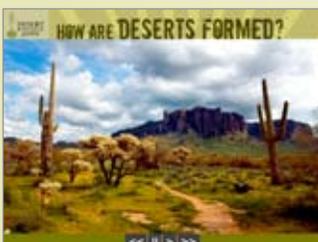


What is a Desert tutorial



How are Deserts Formed tutorial



Virtual Habitat

WHAT IS AVAILABLE HERE?

- **What is a Desert?**- A flash animation tutorial that teaches students about the three characteristics of a desert
- **How are Deserts Formed**- A flash animation tutorial that teaches students about how deserts are formed
- **Virtual Habitat**- An interactive exploration of the Sonoran desert plants and animals
 - Discussion questions
 - Classroom activities
 - Design Your Own Experiment
 - Water Brochure
 - Directly Heated
 - What is Wind?
 - Food Chains
 - Desert Poem
- Necessary worksheets (plus general, optional use Desert Investigation Log and Experiment Log)
- Relevant Arizona State Standards for First Grade

These questions and activities are designed to let students think creatively and to inspire curiosity about the world around them.

OBJECTIVES

The objectives of this curriculum are to

1. Educate students about the Sonoran desert
2. Encourage students to ponder and respect the natural world
3. Encourage students to begin thinking in terms of the Inquiry Process as they observe, ask questions, and formulate hypotheses

BACKGROUND KNOWLEDGE

These are concepts that the educator should understand and that can be found in the glossary.

Bimodal

Interior effect

Nocturnal

Dormancy

Global Air Movement

Rainshadow

Estivate

Legume Tree

Hibernate

Niche

MATERIALS

Paper

2 metal bottle lids/ group

Pencils

Lamp with bulb

Markers

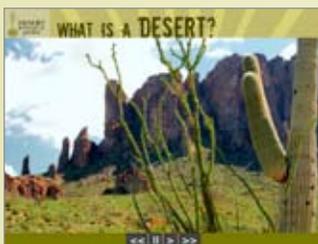
Talcum powder

Worksheets

Scissors

WHAT IS A DESERT?

TUTORIAL QUESTIONS AND ACTIVITIES



What is a Desert tutorial

DISCUSSION QUESTIONS

1. *Present the students with this question before the tutorial begins so that they know what to look for.

Listen for the three characteristics of a desert. What is the Sonoran Desert and where is it located? What is unique about the Sonoran Desert?

2. The tutorial informed us that there are four deserts in North America. Do you know where the other deserts are located or what their names are?

All four deserts in North America are in western United States or Mexico. The Sonoran Desert is in Arizona, California, and Mexico. The Great Basin Desert is in Nevada and parts of Utah, Arizona, Idaho, and Oregon. The Mojave Desert is in parts of California, Nevada, and Arizona. The Chihuahuan Desert is in parts of New Mexico, Texas, and Mexico. You could also tell students that Arizona is special because the Great Basin Desert, Mojave, and Sonoran Deserts all meet in western Arizona

3. While there are three other deserts in North America, the Sonoran Desert is the only one in which two rainy seasons occur. In what ways might the two rainy seasons impact the desert and make it different from the other deserts?

Having two rainy seasons contributes to the great variety of life in the Sonoran Desert. This desert is the most diverse desert in North America, both in plant form and in plant type. Sixty species of mammals, 20 species of amphibians, 100 species of reptiles, and 350 species of birds, and over 2000 species of plants exist in the Sonoran Desert. The Sonoran Desert is known for having tall columnar cacti as well as leguminous trees like the Mesquite and Ironwood. Two rainy seasons also provides many plants and animals with an additional opportunity to collect and use the rainwater.

4. Monsoon rains can be exciting in the Sonoran Desert, however they can make washes a dangerous place to be. What are some things that people living in the desert need to consider when monsoon season approaches? Are people living in urban areas vulnerable to the same issues?

Washes channel rain water and can be especially dangerous during monsoon season. Most of the year washes appear to be just part of the desert landscape, but after a summer monsoon they can quickly become flooded, dangerous places. Because desert ground is so dry and hard, little rain water soaks into the ground. Instead it is rapidly channeled downstream in the desert washes. This creates flashfloods which can carry away cars!

continued

WHAT IS A DESERT?

TUTORIAL QUESTIONS AND ACTIVITIES



What is a Desert tutorial

DISCUSSION QUESTIONS *continued*

People living in the desert, regardless of being in an urban setting or a rural setting need to be aware of the location of desert washes during monsoon season. One way to prepare for these seasonal bursts of flooding is to refrain from building roads in washes. Developing bridges or alternate routes around washes will ensure that travelers are safe during those brief summer storms and will avoid expensive repairs to the damaged road.

Review- What are the three characteristics of a desert? What is the name of the desert we are learning about?

Students are learning about the Sonoran Desert. The three characteristics of a desert are less than ten inches of rain per year, extreme temperature differences from night to day, and high evaporation.

ACTIVITIES

1. Design your own Experiment - This tutorial taught us about the three characteristics of a desert. Now we can design and test an experiment to determine whether or not we might live in a desert.

The purpose of this activity is for students to use the Inquiry Process as they design and perform an experiment. They could do this activity in groups of two or three. Each group should focus on one characteristic of a desert to design an experiment around. Then they will plan their experiment, accounting for materials needed, space, and anything else. They should write up a formal outline of their whole process using the provided worksheet. Each group will perform one experiment related to deserts, but will also design and plan for one other experiment (without performing this one). Suggestions for experiment topics include but are not limited to evaporation, temperature extremes, rainfall, humidity, and dew point.

2. Water Brochure - We learned that deserts are places with limited water. All living things need water including plants, animals, and people. Since water is limited in the desert, it is important for people who live in the desert to be aware of how much water they use and to try to conserve water. What are some things that people living in the desert can do to limit their water use? As a class, discuss solutions to this issue. Then individually, create an informational public brochure that will educate people about smart water use.

The purposes of this activity are for students to understand an important issue in today's world and to connect that they can make decisions that will improve the situation. Then they will also have the chance to share what they learned and create an informational brochure.

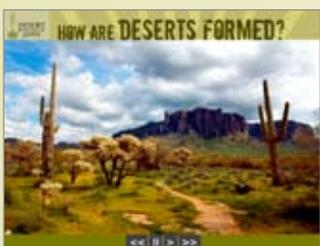
ACTIVITIES *continued*

The class could send their brochures to a local water utility company or ask for a representative to visit the class.

Some things that desert dwellers can do to limit their water use include:

- *Watering plants in the morning*
- *Selecting low water use plants for landscaping*
- *Taking shorter showers*
- *Turn off water while brushing teeth*
- *Run dishwasher only when it is full*
- *Install low water use toilets, dishwasher, washing machines*
- *Check for water leaks in your home*

How DESERTS ARE FORMED? TUTORIAL QUESTIONS AND ACTIVITIES



How are Deserts Formed tutorial

DISCUSSION QUESTIONS

1. ***This introductory prompt should be used before students view the tutorial.*

Pay attention to the forces that create deserts and the basic concepts that explain how these forces happen.

2. What is the interior effect? Explain what it means in your own words. Given this definition, do you think deserts are likely to be on a small island? Why or why not?

Air moving from water to land continuously loses moisture. Eventually the air will contain such a small amount of moisture that precipitation is uncommon. This phenomenon can contribute to the location of deserts in the interior of continents.

Therefore, it is unlikely that a small island would contain a desert. Islands are surrounded by water and so air that moves over this land is full of moisture. Precipitation is probably not rare. Interior effect is most evident over larger land masses- such as Asia.

3. The tutorial described three forces that can contribute to the location of deserts. Must all three of these forces be at work to create a desert or can just one force be responsible for the placement of a desert?

Very often more than one force will be at work determining the location of deserts. However- all three forces are not always involved. Global air movement is almost always evident because all across the earth warm, dry air sinks back to the surface around 30 degrees latitude. Most of the earth's deserts are around this latitude, which are called 'horse latitudes'. As an extension of this question, students could research where the term 'horse latitude' came from.



Rain Shadow Effect

The term 'horse latitude' originated before motorized shipping when vessels depended on the wind to move. The pattern of global air movement would cause ships to become stuck at these latitudes due to lack of air movement. Sailors would throw horses or other livestock over the boat to save precious drinking water. Other vessels would then encounter floating horses- thus the name 'horse latitudes.'

Deserts created by rain shadows are only evident on the windward side of mountains.

The interior effect is responsible for bringing dry air to regions and therefore limiting the amount of rainfall available. Good examples of this are the deserts of Asia.

These deserts are tucked into the interior of a large land mass that does not receive much moisture from any large body of water.

ACTIVITIES

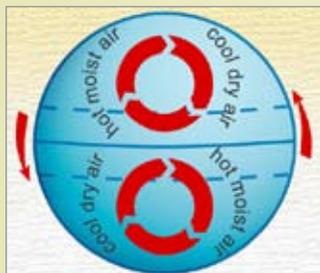
- 1. Directly Heated** - Do you understand why the sun's heat is most intense at the equator? This experiment will help us understand why.

The purpose of this activity is to help students understand why the equator is warmer than the poles.

Paint two metal lids (from a glass bottle or can) with black paint for each group of students. After they are dry, take them outside. Position one so that it is flat on the ground (and receiving the sun's rays at an angle). Position the other one so that it is receiving the sun's rays directly.

Leave them both for ten minutes or so, then come back and have the students touch them. They should be able to feel that the lid that received direct sunlight is hotter than the lid that received slanted, dispersed sun rays.

Ask students which lid represents the equator and which lid represents areas further north and south of the equator. They should connect that the lid receiving direct sunlight represents the equator and that sunlight is a form of energy. More sunlight= more heat. This is why the equator is warmer than other areas of the earth.



Global Air Movement

- 2. What is wind?** - How does global air movement happen? This demonstration will show us why global air movement happens.

The purpose of this activity is for students to understand how global air movement is created and how it contributes to the location of deserts. Review the global air movement section of the tutorial and then do this demo with the students to help them understand.

Place a lamp with an unlit bulb where all students can see. Then shake some talcum powder onto the bulb. Ask students what happens. (The powder should just sink to the bulb).

continued

ACTIVITIES *continued*

Then turn on the bulb and let it warm up for a few minutes. Now shake some more talcum powder onto the bulb. Ask students what happens, now? (The powder should rise away from the bulb.)

Ask students if they understand why this happens. The light bulb creates heat energy when it is on. Connect that the change in temperature creates air movement (wind) around the bulb as it would around the earth. The talcum powder rises because the WARM AIR RISES as the COLD AIR SINKS, creating air movement or wind. The talcum is carried on the warm air currents. It is these same principles that create global air movement, which is one of the forces that create deserts.

VIRTUAL HABITAT

QUESTIONS AND ACTIVITIES



Virtual Habitat



Spadefoot Toad

DISCUSSION QUESTIONS

1. *Provide students with this prompt before they explore the Virtual Habitat.

Do any of these plants or animals look familiar? What factors might allow them to thrive in the desert? Do you think the animals may have some special behaviors?

2. Many of the organisms we learned about are found only in deserts! Can you think of some special **behaviors** that these plants and animals may have that allow them to survive in this arid, hot desert environment?

Many animals avoid the warmest times of day by being active at night. These animals are nocturnal and include pocket mouse, bark scorpion, coyotes, and Spadefoot toads.

Some desert animals estivate during the driest or hottest months of the year and hibernate during the coldest time of the year. Hibernation is a period of inactivity during cold, dry times while estivation is a period of inactivity during hot, dry times. Round-tailed Ground Squirrels hibernate during the winter months and then also estivate during the hottest, driest part of summer. Pocket mice estivate during the summer. Spadefoot toads estivate in an underground burrow for ten months out of the year!

During the hottest times in the desert the ground surface is a place to avoid. The ground surface can be significantly warmer than the surrounding air. Many animals avoid the hot surface by either holding their bodies away from the hot surface or by spending time underground where it's cooler or high in a tree or cactus.

Plants may be dormant during the warmest, driest summer months. This means that they may lose their leaves and stop making food until more water is available and/ or it's cooler.

3. What about **physical characteristics** of these organisms? Do you think there may be anything special about their color, body size or shape, beak size, vision, or any other physical feature that helps them to thrive in the desert?



Jackrabbit

Desert plants and animals often have lighter colors. This keeps them cooler because light colors reflect heat instead of absorbing it as dark colors do.

Many desert mammals (jackrabbits and kit foxes) have large ears to help them radiate heat back into the environment and take in cooler air. This in turn cools the rest of their bodies.

In the Sonoran Desert, spines are a very common feature of plants. Spines serve multiple purposes including shading the plant and thus keeping it cool, protecting it from predators, and capturing and directing rain droplets to the base of the plant.

4. We learned about a handful of the organisms that live in Sonoran Desert but there are many more that also share this habitat. With so many organisms living in the same place, what can plants and animals do to ensure that they have enough resources to survive and thrive?

Animals each have a special 'niche'. Their niche is the role that they play in their habitat and will include what time of day they are active, what food they eat, how they collect water, when a plant blooms or when an animal will mate, as well as other factors. Having a special role in the environment allows many different organisms to occupy the same habitat.

ACTIVITIES

1. **Food Chains** - Scientists use food chains or food webs to describe and study the way that energy moves through an ecosystem. In the Sonoran Desert there are many different ways that energy is consumed. Each of you will create your own food chain by doing some research to learn who eats who. Create four paper links labeled with Sonoran Desert organisms that are all part of the food chain. Start your food chain with a plant, then add an herbivore, then omnivores or carnivores. Connect the paper links and present it to the class, sharing any additional interesting information that you learned. After everyone has presented, we can make our chains into a web by connecting repeating organisms.

The purpose of this activity is to help students understand the connections between organisms in the Sonoran Desert. They will connect that organisms are connected in many ways. The class should also discuss what happens when one organism in that ecosystem is gone.

2. **Desert Poem** - Research an animal or plant from the Sonoran Desert and write a song or poem about it. Discuss adaptations to desert life, diet, coloration, and anything else unique about your organism. Then create a picture to go with your poem or song. Feel free to incorporate music! Share it with the class!

The purpose of this activity is for students to do some research on desert animals while presenting their findings in a fun, creative way.

DIGITAL DESERT INVESTIGATION LOG

Name _____

Plant Name	Cool Fact
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

DIGITAL DESERT INVESTIGATION LOG

Name _____

Animal Name	Cool Fact
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	

DIGITAL DESERT EXPERIMENT LOG

Name _____

Observation:

Question:

Hypothesis:

Prediction:

Experiment:

Results:

Conclusion:

WHAT IS A DESERT?

TUTORIAL

RELEVANT ARIZONA STATE STANDARDS FOR 7TH GRADE

Writing

S1C1: PO2 Determine the purpose of an intended writing piece.

S1C1:PO3 Determine the intended audience of a writing piece.

S1C2:PO2 Organize writing into a logical sequence that is clear to audience.

S1C5:PO1 Prepare writing in a format appropriate to audience and purpose.

S1C5:PO3 Use graphics when applicable to enhance the final product.

S2C1:PO1 Use clear, focused ideas and details to support the topic.

S2C1:PO2 Provide content and selected details that are well suited to audience and purpose.

S2C1:PO3 Develop a sufficient explanation or exploration of the topic.

S2C1:PO4 Include ideas and details that show original perspective.

S3C3:PO1. Write a variety of functional texts.

Science

S1C1: PO1 Formulate questions based on observations that lead to the development of a hypothesis

S1C2:PO1 Demonstrate safe behavior and appropriate procedures in all science inquiry.

S1C2:PO2 Design an investigation to test individual variables using scientific processes.

S1C2:PO3 Conduct a controlled investigation, utilizing multiple trials, to test a hypothesis using scientific processes.

S1C2:PO4 Perform measurements using appropriate scientific tools.

S1C2:PO5 Keep a record of observations, notes, sketches, questions, and ideas using tools such as written and/or computer logs.

S1C3:PO2 Form a logical argument about a correlation between variables or sequence of events.

S1C3:PO3 Analyze results of data collection in order to accept or reject the hypothesis.

S1C3:PO5 Formulate a conclusion based on data analysis

S1C3:PO7 Formulate new questions based on the results of a previous investigation.

S3C2:PO1 Propose viable methods of responding to an identified need or problem.

WHAT IS A DESERT?

TUTORIAL

RELEVANT ARIZONA STATE STANDARDS FOR 7TH GRADE

Technology

3TE1:PO1. Use word processing editing tools to revise a document.

HOW DESERTS ARE FORMED?

TUTORIAL

Science

S1C2:PO3 Conduct a controlled investigation, utilizing multiple trials, to test a hypothesis using scientific processes.

VIRTUAL HABITAT

TUTORIAL

Writing

S3C1: PO2 Write in a variety of expressive forms that according to mode, employ:

- a. Figurative language
- b. Rhythm
- c. Dialogue
- d. Characterization
- e. Plot
- f. Appropriate format

Science

S4C3:PO1 Compare food chains in a specified ecosystem and their corresponding food web.

S4C3:PO2 Explain how organisms obtain and use resources to develop and thrive in niches and predator/prey relationships.

S4C3:PO6 Create a model of the interactions of living organisms within an ecosystem.