Wetland Migration Sensation (3-6)

Overview: In this activity, students will simulate a sandpiper migration between nesting and wintering habitats. Afterwards, students will look for migratory birds in the former salt pond habitat.

Content Standards Correlations: Science, p. 309

Grades: 3-6

Key Concepts: The former salt ponds around San Francisco Bay are human made habitats, that were once used for making salt. Today, these ponds provide important habitat for migratory birds traveling on the Pacific flyway. The plants and animals living in the salt ponds are an important food source for migratory shore-birds and waterfowl.

Objectives:
Students will be able to:
- describe the food chain in the former salt pond ecosystem
- contruct one food chain in this ecosystem
- describe the effects of habitat loss on migratory bird populations
- state one way to help protect migratory birds and their habitats

Materials:
Provided by the Refuge:
- two sets of 6 bases (wintering, wetland habitats and nesting habitats) set out one of each for every two students
- 12 binoculars
- 12 clipboards
- 1 bird id chart
- 4 sets of food chain cards
- 1 food pyramid poster

Provided by the Educator:
- Data sheets and pencils

Time Frame for Conducting This Activity

Recommended Time: 30 minutes

Introduction (5 minutes)
- discuss migration and migratory birds, especially sandpipers

Migration Simulation (8 minutes)
- set up the playing field and discuss the object of the game
- play 4 to 6 rounds of the migration game, each time removing or adding bases from the wintering or nesting habitat.

Discussion (2 minutes)
- discuss ways to protect migratory birds

Bird Behavior Spotting (10 minutes)
- discuss former salt pond habitat
- hand out clipboards, bird data sheets, and pencils to students
- review the bird behaviors on the data sheet
- hand out binoculars
- allow time for students to observe behaviors of birds using the former salt pond habitat

Food Chain Activity & Discussion (5 minutes)
- review what bird behaviors they observed
- discuss the various organisms that the birds are eating in the fomer salt pond
- students arrange former salt pond organisms cards into food chains (one per group)
- relate the importance of organisms that live in the former salt pond to migratory birds

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 wetlands result in a loss of wintering and nesting habitat for migratory birds.

What can students do to help?
Refuge staff conduct a Coastal Clean-Up, but we need your help.
- Be responsible for your own trash
- Participate in a Coastal Clean-Up
- Teach others what you have learned about habitats and migratory birds

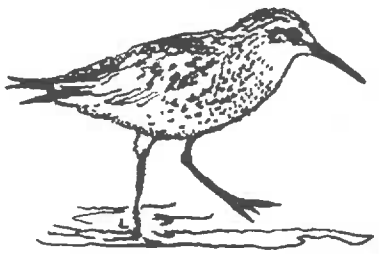
Supporting Information About This Activity

Migratory Birds

- The Pacific Flyway is the West Coast's major migration route; it is used by migratory birds during their flights between breeding grounds in the north and wintering grounds in the south.
  - In the spring, birds migrate to breeding grounds in the north where there is less competition for food and space and where the short summers promote huge insect blooms that provide ample quantities of food.
  - In the fall, birds migrate to wintering grounds in the south, seeking better weather conditions and greater quantities of food than can be found in the northern hemisphere in winter.
  - Since these two regions are often thousands of miles apart, migratory birds need wetland habitats to provide them with food and rest.
  - The primary threats to migratory birds are the disappearance and degradation of wetlands.
    - Agriculture and industry are reducing the availability of natural wetlands.
    - Non-point source pollution, caused by pesticides, freeway runoff, and dumping in storm drains, has taken its toll.
    - Natural limiting factors also affect migratory birds; predators, weather, disease, fire, and drought take their toll.

Sandpipers

- One of the most visible and abundant migratory shorebirds that winters in the wetlands of San Francisco Bay is the western sandpiper. Huge flocks of them can be seen wheeling and diving in unison above the water.
- Sandpipers have relatively small eyes, and use their long bills to detect and capture prey beneath the water surface or buried in the mud.
- Their slender, sensitive beaks are perfectly adapted for finding worms, crabs, shrimp, and other small crustaceans.
- Their bills are so flexible that a bird can open the tip of its bill to grasp prey without opening the base of the bill.
- In spring, sandpipers fly rapidly north to Alaska, where they breed and feed all summer.
- In late summer and fall, groups of sandpipers make a leisurely trip southward, departing at different times.
- During the winter, sandpipers can be found along the entire Pacific coast from Washington to South America.



Western Sandpiper

Salt Pond

- The salt pond is a human-made habitat that was used for the production of salt. In the 1930s, levees (dirt walls) were built around salt marsh (the natural habitat) and the land was flooded with water from the Bay to make solar salt evaporation ponds that were used to make salt.
- Today, these ponds are part of the Salt Pond Restoration Project. This project will restore and enhance 15,100 acres to salt marshes, mudflats, and other wetland habitats.
- The water in this pond used to be saltier than ocean water; it is now brackish (mix of fresh and salt) water from the bay, which is managed by water control structures Some animals that live in the water are zooplankton, mysid shrimp, water boatman, and a variety of fish. Pelicans, grebes, cormorants, shorebirds, gulls and a variety of ducks can be seen at the salt pond.
- The pond (A16) adjacent to the Environmental Education Center will remain a managed pond. There are plans to create various shaped islands to create more habitat for nesting shorebirds, along with shallow water habitat for foraging. The design and management of the pond will be studied in order to provide quality habitat for wildlife.

Salt Pond Food Chain

- Food chains are sequences of organisms in which each member of the food chain feeds on the member below it.
- Food chains begin with a producer that makes energy from sunlight and nutrients.
- In the case of the former salt pond food web, one food chain is:

Sunlight & Nutrients —> Algae —> Mysid Shrimp —> Small Fish > Shorebirds

Supporting Information About This Activity

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  - The primary threats to migratory birds are the disappearance and degradation of wetlands.
    - Agriculture and industry are reducing the availability of natural wetlands.
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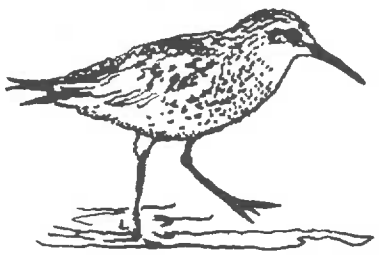

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Mysid Shrimp

- Mysid shrimp are crustaceans, like crabs and lobsters, with an exoskeleton (a hard outer shell or skeleton). They are translucent.
- Mysid shrimp's body length ranges form 5mm to 30mm. They have eight pairs of legs.
- Mysid shrimp are omnivores. They feed on algae (microscopic plants in the pond), detritus, and zooplankton. Mysid shrimp are eaten by water boatmen and shorebirds.
- Mysid Shrimp are free-swimming, rest on algae, or beneath the sediment surface at the bottom.

Mysid Shrimp

Water Boatmen

- Water boatmen are insects found in both brackish waters and salt ponds.
- They have three body parts and six legs.The water boatman goes through incomplete metamorphosis, growing gradually from a tiny nymph into a full size adult with wings.
- Water boatmen eat algae and msyid shrimp. They lunge at the mysid shrimp, pierce its exoskeleton with their mouth parts and suck its juices. Water boatman are eaten by fish and shorebirds.
- The water boatman does not have gills. It must come to the surface to breathe air and carry its air supply with it under water, like a scuba diver, trapping a bubble under its wings.

WaterBoatman

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

Introduction (5 minutes)

Read

"In this activity we will be studying the importance of the former salt pond habitat to migratory birds by becoming migrating sandpipers."

Ask

? **What are migratory birds?** (Birds that spend summer in one habitat and winter in another.)

Read

- "The Pacific Flyway is the West coast's major migration route. It's almost like a highway in the sky. In the spring, birds migrate to breeding grounds in the north where there is less competition for food and space.
- "In the fall, birds migrate to wintering grounds in the south, seeking better weather conditions.
- "Since these two places are thousands of miles apart, migratory birds need wetland habitats to provide them with food and rest in between, just like when people take long vacations and need to stop in at fast food restaurants to feed and rest!"

Ask

? **What are some migratory birds that pass through the San Francisco Bay?** (Ducks, geese, terns, swallows, hummingbirds, and many shorebirds such as sandpipers.)

Read

- "One of the most visible and abundant migratory shorebirds that winters in the San Francisco Bay habitats is the western sandpiper. Huge flocks of them can be seen flying above the water.
- "Sandpipers use their long bills to detect and capture prey that is beneath the water surface or buried in the mud. Their slender, sensitive beaks are per fectly adapted for finding worms, crabs, shrimp, and other small crustaceans."

Ask

? **Can anyone guess where the Western sandpiper goes to nest in the spring?** (In spring they fly rapidly north to Alaska, where they breed and feed all summer.)

Read

"A major threat to migratory birds is the disappearance and pollution of wetlands, such as marshes, sloughs, and former salt ponds. Pollution, caused by pesticides, freeway runoff, and dumping pollution in storm drains, is part of the problem."

Do

- Choose the number of bases so you have one for every two students at each end of the playing field.
- One end is the San Francisco Bay Area (wintering habitat) and the other end is Alaska (nesting

habitat).

- Make certain to include the "fomer salt pond" and "salt marsh" bases in your selection for wintering habitats.

Place the bases in two areas on the playing field as shown below:

Migration Simulation (8 minutes)

Read

- "Many factors impact the survival of migrating birds. Some involve changes in the wintering and nesting habitats.
- "There are times of abundant food and water, with suitable shelter and space. At other times food or water is scarce. Sometimes the available habitat is reduced or polluted.
- "Each base, at either end of the field, provides an area of suitable habitat for two birds.
- "You are western sandpipers starting in the San Francisco Bay Area, which is the wintering habitat. The other end, is your nesting habitat in Alaska.
- "Remember, each base can only be used by two sandpipers."

Do

Have students go to the bases in their San Francisco Bay Area wintering habitat.

Read

- "You are now wintering in the San Francisco Bay Area. There are different types of wetlands here. Look at the base to see the name of the wetland habitat you are standing on.
- "When I give the signal, walk to a suitable habitat in your Alaska nesting area. Flap your wings to show you are flying swiftly to your destination. When you reach the base, you have migrated successfully."

Do

Give the signal and have the students "migrate" to their Alaska habitat to nest. Everybody migrates successfully on the first try because there are an equal number of bases at each end.

Do

To simulate habitat loss remove the salt marsh base from the wintering habitat.

Read

- "A large salt marsh has been drained and used for building houses.
- "When I give the signal, you must "fly" to a base in order to survive. You cannot go to a base if two sandpipers are already there.
- "Anyone not finding a base is a dead bird and will have to sit on the side. You will have another chance to get back in the game as a newly hatched chick when conditions are more favorable. Until then, you will need to stand on the side and decompose."

Do

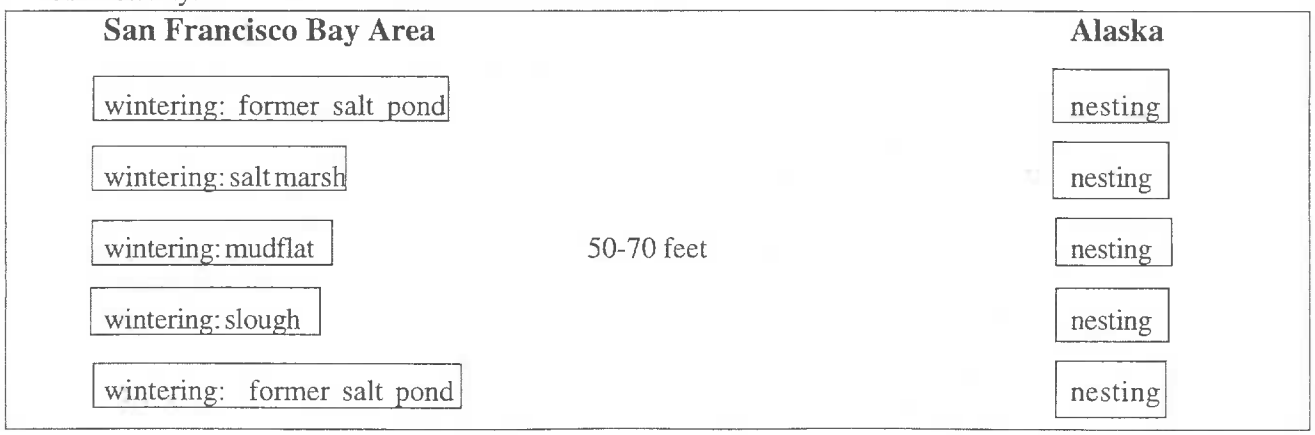
Give the signal for students to "migrate" to their wintering habitat in the San Francisco Bay Area. Two sandpipers will "die" because there is one less base.

Do

Now, remove two bases from the nesting habitat.

Read

"Two wetlands have been lost from the nesting habitat in Alaska. They have been contaminated by an oil spill. You have only a small amount of wetland left for the remaining sandpipers."



Do
Give the signal to migrate. Two more sandpipers will die.

Do
Remove one base from the wintering habitat.

Read
"A slough has been destroyed in the wintering habitat in the Bay Area. It has been polluted by pesticides and soapy water that people washed down the storm drain."

Do
Give the signal for students to "migrate" to their wintering habitat.

Do
While you are still at the "Alaska" site, replace two bases to the nesting habitat to simulate an increase.

Read
"Concerned citizens have learned about the value of wetlands. A large National Wildlife Refuge is created in Alaska to preserve wetlands."

Do
Give the signal for students to "migrate" to their nesting habitat.

Read
- "Thanks to concerned citizens, there is more wetland habitat for sandpipers. Conditions are favorable for a good breeding season.
- "All 'decomposing birds' may now reenter the game as newly hatched chicks."

Ask
? **What happened the last time you migrated to the San Francisco Bay?** (Birds died because there was not enough habitat.)

? **If wetland habitat is not restored in the Bay Area, what will happen when you migrate there?** (Many of the sandpipers will die again due to lack of suitable habitat.)

Read
"Luckily, thousands of people stopped pouring pollutants down storm drains. More wetland habitat is suitable for migratory birds."

Do
Replace the missing bases of the wintering habitat. Give the signal for students to "migrate" to their wintering habitat.

Discussion (2 minutes)

Ask
? **What are some causes of bird population decline from year to year?** (Natural disasters: drought, storms, disease; loss of habitat; predation by humans and wildlife.)

? **What human activities cause habitat loss and degradation for migratory birds?** (Draining and filling in wetlands for farm land, road construction, housing and business development, garbage dumps; dumping of pollutants, oil spills into waterways; tossing of trash into bays and salt ponds, like plastic containers, soda can holders, styrofoam peanuts, etc.)

? **What is one reason a wildlife refuge exists?** (To protect migratory birds; shorebirds and ducks.)

? **How are the former salt ponds important to migratory birds?** (Former salt ponds provide food, like mysid shrimp and water boatmen, for migratory birds.)

? **How can you help protect habitat for shorebirds like the sandpiper?** (Be responsible for your own trash; participate in Coastal Clean-Up; stop putting pollutants down storm drains; educate others about the importance of wetlands; etc.)

Read
"Now that we have seen the importance of wetlands to migratory birds like the western sandpiper, let's move to the former salt pond and find out what makes it valuable to the birds as a feeding ground."

Bird Behavior Spotting (10 minutes)

Do
Focus the students' attention on the salt pond. Discuss the salt pond habitat.

Ask

?Is the former salt pond habitat a natural or a human-made habitat?
(Human-made.)

Read

- "The salt pond was used at one time to produce salt. The salt company built levees around salt marshes and flooded the salt marsh with Bay water.The salt ponds produced salt by using evaporation. Today, they no longer produce salt.
- The water in this pond used to be saltier than ocean water; it is now brackish (a mix of fresh and salt) water from the Bay. Some animals that live in the water are zooplankton, shrimp, water boatmen, and a variety of fish.
- Today, these ponds are part of the Salt Pond Restoraton Project. This project will restore and enhance 15,000 acres to salt marshes, mudflats, and other wetland habitats."

Ask

?What animals can you see feeding in the fomer salt pond? (Birds, such as shorebirds and ducks.)

Read

"We are going to observe the bird's behavior. Then we be able to understand why the former salt pond is so important to migratory birds."

Do

Hand out clipboards, pencils, and the Bird Behavior Tracking worksheets.

Read

- "Take a look at the Bird Behavior Tracking sheet. There are six bird behaviors that we are going to be looking for: *resting, feeding, wading, flying, swimming, and preening (cleaning feathers).*
- "When you observe a bird doing any one of these behaviors, put an X through that behavior on your sheet. Also be sure to fill out the answers to the questions on the sheet.
- "Be sure to look in all directions."

Do

- Hand out binoculars.
- Let the students observe for 3-5 minutes. Go around the group and help the students if needed.
- Once the group has finished, gather up the group and their binoculars.

Ask

? How many people saw birds swimming? (Have them raise their hands.)

? How many people saw birds preening or cleaning their feathers? (Have them raise their hands.)

? How many people saw birds feeding, resting, wading, or flying? (Have them raise their hands.)

? Do you think that the former salt pond is important to these birds that you just observed? Why? (Yes, because the former salt pond is necessary for their survival. It is a place where the birds can find food, rest, and clean themselves.)

<u>Food Chain Activity</u> (3 minutes)

Do

Split the students into four groups. Pass out one set of food chain cards to each group. Each set is backed by a different color.

Read

"Each group has a set of cards that make up a food chain found in the former salt pond habitat. Working as a team, try to arrange your set of cards into a food chain."

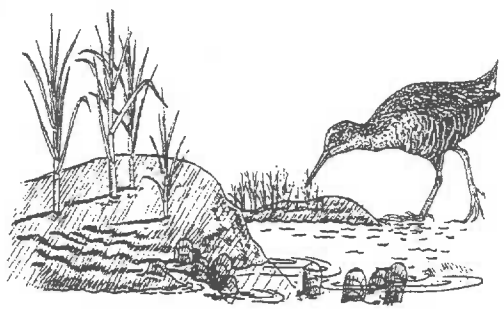
Do

Work with the groups as needed. When the students are finished have each group share their food chain with the rest of the students.

Ask

? Who would like to describe their food chain? (Allow a group to describe their food chain.)

Algae —> Shrimp —> Insects —> Fish —> Shorebirds



Discussion (2 minutes)

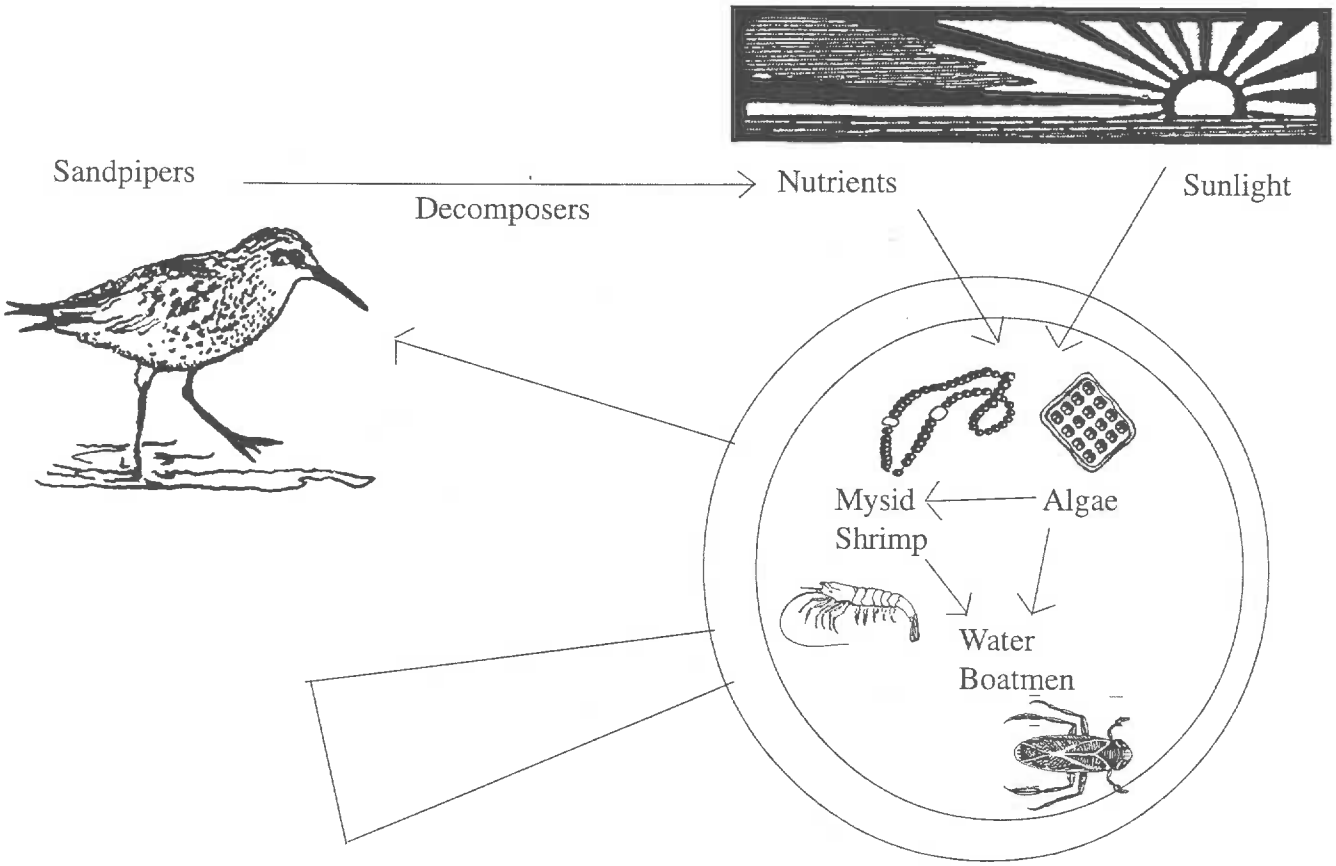
Ask

? **What do former salt ponds provide migratory birds with?** (Provide food: algae, msyid shrimp, water boatmen, and small fish.)

? **How would a reduced food chain in the former salt pond affect migrating birds?** (If the former salt pond habitat provided fewer organisms to feed on, they would have to look elsewhere for food. If the part of the food chain disappeared, so would the migratory birds.)

? **How can you protect migratory birds and their habitat?** (Don't dump anything down storm drains; pick up animal waste and throw it away; teach others about what you have learned, write to your local congressmen; become involved in the Salt Pond Restoration Project, the largest wetland restoration project on the west coast!)

SALT POND FOOD WEB

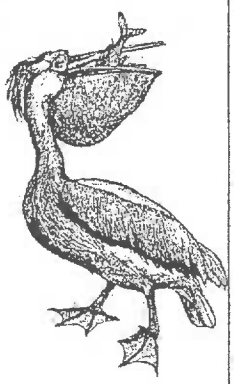


Bird Behavior Tracking

Name: _____ Date: _____

Feeding

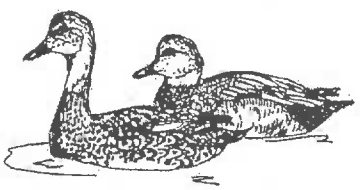
Scooping for fish, shrimp, etc.



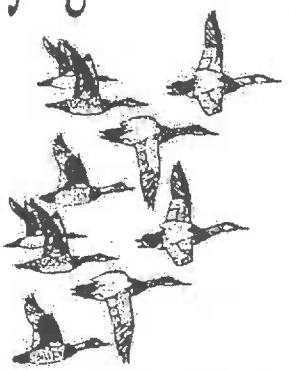
Swimming

Can you identify the bird you observed?

_____

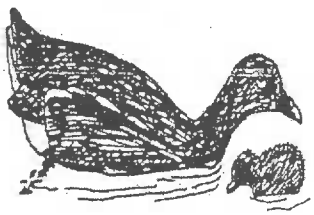


Flying



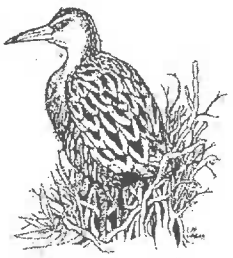
Preening

(cleaning feathers)



Write another bird behavior that you observed?

_____

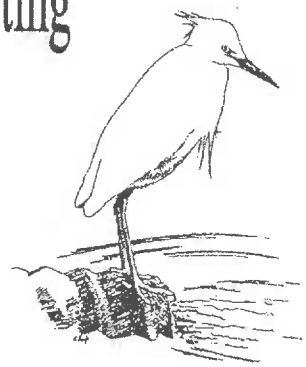


Swimming

Can you identify the bird you observed?

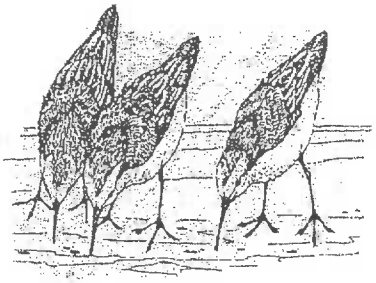
_____

Resting



Feeding

Probing for insects and crustaceans.



Wading