

The Wetlands and Their Influence on our Lives

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INTRODUCTION

When students are asked about their prior knowledge of wetlands, they use the words swamp, alligators, mosquitoes, and weird names of plants and animals. The goal of this unit is to teach the students a different view of the wetlands. They will receive and interact with concepts about how wetlands are related to ancient times, historic facts, geographic distributions, and unique plants and animals. Most importantly of all, this unit will be about the wetlands being a vital part of our environment. The unit will make the students understand that the earth is an interconnected whole and that the absence or decrease in wetland areas will result in a decrease in human quality of life. Another goal is to teach students that a lot of actions are currently being taken to preserve the balance between urban growth and conservation of wetland areas as an essential part of our communities.

These concepts are extremely important for elementary kids. First, children must develop awareness about how important natural places are. They must be able to appreciate the beauty of outdoor settings and activities and feel comfortable with them. Second, they must realize that it is vital for human beings to conserve different animal and plant species, and that protecting wetlands will also help conserve our water resources. Finally, children from Houston must understand how their own city and cultures have developed around wetlands, using and modifying them as a food source, for housing, for waste disposal, to mediate flooding and for different economic activities.

This unit is written for a 4th grade bilingual course in science, language arts, and social studies. Although the original audience is a bilingual class, the unit can be easily adapted to non-LEP classes and to other grade levels, especially one below and one above the 4th grade level. Sylvan Rodriguez Elementary is a modern school, located in an urban area, surrounded by many apartment complexes and all kinds of businesses. Its students are not, in most cases, familiar with rural or semi-urban environments, or, since many of them just arrived in the United States in the last one or two years, with the concept of protecting the environment.

To teach this curriculum unit, we must consider the available time and the age and grade level of our students. This unit includes two field trips to two of the wetland areas surrounding Houston. On these trips, the students will be able to use their senses to find clues to predict and draw conclusions about the wildlife present in the area; conduct different activities, such as sampling water or plants; describe the living and non-living components of the ecosystem; and observe and analyze the concepts of food web, pollution, classification, and bioaccumulation. Back in the classroom, the students will construct their own “living” ecosystem, recognize wetlands as a source for many kinds of food, and define the conditions that allow wetlands to exist.

OBJECTIVES

This curriculum unit will cover multiple Houston ISD objectives in science, social studies, and language arts.

SCI 4.06.A - Identify patterns of change such as weather, metamorphosis, and objects in the sky.

SCI 4.10.A Identify and observe effects of events that require time for changes to be noticeable including growth, erosion, dissolving, weathering, and flow.

SCI 4.08.B Compare adaptive characteristics of various species.

SCI 4.11.A Test properties of soil including texture, capacity to retain water, and ability to support life.

SCI 4.01.B Make wise choices in the use and conservation of resources and the disposal or recycling of materials.

SCI 4.05.A Identify and describe the roles of some organisms in living systems as plants in a school-yard, and parts in nonliving systems such as a light bulb in a circuit.

SCI 4.05.B Predict and draw conclusions about what happens when part of a system is removed.

SCI 4.04.A Collect and analyze information using tools including calculators, safety goggles, microscopes, cameras, sound recorders, computers, hand lenses, rulers, thermometers, meter sticks, timing devices, balances, and compasses.

SCI 5.09.A Compare the adaptive characteristics of species that improve their ability to survive and reproduce in an ecosystem.

SCI 5.09.C Predict some adaptive characteristics required for survival and reproduction by an organism in an ecosystem.

ELAR 4.03.A Develop vocabulary using a variety of strategies.

SS 4.09.A Describe ways in which people in Texas have adapted to and modified their environment.

SS 4.09.B Identify reasons why people have adapted to and modified their environment in Texas.

SS 4.08 Explain the geographic factors that influence patterns of settlement, the establishment of cities, distribution of population in Texas past and present.

RATIONALE

The most important goal of this curriculum unit is that the students develop an understanding of the characteristics of wetlands, relating these to the familiar realm of everyday life.

Students have different prior understandings of wetlands. While there are a lot of people from different cultures and different backgrounds working to protect wetlands because of their importance, some people have never seen, heard, or thought about this topic (Slattery 10). Wetlands are extremely important for plants, animals, humans, and their environment. Wetlands have a unique ability to purify different water and air, promote the decomposition of toxic substances, filter hazardous substances, neutralize different kinds of waste, and relieve flooding. They serve as breeding and rearing habitats for countless numbers and species of wildlife. Also, wetlands are an important habitat for migratory birds, providing them with food and shelter.

Through this unit, students will become aware of the importance and beauty of wetlands and the need to protect the world's wetlands. Students will learn the role of the wetlands in different natural processes, such as food production and the maintenance of food chains. Students will learn the relationship between living and non-living components in an ecosystem and will learn that different aspects of an ecosystem can change slowly.

The lesson plans include two field trips to two different Houston wetlands: a fresh water wetland at Sheldon Lake State Park and a salt water wetland at Galveston Bay. The field trips are important because they will allow the students to see and analyze the characteristics of the wetlands for themselves. They will realize that wetlands are interwoven parts of our communities, very close to our houses, and then they will begin to understand the different ways in which our daily life is affected by wetlands.

The curriculum unit can be modified for use in other classes. In particular, each lesson plan includes suggestions for modifying activities and concepts to suit upper and lower grades.

UNIT BACKGROUND

As the background of the unit, I mention the most important concepts to develop a comprehensive study of the wetlands. These concepts must also provide a framework so the teacher can address the different needs of the students or different grade levels. More complex concepts do not need to be taught in second or lower levels. However, all of them are understandable for fourth grade students or upper levels.

Wetlands are land areas covered by water some or all the time, wherever low-lying lands meet water. Wetlands may not always be flooded but are covered by water at least for a few days during the growing season. Usually, as a result of flooding, soil respiration quickly uses up all available oxygen, and the soils become anoxic. As a result, wetland plants are adapted to live without large oxygen requirements. Water usually moves very slowly through wetlands, which is an important factor to consider as it affects their functions.

Wetlands are found all over the world, except for Antarctica. The chemistry and hydrology of the water is the most important factor that determines the nature of wetland soil development and which kinds of plants and animals live in that area. There are many different types of wetlands, depending on soil differences, climate, water chemistry, and the impact that humans have on them.

An important concept related to wetlands is the “watershed.” A watershed is a geographic area in which water, sediments, and dissolved materials drain to a common water body, such as a creek, bayou, lake, or bay. In our case in the Houston-Galveston area, freshwater flowing from rivers, bayous, and streams blends with salty seawater from the Gulf of Mexico to form the Galveston Bay Estuary. The mixing of the two kinds of water results in a rich environment which offers food and shelter to young marine organisms, resulting in an abundance of plants and animals.

Some other important wetland areas close to us are the prairie wetlands which are important habitats for many migratory and resident bird species, as well as for reptiles and amphibians. We also have freshwater marshes, found along rivers and bayous. These provide an important habitat for migratory and resident birds, mammals, amphibians, and reptiles. The river and bayou habitat absorbs excess rainfall, helping to prevent flooding. It also filters surface storm water runoff, serving to protect water quality in Galveston Bay. Downstream are the tidal marshes, found along bays and tidal reaches of bayous in the transition area between land and water. Tidal marshes serve as essential habitat for fish, crabs, shrimp, and some coastal birds. The marshes also serve to stabilize shorelines. Finally, we have the seagrass meadows, located in shallow, protected areas in bayous and bays. Sea grasses require clear water so that sunlight can penetrate to the bottom. Thus, the wetlands upstream help protect the sea grasses downstream by filtering the water.

Importance of Natural Habitat

A habitat is something like a home, providing food and shelter. In the wild, habitats support a rich diversity of plant and animal life. In a wetland habitat, for example, small fish and shrimp hide and feed in the seagrasses and salt marshes. In turn, larger fish and birds prowl the salt marshes looking for small fish and shrimp to eat. Wetlands and other habitats act like natural cleansers by filtering pollutants from water. Wetlands, forests, and grasslands help control flooding by absorbing rainfall. Besides fishing, wildlife habitats also offer excellent places for crabbing, hunting, boating, kayaking, bird watching, and wildlife photography. Habitats also form a peaceful retreat of beauty for people who want to escape the pace of urban living. However, the reality is that many important wetland habitats have been lost.

From 1950 to 1990, the Galveston Bay Estuary lost 19% of its wetlands and 70% of its sea grasses. Also, vast areas of coastal prairies and forests have vanished due to natural or human causes. The sinking of land, called subsidence, contributes directly to wetland losses. Subsidence is a natural occurrence that can be accelerated by human activity. In the case of the Galveston Bay area, subsidence was accelerated by the withdrawal of groundwater, oil, and natural gas. Regulation of groundwater pumping has reduced the rate of subsidence in recent years along the bay shoreline. Also, coastal marshes and seagrasses have suffered erosion caused by waves and shipping traffic. Finally, the fragmentation of large habitats disturbs wildlife that requires large tracts of land to survive. Highways, subdivisions, and industrial centers have fragmented many of the region's natural areas.

Types of Wetlands

There are several types of wetlands. They are:

- **Marshes:** they are almost all the time inundated with water. They can be salt water or fresh water. Since they are inundated, the vegetation is adapted to saturated soil. Usually rich in nutrients and pH neutral, marshes present an abundance of plants and animals. There are two kinds of marshes: tidal and non-tidal. The tidal marshes, named so because they are under the influence of the motion of ocean tides, are prevalent in the United States eastern coasts and in the Gulf of Mexico. Depending on what kind of water predominates, different plants and animal species will develop. Since freshwater is usually a more friendly environment, it has more species. Tidal marshes slow shoreline erosion, buffer stormy seas, and absorb excess nutrients which could drop the oxygen levels. They also provide food and habitat for different species. Non-tidal marshes are freshwater marshes, the most prevalent in North America. They occur along streams and in shallow water at the boundaries of lakes or rivers. Usually their water level varies from a few inches to two or three feet. Their soil is rich in organic material and minerals, which provides an excellent habitat for birds and small mammals. Non-tidal marshes are one of the most productive ecosystems, sustaining a diversity of life. This kind of marsh also serves to mitigate flood damage and filter excess of nutrients.
- **Swamps:** forested low, spongy land generally saturated with water and covered with trees and aquatic vegetation; may be a deepwater swamp, such as the cypress tupelo, which has standing water all or part of the growing season, or bottomland hardwood forests which are only flooded periodically. Swamps are divided into two categories: shrub swamps and forested swamps. Forested swamps are usually flooded with water from rivers and streams. They may be covered by very slow moving water, and in dry season these swamps can be the only source of water in miles, being critical for the survival of animal species. Their most important function is flood protection and nutrient removal. Forested swamps are high in productivity because of the deposits in their soil. Shrub swamps are similar to forested

swamps but have shrubby vegetation dominated by plants like buttonwood, willow, and dogwood. Usually, both types of swamps are found together.

- **Bogs:** they are characterized by spongy deposits, acidic waters, and a thick carpet of sphagnum moss. Bogs are formed by rain water more than water from runoff or streams. Bogs are poor in nutrients and as a result, the species that live in them are highly adapted to these conditions. Bogs help prevent downstream flooding by absorbing precipitation. They also regulate global climate. Unfortunately, if destroyed, bogs require hundreds or even thousands of years to form naturally. There are two types of bogs. Northern bogs develop in areas with cold climates, high precipitation, and high humidity. The second kind, Pocosin bogs, does not present standing water but as the northern type, they also collect the water from precipitation. They become periodically very dry and natural fires occur. These fires are ecologically important to diversify the shrub community. The most important function of these bogs is to be the habitat for some species adapted to live in unaltered forests. The slow movement of the water removes the excess of nutrients. This pure water is released to estuaries, helping to maintain healthy fish populations.
- **Fens:** these are wetlands that receive water and nutrients from upslope sources. As a result, they have very high nutrient levels and have a greater diversity of plants and animals. These wetlands are usually covered with grasses, rushes, and wildflowers. Fens bring very important benefits to the watershed, lowering the risk of floods, improving water quality, and providing habitat.

Functions

Wetlands have a lot of functions. It is important that my students understand these functions, because this understanding will increase their appreciation about how vital wetlands are for our environment. An increased appreciation of wetlands is likely to cause more people to become involved actively in their conservation. These functions are:

- **Water filtration and improvement of drinking water quality:** drinking water has already passed through natural filters in wetlands near to rivers or streams. Water usually moves slowly around wetland plants, so the suspended sediments settle in the wetland soils. Simultaneously, plant roots and microorganisms in the soil absorb different substances from fertilizers, manure, septic tanks, or municipal sewage. This removal of excess nutrients before water goes through the watershed makes the water healthier for drinking or swimming. In many cases, this filtration process works better or is cheaper than a treatment plant, so to filter the water, environmental agencies prefer to build artificial wetlands (“Water Quality and Hydrology”). There are currently hundreds of wastewater treatment wetlands operating in the United States.
- **Water storage:** wetlands can store water that arrives quickly and release it slowly. This change in the water speed slows down its erosive potential, reduces flood height, and allows greater ground water recharge. This property of wetlands to store flood water reduces the economic consequences of flooding and the loss of human life.
- **Flood control:** wetlands act as natural buffers, soaking up and storing big amounts of water and, therefore, reducing the frequency and intensity of floods. Coastal wetlands protect adjacent uplands from tropical storms, hurricanes, and wind and wave action. After the big flows have passed, wetlands slowly release the water that has been stored.
- **Fishing industry:** the wetlands participate in the life cycle of the fish and shellfish. This is very important not only for the fishing industry but for recreational fishing, too. Wetlands provide shelter and food for salt and fresh water species. These species depend on these areas for their subsistence.

- Recreation: people go to the wetlands for different recreational activities like fishing, bird watching, hiking, photography, and hunting. Almost one hundred million Americans participate in these activities spending more than one hundred billion dollars per year (“National Products for Our Economy”).
- Economic and commercial benefits: products from wetlands provide many benefits to society. Some crops, like rice, can grow in wetlands during part of the year. Other plants can be used in the pharmaceutical industry. Other products, like reed, are used to build houses because they provide better and longer isolation than others synthetic products. Wetlands are also used for fur harvest since muskrats, beavers, and minks use wetlands as their habitat. Of course, wetlands also provide direct employment opportunities for rangers and surveyors and, indirectly, for people related to different industries.

Wetlands Restoration

Restoration is a process that helps to transform an area that has been impacted by human or natural activity to an area that can sustain native habitats. Many years ago, wetlands were plentiful in the United States. Wetlands are the second most endangered habitat in the whole world, right after tropical forests (Zedler 89). Now, the nation has lost more than half of its original wetlands because of agriculture, commercial development, or more rarely, natural changes in climate or sea-level. Although new regulations are in place now, more than 300,000 acres are lost annually and wetlands restoration is a complex and lengthy process. Restoration of a swamp forest takes between 10 to 20 years (“Benefits of Restoration”).

Fortunately, people are realizing how important wetlands are and the efforts for restoring these resources are multiplying. Most of the studies to restore wetlands are short-time, around two years (Hammer 124). This replacement of altered or destroyed wetlands is called mitigation. Mitigation is usually expensive and ideally involves monitoring the area over a long time to detect or avoid problems before they become unmanageable.

Restoration has several steps, many of them very specialized. The most important are those related to plant life. Since plants are the base of the food chain, they need to be reestablished first (Kusler 48). Native plants will attract organisms that are used to living on or around those plants. Non-native plants must be taken out because they compete with the native plants for soil, nutrients, and space.

Wetlands and Adaptation

Plants and animals have had to change their characteristics in order to survive in the wetlands. Some plants, for example, have changed the shape of their roots to facilitate root respiration. Others have developed mechanisms to block salt from entering the roots.

Animals have also adapted to the wetlands. Beavers, for example, have webbed feet, a long broad tail for swimming, and a special waterproof coat. They can close their nose and their ears when they are under the water. Some insects have modified different parts of their bodies (e.g. paddle legs). Different kinds of fish have adapted to survive high levels of salinity, and alligators in Florida wetlands excavate the clay to form a depression which will be cooler and fresh during the dry season.

Houston has several wetlands around the city. The lesson plans below will use field trips to show to the students the characteristics, parts, and similarities and differences of different kinds of wetlands. An important aspect of teaching these lessons is to first find out what the students already know about this topic in order to modify the lessons appropriately.

LESSON PLANS

Lesson Plan 1: Salt Water Wetlands

Objectives

This lesson will take 3 sessions of 45 minutes each plus three hours on a field trip to Galveston Island State Park. The students will visit a salt water wetland close to Houston. They will identify the kind of water; they will take samples which will be analyzed in the classroom or the science lab in the next days. They will also identify different kinds of plants and birds. They will explain the geographic factors that influence patterns of settlement and establishment of cities. They will also learn vocabulary words related to science. HISD objectives SS4.08, SS4.09.a, b, and SCI 4.04.a

Concept Development

Vocabulary words and terms to explain are: algae, channel, detritus, ecology, ecosystem, estuary, habitat, migration, natural resources, nutrients, salt marsh, and wetlands.

The students will also use instruments and materials from the science lab like beakers, pipettes, funnels, microscopes, and different measuring cups to collect samples.

Student Practice and Activities

During the field trip, the students will walk around an area identifying and taking samples of soil and water. They will determine the criteria to take the samples (e.g., color or texture). They may have a color chart with them or use the color chart later in the classroom to discuss the reasons of the different colors when they compare the soil from the wetlands and from other places. They will also fill a chart identifying which type of wetland this is, based on the criteria explained before (see background).

The students will look for different things using their five senses. Things to see: a spider's web, a bird's nest, clouds moving, a flowering plant. Things to hear: mosquitoes buzzing, water sounds, animals jumping in the water, tree leaves rustling. Things to feel: rotten wood, wet mud, slime, an insect crawling in their hands. Things to smell: fresh air, water in a marsh, damp soil, two kinds of flowers. Things to look for: an animal eating, a plant growing in the water, a slug moving.

Back in the classroom, the students will discuss about the new concepts they learned and what they observed. They will write essays using the new words and draw pictures and charts with all the information they have now. In the science lab, they will analyze the samples collected using magnifying glasses first and microscopes later trying to find microorganisms in the water. They will compare the water and soil from the wetlands with local water and soil.

Assessment

The students will work in small groups (3 or 4 students) to elaborate a presentation about a specific topic about the field trip. Some of this topic could be: types of soil, types of water, ecology and habitats, animals and plants in the wetlands, environmental changes (for GT kids or more advanced groups). The presentation must include charts, graphics, pictures, and new concepts.

Closure

Teacher will reinforce the new concepts learned with informal and high-order thinking questions, encouraging the students to make questions to the group.

Lesson Plan 2: Influence of the Wetlands

Objectives

This lesson will take 3 classes, 45 minutes each. In this lesson, students will learn about the importance of wetlands and how they influence our communities. They will learn about the different types of salt water wetlands, and the things that threaten their health. Finally, they will research examples of wetland areas of the U.S., especially Texas, what is being done to protect them, and how we can help. HISD objectives SCI 4.01.a, SCI 4.05.a, ELAR 4.03.a, SCI 4.09.a, c.

Concept Development

Ask students about previous knowledge for the word Wetland and if they think that they are related in any way to their lives. Ask them if they have ever visited a marsh, swamp, or bog, or have ever watched tadpoles swim in small puddles. Ask them what they think some of the things are that make a wetland a true wetland. (Wetlands are covered in water at least part of the year; they have special soils, and support certain kinds of plants that can live in these conditions.) Write some of their answers on a chalk or dry-erase board. Discuss their answers as a class.

The vocabulary for this lesson will be: natural resources, phytoplankton, salt marsh, sediments, tide, tide gates, watershed, subsidence, flyways, decomposers, and erosion.

The materials are: computer with Internet access, crayons, markers, or colored pencils, pencils and paper, and material to create board games (construction paper, tape, scissors, and small pictures that show different kinds of wetlands).

Student Practice and Activities

The students will make a research on the Internet trying to find out the meanings of the vocabulary words. They will also look for pictures of different wetlands in the United States, especially in Texas. The students will research on animals and plants that have developed some adaptation to live in the wetlands.

After the students have organized the information about wetlands, they will start the second part of the lesson: research the different ways that wetlands influence in our environment, the problems that human development has created for the wetlands, and ways that they can help to improve wetlands' condition.

The students will surf inn the web for local or central organizations that protect the wetlands, and they will find out what those organizations' goals are and what they are currently doing.

Finally, the students will show all their research in a visual presentation or in a power point presentation. Pictures are extremely important. The displays must lead the audience to an imaginary field trip mentioning at least five native plants and animals, their location and adaptations, and their current situation.

Assessment

A final activity can be made as assessment. The students will make a board game by groups using cards with topics or questions related to animal or plant adaptation, the distribution of wetlands in the U.S. or the world, threats to wetlands, the benefits of healthy wetlands, etc. When the games are complete, have the groups play each other's games.

Closure

The teacher will ask the students what they know now about wetlands, how they think it is related to the community, and what they can do to protect them.

Lesson Plan 3: Fresh Water Wetlands

Objectives

This lesson will take a field trip of three hours to Sheldon Lake State Park and three more classes in the classroom or the science lab, 45 minutes each. The students will visit fresh water wetlands very close to downtown Houston (around 15 miles) to collect samples of water and soil, observe different animals and plants, and compare these characteristics with those observed in a salt water wetland. They will learn new vocabulary words related to fresh water wetlands. HISD objectives: SCI 4.08.b, SCI 4.11.a, SCI 4.04.a, SCI 5.09.a, c.

Concept Development and materials

Park vegetation consists of a variety of grasses, woody plants, and trees such as oak, pine, cypress, sycamore, and others typical of the Houston area. Marsh, lake and ponds contain a wide variety of water plants, including several types of flowering water lilies. Typical animal life includes deer, raccoon, opossum, rabbit, and alligator. More than twenty species of ducks and geese, other waterfowl, and occasionally bald eagles and osprey are present mainly during winter months. Heron and egret rookeries are visible on the barrier islands along Pineland/Fauna roads during March-June.

The new vocabulary words in this lesson are: flood plain, prairie potholes, habitat, pollution, water quality. We must also include the names of native trees and animals cited above.

Materials: fishing pole (provided by Sheldon Lake State Park), bait, binoculars, beakers, measuring cups to collect water and soil samples, microscope, materials to make a presentation (tri-fold boards, markers, etc.)

Student Practice and Activities

The students will fish (catch and release) different kinds of fishes. They will be able to take a picture and identify them in a chart. They will use binoculars for bird-watching and will walk around the Environmental Learning Center, approximately half a mile, observing the habitat for different animals like bats, alligators, ducks, butterflies, and different plants. It is very important to follow the directions since some species may be poisonous or some animals, like the alligators, are in their natural habitat without restrictions and could be potentially dangerous. The students will observe food chains and food webs. To collect the soil, plants, and water samples, it is necessary to ask for help to the park staff. The students also attend a composting demonstration area that shows easy means of “recycling” household leaves and grass.

Back in the classroom, the students will analyze the differences between fresh water and salt water wetlands. In the science lab, they will analyze the samples of water trying to find micro-organisms. They will also analyze the soil in its different characteristics like color, texture, and ability to retain water.

Finally, they will organize all this information to present a display showing their findings and conclusions.

Assessment

The students will develop a chart about what they knew, what they wanted to know, and what they know now about the fresh water wetlands.

Closure

The teacher will reinforce the new words and the new concepts through informal assessment and promoting the discussion between the students.

Lesson Plan 4: Building Our Own Wetland

Objectives

Creating a model of wetlands allows students to observe this unique environment that has important value to plants and animals. The students will observe the flood-buffering and the filter function that wetlands have. The students will describe how precipitation, runoff, and wetlands are related and how wetlands are important for human beings. This lesson will take two classes of 45 minutes each. HISD objectives are: SCI 4.10.a, SCI 4.01.b.

Concept Development and Materials

The student must have some previous knowledge about wetlands, telling the characteristics of a swamp or the areas close to rivers or the sea. When students make models of the physical characteristics of a wetland environment and observe what happens when it rains, they begin to catch a glimpse of the importance of wetlands, as well as the consequences of getting rid of them, and connect wetlands to everyday issues.

The materials are: small aluminum foil pan (a rolling paint pan could also work), clay (enough to cover half pan), indoor carpet scraps, watering can, and cup of soil. It would be good to have some wetlands plants and some research material about wetlands.

Student Practice and Activities

On one-half of the pan, the clay should make a hill that slopes downward to the middle of the pan. This represents land. Students should make sure the clay seals along the edges. They can also create little streams that flow into the other side which is the “water.” Next to the clay, students should place their sponge or piece of carpet. It also needs to fill the pan to the edges. This represents the wetlands. Each group should then sprinkle the dirt on their land and use clear water in the bottle as the “rain.” Now, the model is ready. We must be sure that the students understand what each part of the model represents.

First, they sprinkle slowly some water over the clay. The students will explain what is happening with the water. A good question is if the amount of water that gets to the river is the same that precipitated over the land. If not, why? The next step is to take out the “wetland” (the sponge) and water the land again. Now the students must observe a difference and conclude that the wetlands slow the rate of flow of the water. They can start analyzing real situations like what would happen during a severe rainstorm without the wetlands.

The other activity using the model is to water again the clay with muddy water explaining to the students that it is polluted water. The students must compare the water from the jar with the water from the “body of water.” They must realize that some particles were trapped by the carpet. Then, we will do it again taking out the piece of carpet and analyzing the final water again. Children must conclude that wetlands filter polluted water, too.

Assessment

Students must answer questions related to the activity: What would happen with fish if they receive the muddy or polluted water? How would that affect to other animals? What about the plants? Is the same for the plants to grow in clear water or muddy water? What mechanisms of adaptation should the plants develop in order to survive? Are commercial activities affected by this muddy water? Finally, two very important questions: How does it would affect you? How can we protect the wetlands from these events?

Closure

Reinforce the concepts of the wetlands’ functions to reduce flooding and retain sediments or pollutants.

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