



Chapter 4: Water and Cave Sculptures

Jenny and Carlos felt refreshed from their lunch break in the Bateteria. They scrambled up a pile of loose slippery boulders. At the top, an entrance took them into another cave room.

Jenny moved the flashlight beam about the room. "Look!" she said. Instead of boulders, this room was crowded with those pointy-shaped stone tree stumps that looked like soft ice cream. Only this room was like a forest of the strange rocks. "It's like a museum of weird sculptures."

Icicle-shaped rocks hung from the ceiling. On the cave walls, the rocks rippled and draped like curtains. Here and there flower-like crystals grew, while others stuck out like strange spirals of funnel cake you buy at the fair. "It's magic," Carlos said. "I've never seen anything like this."

Drops of water hit rock formations everywhere, *drip! drip! drip!*

"Bat," asked Carlos, "what are those things called, again?"

Bat was resting, hanging upside down from a crystal on the wall. He flew to the icicle shapes hanging from the ceiling. *These are stalactites*, he said. *The ones on the floor ... those are stalagmites.*

Carlos complained. "Bat, do you have to use such big words? Why are cave words so hard?"

Bat admitted they were hard words. He said that the big words were made up by humans and had been used for a long time. But the cave explorers use a silly saying to remember which is which.

"Well, tell us what they say," Jenny demanded.

The stalactite holds tight ...

"I know!" Jenny cried. "Hold tight ... they're the ones that hold tight on the ceiling! Right?"

Right.. So stalagmites might one day touch the ceiling.

Jenny agreed. Some of the stalagmites had grown tall enough that they were almost touching the ceiling.

Jenny then turned the flashlight beam overhead. She wondered if she would see another bat colony, but no small shapes were hidden between

the rocks. Some of the stalactites looked like soda straws. They were white and hollow, and water dripped down from their tips.

"We should call these soda straw stalactites," she said to Carlos. Bat agreed. *That's exactly what the cave explorers call them.*

"Bat, what do you mean the stalactites 'grow'?" asked Carlos, looking at a big stalagmite in front of him. "These are rocks, not plants."

They grow, but they're not alive like a plant or animal. They get bigger really slowly. In fact, that stalagmite in front of you probably took ten thousand years to get that big. Just a teeny bit every year.

"How do they grow if they're not alive?" Carlos wondered.

If this was a dry cave, they wouldn't grow here. But this is a wet cave, with water dripping all the time, said Bat Each drop of water brings a tiny bit of rock. The rock is dissolved, like sugar is dissolved in your tea. When the water dribbles down the rock, it leaves the dissolved rock behind. The stalactite gets longer, or the stalagmite gets a little taller. The rock formations grow bigger, day by day and year by year.

And those soda straws .. You can see the drips that fall through all the time. When the water gets to the end of the straw, it leaves some of that dissolved rock on the tip. That's how the straws get longer and longer.

"Carlos! Bat! Look here!" Jenny called. "Some soda straws are broken. They've fallen to the ground like a broken glass!"

The two children looked at the broken soda straw stalactites. It took thousands of years, Carlos thought. He felt sad to see the delicate rocks destroyed forever. Magic gone.

Bat started fluttering around the cave room. *Flap, flap, flap*, his tiny wing-beats echoed angrily though the cave. He squeaked so fast that they couldn't understand him. Slowly he calmed down. He finally rested, hanging from the ceiling, his leathery wings drooping, panting little bat pants.

"What's the matter, Bat?" Carlos asked.

Sometimes I get so upset at humans .. I know there are nice humans like you, but some humans do bad

Natural Bridge Caverns, Inc.
26495 Natural Bridge Caverns Rd
San Antonio, TX 78266
210-651-6101
www.naturalbridgecaverns.com

things. *I like those soda straws so much, and somebody came in here and broke them. It wasn't the cave explorers, just some other people who wandered in. The cavers are really careful and always take their garbage out...except when they lose something like the flash light.*

"And it will take thousands of years to grow the soda straws again," added Carlos. He moved the flashlight beam around the cave.

On the other side of the room, he spotted a small pile of garbage. Together they collected two pop cans, potato chip bags, and plastic sandwich bags.

"Let's take the garbage out, Carlos;" suggested Jenny. "It doesn't belong in a cave." They put the garbage in their backpacks with their own lunch trash. Jenny looked the area over carefully with the flashlight until they found every last piece of garbage.

She looked up and gasped .. On the wall, the thoughtless visitors had scrawled their names in spray paint. *Freddie and Jane Wur Heer, 1996*, it said. Jenny was shocked. "It's ugly, and they can't even spell right. They made this magical place ugly." She put her head on Carlos' shoulder. "It's sad," she said quietly.

"I'm so sorry Bat, " Jenny said. "I'm not going to tell anybody where this cave is after we get back. Will that help?"

Yes Jenny, it will. It would be better if only cavers came here .. Real cave explorers would only tell other responsible cavers. Or tell people if someone was going to build a house on top of a place that would cave in. Then they would tell to prevent accidents.

Once again, they heard the bat's *flap, flap, flap* as he flew around the cave. *Hey! Let's get moving, he squeaked.. We'll be late for supper if we don't get going.*

Carefully they walked between the stalagmites and dodged the low-hanging stalactites. Their good spirits returned. Bat flew toward a shadow where another tunnel led out of the soda straw room. He told them to turn off the flashlight to save energy. Jenny shut her eyes for a moment and gave thanks that they could stand up in this tunnel.

They turned off the flashlight to save battery power. Carefully they walked into the darkness again,. As they left the room behind, Carlos wondered to himself: If nobody could see something ugly, did it matter?

Reading Follow-Up Activity— Chapter 4



SUBJECTS: English, Language Arts & Reading

GRADES: K-3

ACTIVITY SUMMARY: Students will discuss how water can shape rocks and how humans can damage caves.

DURATION: approximately 40-45 minutes

OBJECTIVES:

Students will be able to:

1. Explain how water shapes rock.
2. Describe the impact people have on caves.

TEKS ADDRESSED:

Kindergarten-English, Language Arts, and Reading

4B—ask and respond to questions about texts read aloud.

1st grade-English, Language Arts, and Reading

4C—establish purpose for reading selected texts.

2nd grade-English, Language Arts, and Reading

3C—establish purpose for reading selected texts.

3rd grade-English, Language Arts, and Reading

2C—establish purpose for reading selected texts.

VOCABULARY: crystals, dissolve, rock formations, stalactite, stalagmite, cry, grow, see, sad, soda, straw, bug, dry, joke, paint, sorry, twenty, matter, whisper, tear, whisper, destroy, hungry, dribble, crystal, hollow, ugliness, dodge, spirits, shadow, sculptor

MATERIALS PROVIDED:

Handout: Chapter 4 Coloring Page

PROCEDURE:

1. Read Chapter 4 of *Exploring Caves* out loud to the students.
2. Distribute the coloring page.
3. While students are coloring, discuss questions below.
4. Do the class demonstration.

Natural Bridge Caverns, Inc.
26495 Natural Bridge Caverns Rd
San Antonio, TX 78266
210-651-6101
www.naturalbridgecaverns.com

DISCUSSION QUESTIONS:

1. Can you think of other place where you have seen water acting on a sculpture? (*Cliffs, river beds, hoodoos, mud slides*)
2. Many cave rock formations take tens of thousands of years to form. Should visitors break or collect cave formations?
3. Why is garbage harmful in a cave?
4. What things besides limestone dissolve? (*Salt, dyes, sugar, baking soda*)
5. When people paint or write on walls or other things, it's called "graffiti." Do you have graffiti in your community? Discuss.
6. What kinds of damage can people do in caves? (*Drawing on walls, leaving garbage, breaking rock formations and crystals, collecting rock formations and crystals*) Where on the coloring page is human damage shown?

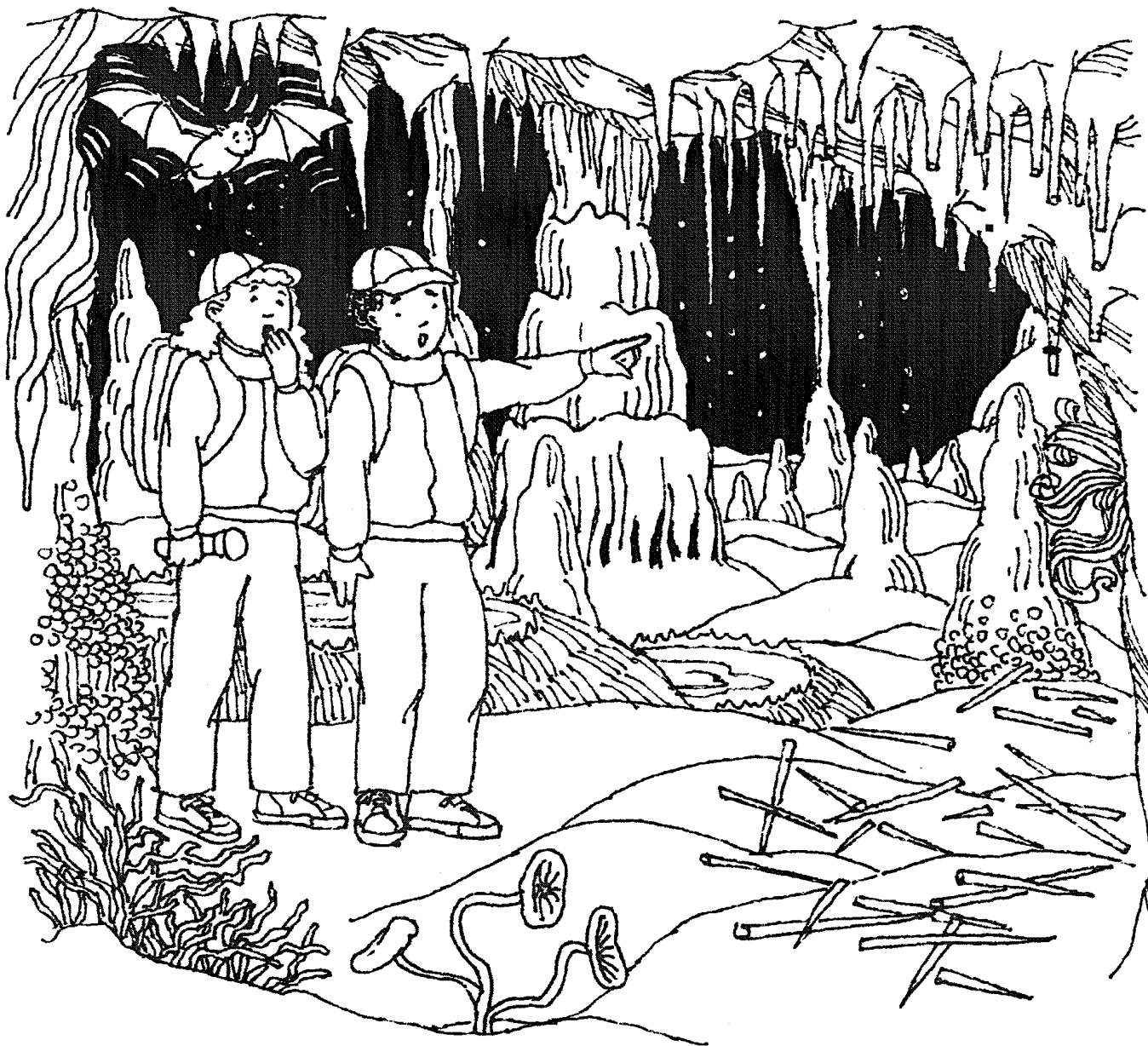
CLASS DEMONSTRATION

MATERIALS REQUIRED:

4-6 cups all-purpose flour
Water
Large mixing bowl and mixing spoon

PROCEDURE:

1. Form hard dough with flour and water in mixing bowl. Knead dough until it is stiff.
2. Run water (gently) over the dough. Gradually, the dough ball will get smaller, until only a small nub of sticky material is left. Explain that this is how water dissolves rock formation in the cave, changing both their size and shape.



Water Creates a Cave



SUBJECTS: English, Language Arts & Reading and Science

GRADES: K-3

ACTIVITY SUMMARY: This activity demonstrates the role of water in limestone cave formation. The teacher illustrates the block-like nature of limestone, or karst bedrock.

DURATION: approximately 40-45 minutes (Add 10-15 minutes if need to read story first.)

OBJECTIVES:

Students will be able to explain the role of water in cave formation.

TEKS ADDRESSED:

Kindergarten-English, Language Arts, and Reading

4B—ask and respond to questions about texts read aloud.

1st grade-English, Language Arts, and Reading

4C—establish purpose for reading selected texts.

2nd grade-English, Language Arts, and Reading

3C—establish purpose for reading selected texts.

3rd grade-English, Language Arts, and Reading

2C—establish purpose for reading selected texts.

Kindergarten-Science

7C—give examples of ways rocks, soil, and water are useful.

1st grade-Science

7A—observe, compare, describe, and sort components of soil by size, texture, and color.

7C—distinguish between natural and manmade resources.

2nd grade-Science

7C—distinguish between natural and manmade resources.

3rd grade-Science

7D—explore the characteristics of natural resources that make them useful in products and materials such as clothing and furniture and how resources may be conserved.

MATERIALS REQUIRED:

- Crayons
- Several block sets, preferably of different sizes. (Or, make plaster blocks in ice cube trays to simulate limestone more closely. Make at least 4-5 trays of different sizes.)
- Cookie sheets with side ridges
- Pieces of limestone, large or small
- Quart container of water
- Dishtowel

Natural Bridge Caverns, Inc.
26495 Natural Bridge Caverns Rd
San Antonio, TX 78266
210-651-6101
www.naturalbridgecaverns.com

BACKGROUND:

Limestone caves are formed in what is called “karst topography” or karstlands. Karstlands consists of limestone bedrock that is fractured into more-or-less rectangular blocks of various sizes. The fractures and blocks are irregular. They may not be continuous in any direction. When water seeps down from the surface, it dissolves limestone along these fractures. The rate of dissolving depends upon how much acid or water is in the rock, and how much acid is in the water. Water is more acidic at levels near the water table.

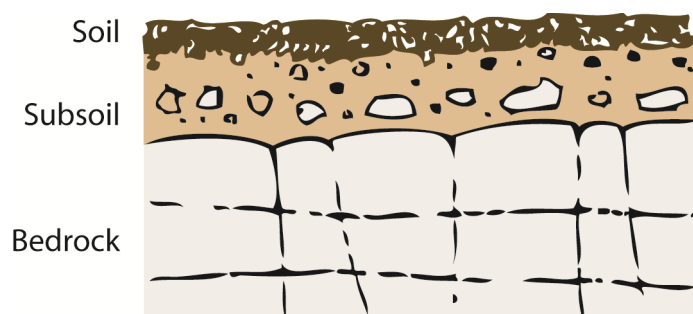
Some areas of the United States have bedrock close to the surface. In areas of the West and Midwest, land was once covered by glaciers during the ice age. Several hundred feet of gravel may cover the bedrock. Children in these areas may rarely see bedrock, and may have a hard time imagining it.

Karst topography develops many interesting landforms. These include caves (with shafts, tunnels and caverns), sink holes (where the surface rock layer suddenly collapses into a cave structure), and a sinking stream or river (where it suddenly disappears underground).


This activity may seem like a lot of work, but it demonstrates the many aspects of limestone quite graphically.

PROCEDURE:

1. Ask students to think about the rocks underneath their school. How far down does the soil go? What’s under the soil? (Ideally, take children into the schoolyard to dig, just to see.) Tell students that eventually, some kind of solid rock is there, called bedrock. Draw a profile of soil, subsoil, and bedrock on the blackboard. (See end of lesson for a black-line master to use to make a transparency)



2. Tell students that limestone is one kind of bedrock. Most caves in the United States are in limestone. This activity is about how caves form in bedrock.
3. Use a central desk in the classroom to demonstrate with the blocks. Build a large, solid, block structure on the cookie sheet. (Practice ahead of time.) Some areas of the structure are large blocks, others consist of smaller blocks. Drape a dishtowel over the structure, to represent the surface layer – and help hold it together. (*Note-the dishtowel may need to be removed at some point during the demo if it gets too difficult to perform with it on.*) Tell students that limestone is something like this structure. Show them a piece of limestone. Millions of years ago, limestone started out as a mixture of mud and seashells at the bottom of the ocean. When it was formed, limestone was in giant blocks. As it dried out, cracks were formed.
4. Ask students to describe the structure. Words that should come up:
Broken, blocks, pieces, different-size pieces, straight lines, chips broken off
5. Ask what would happen when rain falls on the surface. (*Rain trickles down the cracks.*) Demonstrate by pouring some of the water on the top of the block structure. Students should see water collect in cookie sheet. Explain that in nature, rainwater goes down until it can’t go any further. There it joins the water table.

- 
6. Pour more water on the structure. Explain that water dissolves (like sugar in tea) limestone slowly and the cracks get wider. (Spread blocks slightly.) Near the water table, the limestone dissolves even more. (Spreads blocks and remove one or two without collapsing the structure.)
 7. Ask students to name the hole now created in the block structure. (*A cave.*)
 8. Discuss the length of time for a cave to develop (*tens of thousands of years*), and how big a cave can get.
 9. Remove some blocks just under the top row of blocks. The top will collapse. Tell students that this is a sinkhole. Invite students to “make caves” with the blocks if spare time is available.

