

Science, Water and the Rio Grande: MIGRATION STATION AT THE RIO BOSQUE

Activity Overview

In this activity, students will understand the behaviors of the animals of the Rio Bosque Wetlands Park and how their behavior affects the ecosystem and food webs during different times in the day and different parts of the year.

TEKS Alignment

Science:

4.9 A The student is expected to: investigate that most producers need sunlight, water and carbon dioxide to make their own food, while consumers are dependent on other organisms for food.

4.9 B The student will describe the flow of energy through food webs, beginning with the sun, and predict how changes in the ecosystem affect the food web.

4.2 D The student will analyze and interpret patterns to construct reasonable explanations from data that can be observed and measured.

4.8 B The student will represent and natural world using models such as the water cycle and stream tables and identify limitations including accuracy and size.

English Language Arts and Reading:

4.12 B The student will compose informational texts, including brief compositions that convey information about a topic; using a clear central idea using genre characteristics and craft.

4.3 C The student will determine the meaning of and use words with affixes such as mis-, sub-, -ment, and -ity/ty and roots such as auto, graph and meter.

THE SCIENCE BEHIND IT:

Changes in Ecosystems and Food Webs

During the teaching of standard 4.9 A, students learn that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food. Students should have a strong understanding of photosynthesis before moving on to concepts about food chains and food webs.

Grade 4th

Vocabulary

carnivore
omnivore
herbivore
producer
consumer
ecosystem
food chain
food web
photosynthesis
light energy
water
carbon dioxide
nocturnal
diurnal
crepuscular
migration
hibernation
brumation
estivation
model
habitat
energy transfer

Understanding Photosynthesis

All living things need energy to survive, and this energy is given in the form of food. Things that consume food are called consumers, however, only some living things are able to seek and forage for food. Other living things, such as plants, cannot forage for food; they need to produce their own food through a chemical process called photosynthesis. Because plant life can produce its own food, they are known as producers rather than consumers.

Plants have parts located in their leaves called chloroplasts that have the ability to create a chemical change when the leaf absorbs light energy from the sun, carbon dioxide from the air, and water from the plants' roots. With the use of the light energy, a chemical change occurs at the molecular level, transforming the carbon dioxide and water into sucrose (sugar) that the plant can eat to survive. During this chemical change, oxygen is left over, and the plant respire (breathes out) oxygen into the air while it is creating its food.

Animals and plants have a beneficial relationship in this process because animals breathe out carbon dioxide during their breathing process and breathe in oxygen. Plants take in carbon dioxide and respire oxygen. This process is called the Carbon Dioxide/Oxygen cycle.

A Delicate Balance

Plants creating photosynthesis is a delicate balance for life on Earth. If the plant is missing any of the three stages of the process, photosynthesis cannot take place. It is not only a delicate balance for the plant to create its food but also a delicate balance for all of the living things that depend on plants as

food, and for all living things that depend on oxygen to breathe and survive. For this reason, an over-abundance or shortage of water, light energy, or carbon dioxide can also tip the scales and affect the overall system of life.

Understanding Food Chains and Food Webs

In standard 4.9 B, the student will describe the flow of energy through food webs, beginning with the sun, and predict how changes in the ecosystem affect the food web.

To understand the concepts behind food chains and food webs, students will need to understand that all living things need energy to grow and live. The energy source for all life comes from the sun. Many children may have the misconception that food chains and food webs are part of a cycle (O₂/CO₂) that happens between animals and plants, when, in fact, food chains and food webs are a one-way system starting from the sun, each living thing taking from this energy until the energy dissipates.

The chain starts with energy from the sun. The sun gives its energy to plants. In turn, animals eat the plants to gain energy. There are animals that eat these animals to gain their energy and so on. When one living thing eats another living thing for energy, they are able to extract some of the original energy taken from the sun. This is why larger carnivores need many animals to keep them alive.

Food chain and food web models illustrate the flow of energy from the sun through all of the living things that use it. Students should understand that the arrows used in these models need to be pointing in the direction of the flow. Here is an example:

Sun → grass → kangaroo rat → snake → roadrunner → Hawk

In this food chain model, the sun's energy is traveling through living things to get to the hawk. The sun's energy can only travel through so many levels before it dissipates. Because hawk meat does not contain much energy from the sun, predators are not keen on eating a hawk. When students build their food chains and food webs, discussions about energy flow and levels traveled should be discussed for students to get a good understanding of how food chains and food webs work.

Predicting Changes in an Ecosystem

In most examples of standard 4.9B, the students will be presented with a situation in which an animal may disappear due to predation or pollution and the students are asked to predict what will happen to the rest of the chain or food web as a result. For example, a wolf population that may be hunted down in number in a forest may make the rabbit and deer populations grow higher, causing them to over graze an area.

In this unit, students will be able to create food chains and food webs using the Rio Bosque cards. These are a set of cards listing animals and plants that represent producers and consumers in the Rio Bosque food web. The deck also contains cards that represent the sun, water and carbon dioxide needed to create photosynthesis, which is the way most producers (plants) create their own food.

In this unit, students will be asked questions regarding changes in the environment due to the water filling the cells during winter and water evaporating out of the Rio Bosque Park in the summer. The Rio Bosque cards feature producers and consumers with symbols indicating what time of day the animals are active (diurnal, nocturnal and crepuscular), what time of year the species are present (migration, hibernation, estivation, and brumation) and what type of consumer they are (omnivore, carnivore or herbivore). All of these factors can determine natural changes in the environment that affect the food web and animal populations. The communities of ecosystems are constantly changing and reacting as food is taken and replenished within the system. Students will be able to easily see variables in the food webs by analyzing the data present in the Rio Bosque cards.

What Makes the Food Web in the Rio Bosque so Special?

El Paso is unique in that we live in a desert environment that offers very little rainfall for the area plants to create photosynthesis. In turn, these plants (and

animals for that matter) have had to acquire adaptations to survive the desert environment. However, environments along the Rio Grande River allow for water loving plants to be able to survive and create a unique environment within the desert. This means that a distinctly different set of animals can survive and thrive within the desert ecosystem.

Students will be amazed that the Rio Bosque wetlands have inhabitants, such as beavers and muskrats, as well as several species of waterfowl, such as ducks, coots, and herons. There are also specialized water plants, such as cottonwood trees, salt cedar and cattails that provide food and shelter for insects and animals in the wetland habitat.

Common Misconceptions about Rivers in the Desert Ecosystem

Students may have the misconception that the Rio Grande does not contain water anymore. When they look out to the Rio Grande they may notice that it is dry and empty for what seems like most of the year. In actuality, water from the Rio Grande is collected over a period of months and then released back into the river when it is time to irrigate the crops. For this reason, stretches of the Rio Grande may seem dried up during certain parts of the year. Even though the control of water in the Rio Grande through New Mexico and El Paso is a man-made effort, in nature a dried riverbed is a natural phenomenon as there are many rivers that are seasonal and recharge in the spring. This is very much a characteristic of rivers, creeks and streams that exist in desert environments. A river may also change in water flow as it travels across the land. This is because rivers may recharge throughout their route by tributaries along the land. Some students may not understand that the Rio Grande not only

contains water but also does flow out to the Gulf of Mexico because it is recharged along its route through Texas by receiving water through tributaries.

What is a Bosque?

A bosque is a southwestern term used to describe a riparian wetland environment that is created when a river is flooded, usually during its rainy season. In valleys along the river, there are areas called floodplains that are prone to flooding during rains. These areas create ponds and small marshes that will attract wildlife. Water loving plants and trees will grow along this floodplain, creating a woody brush or cattail-filled area that allows plenty of hiding spaces, shade and water for animals that may not survive the desert otherwise. When this water evaporates after the rainy season, the animals may migrate or adapt to the changes of the dry environment while they are waiting for the next rain.

Human's Effect on the River and the Rio Bosque Wetlands.

People rely on water from the Rio Grande for drinking, plumbing and irrigation, which is why the Rio Grande River is dammed in areas and then released during irrigation season. Water from Elephant Butte Reservoir is released in spring and it will travel down the river into the El Paso area, where it will fill levees for irrigation. When this water is released, wildlife will come along for the ride and inhabit the river, the levees and the Rio Bosque Wetlands Park. The Rio Grande is not the only source of water for the park. It also receives reclaimed water from the Roberto Bustamante Water Treatment Plant during certain times of the year.

Rio Bosque Wetlands Park FACT SHEET

Rio Bosque Wetlands Park Fact Sheet

The 372-acre Rio Bosque Wetlands Park is located in El Paso County near the town of Socorro, Texas. Enclosed by irrigation canals and drains on three sides, the west side of the park is adjacent to the international border between the US and Mexico.

History tied to Meandering Rio Grande

The Rio Grande naturally changes its course through a process called “meandering”. Because of this phenomenon, there were disputes regarding land rights between two countries. The treaty of Guadalupe Hidalgo stated that the border between the US and Mexico would be divided by the Rio Grande River. As the river changed course several times over the years with many disputes as to who owned the land as a result, an agreement between both countries allowed for a cement channelization of the river through the El Paso area. This was called the Chamizal Agreement.

One casualty of the channelization was a wide bend of the river that was cut off and left to dry out. This is where the Rio Bosque Wetlands Park stands today. This land area that was once part of the Mexican territory was given to the City of El Paso in 1973 under the Federal Lands and Parks program with 9 more acres added in 1976 and 86 more acres added by the City later in that year. The City envisioned a natural park that could help with environmental education for the community, but it would be years before the City started to create a project that would revive the river habitat.

Bringing Back a Riparian Habitat

In 1997, with recommendations from the U.S. Fish and Wildlife Service, International Bound-

ary & Water Commission and Ducks Unlimited, the Rio Bosque Wetlands Park was developed to rebuild the old river channel through the park and create a water system that would bring water to large shallow wetland cells. The land that had reverted to desert brush was cleared and graded to rebuild and re-create the wetland ecosystem.

Today the landscape is slowly changing. Cottonwood and cattails are now back to their original home, which is along their much-needed water source. Mammals, birds, reptiles, amphibians, insects, and fish that once inhabited the area are starting to return. The goal is to bring the environment back to how it might have looked during the pre-settlement era for people to explore and enjoy for years to come.

Currently migrating birds from the North looking for roosting areas in the Southwest, make their homes at the Rio Bosque Wetlands Park during the winter months. The cells fill with thousands of waterfowl, mostly ducks and coots, which change the food web during their temporary stay.

The Changing Behavior of Animals at the Rio Bosque Park

The Rio Bosque hosts two communities of animals, plants and insects: one native to the desert and another native to a desert riparian wetland. These two communities overlap and affect one another. Seasonal changes in the environment - in the form of climate temperatures, rainfall, and periodic flooding - dictate the activity. In other words, depending on the season, you will see different animals active at the park. Scientists, bird enthusiasts, naturalists, and visitors have logged sightings of the species of animals that live at the park and

keep these lists updated on the Rio Bosque website. The information from this website, as well research done on the most abundant species, were the basis of the Rio Bosque cards.

Active Research at the Park

The Rio Bosque Wetlands Park is managed through the University of Texas at El Paso (UTEP). The park hosts opportunities for citizen science, environmental studies, and conservation. Visitors who come to the park will readily see an active conservation program for the Burrowing Owl. Artificial burrows are established around the park to help support this species. Here is a link to a movie about the burrowing owls at the Rio Bosque: <https://www.youtube.com/watch?v=BeK0m3DLu5g>

Water at the Rio Bosque

For sustaining wetland and riparian ecosystems at the Rio Bosque Wetlands Park, water is essential. The Rio Bosque relies on three water sources: treated wastewater, groundwater, and water from the Rio Grande.

In the early years of the wetland project, water was only available in late fall and winter. During the growing season, the park was dry. However, in recent years, El Paso Water and the El Paso County Water Improvement District #1 partnered to provide additional water resources. Today, water is consistently available at all times of the year.

The availability of water during the growing season has greatly accelerated the development of wetland and riparian ecosystems at the Rio Bosque Wetlands Park

Field trips to Rio Bosque?

The Rio Bosque Wetlands Park is a great field trip destination for students. There are no admission fees to visit the park; however, you will need to make a reservation to bring students out to the park to ensure that bathroom facilities are available and to perhaps book a tour. For more information about the Rio Bosque, including free educational brochures regarding the plants, insects, amphibians, reptiles, birds and mammals of the park, please visit the UTEP Rio Bosque Website at: <https://www.utep.edu/cerm/rio-bosque/rio-bosque-home.html>
To the left of the website homepage is a directory of resources related to the Rio Bosque Wetlands Park.