WATER IS LIFE: Build Your Own Hueco Tanks Model

Grade 6th

Vocabulary

abiotic
algae
bacteria
biotic
community
cryptobiosis
detritus
dormant
ecosystem
hueco
organism
pluton
population
protozoa
rotifer

Activity Overview

In this activity, students will understand that abiotic factors such as water are necessary to create a living environment. Animals use a variety of strategies to deal with harsh environmental conditions, including cryptobiosis.

TEKS Alignment

6.12 (E) The student is expected to describe biotic and abiotic parts of an ecosystem in which organisms interact.

6.12 (F) The student will diagram the levels of organization within an ecosystem including organism, population, community and ecosystem.

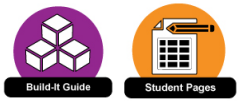
Materials

Per Group:

- 3 wide brim clear containers
- Dry dirt from an area where water naturally pools after a rainstorm such as a dry arroyo bed or riverbed
- Water (dechlorinated) if you are using tap water, let it sit out for a day before using it.
- Magnifying glass
- Camera (Smartphone cameras are fine for this)
- White paper
- Masking tape (used to label the jars by group)

Per Student:

- El Paso Water Chronicles: Issue 1
- Build Your Own Hueco Tanks Lab (Build-It Guide) and Researching Life in the Hueco (Student Pages)



THE SCIENCE BEHIND IT: Cryptobiosis

6.12 (E) Abiotic and Biotic Factors within Ecosystems: An **ecosystem** is only successful when the living things within the ecosystem have everything that they need to survive, which includes both living things **(biotic)** and nonliving things **(abiotic)** within the environment. In earlier grades these were described as “basic needs”. Water is a key abiotic factor with all living things on Earth and in this particular unit, the animals and plant life have evolved adaptations to help them wait until this life saving factor is plentiful enough to flourish. In this activity

the smallest life (bacteria) feeds on the most basic abiotic factor (carbon).

Cryptobiosis: Survival in harsh environments is a never-ending battle for animals and plants that make their home in the Chihuahuan desert. One such adaptation is cryptobiosis. **Cryptobiosis** is a dormant state that some microscopic animals such as tardigrades, brine, fairy and tadpole shrimp and rotifers go into when it encounters an unfavorable environmental condition such as drought. During cryptobiosis the animal dehydrates itself to protect itself from the harsh conditions and will revive itself when exposed to water. This state can occur either during their egg stage or sometimes during their adult life, but always with the possibility that they will be revived with the coming of a desert rain. Cryptobiosis doesn't just happen with microscopic animals, the majority of plant seeds also are in a form of cryptobiosis and the desert plant named the "Resurrection Plant" can also dehydrate itself and bring itself back to life during harsh arid conditions.

Collecting the soil for this investigation should be done at the base of arroyos, dried riverbeds and other areas where ponding occurs. You will almost certainly collect specimens of microbial cryptobiosis in these areas. The animals that spring to life after a desert rain become food for the tadpoles of desert amphibians such as desert toads and tiger salamanders.

6.12 F Levels of Organization: Vocabulary such as **organism** (a single living thing), **population** (multiple living things of the same species) and **community** (living things within the ecosystem that interact together to survive) should be used throughout the lesson to ensure that at risk and second language learners are aware of the academic vocabulary.

ENGAGE: El Paso Water Chronicles Issue 1: Hueco Tanks State Park (East El Paso)

Students will read the El Paso Water Chronicle and discuss life in the huecos at the Hueco Tanks State Park.

Answers to the Life in Huecos Word Puzzle:

Across
3. biotic
7. ecosystem
8. population

Down
1. rotifer
2. dormant
4. pluton
5. community
6. hueco
9. organism
10. abiotic

EXPLORE: Build Your Own Hueco Tanks Model

Students will need the "Build Your Own Hueco Tanks" (Build-It Guide).

Whole class: Students will read and discuss the procedure that describes the setting for huecos to come to life after a desert rainstorm. Then proceed to follow the steps to build their own hueco models:

Purpose:
Understand that water is required to create a living environment.
Models can be used to simulate natural environments. Animals use a variety of strategies to deal with harsh environmental conditions, including Cryptobiosis.

Materials:

- **Three clear containers** that can hold water and dirt. Any size will work. Just make sure that the sides are smooth. (If you are using glasses from your home, make sure you have your parent's permission!)
- **Dry dirt from an area where water naturally pools after a rainstorm such as a dry arroyo bed or riverbed.** You can use the same type of dirt for all three containers, or you can try a different type of dirt in each one. You don't need a lot, just enough to cover the bottom of your container to a depth of about 5-10 cm of the collected dirt. Not everyone can get dirt from an arroyo, so use whatever dirt you can find, such as dirt from a garden. (Try to remove any large objects such as pebbles or sticks that might be in the dirt.) If you cannot get to dirt form an outside source, students could even try dirt from a garden. Note: Do not use dirt that is just on the surface. Dig down a little bit, maybe 20-30 cm below the surface. Organisms that are in a suspended state must burrow down a bit.
- **Water:** Rainwater is best for this experiment, but in El Paso we don't get a lot of it. You can use tap water, but you should let the water sit uncovered for a day or more before using it. Water is treated with chlorine so it is safe for human consumption but may kill microorganisms. Letting the water sit allows the chlorine to evaporate. You will need enough water to cover the dirt to a depth of about 2 cm. You can also treat tap water with a de-chlorinator.

- Magnifying glass
- Camera if you have one (Smartphone cameras are fine for this!)
- White paper

Procedure:

1. Remove the top of the wide brim clear container.
2. In each container place 5-10 cm of dirt. If you are using the bowls, place enough to cover the bottom of each bowl.
3. Pour the water over the dirt until it covers the dirt at least 2cm deep from the surface.
4. Let the mixture settle.
5. Put aside out of direct sunlight, but in a warm environment.
6. If too much evaporation occurs before the animals have a chance to hatch, add more dechlorinated water to the model.

Observations:

Students will use the “Record Your Observations Worksheet” and “Investigation Questions” found in the Build-It Guide.

1. After a day, use your magnifying glass to see if you can spot any signs of life. (You may wish to place the white paper behind the clear bottle if using a bottle or jar container so that you can better see the contents)

2. Observe your artificial “Hueco Tanks Model” for a week or until the water evaporates. Is there change over time? Signs of life might include:
   - bubbles arising from the dirt
   - movement in the dirt
   - movement across the top of the dirt or in the water

3. Check daily for a week to see what happens inside your model.
   - What do you see?
   - Are there signs of life? What are they?
   - Can you see living organisms in the water?
   - How are they swimming? In straight lines? Zig-zag motion?

EXPLAIN: Researching Life in the Hueco

Students will research life forms that are found within the Hueco using the "Researching Life in the Hueco" student pages. In this worksheet students will research the basic needs of the life in the Hueco. With this information they will be able to create a food web.

Possible answers to this worksheet include:

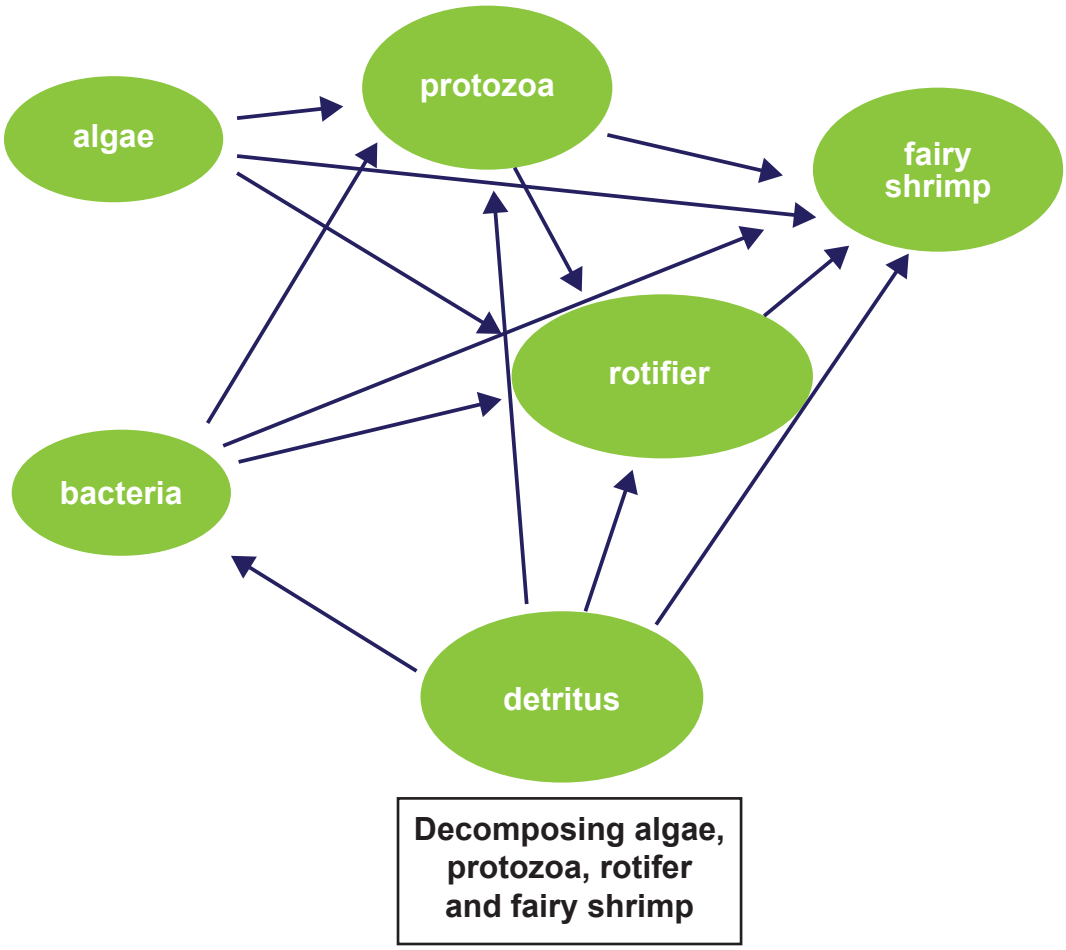
Animal Description (sketch)	Biotic Factors	Abiotic Factors
Bacteria 	• Detritus: (decomposed animal and plant life)	• Oxygen • Nutrients such as: carbon, nitrogen, phosphorus or sulfer • Water • Temperature
Algae	Carbon dioxide released from animals within the environment Nitrogen released from decomposers	Water Sunlight Carbon dioxide Nitrogen
Rotifer	Rotifers are omnivorous and eat anything that fits in their mouth: algae, detritus protozoa, bacteria	Water Oxygen
Protozoa	Protozoa eat bacteria and detritus	Water Oxygen (sometimes soil)
Fairy Shrimp	Fairy Shrimp eat protozoa, rotifers, algae, bacteria and detritus	Water Oxygen

ELABORATE: Design a Hueco Food Web

Using the "Researching Life in the Hueco" data, students will create a Hueco Food Web. Lizards and birds will feast on tadpole and fairy shrimp in huecos. Using your hueco environment research, design a food web that includes the community of the environment. Include the sketches that you made into the food web design.

Possible Food Web Answer:

Design a Hueco Food Web



VOCABULARY

abiotic	Non-living chemical and physical factors in the environment which affect ecosystems.
algae	A simple, nonflowering, and typically aquatic plant of a large group that includes the seaweeds and many single-celled forms.
bacteria	A member of a large group of unicellular microorganismims which have cell walls but lack organelles and an organized nucleus, including some that can cause disease.
biotic	A living component of an ecosystem; for example organisms, such as plants and animals.
community	Living things within the ecosystem that interact together to survive.
cryptobiosis	A dormant state that some microscopic animals such as tardigrades, brine, fairy and tadpole shrimp and rotifers go into when it encounters an unfavorable environmental condition such as drought.
detritus	Organic matter produced by the decomposition of an organism.
dormant	A state in which life suspended until revived.
ecosystem	A biological community of interacting organisms and their physical environment.
hueco	Small depression in the rocks that collect water.
organism	An individual animal, plant, or single-celled life form.
pluton	Happens when igneous rock pushes up from under the surface of the ground.
population	a community of animals, plants, or humans among whose members interbreeding occurs.
protozoa	A phylum or group of phyla that comprises the single-celled microscopic animal.
rotifer	An organism only found in the Hueco. A microscopic creature that is considered more animal than bacteria.