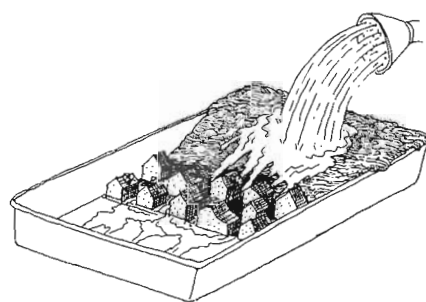
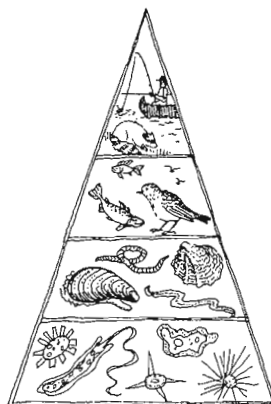
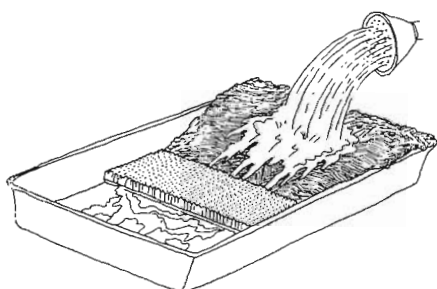




Learning Activities for  
Youth Groups, Age 10-15

# WETLANDS PROTECTOR

*Guarding Our Wild & Watery Lands*



UNIVERSITY of CALIFORNIA  
**Agriculture &  
Natural Resources**  
Publication 21610



# WETLANDS PROTECTORS

## *Guarding Our Wild and Watery Lands*

These materials were developed by the California Aquatic Science Education Consortium

**Project Director**

Willis D. Copeland

Graduate School of Education

University of California, Santa Barbara

**Primary Author/Editor**

Jill Shinkle

The initial formation of the California Aquatic Science Education Consortium (CASEC) in 1990 was undertaken by the Graduate School of Education at the University of California at Santa Barbara with funding provided by the National Science Foundation. In 1995, CASEC moved to the Department of Human and Community Development at the University of California, Davis with the 4-H Youth Development Program taking leadership for its ongoing activities.

The mission of CASEC is to promote a greater scientific literacy, a more thorough understanding of the value and workings of freshwater and marine ecosystems, and an enhanced awareness of scientific, environmental and policy aspects of California water issues. CASEC continues as part of the Division of Agriculture and Natural Resources Science, Technology, and Environmental Literacy Workgroup in the development, and evaluation of community-based aquatic science literacy projects.

*Dedicated to  
the youth of California  
and their care of the earth.*



UNIVERSITY of CALIFORNIA  
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Natural Resources**  
Publication 21610

# CALIFORNIA AQUATIC SCIENCE EDUCATION CONSORTIUM

Department of Human and Community Development  
University of California  
Davis, CA 95616  
(530) 752-8824

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University of California  
Davis

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## Introduction

Wetlands are areas of land that are covered by shallow water for at least part of the year. They are often transitional areas between dry land and the deeper water of an ocean, bay, lake, or stream. There are many types of wetlands, such as freshwater marshes, salt marshes, mudflats, swamps, salt ponds, wet meadows, and vernal pools.

Wetlands are home to an abundant array of plant and animal life. Wetlands provide critical nursery grounds for many species of fish, resting and feeding places for migratory birds, and habitat for a great variety of mammals, including a large percentage of endangered wildlife species. The nutrient-rich water of wetlands provides habitat for plankton (microscopic organisms) that are consumed by numerous small animals. These animals are in turn consumed by larger animals, creating a rich and varied food chain. This food chain encompasses humans, since many species of commercial and sport fish and shellfish are hatched or spend part of their lives in wetlands.

Native Americans lived alongside California wetlands for thousands of years, hunting and harvesting the abundant resources found there. When European settlers arrived in California in the late 1700s, they regarded wetlands as wastelands. Over the next 200 years, 90 percent of California's wetlands were drained or filled to become farmland or to support development. The largest wetland loss occurred between 1860 and 1930 when massive draining and diking of wetlands occurred in the Sacramento River Delta and California's Central Valley. Sadly, these losses continue to this day as wetlands are replaced by freeways, farmland, canals, ports, marinas, and new construction projects for homes and businesses.

**The value of wetlands.** Although land development continues to replace wetlands, the rate of loss has diminished as people have begun to place a higher value on wetland areas. Wetlands can provide:

- A rich habitat that supports a complex food chain that encompasses human beings.
- Resting and feeding places for migratory birds and habitat for varied species of wildlife, including endangered species.
- A place for people to engage in numerous outdoor recreational activities, such as fishing, kayaking, birdwatching, hiking, and hunting.
- A habitat that sustains commercial and sport fishing and supports shellfish during some phases of their lifecycle.
- Reduction in flood damage, achieved by slowing and absorbing flood waters.
- The recharge of groundwater supplies by absorbing and holding water, allowing water to seep slowly into the ground.
- The improvement of water quality due to the thick mat of plants that trap and filter pollutants and silt in run-off water.

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**An opportunity to learn.** The need to protect California's remaining wetlands presents young people with many intriguing scientific and societal issues to study, and numerous opportunities to become involved in citizen action and natural resource protection. Specifically, this set of activities is designed to:

1. Teach basic scientific concepts related to the characteristics of wetland habitats.
2. Involve young people in hands-on science activities.
3. Stimulate and give guidance to young people as they work toward helping others in their community recognize and protect the value of wetlands.

## **"Doing" Science**

Science is more than learning facts about the physical and natural worlds. Scientists do things that help them discover and understand. The *California Science Curriculum Framework* suggests eight separate kinds of thinking processes that characterize the scientific enterprise. These are:

- Observing
- Communicating
- Comparing
- Ordering
- Categorizing
- Relating
- Inferring
- Applying

Studying science should emphasize these same processes of *doing* science that practicing scientists use. Science students need the opportunity to go beyond the simple study of what scientists have learned. These students need to practice *doing* science as scientists do it.

The various activities in this package engage youngsters in the thinking processes and actions typical of those used by scientists. The young participants have the opportunity to organize and classify data, predict outcomes, verify their predictions, collaborate with others in the pursuit of solutions, and create new and different approaches to doing common things. Each activity description in this guide contains science exercises and identifies the particular thinking processes that youngsters will use to carry them out.

## **Which Activities to Use**

For the most part, these are all independent activities and do not require use in any particular order. However, some may be more appropriate to use at the start of your work on water, while others can serve as culminating activities. Further, some activities require more time to develop or multiple meetings to conduct.



## What to Expect


Each activity presented in this book begins with a question to be answered, a summary, and a list of materials needed for the activity.


### *The “Instrument Panel”*

At the upper left of each activity sheet is a shaded box with specific information about the activity that can be viewed quickly. This includes:

- An estimation of the activity's Academic Demand. Some activities require considerable thought and analysis on the part of youngsters. Others are less intellectually demanding.
- An estimation of the Physical Exertion Required by the activity. Some activities require considerable movement or exertion to complete, while others are quieter activities that may require less physical effort.
- A suggestion for the Number of Participants and how to group them most appropriately for the activity. Some activities may require a large group, while others are best accomplished by individuals working alone, in pairs, or in small groups. The following symbols signify different groupings:


 = Youngsters working individually


 = Youngsters working in pairs or small groups

 = Youngsters working in large groups

Note that it is often possible to use more than one grouping method with the same activity.

- An approximation of the Time Needed for the activity. All of the activities in this package require sessions of less than one hour to complete. Some activities may take less time while a few require multiple sessions. Estimates are given to the nearest quarter hour.
- A suggestion as to the Setting that would be most appropriate for the activity. Two settings are presented:

 = The home or club room

 = The out-of-doors

Some activities may be accomplished in either setting.

---

### *Question*

The topic of the activity is presented in question form so that youngsters might more easily see that their task, like that of practicing scientists, is to seek answers for themselves, not merely to learn answers acquired by others.

### *Summary*

A one- or two-sentence summary of the activity is presented as an overview. This should assist the leader in selecting activities and in planning for their use.

### *Materials*

Each activity requires certain materials, many of which are included in this package. For example, most activities make use of included task cards and data sheets that can be photocopied and distributed to the youngsters to guide them through the activity. Additionally, some activities require other items that generally can be found around the home. All necessary materials are listed in this guide.

### *Purpose*

Particular educational goals for each activity are listed in this guide to assist leaders in planning and executing the activity.

### *Activities*

The learning actions of each activity are presented as a series of steps to be directed by the leader. These actions are often mirrored or elaborated on the Task Cards used by the youngsters. It is important to recognize that the activities are presented as suggestions. Individual group leaders should feel free to make alterations that they think might improve the experience for their particular group.

### *Keys to Success*

This section offers suggestions derived from past experience that might help the group leader derive the maximum benefit from each activity.

## **Use by Youth Groups**

The activities in this package have been designed to fit comfortably into a wide variety of educational programs offered by youth-service agencies. Below are specific suggestions concerning how they might be used in particular organizations.

### *Boys and Girls Clubs of America*

These learning activities may be used as a guide for club activities in environmental education, one of the six core services provided by the Boys and Girls Clubs programs. The activities may also complement individual clubs' existing programs in conservation, or marine science.

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## *Girl Scouts*

Within the Junior Girl Scout Program, these learning activities can be used for:

- Working toward badges in the World of Today and Tomorrow (Science in Action; Water Wonders) or in the World of the Out-of-Doors (Eco-Action; Outdoor Surroundings).
- Participating in the Contemporary Issues Program, "Earth Matters," and earning the participation patch.
- Participating in environmental badge activities at Girl Scout summer day camp or long-term camp.

## *4-H Youth Development Program*

These learning materials incorporate the science processes and the learning cycle method of instruction. The materials can be used by adult volunteer and teen leaders working with youth 10-15 years of age involved in 4-H projects focusing on environmental science as well as marine and freshwater science projects. The materials include activities to prepare the youngsters for their experience, on-site activities, and debriefing activities. In addition, individual activities can be led by teens at summer and day camps, fairs and other public events, used as a basis for 4-H demonstration projects, and National 4-H week events.

## *Camp Fire*

These activities complement several projects in the Camp Fire Adventure, Discovery and Horizon programs, including:

- Try-Ad projects and Action Crafts.
- Torch Bearer projects in Environmental Issues or Special Interest.
- Components for the national Project Good Earth.
- As one of the three issues explored in an individual's WoHeLo Medallion project.

The curriculum can also be used in resident and day camp programs located near beaches, lakes, and rivers.

---

## Resources

### Curriculum Guides/Activities about Wetlands

*Adopting a Wetland: A Northwest Guide*, 1993. Available through Adopt-A-Stream Foundation, Northwest Stream Center, Everett, WA 98208. (425) 316-8592. Online at <[www.streamkeeper.org](http://www.streamkeeper.org)>.

*Project Estuary*, Gail Jones, 1989. Published by the North Carolina National Estuarine Research Reserve, Department of Environment and Natural Resources, Division of Coastal Management. Available from John Taggert, (910) 962-2470, UNCW-CMSR. Free.

*Project WILD Aquatic Guide*, California Department of Fish and Game, 1416 Ninth Street, 13th Floor, Sacramento, CA 95814. Available only to Project WILD workshop participants. Call (916) 653-6132 to learn about workshops in your area.

*Ranger Rick's Naturescope: Wading Into Wetlands*. National Wildlife Federation, P.O. Box 50281 Hampden Station, Baltimore, MD 21211. (410) 516-6583.

*Salt Marsh Manual*. Available to workshop participants at the San Francisco Bay National Wildlife Refuge, P.O. Box 524, Newark, CA 94560. (510) 792-0222. Call for information on current workshops.

*Welcome to the Wetlands*. Activity book and information sheet available in multiple copies at no charge from: Environmental Protection Agency, Region 9, 75 Hawthorne Street, San Francisco, CA 94105. (415) 744-1020.

*Wetlands: Water, Wildlife, Plants, and People*. Poster, activity suggestions, and coloring poster. Available from U.S. Fish and Wildlife Service, Publications Unit. (304) 876-7203. Free. Online at <[www.fws.gov/kids/](http://www.fws.gov/kids/)>.

Wetlands monitoring handbooks and equipment. Available from the Izaak Walton League of America, 707 Conservation Lane, Gaithersburg, MD 20878. (800) 284-4952. Online at <[www.iwla.org](http://www.iwla.org)>.

Wetlands teaching guides and activities from the Environmental Protection Agency can be ordered from the Wetlands Information Hotline, (800) 832-7828, or downloaded from the internet at <[www.epa.gov/OWOW/wetlands/scinfo.html#Kids](http://www.epa.gov/OWOW/wetlands/scinfo.html#Kids)>.

*WOW! The Wonders of Wetlands*. Available from Environmental Concern, Inc., P.O. Box P, St. Michaels, MD 21663. (410) 745-9620. Online at <[www.wetland.org](http://www.wetland.org)>.

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### Other Publications about Wetlands

*America's Wetlands: Our Vital Link Between Land and Water*. Free. Order from the Wetlands Information Hotline, (800) 832-7828. This publication, and others, may be downloaded from the internet at <[www.epa.gov/owow/wetlands](http://www.epa.gov/owow/wetlands)>.

*California Coastal Access Guide*, California Coastal Commission. Berkeley: University of California Press. May be available from bookstores or libraries; otherwise order from UC Press. (800) 822-6657. Online at <[www.ucpress.edu](http://www.ucpress.edu)>.

*Common Wetland Plants of Coastal California*, Phyllis M. Faber, 1982, and *Common Riparian Plants of California*, P. Faber and R. Holland R., 1989. Pickleweed Press, 212 Del Casa, Mill Valley, CA 94941. (415) 388-6002.

*Edible and Useful Plants of California*; Charlotte Bringle Clark. Berkeley: University of California Press. May be available from bookstores or libraries; otherwise order from UC Press. (800) 822-6657. Online at <[www.ucpress.edu](http://www.ucpress.edu)>.

*San Francisco Bay Area Shoreline Guide*, guide to trails along the San Francisco Bay. *Exploring Our Baylands*, an guide to the plants, birds, and history of the San Francisco Bay. San Francisco Bay National Wildlife Refuge. (510) 792-0222.

*Status and Trends Report on the San Francisco Estuary*. A comprehensive report on Bay-Delta wetlands. San Francisco Estuary Project, P.O. Box 2050, Oakland, CA 94604-2050. (510) 464-7990.

*Wetlands*. William A. Niering, New York: Alfred Knopf (Audubon Society Nature Guides), 1988. Available in bookstores or libraries.

### Other Resources

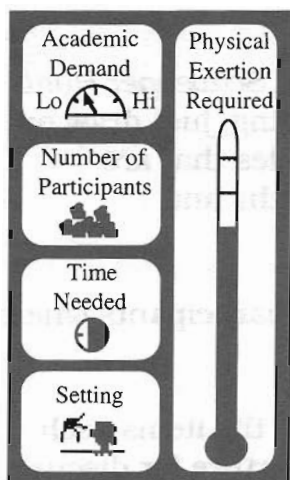
Santa Monica Bay Restoration Project. The project produces public education materials about Santa Monica Bay and has experts on hand to address questions on marine habitats, waste water, wetlands, storm drains, and other conservation issues. (213) 576-6615.

For wetlands maps in your area, contact: Earth Science Information Center of the U.S. Geological Survey, Menlo Park, CA. (650) 329-4309.

For speakers on wetlands, contact: U.S. Fish and Wildlife Service in Sacramento, Public Relations Office (916) 414-6600, or consult the *Directory of Public Resources*, 1999. California Department of Fish and Game. (916) 653-6420. Online at <[www.dfg.ca.gov/](http://www.dfg.ca.gov/)>.



## WETLAND SCAVENGER HUNT



**QUESTION:** What does a wetland sound like? Smell like? Look like?

**SUMMARY:** This is a good activity to help youngsters become familiar with wetlands when they first arrive at a field trip site. Working in small groups, youngsters find and draw or describe designated items. The items on the list are not to be collected or taken, just observed.

**MATERIALS:** (For each group of 3-4 people:)

- Task Card #1, *Wetland Scavenger Hunt* (included). You should add a few items to the list that are specific to the site your group is visiting.
- Clipboard (or cardboard and tape to make one)

**ACTIVITIES:** (Observing, Communicating, Comparing, and Categorizing)

Before the trip

1. Review with the group where you will be going, what you will be doing there, and the following tips for visiting wetlands.

### Tips for Visiting Wetlands

Take time to be quiet. Wildlife will be frightened by groups of noisy humans. At some point during your visit, take time to sit quietly, separated somewhat from the group, and observe the sounds and sights of the wetland.

Follow the regulations of the site you are visiting, particularly those regarding staying on designated paths or raised boardwalks.

Be kind to plants and animals. Watch where you step. Certain plants or animals that may be common to the wetland may be rare everywhere else and may even be endangered. Do not remove any plants or animals unless your group has received special permission.

Be prepared to get your feet wet and muddy. Wear old shoes, and bring extra shoes and socks to change into at the end of the trip.

2. Photocopy and prepare the *Wetland Scavenger Hunt* sheets by adding to the list any items that are specific to your site that you would like the youngsters to find.

At the site

3. Divide participants into groups of 3-4, and pass out the *Wetland Scavenger Hunt* sheets. Remind the youngsters that they are not to collect anything, just draw or describe things on the list as they are discovered. Review the rules that are specific to the site, emphasizing the importance of staying on paths and protecting plants and animals.
4. Designate the boundaries and set a time limit for the hunt. Tell participants where and when they should regroup.
5. When the entire group has gathered again, discuss and compare the items each group discovered. Use some of the items found as points of departure for discussion. For example, if decayed plants are found, discuss how decaying plants help to form the critical bottom layer of the food chain by providing food for microscopic animals in the soil and water. Or talk about migrating birds or any interesting plant or animal species that is specific to your site.
6. Ask members to describe other items they discovered that were not on the list.

**SUGGESTION:**

Follow this activity with **Wetland Sound and Sight Survey** (Activity #3), **Mud Creatures** (Activity #6), or **Tracking the Wetland Dwellers** (Activity #7).



## Task Card #1

### Wetland Scavenger Hunt

With your group, search the designated wetland area for the things on this list. When you find something, either draw or describe it in as much detail as possible.

- The young and the adult of the same species (either plant or animal).
- Something interesting in the water.
- Something heavier than all the people in your group combined.
- The color orange.
- Three different animal sounds.
- An animal track.
- A plant that you imagine might be used by humans.  
What could humans use it for?
- A smell that you would not normally find at home or at school.
- Something that moves faster than you can.
- A sign of plant decay.
- Something that an animal left behind.

**Task Card #1**  
**(continued)**

## **Wetland Scavenger Hunt**

- Three different flowering parts of plants.
- Two noticeably different types of soil.
- Something that was not here 150 years ago.
- Something that you see swimming.

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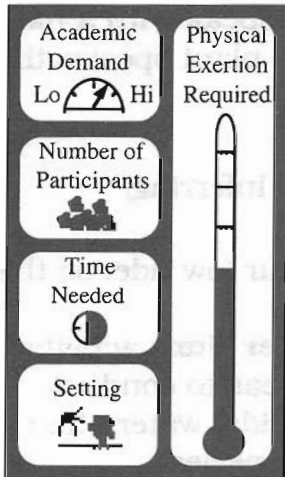
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## SALT MARSH PLANT SURVEY



**QUESTION:** Why are there more types of plants at higher elevations in the salt marsh than there are at lower elevations?

**SUMMARY:** Youth group members conduct a survey of two different areas of the salt marsh, one at a high elevation and one at a low elevation. They then explore the characteristics of plants that can live in the salty environment of the lower marsh.

**MATERIALS:** **For each group of 3-4 people:**

- Clipboard (or cardboard and tape to make one)
- Pencils or pens
- Task Card #2, (included) *Plant Survey Sheet*

**For whole group:**

- Two empty 1-gallon water bottles
- A potted plant (for follow-up activity back at the meeting place)

### PURPOSE:

To help youth:

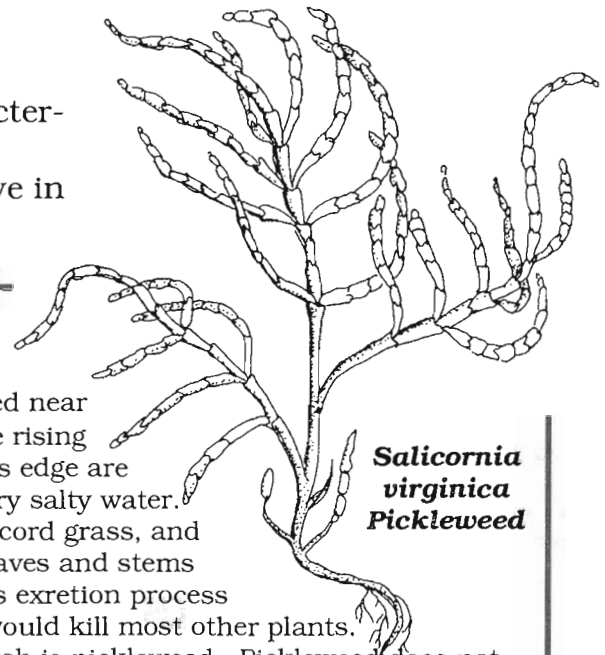
1. Become familiar with some of the unique characteristics of plants that live in salt marshes.
2. Realize that not many types of plants can survive in the salty water and salty soil of salt marshes.

### BACKGROUND

Salt marshes are densely vegetated marsh lands located near the ocean that are flooded and drained twice daily with the rising and falling of the tides. Lower marsh areas near the water's edge are home to only a few species of plants that can survive in very salty water. Several plants in the low marsh areas, such as salt grass, cord grass, and sea lavender, contain glands that excrete salt onto their leaves and stems where the salt can then be washed away by the water. This excretion process allows these plants to survive on a diet of salt water that would kill most other plants.

Another species of plant common in the lower salt marsh is pickleweed. Pickleweed does not have glands to excrete salt, but instead stores excess salt in tiny sacs, called vacuoles, and protects the rest of the plant from the toxic effects of too much salt. As salt accumulates in the vacuoles, the green chlorophyll in the plant stems is replaced by red or yellowish pigment. In the autumn, the red parts of the plant wither and fall away, freeing the plant of the excess salt. Pickleweed is edible for humans and is also a main source of food for the salt marsh harvest mouse, an endangered inhabitant of many California salt marshes.

In the upper areas of the marsh, there will often be a greater variety of plants than in the lower marsh. Areas above the high tide line are home to a greater number of plant species that do not have to have special characteristics to survive in a salty environment.



**Salicornia  
virginica  
Pickleweed**

## SUGGESTION:

Prior to beginning this activity, you may want to visit the marsh briefly to select two areas in which to conduct the plant survey. You may also want to speak with a naturalist or someone familiar with the marsh to learn the names of the plant species that inhabit the lower marsh.

## ACTIVITIES: (Observing, Comparing, Categorizing, Relating, and Inferring)

### Before you go

1. Consult a tide chart and arrange to visit the salt marsh at or near low tide, so the lower marsh plants can be easily viewed.
2. Review the "Tips for Visiting Wetlands" in the **Wetland Scavenger Hunt** activity.
3. If possible, visit the marsh before the field trip to identify two areas to conduct plant surveys. One area should be low in the marsh where the tidal water often covers the plants, and where there is not much variety in plant species. Pickleweed will probably be the dominant plant in this area. The other area should be at a higher elevation in the marsh, where there is much more variety in plant species. The two areas may be very close together, particularly if there is an embankment near the water's edge. (If you cannot visit the marsh before the trip, do this step quietly upon arrival).

### At the marsh

4. Divide the group into smaller groups of 3-4 people and distribute clipboards and Task Cards (*Plant Survey Sheet*).
5. Go to one of the areas you've identified, point out its approximate boundaries, and explain that this will be Area #1 as shown on the *Plant Survey Sheet*. Have the group decide on a name for the area and have everyone write it on the sheet. (Names should be descriptive of the area: e.g., Sea View or Muddy Point). Also explain that the group will survey the plants in this area by making up a descriptive name for each species of plant found and counting the number of each type of plant in the area. Demonstrate this process by having the group choose a plant, make up a descriptive name, and then count the number of those plants found in the area. Make sure everyone understands how to record this information on the *Plant Survey Sheet*.
6. Next, point out Area #2 and define its approximate boundaries. Repeat the process of having the group name the area, and explain that members are to conduct the same type of survey here as in Area #1.
7. Allow the groups approximately 10-15 minutes to complete their surveys of both areas, assisting when necessary with



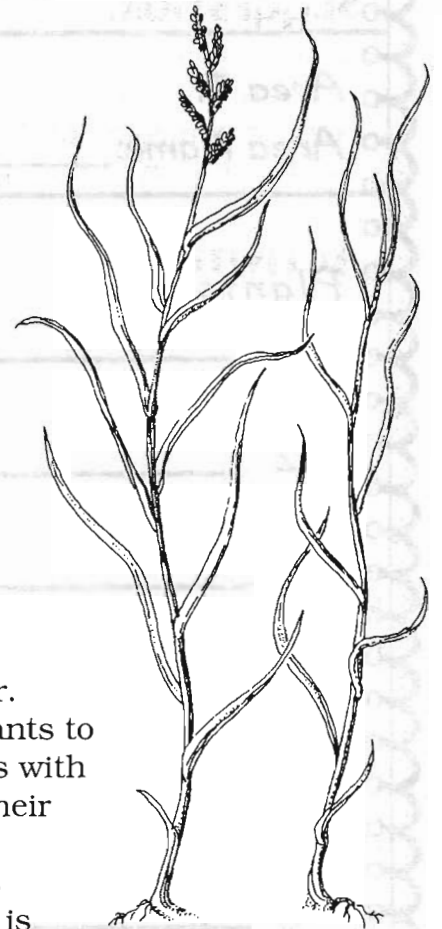
***Scirpus californicus***  
**Tule Plant**  
**California Bulrush**

recording the information or helping participants think of descriptive names for the plants they find.

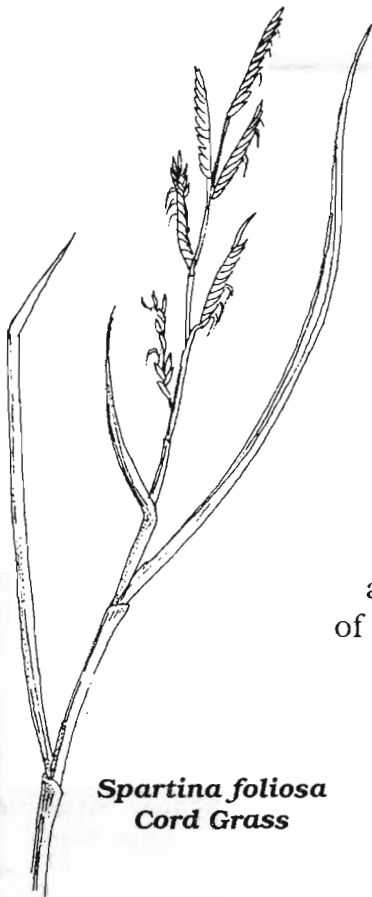
8. Reassemble the group in the low marsh area. First ask them how many different species of plants they identified in the high marsh area. Then ask for the number they identified in the low marsh area. Ask for their ideas of why there are fewer species of plants in the low marsh area. From their ideas, move on to a discussion of tides and how the plants in the low marsh area must survive in a salty environment. Ask for predictions of what would happen if group members were to water the plants near their homes with salt water. Collect two gallons of water from the low marsh area to take back to the meeting place to use in watering a potted plant.
9. Explain that few plants can survive by drinking salt water. Carefully examine the leaves of some of the low marsh plants to see if they have salt crystals on them. Explain that plants with crystals on the leaves survive by pushing the salt out of their systems. Compare this to humans perspiring.

When we exercise, salt accumulates in the bloodstream. Too much salt is toxic to humans (and plants and animals), so the body gets rid of the salt through perspiration. This is similar to what the plants do with salt crystals on their leaves.

10. Next, point out pickleweed plants that should be abundant in the low marsh area. Explain that the pickleweeds survive in a salty environment by storing the salt in only certain sections of their bodies. These sections eventually turn red and fall off, protecting the rest of the plant from the toxic effects of too much salt. Ask for predictions of how the red or yellowish portions of the pickleweed will taste. Pick some pickleweed and give everyone a chance to taste the red or yellowish portions of the plant.



***Distictilis spicata***  
**Salt Grass**  
**Spike Grass**



***Spartina foliosa***  
**Cord Grass**

# Task Card #2

## Plant Survey Sheet

Area #1

Area Name: \_\_\_\_\_

Area #2

Area Name: \_\_\_\_\_

Plants

#

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

8. \_\_\_\_\_

9. \_\_\_\_\_

10. \_\_\_\_\_

Plants

#

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

5. \_\_\_\_\_

6. \_\_\_\_\_

7. \_\_\_\_\_

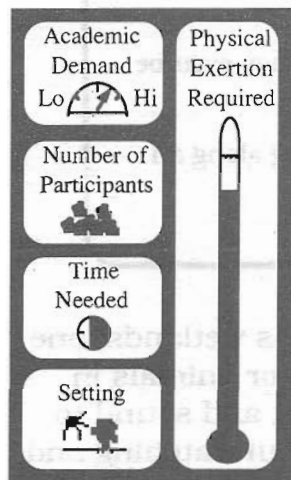
8. \_\_\_\_\_

9. \_\_\_\_\_

10. \_\_\_\_\_



## WETLAND SOUND AND SIGHT SURVEY



**QUESTION:** How do biologists gather and record information about the species of wildlife they are studying?

**SUMMARY:** These survey activities help youth group members become familiar with the wildlife found in wetlands and emphasize the sound and sight observation skills used by biologists doing field work. These are good activities to carry out when your group first arrives at its wetland destination. In the sound survey portion, members sit silently and draw a diagram of the sounds they hear around them at the wetland. In the sight survey portion, members work in small groups to gather, record, and graph data about the wetland wildlife they observe.

**MATERIALS:**

For each person:	For each group of 3-4 people:
• Pencil or pen	• Lab Notebook #3 (included)
• Blank piece of paper	
• Clipboard (or cardboard and tape to make one)	

For entire group:

- Field guides, such as *Audubon Society Field Guides* for fishes, birds, mammals, reptiles, amphibians, and insects (optional)

### PURPOSE:

To help youth:

1. Become familiar with observation skills used by biologists when doing field work.
2. Appreciate the serenity and diversity of wildlife found in wetlands.

### ACTIVITIES: (Observing, Communicating, Comparing, and Inferring)

1. Review with the group the following tips for visiting wetlands, if you have not already done so.

#### Tips for Visiting Wetlands

Take time to be quiet. Wildlife will be frightened by groups of noisy humans. At some point during your visit, take time to sit quietly, separated somewhat from the group, and observe the sounds and sights of the wetland.

Follow the regulations of the site you are visiting, particularly those regarding staying on designated paths or raised boardwalks.

Be kind to plants and animals. Watch where you step. Certain plants or animals

### Tips for Kids in Wetlands (CONTINUED)

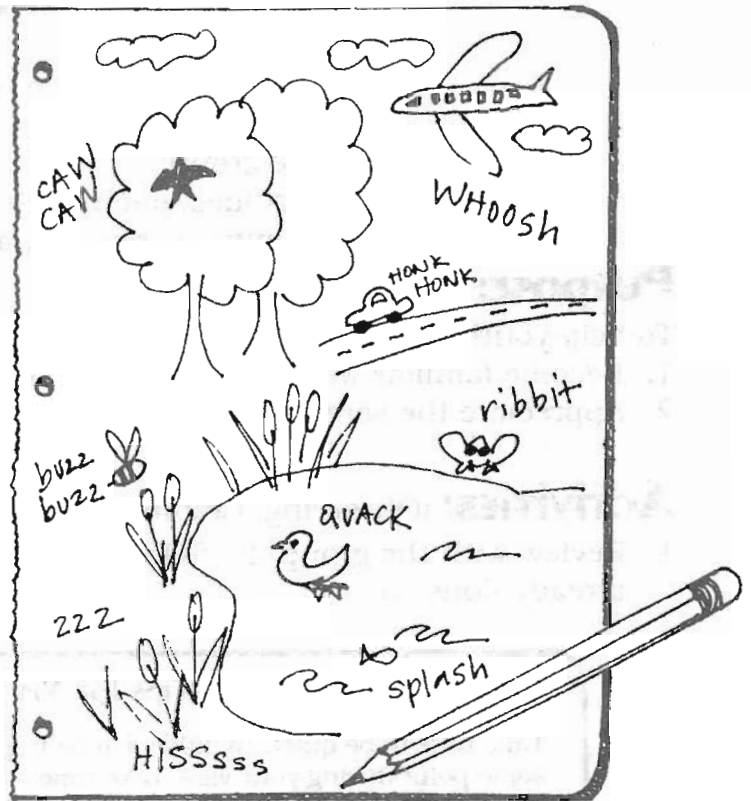
that may be common to the wetland may be rare everywhere else and may even be endangered. Do not remove any plants or animals.

Be prepared to get your feet wet and muddy. Wear old shoes, and bring along an extra pair of shoes and socks to change into at the end of the trip.

2. Discuss the fact that when biologists study natural areas, such as wetlands, one of the first things they often do is conduct a survey of the plants or animals in the area. They use their powers of observation, particularly sight and sound to observe and record information about the species present. Careful watching and careful listening are critical skills of a field biologist. Explain that each person will be using these skills, first to create a sound map of everything they hear, and then to conduct a sight survey of the animal life in the wetland.

3. Explain the sound survey exercise. Each person will sit silently at least 10 feet from anyone else and carefully observe the sounds of the wetland. After sitting quietly for about 3-4 minutes — with their eyes closed, if they wish — the members should open their eyes and begin to draw a diagram of the wetland and the sounds they hear. Show them the sample on this page and answer any questions. Sounds can be represented by words, by a picture of the thing making the noise (picture of an airplane), by writing the sound (pacherp pacherp), or any other way they can think of.

4. Make sure that each person has paper, pencil, and a clipboard or notebook. Answer questions about the procedure before it begins. Then challenge everyone to be absolutely silent during the activity, so they can experience what the wetland is like without humans around.



5. Allow about 10 minutes for the activity, then get together and ask questions to prompt a discussion about the sounds heard and their implications, e.g., Why do birds make noises? What was that high buzzing sound? Did you hear that splash?



6. Next, divide the group into smaller groups of 3-4 members, and distribute the Lab Notebook pages to each group. Review the Lab Notebook instructions with group members, explaining the categories on the data sheet and describing how to tally the number of each species found. Fill in one box together, and answer any questions. Describe the physical boundaries of the survey area, and allow 10-15 minutes for participants to complete the survey. They should record every living creature they see.
7. Reconvene the group, and allow time for members to talk about the animals they saw. Remind them that it is often difficult to see wildlife because animals hide from humans. Describe how to graph the information from their survey. Explain that graphs are useful to field biologists and other scientists because they provide a pictorial summary of the information collected.
8. Allow several minutes for the youngsters to complete their graphs, moving among groups answering questions as necessary.
9. (Optional) Afterward, compare graphs among groups and identify some of the species observed using field guides.
10. (Optional) Back at the meeting site, have the members embellish their sound maps with color, more elaborate drawings, and descriptions of some of the animals they saw at the wetland.
11. (Optional) Repeat this activity several times throughout the year at the same location. Save all survey sheets and graphs and compare them to draw conclusions about seasonal differences.

### **SUGGESTION:**

Follow up or precede this activity with one of the other field activities, such as **Salt Marsh Plant Survey** (Activity #2), **Mud Creatures** (Activity #6), or **Tracking the Wetland Dwellers** (Activity #7).

## Wetland Sight Survey

1. In the boxes beneath the proper heading describe each type of wetland animal you see, using a different box for each species of animal you find. In each box, record the number of animals of that species that you observed, and describe the animal's size, color, other identifying features, as well as what the animal was doing when you saw it.

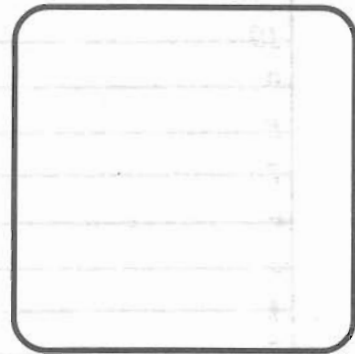
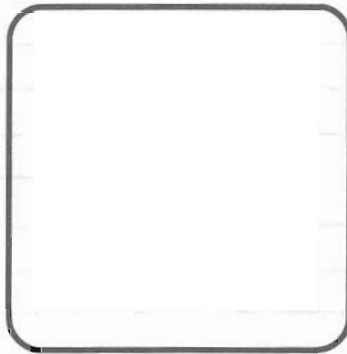
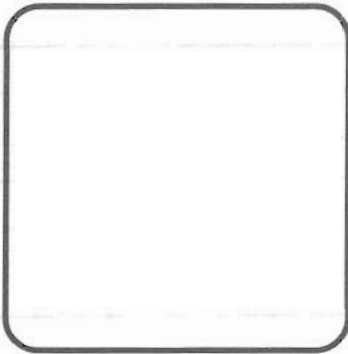
### Birds

### Mammals

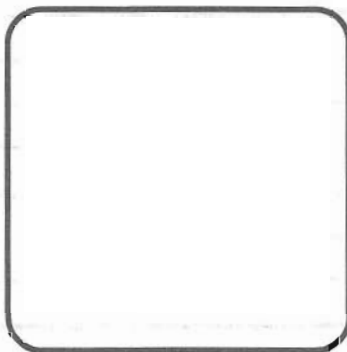
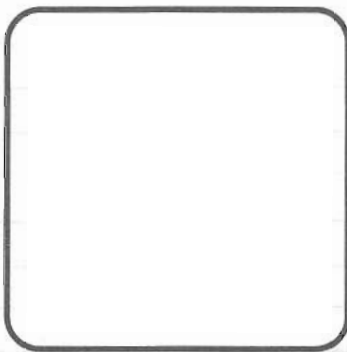
### Reptiles/Amphibians

## Wetland Sight Survey

### Fish/Shellfish

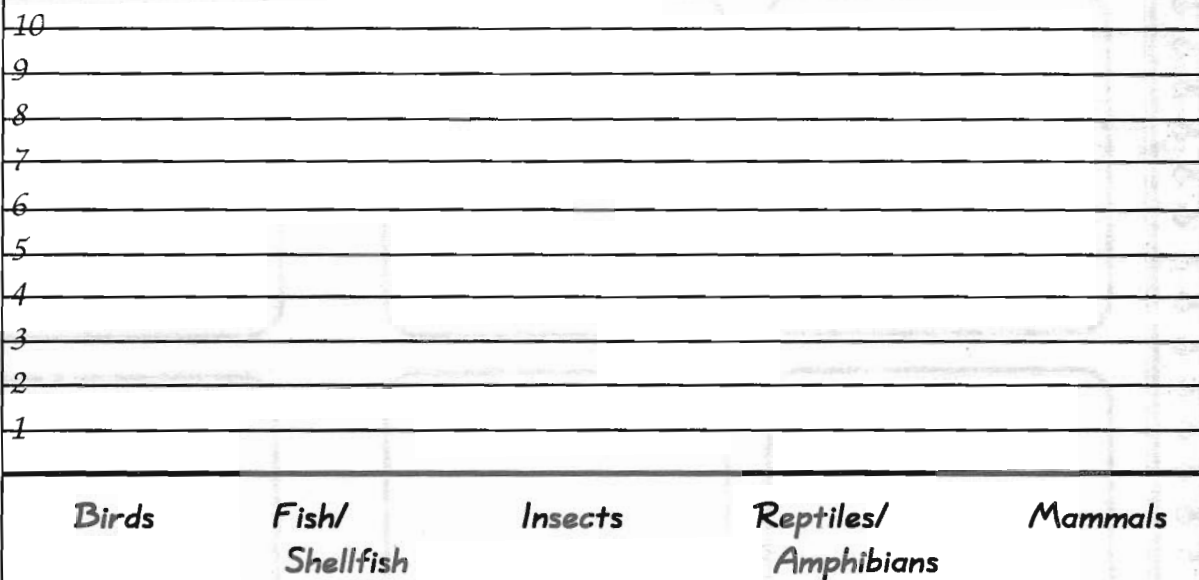


### Insects

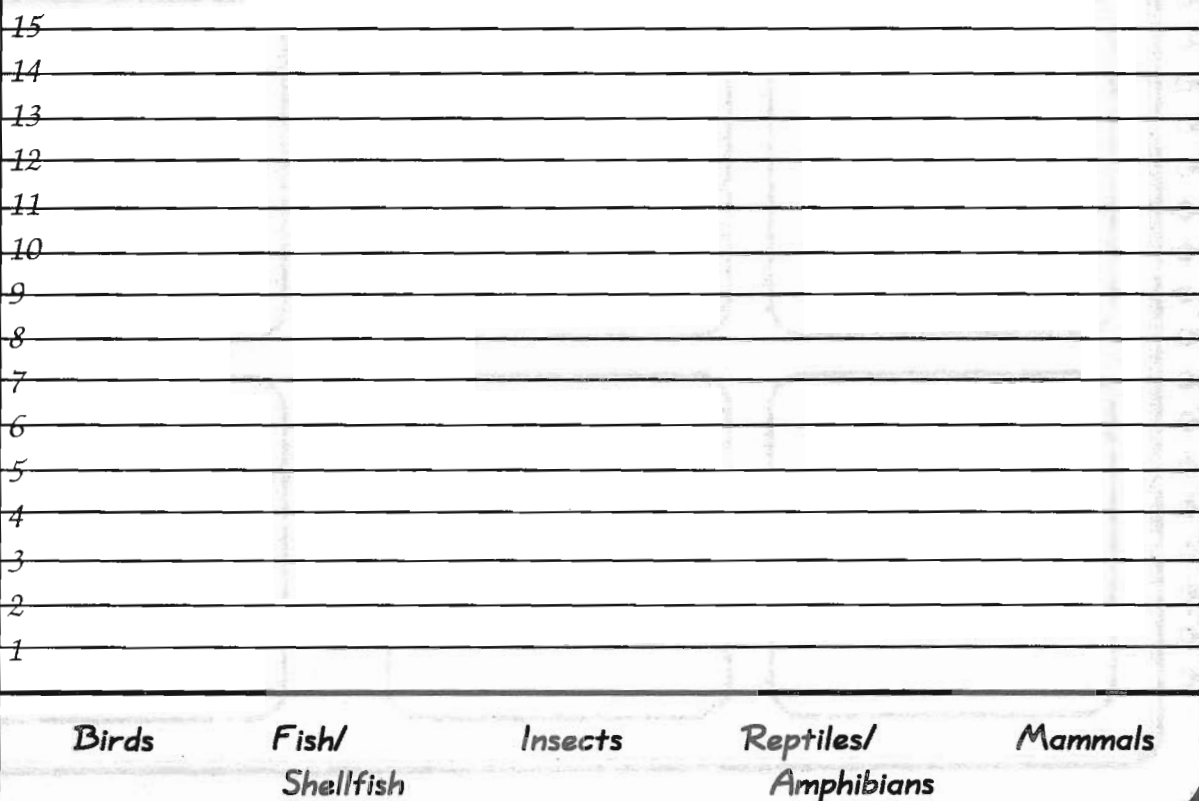


# Wetland Sight Survey






2. Make a bar graph of the total number of species of wildlife you observed.



3. Make another bar graph of the total number of animals you observed.



# Mini Wetland Model

Academic Demand Lo  Hi	Physical Exertion Required 
Number of Participants 	
Time Needed 	
Setting 	

**QUESTION:** How can we construct a model that demonstrates some of the important qualities of wetlands?

**SUMMARY:** Youth group members construct a model wetland out of a roasting pan, clay, and a piece of florist's foam. They then carry out activities with models that demonstrate how wetlands help prevent flooding and filter silt and pollutants out of water that runs off the land.

**MATERIALS:** One for each group of 4-6 group members

- 1/2 cup measurer
- Clay (approx. 1 - 1/2 pounds)
- Butter knife or pocket knife
- Monopoly, Lego, or other toy buildings
- Roasting pan (or other rectangular container)
- Piece of florist foam (the "wet" type that absorbs water)
- Styrofoam cup with pen holes poked in bottom
- Small amount of dirt to make muddy water
- Powdered drink mix, such as Tang or Kool-Aid (approx. 2 teaspoons)
- Task Card #4 and Lab Notebook 4 (included)

## PURPOSE:

To help youth:

1. Understand how wetlands can help filter silt and pollutants from water that runs off the land.
2. Understand how wetlands absorb and hold water and the role this plays in replenishing ground water supplies and in controlling floods.

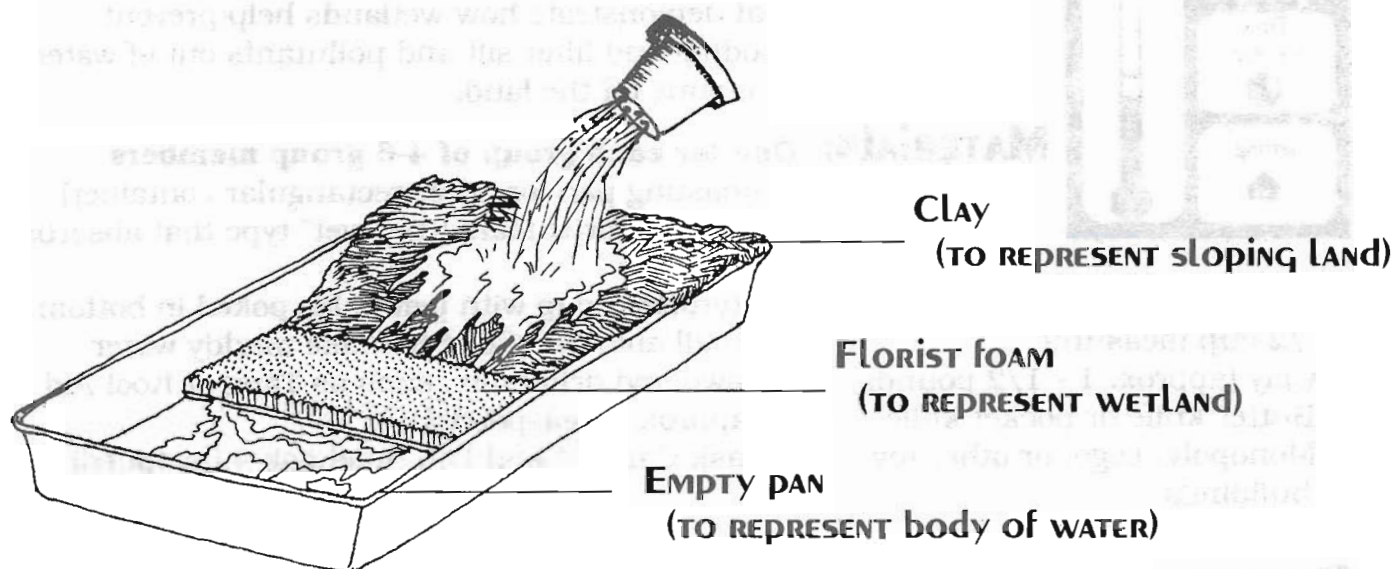
## BACKGROUND

Wetlands are important in many ways. First, wetlands help prevent flooding by functioning as an absorbent buffer zone between dry land and a body of water. Second, they filter and purify run-off water before it flows into the body of water. For example, in a period of heavy rainfall, wetlands act like a sponge, absorbing water that, without the wetland, would flow quickly and directly into the body of water, creating a potential flood. Similarly, without a wetland to filter particles out of the water in a period of heavy rain, water flowing directly into the lake, ocean, or bay would be full of silt and pollutants. Polluted water can harm the organisms that live in it. Water with too much silt can cause these and other problems: fish gills may become clogged, making it difficult to breathe; oysters, clams, and mussels can become clogged with sediment and die; phytoplankton may not receive enough sunlight to survive due to the muddy water. In addition, fish and other organisms may not be able to see their food sources in the dirty water. Birds and other animals that depend upon fish may not get enough to eat (if food sources die or can't be seen), and migrating fish may be confused by the silty water and fail to reach their spawning grounds.



## **Activities:** (Observing, Comparing, Relating, Inferring, and Applying)

1. Begin by reviewing what the group has learned about wetlands and their value. Explain that members will be constructing a model to demonstrate, in a simplified way, some of the important functions of wetlands.
2. Pass out materials and Task Cards, and go over the process of building the model. Stress that it is important that the florist foam fits snugly inside the pan.



3. Allow the groups time to construct and test their wetland models. Circulate among the groups, assisting when necessary with the steps described on the Task Card.
4. When the groups are finished, gather all the group members together and use one group's model to carry out the steps again. Discuss the following questions:

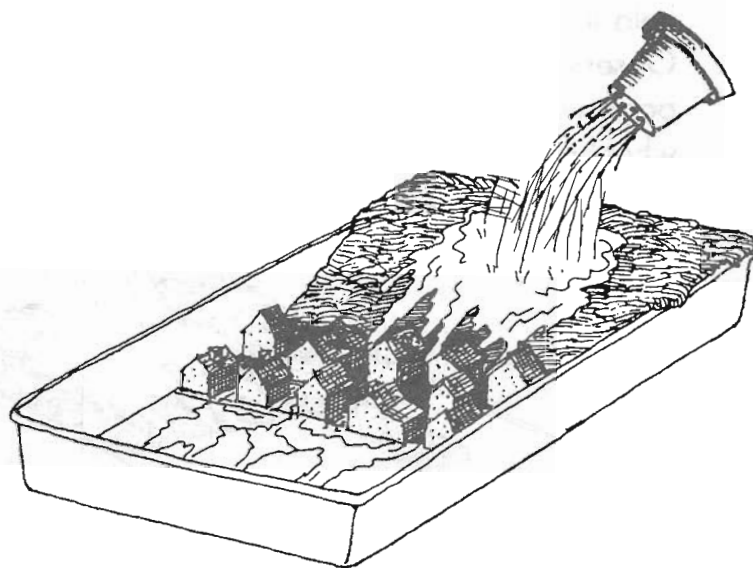
### Flooding discussion

- What happened when it "rained" on the model?  
Do wetlands affect the speed of water that runs off the land?
- How do wetlands help prevent flooding?  
(They slow down the amount and speed of water running downhill and hold water for later release.)
- What happened when the wetland was removed?

### Filtering discussion

- What happens to the soil when it rains?
- How does a wetland help purify water?  
(The wetland traps particles that are in the water, such as dirt or pollutants, and prevents them from draining into the water.)

- What happens if the wetland is removed?
  - How might muddy water affect fish?  
(It might clog gills, making it hard for them to breathe. It also interferes with vision, making it harder to find food.)
  - How might other animals and plants be affected by the muddy water?  
(Shellfish can be smothered by the mud, small aquatic plants such as algae and plankton might not get sunlight needed for growth due to the cloudy water; birds and other animals that eat fish or plants might have less to eat if their food sources die or cannot be seen in the muddy water.)
  - How might all this affect you?  
(Decrease in natural resources, decline in quality of drinking water, affects fishing, might change economy of community.)
  - How can we prevent these undesirable effects?  
(By protecting wetlands and educating others about their benefits.)
5. Change the model to represent a wetland that has been developed into a housing tract. To do this, remove the foam and put in its place a thin, flat, clay bottom sloping up from the water. Then add Monopoly buildings or buildings made out of clay. Repeat the demonstrations and discuss.
- If a wetland is destroyed and houses are built there what might happen to the houses during a severe storm?  
(The houses may be flooded because the wetland is not there to absorb and slow the rush of water.)
  - What might happen to houses built on a wetland during an earthquake?  
(In an earthquake the houses could collapse because the ground beneath them is wet and not firm. A number of homes built on former marshes collapsed in San Francisco in the 1990 earthquake.)



Adapted from *Ranger Rick's Naturescope: Wading Into Wetlands*, National Wildlife Federation.

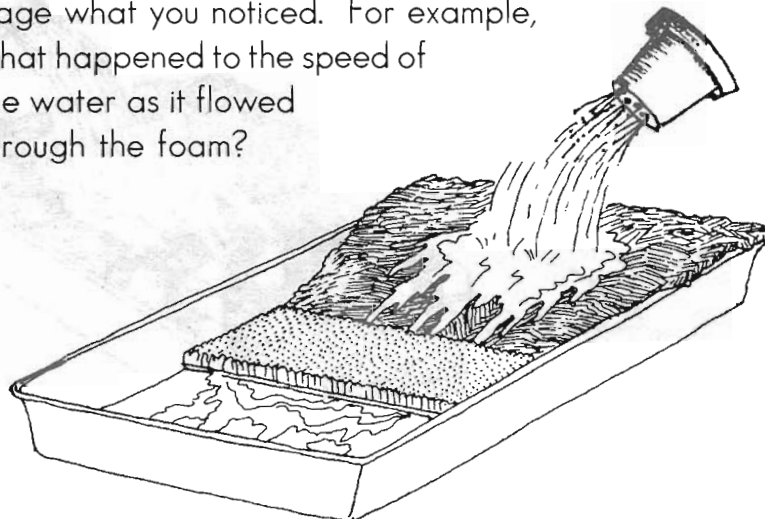
## Mini Wetland Model

**Question:** How can we construct a model that demonstrates some of the important qualities of wetlands?

- Activity:**
1. Spread a layer of clay in one half of the baking pan to represent the land. Leave the other half of the pan empty to represent the ocean or other body of water.
  2. Shape the clay so that it gradually slopes down to the water. Smooth the clay along the sides of the pan to seal the edges. You can also form meandering streams in the clay that lead into the body of water.
  3. Use the knife to cut a piece of florist foam that fits snugly across the pan along the shallow edge of the clay (see diagram). The foam represents a wetland located between dry land and open water. (Tip: The land should slope down to the wetland, with the wetland sitting lower than the land but higher than the water. Also, make sure the wetland fits well – the model won't work if there are spaces under the wetland or between it and the sides of the pan).

### Flooding Demonstration

4. Measure  $\frac{1}{2}$  cup of water into the styrofoam cup while you hold it above the land. Sprinkle this "rain" all along the land. Observe what happens, and write down on the Lab Notebook page what you noticed. For example, what happened to the speed of the water as it flowed through the foam?





## **Mini Wetland Model**

### **Activity:**

5. Pick up the pan and carefully pour the water that ran off the land into the measuring cup. Where is the rest of the water? Remove the wetland. Notice how it absorbed some of the rainfall.
6. Now make it rain again, this time with the wetland removed. Again sprinkle 1/2 cup of water on the land in the same location and at the same rate as before. Observe and write down on the Lab Notebook page what you noticed. What was different this time about the speed and amount of water that flowed off the land?

### **Filtering Demonstration**

7. Pour out the water from the last demonstration and replace the wetland. This filtering demonstration will be just like the last one, except that you will be adding dirt and pollution to the land.
8. Sprinkle a small handful of dirt over the land and then pour about 1 teaspoon of powdered drink mix somewhere on the land. The colored powder represents pollution, such as pesticides or a toxic dump site, that are on land but get washed into the water when it rains.
9. Sprinkle 1/2 cup of water all across the land to simulate rain. Observe and write on the Lab Notebook page. What happened to the dirt particles and powdered drink mix?
10. Remove the wetland and sprinkle some additional dirt and powdered drink mix on the land, so there is approximately the same amount as before.
11. Make it rain again, by sprinkling 1/2 cup of water across the land. Write down your observations about what happened differently to the dirt particles and powdered drink mix when it "rained" after the wetland was removed.

## Mini Wetland Model

With the wetland in place:

WHAT  
HAPPENED  
WHEN IT  
"RAINED?"

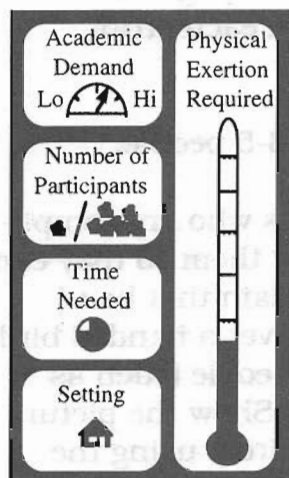
With the wetland gone:

WHAT  
HAPPENED  
WHEN IT  
"RAINED"  
ON THE DIRT  
AND  
POLLUTION?

With the wetland in  
place:

With the wetland  
gone:

## Mapping The Pacific Flyway



**QUESTION:** What routes do Canada geese take as they migrate through North America, and what is the importance of California wetlands to their migration?

**SUMMARY:** Group members learn about bird banding and map the migration route of Canada geese by interpreting data from band reports. To conclude, members discuss the relationship of wetland habitat to successful migration.

**MATERIALS:** Enough for each group of 3-5 participants:

- Task Card #5, Data Sheet #5 (included)
- Map (photocopy the enclosed map of western North America)
- 4 different colored pencils or crayons
- Band report data sheet (photocopy one per group)
- Small bag

### PURPOSE:

To help youth:

1. Become familiar with the Pacific Flyway, the route taken by migratory birds during their flight between breeding grounds in the north and wintering grounds in the south.
2. Become familiar with the process and purpose of bird banding.
3. Gain practice mapping and interpreting data.
4. Recognize the importance of California wetlands to migrating birds.

### Background

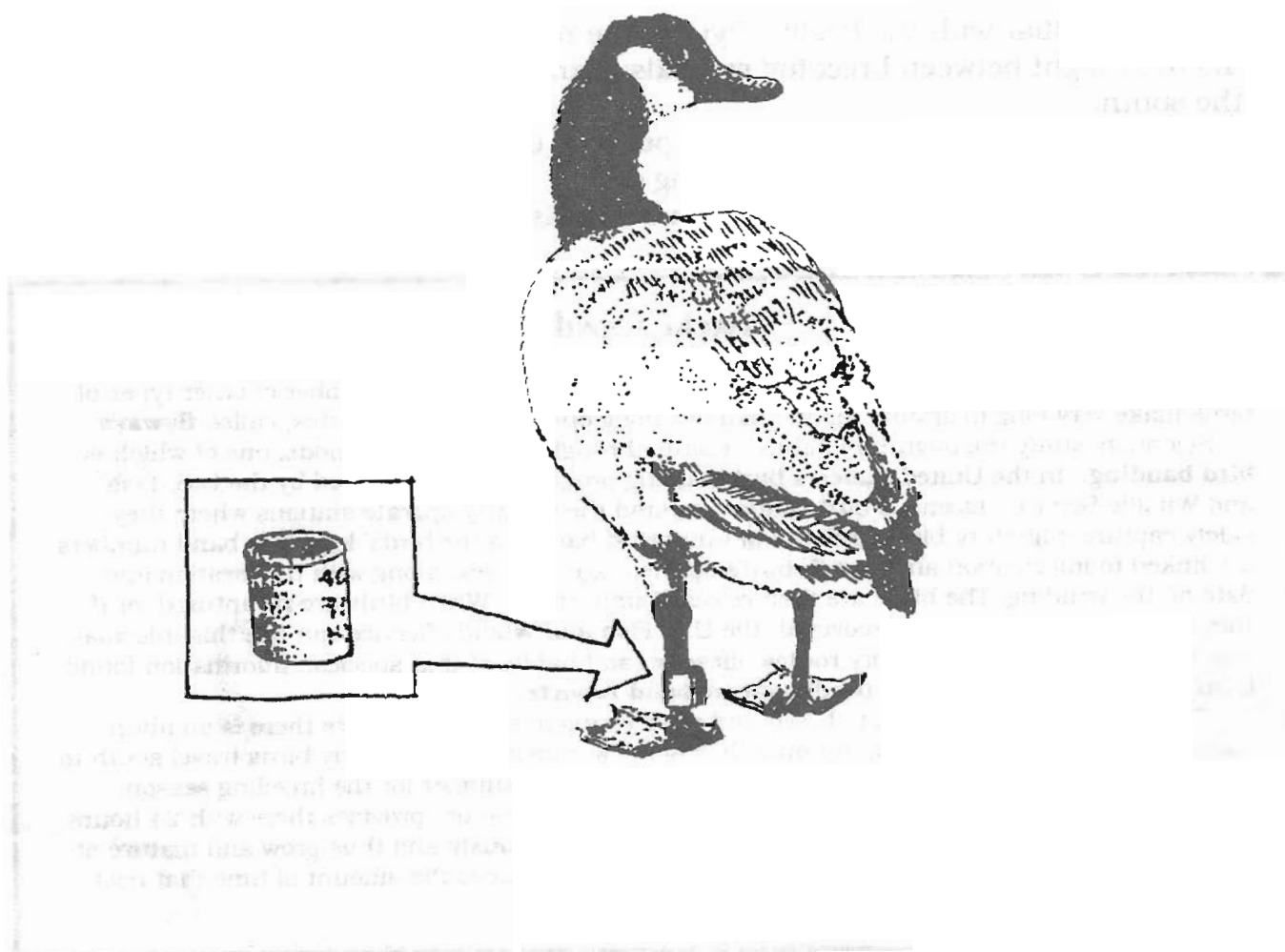
Every year throughout North America, ducks, swans, geese, and a number of other types of birds make very long migratory flights, usually along one of four major routes, called **flyways**.

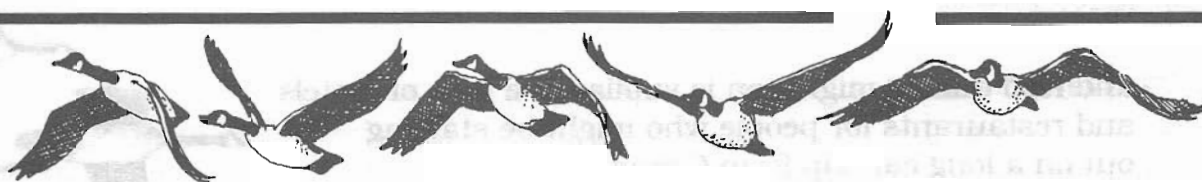
Scientists study the migratory habits of birds through a variety of methods, one of which is **bird banding**. In the United States a bird banding program is administered by the U.S. Fish and Wildlife Service. Licensed bird banders around the country operate stations where they safely capture migratory birds and attach numbered bands to the birds' legs. The band numbers are linked to information about each bird's species, age, and sex, along with the location and date of the banding. The birds are then released unharmed. When birds are recaptured, or if they die and their bands are recovered, the U.S. Fish and Wildlife Service can use this information to learn about the migratory routes, lifespan, and habits of that species. Information found from recovered bird bands are used to create **band reports**.

The reason birds migrate is to breed and raise young in the north where there is an abundance of food, space, and daylight hours during the summer months. Many birds travel south to warmer climates during the winter, but return north every summer for the breeding season. Migrating to the Arctic for the summer, as many Canada geese do, provides them with 24 hours of daylight during which the young birds can be fed continuously and thus grow and mature at an extremely quick pace. This quick maturation greatly reduces the amount of time that nest-bound young are vulnerable to predators.

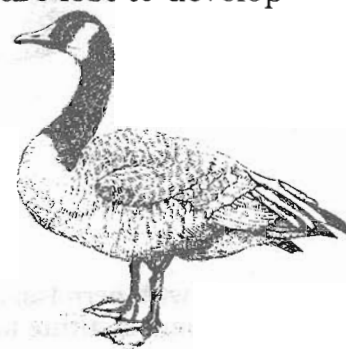
## **Activities:** (Communicating, Comparing, Categorizing, and Inferring)

1. As preparation, for each group of 3-5 members: photocopy the two-page Data Sheet and cut each page into strips so that one band report is on each strip. Put all the strips into a bag.
2. Distribute Task Cards and a bag of data strips to each group of 3-5 people.
3. Explain that members will be playing the role of wildlife biologists who are compiling band reports. Scientists put bands on birds in order to track them so they can learn more about the birds' migration, lifespan, and habits. Explain that band reports are information that come back to these biologists whenever a banded bird is found. Bird bands are recovered and reported by all types of people (such as hunters, naturalists, hikers, schoolchildren, and birdwatchers). Show the picture of the banded bird and talk more about the process of banding birds, using the information from the Background section above.



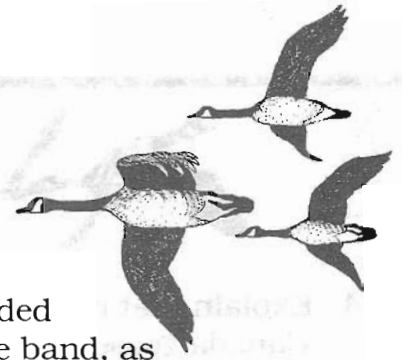


4. Explain that each group has been given a bag containing information about Canada goose recoveries. Each group is going to use this information to map the routes the geese have taken during their migrations north and south, as well as the location of their summer breeding and wintering grounds. Explain that members should first look at the date on each band report, then consult the map's key to determine if the banded goose was found while migrating north, migrating south, at its summer breeding grounds, or at its wintering grounds. Explain that they should use the corresponding color and put a dot at the location where the banded goose was found.
5. Demonstrate the process, answering questions as necessary, then circulate among the groups, offering assistance as required.
6. When the mapping is completed discuss each group's findings.
  - A. Can you tell by looking at your map where the migration routes for Canada geese are? (Introduce students to the idea of flyways, which are general routes taken by migratory birds. Although species' actual migrations do not strictly conform with these flyways, they are a useful way of generalizing migration routes.)
  - B. Name some of the breeding grounds for Canada geese.
  - C. Why would the geese want to migrate north? Why would they leave the north to return south?
  - D. When Canada geese migrate south for the winter, what are some of their destinations?
7. Continue with a discussion of the importance of California wetlands to migratory birds, especially large birds like Canada geese.
  - A. Where do Canada geese rest during their long migrations?  
(Wetlands serve as places to rest and feed for migrating Canada geese. There must be a series of wetland habitats located a day's flight apart in order for the birds to safely reach their destinations. Some Canada geese migrate all the way from the Arctic Circle to Mexico and need wetland habitats along the entire route for feeding and resting.)
  - B. What might be the effect on migratory birds when wetlands are lost to development or drained for agricultural purposes?  
(Birds won't have as many places to feed and rest during their migration. The wetlands that remain will be crowded and there will be greater competition for the food sources. Crowded conditions also promote disease. Some birds will die or will not reproduce as successfully due to the loss of wetlands. Migrating bird populations will decline.)
  - C. Stress the importance of wetlands to migrating birds by pointing out that a lack of wetlands where birds can rest





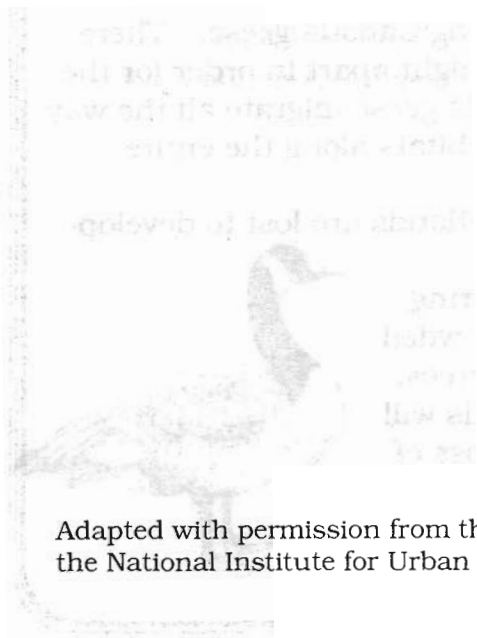
and feed during migration is similar to a lack of motels and restaurants for people who might be starting out on a long car trip from Canada to Mexico.



8. Conclude with a discussion of what to do if you find a banded bird. (Record the numbers on the band and the color of the band, as well as the date, location, and circumstances under which it was found. Was the bird dead, injured, or alive? Could you tell the circumstances of its death? Send this information to U.S. Fish and Wildlife Service, Bird Banding Laboratory, Laurel, MD, 20708. (The bands are very small and do not have space for the address where the information should be sent.) Explain that if you ever find a banded bird and can't remember where to send the information, you can contact a local Audubon Society office to find out. In return for sending in the banding information, the sender will receive a Certificate of Appreciation. The person who banded the bird will also be notified of the report.)

## Optional Follow-up

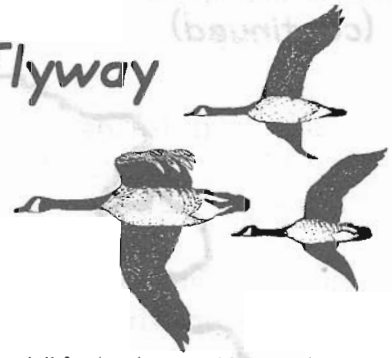
1. Visit a wetland to look for large migratory birds, such as ducks, geese, heron, and egrets.
2. Invite a volunteer from the Audubon Society to visit your group and bring actual samples of bird bands and mounted birds. Consult a phone book to locate your local chapter of the Audubon Society or call their national office at (212) 979-3000 for a reference to a chapter near you.



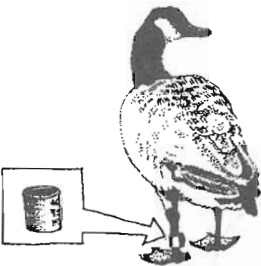
Adapted with permission from the *Migratory Birds Issue Pac.*, U.S. Fish and Wildlife Service and the National Institute for Urban Wildlife, 10921 Trotting Ridge Way, Columbia, MD 21044.

## Mapping the Pacific Flyway

**Question:** What routes do Canada geese take as they migrate through North America and what is the importance of California wetlands to their migration?



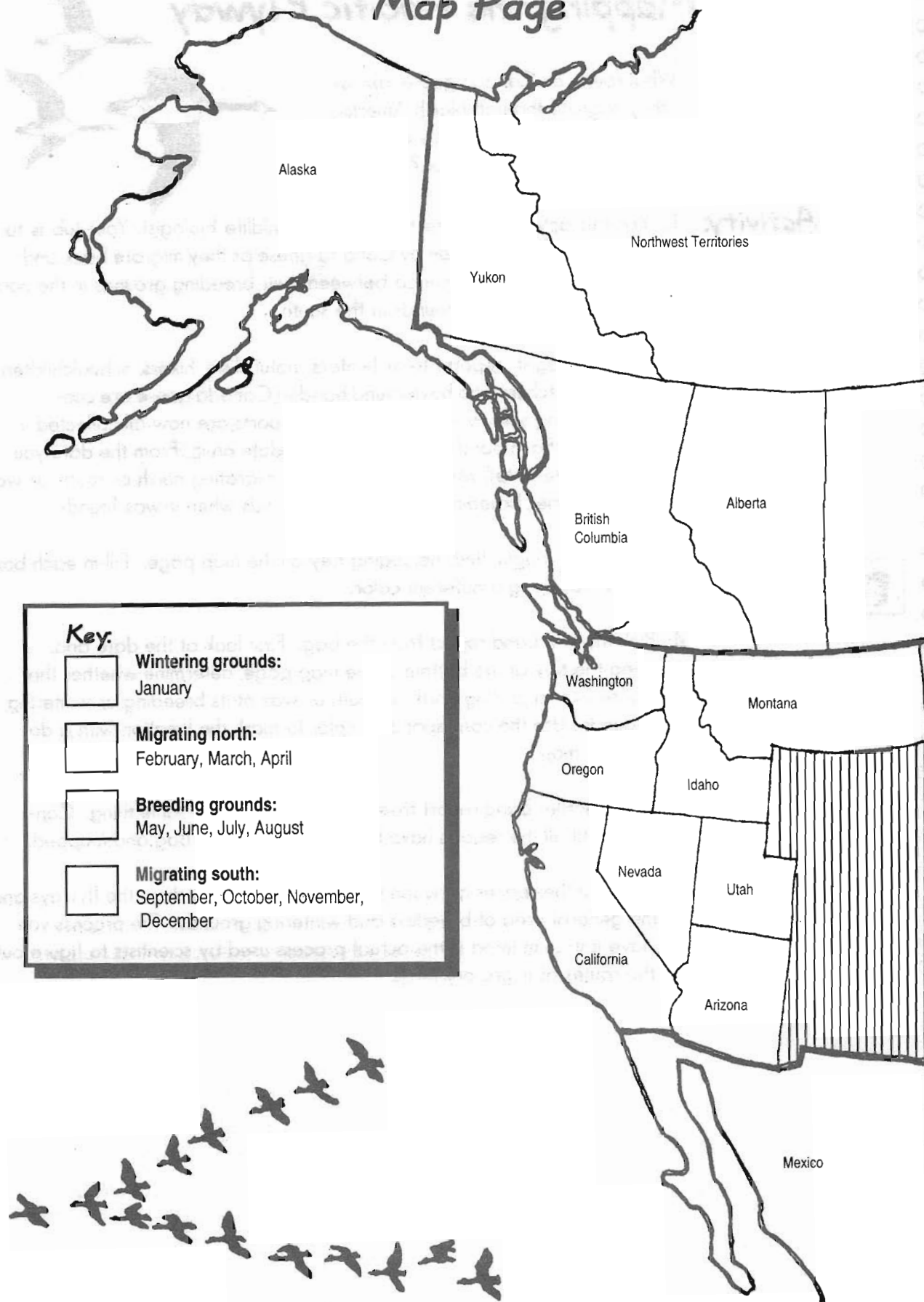
- Activity:**
1. For this activity, you are to become a wildlife biologist. Your job is to figure out the route taken by Canada geese as they migrate back and forth across North America between their breeding grounds in the north and their wintering grounds in the south.
  2. As a biologist, reports from hunters, naturalists, hikers, schoolchildren, and birdwatchers who have found banded Canada geese are constantly being sent to you. These band reports are now all collected in your bag. Each band report will have a date on it. From the date you will be able to tell whether the bird was migrating north or south, or was at its summer breeding or wintering grounds when it was found.
  3. Before you begin, find the coding Key on the map page. Fill-in each box of the Key using a different color.
  4. Pick the first band report from the bag. First look at the date and, using the Key at the bottom of the map page, determine whether the goose was migrating north or south or was at its breeding or wintering grounds. Use the corresponding color to mark the location with a dot on your map.
  5. Take another band report from the bag and do the same thing. Continue until all the reports have been taken from the bag and mapped.
  6. Shade in the spaces between same-colored dots to show the flyways and the general area of breeding and wintering grounds. The process you have just completed is the actual process used by scientists to figure out the routes of migratory birds.



**Task Card #5**  
(continued)

**Mapping**

**Map Page**



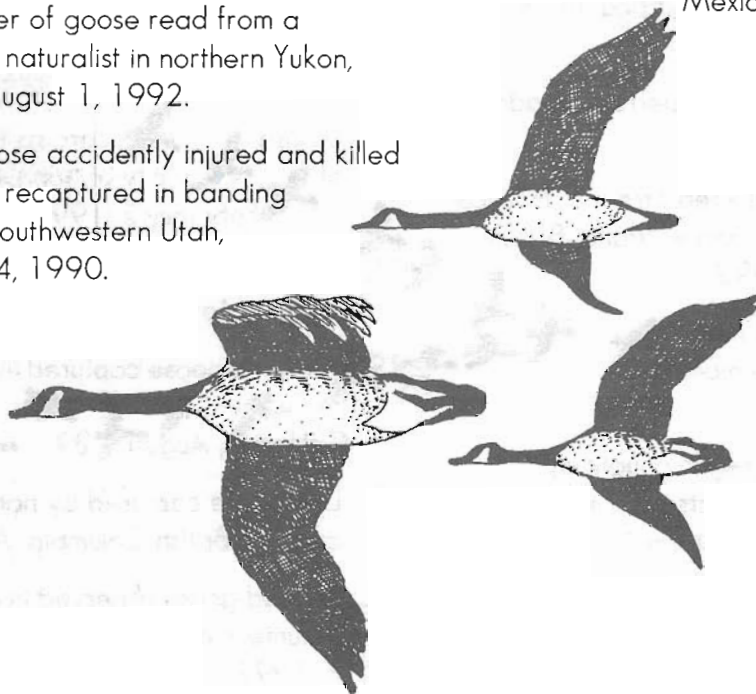


## Canadian Geese Band Reports






1. Goose caught by hand in southern Alberta, Canada, August 16, 1992.
2. Neck-collared goose observed by a family hiking in southwestern Montana, November 28, 1992.
3. Goose shot by hunter in Alberta, Canada, August 16, 1992.
4. Band number of goose read from a distance by observer on Vancouver Island, British Columbia, July 9, 1992.
5. Hunter reports band from central Oregon, December 30, 1989.
6. Goose in southern Oregon caught by junior high school students after it was weakened by a severe storm, November 15, 1992.
7. Goose found dead by campers in central Utah, November 11, 1989.
8. Goose band sent in from Alberta, Canada with no information about recovery or cause of death, August 4, 1992.
9. Hunter reports goose that was shot by his hunting party in eastern Idaho, October 13, 1992.
10. Goose banded in northern California was identified by neck collar and reported from northern Montana by resident, May 19, 1992.
11. Skeleton of banded goose found and reported from central Nevada, September 30, 1992.
12. Goose recaptured almost a year later in the same place where banded in northern Oregon, October 8, 1992.
13. Goose banded in Utah, killed by a hunter in Idaho, October 31, 1992.
14. Injured goose caught in central Nevada, November 11, 1992.
15. Goose banded in California in 1974 and shot by hunter approximately 18 years later in Oregon on January 30, 1992.
16. Dead goose found near borders of Nevada, California, and Arizona, January 13, 1992. Death due to predator.
17. Goose carcass found on outskirts of city of San Diego, CA, February 2, 1991.
18. Goose found injured in northwestern Nevada, May 13, 1991.
19. Banded goose captured live near Lake Tahoe, California, August 29, 1992.
20. Live goose captured by naturalist on northern coast of British Columbia, August 18, 1991.
21. Banded goose observed in arctic circle by volunteer on a scientific research trip, July 17, 1992.
22. A woman fishing finds recently killed goose in southern Alaska, July 30, 1991.
23. Goose found after being hit by a vehicle on the central coast of British Columbia, September 26, 1990.
24. Goose shot by hunter in northern Alberta, September 30, 1991.
25. Goose recaptured by another bander in southern Northwest Territories, April 9, 1991.
26. Banded goose captured live by campers, coastal Northwest Territories, July 4, 1992.
27. Two geese banded on the same day in 1974 found dead near the Oregon/Idaho border, March 30, 1991.
28. Goose found injured in central Oregon near the Washington border, April 4, 1990.
29. Goose found dead by backpackers near a small lake in the Sierra mountains of California, October 9, 1991.

## Canadian Geese Band Reports

30. Goose injured by a dog and then rescued by schoolchildren on a coastal island in British Columbia, June 30, 1991.
31. Band number of goose read from a distance by naturalist in northern Yukon, Canada, August 1, 1992.
32. Banded goose accidentally injured and killed while being recaptured in banding operation, southwestern Utah, February 14, 1990.
33. Goose band sent in from northwestern British Columbia with no information about recovery or cause of death, March 27, 1992.
34. Dead goose found by family in central Alberta, Canada, May 1, 1990.
35. Goose captured and released by tracker in central Idaho, August 18, 1990.
36. Band number of goose observed by bird watching group at the Tijuana River Estuary, at the border between California and Mexico, October 31, 1991.
37. Band sent in from central Mexico, December 25, 1990.
38. Banded goose captured and released in northwestern Mexico, May 19, 1992.
39. Goose shot by hunter in north central Mexico, January 31, 1991.



## MUD CREATURES

Academic Demand Lo  Hi	Physical Exertion Required 
Number of Participants 	
Time Needed 	
Setting 	

**QUESTION:** What creatures live buried in tidal mud?

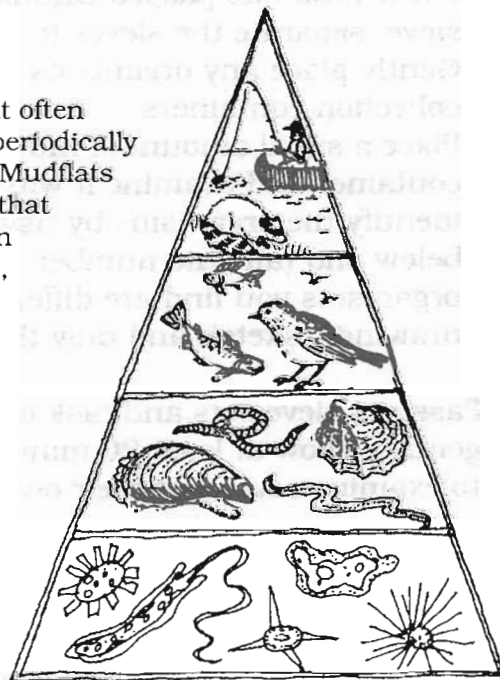
**SUMMARY:** During a visit to a tidal mudflat, a sample of mud is taken and examined for the presence of life.

**MATERIALS:** One for each group of 3-5 members:

- Sieve set (purchase at Carolina Biological Supply (800-334-5551) or construct sieves as instructed below)
- White-bottomed containers for collecting organisms (empty yogurt, sour cream, cottage cheese containers)
- Clipboard (or cardboard with tape)
- *Mud Creatures Identification Guide* (included)
- Container for water
- Hand lens
- Popsicle stick
- Pencil
- Towels
- Task Card #6

### Background

A tidal mudflat is a specific kind of wetland habitat that often lies between a marsh and the water's edge. Mudflats are periodically submerged by ocean or bay water tides that rise and fall. Mudflats can vary greatly in size: they can be as extensive as those that surround some parts of the San Francisco Bay, or they can simply be narrow strips of mud along the edges of any bay, marsh, or other waterway. At first glance, it may seem there is nothing interesting happening in a mudflat, but there is actually an abundance of life in these areas. For example, in one cubic inch of tideland mud there may be as many as 40,000 living organisms! While most of these are microscopic, many types of tiny animals are visible, such as mussels, snails, worms, clams, and shrimp. These animals feed on the microscopic animals living in the mud and in turn are eaten by birds and mammals that come to the mudflat to feed. Mudflats are important ecologically because of these relationships.





## **Activities:** (Observing, Communicating, Comparing, and Categorizing)

### Before the Trip

1. Purchase or construct enough sieves so that each group of 3-5 people can have two sieves with different sized screens. Sieves can be purchased through Carolina Biological Supply (800-334-5551) or other scientific supply catalog. They can also be constructed, as shown below.
2. Photocopy the Task Cards and the *Mud Creatures Identification Guide*. To protect the guides from getting wet during the activity, place them in plastic notebook sleeves, laminate them, or cover them on both sides with clear contact paper.

### At the Site

3. Divide your group into smaller groups of 3-5 members. Tell the members that their challenge will be to discover what creatures live in mudflats.
4. With the help of a group member, demonstrate the following procedure for examining mud samples:
  - Hold the sieves with the coarsest screen on top and the finest screen on the bottom.
  - Place a piece of mud the size of a golf ball on the top screen and loosen it with the popsicle stick while another person carefully pours water through the mud. When about  $\frac{2}{3}$  of the mud has passed through the top sieve, separate the sieves for examination.
  - Gently place any organisms you find in collection containers.
  - Place a small amount of mud in one container and examine it with the hand lens. Identify the organisms by using the drawings below and tally the number you find. If the organisms you find are different than those in the drawings, sketch and tally them in the empty squares provided.
5. Pass out sieve sets and task cards. Remind members to handle all organisms gently. Allow at least 20 minutes (or longer, if interest holds) for the small groups to examine several of their own samples of mud.
6. Reassemble the group to compare organisms and drawings. Discuss the significance of mudflats, describing the abundance of life and how it forms a critical component of the food pyramid. Discuss the parts of the food pyramid illustrated above. Point out that the organisms found in the mud feed on the microscopic animals illustrated in the bottom layer of the pyramid. Look for birds



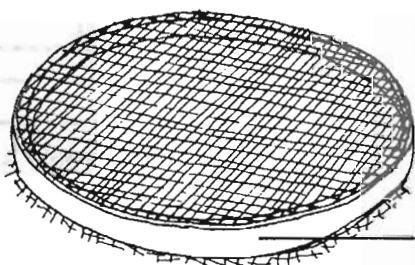
in the area, and point out that these birds are feeding in the mudflats. Explain that if one link in the food chain is destroyed, all the animals that depend on it for food will also be affected. For example, if polluted water drains into a mudflat and kills the small organisms living in the mud, the larger animals that eat those organisms as food will also be affected. Remind group members to return all creatures to the spot where they were found.

7. If time and suitable sites are available, conduct another field activity, such as **Salt Marsh Plants Survey** (Activity #2), **Tracking the Wetland Dwellers** (Activity #7), **Wetland Scavenger Hunt** (Activity #1), or **Wetland Sound and Sight Survey** (Activity #3).

### MAKE YOUR OWN SIEVE SETS

Materials needed per sieve set:

- Two different gauges of nylon mesh (from a fabric store)  
OR metal screening (from a hardware store)
  - Two plastic quart-sized containers, that have edges on the lids that are least 1/2" wide (try ice cream or frozen yogurt containers)
  - scissors
  - stapler
  - knife
1. Cut the centers from the container lids with a knife.
  2. With scissors, cut circles of nylon mesh or screening material that are slightly larger than the lids.
  3. Staple screening to edges of lids.
  4. Reattach lids to the bottoms of the containers.



## Task Card #6

### Mud Creatures

**Question:** What creatures live buried in tidal mud?

**Activity:**

1. Watch the sieve demonstration given by your group leader.
2. With your group, use your sieves as follows:

- Hold the screens so that the screen with the larger holes is on top and the one with the smaller holes is on the bottom.
- Place a piece of mud the size of a golf ball on the top screen and loosen the mud with the popsicle stick while another person carefully pours water through the mud. When about 2/3 of the mud has passed through the top screen, separate the screens for examination.
- Gently place any organisms you find in collection containers.
- Use your *Mud Creatures Identification Guide* to identify the organisms you find and tally the number of each type you find. If you find organisms that are not shown in the guide, tally them in the empty squares provided.
- Place a small amount of mud in one container and examine it with the hand lens.

*Shrimp*

# —

*Oligochaete*

# —

*Polychaete*

# —

*Clam/Mussel*

# —

Task Card #6  
(continued)

# Mud Creatures

Isopod

# \_\_\_\_\_

Crabs

# \_\_\_\_\_

Amphipod

# \_\_\_\_\_

Snails

# \_\_\_\_\_

# \_\_\_\_\_

# \_\_\_\_\_

# \_\_\_\_\_

# \_\_\_\_\_

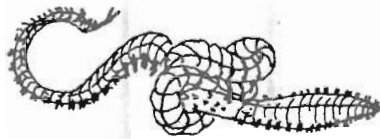


# MUD CREATURES IDENTIFICATION GUIDE

**Oligochaete**  
(1/4" long)



**Polychaete**  
(2-6" long)



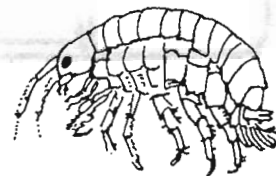
**Isopod**  
(1/4" long)



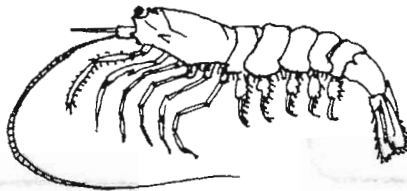
**Clam/Mussel**  
(1-3" long)



**Amphipod**  
(1/4" long)



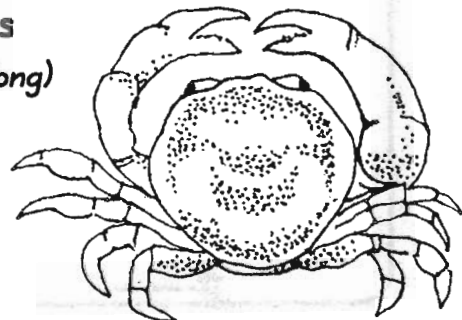
**Shrimp**  
(1-1/2" long)








**Snails**  
(1" long)



**Crabs**  
(1/2"-1" long)



## TRACKING THE WETLAND DWELLERS

Academic Demand Lo  Hi	Physical Exertion Required 
Number of Participants 	
Time Needed 	
Setting 	

**QUESTION:** What clues can be found about the animals that live in wetlands?

**SUMMARY:** Group members search the wetland for signs left behind by animals, such as feathers, tracks, tufts of fur, nests, droppings, or dug-up dirt. They then try to interpret the clues to come up with information about the animals that left these clues behind.

**MATERIALS:**

- Popsicle sticks (2 per person)
- Brightly colored yarn or flagging tape (two 6 inch pieces per person)
- *Mini Field Guide to Animal Tracks* (included), photocopy at least one per group of 4-6 people
- *Peterson's Field Guide to Animal Tracks* (optional)
- *The Tracker* by Tom Brown, Jr., available from a bookstore or library (optional)
- Plaster of paris or resin kit (available at crafts stores) (optional)
- Towels for cleaning mud off feet (optional)

### PURPOSE:

To help youth:

1. Become familiar with signs of the different kinds of animals that live in wetlands.
2. Understand that scientists can learn much about the habits of wild animals by examining the clues they leave behind.

### BACKGROUND

Wetland wildlife is not always easily observed, especially not by groups of noisy children. However, clues left behind by animals are usually much easier to find than the animals themselves, and they can be interpreted to gain information about the animals' characteristics and activities. Animal tracks can often be found in the mud or sand near waterways. They can be identified using a field guide or the mini field guide included here. Tufts of fur or feathers may show where an animal has been eaten by a predator. Claw marks on trees may indicate where raccoons climb, and nutshells or other food fragments can show the place where animals feed. You might also find nests or burrows, animal droppings (scat), compressed vegetation showing where larger animals lie down, or small trails between wetland plants where animals walk.

## **Activities:** (Observing, Communicating, Comparing, Categorizing, and Inferring)

### Before the trip:

1. Choose a site and visit it to make sure it has soft ground and offers good potential for viewing diverse signs of wildlife. Well-traveled paths, mudflats near wetlands, and the sides of streams or other waterways are all good possibilities.
2. Describe the area you will be visiting to the group members and brainstorm about the types of animals that live or feed there. Discuss clues that those animals might leave behind. Make a list.
3. Photocopy the *Mini Field Guide to Animal Tracks* (included) and follow instructions to fold them into little books.
4. (Optional) Read portions of *The Tracker* by Tom Brown, Jr., such as pp. 32-33, and discuss how animals always leave clues about their activities. Point out that it takes a very perceptive person to be able to see and read these clues.

### At the wetland:

5. Divide the group into small groups of 4-6 children. Pass out popsicle sticks and yarn and have each person make two flags by tying the yarn around the top of the stick. Explain that each group will be searching the site for signs of wildlife. Discuss briefly what some of these signs might be. Explain that they should place the flag in the ground near the object they observe. If the sign is something like a nest that is high up in a tree, they should place the flag in the ground in the spot from which the nest can be viewed.
6. Assign an approximate area for each group to cover and allow about 20 minutes for them to explore.
7. Reconvene the entire group. Have each of the smaller groups conduct a quick tour of their area to show the larger group what they found. At each location, discuss the clues that each sign gives about the animal that left it behind. Speculate about whether the animal was pursuing food, water, or shelter when each clue was left behind.
8. Identify animal tracks found by using the mini field guide or consulting the *Peterson's Field Guide to Animal Tracks*. Scat can also be identified by using the Peterson's guide.

### Optional, but highly recommended:

9. If any clear animal tracks are found, make models of them by following the instructions on a plaster of paris or resin kit.
10. Allow group members to take off their shoes and make their own tracks in the mud or sand. Ask them to imagine that they are dependent on this wetland

for their livelihood, just as Native Americans were, long ago.

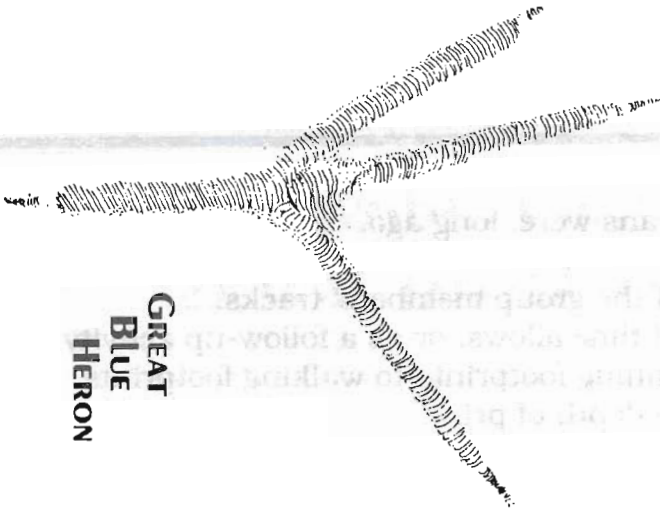
11. Make a plaster of paris or resin model of the group members' tracks.  
You can do this on site in the wetland, if time allows, or as a follow-up activity back at the meeting place. Compare running footprints to walking footprints. Notice differences in length of stride and depth of print.

### SUGGESTION

Follow or precede this activity with one of the other field activities, such as **Salt Marsh Plant Survey** (Activity #2), **Mud Creatures** (Activity #6), or **Wetland Sound and Sight Survey** (Activity #3).

Adapted from *Virginia's State Parks . . . Your Backyard Classroom*, Dept. of Conservation and Recreation, Division of State Parks, 203 Governor St., Suite 306, Richmond, VA 23219, and *W.O.W! The Wonders of Wetlands*, Environmental Concern, Inc., P.O. Box P, St. Michaels, MD 21663.

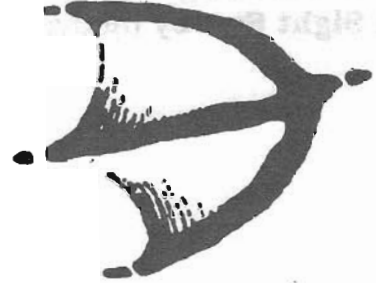
**GREAT  
BLUE  
HERON**



**Opossum**



**Duck**



**RACCOON**



**RED FOX**



**Mini Field Guide  
TO  
ANIMAL TRACKS**

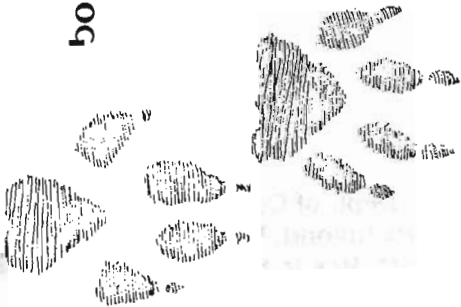
**COTTONTAIL  
Rabbit**



**SQUIRREL**



**DOG**



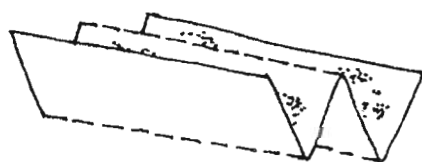


# INSTRUCTIONS for Folding Mini Field Guide to Animal Tracks

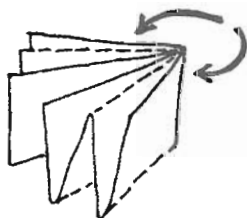
1. Fold the sheet in half crosswise, so the text and pictures appear on the outside.



2. Fold up ends separately to form a "W" shape.



3. Next, fold it in half again to form a small rectangle. Then unfold this last fold, and fold it again back the opposite way, making good, hard creases on each side.



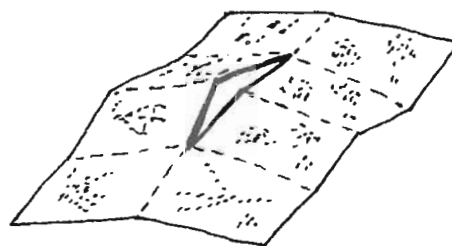
4. Unfold back to back to step #1, where the sheet is only folded in half.



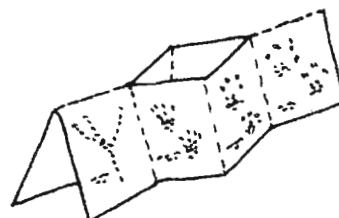
5. Place flat on the table with folded edge closest to you and cut along the middle fold through both sides to the center as seen in the diagram.



6. Unfold the sheet entirely, with the text and pictures facing up and with the short edge of the sheet closest to you.



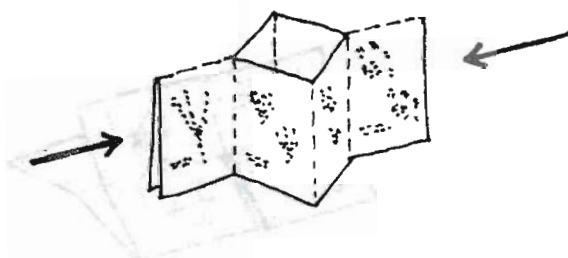
7. Refold the sheet in half, lengthwise. Stand the sheet up on the table so the pictures appear right side up, as seen in the diagram.



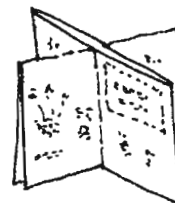


## INSTRUCTIONS for Folding Mini Field Guide to Animal Tracks (CONTINUED)

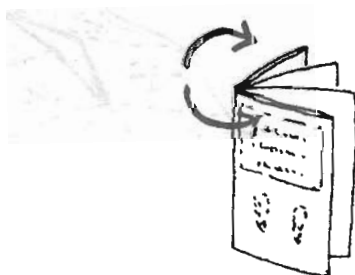
8. The part you cut with the scissors should open up and form a diamond. Grab the two outside panels and push inward until you form a four-panelled revolving door.



"REVOLVING DOOR"








9. Finally, fold all the pages together to form a small book. Make sure the cover page is on the front.



10. Make good, hard creases on all sides and YOU ARE DONE.

## CATTAIL GARDEN

Academic Demand Lo  Hi	Physical Exertion Required 
Number of Participants 	
Time Needed 	
Setting 	

**QUESTION:** What is interesting about cattails and how can cattails be grown in your own backyard?

**SUMMARY:** Cattails are transplanted to a wading pool at the meeting site. Youth group members observe and measure their growth, study their unique structure and taste their edible portions.

**MATERIALS:**

**For entire group:**

- Plastic wading pool (preferably rigid) or other large, shallow container
- Plastic bags
- Soil and water
- Cattail plants

**One for each group of 3-5 members:**

- Lab notebook #8a and 8b
- Pocket or kitchen knife
- Magnifying lens — (optional)

### PURPOSE:

To help youth:

1. Become familiar with the unique characteristics of cattails that allow them to survive while submerged in water.
2. Practice the scientific skills of data collection and graphing.
3. Become familiar with the structure and uses of the cattail.

### Background

Cattails (***Typha***) are native California plants that grow partially submerged in fresh or slightly salty water. Cattails can be easily transplanted by pulling on the stalks or digging gently into the soil to remove them in their entirety. They can then be replanted in soil submerged in water, such as in a children's wading pool. Transplanted cattails grow and reproduce easily in a variety of soil and water conditions. The structure of cattails is unique and interesting to study. Cattails are called an **emergent** plant, which means they grow sticking out of the water. Because the soil in which they grow does not contain oxygen, cattails have hollow tubes in their shoots and stems to allow them to transfer oxygen from their tops down to their roots under water. Cutting a cross-section of a cattail's shoot or stem will reveal these tubes. Cattails are edible and were eaten in various ways by Native Americans throughout California. The peeled shoots taste somewhat like cucumber (the young ones are best). Also, when the flower (the part that looks like a cattail) is still green, it can be steamed and eaten like corn on the cob. Or after the flower has turned brown, its pollen can be harvested and used to make pancakes or bread.

## **Activities:** (Observing, Communicating, Comparing, and Applying)

### Before the meeting

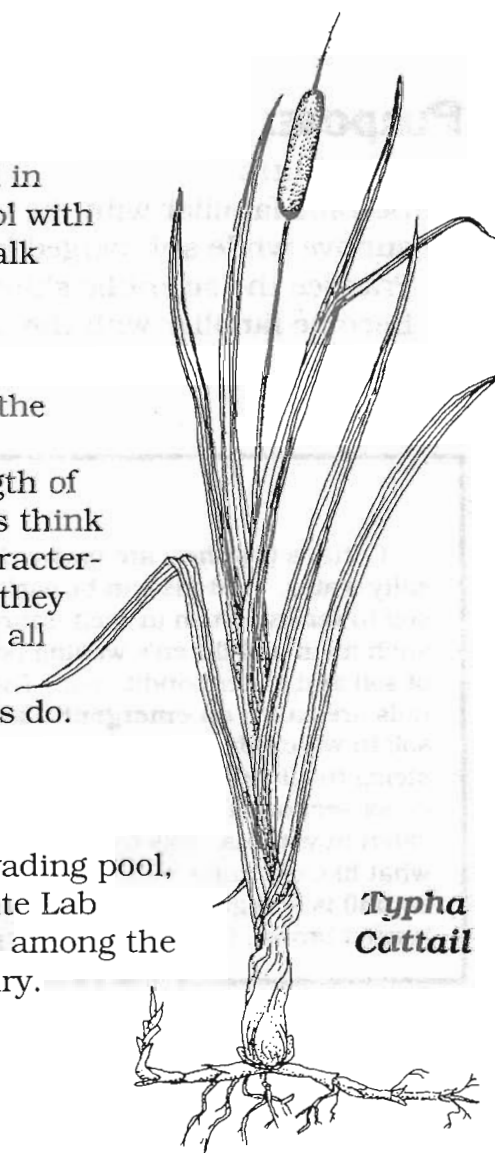
1. Locate a freshwater pond, creek, marsh, or roadside ditch where cattails are growing. Ask permission from the owner or park official to remove a few cattail plants. It is probably best, but not absolutely necessary, that you remove the cattails in the spring. That way your group can watch the plants grow and flower throughout the spring and summer.
2. With the youth group members, or as preparation before the meeting, remove several cattail plants by pulling firmly on their stalks or by digging slightly into the soil to loosen and remove the plants, roots and all. Collect enough for each group of 3-5 members to have at least one plant, plus one to use for a dissection demonstration. Place the plants' roots in plastic bags and transport them to your meeting place.

### At the meeting

3. Replant the cattails in at least 4 inches of soil placed in the bottom of a plastic wading pool. Then fill the pool with water, making sure that at least half of the cattail stalk and leaves are above the water. Reserve at least one cattail stalk for dissection and study.
4. Cut a cross-section of the cattail shoot, as shown in the diagram in the Lab Notebook. Point out the holes. Explain that these are hollow tubes that run the length of the shoots and stems. Ask what the group members think the hollow tubes are for. Explain that almost all characteristics of plants and animals have developed because they in some way aid their survival. Discuss the fact that all plants need oxygen, and that plants growing in water do not get oxygen from the soil like other plants do.

### Possible activities for subsequent meetings

5. At a later meeting, remove several cattails from the wading pool, so that each group of 3-5 members has one. Distribute Lab Notebook sheets and a knife to each group. Circulate among the groups, offering assistance where necessary. Add a little fresh water to help replenish the pool approximately once a week.



6. Observe and measure the growth of the cattails at subsequent meetings over a period of several weeks or months. Use the Lab Notebook page for each group of 3-5 members so they can record and graph the cattails' growth. Have measuring sticks, string, and tape measures on hand. At the end of several weeks or months of observation, help group members make bar graphs or line graphs of the data they collected.



7. In early summer the plant will begin to bloom. When the cattail spikes are still green and wrapped in leaves, they may be picked, washed, boiled and eaten like corn on the cob. Try it!
8. Talk about some of the following ways Native American groups used cattails. The underground portions of the plant were gathered, dried, and then ground into a meal.
- The pollen was used to make cakes and mush.
  - The stalks were used for matting and bedding material and to make ceremonial bundles.
  - The brown spike fuzz was mixed with tallow to make chewing gum.
  - Torches were made by cutting off a stalk, dipping the spike in coal oil, then lighting it.
  - The fuzz for the spikes was used to line cradle boards.
  - The leaves were used to weave mats and baskets.
9. Harvest the pollen from the cattail spikes in late summer or early fall. The pollen is bright yellow and forms on the male tops of the cattail spikes. To gather the pollen, just bend the cattail stalk over and shake the pollen into a clean bucket or bag. Use the collected pollen to prepare the following recipe for cattail pancakes:

### CATTAIL POLLEN PANCAKES

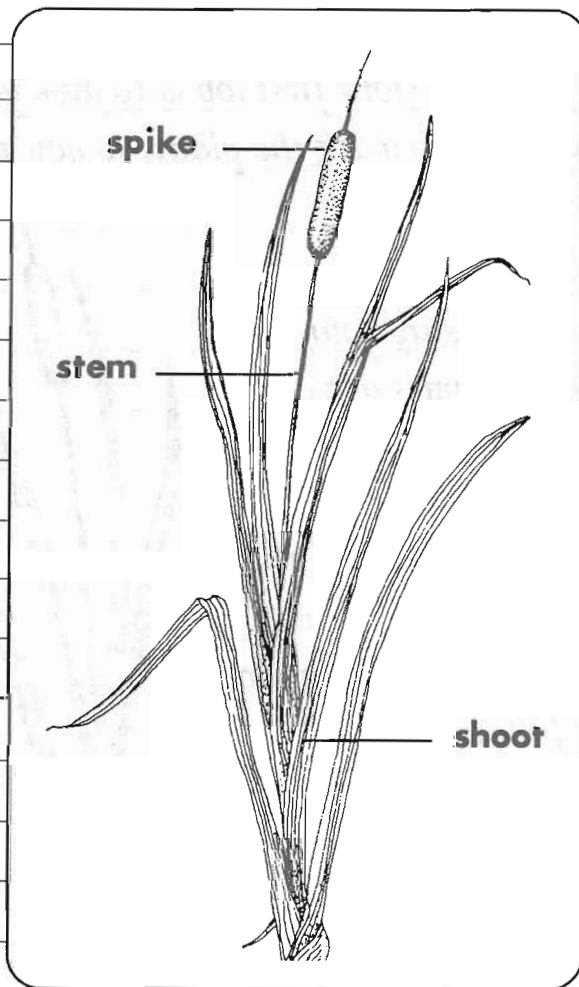
- 3/4 cup cattail pollen
- 3/4 cup flour
- 2 eggs
- 1 t. baking soda
- 1/2 t. salt
- 1 cup milk
- 2 T. vegetable oil
- 1 T. brown sugar or honey
- shortening or butter for frying

Stir together the cattail pollen, flour, soda, sugar, and salt. In another bowl, stir together the milk, eggs, and oil. Add the liquid ingredients to the dry mixture, mix, and set the batter aside for about 10 minutes until it thickens. Cook the pancakes on a hot, greased or non-stick griddle. Try filling some with fresh fruit, jam, or whipped cream.

10. After dismantling the garden, cut and arrange some of the cattails that remain in vases or flower arrangements and have group members take them home to friends or family as gifts.

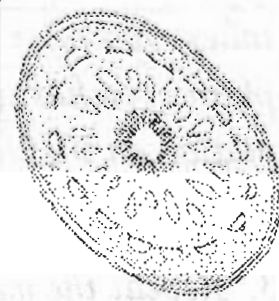


# Cattail Garden



1. Look carefully at your plant and use the diagram to help identify its parts.

2. Cut a cross-section of the shoot and notice the holes. What do you think the holes are for?



**cross-section  
of the shoot**

3. Cut a thin slice of the stem. Can you see the holes? Look with the magnifying lens if you have one.

4. Pull apart a cattail spike. The individual pieces of white fuzz are the fruits. Look at them with your magnifying lens, if you have one.

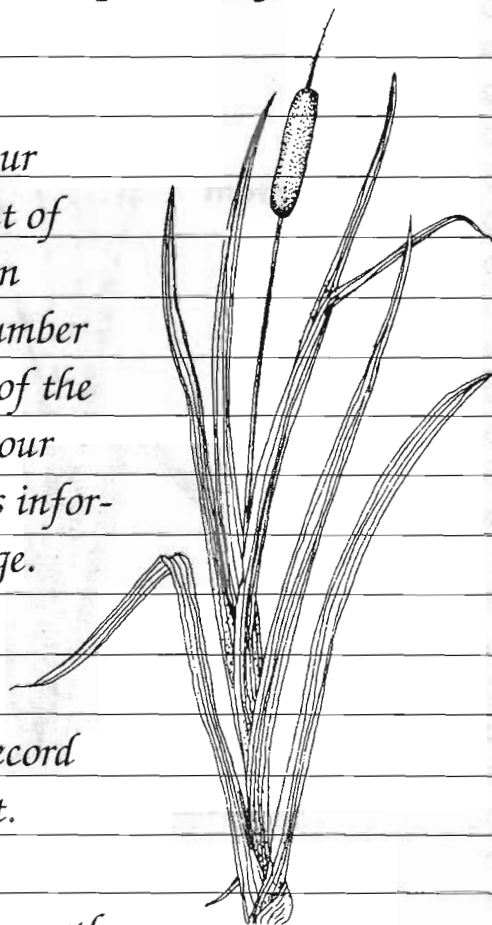
5. Find the tan bulb in the center of each spike. These are the ovaries. If they become fertilized by the yellow pollen they evolve into a seed that can grow into a new plant.



# Cattail Garden Growth Record

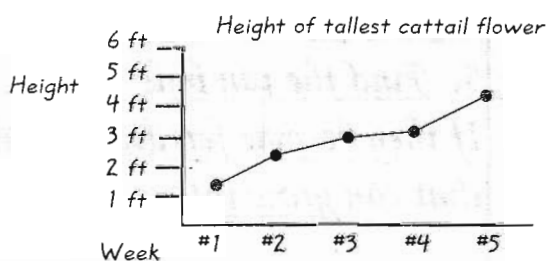
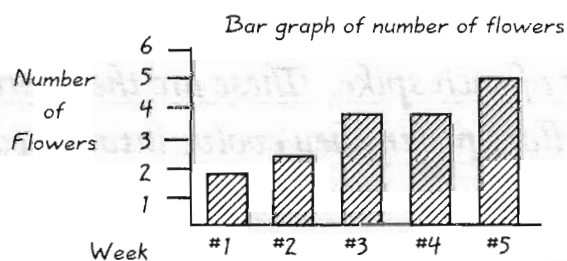
1. Individually, or with a group of 2 or 3 people, choose one of the cattail plants to follow its growth. Your first job is to give your plant a name and then figure out a way to mark the plant, so you will always be able to identify it as yours.

2. Next, figure out a way to measure your plant from the bottom where it comes out of the soil to the top of its tallest leaf. Then count the number of leaves, count the number of flowers, and then measure the height of the tallest spikes (it may take awhile until your plant even has spikes). Record all of this information on the chart on the following page.



3. Repeat the measurements several more times as the plant grows. Always record the date and the information in the chart.

4. When you are finished recording the growth of your cattails after several weeks or months, make graphs of some of the information you gathered. For example: a bar graph showing the number of flowers or leaves over time; a line graph showing the growth in height of the tallest leaves or flowers over time. Get help from your leader or another adult, if necessary.



# CATTAIL GARDEN GROWTH RECORD

Names of Observers: \_\_\_\_\_






Cattail Plant Name \_\_\_\_\_

Identifying Mark \_\_\_\_\_

Date	Height of tallest leaf	# of leaves on the plant	Height of tallest spike	# of spikes on the plant	Comments
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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## WHERE HAVE ALL THE WETLANDS GONE?

Academic Demand Lo  Hi	Physical Exertion Required 
Number of Participants 	
Time Needed 	
Setting 	

**QUESTION:** How are wetlands destroyed and what happens to the animals that lived there when the wetlands are gone?

**SUMMARY:** Youth group members analyze and arrange illustrations depicting wetland development, then play a game that simulates the effects of the loss of wetland habitat on the animals that live there.

**MATERIALS:** **For the whole group:**

- 1 long rope (approx. 40 feet)
- Small plastic bags (1 per person)
- Task Card #9c, *Wetlands Animals* (included)
- Task Card #9b, *Food Pieces*, colored, cut into pieces (included)

**One per group of 4-6 people:**

- Scissors and construction paper
- Task Cards #9a and #9d (included)
- Crayons or colored pens (optional)
- Glue and tape

### PURPOSE:

To help youth:

1. Realize that 90 percent of California's original wetlands have been lost to development.
2. Understand how wetlands loss is related to population growth and the historic settlement of California by European and American settlers.
3. Understand the effect of wetlands loss on wild animals that inhabit wetlands.

### BACKGROUND

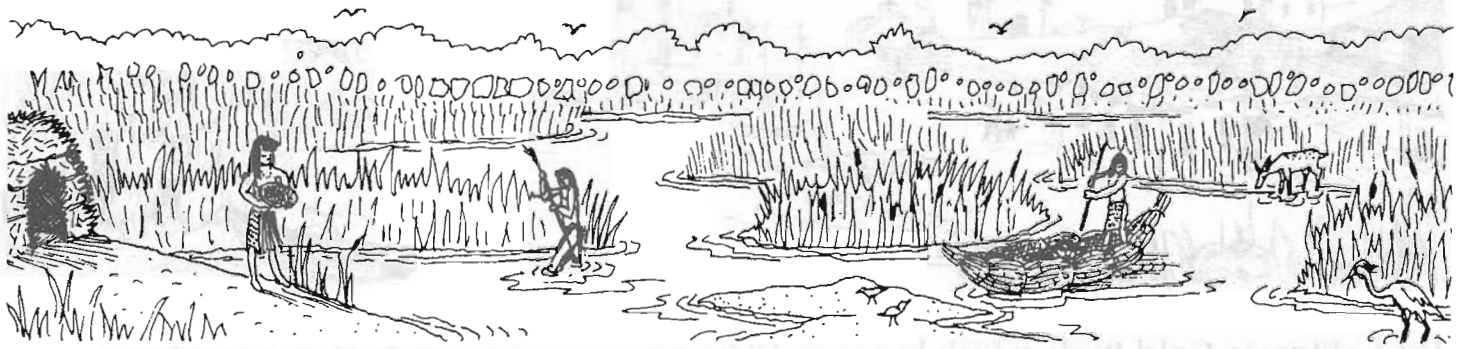
The majority of California wetlands have been lost to development. Wetlands were valued by California's Native Americans because of the abundant food they provided, but the Spanish and American settlers that came to settle California, beginning in the late 1700s, did not recognize the value of wetlands. The new settlers often drained wetlands in order to farm and build houses on the land. This destruction of wetlands for agricultural and building purposes continued throughout the next 200 years. It still continues today, with the result that 90% of the wetlands that existed in California 200 years ago have been destroyed. As more and more wetlands were destroyed, the plants and animals that depended on the wetland for survival died, causing some species to become extinct or approach extinction. A major reason that animals or plants become extinct is that their habitats are destroyed. If land that wildlife depends on for breeding, nurturing their young, gathering food, and seeking shelter is destroyed or significantly altered, the animals' chances for survival are often destroyed. Over half (55%) of the animals listed on the California endangered or threatened species list depend on wetland habitats for their survival.

## **Activities:** (Observing, Communicating, Comparing, Ordering, and Inferring)

### Introduction

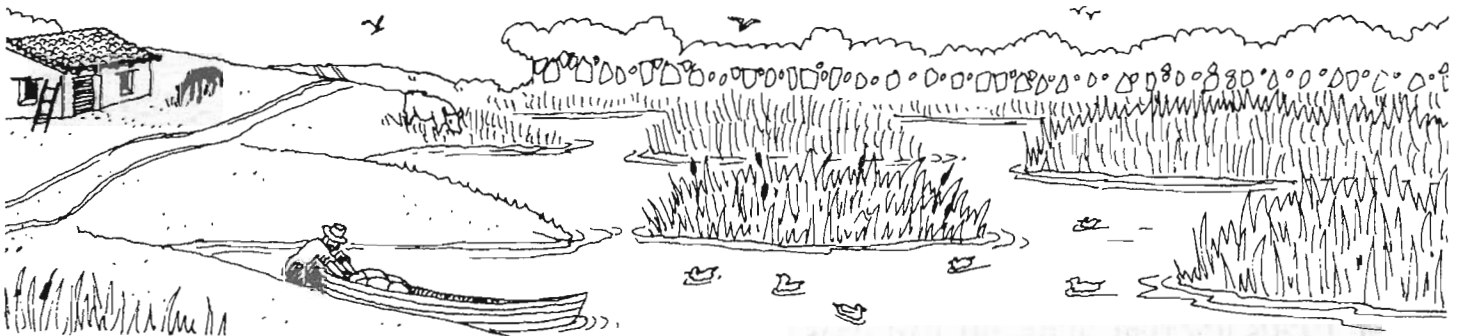
1. As review, ask the group members to recall some of the reasons why wetlands are important. (They provide breeding and nursery grounds for many young fish; they are full of nutrients that feed the small organisms at the bottom of the food chain; they help control flooding; they provide habitat for many endangered species and provide resting places for migrating birds.)
2. Stack together 10 blocks or any 10 items that are alike. Say that these represent the total number of wetlands that existed in California 200 years ago, around the time the first European settlers arrived. Take guesses on the number of wetlands that remain by asking group members to take away blocks representing the number of wetlands they guess have been lost to land development. After a few guesses, tell them that 9 out of 10 California wetlands have been lost to development for building or agriculture. Take away the blocks to represent this. Point to the remaining one block or object and say that it represents the remaining wetlands of California: only one out of every ten wetlands exists today.
3. Explain that most wetlands were lost when they were drained to become farmland or were drained to create areas on which to build homes and businesses. Use information from the Background section to lead a discussion about wetlands loss.
4. Divide group members into smaller groups of 3-5 children. Distribute to each group a photocopy of Task Card #9a, *Wetlands Through California History*, and construction paper, scissors, and glue. Explain that the illustrations show the development of a wetland area over a 200 year period. Ask the group members to cut out the pictures and paste them onto the construction paper in chronological order, coloring the illustrations if they wish. Allow about 10 minutes for this activity.
5. When the groups are finished, compare sequences among groups, discussing how groups made decisions regarding chronological order. Briefly discuss the development of wetlands in our country, using the descriptions on the following pages. To wrap up the discussion, explain that there are now laws that partially protect wetlands from development. Some wetland areas have been designated as sanctuaries where wildlife can use the resources of the wetlands for food, water, and shelter just as they did when Native Americans hunted and fished in them hundreds of years ago.





**Picture 1**

NATIVE AMERICANS WERE THE FIRST PEOPLE TO USE THE RESOURCES FOUND IN CALIFORNIA'S WETLANDS. THEY FOUND PLENTY OF GAME TO HUNT IN THE WETLANDS, ESPECIALLY IN THE FALL WHEN HUGE FLOCKS OF DUCKS AND GESE PASSED THROUGH ON THEIR TRIP SOUTH FOR THE WINTER. NATIVE AMERICANS ALSO BUILT SPECIAL TRAPS AND SCOOPS TO CATCH WETLAND FISH, AND THEY GATHERED CLAMS, MUSSELS AND OTHER SHELLFISH IN TIDAL WETLAND AREAS.



**PICTURES 2 AND 3**

SPANISH SETTLERS WERE THE FIRST PEOPLE OF EUROPEAN DESCENT TO SETTLE NEAR WETLANDS IN CALIFORNIA, AND THEY BEGAN ARRIVING IN THE LATE 1700S. THE SPANIARDS BUILT ADOBE HOUSES AND FARMED AND RAISED LIVESTOCK, OFTEN HAVING HUGE HERDS OF CATTLE. WETLANDS MADE GOOD GRAZING GROUNDS FOR CATTLE.

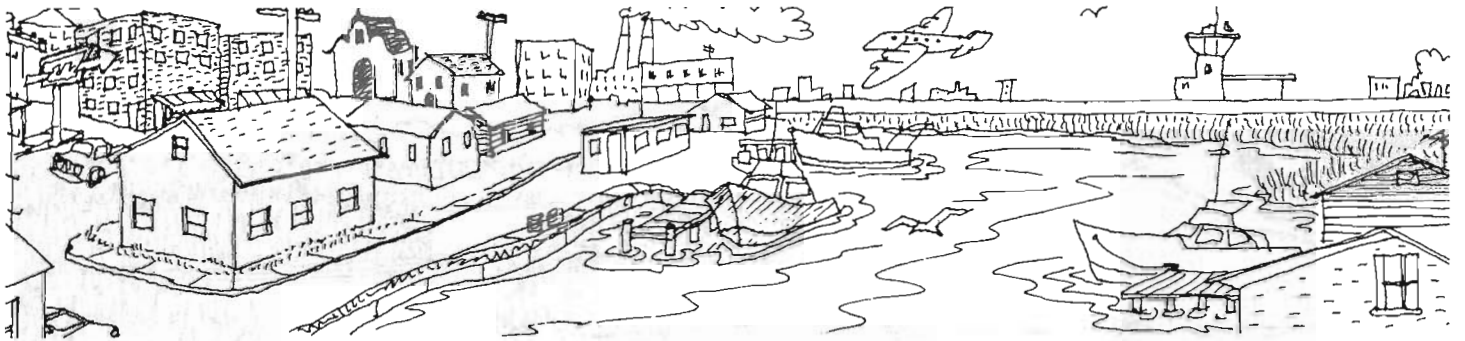






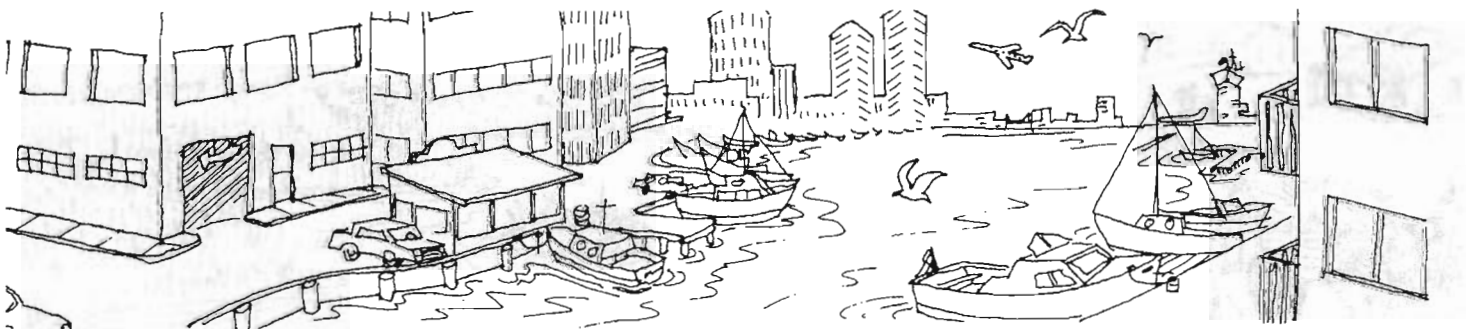
**Picture 4**

The California Gold Rush, which began in 1849, brought thousands of new settlers to California from the eastern United States. Towns began to spring up around wetlands and the growing population had a bigger and bigger impact on the land. There were no regulations on the hunting of birds and some species were hunted to near extinction. Ducks, geese, and sandpipers were hunted for their meat, and egrets and herons were hunted for their feathers, which had a commercial value. Neither were there regulations regarding dumping of sewage and garbage, and wetland areas near growing towns often became terribly polluted.



**Pictures 5 & 6**

By the 1950s (Picture 5) people had drastically changed many of California's original wetlands. Few people realized wetlands' ecological significance, and instead looked for ways to turn wetlands into something they considered useful. Thousands and thousands of acres of California's wetlands were filled in with dirt in the 1950s, 1960s, and 1970s to build airports, houses, shopping centers, and other businesses. Today (Picture 6) many wetlands near urban areas have been completely built over and destroyed, with no sign of the original wetland or native wildlife that depended on it remaining.

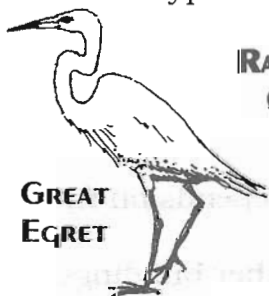


### Game: Who Eats What?

6. As preparation, have one or two group members color the illustrations on Task Card #9b, *Food Pieces*, using a different color for each type of animal. Prepare enough pieces to have a total of 15 each of the fishes, insects and snails and 10 each of the small mammal/reptile pieces. Cut the sheets into separate pieces and place them in a bag or container for future use. Then have someone cut out the illustrations on Task Card #9c, *Wetlands Animals*.
7. Move to a large empty space in a room. Place a rope on the floor, arranging it into any shape desired, as long as the ends of the rope meet to form an enclosed space. Explain that the group is going to play a game that demonstrates what happens to wildlife when wetlands are developed. The area inside the rope will represent the wetland.
8. Have the group members sit around the edges of the wetland. Assign each person to represent one of the following animals that lives or feeds in a California wetland: raccoon, great egret, California clapper rail, northern harrier, or salt marsh harvest mouse. Give each person one of the wetland animal pictures (Task Card #9c) that corresponds to the animal they represent. Provide each person with a plastic bag that will represent the stomach of their animal.
9. Post a copy of Task Card #9d, *Who Eats What*, so that all players can refer to it during the game. Explain that when the game begins, each person will be allowed to gather the food their animal eats. Using the following information, the type of food each animal eats.



**RACCOON**



**GREAT  
EGRET**

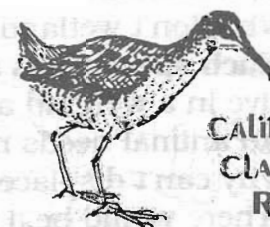
**RACCOON:** Eats pickleweed, fish, insects, snails, small animals, and reptiles.

**GREAT EGRET:** Eats fish, insects, snails, small animals, and reptiles.

**CALIFORNIA CLAPPER RAIL:** Eats insects and snails.

**NORTHERN HARRIER:** Eats fish, small mammals, and reptiles.

**SALT MARSH HARVEST MOUSE:** Eats pickleweed.



**CALIFORNIA  
CLAPPER  
RAIL**

10. Show the group which colored food pieces represent which type of food. In the first round of the game, sprinkle all the food pieces throughout the wetland. Remind players that they should collect only the types of food that their animal eats. When you say "Go," allow everyone to put food pieces into their plastic bags. After 30-60 seconds, or when the food is gone, say "Stop" and have members sit down again outside the wetland.



**NORTHERN  
HARRIER**



11. Players should count the number of food pieces in their "stomachs," only counting the types of food that their animal really eats. If any have fewer than three pieces of food in their stomachs, those animals have starved to death and they should help run the game during the following rounds. Explain that when animals die, they decompose, return to the bottom of the food chain, and help other organisms grow. (Remember, the animals who starved to death do not feed again.)

12. Use some of the "dead animal" helpers to assist in collecting all the food pieces for the next round. Now tell the group that part of the wetland is being filled in to build a road across it. Have helpers shorten the rope to make the wetland smaller. Explain how loss of habitat also means loss of food for many animals. To demonstrate this remove from the food supply: 3 snails, 3 insects, 3 fish, and 1 pickleweed. Send the living animals off to feed again for another 30-60 seconds.



**SALT MARSH  
HARVEST MOUSE**

13. Repeat the feeding sequence for several more rounds, having helpers shrink the wetland, remove more food pieces, and scatter remaining food pieces for living animals to feed upon. They can also help count pieces in their friend's stomachs to determine whether they lived or died. Continue until only a few animals are left. Use a different reason each time for shrinking the wetland. Ask the group members what reasons they think might cause people to want to develop a marsh. Here are some suggestions:

- The wetland was filled-in to build houses, airports, office buildings, or garbage dumps.
- The wetland filled up with silt caused by developments upstream.
- A company dumped toxic waste in the wetland, thereby contaminating some of the food sources.

### Follow-up Discussion

14. Conclude by discussing some of the following questions:

- What are the effects of a shrinking habitat on an animal that depends on it? (Loss of shelter, food, water, and space.)
- What are some alternatives to building marinas, homes, and other buildings on wetlands?
- Why don't wetland animals go somewhere else to live, such as a forest? (Each species has specific requirements in order to live. Most species that live in a wetland are adapted only for life in that habitat. The specific things an animal needs may not be available in other ecosystems, such as forests.)
- Why can't displaced animals exist in smaller, but more crowded marshes? (There would be a lot of competition for food, shelter, water and space, which usually causes a portion of the population to become diseased and die.)

- What can be done to help plants and animals that are threatened by wetlands development?  
(Make efforts to learn about them and to educate others about the value of wetlands to endangered species. Write letters to your legislators. Participate in the Adopt-an-Endangered-Species Project or The California Native Plant Society Poster Contest.)

For more information, contact:

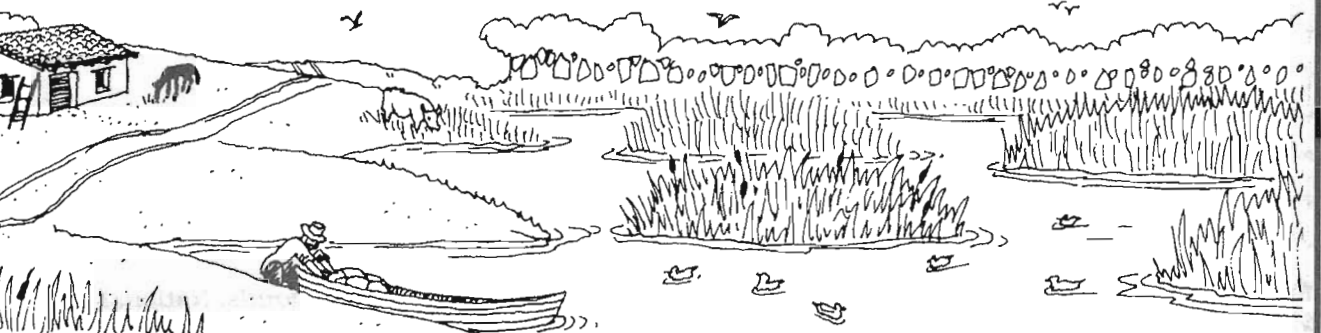
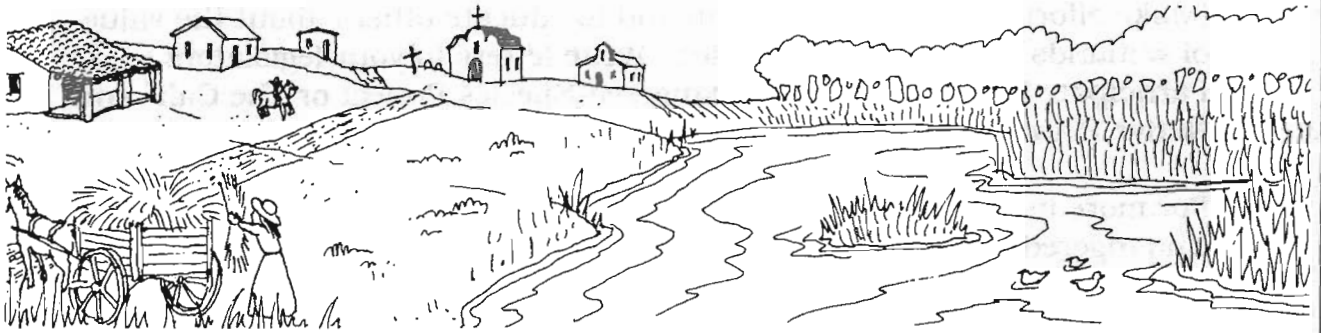
Endangered Species Education Project at the Richardson Bay Audubon Society, (415) 388-2524.

The California Native Plant Society, 909 12th Street, Suite 116,  
Sacramento, CA 95814.

Adapted from: "Marsh to Marina," *Ranger Rick's Naturescope: Wading Into Wetlands*. National Wildlife Federation.

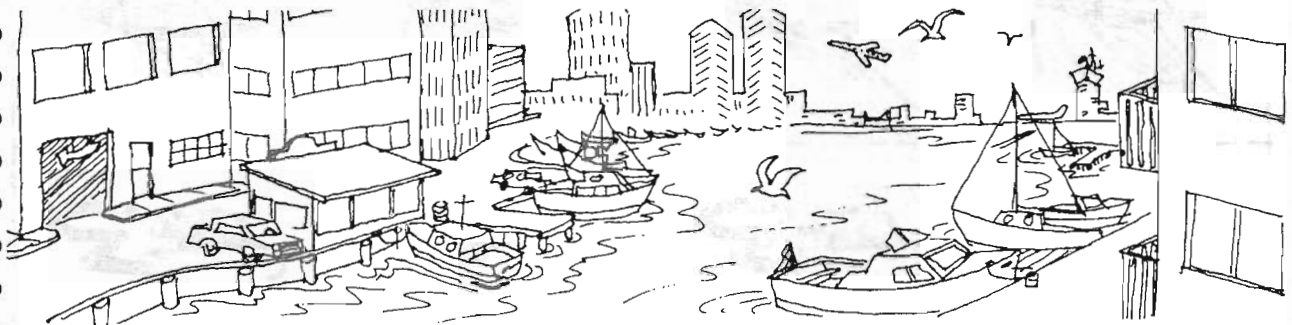
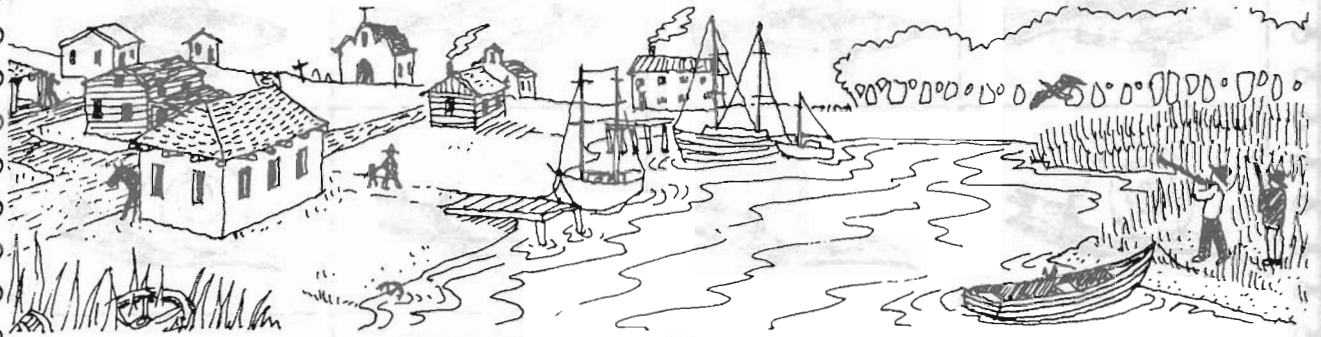


# Wetlands Through California History ✂

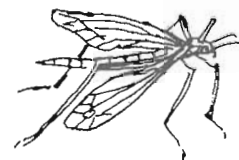
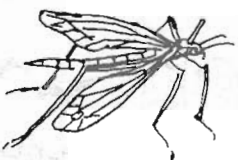
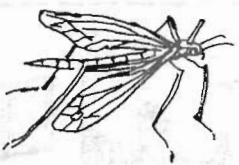




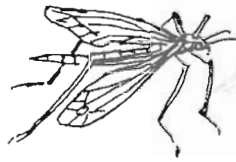
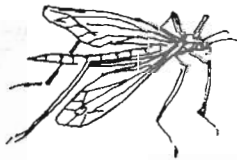
# Wetlands Through California History ✂



# Food Pieces



# Food Pieces





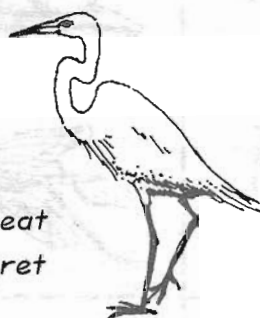
# Wetlands Animals



Raccoon



Raccoon



Great  
Egret



Great  
Egret

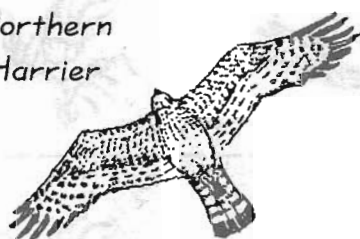


California  
Clapper Rail

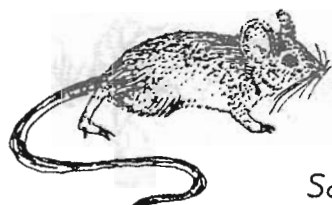
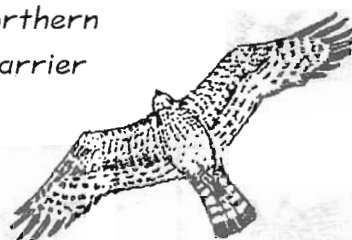


California  
Clapper Rail

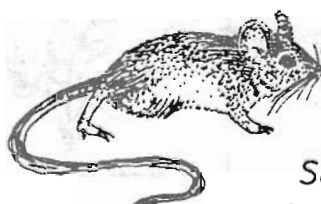
Northern  
Harrier



Northern  
Harrier



Salt Marsh  
Harvest Mouse



Salt Marsh  
Harvest Mouse

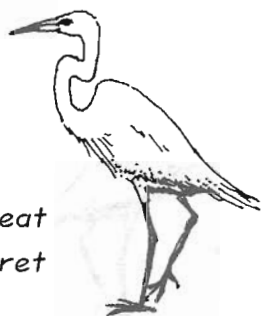
# Wetlands Animals



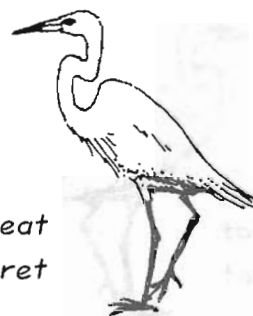
Raccoon



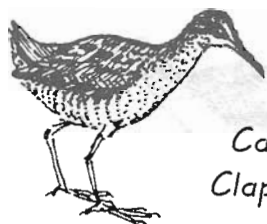
Raccoon



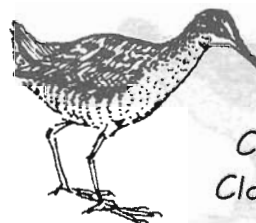
Great  
Egret



Great  
Egret

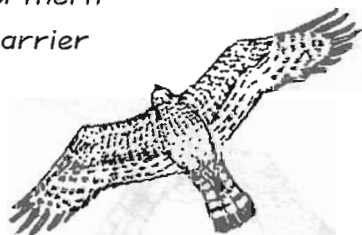


California  
Clapper Rail

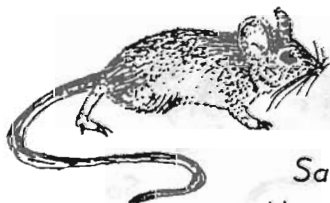
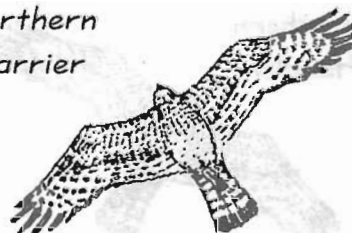


California  
Clapper Rail

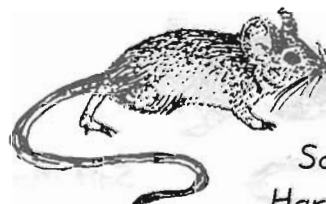
Northern  
Harrier



Northern  
Harrier



Salt Marsh  
Harvest Mouse



Salt Marsh  
Harvest Mouse



# Wetlands Animals



Raccoon



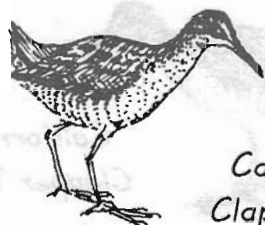
Raccoon



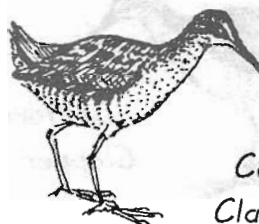
Great  
Egret



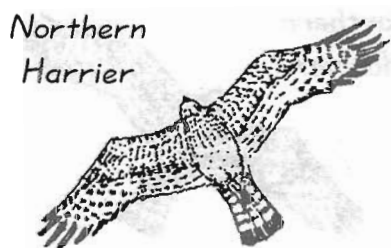
Great  
Egret



California  
Clapper Rail



California  
Clapper Rail



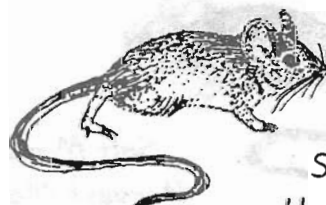
Northern  
Harrier



Northern  
Harrier



Salt Marsh  
Harvest Mouse



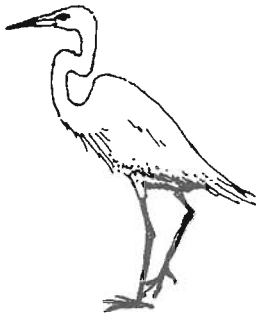
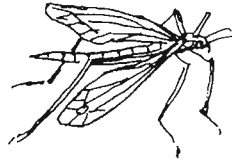
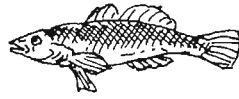
Salt Marsh  
Harvest Mouse

Task Card # 9d

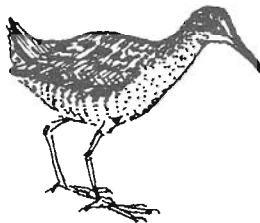
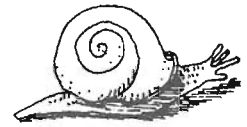
"Who Eats What"



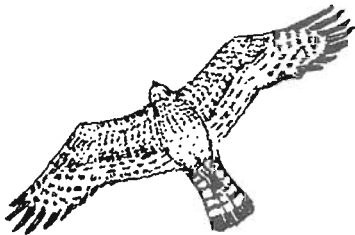
Raccoon



Great Egret



California Clapper Rail



Northern Harrier








Salt Marsh Harvest Mouse





## WETLAND METAPHOR

Academic Demand Lo  Hi	Physical Exertion Required 
Number of Participants 	
Time Needed 	
Setting 	

**QUESTION:** Why are wetlands important to our environment?

**SUMMARY:** Youth group members explore the value of wetlands as expressed metaphorically through a number of everyday objects. For example, a sponge is like a wetland because it absorbs excess water during periods of heavy rain, and this helps to control flooding.

**MATERIALS:**

- A large pillowcase, bag, or box filled with as many as possible of the following objects:
- Small pillow or miniature bed (or picture of a bed)
- Doll cradle or picture of a baby's room
- Sieve or strainer
- Soap
- Sponge
- Egg beater
- Picture of a grocery store
- Small cereal box
- Picture of a vacation resort
- Coffee filter
- Small house or picture of a house

### PURPOSE:

To help youth:

1. Understand why wetlands are so valuable.

### BACKGROUND

Wetlands — areas like freshwater marshes, saltwater marshes, wet meadows, swamps, and mudflats — are some of the most productive places on earth, acre for acre. They support scores of microorganisms, insects, fish, birds, mammals, and plants. All wetlands, whether coastal or inland, provide special habitats that benefit plants, animals, and humans. Because of the abundance of food, shelter, and water found in wetlands, these areas contain diverse wildlife, including many of California's endangered species. Wetlands are often called "nurseries" because they provide critical breeding habitats for so many kinds of wildlife. California wetlands provide breeding, resting, and wintering habitats for millions of migratory birds. Many fish species spend all or part of their life cycle in fertile wetlands. These fish species — such as bass, salmon, and perch — often have commercial value. The abundance of plant life found in wetlands provides nutrient-rich foods for the animals that live and feed there. Microscopic plants — phytoplankton — are abundant and provide food for the smallest of animals, such as zooplankton, krill, and shrimp, which in turn provide food for larger animals.

Wetlands also have the unique ability to purify the environment. They act as natural filtering systems that can trap pollutants, allow silt to settle, and promote the decomposition of many toxic substances.

Of great importance to humans are the flood control characteristics of wetlands. When runoff from rains and spring thaws is high, wetland areas slow the flow of water, allowing it to gradually drain away. In this way, wetlands help prevent flooding during rainy periods. In dryer periods, wetlands retain precious moisture after open bodies of water have evaporated.

As shown on the following page, many of the major attributes of wetlands can be explored through metaphors.

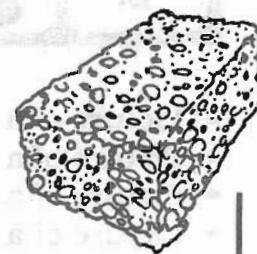
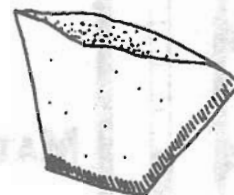
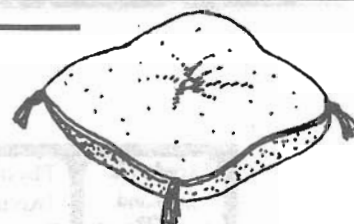


## WETLAND METAPHORS

### Object

### Value of Wetlands

Sponge	absorbs excess water during wet periods helps prevent floods
Pillow	provides a resting place for migratory birds
Cradle	provides a nursery that shelters and feeds young wildlife
Filter	filters impurities from the water
Cereal	provides food
Soap	helps cleanse the environment
Zoo	has abundant wildlife
Gas station	helps fill underground water supplies
Grocery store	provides abundant food
House	provides a home for wildlife
Egg beater	mixes nutrients and oxygen into the water
Strainer (Sieve)	strains silt and debris from water
Dam	helps control flooding
Vacation resort	provides resting or wintering place for birds
Playground	provides a recreation place for people



### **Activities:** (Observing, Communicating, Comparing, Categorizing, and Inferring)

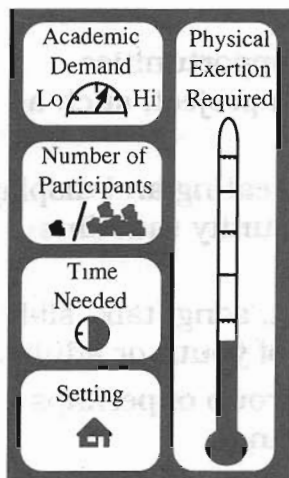
- Discuss that wetlands are areas of land that are covered by shallow water at least part of the year. Talk about the names of the different kinds of wetlands: salt marshes, freshwater marshes, wet meadows, mudflats, swamps. Explain that over 90 percent of California wetlands have been destroyed during the past 200 years due to human activity. In the past, people did not value wetlands and would often drain them for agricultural use or for building developments. Now, people realize the tremendous value of wetlands and many people are working to protect the California wetlands that remain.
- Why are wetlands so important? Have the group generate a list of the things that might be found in a wetland. During this discussion, introduce the following values of a wetland:
  - Provides food and shelter for wildlife, including many endangered species
  - Absorbs and slows excess run-off during rainy periods, helping prevent floods
  - Filters toxins and wastes out of the water
  - Provides protection and nourishment for the young of many species, since many animals breed and raise their young in wetlands
  - Provides a resting place for migratory birds
  - Provides a natural area where humans can go to relax and play



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3. Divide the group into smaller groups of 3-5 children.
  4. Display the pillowcase or box and announce that everything in it represents something about a wetland. The group members' job is to figure out what process or wetland value each object represents. Demonstrate by removing one of the items from the bag and soliciting suggestions from the group about what wetland value the object represents.
  5. Ask a person in each group to reach into the bag and grab one object. Allow about five minutes for groups to discuss and determine the wetland value that their object represents. Circulate among groups, asking probing questions and offering suggestions if necessary.
  6. Ask that one member from each small group describe to the larger group the value that their object represents. Guide the discussion as necessary.
  7. If more objects remain in the bag, continue with another round.
  8. Summarize the major roles that wetlands perform by making a list of how wetlands benefit humans. Make another list about how they benefit animals.
  9. To conclude, stress the connection between humans and wetlands. Recreation, aesthetics, environmental quality, nature study, and food sources are a few of the connections we have with wetlands.



## WORKING FOR CALIFORNIA'S WETLANDS



**QUESTION:** What can your group do to help protect and restore California's wetlands?

**SUMMARY:** Youth group members identify potential things they can do to help protect or restore wetlands. They then choose, plan, and complete a community action project.

**MATERIALS:** Task card #11 (included). Photocopy one for each group of 3-5 people.

### **PURPOSE:**

To help youth:

1. Realize that their actions can actually help protect and restore California wetlands.
2. Improve their ability to work as a group to plan and carry out a project aimed at a valued goal.

### **BACKGROUND**

California has lost more of its original wetlands than any other state. In fact, 90 percent of California's wetlands have been destroyed. The wetlands that remain are tremendous resources for wildlife and humans and should be protected. Projects directed at restoring wetlands are succeeding in several places in California. Young people are often extremely concerned about the future of the environment and the protection of wildlife. Through community service, or public education projects, they can contribute to the protection or restoration of the state's valuable wetland habitats.

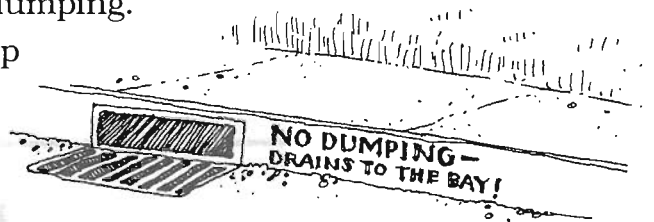
### **ACTIVITIES:** (Observing, Communicating, and Applying)

#### First meeting

1. Pass out Task Cards to each group of 3-5 members and allow time for members to read them and come up with suggestions for community action projects.
2. Reconvene the entire group. Talk about ways that wetlands have been destroyed (through land development and agricultural drainage), the value of wetlands, and potential ways that young people can help improve or protect California wetlands. Accept all their ideas as valid. Below are some ideas that may surface in the discussion or that you may want to contribute for the group members to discuss:
  - Growing seedling plants to be introduced in a wetland habitat restoration

discussion or that you may want to contribute for the group members to discuss:

- Growing seedling plants to be introduced in a wetland habitat restoration project.
- Speak with managers of the wetland site you visit about opportunities available at that site. Participate in a wetlands restoration project, such as reintroducing native plants or working on trails.
- Educate the community about the value of wetlands by creating and displaying a mural or window painting somewhere in your community that illustrates the importance of wetlands.
- Develop a presentation about the value of wetlands (a skit, song, talk, slide show, photo essay, or video) and show it to other groups of youth or adults.
- Carry out any of the activities in this book with another group of perhaps younger kids, stressing the importance of protecting wetlands.
- Organize or participate in a wetlands clean-up. (Lots of litter gets washed down storm drains and ends up in wetlands.)
- Stencil storm drains to warn against dumping.
- Become involved in a community group that works to enhance and protect a local wetland. Many small groups exist and often have names such as Friends of the Morro Bay Estuary or Friends of Strawberry Marsh. Assist with the group's preservation, publicity, or fundraising efforts. Children are often powerful advocates.
- Remove alien plants in uplands adjacent to wetlands.
- Adopt a wetland (clean up litter, watch wildlife, and monitor the area over time; educate others about the value of your adopted wetland).
- Start a campaign in your school or neighborhood to let people know about wetlands and why they are valuable. Think of a catchy slogan or phrase that's easy to remember. Make poems and put an "ad" in your school or community newspaper or newsletter. These should tell how people can help conserve and protect wetlands.
- Help younger kids learn about wetlands by taking them birdwatching or hiking, and use the time to teach them about the importance of wetlands and respect for nature.



3. Through discussion, help the group identify one or two projects that they can actually carry out. Choose projects appropriate for your group's organizational ability and skill levels.
4. As a group, develop a written plan for the project. Include a schedule showing who is responsible for what and in what time frame. During this planning phase, be sure to identify the type of help needed from parents, experts, and others.

### Field work

5. Carry out as much of the project as possible. Encourage the group to follow the project through to completion. Make arrangements for completing any work the members cannot accomplish.

### Follow-up meeting

6. Talk about the successes or shortcomings of the completed project. A few weeks after the project is completed, arrange for someone to visit any sites where work was done or displayed to determine if any follow-up is required.
7. Provide recognition for the group's good work, perhaps through media attention, a trip, a party, pizza, or merit badges earned in conjunction with the project.



## Working For California's Wetlands

**Question:** What can your group do to help protect and restore California's wetlands?

- Activity:**
1. Keep in mind that the things that most threaten the health of wetlands and the wildlife that depend on them are:
    - water pollution from streams and storm drains that flow into the wetland
    - garbage dumping
    - non-native plant species crowding out native wetland plants
    - draining and building upon wetlands
  2. In the next 5 - 10 minutes, come up with some ways that your group can help solve or educate others about these problems and any other ways to help protect wetlands.
  3. Choose one person from your group to tell the large group about your best ideas. Today your youth group will decide upon one or two projects that you will actually carry out that will help protect California's wetlands.

## CALIFORNIA WETLANDS YOU CAN VISIT

This is only a partial list of wetlands that are open to the public. For more information, contact park officials in your area. You may also wish to consult guidebooks, such as the *California Coastal Access Guide* (see Resources) for details about wetlands along the California coast.

California Wetlands Include:

Salt Marshes, Mudflats, Freshwater Marshes, Tidal Sloughs, Wet Meadows, and Vernal Pools.

### MARIN COUNTY AREA

Bothin Marsh. Public access marsh in Mill Valley, CA. For more information call (415) 927-1670.

Strawberry Point, Sausalito, CA. Contact the Bay Model Visitor Center about marshwalks for youth groups. (415) 332-3871.

Mill Valley Bike Path Marsh, public access marsh, Mill Valley, CA. (No phone)

Strawberry Marsh, public access marsh in Mill Valley, CA. For more information, (415) 927-1670.

Marin Headlands, Rodeo Lagoon, Golden Gate National Recreational Area. For more information contact (415) 332-3871.

Richardson Bay Audubon Center, Tiburon, CA, (415) 388-2524.

Loch Lomond Marina, San Rafael, CA. (415) 454-7228.

China Camp State Park, San Rafael, CA. (415) 456-0766.

### NORTH SAN FRANCISCO BAY AREA

Fairfield Osborn Preserve, Penngrove, CA. (707) 795-5069.

Kettleman Ranch administered by U.S. Fish and Wildlife Service, visitor center in the works. Call U.S. Fish & Wildlife in Newark for information, (510) 792-0222.

Port Sonoma Marina, Petaluma, CA. (707) 778-8055.

San Pablo Bay National Wildlife Refuge, Tubbs Island, Hwy 37, Sonoma County, (510) 792-0222.

Benicia State Recreation Area, Benicia, CA. (707) 648-1911

### **EAST SAN FRANCISCO BAY AREA**

Carquinez Strait Shoreline (510) 228-0112

Coyote Hills Regional Park, Fremont, CA. (510) 795-9385.

Hayward Shoreline Interpretive Center, Hayward, CA. (510) 881-6751.

San Francisco Bay National Wildlife Refuge Visitor Center, Newark, CA  
(510) 792-0222.

San Francisco Bay National Wildlife Refuge, Environmental Education Center,  
Alviso, CA, (408) 262-5513

Point Pinole Regional Shoreline, Pinole, CA, (510) 237-6896.

Emeryville Shoreline & Marina, Emeryville, CA (510) 596-4340

Crown Memorial State Beach, Alameda, CA. (510) 521-6887.

Doolittle Beach, Oakland, CA, (510) 562-1373.

San Leandro Bay Regional Shoreline, Oakland, CA, (510) 562-1373.

Arrowhead Marsh, Oakland, CA, (510) 562-1373.

Oyster Bay Regional Shoreline, San Leandro, CA, (510) 562-1373.

Alameda Creek Regional Trail, Fremont, CA, (510) 790-2612.

### **SOUTH SAN FRANCISCO BAY AREA**

Mountain View Shoreline Park, Mountain View, CA. (408) 966-6392.

Bayfront Park, Menlo Park, CA.

Port of Redwood City, Redwood City, CA.

Burlingame Public Shore, Burlingame, CA.

Burlingame Shorebird Sanctuary, Burlingame, CA.

Baylands Preserve and Interpretive Center, Palo Alto, CA. (650) 329-2506.

## **THE SACRAMENTO RIVER DELTA**

Grizzly Island Wildlife Area, Suisun, CA. (707) 425-3828.

Suisun Marsh, Suisun City, CA.

## **MONTEREY BAY AREA**

Elkhorn Slough National Estuarine Research Reserve, Watsonville, CA.  
(831) 728-2822.

Monterey Bay Aquarium, 886 Cannery Row, Monterey, CA. (831) 648-4800

Moss Landing Wildlife Area, Off Hwy 1. in Moss Landing, CA. (408) 649-2870

Pescadero Marsh Natural Preserve, Pescadero, CA. (650) 879-2179

Salinas River National Wildlife Refuge, Castroville, CA. (510) 792-0222

Zmudowski State Beach, 3 miles north of Moss Landing. Large fresh water slough and pond behind dunes. Good viewing area for waterfowl. Call State Parks & Recreation in Monterey. (831) 649-2836

## **NORTHERN SAN JOAQUIN VALLEY**

Gray Lodge Wildlife Area, Gridley, CA (530) 846-3315.

Effie Yeaw Nature Center, Carmichael, CA. (916) 489-4918. Bonnie Ross

Colusa National Wildlife Refuge, Willows, CA (530) 934-2801

Cosumnes River Preserve, Galt, CA. (916) 684-2816.

Delevan National Wildlife Refuge, Willows, CA (530) 934-2801.

Gray Davis Dye Creek Preserve, Red Bluff, CA. (530) 527-0487.

Jepson Prairie Preserve, near Travis Air Force Base. (707) 752-6580.

Sacramento National Wildlife Refuge, Williams, CA. (530) 934-2801.

Sacramento River Oxbow Preserve, Willows, CA. (530) 343-3185.

Sutter National Wildlife Refuge, Yuba City, CA. (530) 934-2801.

Vina Plains Preserve, Chico, CA. (415) 777-0487.

## **SOUTHERN SAN JOAQUIN VALLEY**

Carrizo Plain Natural Area, California Valley, CA. (805) 475-2360.

Creighton Ranch Preserve, Visalia, CA. (209) 627-4328.

Kaweah Oaks Preserve, Visalia, CA. (209) 627-4328.

Kern Lake Preserve, Weldon, CA. (619) 378-2531.

Kern National Wildlife Refuge, Delano, CA. (805) 725-2767.

Kern River Preserve, Weldon, CA. (619) 378-2531.

Kesterson National Wildlife Refuge, Los Banos, CA. (209) 826-3508.

Los Banos Wildlife Area, Turlock, CA. (209) 826-0463.

Merced National Wildlife Refuge, Merced, CA. (209) 826-3508 or -0463.

Pixley National Wildlife Refuge, Pixley, CA. (805) 725-2767.

Pixley Vernal Pools Preserve, Pixley, CA. (415) 777-0487.

San Luis National Wildlife Refuge, Los Banos, CA (209) 826-3508 or -0463.

Semitropic Ridge Preserve (formerly Paine Preserve), Corcoran, CA.  
(209) 992-2833.

## **FAR NORTHERN CALIFORNIA**

Arcata Marsh and Wildlife Sanctuary, Arcata, CA.

Ash Creek Wildlife Area, Bieber, CA. (530) 294-5824.

Boggs Lake Preserve, Kelseyville, CA. (415) 777-0487.

Humboldt Bay National Wildlife Refuge, Loleta, CA. (707) 733-5406

Lake Early Wildlife Area, Crescent City, CA. (707) 464-2523.

Lanphere-Christensen Dunes Preserve, Arcata, CA. (707) 822-6378.

Lower Klamath National Wildlife Refuge, Tulelake, CA (916) 667-2231.

McCloud River Preserve, McCloud, CA. (415) 777-0487.

Modoc National Wildlife Refuge, Alturas, CA. (916) 233-3572.



Tule Lake National Wildlife Refuge, Tulelake, CA. (916) 667-2231.

### **Tri-COUNTIES AREA (SAN LUIS OBISPO, SANTA BARBARA, & VENTURA COUNTIES)**

Carpinteria State Beach, Carpinteria, CA, (805) 684-2811.

Carpinteria Salt Marsh Reserve, Carpinteria, CA, (805) 893-4127.

Coal Oil Point Reserve, Santa Barbara, CA, (805) 893-4127.

McGrath State Beach, Ventura, CA, (805) 654-4611.

Ventura River Group Camp, Ventura, CA, (805) 654-4611.

Santa Clara River Estuary Natural Reserve, Ventura, CA, (805) 654-4611.

Morro Bay Estuary, Morro Bay, CA, (805) 772-7434 or contact the Morro Bay State Park Museum, (805) 772-2694.

Cachuma Lake, Santa Ynez, CA (805) 568-2461

### **LOS ANGELES & ORANGE & RIVERSIDE & SAN BERNARDINO COUNTIES**

Ballona Lagoon Marine Preserve, Marina del Rey, CA. (310) 306-5078.

Big Bear Valley Preserve, Sugarloaf, CA. (714) 866-4190.

Bolsa Chica Ecological Reserve, Huntington Beach, CA. (714) 897-7003.

Huntington Beach Wetlands, Huntington Beach, CA. (714) 963-2123.

San Jacinto Wildlife Area, Lakeview, CA. (714) 654-0580.

San Joaquin Freshwater Marsh. UC Irvine Nature Reserve, Irvine, CA (714) 856-6031.

Upper Newport Bay Ecological Reserve, Newport Beach, CA, (714) 640-6746.

### **FAR SOUTHERN CALIFORNIA**

Imperial Wildlife Area (Wister Unit), near Salton Sea. (619) 359-0577.

Salton Sea National Wildlife Refuge, Calipatria, CA. (619) 348-5278.

Sweetwater Marsh National Wildlife Refuge, Chula Vista, CA. (619) 575-1290.

Tijuana River National Estuarine Research Reserve, (619) 525-3613. Fish & wild life in S.D. (619) 557-5063, (619) 796-4270, (619) 643-4270

Tijuana Slough National Wildlife Refuge, Imperial Beach, CA. (619) 575-1290.

### **DESERT AREAS**

Amargosa Canyon Preserve, Tecopah, CA, (619) 256-3591.

Big Morongo Valley Regional Park and Preserve. Route 62 between Desert Hot Springs and Yucca Valley, (619) 363-7190.

Joshua Tree National Monument, 49 Palm, Oasis, Barker Dam, or Cottonwood Springs Oasis, (619) 367-7511.

Efton Canyon Natural Area, 45 miles east of Barstow, (619) 256-3591.

Death Valley National Monument (619) 786-2331.



