work hard when they go out at night. How many insects would you guess Mexican Free Tail bats catch and eat when they fly from their cave in Bracken, Texas? Make a guess; it's a lot! (*Pause - for guesses.*) Well, hold your breath. The thousands of Mexican Free Tail bats that fly into the evening eat 250 *TON* of insects before morning.

Bat colonies fly as a group, roost as a colony, and hibernate as a colony. They feel safe together and sometimes need help so they can get their rest.

Bat pups are born in the spring and summer. They hang upside down or roost in the bat nursery. Each square foot of the bat cave nursery ceiling is covered by a hundred pink, hairless, squeaky pups. Mother bats carry their newborn pups with them when they hunt for food at night. The pups hang tightly to their mother's fur so they won't fall. When bat pups are about three weeks old, their wings are strong enough for them to fly.

Another special cave in which bats live is the New Mammoth Cave in Campbell County, Tennessee. Thousands of cave-dwelling gray bats live and hibernate here. The cave temperature can change from 50 degrees Fahrenheit to below freezing. During warm spring, summer, and early fall months the gray bats catch thousands of insects each night. When the weather becomes cooler, they store food as fat in their bodies so they can hibernate throughout the winter in safety. Some gray bats live up to 32 years.

Locate Tennessee on a United States map. Ask:

-How far is Tennessee from where you live?

It is very important for bats to roost and hibernate safely and peacefully. To get their bodies ready for hibernation, bats eat and eat and EAT. By the time the temperature is very cold, they will have stored a lot of food energy in their bodies in the form of fat. This energy helps them survive the winter. The bats fly into their caves or mines or safe areas, find their own places to hang upside down, and roost undisturbed until warm weather comes again.

If the roosting, hibernating bats are disturbed and awakened, stored-up food energy is used up quickly. By using this energy early, the bats may not have enough strength to continue roosting throughout the entire cold season. If they lose too much strength, they may fall to the cave or mine or "home" floor and die. Bats without strength cannot fly.

Because bats help the environment, the United States Forest Service has developed bat grates for great bats. (Grate and great are spelled differently. They mean different things but sound the same. Words like this are called homonyms.) The bat grates (strong metal fences) cover the mouth of the cave and protect their living area. The bat grate on New Mammoth Cave weighs 120 ton. The bat grate is made of heavy metal bars spaced far enough apart to allow the gray bats to leave the cave and return to the cave.

A door was built in New Mammoth Cave, so ecologists and Forest Service personnel can check on the number and safety of the bats. These people must walk through guano on the floor of the cave. Guano are bat droppings. The ecologists and Forest Service personnel are very quiet and very careful not to disturb the bats when they enter the cave.

Bat grates are also put on vacant mines. When miners no longer work or operate a mine, the opening to the mine is sometimes left open. Sometimes a sign is posted that says NO TRESPASSING or KEEP OUT to keep people away.

Ask:

-How do ecologists and the United States Forest Service personnel help protect bats? (*Bat grates.*)

-What other groups are protected by bat grates on caves and mines? (*Humans and other animals.*)

Bat grates are GREAT!

2. Show a picture of a bat cave or mine entrance. Ask students to draw a bat cave or mine showing a grate covering the front.

3. Depending upon amount of materials available, put students in groups to construct bat cave dioramas. Ask them to follow the procedure below to construct their bat caves.

A. Teacher or adult preparation: Prepare the following mixture for tumblers. Combine five cups epsom salts and four cups boiling water. Cook in a metal pan until solution is dense and epsom salts are thoroughly combined with water. Add colored dye. Stir with a spoon and cool. Keep away from students as a safety precaution. Caution children not to taste or touch the mixture.

B. Have students cover the inside of a shoebox with black construction paper, then trace the diameter of the top of a 5-oz. tumbler on top of the box (see figure 1). Punch holes in three places around the circle you have drawn to drop yarn into. Glue bottom of tumbler to the top of the box, inside the three places where holes for yarn have been made (see figure 1). Students may want to repeat this step two or three times depending on the size of their boxes.

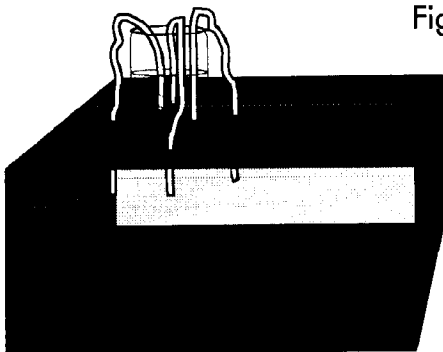


Figure 1

C. Soak the six-inch yarn pieces in the solution. Put one end of the yarn in the hole on top of the box and the other end in the plastic container. Add solution about half way up tumbler. The solution should be absorbed by the yarn. The excess will drip from yarn strand hanging into box to form stalactites. Stalactites are formed from the ceiling down from calcareous water (water containing carbonate of lime) flowing down to form a column. Stalagmites may form from the floor of the cave or mine to the stalactite column.

When plastic tumblers are to be refilled, solution must again be heated in metal pan and stirred with metal spoon. The solution may be stored in refrigerator or kept in the pan.

D. When the cave stalagmites have finished forming, use pattern (figure 2) to trace and cut bats from black construction paper. Add them to the scene.



Figure 2

ASSESSMENT: Students pictures and dioramas should show how bats use abandoned mines or caves and how bat grates help protect the bats.

EXTENSIONS:

1. Students research how and where stalagmites form.
2. Locate Carlsbad Cavern on a map.

RESOURCES:

Amazing Bats, Eyewitness Juniors #13, Frank Greenaway, Alfred A. Knopp, New York. ISBN 0-679-81518-X.

Amazing Mammal - Parts I, II, Nature Scope, Ranger Rick, National Wildlife Federation, 1400 16th Street NW, Washington, DC, 20036-2266, 1986.

Bats, A First Nature Fact Book, D.J. Arneson, Kidsbooks, Inc., 3535 Peterson Avenue, Chicago, Illinois 60659, 1993. ISBN 1-56156-253-0.

Bats, Creatures of the Night, Jill Wolf, Antioch Publishing Company, Yellow Springs, Ohio, 45387, 1990. ISBN 0-89954-549.

Bats of Colorado, Shadows in the Night, Colorado Division of Wildlife, Department of Natural Resources, 6060 Broadway, Denver, CO 80216, 1984. (303) 297-1192.

Bats, Wings in the Night, Patricia Lauber, Random House, New York, Canada, 1968. Library of Congress Catalog Number 68-23674.

Bats, Zoobooks, Linda C. Wood, Deane Pink, Frye and Smith, San Diego, CA, Wildlife Education, Ltd., 1989. USA ISBN 0-937934-59-3.

I Can Read About Bats, Elizabeth Warren, Troll Associates, Mahwah, N.J., USA. Library of Congress Catalog Number 74-24928, 1975.

Stellaluna, Janell Cannon, Harcourt Brace & Co, San Diego, CA. ISBN 0-15-280217-7.

Very Elementary Bats, Bat Conservation, International, (catalog) P.O. Box 162603, Austin, TX 78716.

Colorado Division of Wildlife, "Bats are Beautiful" 22 minutes; "Bats: Myth and Reality" 16 minutes, "Bats of America" 15 minutes; 6060 Broadway, Denver, Colorado 80216. (303) 297-1193.

National Geographic, "Bats Aren't All Bad" Alvin Novick, MD, May, 1973.

