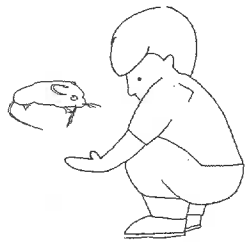


Salt Marsh Food Web

Overview: In this activity, students take on the role of plants, animals, and physical aspects of the salt marsh. They create a web demonstrating the interconnections of all parts of the marsh.
Content Standards Correlations: Science, p. 305

Grades: 3-6

Key Concepts: Many plants and animals depend upon the salt marsh habitat for survival, including two endangered species: the California clapper rail and the salt marsh harvest mouse. It has a complex food web made up of plants, animals, and the physical environment. When one part of the food web disappears, the entire web is affected.

Objectives:
Students will be able to:
- identify at least five different marsh plants and animals
- name at least two relationships between marsh plants and animals
- identify two of the endangered species found in the salt marsh and explain why they are endangered

Materials:
- ball of yarn to create web
- 20 salt marsh food web cards, p.159-161, For more participants, add more cordgrass, phytoplankton, zooplankton, and aquatic worm cards. Copy the cards, cut apart, and mount on poster board - you can poke holes in the top and tie yarn through so that students can wear the cards

Supporting Information About This Activity

- Tidal salt marshes such as those surrounding the San Francisco Bay form a very unique environment where ocean water meets fresh water to form an estuary. The salt marsh is a transition between the water and dry land.
- A tidal marsh is subject to flooding when the tide comes in and the water overflows from the Bay or slough. This causes the soil to be very salty making it difficult for most plants to grow in this environment.
    - There are some plants which have adapted to high salinity soils. They are called "halophytes" meaning "salt loving".
    - You will find that in the salt marsh all of the plants are shorter with smaller leaves. This is due to the fact that they expend so much of their energy excreting salt as well as drawing water into their roots that they are unable to grow very large.
    - The plants which grow in a tidal marsh also tend to grow in particular zones.
        - In the lower marsh zone, cordgrass is most prevalent. The lower marsh zone is closest to the slough and therefore is often completely submerged under water. Cordgrass is able to live up to 22 hours under water. Cordgrass also provides the first link in the food chain. When it dies it decomposes forming a material called detritus, an important food for small estuary animals.
        - In the middle marsh zone you will find pickleweed. Pickleweed, like cordgrass, is very salt tolerant but it can't be covered by water for extended periods of time. The pickleweed rids itself of salt by transporting the salt to the tips of its stems which turn red and eventually break off.
        - In the upper marsh zone there is a more diverse plant life. This area is home to alkali heath, Australian salt brush, and salt grass. Each of these plants sweat salt out of their pores where it crystallizes on their leaves.
- The Salt Marsh is also home to many different types of animals.
    - Two of the endangered species found on the Refuge can be found in the salt marsh.
        - The salt marsh harvest mouse lives only in the San Francisco Bay marshlands. Its diet consists primarily of pickleweed and it can drink salt water.
        - The California clapper rail, an endangered species as well,

depends exclusively on the salt marsh for its food and shelter. The California clapper rail feeds on mussels, clams, crabs, small fish, insects, spiders, and salt marsh harvest mice.

- Other animals found in the salt marsh include many different types of birds.
  - Shorebirds such as dowitchers, sandpipers, and black-necked stilts can often be found during the low tide probing the mud for food. The mud contains an abundance of life including aquatic worms, snails, and crabs.
  - Larger birds such as egrets are often seen along the slough's edges and within the marsh itself. They are looking for fish and small mammals, whereas hawks, such as the northern harrier, fly above the marsh in search of food.

- An ecosystem is defined as a community of living things and the physical environment with which they interact. Four physical elements are necessary for all life: air, water, soil, and sunlight. There are many relationships and interactions within an ecosystem. These relationships and interactions can be demonstrated as a "web," with each plant, animal, or physical characteristic connected to each other either directly or indirectly. When one part of the web is touched, every part is affected.

Teaching Method

Do
Ask the students to form a circle. Hand out a food web card to each student (**Note:** Save the sun card for yourself).

Read
"Some of you will have the same plant or animal, these are on the bottom of the food web."

Ask
? Why do we have more of these in the food web? (Because the bottom of the food web needs to be larger to support the animals at the top.)

Do
Have the students read their cards aloud to the rest of the students. Let the students know that they need to listen and learn about each organism in order to build the food web. When they have finished, you can begin forming the food web by showing the students the sun card and reading the following:

Read
"I am the sun. Everything on earth depends on me. In my hands, I hold the web of life."

Do
Show the students the ball of yarn.

Read
"Because all life depends on energy from the sun, I am connected to all of you."

Ask
? Can the pickleweed tell how I am connected to it? (I am the sun and I'm connected to the pickleweed because I provide the energy pickleweed needs to make its own food.)

Do
Wrap one end of the yarn around your hand and pass the ball of yarn to the student with the pickleweed card.

Read (To the student with the ball of yarn)
"Tell us who or what you are and how you are related to some other plant, animal, or physical feature represented by another card For example, "I am pickleweed and I am eaten by the salt marsh harvest mouse.""

Do
Now have the student with the yarn pass it to the person with the card which they related to their own card. *Using the example above, the student with the pickleweed card would throw the yarn to the student with the salt marsh harvest mouse card.*
Please Note: Relationships can be direct or indirect. For instance, the northern harrier is a predator which eats the salt marsh harvest mouse, but it also depends on air and water.

Do
When all the players are connected by a yarn web, have a discussion about endangered species.

Ask

? What does it mean when a species is listed as endangered? (Plants and animals are considered endangered when there is so few of a particular species left that it runs the risk of becoming extinct.)

? Which of the animals in the web are endangered? (The California clapper rail & the salt marsh harvest mouse.)

? Why do you think these animals are endangered? (Both of these animals rely on the salt marsh for their food and shelter. Over the past 200 years, 85% of the salt marshes in San Francisco Bay have been lost. In short, these animals are endangered due to loss of habitat.)

? What do you think we can do to help the California clapper rail and salt marsh harvest mouse? (Recycle-helps reduce the need for landfills built on salt marshes; participate in coast clean-ups; write letters to legislatures about why wetlands are important; keep pollutants out of storm drains.)

Do

Choose either the California clapper rail or the salt marsh harvest mouse to be removed from the web due to extinction. The selected player should sit down and pull on his/her yarn. Other students should sit down and tug when they feel the pull. Soon the entire circle will be sitting on the ground.

Read

"Everyone in the web is affected by the loss of one species."

Ask

? Why does the loss of one species affect other species? (For example: If the salt marsh harvest mouse becomes extinct, the northern harrier will lose part of its food supply and could, in turn, prey more heavily on other animals.)

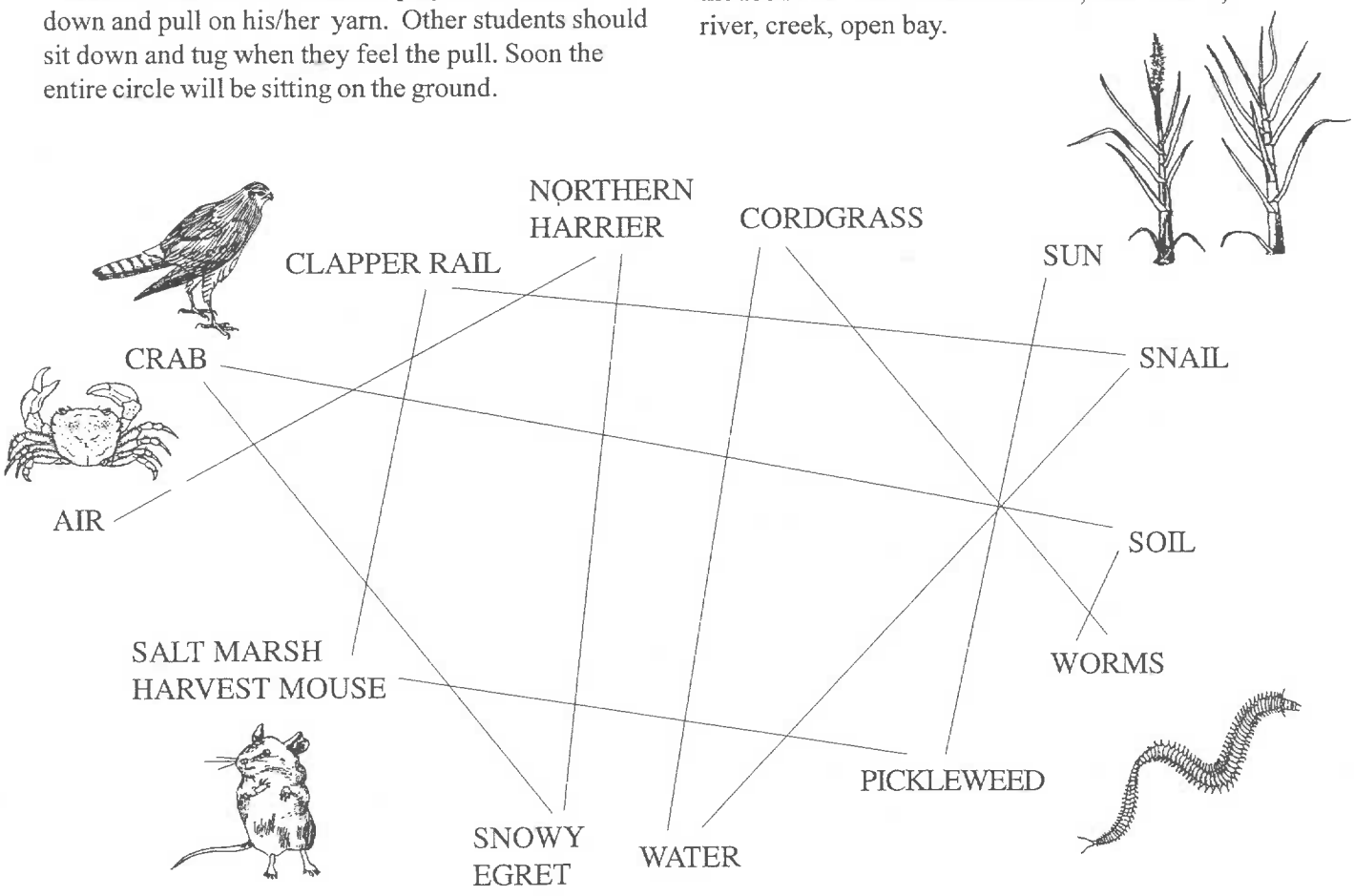
Extensions

1. Hand out one set of web cards to each student or group of students and have them create many food chains out of the cards.
2. If you did the activity "Habitats and Food Chains" as a pre-visit activity, use the food chain links that the students created to make food webs. Link the chains together to make a large web.

Ideas for Writing and Speaking Topics of Language Arts Content Standards, p. 311

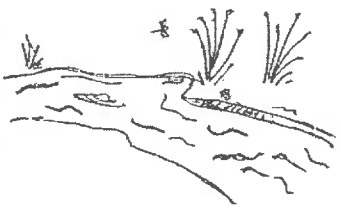
Students can explore:

- how plants and animals are interconnected into a food web in the salt marsh.
- the food web of a different habitat; oak foothill, river, creek, open bay.



Sun

I am the sun.
Everything on earth depends on me.
And in my hands I hold the web of life.

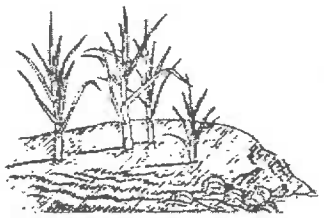


Water

I am water. **All living things** need me to survive.
Most plants and animals in the salt marsh are adapted to salt water. Twice a day, the high tide fills the slough and marsh with salty bay water. San Francisco Bay is called an estuary because salt and fresh water mix here.

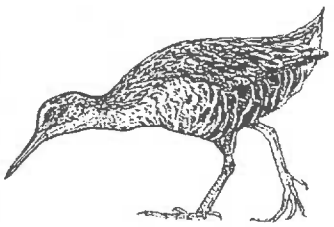
Air

I am air.
I am made up of oxygen and nitrogen. I am very important to **all living things.**
Fish, which don't breath air directly, get oxygen from the water.
It is important to keep me clean because pollution in the air is harmful for all creatures.



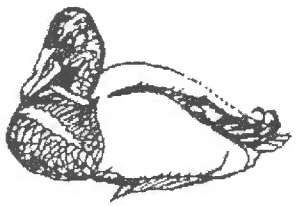
Soil

I am soil.
I am very important to **all living things.**
Plants use the nutrients in me to grow. **Animals** get their nutrients from plants.
When living things die, they decompose and return their nutrients to me.



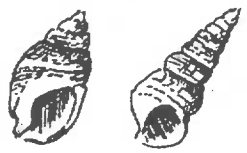
California Clapper Rail

I am an endangered bird called the California clapper rail.
I eat lots of different things such as **crabs, small fish, snails**, and even **salt marsh harvest mice**.
I am sometimes eaten by **northern harriers**. I live in the salt marsh, hiding and nesting in the **pickleweed** and **cordgrass.**



Mallard Duck

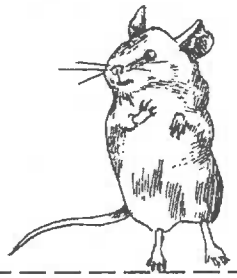
I am a mallard duck.
Some of the foods I like to eat are **detritus, worms, phytoplankton**, and **zooplankton**.
Sometimes **people** eat me.
I live in the **waters** of lakes, ponds, sloughs, and rivers.



Snail

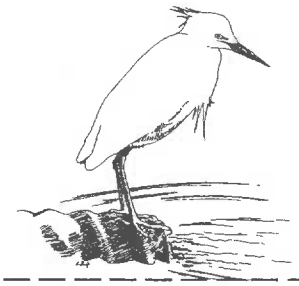
I am a snail.
I eat **phytoplankton** and **zooplankton**.
Lots of different birds prey on me such as **egrets, California clapper rails** and **killdeer**.
I live in the mudflats of the slough.

Salt Marsh Harvest Mouse



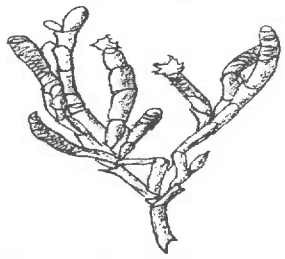
I am "salty", the salt marsh harvest mouse, an endangered species.
I eat **pickleweed**.
Northern harriers, California clapper rails, and **egrets** like to eat me.
You can only find me living in the salt marshes of San Francisco Bay, but you won't see me during the day because I am nocturnal.

Snowy Egret



I am a snowy egret.
I eat lots of different things including **small fish, mice, snails** and **crabs.**
Northern harriers try to eat my young. In the past I was often killed by **people** who used my feathers to decorate hats.
I live in the salt marshes and tidal sloughs.

Pickleweed

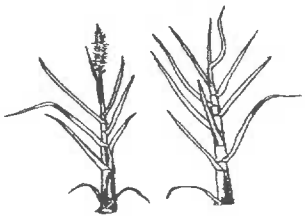


I am pickleweed.
I use the **sun** to produce my own food.
I am eaten by the **salt marsh harvest mouse.** The **California clapper rails** build their nests on me.
I live in the salt marsh and get wet when tidal **water** comes in from the bay.

Northern Harrier

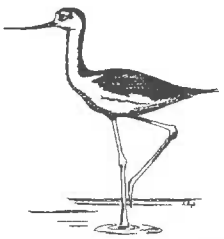
I am a northern harrier.
I eat different animals including the **salt marsh harvest mouse** and **birds.**
I am at the top of the food chain so other animals don't prey upon me.

Cordgrass (Detritus)



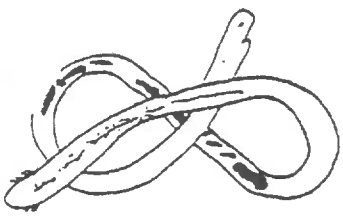
I am cordgrass.
I use **sunlight** to produce my own food.
When I die I decompose into a material called **detritus**. Lots of animals feed on **detritus** such as **zooplankton, ducks, fish, worms,** and **crabs**.
I grow close to the slough and the **California clapper rail** hides under me.

Black-necked Stilt



I am a black-necked stilt.
I eat **snails, fish,** and **worms**
Sometimes **northern harriers** will eat me or my young.
You can find me in the salt pond, salt marsh, and mudflats.

Aquatic Worm



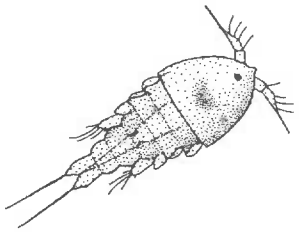
I am an aquatic worm.
I eat mostly **detritus, phytoplankton,** and **zooplankton.**
Lots of birds including **killdeer** and **black-necked stilts** like to eat me.
Fish like to eat me as well.
I live in the mudflats of the slough.

Crab

I am a crab.
I eat different foods including **detritus, phytoplankton, zooplankton,** and dead **fish**.
Lots of animals feed on me including birds such as **egrets, California clapper rails,** and **killdeer.**
I burrow in the mudflats of the slough.

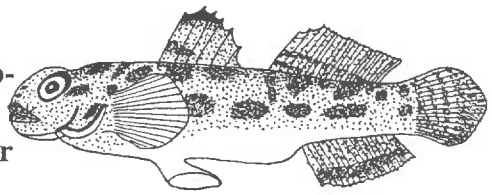
Zooplankton

I am zooplankton.
I like to eat **detritus, phytoplankton** and other **zooplankton**.
I am eaten by lots of different animals including small **fish, crabs, worms** and **snails**.
I can be found in the slough.



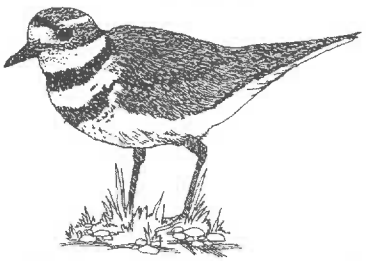
Bay Goby

I am a bay goby.
I feed on the bottom of the slough eating **phytoplankton, zooplankton, detritus,** and tiny mud creatures such as **worms**.
I am eaten by different birds such as **egrets, California clapper rails,** and **black-necked stilts.**
I live in the slough **water.**



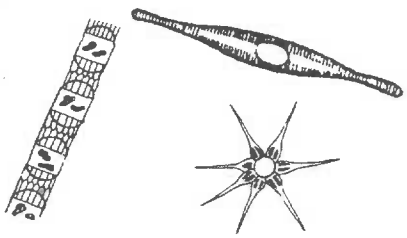
Killdeer

I am a killdeer.
You will often find me probing the mud for food such as **worms, snails,** and small **crabs**.
Many animals try to eat me including the **northern harrier**.
I can usually be found on the mudflats during low tide.



Phytoplankton

I am phytoplankton.
I use **sunlight** to produce my own food.
Many different organisms like to eat me including **aquatic worms, zooplankton, snails, crabs**, and fish such as the **goby**.
You can find me in the slough.



Human Being

I am a human being.
As you know I eat a huge variety of different foods including **ducks** and **fish**.
I am at the top of the food chain so no animals prey on me.
I live in many different places on the earth and sometimes I build my home on top of salt marshes.