Habitat Hike – Seasons of Change

Overview: Students will hike through five different habitats on the Refuge, four wetland habitats and one upland habitat. During the hike, students will be gathering information about the plants and animals that live there and how humans have had an impact on the habitats.

Key Concept: A habitat provides animals and plants with suitable food, water, shelter, and space. Each habitat supports plants and animals that are adapted to living under particular environmental conditions. Habitats are affected by both natural and human influences.

Objectives:

Students will be able to

- identify and compare at least three different habitats on the Refuge
- identify at least one plant or animal found in each habitat
- describe one human and one natural influence affecting the habitats
- discuss the importance of preserving habitats for wildlife and people

Time: 50 minutes

Agenda Outline

Introduction	5 minutes
New Chicago Marsh (non-tidal salt marsh)	10 -15 minutes
Former Salt Pond A16	5 -10 minutes
Artesian Slough (tidal slough)	10 - 15 minutes
Upland	5 minutes
Wrap-Up	5 minutes

Introduction (5 minutes)

DO: (See the agenda for your assignment)

You can start the hike at two different starting points. Your first choice is to begin at the butterfly garden and walk around the loop ending at the back deck. Your second choice is to begin at the back deck and end at the butterfly garden. It may be that your group is so large that two groups embark on the hike at the same time. In this case, one leader could begin at the back deck and the other can begin in the garden. Once you have decided on a starting point, gather the group together to begin the program.

SAY:

We will be exploring five different habitats on our habitat hike: salt marsh, former salt pond, tidal slough, mudflats (dependent on tides) and upland. We will be looking for similarities and differences in the habitats and identifying some animals and plants that live in these habitats. We will also be searching for clues of both natural and human influences.

If you see an animal get my attention! You all have much better vision than I do!

We will be stopping along our hike to talk about the habitats. When we stop, I would very much appreciate your attention.

ASK?
What is a habitat?
A habitat is a home for plants and animals.

ASK?
What are four things that you need to make a habitat? Think of what we need to survive.
Food, water, shelter, and space. Many students will not think of space, you can use the example of asking the students if they would all like to live in one of their rooms for the rest of their life, would there be enough room to survive? Many students will also come up with oxygen (air) and sunlight. These two are things that many organisms need to survive, but not all organisms need them to survive.

ASK?
Now that we know what a habitat is, can you help me think of some possible natural and human influences on these habitats?

- Natural - rain, wind, earthquake, tides, etc.
- Human - urban runoff pollution, urbanization, Facility wastewater effluent

Salt Marsh – New Chicago Marsh (10-15 minutes)

DO:
Guide the group to the entrance of the boardwalk.

ASK?
Does anyone know what habitat this is?
Salt marsh habitat.

SAY:
That's right, it is a salt marsh and a slough habitat. Salt marsh and slough habitat used to cover the edge of the entire San Francisco Bay acting like a buffer zone. This specific salt marsh and slough is named New Chicago Marsh. There is something very human-impacted about this particular habitat. Follow your eye along the boardwalk until it ends. That wall of dirt at the end of the boardwalk is called a salt pond levee and it was built by people to enclose the salt pond behind it. The slough in the New Chicago Marsh should be connected to the San Francisco Bay, however when they build these salt ponds, they cut off the slough from the Bay. Therefore, this is now a managed salt marsh.

ASK?
So how does New Chicago Marsh receive new water?
Rain, tide gate.

DO: Point out the tide gate on the levee.

SAY:
The Refuge pumps the water from under the levee, to circulate it and keep it oxygenated. There is also a tide gate, way out toward the Bay, that the Refuge staff opens during the dry season to allow water to flow in, and closes during the rainy season to prevent flooding. Even when this tide gate is opened, Bay water only flows in

at high tides and it never flows out, so this habitat is an altered or disturbed habitat. Let's continue walking to see New Chicago Marsh up close and personal.

DO:
Stop at a spot with a lot of pickleweed. A good stopping point is usually between the beginning of the boardwalk and the first bridge. Step off of the boardwalk into the salt marsh. Please emphasize that only people with special use permits can step off the boardwalk. If they ask why, explain that walking in the marsh can destroy habitat if you step in the wrong place.

ASK?
What types of wildlife do you see in the New Chicago Marsh?
Students should notice the plants and animals (birds) feeding or hanging around the marsh.

SAY:
One of the wild animals that live in this habitat is the salt marsh harvest mouse. People who work at the Refuge are very interested in monitoring the salt marsh harvest mouse because it is an endangered species.

ASK?
What is an endangered species?
An animal or plant that is in danger of becoming extinct.

SAY:
The salt marsh harvest mouse builds its home in the pickleweed plant and uses it as its food source. In fact, the salt marsh harvest mouse is a very picky eater. The mouse's diet consists only of pickleweed and nothing else. Pickleweed is a halophyte plant. Halophyte plants have adapted to living in salty habitats. The pickleweed has adapted by separated the excess salt from the water and storing it in the leaves. Once the leaves are saturated with salt they turn a bright red, orange, or purple color and then fall off returning the salt to the soil which acts as a defense mechanism warding off non-halophyte plants.

ASK?
What do you notice about these plants? Are they really big and tall or are they short and small?

SAY:
They are short because they spend most of their time trying to get rid of salt instead of growing tall.

ASK?
Who would like to taste the only food source of the endangered salt marsh harvest mouse?

DO:
Hand out the pickleweed.

SAY:
It's important to know that only authorized personnel like me can pick pickleweed because it is the food source of an endangered animal. Unfortunately, we will not get to see a salt marsh harvest mouse because they are nocturnal and are very good hiders, but you never know.

DO:
Once students have tasted the pickleweed have them look for some other salt clues in the marsh. They should see salt crystals on other plants like alkali-heath and on open areas on the ground.

SAY:
Even though you may not see a lot of salt marsh animals right now, doesn't mean they aren't around. As we walk to the next stop, keep you eyes open for signs of animals like tracks, trials, scat, skeletons, and burrows.

DO:
Guide the group to the first bridge and stop.

SAY:
The water level in New Chicago Marsh changes between the rainy and dry seasons. Sometimes when it rains a lot, the water can be fresh with a little bit of salt in it. Sometimes in the summer, when it doesn't rain, the water can be saltier than the ocean because of evaporation and lack of fresh rainfall. The color of the water also can give us clues about how salty the water is. Specific kinds of algae live at specific salinity levels. Sometimes the water in New Chicago Marsh is green, which means that a specific algae is living there and reflecting this color. Sometimes it is bluer, which means that another kind of algae is living in it at that time.

ASK?
Can you tell me what we are breathing in right now?
Oxygen.

ASK?
Where do you think that oxygen came from?
Plants and bacteria.

SAY:
Plants produce oxygen through photosynthesis, but some bacteria produce oxygen too. The bacteria that live in this salt marsh are called cyanobacteria. It produces about half of the oxygen in the air we breathe because it can also undergo oxygenic photosynthesis. This means that it gets its energy from the sun and produces oxygen as a byproduct, just like plants. Although this water may not be fresh water that is safe for drinking, it is still a very healthy habitat for bacteria.

ASK?
What other animals do you see in the New Chicago Marsh? What are they doing?
Black necked stilts and American avocets hunting for macroinvertabtrates in the mud and water, jackrabbits leaping through the marsh, northern harrier soaring over the marsh looking for lunch, etc.

DO:
Discuss the adaptations of the birds that you see. For example, long legs and beaks.

ASK?
We already talked about the human influences on this habitat, what are some natural influences on this salt marsh?
Rain, wind, animals making their homes in the marsh, etc.

Former Salt Pond A16 (5-10 minutes)

ASK?
Can anyone tell me what type of habitat this is?
Many students may answer the Bay, but from the Education Center in Alviso, you can not see the actual Bay. It is a salt pond.

ASK?
Do you think this habitat is natural or human built?
The salt ponds are made by humans.

SAY:
These salt ponds are human built to harvest salt. It's a pretty simple process; all you have to do is pump in water from the Bay, which is brackish (mixture of fresh and salt water), and then wait.

ASK?
What will happen to the water?
It evaporates.

ASK?
What's left after the water evaporates?
Salt.

SAY (Please visit the Water Control Structure on A16):
That's right! For this reason, the ponds were built to be very shallow with a lot of surface area. The water in the ponds stays there for a year and is then pumped to a new pond, where it sits for another year. It takes 5 years of sitting in different ponds to allow the water to evaporate enough to make salt. There are many salt ponds around the San Francisco Bay. In 2003, the Refuge joined forces with the state of California and some private funders to purchase 16,500 acres of salt ponds. This restoration project is a big deal. Rarely do urban refuges like this one, get a chance to restore or bring back this much habitat. This salt pond is now called a former salt pond because we have connected tide gates that allow tidal water from the Coyote Creek to enter. There is also a flow exit gate that allows some tide water to exit into a slough on the other side of that levee.

(Extra facts about the salt pond – if you see necessary) Pond A17 across the way was breached in October 2012 and now receives tidal water. Pond A16 that you are looking at will never be breached and completely tidal because it would cause flooding. Between ponds A16 and A17 there are fish gates for steelhead (rainbow trout) and Coho salmon.

ASK: Does anyone know what a levee is?
A levee is like the earthen wall we are standing on now. These levees control the water level or keep the water from connecting to the bay.

SAY: To restore the salt ponds, we are breaking down the levees so that the ponds are reconnected to the bay and gets tidal flow once again. Once we are done with this project, more plants and wildlife will come back naturally. This restoration project is a very positive human impact that will help to provide new habitat for many salt marsh wildlife creatures.

ASK?
We now know some human impacts, can you think of any natural impacts?
Rain, evaporation, wind, etc.

Artesian/Mallard (Tidal) Slough (10-15 minutes)

DO: Walk over to the floating dock.

SAY:
We are about to get on the floating dock. As the name implies, it is completely floating so the rules are:
#1: Please do not jump on the floating dock
#2: Please do not climb on the rails
#3: Please spread out evenly so that we won't sink onto one side

DO: Lead the group onto the floating dock.

SAY:
We are standing on a floating dock. Take a look around at the plants and animals you see. Let's listen to all of the different sounds we can hear, if we are silent for 30 seconds. How many different sounds did you hear? What did you hear?

ASK?
What habitat is the dock floating on?
Depending on the time of day, it may be on the mud or on the slough water.

ASK?
Can anyone tell me what a slough is?
A slough is an extension of the Bay. If the palm of your hand is the San Francisco Bay, your fingers would be the slough – they are extensions of the bay.

ASK?
Is this slough a tidal slough, or a non-tidal slough like in the salt marsh? How can you tell?
It is a tidal slough. Water is brought in from the Bay via the tide and fills up the slough twice a day. That water is also carried back out to the Bay twice a day via the slough, exposing the mud flats on the bottom of the slough. Students should be able to see the water is flowing and can find water marks on plants and on the poles of the floating dock.

SAY: During low tides the slough collects C02 in the air and during high tides, it covers the C02 and doesn't release it back into the atmosphere. This way, it is reducing carbon dioxide and helping to prevent global warming.

IF YOU SEE MUDFLATS ASK?
Why do we see mud and what are the animals doing in the mud?
You can see the mudflats because it is low tide. Many birds will gather here when it is low tide because they can easily find invertebrates in the mud.

DO:
Discuss the adaptations of the birds that you see. For example, long legs, wide spread toes, and long beaks.

ASK?

Is the tide coming in or going out?

You can tell by looking at the water. If you see floating pieces of plant floating towards the building, the tide is coming in. If the pieces are floating towards the Bay, the tide is going out. Also, you can look at the plants. If there is a wet mark on the plants, you can determine that the plants were just wet and the water level is getting lower, so the tide is going out. If you don't see a water mark, the tide is coming in, making the plants wet as the water rises.

DO:

Point in the direction of the Bay.

SAY:

If we were to follow this slough all the way up, we would reach the San Francisco Bay.

DO: Point to the opposite direction, which is where the slough ends and the Wastewater Facility releases its effluent into the slough.

SAY:

In the opposite direction of the Bay, at the very end of the slough, is the San Jose -Santa Clara Regional Wastewater Facility. The Facility releases its clean, but FRESH, wastewater into this slough. The high tides fill up this slough with brackish water, which is a mixture of fresh and salty.

ASK?

How many gallons a day of the fresh wastewater do you think are released into this slough?

The Regional Wastewater Facility processes about 90 million gallons a day. That is enough water to fill the San Jose Arena (the shark tank) 3 ½ times, completely full with water. About 80 million gallons of treated effluent is released into this slough and 10 million gallons are used as recycled water for irrigation throughout Santa Clara County.

ASK?

Is this fresh water, brackish water or salt water?

It is freshwater! That is why we find different plants than in the salt marsh. The dominant plant that grows in the Artesian Slough is this tule plant. It is a California native plant that grows in freshwater wetlands. Notice that there is no pickleweed growing here. Tule can grow a lot taller, because they don't have to spend all that extra energy getting rid of excess salt. The freshwater ultimately mixes with the bay and which creates a very important and productive habitat for plankton, and fish, including a great nursery for baby fish!

ASK?

What are some animals you see or might find in this slough?

Great blue herons, sandpipers, black crowned night herons, muskrats, etc.

ASK?

What are some natural influences on the slough?

Rain, wind, evaporation, tidal action

ASK?

What are some human influences on the slough?

Pollution, urban runoff, wastewater from the Facilty.

Upland (5 minutes)

DO:
Gather students and guide them to the upland.

ASK?
What is an upland habitat?
An upland habitat is a habitat that is not covered with water, it is mostly dry. Examples of some other upland habitats: forests, neighborhoods, mountains, etc.

ASK?
Can anyone tell me what a native species is?
A native species is one that would live in a certain habitat naturally without foreign influences, such as human intervention.

ASK?
Can you think of some animals that might use this habitat as their home or for hunting grounds?
California ground squirrels, jack rabbits, cotton tail rabbits, gopher snakes (not harmful), western fence lizards (a.k.a. blue belly lizards), grey fox (native), red fox (non-native & invasive), barn owls, burrowing owls, pigmy blue butterfly (smallest butterfly in North America & some scientists say the smallest in the world), migratory monarch butterflies, swallowtail butterflies, pollinating insects like bees, pollinating birds like Anna's hummingbird, barn swallows, etc.

DO:
Guide the group through the garden pointing out plants that are in bloom, or seeding, or in dormancy. Also point out any animals or evidence of animals that you can find.

SAY:
This parking lot has been designed to combat urban runoff and is called a bioswale. The entire parking lot is like a shallow bowl. The concrete surfaces were built to tilt inward towards the center. The rains water is forced to flow into the center bringing the urban runoff with it. The plants that were planted in the parking lot are really good at filtering pollution. Some of these plants convert the pollution into a nutrient whereas other plants store the pollutants inside their tissue. By the time the rain water passes through the plants, it has been cleaned by nature's wastewater treatment plant. In this way, these bioswale plants provide an eco-service for the upland habitat. Many new parking lots are being designed this way to help prevent urban runoff pollution from entering our waterways and ultimately our drinking water sources.

ASK?
Does this habitat look like a natural or un-natural habitat?
The upland habitat, 100 years ago, was salt marsh. The land was used as a landfill for construction materials and eventually, due to all of the dumping, was considered an upland habitat. When the Refuge was established, rather than keeping a landfill, they converted the landfill into a California native garden. Even though the habitat might look natural, buried underneath all of the plants is construction waste.

SAY:
Imagine what it might be like for the California native plants that live in this upland habitat. Plants growing here face some hardships that they might not in a natural upland habitat. Sometimes the plant roots are not able to find an underground water source because a big piece of concrete is in the way. We have had some plants die suddenly because their roots have hit a polluted area of the former landfill.

Wrap-Up (5 minutes)

DO:
Travel back to the main building. Each small group should take a bathroom break and collect their equipment for collecting data.