Salt Marsh Mini-Expedition (3-6)

Overview: In this activity, students will work in pairs to examine a small section of the salt marsh. They will study plants, animals, and physical characteristics of the salt marsh.
Content Standards Correlations: Science, p. 294

Grades: 3-6

Key Concepts: The salt marshes around San Francisco Bay provide a unique habitat for a specialized group of plants and animals. Human impacts have drastically reduced the salt marsh habitat, causing two species to become endangered: the salt marsh harvest mouse and the California clapper rail.

Objectives:
Students will be able to:
- describe the physical and biological components of the salt marsh habitat
- describe important values of the salt marsh habitat
- name two to three ways in which humans impact the salt marsh

Materials:
Provided by the Refuge:
- 6 mini-expedition packs, each containing:
  - 1 boundary rope
  - 1 soil thermometer
  - 2 hand lenses
- 6 clipboards
- 1 scat display
- 1 salt marsh plant book
- 1 bird identification chart
- 1 key to Salty's Home
- 1 animal track chart

Provided by the Educator:
- copies of Salt Marsh Data Sheet (p. 259) and pencils: one copy for every two students

Time Frame for Conducting This Activity

Recommended Time: 30 minutes
Introduction (8 minutes)
- discuss the salt marsh habitat and the Key to Salty's Home
- divide students into groups of two and hand out clipboards, pencils, data sheets, and mini-expedition bags
- discuss the responsibilities of each group

Exploring the Salt Marsh (15 minutes)
- allow each group time to explore their section of the marsh
- circulate among the groups with the plant book and scat display

Discussion (7 minutes)
- gather students to share discoveries and answer data sheet questions
- ask discussion questions
- collect materials, including data sheets

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?
- Loss of salt marsh habitat due to development, such as landfills, salt ponds, buildings, roads, airports, etc. The introduction of nonnative plants and animals.

What can students do to help?
Refuge staff acquire and preserve wetland habitat and control introduced plants and animals, but we need your help.
- Reduce, reuse, and recycle, decreasing the need for landfills.
- Adopt a wetland or an endangered species
- Plant native plants
- Teach others what you have learned about habitats and endangered species

Austrailian Saltbush

Supporting Information for This Activity

Salt Marsh

- Salt marshes once surrounded the San Francisco Bay. Today, less than 20% of the original salt marsh exists. More than 80% of the salt marsh around San Francisco Bay has been lost due to human development. Salt marshes have been diked, filled, dredged, and drained; landfills, buildings, airports, roads, and salt ponds have been built on top of former salt marshes.
- Salt marshes serve as a transition zone between the open waters of the bay and the dry upland, and salt marshes usually form between the mean (average) tide levels and the mean (average) high tides.

Plants

- The plants in the salt marsh are adapted to living in salty soils and salty water.
  - They are called halophytes, meaning "salt-loving".
  - They excrete salt through special cells and expend enormous energy to actively draw water into their roots.
- The plants in the salt marsh are also adapted to being covered by tidal waters part of the time.
- **Cordgrass** grows in a narrow band close to the edge of the slough and mudflats.
  - Cordgrass tolerates long periods of being covered by tidal waters.
  - When cordgrass dies, bacteria decomposes it into detritus, an important food for small estuary animals.
- **Pickleweed** dominates the salt marsh.
  - Pickleweed is a succulent plant that is very salt tolerant. It has special cells for getting rid of salt. These cells transport salt to the tips of the branches, which turn red in the fall, dry up, and eventually break off.
  - Pickleweed tolerates less time under water than cordgrass; therefore, it grows at a higher elevation in the marsh than cordgrass.
  - The compressed leaves look like a series of green, slender pickles attached end to end.
- Other salt marsh plants include **alkali heath, Australian salt bush, salt grass, brass buttons, ice plant, and sea lavender**.
  - These plants "sweat" salt out of their systems through small openings on their leaves, leaving tiny salt crystals on the surface.
  - These plants grow at a higher level in the marsh than pickleweed.

Animals

- There are two endangered species that live only in the salt marshes of San Francisco Bay and nowhere else in the world: the salt marsh harvest mouse and the California clapper rail.
  - The endangered salt marsh harvest mouse, a nocturnal animal, makes its nest of dry pickleweed, eats pickleweed, and can drink salt water.
  - The endangered California clapper rail also depends exclusively on the salt marsh for its food and shelter, feeding on mud creatures, spiders, insects, and small mammals, and hiding and nesting in the pickleweed and cordgrass.
- Small mammals in the marsh include mice, voles, and shrews.
- Many birds depend on the marsh for feeding and/or nesting, including terns, plovers, sandpipers, stilts, avocets, rails, ducks, geese, egrets, and herons.
- Birds of prey, such as owls, eagles, kites, falcons, and hawks feed on small marsh rodents and birds.
- There are many smaller animals in the marsh, which you may not notice until you look very closely, including insects (such as butterflies), spiders, mussels, snails, crabs, clams, etc.

Soil

- Soil in a wetland has different physical characteristics than upland soil because of the presence of water.
- Salt marsh soils are, at times, so saturated with water, that they cannot contain much oxygen; these are anaerobic conditions.
  - The color of the soil is changed over time because of the amount of water and lack of oxygen. Salt marsh soils are generally black, dark brown, or gray, while upland soils are yellow, red, tan, or other light colors.
  - Dark colored soils absorb heat, while light colored soils reflect heat. Marsh and upland soils may have different temperatures at the same time of day because of their color.
- Salt marsh soils are generally clay-like (fine particles). Clay-like soils hold water longer, unlike sandy soils with large particles, which water passes through more quickly.
- The color and texture of soil can be used to identify an area as a wetland, even if it is not currently wet.

How to Lead this Activity by Following the "Do, Read, Ask" Teaching Format

Introduction: (8 minutes)

Do

Gather the students for an opening discussion.

Read

"The salt marsh is a very unique habitat around San Francisco Bay (point out the salt marsh)."

Ask

? **What do you notice about the salt marsh?**

? **What are some differences between the salt marsh and the upland (point out the upland hill to the students)?** (The plants are shorter in the marsh, the marsh is a wetland habitat, the marsh is affected by the tides, there are different plants and animals in each habitat.)

? **Could a house plant grow in the salt marsh? Why/why not?** (Probably not. The plants in the salt marsh are specially adapted to salt water and to being covered by the tide periodically.)

Read

- "We are going to have the opportunity to enter the salt marsh and study it close-up. Because we have the Key to Salty's Home (hold up the key), we have permission to enter the salt marsh.
- We are able to get off the trail and enter this special habitat, but we need to stay in a small area and we need to try not to step on plants."

Ask

? **Why do you think we need to treat the salt marsh so well?** (It is a home for endangered species, such as the salt marsh harvest mouse.)

Read

"The salt marsh is made up of living things and the physical environment around them. We are going to be biologists and study the living things in the salt marsh and their physical environment."

Do

Divide the students into groups of two and hand each group a salt marsh data sheet and pencil (must be provided by the Educator), a clipboard, and a mini-expedition pack (boundary rope, soil thermometer and 2 hand lenses).

Ask

? **Each group is going to collect data for a section of the marsh. What are data?** (Data are "facts" that are measured and observed)

? **Why do biologists collect data?** (Biologists gather data to understand the behavior of a plant or animal or to find out how things in a habitat are changing over time.)

Read

- "First, choose a section of the marsh to study. Make sure the section has pickleweed and at least one other plant in it.
- Lay down the rope to mark the boundaries of the site.
- You will then study the physical characteristics of the site, the plants in the site, and the animals or signs of animals in the site.
- Answer the questions on your data sheet so we can share information after the investigation."

Exploring the Salt Marsh (15 minutes)

Do

Allow the students time to find a site and answer the questions on the data sheet. The activity leader and chaperone circulate through the groups, encouraging the students to explore, using the scat display and plant book to help identify what they find.

Please Note: Students may only enter the section of marsh circled on the map. Do not allow the students to wander into other sections of marsh.

Discussion (7 minutes)

Do

After the expedition, gather students to share their discoveries and their data sheets. Use the questions below for more discussion and to answer questions from the data sheet.

Ask

? **Why was it important to write the date and time on your data sheet?** (Habitats change - over many years, during different seasons of the year and also over the course of a day. It is important to know when data was collected.)

? **Is the soil in your site dry or moist?** (This will depend on whether the area being studied has been flooded by water recently.)

? **What was the temperature of the air above the plants? The air under the plants? The temperature of the soil? Which temperature is the coolest? Why?** (This will depend on a number of factors, including whether the soil is moist or dry (water holds heat longer than air), what color the soil is (dark soil absorbs light, light soil reflects light), what the weather has been like recently, and whether the sun is out while you are taking the temperatures.)

? **How would you describe the leaves of pickleweed?** (They can be green, yellow or red; smooth or bumpy and thick. The leaves are compressed against the stem. There are not any salt crystals on the leaves.)

? **How does pickleweed get rid of salt? Do you see salt crystals on it?** (It has special cells which transport the salt to the tips of the branches, which will eventually turn red and fall off. There are no salt crystals on the leaves.)

? **What do you think pickleweed tastes like?** (It tastes salty and bitter from other minerals. ***Note: ADULTS should pick pickleweed and give each student a taste. Students may NOT pick plants.***)

? **How did other plant's leaves differ from pickleweed leaves?** (They could have been fuzzy, thin or be a different shade of green. If the weather is dry, they might see salt crystals on other plants.)

? **Why do some plants have salt crystals on their leaves?** (They are sweating out excess salt through openings on their leaves like humans sweat through pores on their skin.)

? **Why are salt marsh plants low growing?** (The plants in the salt marsh use much of their energy getting rid of salt.

? **Did many of the plants have small leaves? Why do you think they have small leaves?** (Sunlight evaporates water. If a leaf is large, it has more area that the sun is hitting, evaporating precious water in the plant. With small leaves, less sunlight hits the plant and the plant loses less water through evaporation.)

? **How do plants use sunlight?** (Plants use sunlight to produce food - energy.)

? **What signs of animals did you find?** (For example, scat, webs, insects, feathers, shells, nests, tracks, or holes.)

? **How do animals use plants in the salt marsh?** (Animals eat plants, nest in plants, hide from predators under plants, insects lay eggs on plants, and spiders spin webs in plants.)

? **Can you list a food chain in the salt marsh that starts with pickleweed?** (Pickleweed is eaten by salt marsh harvest mice which are eaten by birds (hawks, owls, egrets, herons, clapper rails, etc.)

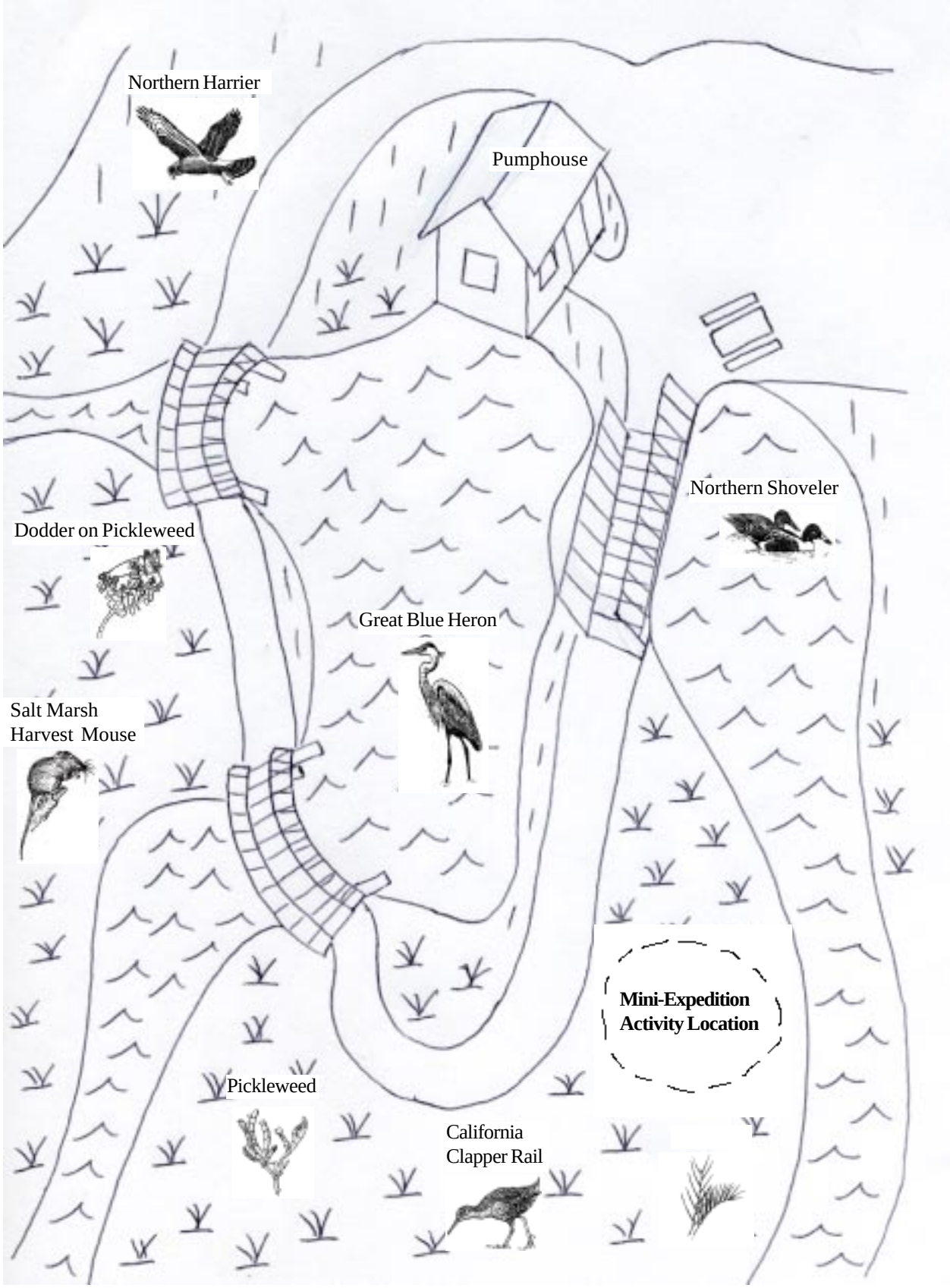
? **What endangered animals live in the salt marsh?** (The salt marsh harvest mouse and the California clapper rail are found only in salt marshes around San Francisco Bay.)

? **Why are they endangered?** (Loss of habitat. Less than 20% of San Francisco Bay salt marshes still exist.)

? **Do you think the salt marsh is important?** (Many animals and plants are adapted to the physical characteristics of the salt marsh. It is a home for endangered species and is also used by migratory birds for feeding and nesting.)

? **What can you do to help protect the salt marsh?** (Reduce, reuse, recycle - to reduce the need for landfills. Don't litter and pick up garbage - so animals don't become entangled in plastics. Never dump anything down storm drains they flow to creeks which enter the Bay. Write letters to legislators and learn about the salt marsh to teach others.)

Do

Collect the mini-expedition packs, the data sheets, clipboards, and pencils from the students.

Mini-Expedition Map (3-6)