



WETLANDS WATER CAFÉ

Overview: In this activity, students investigate the plants and animals that live in the nontidal sloughs of New Chicago Marsh and work in groups to create food chains from slough organism cards.

Next Generation Science Standards:

- 3-LS1.1 (LS1.B)
- 3-LS2-1 (LS2.D)
- 3-LS4-3
- 3-LS4-4

Grades: 3-4

Key Concept: The nontidal sloughs in New Chicago Marsh provide an important habitat for many aquatic plants and animals. These plants and animals are an important source of food for both resident and migratory birds.

Objectives:

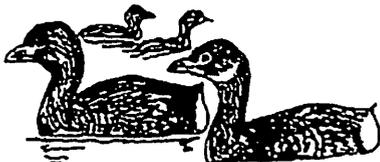
Students will be able to:

- name at least one plant and two animals living in the nontidal slough
- construct one food chain, using these plants and animals
- describe the importance of the nontidal slough habitat to migratory birds.

Materials:

Provided by the Refuge:

- 1 sample of slough water
- 4 large glass dishes
- 6 student microscopes
- 2 large microscopes
- 4 sets food chain cards
- 12 glass petri dishes
- 12 plastic microscope slides
- 12 eyedroppers
- 4 small dipping containers
- 12 tripod magnifiers
- 12 hand lenses
- 12 placemats with slough ID
- 1 set of food chain cards
- 1 food web display



Pied-billed Grebes

METHOD OUTLINE

Recommended Time: 30 minutes

Introduction (7 minutes)

- define the terms habitat, slough and food chain
- introduce the concept of food webs

Investigate Water Sample (15 minutes)

- students take individual water samples from pre-collected samples
- students find and identify organisms

- construct food chains from organisms found

Construct Food Chains (6 minutes)

- divide students into four groups
- students arrange slough organism cards into food chains (one per group)

Discussion (2 minutes)

- individual students present the food chains they have found
- discuss how these food chains are important to migratory birds

HOW THIS ACTIVITY RELATES TO THE REFUGE'S RESOURCES

What are the Refuge's resources?

- significant wildlife habitat
- endangered species
- migratory birds

What makes it necessary to manage the resources?

- Tidal salt marshes have been cut off from the tide by levees built to create salt ponds. The sloughs running through New Chicago Marsh were once connected to the Bay. These sloughs are now nontidal, pond-like bodies of water.

What can students do to help?

Refuge staff have installed a tide gate to allow water to flow into New Chicago Marsh in order to retain the salt marsh habitat, but we need your help.

- Never dump anything down storm drains.
- Teach others what you have learned about salt marsh habitat.

BACKGROUND

Tidal Slough Ecosystems

- Sloughs are like “fingers of the Bay” —natural waterways or channels that carry water from the Bay into the salt marsh as the tide comes in and return the water to the Bay as the tide goes out.
- Sloughs carry Bay water into the marsh twice a day during the flood (incoming) tide and back to the Bay during the ebb (outgoing) tide.
- Tidal waters transport food, detritus (decomposing plants and animals), phytoplankton (tiny drifting plants), and zooplankton (tiny drifting animals) to the inhabitants of the mudflats and salt marsh.

Nontidal Slough Ecosystem

- Historically, the slough channels feeding New Chicago Marsh were connected to the Bay, and were influenced by the tides. When the levees were constructed in the early 1960s to create salt ponds for the solar production of salt, the sloughs in New Chicago Marsh were disconnected from the Bay, making them nontidal, pond-like bodies of water.
- The Refuge has installed a tide gate in the levee at Triangle Marsh to allow a controlled amount of water to flow periodically into the nontidal slough channels. This water management system retains the salt marsh habitat, which supports pickleweed growth and a population of the endangered salt marsh harvest mouse. Both Bay water and rain water collect in the nontidal sloughs that run through the pickleweed habitat.
- These large bodies of water have created an ecosystem which supports a variety of plant and animal life. Microscopic phytoplankton (small drifting plants) and zooplankton (small drifting animals), as well as water boatmen, worms, and fish, all live in this habitat.
- These and other organisms make up the food web of the nontidal sloughs. This food web in turn is part of a larger system which helps to support many of the resident and migratory birds at the refuge.
- Pollutants such as soapy water, motor oil, heavy metals (mercury, copper, etc.) and pesticides may alter the physical characteristics of water in the natural environment.

Food Chains

- A food chain illustrates a sequence of living organ-

isms that feed on each other. An ecosystem may consist of one or many food chains.

- In the nontidal sloughs, several food chains may be combined to form a food web. The food web represents the dynamic relationship between the living organisms, as well as the sun, air, water, and nutrients.
- Two distinct types of organisms live in most habitats; they are producers and consumers. Producers, as the name implies, are living organisms which utilize the sun to produce their own food.

Producers

- The producers of the nontidal sloughs are tiny plants called phytoplankton. These are free-floating plants, which include algae and diatoms.
- Phytoplankton are at the beginning of all of the food chains in the nontidal sloughs. They provide the food base that supports all the other organisms.

Consumers

- Consumers are all organisms which cannot produce their own food and thus feed on the producers directly or indirectly.
 - The organisms which feed directly on the producers are primary consumers, or herbivores. The diet of these organisms is restricted to plant material, including phytoplankton, and detritus (decaying plant or animal material).
 - In the nontidal slough, the primary consumers include zooplankton, some worms, and snails.
 - Organisms which feed on the primary consumers are secondary consumers. These may feed also on plant material (omnivores) but rely mostly on primary consumers or smaller secondary consumers. If the consumer eats primarily animals, it is a carnivore. Secondary consumers include bugs, worms, and fish.
 - Top level consumers of the nontidal sloughs are those organisms which feed on secondary consumers. These organisms hunt for their food and are thus predators, they

include water fowl, large wading birds and raptors.

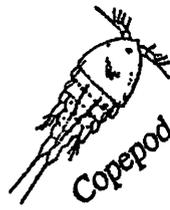
- The different organisms of the nontidal sloughs are thus linked to each other and are either directly or indirectly linked to the primary producers.

Primary Consumers/Herbivores - feed directly on producers

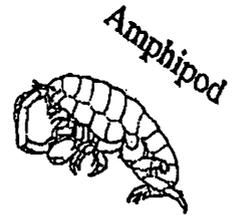
- Zooplankton are small animals that drift in water.
 - Crustaceans possess exoskeletons and breathe with gills in the water. Common crustaceans found in the slough are copepods, ostracods, and amphipods, which are microscopic in size.
 - Rotifers are microscopic animals that feed by rotating the cilia (hairs) on the front of their bodies to collect algae.
- Worms are animals that share a similar body type, yet belong to many different groups of organisms.
 - Nematodes have slender, unsegmented bodies and are one of the most widespread organisms on earth.
- Insects have three body parts (head, thorax, and abdomen) and six legs.
 - Backswimmers are slender bugs with long flattened hind legs that work as oars. As their name implies, they swim on their backs. They carry an air bubble with them underwater in order to breath.

Secondary Consumers/Omnivores - feed on primary consumers and producers

- Worms are animals that share a similar body shape, yet belong to many different groups of organisms.
 - Polychaetes are segmented worms; each segment has bristles that protrude from either side. They live almost exclusively in salt water.
 - Turbellarians are free-living (non-parasitic) flatworms, some of which can grow lost body parts. They use a muscular projection from their mouth to suck out the soft parts of their prey.
 - Pobiscis worms possess a long extendible appendage called a pobiscis, used to capture small animals.



Copepod

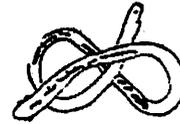


Amphipod

Ostracod



Rotifer



Nematode



Backswimmer



Polychaete

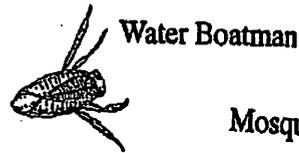
Turbellarian



Pobiscis Worm



- Insects have three body parts (head, thorax, and abdomen), and six legs.
 - Water Boatmen use their long back legs like oars to propel themselves through the water. They carry an air bubble with them underwater in order to breath.
- Fish
 - Mosquito Fish look similar to guppies. Females grow to two inches, while males remain much smaller. They eat mosquito larvae found on the surface of the slough. They are a nonnative species originally introduced from the Pacific Northwest to control mosquitoes.
 - Threespine Sticklebacks feed on small insects, larvae, worms, other small fish. The three spines on their back are often lying down and not easily seen. They grow to approximately three inches long, and appear to have a brown or green color, with silver sides.



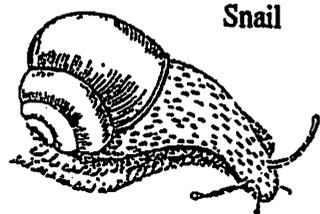
Water Boatman



Mosquito Fish



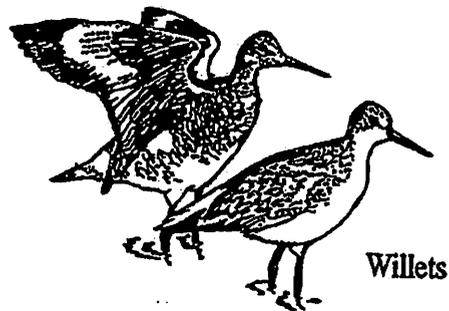
Threespine Stickleback



Snail

Primary or Secondary Consumers

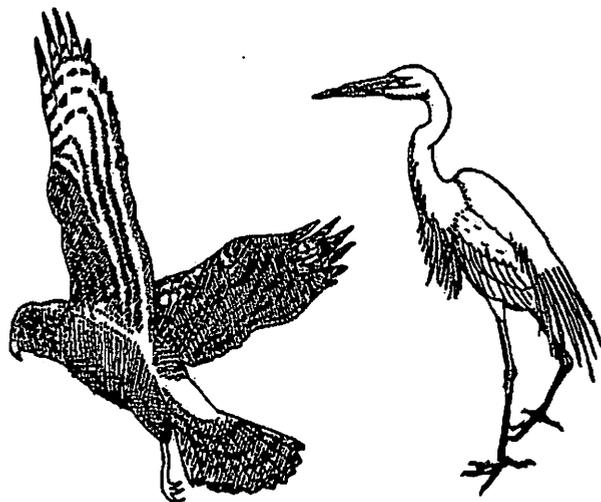
- Snails are a type of mollusk (soft bodied animals with an outer shell). They use a thick muscular foot to move. Their single shell is usually whorled, and they have two tentacles on their heads, each of which contains an eye.
- Birds
 - Shorebirds, such as sandpipers, avocets, and stilts feed on the phytoplankton, zooplankton, and larger invertebrates of the slough. Therefore, they may occupy several consumer levels. A bird's beak will determine which of the organisms it eats. For example, sandpipers feed on tiny snails and plankton at the surface of the mud while dowitchers probe with their longer beaks into the mud in search of worms.
 - Ducks feed on invertebrates, small fish, and plants.



Willetts

Top Consumers/Carnivores

- Birds
 - Egrets both great and snowy egrets feed on fish and crustaceans. Egrets are tall, slender white birds. Snowy egrets have yellow feet and a black beak, while great egrets have a yellow beak and black feet.
 - Northern harriers feed on birds and/or fish, and/or mammals, but they have no natural predators. A type of hawk, northern harriers fly low over marshes looking for prey.



Northern Harrier

Great Egret

HOW TO LEAD THIS ACTIVITY BY FOLLOWING THE "DO, READ, ASK" TEACHING FORMAT

Introduction (7 minutes)

Do

With students sitting at the table, begin the activity by defining a habitat, slough and food chain.

Read

"In this activity, you will learn about the plants and animals that live in the nontidal slough habitat by observing slough water samples and building slough food chains."

Ask

? **Who can tell me what a habitat is?** (A habitat is a home for a plant or animal and it provides food, water, shelter and space suitable to the organism's needs)

? **Does anyone know what a slough is?** (A slough is a natural waterway. It can be thought of as a finger of the bay. It is an aquatic habitat.)

? **Who can describe a food chain?** (A food chain is a series of living organisms that feed on each other.)

? **Who knows what the producer is in a food chain?** (A green plant capable of using the sun's energy to produce food)

? **Then what are the consumers in a food chain?** (Animals that get their energy by eating producers or other consumers.)

? **Can anyone give me an example of a food chain?** (In the salt marsh, the northern harrier feeds on the endangered salt marsh harvest mouse which feeds on pickleweed. Other answers are acceptable.)

Do

- Show the students the food web of the nontidal sloughs which is mounted on the wall.
- In order to familiarize the students with some of the plants and animals of the slough, talk through two food chains which make up the larger food web (each color of yarn designates one food chain).

Read

"This is a food web. It is made up of several different food chains. Let's look at two food chains that make up this food web."

Do

Follow the colored yarn with your finger as you read, pointing to the plants and animals.

Read

"One food chain is: Phytoplankton (tiny plants) are eaten by zooplankton (tiny drifting animals) which are eaten by ducks."

Ask

? **What is the producer?** (Phytoplankton)
? **What are the consumers?** (zooplankton and ducks)

Read

"Another food chain is: Phytoplankton are eaten by bugs which are eaten by worms which are eaten by ducks."

Ask

? **What is the producer?** (Phytoplankton)
? **What are the consumers?** (bugs, worms and ducks)

Read

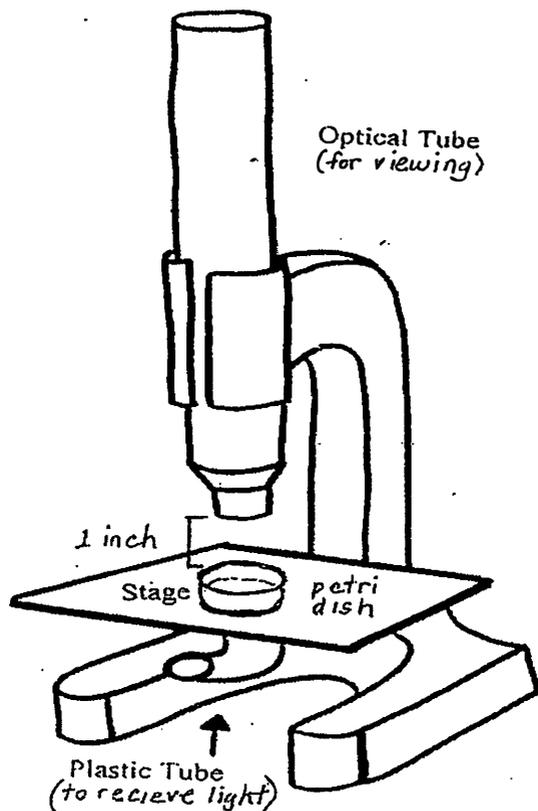
- "These food chains, along with others, combine to form a food web.
- "In each of the bowls on the table there is a sample of water from the nontidal sloughs that are outside in New Chicago Marsh. This water contains a number of food chains which contribute to the food web of the nontidal sloughs."

Investigate Water Sample (15 minutes)

Read and demonstrate

- "You are going to investigate the sample of slough water in front of you. When I am finished explaining the directions, dip your cup carefully into the large dish to get a sample for your petri dish. Make sure the petri dish is half full.
- "Use your hand lens to look at the swimming creatures.
- "To see an animal up close, use your eyedropper to suck it up. Hold the slide with the depression side up and carefully place a single drop containing the creature in the hollow part of the slide.
- "Put it under the tripod magnifier and screw the top up and down to focus.

- "There are also Magiscopes® which you can take turns using.
 - "To use this type of microscope, place your slide on the stage directly under the objective lens about 1/2 inch away.
 - "To focus, slide the Magiscopes® tube slowly up or down until the image sharpens."
- Do**
- Have the students investigate their sample/ slides



Construct Food Chains (6 minutes)

Do

Split the students into four groups. Pass out one set of food chain cards to each group — each set is backed by a different color.

Read

"Each group has a set of cards that makes up a food chain found in the nontidal sloughs outside in New Chicago Marsh. Working as a team, arrange your set of cards into a food chain."

Do

Work with the groups, as needed. When the students are finished have each group share their food chain with the rest of the students.

Ask

- ? **Who would like to describe their food chain?** (Allow each group to describe their food chain.)
- ? **Why did the water look green?** (It appears green due to phytoplankton, made up of tiny plants called algae, that are suspended in the water.)
- ? **What is the first link in our food chain?** [Tiny plants: phytoplankton(algae)]
- ? **How do plants get their food?** (Plants are producers and make their own food using energy from the sun.)
- ? **What animal in your food chain eats the producer?** (Plants are eaten by animals which are called consumers.)

Discussion (2 minutes)

Ask

? **What would happen if (select one: phytoplankton, zooplankton, water boatman, fish, etc.) disappeared?**

- (The next organism up in the food chain would be negatively affected, and the next organism above that one, and so on, and so on.
- Loss of one food link in the chain could lead to extinction of one or more organisms in the habitat.
- Organisms below the vanished animal in the food chain might experience uncontrolled population growth. All members of the food web are interdependent.)
- ? **How would a reduced food chain in the slough habitat affect migrating birds?** (If the slough habitat provided fewer organisms to feed on, they would have to look elsewhere for food. If the food web disappeared, so would the migrating birds.)
- ? **Pollutants affect the health of plants and animals in the slough. How do some pollutants enter the bay and sloughs?** (Through storm drains, which run directly to the bay. Water carries things from driveways and streets into storm drains.)
- ? **Once pollutants enter the slough, what damage do they do?** (Pollutants enter the food pyramid and become concentrated in animals at the top of the food pyramid.)
- ? **How can you help prevent pollutants from entering the slough?** (Don't dump anything down storm drains; use garden pesticides, herbicides, and fertilizers sparingly; pick up animal wastes and throw away; recycle motor oil; use nontoxic cleaners, such as baking powder and vinegar, or products in stores that say "nontoxic"; teach others about pollution; stencil storm drains. etc.)