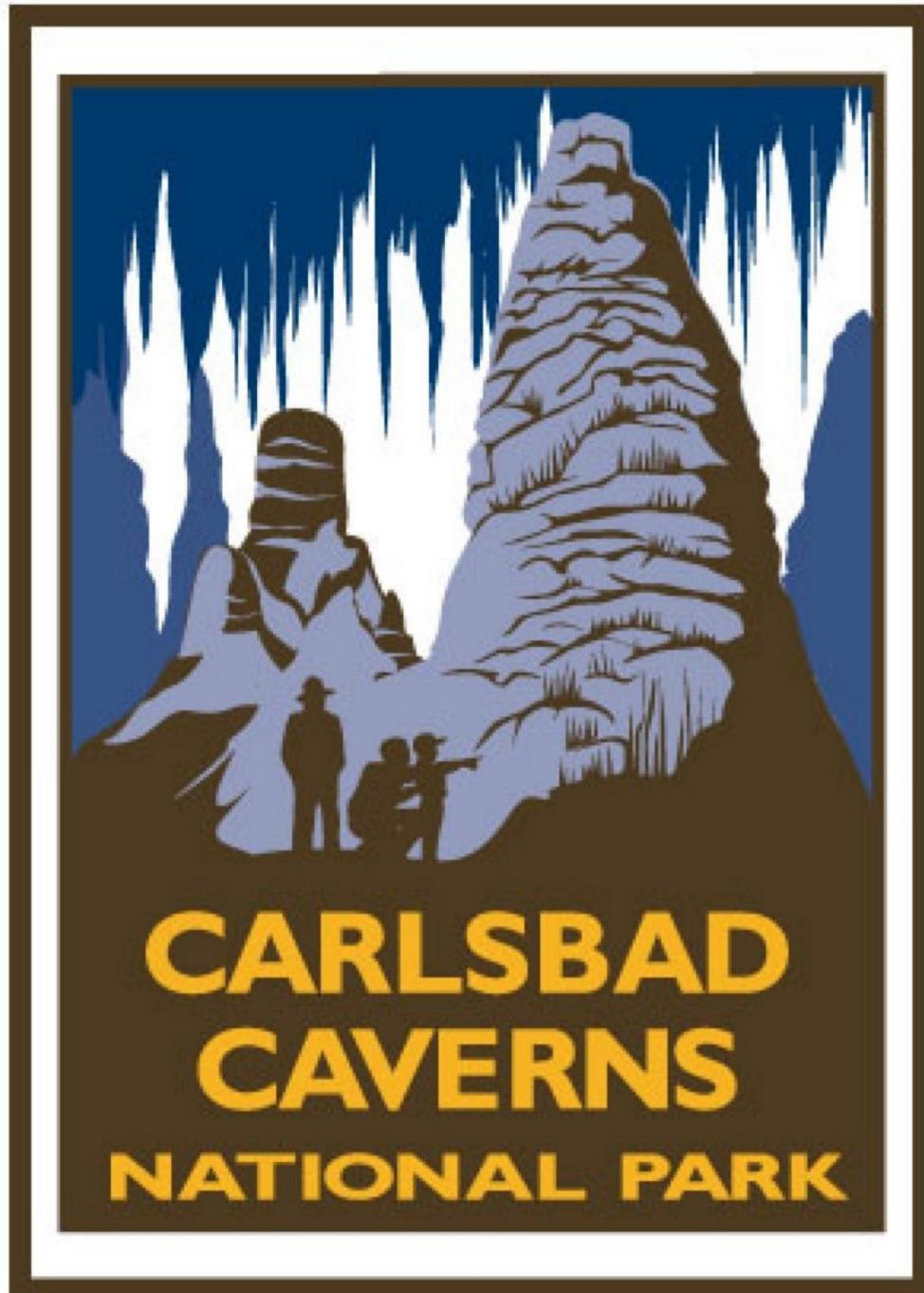


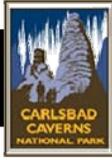
About Bats, Caves, & Deserts

A curriculum and activity guide for Carlsbad Caverns National Park



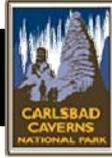
Elementary School





Section 11 – Miscellaneous Activities

- What to Take
- Night Owls
- Make a Solar Hot Water Heater
- Moon Over the Classroom



What to Take

Pre-Visit Activity

Primary/Elementary, Intermediate and Secondary Levels

Science (Life)

45 Minutes

Objective(s)

- Students will identify things they need to survive in the desert.
- Students will appraise one another's choices.

Related NM Content Standards with Benchmarks. SC11-E9, SC11-E10, SC11-M9, SC11-M10, SC11-H9

Method. Students brainstorm things they need to bring when they visit the desert.

Materials

- Older Students: desert survival guide or scout manual for reference, paper, pencils
- Younger Students: a wide variety of clothing, a variety of food, sack lunch, medication, bandages, backpack, water bottle with water, camera, caving gear, toys, flashlight, tent, blankets, sunglasses, hats, proper shoes, etc.

Background. Carlsbad Caverns National Park is located in the Chihuahuan Desert. Deserts are lands that are very dry and receive little rain. Strong winds often blow. The weather can be either hot or cold in the desert.

Some deserts sizzle with temperatures as high as 130°F. Desert plants and animals have special features that help them thrive in hot temperatures. What precautions do people need to take in the desert? What do you need to wear and take with you on your field trip to Carlsbad Caverns National Park? If you and your family were planning a backcountry hike at the park, what would you pack?

See The Backcountry of Carlsbad Caverns National Park.

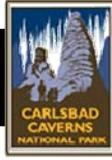
Suggested Procedure for Young Students

1. Teach a desert unit.
2. One or two days before your field trip to Carlsbad Caverns National Park, place desks along the walls of the classroom, leaving a large space in the middle of the room. Place all kinds of things that students might need and/or want to take along on the field trip or on a backcountry hiking adventure.
3. When students enter the classroom, hand one student the backpack. Instruct him/her to put in the backpack only those things that would be useful for the field trip.
4. Allow the student to explain why he/she selected those items placed in the backpack.

5. Allow classmates to question the student about his/her selection.
6. Empty the backpack and hand it to a second student. Instruct the student to pretend like he/she is going on a two-day backcountry adventure with his/her family at the park, and pack his/her backpack accordingly.
7. Allow the student to explain his/her thought processes during the packing.
8. Allow classmates to question the student about his/her selection.
9. Repeat this process using all students who would like to be packers.
10. Discuss safety rules for the desert—stay calm if lost, find shade and stay put.

Suggested Procedure for Older Students

1. Have students brainstorm what they know about the desert.
2. Have students brainstorm about appropriate behavior and dress in the desert.
3. Have students make a supply list for their trip to the desert.
4. Discuss safety rules for the desert.



Night Owls

Pre-Visit and Post-Visit Activities

Primary/Elementary and Intermediate Levels

Science (Inquiry, Life)

2-Hour Pre-Visit Hike, 40-Minute Post-Visit Presentation

Objective(s). Students will use their senses to investigate the outdoors after sunset.

Related NM Content Standards with Benchmarks. SC5-E2, SC5-M1, SC5-M2 SC6-E2, SC6-M2, SC10-E1

Method. Students hike after sunset, stopping every 10 - 15 minutes to participate in mini-science activities.

Materials

- Night Vision: candles and matches
- Colored Paper: a 3" X 2" square of different colored paper for each student
- Wintergreen Lifesavers: wintergreen -flavored lifesavers
- Scents: 4 jars or film containers, 4 cotton balls with different scents (cinnamon, vanilla, vinegar, rubbing alcohol, etc.)
- Moth-Bat Game: blindfold

Key Vocabulary. diurnal, nocturnal, adaptation, echolocation, rods, cones

Background. People are often less comfortable and familiar with the world of dark than with the light of day. People are diurnal—awake in the day. Some animals are nocturnal—awake in the night. They have special adaptations that people do not. A visit to the *dark side* is coming!

Suggested Pre-Hike Procedure

1. The purpose of the night hike is to give students a greater appreciation of the outdoors after the sun sets. Before going outside, facilitate a discussion about night life—nocturnal animals, night vision, etc.
2. Establish guidelines for the hike.

Suggested Hike Procedure. Begin the hike. Stop every 10 minutes to do one of the following mini-science activities.

- *Night Vision.* Have students cover one eye with one hand. Light the candle and have students look at it for about one minute using the uncovered eye. Blow the candle out and have students look around alternating opening and closing each eye. (Students will see and feel the difference between night and day vision simultaneously.)
- *Solo Walk.* Discuss how it feels to be in the desert at night. Ask students if it would feel different to be in the desert by themselves. Have one leader walk approximately fifty feet

ahead. Then, have students walk one at a time towards the leader that has walked ahead. Follow-up with a discussion about how it felt.

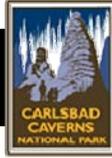
- *Colored Paper.* Pass out a different color square of paper to each student. Ask them to look at it and guess what color they think it is. Have the students put the square in a pocket. When the class returns to light, have them check and see if they were right.
- *Wintergreen Lifesavers.* Have your students form a circle. Pass out the Lifesavers. Tell them that they are to chew with their mouths open. Count to three and have everyone chew at same time, watching each other. (They should see sparks caused by an ingredient in the Lifesaver.) Ask students to explain what caused the sparks.
- *Scent.* (Before your outing, place variously scented cotton balls in film containers.) Have students form a circle. Explain that you will be passing around something to smell. Pass around one container at a time. When the container has gone all the way around the circle, let students guess the scent they smelled.
- *Moth-Bat Game.* Have your students form a circle. Explain echolocation. Have someone volunteer to be the bat. The bat is blindfolded and placed in the center of the circle. Have someone volunteer to be the moth. The bat says “bat” and the moth must answer immediately with “moth.” They move around the circle until the bat catches the moth. (You may wish to repeat this exercise until all have had a turn.)
- *Animal Ears.* Ask students to find a spot to sit quietly alone. Using hands cupped around their ears, listen for animal sounds. Have students stand in a circle. Have them cup their ears while one student talks to them. Then try listening normally. Once they realize the difference, have them cup their ears and listen for as many sounds as possible during a 45-second period. Talk about what they heard.
- *Disappearing Heads.* Have students stand in two rows facing each other about eight feet apart. Instruct them to stand completely still and stare at the face of the person across from them. (Their head should disappear.) Explain why their heads seem to disappear. Rods in the eyes see light and cones see color. When you stare straight ahead, you use the cones and ignore the rods. But at night, light is more important than color. In a sense, your eyes are turning off the light, making the object seem to disappear.

Suggested Post-Hike Activities

1. Have students brainstorm various occupations that require people to work during the night hours. Do their occupations require them to work inside a building with good lighting? Do they work outdoors at night? Why is it necessary for some people to work at night? Do people have special adaptations like nocturnal animals?
2. Ask students if they know of any occupation that requires people to work day hours in an environment where there is no sunshine? Tell students to close their eyes and pretend.

Your alarm clock goes off at six o'clock in the morning. You bathe, dress and start on your way. The sun is beginning to rise. You drive for forty-five minutes, meeting only a few cars along the highway. You are in a very rural area—the Chihuahuan Desert. You arrive at your job site and the sun is now shining brightly. You step onto an elevator to begin your work day. The elevator's first stop, and only stop, is 750 feet below the surface of the earth. There is absolute no natural lighting at your work site. You turn on your flashlight to find a switch. Who are you?

3. Introduce the park ranger you have invited to your school. The park ranger will share his/her total darkness stories with your students.



Make a Solar Hot Water Heater

Pre-Visit or Post-Visit Activity

Intermediate Level

Science (Unifying Concepts, Inquiry, Physical)

45-Minutes for Construction

Objective(s). Student will construct and operate a solar hot water heater and explain how it operates.

Related NM Content Standards with Benchmarks. SC2-E3, SC6-M1, SC9-M1

Method. Students design and construct a hot water heater.

Materials. 10 feet of flexible black tubing, shallow cardboard or wooden box (about 12" X 18"), a piece of glass to cover the box, flat black paint, black paper or black cloth for inside the box, spring-type wooden clothes pins, tape, 2 empty cans or buckets, thermometer, pencil, paper

Key Vocabulary. solar

Background. If you spend all your time underground while visiting Carlsbad Caverns National Park, you may not notice one of the park's most valuable and abundant resources—the sunshine which illuminates the surface of the park's almost 47,000 acres. In fact, the whole State of New Mexico has so much sunshine that in 1925, its citizens selected a flag design with the ancient Zia sun symbol against a yellow background.

Scientists estimate that the sunlight falling on the United States during a single summer day contains twice as much energy as our nation uses in an entire year. But how can we collect it? Solar energy is clean and available. In remote areas, sunlight is more practical and less costly than transmission lines. However, there are a few disadvantages connected with solar energy. First, it is only there on sunny days. Secondly, it is at its weakest in the winter when we need it the most. And lastly, collectors and storage devices are expensive. Nevertheless, the potential benefits outweigh the shortcomings.

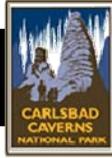
Every park ranger at Carlsbad Caverns carries three sources of light into the cave. If you are worried about the taxpayers footing the bill for large quantities of batteries, worry no more! Park rangers use energy from the sun to recharge their batteries.

Suggested Procedure

1. Cover the inside of the box with black paint, black paper or black cloth. Cut two holes on one side of the box. Loop the tubing back and forth inside the box. Both ends of the tubing should stick out of the sides of the box several feet.
2. Place the glass cover on the box. Secure it with tape.
3. Fill one bucket with water. Place the box and the bucket in full sunlight. Put one end of the tubing into the bucket of water. Place the other bucket under the opposite end of the tubing at a lower level. Suck gently on the end of the tubing to establish siphon action.

When the water starts to flow through the tubing, pinch the tubing with a clothespin to limit the water flow to a small trickle.

4. Note the temperature of the water. After a while, take the water temperature again. Is it warmer than the water before it goes through the water heater? Why? What would happen to the water temperature if it were slightly overcast? What would happen to the water if it moved faster through the water heater?



Moon Over the Classroom

Pre-Visit or Post-Visit Activity

Primary/Elementary Level

Science (Space)

45 Minutes

Objective(s). Students will identify the different moon phases and will describe an eclipse.

Related NM Content Standards with Benchmark. SC13-E1, SC13-M1

Method. Phases of the moon are demonstrated using a lamp (sun), a ball (moon) and student (earth).

Materials

- The Class: lamp with a 40-70 watt clear bulb (no lamp shade), extension cord
- Each Student: pencil, ball

Key Vocabulary. eclipse, moon phases

Background. There are five phases of the moon: new, crescent, half, gibbous and full. When the moon is in new or crescent phase, it is close to the sun. It takes about one month (29.53 days) for the moon to go from full to new and back to full again. Only during a new moon can an eclipse of the sun happen (solar eclipse). Only during a full moon can there be an eclipse of the moon (lunar eclipse). A solar eclipse occurs when the moon passes directly between the Earth and the sun and only lasts a few minutes. A lunar eclipse occurs when the earth casts a shadow on the moon. It can last a few hours.

During warm months, up to a thousand park visitors at Carlsbad Caverns National Park attend Bat Flight Programs each evening at sunset. Many visitors remain in the amphitheater after the bats disappear into the skies. They stay to enjoy brilliant stars, planets and the moon. Why does Carlsbad Caverns have such a magnificent night sky?

Suggested Procedure

1. Using the extension cord (taped securely to the floor to prevent tripping), set the lamp in the center of the room. Give each student a pencil and a ball. Have them poke the ball on the end of the pencil.
2. Explain to students that the lamp bulb represents the sun, the ball represents the moon and their head represents the Earth.
3. Turn on the lamp and arrange students in a circle around it. Have students hold the *moon* at arms length in front of them.
4. Ask students to move the ball a little to the left until they see a thin crescent light. Is the crescent facing the *sun* or away from it? (Make sure students are looking at the ball, not the light.)

5. Move the *moon* around the *earth* until exactly half of the *moon* is lit. Does the *moon* have to move away from or toward the *sun* to make it fuller?
6. Keep moving the *moon* until it is fully lit. (Students need to move the *moon* out of their head's shadow.) When the *moon* is full, is it between the *Earth* and the *sun*, or is the *Earth* between the *moon* and the *sun*?
7. Continue moving the *moon* in the circle until it is a quarter again and then a crescent. When the *new moon* appears, explain that the *moon* cannot be seen because it is so close to the *sun*. Also explain that from new moon to new moon is about one month. Repeat this exercise until students fully understand.
8. Create an eclipse by having students move their *moon* directly in front of the *sun* to create a shadow. Have students hold the *moon* in this position, but look around the room to see the shadows on other faces. Your head is the *Earth*, so only the people living where your eyes are, can see the eclipse. People on your chin do not see it. What phase is the moon just before or after a solar eclipse?
9. Create a lunar eclipse by moving the *moon* into the shadow of the *Earth*. What phase is the *moon* in just before or after an eclipse of the *moon*? Unlike the eclipse of the *sun*, everyone facing the *moon* can see the *moon* in an eclipse.