
FEATURE

Deserts: Expand your learning oasis



“What was your favorite animal at the zoo?” Ms. Johnson asks 4-year-old Trent, climbing into the van after the field trip.

“The Gila monster,” says Trent.

“Tell me about that,” Ms.

Johnson says. “What did you like about this lizard?”

“It’s big,” Trent says, holding his hands a foot apart to demonstrate its length. “And it’s a MONSTER,” he adds, raising his voice for emphasis.

“A bad monster or a good monster?” Ms. Johnson asks.

“A good monster,” Trent responds. “It can bite you but not if you don’t bother it. And its spit

helps sick people.”

“That’s right,” says Ms. Johnson. “You listened to what the docent told us.”



When the class returns to school, Ms. Johnson finds pictures of the Gila (pronounced hee-lah) monster on the Internet. Trent and other children peer at the laptop computer screen, noting the animal’s scaly body and tiny feet.

“Where does it live?” one child asks.

“It likes the desert,” Ms. Johnson says.

“What’s a desert?” another child asks.

“Good question,” says Ms. Johnson. “Let’s find out more about deserts and the other animals that live there.”



A curriculum unit on deserts offers an enriching experience for children. It suggests many possibilities to refresh play and learning centers—as well as revive drooping teachers.

What’s a desert?

Most of us think of deserts as hot, dry places with lots of sand.



Deserts are dry, all right. They get less than 10 inches of rain a year. But not all deserts are hot. They can get really cold at times, and some have boulders and rocky soil instead of sand.

Deserts have been around for millions of years, although their size and location have changed many times. What causes deserts to form is complex and not entirely known. One kind of desert occurs in areas with high atmospheric pressure that reduces humidity, leaving hot, dry air to settle or blow across a region. That's how the Sahara Desert was formed. Another kind forms near mountain ranges that block warm moist air from reaching the land on the other side. That's how deserts in the western United States were formed.

Desert creation, or **desertification**, can be increased by human activity. Overgrazing by cattle, over-irrigation that lowers the water table, and cutting down forests all destroy natural vegetation. That makes the soil erode, leaving nothing to hold moisture and making the land more arid.

Where are deserts?

The United States has four major deserts, all in the West. From north to south, they are:

- Great Basin, which covers most of Nevada and much of Utah;
- Mohave (pronounced mo-HA-vee), which consists mainly of a small section of southeastern California;
- Sonoran, which covers part of southern Arizona and southeastern California, most of the Baja California peninsula, and most of the state of Sonora in Mexico;

- Chihuahuan, which stretches from southern New Mexico and western Texas into Mexico.

For a map, see the website of the Missouri Botanical Garden, <http://mbgnet.net/sets/desert/ofworld.htm>.

Elsewhere in the world, one of the largest deserts is the Sahara in northern Africa that covers 3.5 million square miles. One of the driest is the Atacama Desert in northern Chile, which gets less than a half inch of **precipitation** a year, mostly from condensed fog—not rain. Other major deserts are the Gobi in China, the Arabian in the Middle East, and the Kalahari in southern Africa. Surprising as it may sound, geographers consider Antarctica, the continent around the South Pole, a desert because it gets so little rainfall.

Do you live in or near a desert? If your area gets less than 10 inches a year, you do. Don't confuse desert with **drought**. A drought is a period of abnormally dry weather that damages crops, reduces water supply, creates dust storms, and increases the chance of wildfires. Droughts—and floods—make up part of the normal changes in the water cycle, sometimes occurring in the same year. For more on droughts, see www.wrh.noaa.gov/fgz/science/drought.php?wfo=fgz.

What's your average annual rainfall? To compare your community with other parts of your state, see the U.S. Department of the Interior's National Atlas at www.nationalatlas.gov/printable/precipitation.html#list. Precipitation in Texas, for example, ranges widely, from 50-60 inches in the Beaumont area to 5

inches or less in El Paso.

Despite familiar images of sand dunes stretching as far as the eye can see, deserts can harbor a variety of plant and animal life. In some spots, fresh water springs permit plants and trees to grow, creating an **oasis**. Travelers can stop to rest at oases, and if the water is plentiful enough, people may choose to live there.

Ample information and resources on deserts are available in books and on the Internet. Online resources include the websites of New Mexico State University, <http://ddl.nmsu.edu/overview.html>, and the Arizona-Sonora Desert Museum, www.desertmuseum.org/kids/oz/long-fact-sheets/.

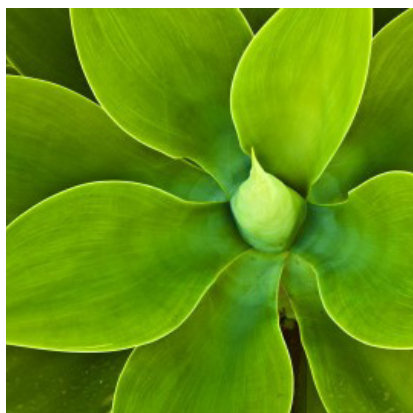
The information below, which applies largely to the southwestern United States, will give you a start.

Desert plants

Because all living things need water, plants and animals must be able to store water or survive on small amounts. Plants like the **cactus**, for example, store water inside their fleshy pads. Other plants like the **mesquite** tree have roots that spread wide or dig deep to reach water underground.



Plants with water-storage stems, leaves, or roots are commonly known as **succulents**. Perhaps the most well-known succulent is cactus, a plant family of many species. The **prickly pear cactus** grows spines that deter most animals from eating it. The **saguaro** (pronounced suh-WAR-oh) and the **barrel cactus** have ribbed or pleated sides that expand like a sponge after a rain and shrink during dry periods. The saguaro grows slowly, taking 20 years to grow from seed to a height of about 1 ½ feet. But it's also the largest cactus in the world, reaching 30 or more feet tall after 150 years. A comprehensive guidebook is *Cacti of Texas and Neighboring States* by Del Weniger (Austin: University of Texas Press, 1991).



Some people refer to all succulents as “cactus plants,” but many are actually members of the lily family. The **desert spoon**, or **sotol**, has a flower stalk up to 15 feet tall with tiny white blooms. A similar looking plant, the **yucca**, has a short flower stalk with cup-like flowers that look like big lilies-of-the-valley. **Agaves**, such as the **century plant**, have wide blue-gray leaves and bloom only once,

then die, leaving new offshoots around its base. For other plants native to Texas and the Southwest, see <http://aggie-horticulture.tamu.edu/ornamentals/nativeshrubs/indexcommon.htm#P>.

Another succulent, the **aloe**, is from an entirely different family, *asphodelacea*. It is commonly found in Africa and the Arabian Peninsula, although it is often available in U.S. plant nurseries. Its juice is used in treating burns and making lotion.

The **creosote bush**, which produces yellow flowers in spring and summer, survives desert conditions with waxy leaves that conserve water and tolerate high heat. The **desert fan palm**, one of a few palms native to the United States, is typically found in oases where it can access a constant supply of water.

Desert wildlife

Deserts have abundant insects and reptiles as well as a variety of birds and small mammals. Most animals are **nocturnal**, sleeping during the day and coming out only at night when it's cooler. Large mammals are rare, except for those that can store water and withstand the heat.

Among the insects are grasshoppers, which get most of their water from the plants they eat. They use their long hind legs not only to jump but also to climb plant stems and hang down to eat the leaves. **Honey pot ants** gorge themselves on plant nectar and regurgitate it when they return to the nest. Certain beetles in the Namib Desert in Africa stand on their heads when the fog rolls in, allowing the water vapor that

condenses on their bodies to slide into their mouths.

Insects provide food for **arachnids** (spider family, pronounced a-RACK-nids), notably scorpions and tarantulas. Scorpions use their stinger tails for self-defense, and tarantulas use barbed hairs on top of their abdomens for the same purpose. Arachnids get almost all the water they need from the fluids in the insects they eat.



Reptiles are well adapted to desert life because their scales prevent water loss through the skin. They get most of the water they need from the food they eat. They are **cold-blooded**, which means their body temperature changes with that of the environment. When they need refuge, they can seek the shade of plants or crawl into a hole. One large reptile, the **desert tortoise**, spends 95 percent of its time underground.

An eye-catching reptile in the deserts of the Southwest and Mexico is the **Gila monster**. This lizard produces a venom in its lower jaw that helps it kill prey (but is rarely fatal to humans). In recent years, a component of the lizard's saliva has been used in making a medicine to treat diabetes. (For more information about this drug, visit the website of the

University of Texas Health Science Center at Houston, www.healthleader.uthouston.edu/archive/Diabetes/2006/fewgood-monsters-1115.html)

Among the most dangerous reptiles to humans are rattlesnakes, so named because of the rattle at the end of the tail. The majority of species live in the desert Southwest, but they can be found all the way from southwestern Canada to Argentina. **Sidewinders** are the smallest rattlesnakes at about 2 feet long. Their name refers to the way they move along the ground in a sideways motion.

A much-fabled desert bird is the **roadrunner**, which can scurry along the ground at up to 15 miles an hour. It eats insects, lizards, snakes, and mice. **Ravens**, shiny black birds about the size of hawks, eat plants, insects, and small reptiles. **Vultures**, commonly called buzzards, feed on carcasses of dead animals, thus serving as the clean-up crew in the desert as they do almost everywhere.

Deserts provide homes for numerous small mammals. **Rodents**, which include mice, rats, and ground squirrels, are hunted by many animals but keep their numbers up by breeding prolifically. **Kangaroo rats** are especially adapted to the desert because they never need to drink water. **Jackrabbits** have enormous ears and rely on speed to escape predators.

Coyotes eat small prey, often the babies of larger animals such as sheep and buffalo. They are expanding their range in the United States, despite human efforts to kill them. **Javelinas** (pronounced ha-va-LEE-nahs), also known as **peccaries**, resemble

large pigs. They feed on roots and will eat prickly pear cactus, spines and all.

Mule deer, so named because of their large mule-like ears, browse on mesquite leaves and grasses. **Bighorn sheep** prefer rocky cliffs and canyons. Their large stomachs allow them to store water for several days.

The **camel**, often a symbol of the desert, does not truly belong in this discussion because it's a domesticated animal. There are two species: the one-humped, or **dromedary**, camel native to the Middle East and western Asia, and the two-humped, or **Bactrian**, camel native to Central and East Asia. Interestingly, the U.S. military experimented with camels as a mode of transportation in the Southwest in the late 1850s. For more information about this experiment, visit the website of *The Handbook of Texas*, www.tsha-online.org/handbook/online/articles/quc01.

Learning centers

Introduce the desert unit to children with a field trip to a zoo or by showing a video or photographs at group time.

One example of a video that introduces children to deserts is *Ecosystems for Children: Deserts and Grasslands*. 2005. Wynnewood, Pa.: Schlessinger Media. Preview the DVD in advance and choose appropriate sections to show children.

Photos of landscapes in the four major U.S. deserts are available at the Life Science Museum at Brigham Young University, <http://mlbean.byu.edu/Portals/26/docs/Desert%20Communities.pdf>.

Sand and water center

Make a desert landscape

After viewing videos or photos of desert landscapes, ask children questions, such as: "What kinds of plants grow there? What kinds of animals might live there? What do you see in the distance?" Ask children to describe the soil by color, sandy versus rocky, and ground cover.

Invite children to create their own desert landscapes in the sand play area. Offer dirt and rocks as an option to sand, and provide animal and people figures as well as toy vehicles.

Do a dune

Show children images of sand dunes in books and on the Internet. Sample sites are:

- Monahans Sandhills State Park, Texas, www.tpwd.state.tx.us/spdest/findadest/parks/monahans_sandhills/
- Great Sand Dunes National Park, Colorado, <http://travel.nationalgeographic.com/travel/national-parks/great-sand-dunes-national-park/>
- Coral Pink Sand Dunes State Park, Utah, <http://stateparks.utah.gov/parks/coral-pink/video>

Ask questions, such as "What's a sand dune? What's its shape and color? What would it be like to visit a park with sand dunes? How are sand dunes formed?" Invite children to shape sand dunes in the sand play area.

Take a closer look

Invite children to look at a few grains of sand under a magnifying glass. Ask children to describe the

sand grains by color and shape. Ask how sand may have been formed (breaking up of rocks).

To extend the activity, find images of sand grains magnified 250 times at <http://inspiration-green.com/magnified-grains-of-sand.html>.

Science center

Make a rain gauge

Besides giving children practice in measuring rainfall, this activity can introduce fractions. Rainfall is usually measured in tenths of an inch, but quarter- and half-inch measurements will be enough to get children started.

Take time to demonstrate simple fractions using yarn and a ruler. Measure and cut an inch of yarn, then cut it in **half**, noting that two halves make a **whole** inch. Cut each half in two, making **fourths**, or **quarters**, noting that four fourths make a whole inch.

Here's what you need:

- cylinder-shaped, clear plastic jar, such as pint milk container

- funnel wide enough to cover the mouth of the jar
- clear, waterproof tape
- ruler
- permanent marker
- water

1. Clean and dry the jar, inside and out. If using a pint milk container, cut off the top 2 inches to make the cylinder the same diameter from top to bottom.
2. Affix a length of tape vertically to one side of the jar.
3. Hold the ruler level with the bottom of the jar, and mark off quarter- and half-inches on the tape with the permanent marker.
4. Place the funnel in the top of the jar.
5. To provide practice, pour a little water into the jar several times and invite children to observe the amounts.
6. When your local TV meteorologists predict rain, place the rain gauge outdoors in an open area (not under trees or roof overhangs). Place it in a box on the ground or other secure setting where it won't be tipped or

blown over.

7. Have children observe the rainfall amount, and record it in a notebook. Talk with children about the results. A light rain may produce less than a quarter-inch, while a heavy rain may produce as much as an inch. Compare your results with the local weather report. Empty the jar after each use. Note: A *trace* is defined as less than five-thousandths of an inch.
8. Add up the rainfall amounts during a month. Is the amount more or less than the average monthly rainfall in your area? Talk with children about the impact of too little or too much rain.

Variation: Buy a rain gauge from a local garden or home supply center. Talk with school-age children about rainfall amounts in tenths of an inch.

Plant a non-prickly cactus

An outdoor planting gives children an opportunity to dig in the dirt and get dirty themselves.

PHOTOS BY SUSAN GAETZ



Contrary to popular belief, cactus cannot live in sand alone. You will need existing soil (or potting soil) and a small amount of sand and pebbles to promote drainage.

Talk with a nursery expert to find a spineless cactus that will grow well in your area. For a list of varieties, see the website devoted to the work of California horticulturist Luther Burbank at <http://lburbank.users.sonic.net/about-us/specialty-gardens/spineless-cactus>. Some cactus can withstand low temperatures, but regular drops below 32 degrees Fahrenheit can make the water inside the pads freeze. When freezing weather is expected, drape canvas or plastic over the cactus to help shield it from the cold.

Here's what you need:

- spineless cactus in a container
 - shovels
 - sand
 - gravel
 - small rocks for topping
 - large rocks or bricks for a border
 - camera
 - dowel or stick
1. Show children the cactus plant. Ask questions such as "What kind of plant is this? Where does it usually grow?" Ask children to describe its color, shape of pads, and texture. Be careful in handling because some spineless plants may still have a few spines that will be hard to see.
 2. Explain that you will plant the cactus in the play yard. Ask: "What does this plant need to grow? Where in the yard shall we plant it?" Cacti thrive in full sun, but a bit of shade won't hurt because cacti get occasional shade from other plants in their

native habitat. If possible, chooses a higher elevation site that will drain water, or plan to build up the site slightly.

3. Invite children to mark off a planting site about 2-feet square. Provide shovels and encourage children to begin removing grass and weeds and loosen the soil. Keep the camera handy and photograph the children as they work.
4. If you live in an arid area, the existing soil may work well. If not, have children scoop out about 6 inches of the top soil that you may use elsewhere. Invite children to add sand and gravel so that you end up with about 2 parts soil, 2 parts sand, and 1 part gravel.
5. Have one child make a hole in the soil about the width and depth of the container. Remove the cactus plant from the container, keeping as much of the soil clinging to its roots as possible, and place it in the hole. Tamp it into place.
6. Have children water the plant just enough to moisten the soil. Demonstrate how you will determine when to water by inserting a dowel into the soil. If it brings up moist soil, don't water. If it comes up dry, water the cactus.
7. Invite children to place small rocks around the base of the plant and large rocks around the edges to make a border.
8. Talk with children about the experience: "Why did we choose this spot? How is a cactus different from other plants in the yard? Will it get enough sunlight? How will we know when to water it?"
9. Take a close-up photo of the

cactus for later comparison. Record the date and the children's comments about the experience.

10. Encourage children to monitor the cactus every month or so. Compare the cactus with the photo, and note any changes. If the cactus develops problems, invite a gardener to visit and make a diagnosis.
11. Watch the cactus closely in the spring to see if it will produce a flower. The flower will then form a fruit, known as a *tuna* or *pear*. Cut open the pear to find seeds. Also in the spring, plan to give the cactus a once-a-year dose of fertilizer.

Reading center

Read aloud about deserts

Stock your reading center with books about deserts from your local library. See the list at the end of this article. Choose a different book to read aloud at group time every day. After reading, ask questions about the characters and the scenery.

Some books will lead naturally to activities in other learning center. *Roadrunner's Dance* will provide inspiration for imaginative art projects, for example, and *Way Out in the Desert* will reinforce the skill of counting from 1 to 10 with rhyming text about desert animals.

Re-tell a story

Use a color printer to photocopy pages from a fictional story such as *The Three Little Javelinas* (a retelling of *The Three Little Pigs*) or *The Seed and the Giant Saguaro* (based on the cumulative structure of *The House That Jack Built*).

Cover each page with adhesive-backed paper and place them randomly in a basket. Invite children to place the pages in sequence.

Which is it?

Here's what you need:

- 2 index cards
- black marker
- glue
- photos, about 1-inch square, one of a desert landscape and the other of strawberry shortcake (see <http://allrecipes.com/Recipe/strawberry-shortcake/detail.aspx>).

1. Write the word *desert* on one card, and *dessert* on another card. Glue the photos on the appropriate cards.
2. Show children the cards and say each word aloud. Ask the children what's different about the two words. Sound out each word to emphasize the difference in pronunciation. Ask children if they can see a difference in the way the two words are spelled. Acknowledge that the word with one S refers to a dry area of land, and the word with SS refers to what you eat, like strawberry shortcake.
3. As you read a book about a desert, ask children to listen for the word *desert* and raise their hands when they hear it.
4. Display the cards on a bulletin board.

Art center

Desert sculpture

Desert landscapes and wildlife can inspire many art projects, from painting and collage to sculpture. In the play dough activity below, encourage children

to be as realistic or as imaginative as they wish.

Here's what you need:

- color photos of desert plants and animals
- play dough
- food coloring
- small containers for mixing colors of play dough
- plastic knives
- tissue paper scraps in different colors
- toothpicks broken in half

1. Invite children to choose a desert plant or animal and fashion it out of play dough. They can add food coloring to a lump of dough to achieve the desired color.
2. Encourage children to use a plastic knife to create an animal's face and body patterns or to mark ribs in the sides of cactus. They can crumple tissue paper for flowers and insert toothpicks to represent spines.

Manipulatives center

Desert puzzles

With the Internet and a color printer, you can create a variety of puzzles and games. Two examples:

- Print out a simple photo of a Gila monster or a saguaro, cover both sides with clear, adhesive-backed plastic, and cut it into pieces to make a puzzle.
- Print out photos of desert animals, glue them on index cards, and invite children to sort by type (insect, arachnid, reptile, mammal). Or make duplicates of photos and have children match the pairs.

Dramatic play center

Create an oasis

Place a large cardboard box in the home center to represent springs or a water well. Inside the box place a stool or small table with a pitcher of water and cups. Add props such as large potted palms, straw baskets, sun hats, sunglasses, and paper fans. Offer a variety of dried fruits, such as figs, apricots, and raisins for children to eat.

Make squash soup

The Pueblo peoples of the Southwest, as well as other Native Americans, cultivated corn, beans, and squash. They chose moist areas of land for farming and relied on summer rains for water. Eventually they learned to divert water from streams to their fields to irrigate their crops.

They ate squash prepared in many ways: roasted in hot coals, sliced and boiled, and sun dried. The recipe below uses butternut squash, a bell-shaped variety available year-round. The soup will be bright orange and taste like sweet potatoes.

To learn about other authentic native foods, see the University of Kansas American Indian Health and Diet Project, www.aihd.ku.edu/foods/southwest.html

Butternut squash soup

- 1 butternut squash
- 1 large yellow onion
- 3 large carrots
- 4 cups of broth, vegetable or chicken
- salt and pepper
- 1 cup orange juice (optional)
- food processor or blender

Scoop out the core of seeds in the squash. Peel the squash and cut it into small squares. Chop the onion. Cut up the carrots. Place the vegetables and broth into a large soup pot. Cook for about an hour or until tender. Ladle the hot mixture into a food processor or blender, and blend until smooth, about the consistency of applesauce. If too thick, add more broth or stir in orange juice. Season with salt and pepper to taste. Let the soup cool slightly before serving. If desired, top each cup or bowl with a sprig of cilantro or a slice of bell pepper.

Books for children

- Anaya, Rudolfo. 2000. *Roadrunner's Dance*. New York: Hyperion. Illustrations by David Diaz.
- Dunphy, Madeleine. 1995. *Here Is the Southwestern Desert*. New York: Hyperion. Illustrations by Anne Coe.
- Johnson, Rebecca. 2001. *A Walk in the Desert*. Minneapolis: Carolrhoda Books. Illustrations by Phyllis V. Saroff.
- Lesser, Carolyn. 1997. *Storm on the Desert*. New York: Harcourt Brace. Illustrations by Ted Rand.
- Lowell, Susan. 1992. *The Three Little Javelinas*. Flagstaff, Ariz.: Rising Moon. Illustrations by Jim Harris.
- Marsh, T.J. and Jennifer Ward. 1998. *Way Out in the Desert*. Flagstaff, Ariz.: Northland Publishing. Illustrations by Kenneth J. Spengler.
- Rabe, Tish. 2011. *Why Oh Why Are Deserts Dry?* (The Cat in the Hat's Learning Library®). New York: Random House.
- Serafini, Frank. 2008. *Looking Closely Across the Desert*. Tonawanda, N.Y.: Kids Can Press.
- Wadsworth, Ginger. 1997. *Desert Discoveries*. Watertown, Mass.: Charlesbridge. Illustrations by John Carrozza.
- Ward, Jennifer. 2003. *The Seed and the Giant Saguaro*. Flagstaff, Ariz.: Rising Moon. Illustrations by Mike Rangner. ■