



Visiting the Bolsa Chica Wetlands: Grades 9-12

Dear Teacher,

Welcome to the Bolsa Chica Wetlands! We are excited that you chose to visit the Wetlands as a tour and learning experience for your students.

To help your students get the most from their time at the Wetlands, we have prepared a learning activity worksheet (see below) that you can use in your classroom to stimulate thinking about wetlands concepts in the days or weeks before your visit. The activities on the worksheet are designed to coordinate with California's Next Generation Science Standards for High School.

Students can observe a number of core NGSS ideas for grades 9-12 in action at Bolsa Chica Wetlands, these include but are not limited to:

Core NGSS ideas for high school

- How to explain the cycling of matter and flow of energy in aerobic and anaerobic conditions
- How matter is cycled and energy flows within organisms in an ecosystem
- How complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions
- How altered conditions in an ecosystem can disrupt an ecosystem's stability
- How to reduce the impacts of human activities on the environment and biodiversity
- How changes in environmental conditions may result in the increase in the number of individuals of some species
- How changes in environmental conditions may result in the emergence of new species in an ecosystem
- How some species are threatened through changes in environmental conditions
- Methods to mitigate adverse impacts of human activity on biodiversity
- The different properties of water and their effects on Earth materials and surface processes
- How human activity has modified the relationships between Earth systems

We encourage you to talk with your students about examples of what they might see at the Bolsa Chica Wetlands that fit these core ideas.

● Bolsa Chica has many unique native plants and animals. The Great Blue Heron, California Ground Squirrel, Side-blotched Lizard, California Horn Snail, are some of the animals we are likely to see on our tour. Some birds of the wetlands, like the Least Tern (*Sternula antillarum*) and Belding's Savannah Sparrow, (*Passerculus sandwichensis beldingi*), are endangered, because there only a few California coastal marshes left for them to nest in.

- Plants that live in the marsh area are adapted to grow in salty soil and be watered mainly by ocean water. Their roots, stems, and leaves have evolved adaptations to keep the plant from being killed by the salt. Examples we can see on the tour are Pickleweed, Saltwort, and Cord Grass. Most house plants and inland plants cannot live in this type of soil.

- Plants along our tour path that are further from the water, such as the California Coastal Sunflower, Buckwheat, and Sagebrush, have adapted to thrive in the southern California climate where most of the rain falls in winter. Just after the rainy season most have more flowers and leaves than in late fall when it is dry. The leaves dry up in summer and the plant is dormant, conserving its energy and waiting for the winter rains to regrow its leaves.

- Shorebirds such as Marbled Godwits, Curlews, and Sandpipers feed on the mud flats in the bay. Their long legs and long thin beaks adapt them to stand in shallow water and pull crabs and other small invertebrates out of the mud to eat. By contrast, sparrows and finches stay near the coastal bushes, where their short thick beaks can pick and crunch seeds. Hummingbirds use their long, thin beaks to reach deep into flowers to drink nectar, acting as a pollinator for the plants it feeds from.

- Bolsa Chica Wetlands is on the Pacific Flyway, a migratory path for thousands of birds. Some birds, like ducks, nest in the far north and come to Bolsa Chica with their young in winter, so they can stay warm and find food before flying north again in mid-spring. Others, nest at Bolsa Chica in spring and summer, then fly south with their young in the fall. Still others live at Bolsa Chica year-round. Each bird species follows the pattern that is best for the survival of its offspring.

Everyone can help keep the wetlands healthy.

- ✓ Put all trash in trash containers
- ✓ Recycle and reuse paper and plastic.
- ✓ Use less plastic, and reuse items at home so as not to waste.
- ✓ Help wetlands species survive by not bringing pets into the wetlands that can frighten and disturb the native animals.

THE MOST IMPORTANT THING....

The most important thing you can do is encourage your students to be alert to what they see, hear, and even smell as they explore the wetlands on their tour. Every tour is unique, depending on the season, time of day, whether the sun is shining, or the tides are high or low. Encourage your students to report and remember what they observe, and help them explain how each element fits into the system. Your tour guide will point out the plants and animals, and explain how the wetlands ecosystem functions, in terms your students can understand.



Visiting the Bolsa Chica Wetlands: Introductory Worksheet

Name: _____

Date: _____

Introduction

Wetlands are a unique habitat that can be found on every continent of the planet. The soil in wetlands are wet for at least part of the year, and can be found along bodies of water such as rivers, lakes, oceans, and prehistoric lake beds. Plants and animals that live in wetlands have evolved adaptations to aid in their survival through natural selection. Individual plant and animal species developed genetic variations that allowed them to acquire more advantageous characteristics than other individuals, ensuring their survival in the wetlands. Examples include bird species with webbed feet and plants that can pump oxygen into their roots from their leaves. If it weren't for these adaptations, many plants and animals would not be able to survive in a wetland habitat.



Least Tern

From recreation to flood control and water filtration, wetlands are a vital aspect of our ecosystem. Wetlands are great at minimizing flood damage by providing a place for water to spread out through dense plant vegetation. This reduces the speed of water flow which allows suspended materials such as sediments and pollutants to settle and for the roots of wetland plants to accumulate the sediments. This process prevents flooding in surrounding areas that are inhabited by humans as well as reduces water pollution, and recharging groundwater sources. This makes the mud in the wetlands a feast to all, including even the smallest bacteria. The combined functions of water absorption and filtration, allow for water to return to the water table-much cleaner than before-where we can then use it for human consumption.

The Bolsa Chica Ecological Reserve is one of the largest remaining coastal saltwater marshes in Southern California. Today, Bolsa Chica is characterized as a saltwater marsh with its low growing vegetation such as saltgrasses and reeds, as well as a salt content similar to the ocean; in the past it functioned more as a brackish marsh. A brackish marsh is a saltwater marsh that has been exposed to significant amounts of freshwater which reduces the salinity of the water. This no longer occurs year-round, but seasonally, due to human activity in the early 1900s.

Located in a highly urbanized area, Bolsa Chica has over 1,400 acres of native and endemic habitat, and is home to rare plants like the Southern Tar Plant (*Centromadia parryi ssp. australis*) and Pickleweed (*Salicornia sp.*) that are able to withstand the high salinity of the wetlands and provide stability to the marsh by trapping and binding sediments. Additionally, endangered animals like the Belding's Savannah Sparrow (*Passerculus sandwichensis beldingi*) and the Ridgway's Rail (*Rallus obsoletus*) reside at Bolsa Chica. The Belding's Savannah Sparrow relies on the Pickleweed plants in order to be able to successfully nest during their breeding season. Migratory birds use wetlands as a pit stop, to rest and refuel during their travels. Bolsa Chica is a part of the Pacific flyway that spans from Alaska to Chile which these birds migrate along.

During the winter, various duck species such as the Bufflehead (*Bucephala albeola*) move south from regions of Alaska and Canada. Many spring visitors, like the endangered California Least Tern (*Sternula antillarum*), come to Bolsa Chica to nest and raise their young by flying up from Mexico and Central America. Like all wetlands, Bolsa Chica benefits both the wildlife that resides inside, and the humans residing around it.

During your visit to the Bolsa Chica Wetlands, you will learn about wetland functions, animal adaptations, watershed ecology, and how your local community is connected to wetlands. Prepare yourself to learn about these topics by working on questions below, before you arrive.

Warm-Up Questions

1. What type of wetland is Bolsa Chica (circle one):

Swamp Saltwater Marsh Brackish Marsh Bog

2. Based on your answer to Question 1, describe the characteristics of the type of wetland Bolsa Chica is.

3. Provide an example of how both plants and animals rely on one another in a wetland.

4. Describe the process in which wetlands reduce flooding.

5. Describe and provide an example of why migratory birds rely on the Bolsa Chica Ecological Reserve.



Visiting the Bolsa Chica Wetlands: Introductory Worksheet - KEY

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Warm-Up Questions

1. What type of wetland is Bolsa Chica (circle one):

Swamp

Saltwater Marsh

Brackish Marsh

Bog

2. Based on your answer to Question 1, describe the characteristics of the type of wetland Bolsa Chica is.

Saltwater Marshes are wetlands that contain salt water and its vegetation is primarily reeds, grasses, and low-growing plants

3. Provide an example of how both plants and animals rely on one another in a wetland.

Then endangered Belding's Savannah Sparrow builds its nests in the pickleweed that grows in the wetlands.

4. Describe the process in which wetlands reduce flooding.

Wetlands naturally slow water movement due to property of cohesion, where a substance sticks to itself, thereby greatly slowing its movement.

5. Describe and provide an example of why migratory birds rely on the Bolsa Chica Ecological Reserve.

Wetlands serve as a resting stop for migratory birds. Some birds will nest in spring, while others ride out the winter months in Bolsa Chica.