



## HABITAT COMPARISON WALK (3-6)

**Overview:** In this activity, students will hike through and compare five different refuge habitats, looking for plants and animals in each habitat, and working on a Habitat Hunt Sheet.

**Content Standards Correlations:** Science, p. 293 (2016)

**Grades:** 3-6

**Key Concepts:** A habitat provides a home for a plant or animal with suitable food, water, shelter, and space. There are five habitats along the trail: the upland, salt marsh, slough, mudflats, and salt pond. Each habitat supports plants and animals adapted to living in it.

**Objectives:**

Students will be able to:

- identify and compare the five habitats on the refuge
- identify one plant or animal in each habitat
- name one reason each habitat is important

**Materials:**

**Provided by the Refuge:**

- 1 bird identification guide
- 1 plant book
- 1 habitat components poster
- 12 compasses
- 4 bug boxes
- 12 binoculars
- 12 clipboards
- 1 brine shrimp and brine fly poster

**Provided by the Educator**

- pencils & copies of Habitat Hunt (*one per student, optional*)



*Song Sparrow*

### TIME FRAME FOR CONDUCTING THIS ACTIVITY

**Recommended Time:** 30 minutes

**Introduction** (5 minutes)

- discuss the five habitats from the Eucalyptus Grove Overlook
- hand out binoculars, clipboards, pencils, and Habitat Hunt (*if provided by the educator*)

**Habitat Walk** (22 minutes)

- hike the trail from the Eucalyptus Grove Overlook to the Hunter's Cabin, walking through the upland, the salt marsh, over the slough and mudflats, and ending at the salt pond
- stop at the numbered stops on the map and lead discussions about the habitats and the plants and animals in each habitat

**Discussion** (3 minutes)

- answer any questions about the Habitat Hunt, using the answer sheet
- collect the equipment and Habitat Hunt 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?**

- The introduction of nonnative plants and animals that compete with or prey upon native plants and animals.

**What can students do to help?**

Refuge staff control introduced plants and animals, but we need your help.

- Plant native plants
- Keep your cat inside your house; they catch migratory birds
- Only take your dog to places that permit dogs and keep it on a leash
- Teach others what you have learned about refuge habitats

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## SUPPORTING INFORMATION FOR THIS ACTIVITY

### Habitats

- A habitat is a home for a plant or animal. It provides food, water, shelter, and space suitable to the plant or animal's needs.
- Each habitat has its own unique characteristics.
- On the refuge, there are a variety of habitats, each of which supports different plants and animals.
- Each habitat that you will explore in the Habitat Comparison Walk is described below.

### Upland

- The upland is the raised portion of land located above the marsh, out of reach of the tides. It is a higher and drier habitat than the marsh.
- There are a variety of native and nonnative (introduced by people) plants in the upland.
  - Native upland plants include California poppies and coyote brush.
  - Introduced upland plants include sweet fennel, eucalyptus, wild oat, and acacia.
- Animals in the upland include rabbits, ground squirrels, gopher snakes, lizards, hummingbirds, and other small, upland birds.
  - Animals may not be seen but evidence of them may be found (e.g. nests, webs, tracks, holes, scat, etc.).

### Salt Marsh

- The salt marsh is a transition zone between the bay or slough and dry land.
- The salt marsh is a wetland habitat that is flooded by the tides twice daily.
- Plants in the marsh are shorter and less diverse than in the upland.
  - Plants include pickleweed, alkali heath, gumplant, salt grass, and sea lavender.
- Animals may not be seen but evidence of them may be found.
  - Animals in the salt marsh include voles, shrews, spiders, crabs, clams, ducks, shorebirds, hawks, and egrets.
  - The salt marsh is home to two endangered species that are found no where else - the salt marsh harvest mouse and the California Ridgway's rail.
- Approximately 80% of the salt marsh surrounding San Francisco Bay has been altered or destroyed.
  - Salt marshes were dredged, diked, and filled.
  - Landfills, salt ponds, buildings, and roads were built on top of the salt marshes.

### Tidal Slough and Mudflats

- A slough is a natural waterway. Newark slough is a finger of the bay which carries bay water into the salt marsh with each high tide.
- At low tide, when the slough water is carried out to the bay, the mudflats below the slough are revealed.
  - Small, drifting plants and animals (plankton) live in the slough water, along with a variety of fish.
  - In the mudflats are a wide variety of mud creatures, including snails, crabs, mussels, crabs, worms, and amphipods.
- Many birds feed in and near the slough.
  - Dabbling ducks, such as mallards and northern shovelers, and shorebirds feed on mud creatures and plankton on the mudflats.
  - Diving ducks, such as canvasback, feed on plankton and clams in the slough water.
  - Egrets and herons, fish in the slough water, stabbing at fish and crabs.

### Salt Pond

- The salt pond is a human-made habitat. Cargill Salt Company uses the ponds to harvest salt through the process of solar evaporation.
- Bay water is pumped through a series of ponds and after five years the salinity is high enough for salt crystals to form. The salt is harvested, processed, and sold.
- Salt ponds of varying salinities encompass the South San Francisco Bay. The water of the salt pond is very salty, and few organisms are adapted to live in the salt pond.
  - In lower salinity ponds, there are fish, water boatmen, brine shrimp, brine flies, and algae; in middle salinity ponds, it is just brine shrimp, brine flies, and algae; in the highest salinity ponds, only bacteria can live.



*Ruddy Duck*

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

### **Introduction** (5 minutes)

#### **Do**

Begin the walk at the Eucalyptus Grove overlook with the following discussion about habitats.

#### **Read**

"We are going to take a walk to look at and compare the different habitats that are found here at the refuge."

#### **Ask**

**? Can anyone tell me what a habitat is?** (A home for a plant or animal)

#### **Do**

Show [habitat components poster](#).

#### **Ask**

**? What do animals need to survive in their habitat?** (Food, Water, Shelter, Space)

#### **Do**

Reinforce this concept by pointing to each habitat component on the poster.

#### **Read**

"Animals need food, water, shelter and space to survive."

#### **Ask**

**? Can anyone identify the habitat we are standing on?** (Upland.)

**? What animals do you think live in the upland?** (Gopher snakes, rabbits, ground squirrels, fence lizards, and a variety of birds, including hummingbirds and owls.)

**? Where is the salt marsh?** (The low, flat, wetland just below the upland.)

**? What differences can you see between the salt marsh and the upland?**

- (The salt marsh is lower than the upland, the salt marsh is sometimes covered by the tide.
- The plants in the salt marsh are smaller than the plants in the upland, there's a greater variety of plants in the upland.

- Plants in the upland get freshwater from rain, while plants in the salt marsh get saltwater from the slough and bay.)

#### **Read**

- "The waterway that winds through the marsh is called the slough (rhymes with "you"). This slough is named Newark Slough.
- The slough is connected to the bay; when the tide comes in from the bay it fills the slough, when the tide goes back out, a habitat beneath the slough is exposed. "

#### **Ask**

**? What is this habitat?** (The mudflats.)

**? The last habitat we can see is just beyond the salt marsh. What are those ponds of water called?** (Salt Ponds.)

**? Is the salt pond a natural or a human-made habitat?** (Human-made. Salt ponds were built on top of salt marshes in order to produce salt.)

#### **Read**

"Let's start our habitat walk. We will be exploring each of the habitats we just discussed and the plants within them. You will be working on a Habitat Hunt sheet during the hike." **Note: The Habitat Hunt is optional, the teacher must provide these sheets.**

#### **Do**

As appropriate, hand out to each student: a pair of binoculars, a clipboard, a pencil, and a Habitat Hunt sheet. Refer to the ["How to Use Binoculars" sheet](#) if students are having difficulties.

### **Habitat Walk** (22 minutes)

#### **UPLAND**

#### **Ask**

**? We are in the upland habitat now. Why do you think the upland is an important habitat?** (There are many different plants that grow in the upland; many animals live in the upland; humans use the upland to build on.)

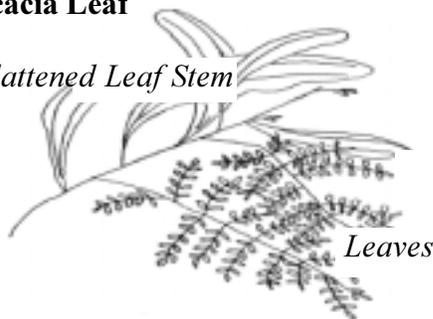
#### **Stop #1**

#### **Do**

Use the activity map and walk to stop #1. Use the [plant identification guide](#) to identify the Acacia trees.

## Acacia Leaf

*Flattened Leaf Stem*



### Ask

**? These are Acacia trees, a tree that was introduced from Australia. What does introduced mean?** (They were brought by humans, they were not here naturally. Introduced plants compete with native plants for space in the habitat.)

### Do

Have each student hold on to a “leaf” on the Acacia tree. **Note: Remind the students not to pick the “leaves.”**

### Ask

**? How many of you think you found a leaf on the Acacia tree?** (Take all answers)

### Do

Check each student’s “leaf” to see if they found the correct leaf or not. Compare with the picture above.

### Read

- “The Acacia trees have very interesting adaptations. In fact, no one is holding a leaf on the Acacia tree. What you are holding is a flattened leaf-stem.
- Look more closely at the plant to see if you can find the real leaves.” (Note: This should be true in most cases)

### Do

Continue walking down the trail. Look for native plants between stop #1 & #2. Use the [plant identification guide](#) to help identify these. Scratch and sniff a few leaves to release the aromatic oils. At the bend in the trail, turn left. Continue on the path to stop #2.

## STOP #2

### Ask

**? This is coyote bush. How do you think this plant got its name?** (No one really

knows for sure, but some possible answers are that the flowers are fluffy like a coyote’s fur, or that coyotes like to hide in it.)

### Do

Across from stop #2 is stop #3. Along the right side of the trail, you will see a large bush that spreads out towards the marsh. This is California blackberry. Use the [plant identification guide](#) to identify the California blackberry.

## STOP #3

### Ask

**? This is California blackberry which is native to California. How do its branches differ from those of coyote bush?** (The branches have thorns)

**? Why does the California blackberry have thorns?** (To protect its fruit from being eaten by birds and mammals.)

### Read

The California blackberry flowers in the spring, which turn into fruit in the summer.

### Do

If you see any other interesting plants as you walk along the trail, you can identify them by using the [plant identification guide](#).

## SALT MARSH

### Do

Walk along the boardwalk until it begins to bend to the left. Have the students face left towards the upland.

## STOP #4

### Ask

**? We are now standing over the salt marsh habitat. Can you find where the salt marsh ends and the upland begins?** (Students should notice a distinct plant border between the salt marsh and the upland.)

**? Are the plants taller in the upland or the salt marsh?** (Upland.)

**? Why do you think the upland plants grow taller?** (Salt marsh plants have to be adapted to living in a salty environment. Salt marsh plants use much of their energy for getting rid of salt, while

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upland plants do not live in salt water (they get fresh water from rain) and can use their energy to grow tall.)

**Do**

Have the students look over the sides of the boardwalk at the marsh below.

**Ask**

? **What is the predominant plant you see below us in the salt marsh?** (Pickleweed.)

**Ask**

? **What endangered species lives in and feeds on the pickleweed?** (The salt marsh harvest mouse.)

? **What animals might eat a salt marsh harvest mouse?** (Hawks, eagles, owls, northern harriers, egrets, herons, rails, and other birds.)

? **What are animals that eat other animals called?** (Predators.)

**Do**

Have the students look for the predators of the salt marsh harvest mouse with their binoculars.

**Ask**

? **Do you see any of the predators of the salt marsh harvest mouse?** (Take all answers.)

? **If the salt marsh harvest mouse went extinct, would anything be affected?** (The animals that feed on harvest mice would have one less source of food.)

? **Why is the salt marsh harvest mouse endangered?** (Loss of habitat. Less than 20% of the salt marsh remains; 80% has been altered or destroyed by humans to build roads, buildings, salt ponds, and landfills.)

## **SLOUGH & MUDFLATS**

**Do**

Continue walking along the boardwalk, until you are halfway across the bridge. Face right (north towards the Coyote Hills). The slough goes out to the Bay in the direction you are facing.

**STOP #5**

**Ask**

? **The slough is a natural waterway that winds through the marsh. What body of water is this**

**slough connected to?** (The San Francisco Bay. A slough is not a river or stream, but a finger of the bay, with a mixture of fresh and salt water.)

? **Which direction is the slough water traveling?**

(If the tide is coming in, the water is moving south towards Headquarter's hill; if the tide is going out, the water is moving towards the bay and the Dumbarton Bridge.)

? **Does it look like high tide or low tide now?**

**How can you tell?** (During high tide the water comes up to the plants and may cover them, whereas during low tide the mudflats under the slough will be visible.)

? **There is a plant called cordgrass that grows along the edge of the sloughs and mudflats. Does anyone see cordgrass?**

- (Cordgrass is a tall plant that grows in clumps
- along the edge of the slough. The leaves are long, and thin (resembles grass).
- If it is high tide you will see the tips of the cord grass sticking up out of the water. If it is low tide you will see the cordgrass growing in the mudflats.
- Cordgrass can stay underwater for long periods of time when the tide comes in.)

**Do**

Use the plant identification guide to identify the cordgrass. Have the students use their binoculars to look at the cordgrass.

**Ask**

? **The slough and mudflats are full of organisms called phytoplankton and zooplankton. What are they?** (Phytoplankton are small, drifting plants, and zooplankton are small, drifting animals.)

? **What animals do you think live in the mudflats or in the slough, that feed on the plankton?** (Fish and mud creatures, such as crabs, clams, mussels.)

? **What animals feed on the fish and mud creatures?** (Birds, such as shorebirds and the California Ridgway's rail, an endangered species.)

? **Why is the Ridgway's rail endangered?** (Loss of habitat. The rail needs the marsh and over 80% of the marsh has been altered or destroyed.)

? **Can you see any birds feeding in the slough or mudflats?**

**Do**

Have the students use their binoculars to look for

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birds feeding in the slough and mudflats. Encourage students to identify any birds that they see with the [bird identification chart](#).

## SALT MARSH

### Do

After discussing the slough, continue over the bridge and walk to the end of the boardwalk and turn to the plants on the left. You can get a close up view of the salt marsh plants at this point.

### STOP #6

#### Read

“Plants in the salt marsh live in salty soils with salty slough water; it is the only water available to them. These plants have adapted different methods to get rid of the excess salt.”

#### Ask

**? Can you and I drink only salt water?** (No.)

**? What would happen to us if we drank only salt water?** (We would become more thirsty, get sick, and eventually die.)

#### Do

Find salt grass, gumplant, and/ or alkali heath in the salt marsh, using the [plant identification book](#) to identify them. Point them out to the students.

#### Ask

**? How do these plants get rid of extra salt?** (Salt grass, Australian saltbush, and alkali heath “sweat” the salt out through openings on their leaves.)

#### Do

Look closely at one of the plants leaves.

#### Ask

**? Do you see salt crystals?** (Note: this may be difficult if the plant is wet. The salt would be in solution and not visible)

#### Do

Allow the students to feel the leaves on these plants, but **do not pick these plants**. The leaves should feel chalky from the salt. Walk down a little further on the trail and look at the pickleweed found under the Hunter’s Cabin sign on the left.

#### Ask

**? Do you see salt crystals on this pickleweed?** (No.)

**? If pickleweed does not sweat salt out like the other plants, does anyone know how it gets rid of the excess salt?** (Pickleweed sends the salt to the tips, which turn red and fall off.)

**? What do you think pickleweed tastes like?** (Salt, pickles, bitter.)

#### Read

“I will pick some pickleweed for us to taste and find out. **Remember never to eat a plant unless an adult tells you it is safe.** Some plants are poisonous and can make you very sick.”

#### Do

**Only the leader should pick some pickleweed and give a small taste to each student.** Students should not pick any plants. Also, put a small sample in the [magnifying bug box](#) to get a closer look at the pickleweed.

(Note: Tiny yellow specks on the leaves are the flowers. Found May - August.)

#### Ask

**? What kinds of animals do you think live in the salt marsh?** (There are two endangered animals in the salt marsh- the salt marsh harvest mouse and the California Ridgway's rail. Other animals in the marsh include voles, shrews, rats, butterflies, insects, spiders, and birds.)

#### Do

Direct the students attention to the Hunter’s Cabin.

#### Read

- “The Hunter’s Cabin was built during the 1910s. During this time period, a hunter could kill 100 ducks with one shotgun blast! People got rich by selling ducks for three cents each.
- Hunting is still a popular sport and is allowed in some remote parts of the refuge, but there are now limits on the number of ducks a hunter can take.
- Hunters support refuges by purchasing Duck Stamps.

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## SALT POND

### Do

Turn the students attention to the salt pond behind you. Have the students observe the salt pond from the shore.

### STOP #7

#### Ask

**? Look out over the salt pond toward the Dumbarton Bridge. Which direction is the bridge?**

- (Use the compasses with the students. To use the compass, point the arrow on the base of the compass at the bridge.
- Holding the compass still and level, turn the dial on the compass until the two red arrows line up.
- Read the direction where it says “read bearing here.” The bridge is West.)

**? What is a salt pond?**

- (Salt ponds are a human-made habitat created for the production of salt. The salt ponds are surrounded by walls called levees. We are standing on a levee now.
- Bay water is moved from pond to pond becomes saltier as the water evaporates. After five years of evaporation, the salinity is high enough to form salt crystals. The salt is harvested and sold.)

**? Where does the water evaporate to?** (The sky to form clouds.)

**? How do the salt pond and the slough differ from each other?**

- (The salt pond has much higher salinity water than the slough. Slough water is flowing whereas the salt pond water remains still until moved into another pond.
- The slough is connected to the bay while the salt pond is completely surrounded by levees.
- The salt pond is a human-made habitat while the slough is a natural habitat.)

**? Since the salt pond has a higher salinity than the slough what kinds of plants can live in the salt pond?** (Only algae grows in the salt pond.)

**? What kinds of animals do you think live in or near the salt pond?** ( Brine shrimp, brine flies, shorebirds, ducks, gulls, and other birds.)

### Do

Show the students the picture of the brine shrimp and brine flies. Then focus the students attention on the edges of the salt pond.

#### Ask

**? Look in the salt pond water. Can you see any brine shrimp? Find a male and a female. What is the difference?** (Male brine shrimp have claspers and the females have egg sacks.)

**? Find a brine fly. How are brine shrimp and brine flies different?** (Brine flies have wings, now fills, and 6 legs, while brine shrimp have no wings, gills on their legs, and 22 legs; brine flies are insects and brine shrimp are crustaceans.)

**? Migratory birds feed on brine shrimp and brine flies in the salt pond. What does migrate mean?** (To move from place to place, usually seasonally. San Francisco Bay is part of the Pacific Flyway - a highway in the sky for migratory birds.)

### Do

Have the students use their binoculars to look for migratory birds in the salt pond. Use the Bird Guide to identify birds.

### Discussion (3 minutes)

#### Ask

**? Why are the uplands so important?** (The tall trees and shrubs in the upland food and shelter for migratory songbirds, raptors such as Red tailed hawks and Peregrine Falcons, also egrets roost in the trees during the night.)

**? Why are the salt marshes are important?** (The salt marsh is home for endangered species and for migratory birds. Salt marshes guard against flooding, filter out pollutants from water, and provide a place for people to visit and learn about.)

**? Why are the sloughs and mudflats are important?** (The slough and mudflats provides food for migratory birds and endangered species. Sloughs bring bay water into the marsh with each high tide, providing nutrients to the marsh; mudflats are a home for mud creatures and sloughs are a home for fish and phytoplankton.)

**? Why are the salt ponds important?** (Salt ponds provide food for migratory birds; some birds nest on the levees around salt ponds; they are a home for

brine shrimp and brine flies; they are used by humans to produce salt.)

**Read**

“All of these habitats are important because they provide food, water, shelter, and space for many different plants and animals.”

**Ask**

? What can you do to keep these Bay habitats clean and healthy?

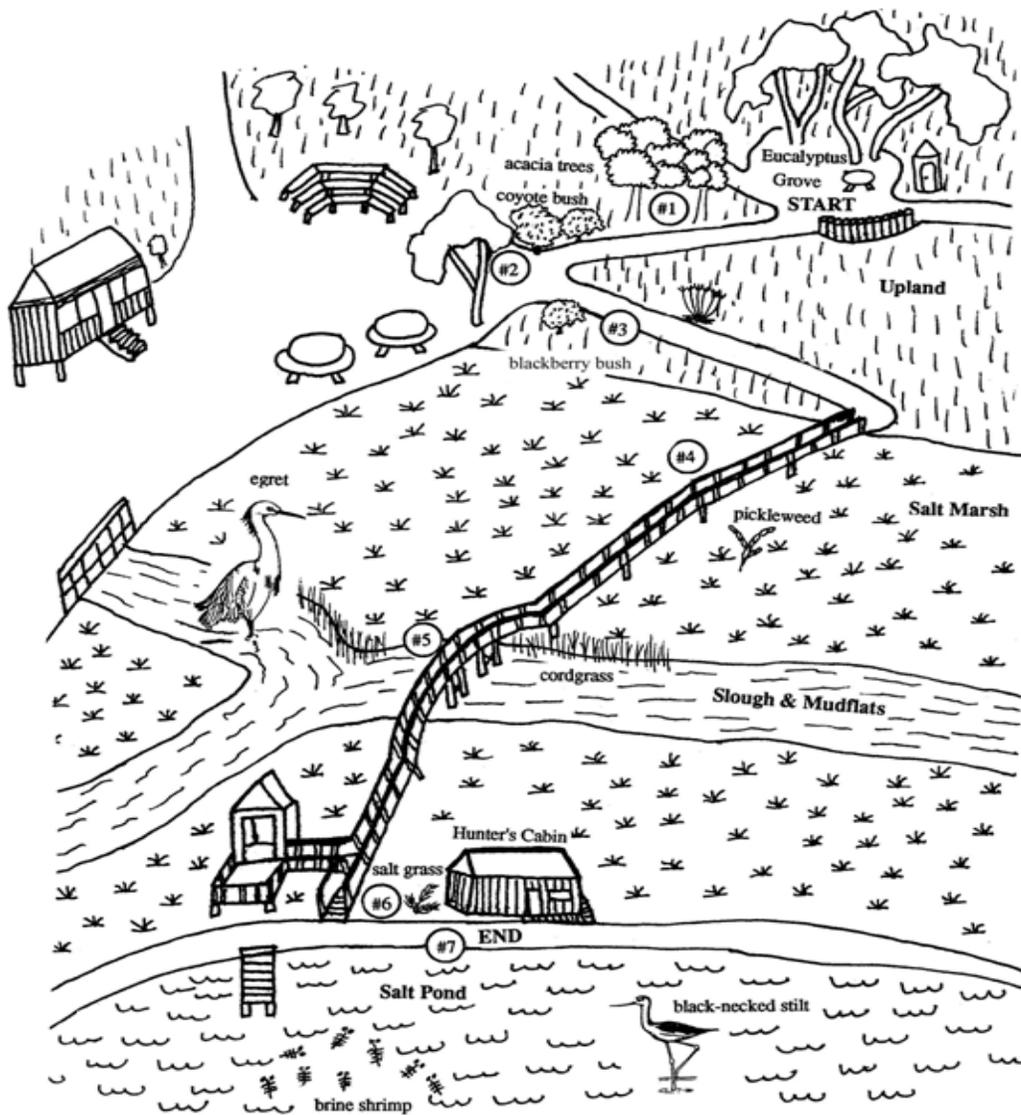
(Never pour anything down storm drains, don't litter, reduce, reuse, recycle, learn about the habitats and teach others, etc.)

**Do**

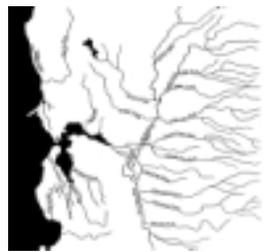
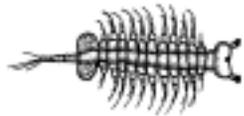
If there is time at the end, review the Habitat Hunt Sheets. Collect binoculars, clipboards, pencils, and Habitat Hunt Sheets.

Return to the Eucalyptus Grove to meet your next group.

### HABITAT COMPARISON WALK MAP (3-6)



# HABITAT HUNT DATA SHEET

<p>My <b>name</b> is _____</p> <p>_____</p> <p>_____</p> 	<p><b>Acacia</b> grows in the _____ habitat. Where was it introduced from?</p> <p>Australia <u>or</u> Europe</p> 	<p><b>Coyote brush</b> grows in the _____ habitat.</p> 	<p><b>California blackberry</b> has _____ on its branches.</p> 
<p><b>Pickleweed</b> grows in the _____ habitat.</p> 	<p>The <b>Salt Marsh Harvest Mouse</b> is an <b>ENDANGERED SPECIES</b> that lives in the _____ habitat.</p> 	<p>Only 20% of the <b>salt marsh</b> is left. Why?</p> <p>_____</p> <p>_____</p> <p>_____</p>	<p>What large body of water is the <b>slough</b> connected to?</p> 
<p><b>Mudflats</b> are found at the bottom of the _____</p> <p>When can you see them? _____</p> 	<p><b>Cordgrass</b> grows at the edge of what habitat?</p> 	<p>The <b>snowy egret</b> has a _____ colored beak and _____ colored feet.</p> 	<p>The <b>great egret</b> has a _____ colored beak and _____ colored feet.</p> 
<p>Look closely at <b>salt grass</b> leaves. What is on the leaves in dry weather?</p> 	<p>Which direction is the <b>Dumbarton Bridge</b>?</p> <p>_____</p> <p>Which direction is the <b>bay</b>? _____</p> 	<p><b>Brine shrimp</b> live in a human-made habitat called the _____</p> <p>What feeds on brine shrimp?</p> 	<p>I can keep the Bay healthy and clean by _____</p> <p>_____</p> <p>_____</p> <p>_____</p>

## HABITAT HUNT ANSWER SHEET (3-6)

<p>My name is</p> <hr/> <hr/>	<p><b>Acacia</b> grows in the <u>UPLAND</u> habitat. Where was it introduced from?</p> <p style="text-align: center;">(Australia) or Europe</p>	<p><b>Coyote brush</b> grows in the <u>UPLAND</u> habitat.</p>	<p><b>California blackberry</b> has <u>thorns</u> on its branches</p>
<p><b>Pickleweed</b> grows in the <u>SALT MARSH</u> habitat.</p>	<p>The <b>Salt Marsh Harvest Mouse</b> is an <u>ENDANGERED SPECIES</u> that lives in the <u>SALT MARSH</u> habitat.</p>	<p>Only 20% of the <b>salt marsh</b> is left. Why? <u>DEVELOPMENT, SUCH AS BUILDINGS, ROADS, LANDFILLS, AIRPORTS, SALT PONDS.</u></p>	<p>What body of water is the <b>slough</b> connected to? <u>SAN FRANCISCO BAY</u></p>
<p><b>Mudflats</b> are found at the bottom of the <u>SLOUGH</u> When can you see them? <u>WHEN THE TIDE IS OUT</u></p>	<p><b>Cordgrass</b> grows at the edge of what habitat? <u>MUDFLATS OR SLOUGH</u></p>	<p>The <b>snowy egret</b> has a <u>BLACK</u> colored beak and <u>YELLOW</u> colored feet.</p>	<p>The <b>great egret</b> has a <u>YELLOW</u> colored beak and <u>BLACK</u> colored feet.</p>
<p>Look closely at <b>salt grass</b> leaves. What is on the leaves in dry weather? <u>SALT CRYSTALS</u></p>	<p>Which direction is the Dumbarton Bridge? <u>WEST</u> Which direction is the bay? <u>WEST, SOUTH-WEST, NORTH-WEST</u></p>	<p><b>Brine shrimp</b> live in a human-made habitat called the <u>SALT POND</u> What feeds on brine shrimp? <u>DUCKS AND SHOREBIRDS</u></p>	<p>What can you do to keep the bay healthy and clean? <u>NEVER DUMP DOWN STORM DRAINS; REDUCE, REUSE, RECYCLE; PICK UP LITTER; LEARN AND TEACH OTHERS; ETC.</u></p>