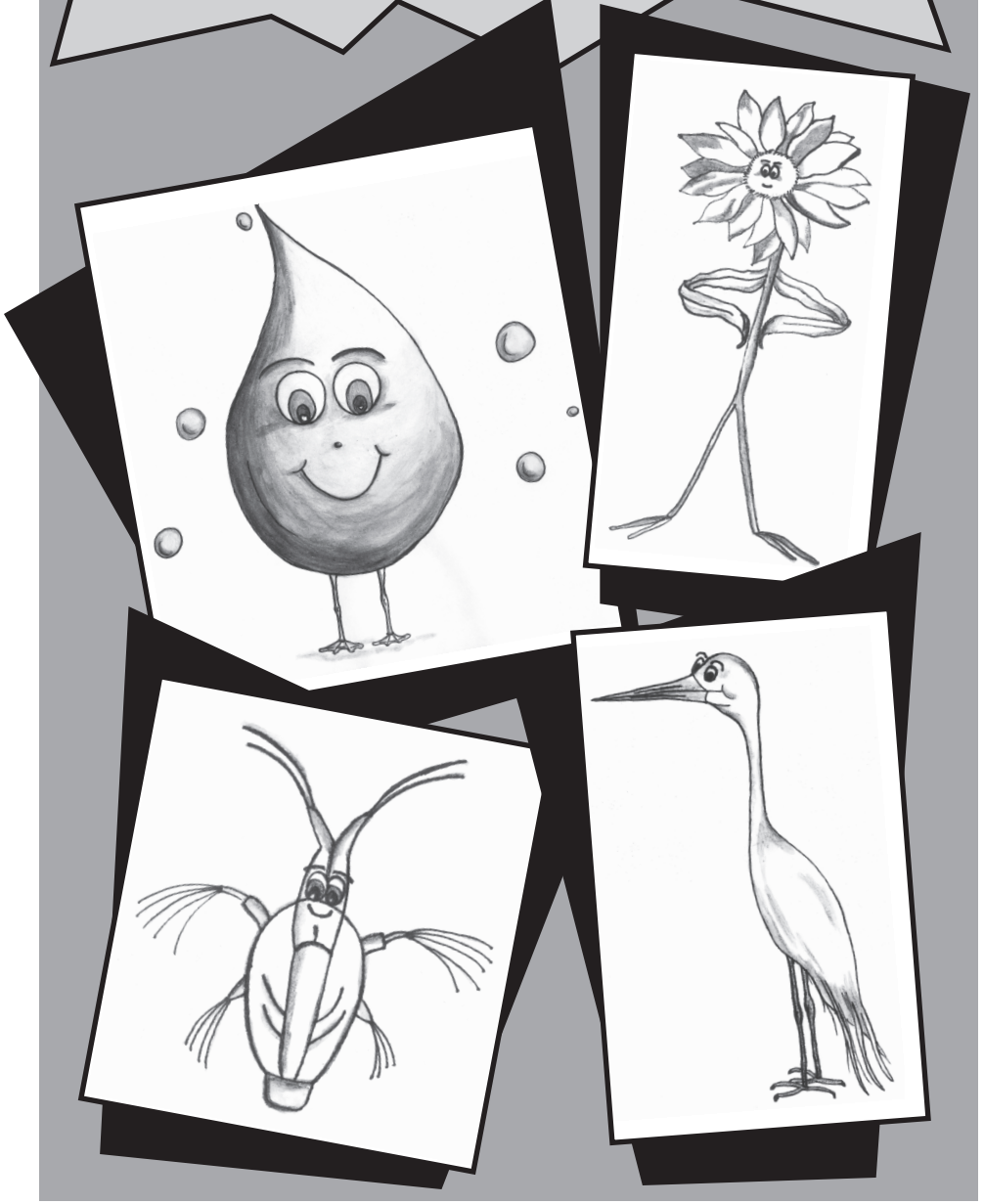
The Estuary Explorers



ACKNOWLEDGEMENTS

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Collaborating Organizations:

Zoological Society of San Diego
www.zoo.sandiegozoo.org

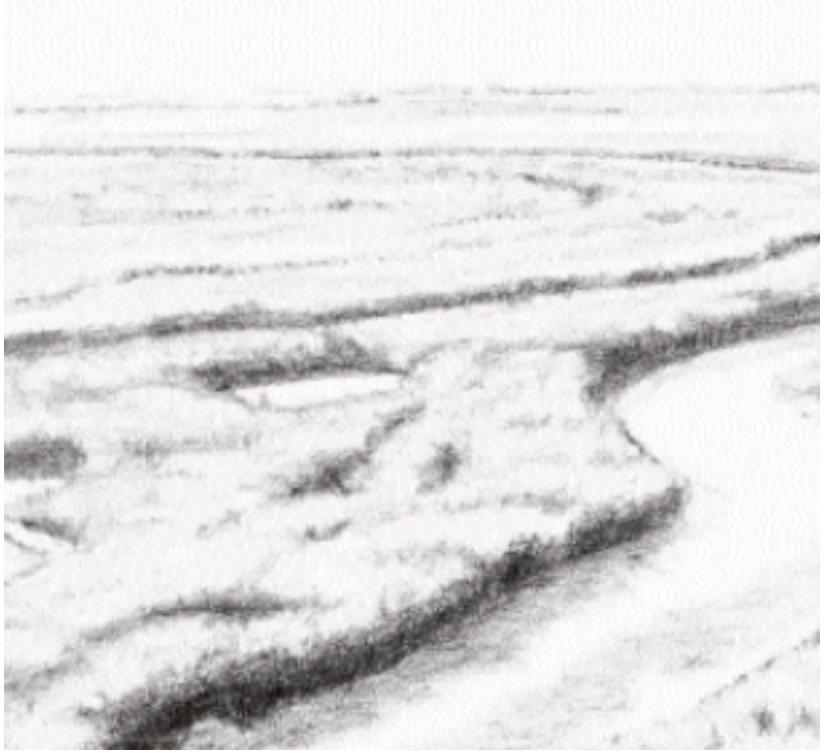
US Fish and Wildlife Service San Diego NWR Complex
http://www.fws.gov/refuge/San_Diego/About_the_Complex.html

Tijuana River National Estuarine Research Reserve
http://www.trnerr.org

WHAT IS INSIDE...

Visiting the Tijuana Estuary

The Tijuana Estuary extends 2,500 acres and is the endpoint for the 1,735 square mile Tijuana River Watershed. This Reserve is home to over 370 species of birds that depend on this **habitat** for nesting, breeding, and feeding. The Tijuana Estuary has a **diversity** of habitats including sand dunes, salt marsh, mudflats, brackish ponds, riparian, coastal sage scrub and vernal pools. The estuary is also an important research site where field biologists and other researchers monitor and study the fish, invertebrates, plants, birds, and water quality of the habitats.



Endangered means there is still time…

Share the information you learned through the Estuary Explorers with someone else.

Make a list of things you can do at your school or home to save local wildlife:

1._____

2._____

3._____

4._____

5._____

6._____

You can be part of the solution by saving endangered wildlife!

Draw your plant below.

The name of my plant is:

_____

FIELD MANNERS

There are special manners that you need when visiting a reserve where wildlife lives:

1. Can you hear the birds and their song? Remember to use a quiet voice.

2. What can you see? Walk with a purpose, looking for clues of animals and other live things. Remember, running is not allowed in the estuary.

3. Stay on the trails…for the wildlife. Trails were made to protect wildlife and nesting sites.

4. Every animal has a safety zone, the place where the animal feels safe and protected. Leave a safety zone of at least twelve inches around any animal you find.

5. Please leave plants, flowers, feathers, shells, nest, bones, etc. in the reserve. If everyone from your class picked a flower, more than 30 food sources for butterflies and other insects would be removed!

6. No eating or drinking on the trails. As a field biologist, it is important that your hands are free to touch, feel, and write about your new discoveries.

Your Journal for the Estuary Explorers

Why might a field biologist keep a journal? How would the journal of a field biologist be useful in the future? Why should you keep a journal?

Naturalists, biologists, and botanists keep a journal. They record their observations of plants, animals, the weather, and their environment when out in nature.

Field notes in a journal always include the date, time, weather conditions, and location. Notes should also include sketches, drawings, or photos. Sometimes people include poetry and paintings to explain what they see.

Your journal will be a way for you to write down and draw what you learn before and during your adventure to the Tijuana Estuary. Your field notes and the data you collect should be shared with others so they too can learn about the wildlife of the Tijuana Estuary.

Follow these simple steps when writing in your journal:

- Note the time, date, location, and weather.
- Draw or sketch what you see and then describe it.
- Look and watch quietly.
- Look closely and carefully.
- Look down, around, and up.
- Write down what you smell.
- Write down what something feels like.
- Use as many of your senses as you can when you are outside.
- Enjoy nature and explore!

LOOK AT THE PLANTS NEAR YOUR PLANT.

7. How are the plants similiar?

8. How are the plants different?

9. How does your plant survive in the salt marsh?

ACTIVITY: Salt Marsh Plants

Date:_____Time:_____

Weather Conditions:_____

INSTRUCTIONS: Observe a plant in the salt marsh area of the estuary. Circle the answers to the questions below and then sketch your plant.

CHECK OUT YOUR PLANT'S HABITAT.

1. **Is the soil:** Wet Damp Dry
2. **Is your plant:** Tall Low to the ground
3. **How many stems are there?** One Many

FEEL THE LEAVES.

4. **Are they:** Thick Thin
5. **Are they:** Sticky Waxy Smooth Hairy
6. **Do the leaves have salt crystals?** Yes No

Adventures of Pablo and Silvia Hernandez

Throughout your student journal you will read the field notes written by Pablo and Silvia Hernandez as they explored the watershed and estuary that you too will soon visit. Along with their journal notes you will find pages for you to start your own journal, using the questions and activities provided.

The Hernandez family lives in San Diego, California. They are a small family – Mr. and Mrs. Hernandez and their two children, Pablo and Silvia. Pablo and Silvia are ten-year old fraternal twins. Pablo is three minutes older than Silvia, and makes sure to remind her of this on a regular basis.

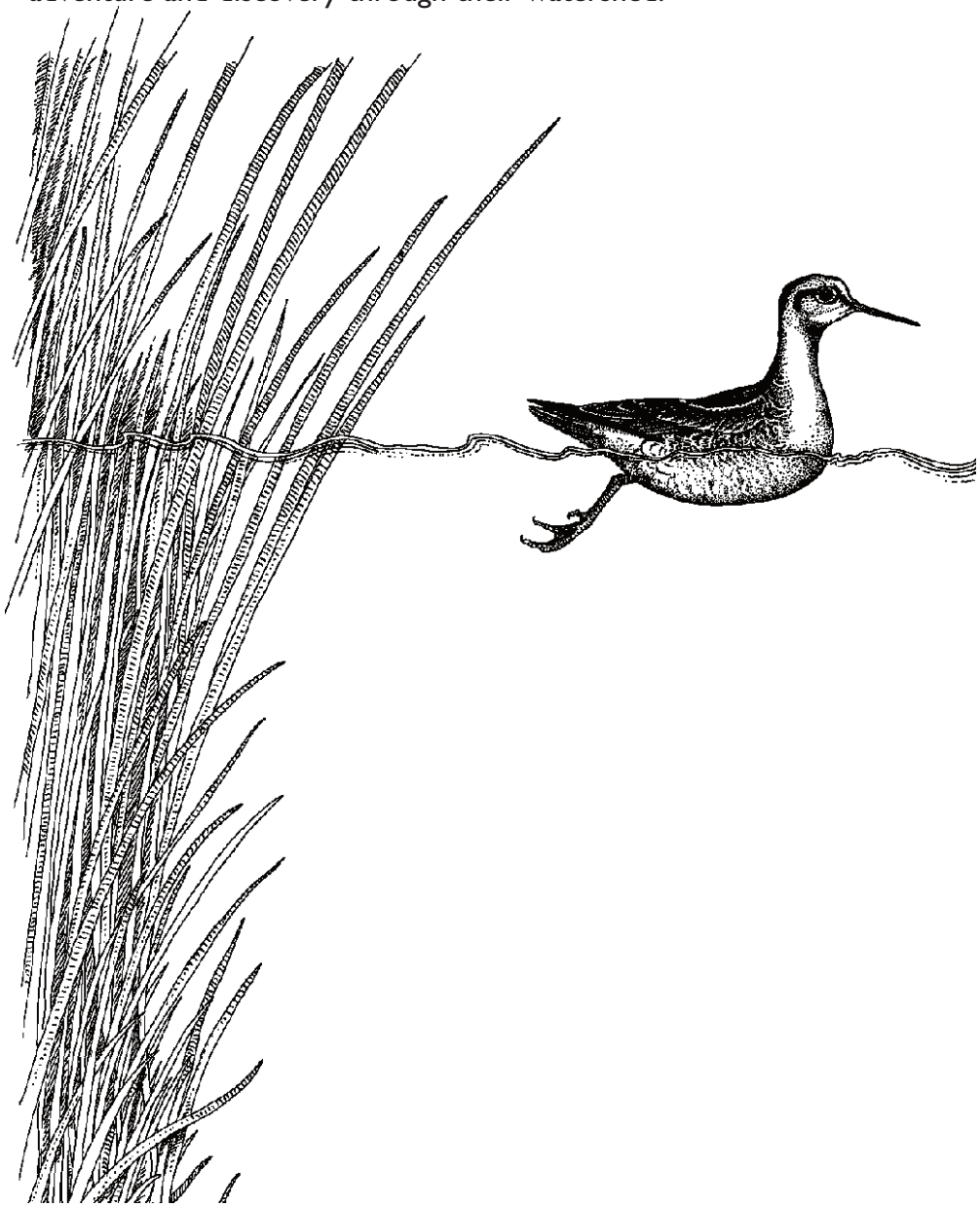
Pablo and Silvia like to play outside. They are part of an ecology club at school that goes on adventures all over San Diego County exploring wild places!

At their last club meeting it was announced that they could enter to win an adventure exploring their local watershed. Through this adventure they would learn what it is like to be a field biologist. The entry form asked, "Have you ever wanted to learn how water is made? What a least tern looks like or what invisible animals live in water? How a pickle turns red?"

Pablo and Silvia raised their eyebrows and looked at each other, shrugging their shoulders. Pablo said, "It might be kind of fun." Silvia said, "What in the world is a watershed?" Pablo and Silvia decided to sign up and apply.

Two weeks later, a letter arrived for Pablo and Silvia, inviting them to be a part of the watershed adventure known as the **Estuary Explorers**.

Only six students were invited for this exploration! Dr. Pelly, a field biologist, would be arriving at their home at 5:00 a.m. for the next five weekends ready to take them on their adventure and discovery through their watershed.



Did you know salt marsh bird's beak is a plant that only lives with the help of ground nesting bees? Without these kinds of bees this marsh plant would not survive.

YOUR PLANT NOTES

What do the ground-nesting bees do for the salt marsh bird's beak to help it survive?

_____

_____

_____

_____

Why is this important for a plant?

_____

_____

_____

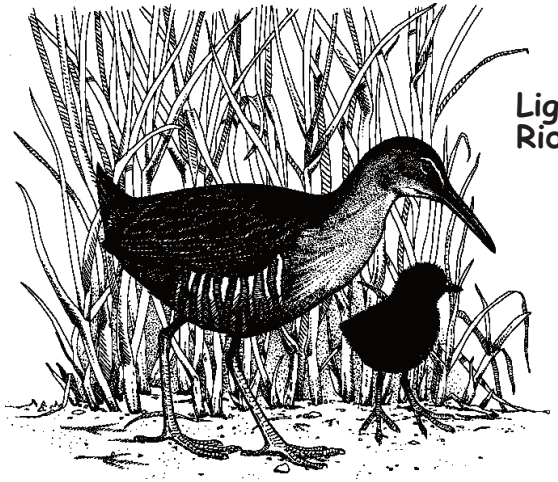
_____

_____

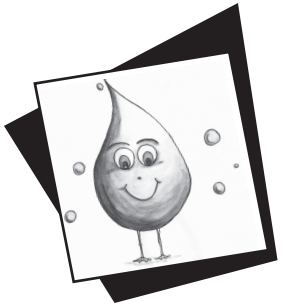
Dr. Pelly said the cordgrass gets rid of the salt instead of keeping it inside. If you looked at the blades of the cordgrass you could see the salt crystals that formed from the salt being **excreted** from the plant.

Another endangered bird, called the light-footed ridgway rail, makes its nest in cordgrass.

Belding's Savannah Sparrow



Light-footed Ridgway Rail



SILVIA'S FIELD NOTES
Where does your water live?
5:00 a.m., On our doorstep
Location: Chula Vista, CA

We sat on our doorstep at 5 a.m. We were so excited to be a part of the **Estuary Explorers** that we could hardly sleep the night before. Suddenly, a fire-red jeep appeared coming up the street. In the back seat of the car, sat Theresa, Francisco, and a few other students from our ecology club. After we said hello to everyone we jumped into the back seat of the large jeep that amazingly sat all six of us! Dr. Pelly announced, "Our first stop — the Tijuana River Watershed."

We drove for a long time. I saw a sign that said Border Crossing. We began to drive up some mountains. Finally, we stopped at a river and Dr. Pelly said we were at our first exploration site. I wondered, "Where are we and why are we here?"

We stood beside the river and I could see a lot of people, animals and cars moving around the river below. Dr. Pelly said we were at the beginning of our watershed in the Juárez mountains of Baja California. "A **watershed**," Dr. Pelly explained, "is where our water is naturally stored. It starts at the mountains where the

snow melts, becoming water, and enters a river or stream. The river or stream, sometimes called a waterway, flows downhill. Often a few streams or rivers will join at certain points along the watershed creating one waterway. The water continues to flow through different habitats and towns, finding its way to the coast and ocean. Along the way, water may be added from rain or run-off from the land. The watershed starts as freshwater at the top of the mountains and eventually mixes with the saltwater of the ocean when it reaches the coast."

"Everyone lives in a watershed and needs the watershed to survive," said Dr. Pelly. "We use fresh water for drinking, watering our plants and crops, and we also use resources in our watershed for recreation like swimming. Our watershed is also VERY important for many different types of wildlife. It provides a home, food and water for many animals and plants that you will be learning about as an **Estuary Explorer**."

Dr. Pelly asked us if we knew that three-fourths of our watershed is in Mexico. The Tijuana River watershed has two main river branches, one coming from Mexico in the south and one river branch coming from the United States in the northern part of the watershed. Each of these branches are made up of many different rivers and creeks that come together to make the watershed. The water finally ends up in the Tijuana Estuary along the coast.

Along the way, different things affect the health

PABLO'S FIELD NOTES
Plants of the Estuary
6:30 a.m., Tijuana Estuary
Location: Imperial Beach, CA

We stood along the marsh where all sorts of funny-looking plants grew. On the soil along the water's edge was some dry white powder. Dr. Pelly said it was salt! How could all of these plants grow here if the water was full of salt? Wouldn't that harm the plants?

Dr. Pelly showed us a plant with branches that look like a bunch of green wires or chains of little pickles. This was a plant many people call the pickle plant or pickleweed. At the tips of this plant were some red parts. So why do the little pickles turn red?

Dr. Pelly said that this plant deals with the salt in the water by holding in or **accumulating** the salt. The salt goes to the tips of the branches turning some of the parts red. The red parts will finally fall off, saving the plant from taking in too much salt.

I also found out that the pickleweed plant is also where the Belding's savannah sparrow, an endangered bird of the marsh, makes its nest. This little sparrow only lives in marsh habitats of California!

After the pickle plant, we took a look at another plant called cordgrass. This plant lives in the same areas as the pickleweed, so why doesn't it have red tips?

What other clues for identification do you notice about your bird, such as body shape, size, or color?

_____

_____

_____

According to your field guide, what bird do you think you are studying?

_____

Draw the bird here:

of the watershed. For example, water from storm drains on our streets flows right into the watershed. This means we need to be very careful about what is on our streets because, along with the water, pollutants can also flow into the watershed making it unsafe for humans or animals to drink the water.

In the distance I could see a huge wall of concrete dividing the river. It caused the river to look like a lake. I asked Dr. Pelly what the concrete was for and if it was part of the watershed.

"Three dams are found along the Tijuana River watershed that you live in," said Dr. Pelly. "Dams change the way the water flows in a watershed. This changes the homes of many animals and the lives of people along the watershed. For example, if you are a farmer who usually gets water from a river or a stream, a dam may limit how much water you receive because it holds the water back, or it may help you to get more water depending where you are along the river. What will happen to the farmers' crops if they do not get enough water?" Of course, we all answered that the crops would die. I thought to myself, "I wonder why they build dams?"

' USFWS

Did you know that the water that you drink today is the same water that was here when dinosaurs lived?

YOUR WATERSHED NOTES

Answer the following questions in the space provided. Share your journal notes with your class and family.

Why is the water that you drink today the same water that was on earth billions of years ago?

FIELD TRIP

ACTIVITY: Going Birding

Date:_____Time:_____

Weather Conditions:_____

INSTRUCTIONS: Observe a bird with your binoculars. Describe the beak, the feet, and other clues below. Review the ***What to Look for*** information before you begin.

What does the BEAK look like?

What do the FEET AND LEGS look like?

What is the bird doing?

Write about one of the birds that migrates to the Tijuana Estuary:
(*Choose from the list below*)

California least tern
Snowy egret
Great blue heron
Ruddy duck
Northern shoveler
Osprey
Willet
Marbled Godwit
American avocet
Western grebe

Which watershed do you live in? Draw your watershed.

FIELD TRIP

ACTIVITY: Building a Watershed

Date:_____

INSTRUCTIONS: Each explorer in your group will be given an item that is part of your watershed. With the group, listen to the story being read. Your leader will ask you to place the item in the watershed model when you hear about it in the story. (On the back of your item there are instructions that tell you where to place it in the watershed.)

What item did you add to the watershed?

_____

Is your item a natural part of the watershed?

_____

What is something you can do to help protect the watershed?

_____

_____

_____

Did you know there are more than 370 species of birds that make their home at the Tijuana Estuary? 320 of those species are **migratory** birds.

YOUR BIRD NOTES

Answer the following questions in the space provided. Share your journal notes with your class and family.

What percentage of the bird species at the Tijuana Estuary are migratory birds?

_____

_____

_____

_____

_____

_____

_____

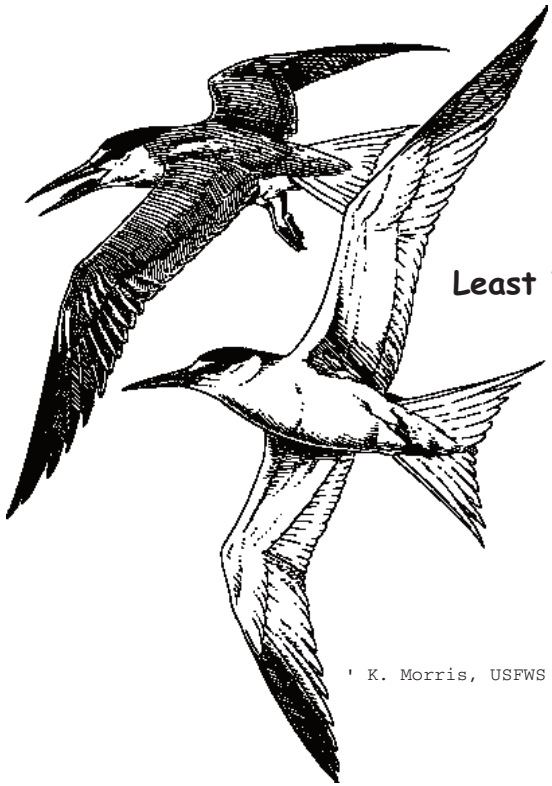
_____

_____

_____

endangered because they survive on the food, water, shelter, and space of the habitat.

We observed the sand dunes from a little wooden deck. It was Theresa's turn to play. She described a small little bird with black on top of its head, a white forehead, and a yellow bill. She thought it might be sitting on some eggs. The bird called out "*kip, kip, kip*." Francisco figured this one out! It was the endangered least tern. The field guide said it lives here during the spring and summer during the nesting season. This means the least tern **migrates**. As we started to leave, we saw another least tern dive into the ocean catching fish.



Least Tern

' K. Morris, USFWS

PABLO'S FIELD NOTES
Invisible Water Animals
6:00 a.m, at the Tijuana Estuary
Location: Imperial Beach, CA

We stood on a muddy trail just a few miles from the ocean. Dr. Pelly called this place an estuary. Francisco asked what that meant. I am glad he did because I had no idea. We were surrounded by what I thought were many rivers or streams. Alongside the water this funny-looking grass was the only thing growing. There were many birds picking at the mud with their beaks and you could feel the ocean breeze. There was a ripple in the water coming upstream.

After having us guess what an estuary was, **FINALLY** Dr. Pelly told us that an **estuary** is where **freshwater** and **saltwater** meet. In an estuary there is a daily ocean **tide** that moves in and out. The combination of the fresh and saltwater is called **brackish** water. Alongside the estuary different types of wildlife (both animals and plants) live and adapt to the salt in the water.

Dr. Pelly took out this huge pole from the jeep that had a net at the end of it and a small hand-held microscope. "Have you ever caught plankton?" asked Dr. Pelly. "What is plankton?" I wondered. "Maybe it's a fish."

Dr. Pelly explained that plankton is one of the most important food sources for marine mammals. **Plankton** are *drifting* organisms that we can usually only see under a microscope. But there are also some plankton that are as large as a jellyfish!

Here are some cool facts Dr. Pelly told us that I thought a field biologist would write down:

Phytoplankton are small drifting plant-like organisms in the estuary, and important food for many animals. They also make oxygen in the water for aquatic life to breathe!

Zooplankton are animals that can also drift, but they have the ability to move small distances on their own. They can be eggs, larvae, juveniles, or adults of other animals such as fish that live in the estuary.

Ichthyoplankton are the **larvae** (babies) of fish. Ichthy means fish.

Dr. Pelly explained that many fish species come to the estuary from the ocean to lay their eggs. It is a safe and important fish-hatching area. Over 28 different types of ichthyoplankton have been found by field biologists in the Tijuana Estuary. Without the estuary, these fish would not survive and the many animals that depend on them for food would also suffer.

guides, Dr. Pelly explained that it had a white underside and gray top feathers. As it soared it tilted from side to side.

What kind of bird could this be? It almost looked like an owl but it was daylight and owls fly at night. Could it be a northern harrier? I was right! Dr. Pelly said it was a male northern harrier gliding in search of small mammals for its breakfast. Cool!

We walked further east along the channels to the riparian habitat where willow and cottonwood trees stood. Dr. Pelly said that these types of trees could only grow in freshwater habitats. We sat quietly on the ground below a small cottonwood tree listening to a bird singing "*cheedle-cheedle chew*." We could not see where the sound was coming from. I spotted it with my binoculars and quietly whispered my clues to the group.

"It is a small sparrow-like bird that is eating insects from the ground. It has gray top feathers and a whitish underside. Around its eye there is a light, white circle. It looks like it is gathering grass and leaves to make a nest." Pablo got the answer — the least bell's vireo, an **endangered** bird species of Southern California.

Dr. Pelly said we only had time for one more habitat — the sand dunes. The sand dunes were along the shoreline and are an endangered habitat of Southern California. Dr. Pelly said when a habitat is endangered much of the wildlife that depends on it also becomes

SILVIA'S FIELD NOTES
Going birding
5:00 a.m., Tijuana Estuary
Location: Imperial Beach, CA

We started our day at what Dr. Pelly called the channels, the different waterways that make up the **salt marsh** habitat of the estuary. The sun was just starting to rise behind us and the birds were waking up chirping. Dr. Pelly did say we would have to get up before the birds if we wanted to watch them. We were just in time!

Dr. Pelly named the habitats of the estuary — coastal dunes, brackish ponds, **mudflats**, salt marsh, **riparian**, and **coastal sage scrub**. Today we would be visiting each of these areas and learning what bird species live in each habitat.

Dr. Pelly said that each bird has a unique beak. A bird's beak acts like a utensil helping it to pick up, catch, or eat its food.

Our activity today would be similar to a scavenger hunt. Each of us would find one bird and describe its beak, feet and behaviors to the group. We'd see who could guess the right bird from our description.

We took a short walk to a habitat area that Dr. Pelly called the uplands or coastal sage scrub. Soaring above us was some type of large bird. Dr. Pelly said it was a bird of prey. While we looked for it in our field

Did you know that a blue whale, the largest mammal, eats 4 tons or 40 million krill, a type of zooplankton, a day?

YOUR PLANKTON NOTES

Answer the following questions in the space provided. Share your journal notes with your class and family.

Research the life-cycle of a fish. Draw and label it below.

When is a fish an ichthyoplankton during its life-cycle?

_____

_____

FIELD TRIP

ACTIVITY: Plankton Catch

Date:_____Time:_____

Weather Conditions:_____

INSTRUCTIONS: Draw and identify any plankton that you discover.

Circle one: phytoplankton or zooplankton.

Circle one: phytoplankton or zooplankton.

What helped you make the identification?

_____

_____

_____

Hold the Discovery Scope against the black background to see plankton more easily.