

MUD CREATURE STUDY

Overview: The mudflats support a tremendous amount of life. In this activity, students will search for and study the creatures that live in bay mud.

Content Standards Correlations: Science p. 307

Grades: K-6

Key Concepts: Mud creatures live in high abundance in the mudflats, providing food for migratory ducks and shorebirds and the endangered California clapper rail. When the tide is out, the mudflats are revealed and birds land on the mudflats to feed.

Objectives:

Students will be able to:

- name and describe two to three mud creatures
- describe the mudflat food pyramid
- explain the importance of the mudflat habitat for migratory birds and endangered species

Materials:

Provided by the Refuge:

- 1 set mud creature ID cards
- 1 mud creature flannel banner
- 1 mudflat food pyramid poster
- 1 mud creature ID book
- 1 four-layered sieve set
- 1 dish of mud and trowel
- 1 bucket of slough water
- 1 pitcher of slough water
- 12 glass petri dishes
- 12 plastic microscope slides
- 12 hand lenses
- 12 microspatulas
- 12 eyedroppers
- 12 tripod magnifiers
- 4 containers of slough water
- 1 plastic tub
- 2 large microscopes
- 6 student microscopes
- 12 placemats with mud ID

Provided by the Educator:

- copies of data sheets (p.192) and pencils, one per student (*optional*)

TIME FRAME FOR TEACHING THIS ACTIVITY

Recommended Time: 30 minutes

Mud Creature Banner (7 minutes)

- use the Mud Creature Banner to introduce students to mudflat habitat

Mudflat Food Pyramid (3 minutes)

- discuss the mudflat food pyramid, using poster

Mud Creature Study (20 minutes)

- sieve mud in sieve set, using slough water
- distribute small samples of mud to petri dishes
- look for mud creatures using hand lenses
- use the microscopes for a closer view of mud creatures
- if data sheets and pencils are provided, students can draw what they find

HOW THIS ACTIVITY RELATES TO THE REFUGE'S RESOURCES

What are the Refuge's resources?

- significant wildlife habitat
- endangered species
- migratory birds

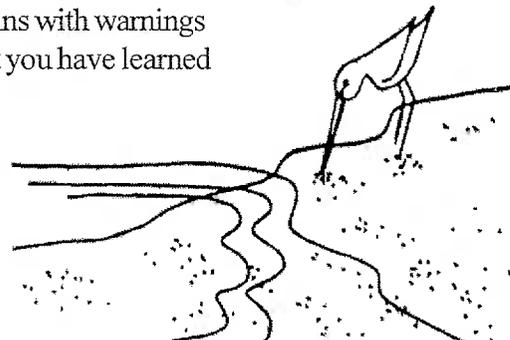
What makes it necessary to manage the resources?

- Pollution, such as oil, paint, and household cleaners, when dumped down storm drains enters the slough and mudflats and travels through the food chain, harming animals.

What can students do to help?

Refuge staff study pollutants found in the Bay to see how they affect wildlife, but we need your help.

- Never dump anything down storm drains
- Label storm drains with warnings
- Tell others what you have learned

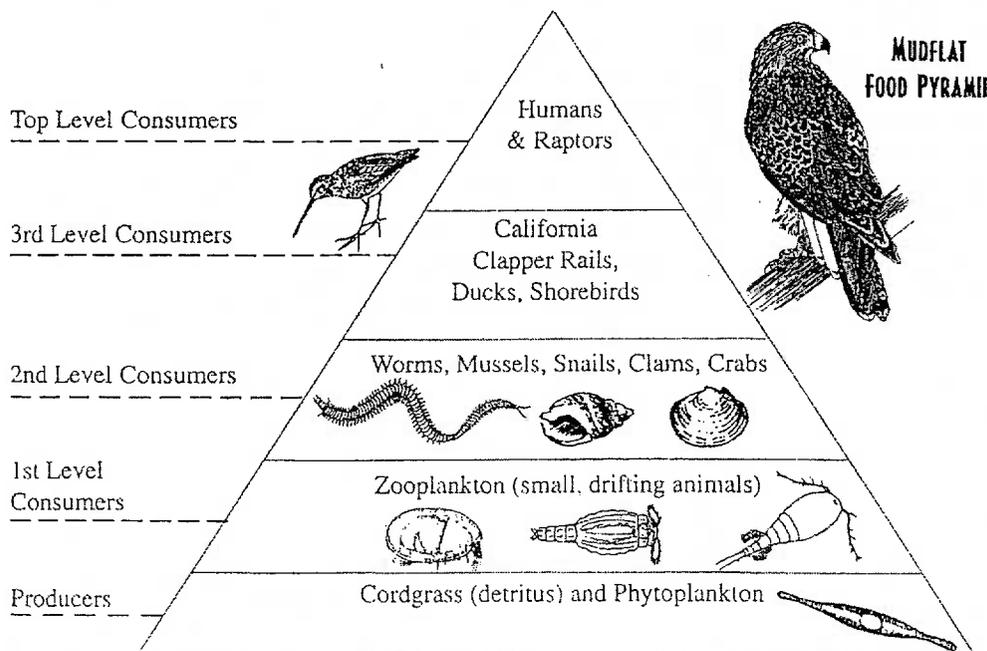


SUPPORTING INFORMATION FOR THIS ACTIVITY

- Sloughs are “fingers” of San Francisco Bay. They are natural waterways connected to the bay and winding through the salt marsh. Because they are connected the bay, they are a tidal habitat. There are two high tides and two low tides each day.
- Mudflats appear in the slough channels and around the edges of the bay when the tide flows out.
- Despite an apparent lack of plants and animals, mudflats support an abundance of life. An estimated 40,000 organisms live in a double handful of mud.
 - Many of these organisms are microscopic or nearly microscopic, such as ostracods, copepods, and many different kinds of worms.
 - In addition to microscopic organisms, larger, more visible animals inhabit the mudflats as well, such as clams, mussels, snails, and crabs.
- When the mudflats are exposed at low tide, hundreds of shorebirds and waterbirds of varying sizes appear. They probe their beaks into the mud or sweep them across the mud’s surface in search of food - the mud creatures.
- Migratory ducks and shorebirds depend upon the mudflats. They use the San Francisco Bay as a feeding and resting stop as they travel along the Pacific Flyway.
- The California clapper rail, an endangered species, also depends upon the mudflats. Clapper rails hide

and nest in the pickleweed and cordgrass and feed on mud creatures in the mudflats.

- The diversity of mudflat plants and animals results in a dynamic **food pyramid**. A food pyramid explains the loss of energy between different levels of producers and consumers.
 - Cordgrass (only at Visitor Center) and **phytoplankton** (small, drifting plants) are producers. They support the entire food pyramid because they use sunlight to make their own food or energy.
 - **Zooplankton** (small, drifting animals) are the first level of consumers. They feed on dead, decomposed cordgrass (detritus) and phytoplankton.
 - **Worms, crabs, snails, mussels, and clams** (the mud creatures) feed on the zooplankton, phytoplankton, and detritus and represent the second level of consumers.
 - This is evident with **birds** (such as ducks, shorebirds, and the California clapper rail), which are the third level consumers, feeding on the mud creatures.
 - A food pyramid always reaches a final level where there are no additional natural predators. In this pyramid, **humans and raptors** (such as red-tailed hawks, northern harriers, and peregrine falcons) are the top level consumers, feeding on the birds that use the mudflats.



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

Mud Creature Banner (7 minutes)

Do

Ask the students to sit at the table.

Read

"We are going to search for and study the creatures that live in the bay mud. But first, let's look at the birds that feed in the slough channel when the tide is low and the mudflats are exposed."

Do

The mud creature banner should be set to high tide, with the mud creatures hidden behind the flaps on the banner and the birds in the air or in the high marsh.

Read

"Sloughs are fingers of San Francisco Bay that cover the mudflats at high tide. Sloughs are affected by the tides because they are connected to the bay, which is connected to the ocean."

"Look at this mud creature banner."

Ask

Is it high tide or low tide on this banner? (It is high tide because the slough is full of water.)

Ask

? Why aren't the birds looking for food in the slough? (The water is too deep to reach the creatures living in the mud at the bottom of the slough.)

Read

"At low tide, when the water has returned to the bay, the mudflats appear in the slough channels. Twice a day, the tide is low and the mudflats appear."

Do

Remove the high tide fabric so that the banner is set at low tide. Put the high tide fabric in the box labeled "San Francisco Bay."

Read

"When the mudflats are exposed (point out the mudflats sloping down from the marsh to the slough water), hundreds of birds appear. They land on the mudflats and probe into the mud with their beaks."

Do

Select volunteers to move the birds from the air and high marsh onto the mudflats.

Ask

? What are these birds doing on the mudflats? (Looking for food.)

? Are they eating mud? (No, they are eating creatures that live in the mud.)

Read

"Despite an apparent lack of plants and animals, tidal mudflats support an abundance of life. An estimated 40,000 organisms live in a double handful of bay mud."

Ask

? What do you think lives in the mud? (Accept all reasonable answers as possibilities.)

Read

"Let's find out what lives in the mud."

Do

Select volunteers to open up one flap at a time to expose a mud creature and read the name of the creature. Help the students read the names.

Read

"These are some of the mud creatures we are going to be looking for. Most of these creatures are not shown as their actual size."

Mudflat Food Pyramid (3 minutes)

Do

Hold up the food pyramid poster.

Read

"All food pyramids must have producers at the bottom.

- "Producers support the rest of the food pyramid. Detritus (decomposing plants) and phytoplankton (small, drifting plants) are the producers in the mudflats. Like all plants, they use sunlight to make food or energy.
- "Zooplankton (small, drifting animals) feed on phytoplankton and detritus. They are the first consumer level.

- "Mud creatures are the second consumer level - they feed on zooplankton, phytoplankton, and detritus.
- "Birds (such as ducks, shorebirds, and California clapper rails, an endangered species) eat the mud creatures. They are the third level consumers.
- "Animals at the top level of a food pyramid have no natural predators. In this food pyramid, humans and birds of prey (such as northern harriers, red-tailed hawks, and peregrine falcons, an endangered species) feed on the birds."

Ask

? **Why are mud creatures important?** (They provide an important source of food for birds.)

? **Do you think mudflats are important to preserve?** (Possible answers: Mudflats provide a home and food for many animals, including birds such as the California clapper rail, an endangered species. Humans also eat ducks that feed on mud creatures.)

? **What happens when pollution is dumped down storm drains?** (It runs directly to creeks and rivers, which run to the bay. The pollution can end up in the slough and mudflats and enter food chains. Animals, such as the California clapper rail, can be harmed by pollution.)

? **How can we prevent pollution from entering mudflat food chains?** (Never dump anything down the storm drain. Label storm drains with warnings. Tell others about storm drains.)

Mud Creature Study (20 minutes)

Do

Hold up the sieve set and show the students that the sieves are stacked with the coarsest screen (largest

holes) on top and the finest screen (smallest holes) on the bottom.

Read

"Now we are going to be searching for zooplankton (first consumer level) and mud creatures (second consumer level). I need a volunteer to place a "golf-ball" size mud sample on the top sieve and carefully loosen it with your fingers."

Do

Student puts on a glove before loosening the mud.

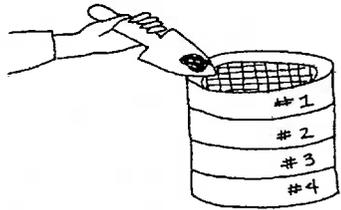
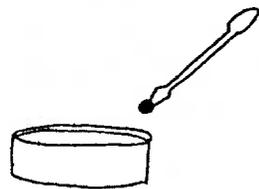
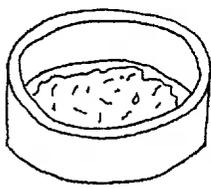
Read

"I need another volunteer to pour slough water over the mud."

Do

- When the mud has passed through the top screen, separate the sieves and pass them out to the students.
- Students should examine the sieves for animals. If animals can be seen with the naked eye, have students remove them and place them in their petri dishes.
- If animals cannot be seen with the naked eye, direct students to scrape a sample from the sieve with their micro spatula and place it in their petri dishes.
- Add some slough water to the mud sample and stir it up with the spatula stick.

(**Note: use a very small amount of mud and slough water for easier viewing. About the size of this dot** → ●).

<p>1. Place a golf-ball size mud sample onto the top sieve</p> 	<p>2. Pour slough water over the mud to wash it through the sieves. Use a gloved hand to loosen the mud.</p> 
<p>3. Use a microspatula to take a <u>small</u> sample of mud from a sieve and put it in the petri dish.</p> 	<p>4. Add a small amount of slough water to the petri dish. The petri dishes should have very little mud. The water should be almost clear.</p> 

Read

“First examine the mud with a hand lens. If you find something moving, use the microscopes for a closer look. Identify the creatures in your samples by using the mud creature identification cards and mud creature book.”

Do

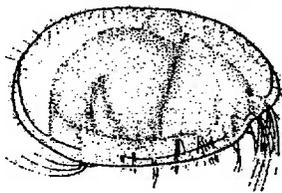
Assist the students with the microscopes and help them identify mud creatures. It is not necessary to know exact names -there are hundreds of species in the mud.

Note: If data sheets and pencils were provided by the educator, students should draw sketches of what they find.

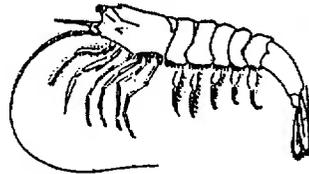
Hints for finding mud creatures: Look for creatures swimming on the surface of the water in the mud bucket. You can extract these with an eyedropper. Look for worms stuck on the bottom of the sieve, as well as for any sort of movement on the top of the sieve. You can use the microspatula to remove creatures from the sieve set. Creatures are very small. You may want to use a hand lens to get a closer look in the sieve. *Please ask the Refuge intern or staff person for additional assistance if you have trouble finding creatures.* At the end of each rotation, have students place found creatures in a bowl of slough water to save for the next group.

At the end of the activity, have students clean their equipment and reset their stations.

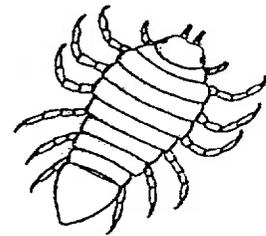
MUD CREATURES



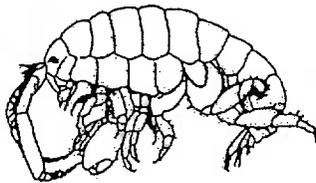
Ostracod



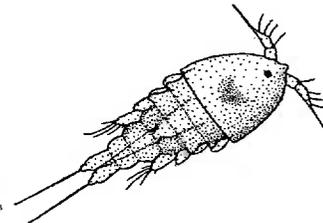
Shrimp



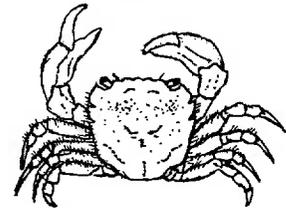
Isopod



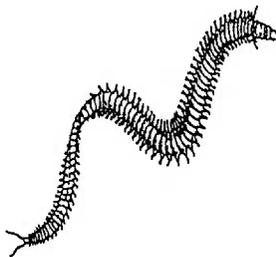
Amphipod



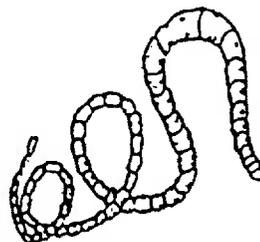
Copepod



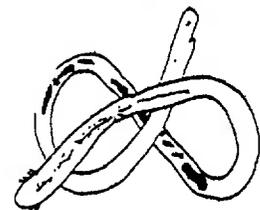
Crab



Polychaete



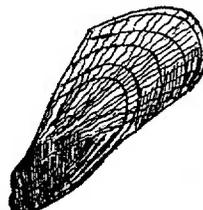
Oligochaete



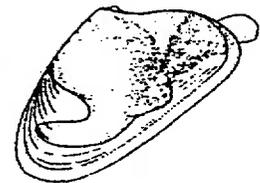
Nematode



Snail



Mussel

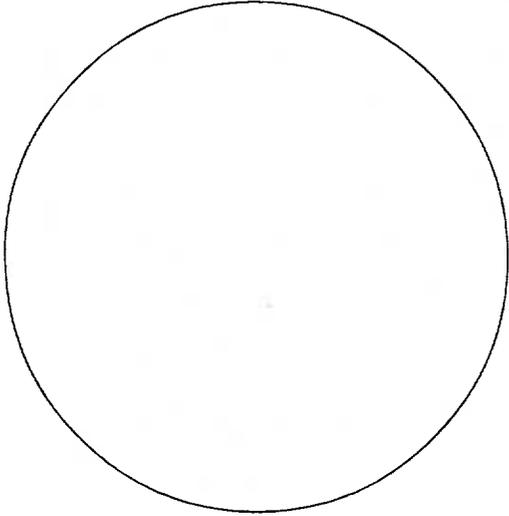


Clam

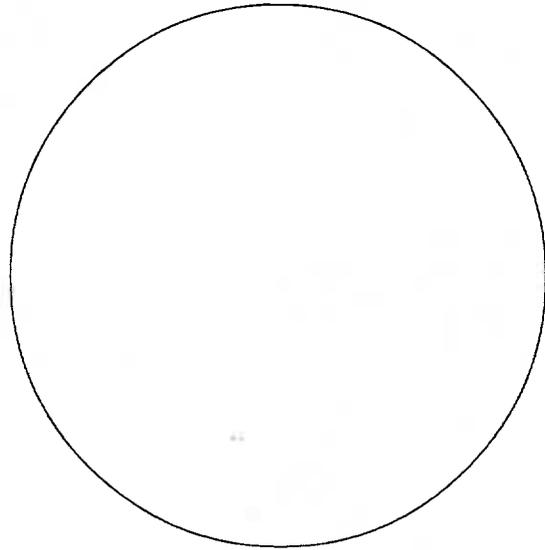
MUD CREATURE DATA SHEET

Student Name: _____

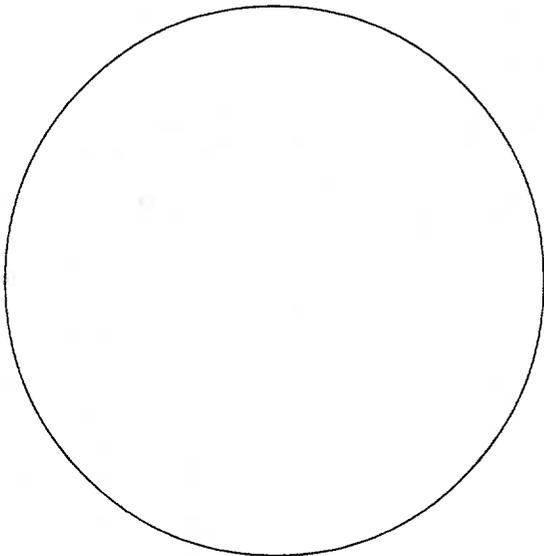
Draw and identify any mud creatures that you discover



Name: _____



Name: _____



Name: _____