

SAN DIEGO NATURAL HISTORY MUSEUM



COAST TO CACTUS IN SOUTHERN CALIFORNIA

Curriculum and Lesson Plan Resource Guide Grade 4



www.sdnat.org/coasttocactus

Desert at night

Shaped by searing heat and very little rainfall, southern California's deserts are home to a rich variety of life—and a raw beauty—that you might not expect. From vast sand dunes and rocky slopes prickling with cactus to palm-shaded oases this environment might seem void of life. Lots of animals such as snakes, birds and mountain lions live in the desert. Many of them are rarely seen during the day because of scorching temperatures, but it gets cooler at night. The desert comes alive at night! It is full of sounds and nighttime hunters. Every animal that lives in the desert has unique adaptations and behaviors that help it to survive in the harsh conditions of the desert.



Guiding Question: What internal or external features do animals have that help them survive in the desert at night?

Activity: This activity can be done by students working independently or by students working in groups.

- 1) Ask students what they know about the animals that live in the desert.
- 2) Make a list of ideas that students present.
- 3) Assign each student (or pair of students) one of the animals listed in the chart below. All of these animals live in the deserts of southern California.
- 4) Have students use computers and the internet to find information on their assigned animal.
- 5) Students should make notes regarding the special features each animal has that help it survive the high temperatures, survive the scarcity of water, help them catch their prey or get away from predators.
- 6) After the research is complete, students should make a presentation to the class about their assigned animal. Students can use a variety of methods in their presentation: PowerPoint, Prezi, posters, stuffed animals, drawings, pictures cut from magazines, etc.
- 7) During a visit to the museum, challenge students to locate the animals in the exhibition and to notice the features that they learned about during their research.
- 8) Back in the classroom, refer to the list made at the beginning of this lesson and ask students to add new information they learned.

Standards: Grade 4

For details see page #1-2 of CA's NGSS for K -12
<http://www.cde.ca.gov/pd/ca/sc/documents/ngss-ca-gr4-dci.doc>

Performance expectation: 4-LS1-1.

Science & Engineering Practices:	Disciplinary Core Ideas	Crosscutting Concepts:
Construct an argument with evidence, data, and/or a model.	LS1.A: Structure and Function Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.	Systems and System Models.

Interdisciplinary Common Core Connections:

SL.4.5 W.4.2 W.4.7 W.4.8 RI.4.1



This is a pre-visit activity

What's the point?

In this activity, students examine the features that animals must have to survive in desert conditions.

Students learn behaviors that animals use to escape the high temperatures during the day and cope with the low temperatures at night. Students learn that deserts are teeming with life...life that is most active at night.

Science Concepts: In any environment, animals must have specific adaptations (internal and external structures) that serve various functions. Adaptations help animals survive harsh conditions such as times of drought, scarcity of food, and attacks from predators. Animals have many different ways to survive: The type of skin or amount of fur, claws or sticky toe pads or hooves. Some animals can hear far distances because of the size of their ears, some can see better during the dark hours because of the structures lining their eyeballs. Some can dig deep into the ground for protection, some animals have strong legs that help them jump away or run fast from predators. Most animals have coloring that helps camouflage them by making them blend in to the muted colors found in the desert.

Materials:

- List of desert animals (see below)
- Access to computers linked to the internet

Advance Preparation:

- Reserve computer lab.
- Assign an animal to each student.

Key words:

- Desert habitat
- Adaptations
- Behaviors
- Rainfall
- Plants and animals
- Hands on and feel of outdoors
- Predator
- Prey

Supplemental materials available from our Nature to You Loan Program: 619.255.0236 or loanprogram@sdnhm.org

- California Lyre Snake
- Chuckwalla
- Rattlesnake
- American Badger
- Coyote
- Kangaroo Rat
- Pallid Bat
- Barn Owl
- Great Horned Owl
- Hooded Oriole
- Loggerhead Shrike

Websites with activities and more information on this topic:

<http://kids.nationalgeographic.com/animals/>

<http://www.desertusa.com/animals.html>

List of Animas Found in Southern California Deserts

Badger	Granite Spiny Lizard
Banded Rock Lizard	Hooded Oriole
Banded Gecko	Horned Lizard
Barn Owl	Le Conte's Thrasher
Bighorn Sheep	Lesser Night Hawk
California Tree Frog	Loggerhead Shrike
Canyon Wren	Lyre Snake
Chuckwalla	Mountain Lion
Common Poorwill	Pallid Bat
Costa's Hummingbird	Ringtail
Desert Hairy Scorpion	Rock Wren
Desert Iguana	Scott's Oriole
Desert Kangaroo Rat	Speckled Rattlesnake
Gambel's Quail	Western Banded Gecko
Giant Hairy Scorpion	Western Pipistrelle
Glossy Snake	White-tailed Antelope Squirrel
Great Horned Owl	

Fire, floods, and mudslides

As any local can attest, fires are a part of life in southern California. The virtual storybook in-the-round exhibit illustrates how land is affected by wildfires. Green chaparral scrub covers more than 20,000 square miles of California's hillsides. It's a habitat shaped by drought, mostly made up of plants that can withstand months without water and months without water can mean fire. Natural fires that happen every 30 years or so help keep chaparral habitat healthy. More frequent wildfires destroy the vegetation and shallow roots that hold together soil which absorbs rain water. As heavy winter rains sweep over southern California they can trigger flash floods and mudslides on land recently damaged by wildfires. Since wildfire removes the vegetation, there is nothing to anchor the soil, so the rains loosen it and carry it away. Humans cannot eliminate hazards, such as mudslides, but we can take steps to reduce their impacts.



Guiding Question: How can humans reduce the impacts of wildfires?

Activity: This activity is best done as a demonstration by the teacher.

- 1) Explain to students that models are not perfect examples of events; they are imitations that help us understand science concepts and how things relate to each other.
- 2) Place "mud hill" made during advance preparation (see next page) on a tray or in large plastic container.
- 3) Place "houses" on the top, the sides and at the bottom of the hill as seen in figure 1.
- 4) Place rocks only on one side of the hill.
- 5) Place "trees" on the same side of the hill that has rocks and make certain the "roots" are in the soil to represent deep root systems. On the side without rocks, place trees on top of soil (shallow roots).
- 6) Explain that the side of the hill with no trees or rocks represents a hill damaged and cleared by wildfire.
- 7) Ask students to write down what they predict will happen on each side of the hill when it "rains."
- 8) Hold bottle of water over the center- top of the hill and allow the water to flow through the holes to simulate rain. A loose cap make rain fall faster.
- 9) After they have observed the demonstration, have students check their predictions and compare them to what actually happened.
- 10) Initiate a discussion about why one side of the hill lost more soil than the other side. (Roots and rocks hold the soil.)
- 11) Have students draw a diagram of the experiment and write an explanation of how the rain affected the soil on both sides of the hill. Also, have students write about how we can reduce impacts of wildfires.

Standards: Grade 4.

For details see pages #7-8 of CA's NGSS for K -12
<http://www.cde.ca.gov/pd/ca/sc/documents/ngss-ca-gr4-dci.doc>

Performance expectation: 4-ESS3-2

Science & Engineering Practices:	Disciplinary Core Ideas	Crosscutting Concepts:
Constructing explanations and designing solutions.	ESS3.B: Natural Hazards.	Cause and Effect. Interdependence of Science, Engineering and technology.

Interdisciplinary Common Core Connections:

RI.4.7 W.4.2 MP.2

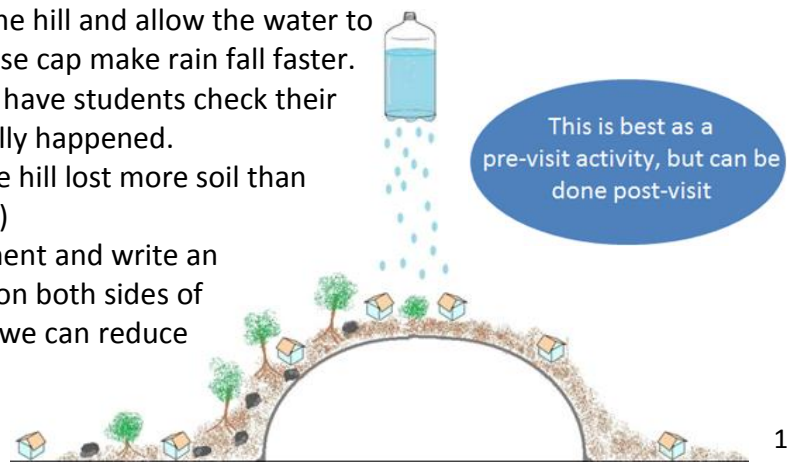
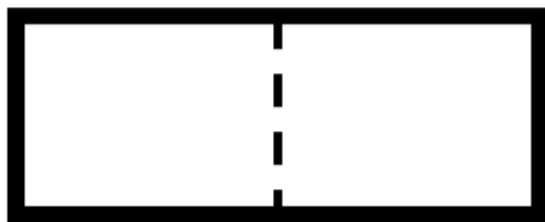


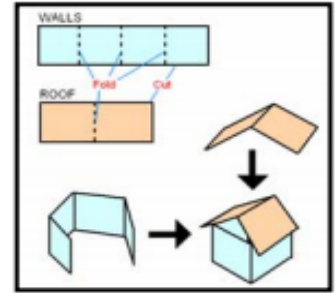
Figure 1



← walls



← roof



What's the point? During this activity, students gain an understanding of how wildfires contribute to mudslides. **Students learn** that the roots of vegetation such as trees and bushes hold the soil to reduce the amount of soil carried away in a mudslide after heavy rains. Wildfire results from natural processes; wildfires also destroy vegetation. Lack of vegetation combined with heavy rain results in mudslides on the sides of hills damaged by wildfires. More of the soil on the side of the hill without trees and rocks should have been swept away with the “rain.”

Science Concepts: Students learn how to use a model to increase their understanding of events that occur on a larger scale in nature. Students also learn how to identify the causes and effects of an occurrence, such as a mudslide. Some plants and trees have shallow root systems while others have deeper root systems. Wildfires destroy the plants above ground and even the shallow root systems below ground. Plants with root systems deeper below ground may lose stems and leaves above ground, but their root systems can survive because they are deep in the soil which protects them from the fire and extreme heat above ground. The deeper root systems also hold onto soil, in effect clumping it together, so that when rains pass over the area not as much soil is carried away (eroded). This effect minimizes, or can even eliminate, the damage caused by mudslides. By planting trees and other vegetation that have deep root systems on the side of hills, humans can reduce the impact that wildfires have on mudslides.

Materials:

- Mixing bowl (or similar)
- Plastic container/tray larger than mixing bowl
- Dirt or soil
- One 2 liter bottle
- Room temperature water
- Scissors
- Coffee mug
- Card stock or cardboard
- Plastic aquarium plants (or use chenille stems to make trees – “advance preparation” section)
- Green construction paper or cotton balls
- Rocks (Various sizes)

Advance Preparation:

- 1) Invert bowl and place in plastic container or on tray. Create mud hill by packing dirt on and around it as in figure 1 above.
- 2) Poke holes in the bottom of the bottle. To fill it with water, submerge it in a sink filled with water then cap while it is still submerged. Store bottle with cap down in a coffee mug with holes up until ready for use so as to not spill water.
- 3) Construct cardboard houses using template below.
- 4) Buy plastic “trees” (small aquarium plants will work) or make some out of chenille stems. (Figure 2)
- 5) Gather rocks of various sizes no larger than houses.

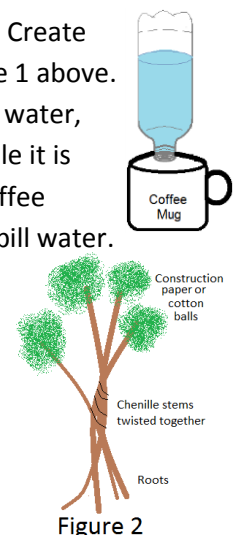


Figure 2

Key words:

- Hazard
- Mudslide
- Vegetation
- Roots
- Erosion
- Chaparral

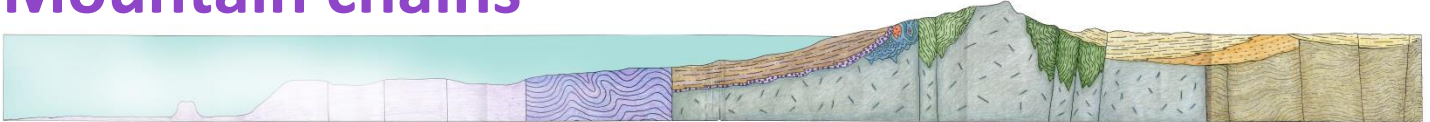
Websites with activities and more information on this topic:

- http://interwork.sdsu.edu/fire/resources/fire_education.htm (SDSU Fire Education and habitats in southern California)
- <https://www.youtube.com/watch?v=6tSnA9l6uL4> (a similar demonstration of mudslides)

This lesson adapted from:

https://www.teachengineering.org/view_activity.php?url=collection/cub_/activities/cub_natdis/cub_natdis_lesson05_activity1.xml

Mountain chains



In southern California, as you travel from the ocean to the mountains, you move from land that is below sea level to mountains over 11,000 feet high. This change in elevations in our landscape was caused millions of years ago by the movement of tectonic plates that make up the Earth's crust. Part of the land that makes up California is on the North American plate and part is on the Pacific Plate. Millions of years ago these two plates met and collided under the Pacific Ocean just off the coast of California. Tectonic plates move 1-2 inches each year. Over millions of years the mountain chains formed through a process called uplift. Today, in southern California the plates do not collide; they slide past each other. The San Andreas Fault marks the location where the two plates meet. A topographical map, such as the one at the entrance to the Coast to Cactus exhibition, is contoured so that you can feel the height difference between low coastal areas and high mountain areas. Large-scale system interactions millions of years ago resulted in the building of mountains in patterns found in predictable locations.

Guiding Question: Why do the mountains in southern California seem to make a pattern that runs along the Pacific Ocean?

Activity: This activity can be done as a demonstration by the teacher followed by students working with partners.

- 1) Explain to students that models are not perfect examples of events; they are imitations that help us understand science concepts and how things relate to each other.
- 2) Show students this map of mountain ranges in California:

<http://www.calrecycle.ca.gov/eei/UnitDocs/Maps/Environment.pdf>

- 3) Focus on the mountains in southern California (south of Point Conception) and ask students why they think the mountain ranges are lined up and run parallel to the ocean.
- 4) Have students discuss their ideas with a partner and write down their predictions.
- 5) Demonstration: Place two wash cloths side by side on a flat surface at an angle to represent the orientation of the southern California coast to the Pacific Plate (Figure 1).
- 6) Hold the wash cloth on the right so that it does not move, while pushing the washcloth on the left away from your body to simulate movement in a northerly direction (Figure 1).
- 8) The edges of the cloths should rise upward mimicking how land is pushed up to form mountains.
- 9) Have students check their predictions, then lead a discussion on how mountain building occurred along California's southern coast millions of years ago; point out that plates move only 1 or 2 inches each year.
- 10) Have students draw and label a diagram of the demonstration (Similar to Figure 1 or 2) and write an explanation of what process created mountains in southern California including why they are located parallel to the coast.

Standards: Grade 4

For details see page #5-6 of CA's NGSS for K-12

<http://www.cde.ca.gov/pd/ca/sc/documents/ngss-ca-gr4-dci.doc>

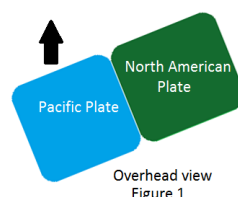
Performance expectation: 4-ESS2-2

Science & Engineering Practices:	Disciplinary Core Ideas	Crosscutting Concepts:
Analyze and interpret data.	ESS2.B: Plate Tectonics and Large-Scale System Interactions.	Cause and Effect. Patterns.

Interdisciplinary Common Core Connections:

RI.4.7 W.4.7 W.4.8 SL.4.5

This activity can be done pre-visit or post-visit



Overhead view
Figure 1

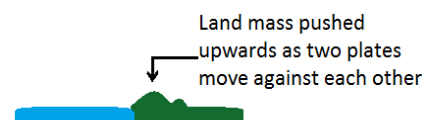


Figure 2: Side View

What's the point? During this activity, students use a model to discover one way that mountains are formed when two tectonic plates collide. In this case, an oceanic plate collides with a continental plate. **Students learn** that mountain ranges are created in a predictable pattern along the coastal edges of a continent when two tectonic plates collide.

Science Concepts: The movement of the tectonic plates that make up the Earth's crust act on a large scale and result in the formation of mountain ranges. When the plates move towards each other, the oceanic plate is pushed beneath the continental plate. The crust (soil and rocks) at the edge of the continental plate is forced upward as the large land masses collide. This process takes millions of years and is on-going.

Materials:

- Map of California that shows locations of mountains
- Blue construction paper
- Brown washcloth (or piece of fabric at least 5"x5")
- Grey washcloth (or piece of fabric at least 5"x5")
- Tape

Advance Preparation:

- Gather materials

Key words:

- Elevation
- Tectonic plates
- Earth's crust
- oceanic crust
- continental crust
- mountain chain
- continent
- topographical map

Supplemental materials available from our Nature to You Loan Program: 619.255.0236 or loanprogram@sdnhm.org

- Topographical map of San Diego County

Websites with activities and more information on this topic:

<https://www.youtube.com/watch?v=loFxYSHxTf0> a brief animation of mountain building when plates collide

http://commons.wikimedia.org/wiki/File:California_Coast_Ranges.png Map of mountains in California