Exploring the Food Web

Wetlands

Teachers' Guide

TEXAS PARKS & WILDLIFE

Exploring the Food Web

Wetlands Exhibit (Teacher's Edition):

-Food web/ food chain: Students will come to Sea Center Texas' wetland exhibit and observe the various organisms present. Once the organisms are identified they will be used to create a food web. A discussion will be conducted about the food web and how the organisms are inter-dependent.

Overview:

Students learn how organisms are dependent on each other and how they interact in the food web.

Curriculum

-Science

K.1, K.2, K.3, K.4, K.5, K.6, K.7, K.8, K.9
1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10
2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10
3.1, 3.2, 3.4, 3.5, 3.8, 3.9, 3.10
4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.8, 4.10
5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.9, 5.10, 5.11
6.1, 6.2, 6.3, 6.4, 6.5, 6.8, 6.9, 6.10, 6.12, 6.14
7.2, 7.5, 7.8, 7.10, 7.11, 7.12, 7.14
8.6, 8.11, 8.14
Biology 3, 6, 8, 9, 12, 13

-TAKS Grad 5, 10, and 11; Science objective 1 and 3

Vocabulary:

Abiotic
Adaptation
Biomass
Biotic
Carnivore
Decomposer
Ecosystem
Energy pyramid
Habitat
Herbivore
Limiting Factors
Natural selection
Omnivore
Photosynthesis
Population

Primary Consumer
Primary Producer
Secondary Consumer
Species
Tertiary Consumer

Exploring the Food Web

Pre-trip

1. Students should discus what a wetland is and how organisms interact with each other, including the food web
    a. The wetland
        i. Define what a wetland is.
        ii. State why it is hard to define a wetland.
        iii. Identify what animals and plants can live in either a saltwater or a freshwater wetland.
        iv. Discuss how wetlands affect the surrounding environment.
    b. Students should discuss the food web.
        i. Primary producers, primary consumers, secondary consumers, tertiary consumers.
        ii. Food energy web.
        iii. Interrelations of organisms.

Visit to the Sea Center Texas

2. Observing the wetland
    a. Students should observe the various organisms that are present as they go through the tour of the wetland exhibit.
    b. Throughout the tour, using the field guide, the students will identify and hold the cards of the identified organism (cards provided by Sea Center).
    c. At the end of the tour, the students will take the cards of the organism and create a food web.
    d. After the discussion of the food web, additional questions will be asked, including natural selection, limiting factors, adaptation, and how the food web would be affected if organisms were removed.

Post-trip

3. Discussion and observations of an ecosystem closer to home or school.
    a. Students can discuss what they learned as a whole, then create their own food web to share with the class by going home or observing in the school yard the organisms present.
    b. Students can compare and contrast how the wetland habitat and the habitat that they observed varied.
    c. A word search and worksheet involving the food web has also been included for the students.
    d. Student observations of the wetland itself can also lead to a discussion about the water cycle, and carbon dioxide-oxygen cycle.

Wetlands

Background:

Bog, Bottomlands, Fen, Marsh, Mire, Moor, Muskeg, Peatland, Playa lake, Potholes, Slough, Swamp, Wet meadow. What do these all have in common? These are names of just a few of the wetlands found in the United States.

What is a Wetland?

Wetlands are the transition zones between land and water. They are hard to define because of their great variation in size, location, and human influence. To be defined as a wetland three main components must be included: 1) Wetlands must have water present, either at the surface or within the root zone, 2) wetlands must have unique soil conditions that differ from the adjacent upland, and 3) wetlands must support water tolerant plants (hydrophytes).

Hydrology

Hydrology is related to a wetland in the sense that it supplies the area with the water to affect the soil and plants present in the area. The hydrolic conditions affect both the abiotic and biotic condition of the wetland. Abiotically, water affects the soil gas content (and eventually the biotic levels), nutrient availability, and in coastal wetlands, the salinity. Biotically, the water affects the life in and around the wetland. The sources and availability of water in a wetland are continuously changing. Tides, periodic storms, seasons, floods, droughts and many other factors affect the water level of a wetland. The source of water for a wetland can come from ground water, precipitation, and for coastal wetlands –ocean tides, just to mention a few.

Hydric soil

Hydric soils are soils that have been saturated long enough during the growing season to create anaerobic (low oxygen) conditions in the top layers of the soil. Chemical transformations and primary storage for the nutrients needed by the wetlands plants take place in the hydric soil. Soil from wetlands can be classified either as organic or mineral soils, depending on the amount of organic matter present. These soils' physical and chemical characteristics affect several features of wetlands, including the ability to hold water, nutrients and to trap pollutants. Hydric soil has many distinguishing characteristics such as a sulfurous (rotten egg) smell; brown, dark gray or black soil; soil having a wet feel and a mottled color.

Hydrophytic Plants

Hydrophytic plants have adapted to survive in wetlands despite the stress of an anaerobic and flooded environment. Unlike common land plants that are able to get oxygen directly into their roots, the hydrophytes have internal oxygen-transporting tubes, the ability to float on shallow water or buttressed trunks to take oxygen down to the roots of the plants. These plants are often the first and most important indicators of a wetland.

There are several plant adaptations that help capture and transport oxygen to other parts of the plants. For example, tree roots may jut out of the ground (such as Black Mangrove) and extend above the low tide

line allowing oxygen to get directly to the exposed roots. Some hydrophytic plants have exposed or shallow roots to pick up the small amount of oxygen from the soil surface. Other plants have hollow tubes or sacs that transport oxygen to the roots. Buoyant plants have root systems that dangle in the water, providing access to oxygen that is mixed in the water. All these adaptations help the plants to survive in a habitat that no land plants could survive in.

Difficulties of Defining a Wetland

Many factors affect the distribution of wetlands across the United States and the world. As seen by the hydrology, hydric soil, and the variety of plants, the smallest change in the system can drastically change the entire wetland. Existing wetlands are affected by seasonal fluctuations in precipitation, low-lying topography that collects surface water, draining properties of soils in the considered area, temperature which can affect evaporation and plant growth and much more.

Even though these are fairly straight forward components, combining them to make one general definition is difficult because components vary from wetland to wetland, and, more importantly, the three variables are not independent of each other. Each wetland's hydrology, soil, and plants vary from season to season and from year to year, making it hard to define strict boundaries of any wetland. Each wetland also has its own unique hydrology, soil and plants according to its location. In addition, defining a wetland is subject to individual or professional interpretations. Thus a geologist, hydrologist, biologist or ecologist will each define a wetland according to their professional frame of reference making a common definition even more difficult.

Functions of a Wetland

Flood control, storm buffers, soil stabilization, nurseries and habitats for various species are just a few of the important roles that wetlands play. Wetlands have the ability to store flood waters and then slowly release the stored water, reducing the impact of floods. By storing the flood water, it reduces the velocity of floodwaters, reducing the amount of damage caused by the runoff.

Along with reducing the velocity and stage of the flood water, some of the stored water seeps into the ground, recharging the aquifer. The wetlands ability to recharge the groundwater is dependent on the soil permeability, porosity, wetland size and local geology. The soil permeability and porosity affects how fast the water can be moved through the earth to the aquifers. If the permeability and porosity are high, then more water can be moved more quickly into the aquifer than if the permeability and porosity are low. The size of the wetland also has an effect on the recharging of groundwater, because the greater the boundary area between land and water, the more water that can be moved to the aquifer.

Wetlands along the coast such as coastal marshes and mangrove swamps can act as effective storm buffers. The roots of the wetland vegetation hold the soil in place and their stalks and leaves reduce the destructive energy of the waves, allowing more sediment to be collected. The collection of sediments increases the area of the wetland, making it a more effective storm buffer.

Wetlands account for a tremendous amount total global productivity primary productivity (24 percent), and as a whole they out-produce almost all other ecosystems. This primary productivity derives from all

the vegetation that has the ability to photosynthesize and creates diverse habitats that play an important biological role. Their biological productivity attracts wildlife, which utilize the wetlands for food, nesting, spawning, predatory opportunities and shelter.

The Wetlands at Sea Center Texas

At Sea Center Texas, wetlands were created to compensate for the loss of natural wetlands when the visitor center, hatchery building, and ponds were constructed. The wetland exhibit was opened to the public in 1999 and included a 3-acre freshwater marsh and a 1-acre saltwater marsh. Because both marsh areas are viewable, visitors can observe the difference between a freshwater and saltwater marsh.

Freshwater Marsh

Freshwater marshes are commonly characterized by emergent soft-stemmed aquatic plants such as arrowheads and bulrush, a shallow-water regime and normally shallow peat deposits. These marshes generally occur around isolated basins, sluggish streams, and rivers.

Saltwater Marsh

Saltwater marshes on the other hand have high salinity and are generally influenced by tides. However, since Sea Center Texas is some distance inland, the saltwater marsh is not influenced by the tide. Instead, the saltwater for this marsh is pumped in. This marsh is characterized by emergent aquatic plants that have a tolerance for high salinity, such as black mangroves and Black rush. Such marshes commonly occur along the coast.

Why Sea Center Built the Wetlands.

In the past wetlands were looked upon as wastelands and until the 1970's, drainage and destruction of wetlands were accepted practices. Since people have gained a better understanding of wetlands and how they benefit the environment, today's view is quite different. Currently, the government is following a no-net-loss policy: If any wetland is destroyed then a similar wetland must be created in its place. Sea Center's hatchery ponds and facilities were built over existing wetlands, destroying them; therefore the wetland exhibit was created to compensate for this loss. To lessen or compensate for such impact caused by construction is called mitigation.

Even though wetlands are hard to define because of the variations among the hydrology, hydric soil, and hydrophytic plants, since the 1970's most people have recognized that wetlands protection is important. Many important functions including recharging ground water, nurseries, and habitats, and building or enhancing already existing wetlands are observable at Sea Center Texas. Youth and the public at large can learn about the importance of wetlands to all aspects of the environment.

Name:_____ Date:_____

SEA CENTER TEXAS

The Food Web

1. In your own words describe what a food web is.

2. How do plants use the sun?

3. Explain the difference between a primary consumer and a tertiary consumer.

4. Explain the difference between a primary producer and a primary consumer.

5. What happens if there were no producers? Does the food chain still work?

6. What would occur if there where no decomposers?

7. What do all living things need to survive?

8. How would a drought affect the food web?

9. What animal(s) would be affected if one organism in the food chain became extinct?

10. A cow, squirrel and girl all eat food. What are they called?

11. What are the tiny organisms that cause dead plants and animals to decompose?

Food Web
Word Search

AMPHIBIANS
BLACK MANGROVE
BLACK NECKED STILT
BLUE CRAB
COONTAIL
DOVE
DRAGONFLIES
FOOD WEB
GREAT EGRET
GREEN TREEFROG
HALLOWEEN PENNANT
INSECTS
MAMMALS
MINNOW
OPOSSUM
PHOTOSYTHESIS
PLANTS
PRIMARY CONSUMER
PRIMARY PRODUCER
PROCYON LOTOR
RATTLE BUSH
REPTILES
SEA CENTER TEXAS
SECONDARY CONSUMER
SMOOTH CORDGRASS
WATER
WETLAND
WHITE IBIS
YELLOW GARDEN SPIDER

Try to find **all 29** words on this board.

H D G D O K R S A H S M O J D G P D J F
O P R E M P E A Y Q E T Q A N J X O E Y
C R E F D P M X R J I S E W A S Y B E Z
Z O E K C H U E L B L E S C L E L L P B
H C N P V O S T B E F L L D T C L A Y C
A Y T R P T N R A W N I A F E O U C P M
L O R I K O O E R D O T M L W N R K E I
L N E M F S C T C O G P M G H D D N V N
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N J Q C D B M A S N W U N T K M C L A X
A G L E B S R L O O F S S E H E T T L I
N D R R L V S P P O G H T O Y R S C B Y
T S S A R G D R O C H T O O M S T G F Y

Reference Sources

Websites

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U.S. Fish and Wildlife Service. (http://www.fws.gov/)
National Park Service. (http://www.nature.nps.gov/water/wetlands.htm)
Texas Parks and Wildlife (http://www.tpwd.state.tx.us/landwater/water/habitats/wetland/)
Texas Parks and Wildlife (http://www.tpwd.state.tx.us/learning/project_wild/)

Curriculum Guides

Project Wild Aquatic K-12 Curriculum and Activity Guide. Council for Environmental Education. 2002. www.projectwild.org

WOW! The Wonders of Wetlands, An Educator's Guide. Environmental Concern Inc. and The Watercourse. 2003. http://www.wetland.org/wowteacher.html