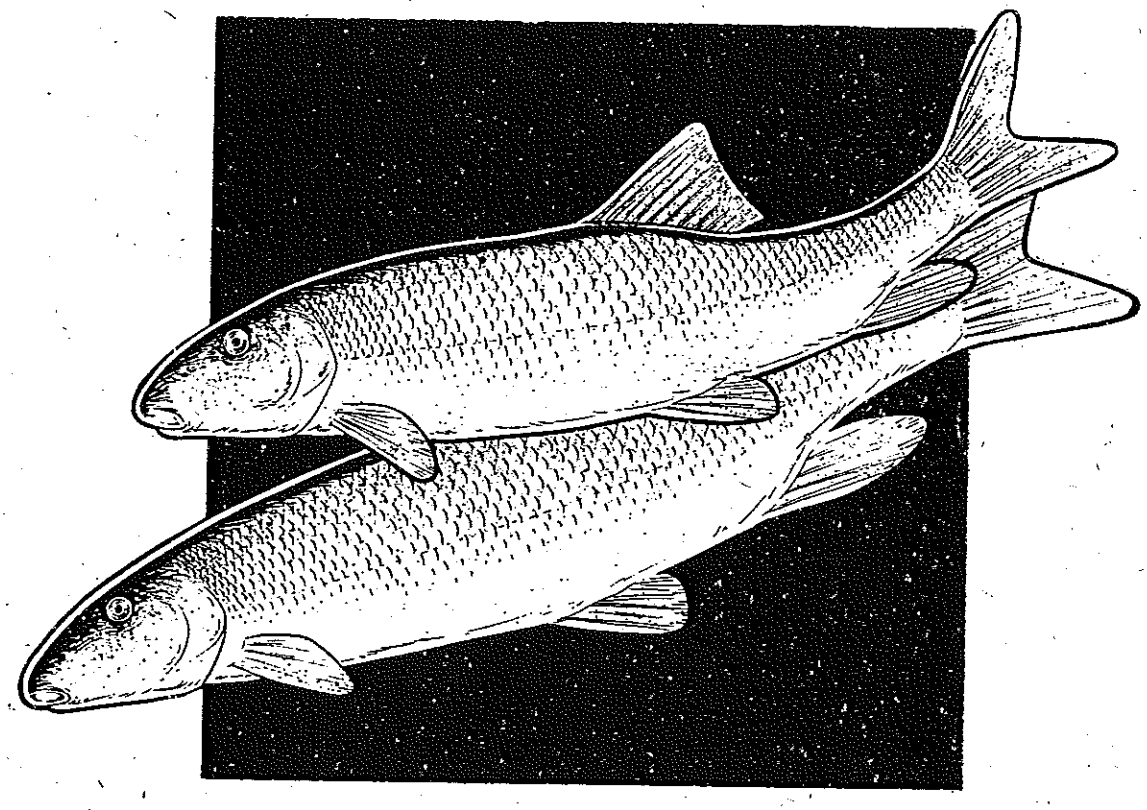
Cosumnes River Preserve

curriculum—grades 4-6



Cosumnes River Preserve
13501 Franklin Blvd.
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(916) 684-2816
1995

outline

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Much of the material contained within was adapted from other curricula. Each source is credited with the related activity.

Please Note:
Cosumnes River Preserve Staff welcomes any comments/suggestions on this first edition curriculum. With your input, the next edition promises to be even better.

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introduction

Do not try to satisfy your vanity by teaching a great many things. Awaken people's curiosity. It is enough to open minds; do not overload them. Put there just a spark. If there is some good inflammable stuff, it will catch fire.

Anatole France

Welcome to the Cosumnes River Preserve, a cooperative project of The Nature Conservancy, Ducks Unlimited, the U.S. Bureau of Land Management, California Department of Fish and Game, The Wildlife Conservation Board, Sacramento County Department of Parks and Recreation, and the American Farmland Trust. These organizations work together on this Preserve to conserve agricultural lands, restore freshwater wetlands, and to protect and expand the best remaining example of valley oak riparian (streamside) forest left in the world. This 5,400-acre Preserve is located on the eastern edge of the 1,153-square-mile Sacramento-San Joaquin Delta, which is a rich network of waterways, wetlands, and (in this century) agricultural land.

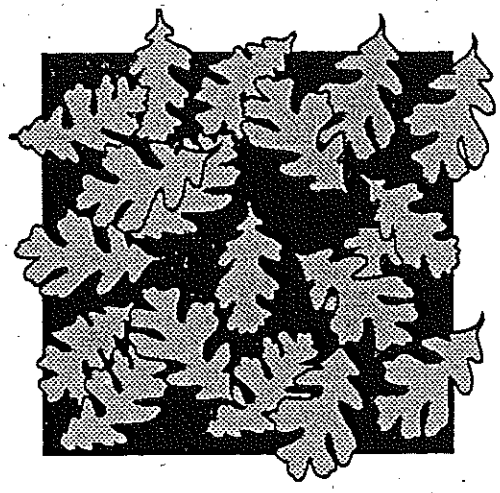
We are pleased that you have requested these materials and look forward to your field-trip to the Preserve. As you prepare for the trip and review the following pages, you will notice some reoccurring themes. These are the fundamental concepts we hope students will grasp as they venture out onto the Preserve—we also hope that they bring them back to the classroom and their personal lives. Please take the time to discuss the following concepts with your students:

1. The Cosumnes River is the last undammed river flowing from the Sierra Nevada through California's Central Valley and ultimately to the Pacific Ocean. The river is partially channelized and levied (especially near agricultural lands) to control flooding. Because the river is not dammed, it floods naturally in some areas, and this flooding creates some important environmental conditions.

2. Natural flooding still occurs in winter and spring. This flooding is the key ecological process underlying the natural regeneration of the rare valley oak riparian forest. Flood waters are beneficial to valley oak forests in several ways: (1) they deposit rich silty soils which nourish existing valley oaks; (2) they drown small herbivores, such as mice, which normally eat acorns (oak tree "seeds"), leaving larger numbers of acorns to sprout; and (3) they scour weeds from the landscape, cutting down on competition for soil nutrients and moisture and clearing the way for oak seedlings.

3. Restored and created freshwater marshes are managed to provide habitat for migratory waterfowl spending the winter at the Preserve. Central Valley wetlands have gradually been lost over the years. The Preserve is committed to protecting many species of birds that are dependent upon seasonal and permanent wetlands. This includes increasing the acreage available as habitat for these animals. A bird's basic mission when it comes to the Central Valley in the winter is to rest-up and get fat. They are preparing for the spring return to their nesting grounds and the rigors of raising young. The Delta marshes at the Preserve provide precisely what these birds need before flying north in early spring.

The natural flooding that occurs at the Cosumnes River Preserve in the winter also explains why we encourage your visits in the spring and fall. The following activities are actually designated for those two seasons, though you will see that many can be used interchangeably. Enjoy your visit, and please do not hesitate to call Preserve Outreach Coordinator (916-683-1700) if you have any questions.



fall





What's On the Menu at the Preserve?*

Background

The Cosumnes River Preserve is committed to restoring freshwater wetlands to increase the Pacific Flyway's populations of migratory waterfowl (ducks, geese, and swans). The Preserve's wetlands provide habitat critical to the survival of diverse animal and plant species. Because the Cosumnes River is the last remaining undammed river flowing from the Sierra Nevada through California's Central Valley and ultimately to the Pacific Ocean, it provides a unique aquatic habitat and supplies the lifeblood of the Preserve's various habitats—water!

Historically, heavy seasonal rainfall in the Central Valley resulted in flooding and extensive seasonal wetlands. Today, less than 4% remain, due to filling of wetlands and damming of rivers. Although dikes and levees in the Cosumnes floodplain reduce naturally occurring wetlands as well, natural flooding still occurs. In addition, the Cosumnes River Preserve purposefully floods and manages seasonal wetlands to provide much-needed habitat.

Migratory waterfowl and other resident birds that depend on these rich wetlands find nourishment in an amazing variety of foods. Wetland grasses, sedges, rushes, and wetland wildflowers dominate this environment and are complemented by thousands of insects, other invertebrates, reptiles, amphibians, and mammals.

Like many other winter visitors, sandhill cranes live temporarily on the Preserve to rest, eat, and get fat in preparation for their migration north at the end of the winter. (They will eventually nest and raise their young in northeast California, Oregon, Canada, and Alaska.) During their stay at the Preserve, they eat mostly carbohydrates (grains, wheat shoots, tuberous plants, spike rush, sedges, etc.) for

* This activity is adapted from *Salt Marsh Manual: An Educator's Guide, Trekking the Refuge* (Newark, California: San Francisco Bay National Wildlife Refuge, 1992), p. 153.

winter food. Then, just before the strenuous trip north, they eat foods rich in proteins (insects, frogs, mice, even small birds).

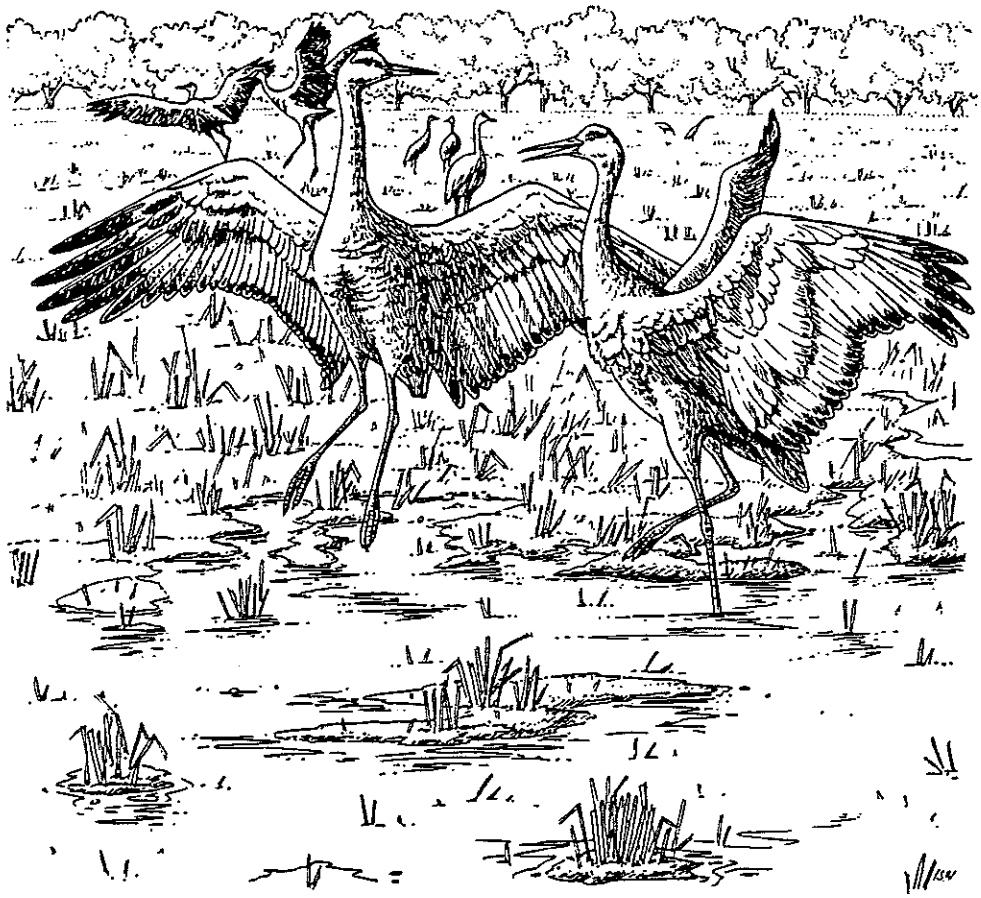


Illustration by Inga Wiess, Sea Reach Ltd.

Objectives

Students will create 10 "ID" cards for wetland foods and will be able to identify various wetland plants and animals found at the Preserve. In addition, they will understand the usefulness of wetland plants and animals to migratory birds, and they will be able to calculate the round-trip mileage and fuel costs for their upcoming trip.

Materials

- Index cards or card stock cut into 3" x 5" pieces—5 pieces per student
- Thin-tipped colored markers and crayons
- Pencils
- Laminating material or contact paper
- Reference books or field guides
- "Wetland Identification Cards" (xeroxed from this packet)

Procedure

Tell the class they are going to become "Cosumnes River Preserve Food Specialists." Ask them to work in pairs—each pair researching one of the species found on the "Wetland Identification Cards": smart weed, tule tubers, a sedge, elderberry, wild rose, valley oak, dragonflies, mosquitoes, diving beetles, tree frogs, bull frogs, mice, garter snakes, pond turtles, blue heron, and dowitchers. They should include as much descriptive information as will fit on an index card (including a color sketch), concentrating on where the plants and animals are found and what the animals eat. This research might be done over one or two weeks.

Have the researchers bring their reference materials to class and display them so that other students can also record the information Set up a mini-Preserve-library-corner and allow everyone to gather information about and make an ID card for all the other species. Upon completion, each student will have five cards (two species per card, one on each side) filled on front and back with this information. If possible, have the cards laminated for use in the field (on-site at the Preserve) or cover them with contact paper.

Discuss the upcoming visit to the Cosumnes River Preserve. Tell students that they will be looking for signs of the plants and animals they have just studied. Explain that for migrating birds, the Preserve is like a fantastic restaurant offering "wetland delicacies" to its visiting waterfowl.

Remind students to take their ID cards with them to the Preserve. They will try to locate as many of the plants and animals as possible during their visit.

Finally, prepare the students for their "migration" to the Preserve. Discuss the fact that they too will be making a sort of migration in which they will travel to the Preserve and then back to school. Next, complete the following questions:

1. Estimate the number of miles between the Cosumnes River Preserve and your school. How many miles will a round trip be?

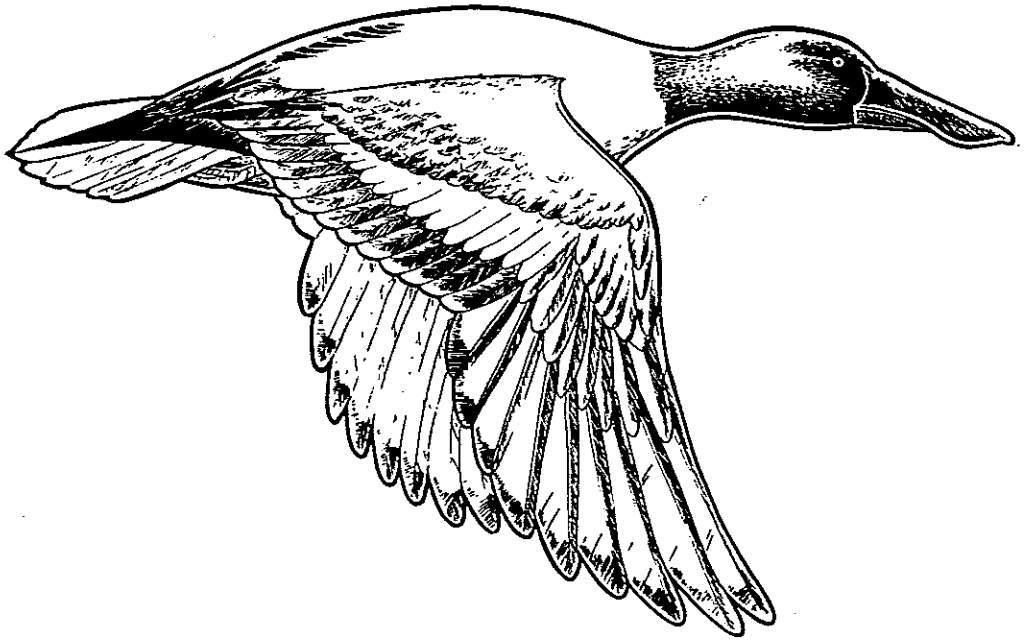
2. What form of transportation will you take? Bus, car, van? Provide students with the fuel consumption (miles per gallon) for the vehicle.

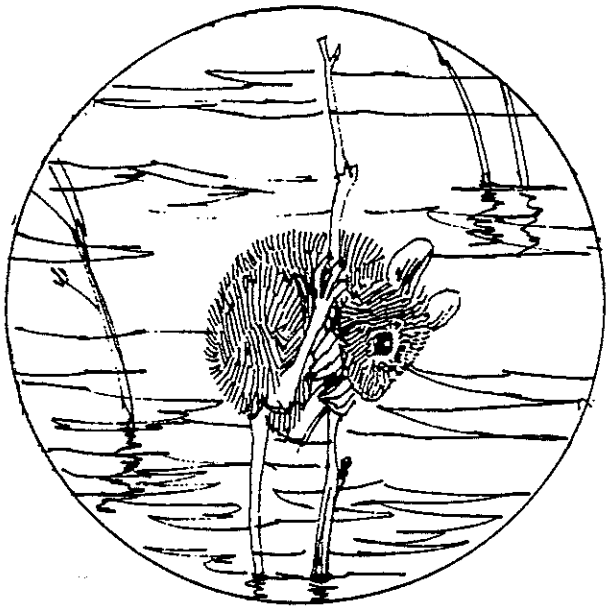
3. How many gallons of gas (a non-renewable fuel) will be used for the round-trip?

4. How much will transportation cost?

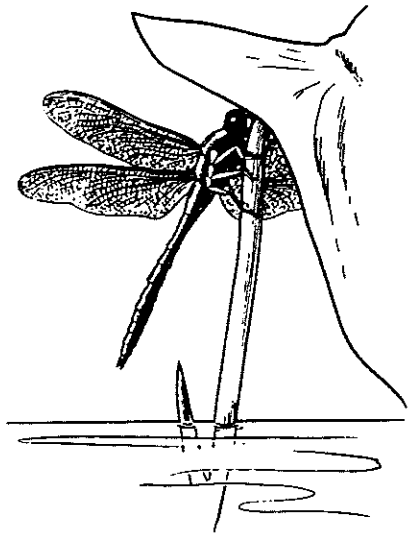
5. Discuss how to make the trip "worth it."

6. Make a mileage comparison using the distance from Sacramento to San Francisco (80 miles one way, 160 miles round trip). Consider the distance a Swainson's hawk flies on its annual migration north (average distance is 16,000 miles). How many round trips from Sacramento to San Francisco would that be? The Swainson's hawk takes approximately six weeks to make the annual trip. How many miles per day must the Swainson's hawk fly to complete its journey? (Average speed of flight for the Swainson's hawk is 15 miles per hour!)

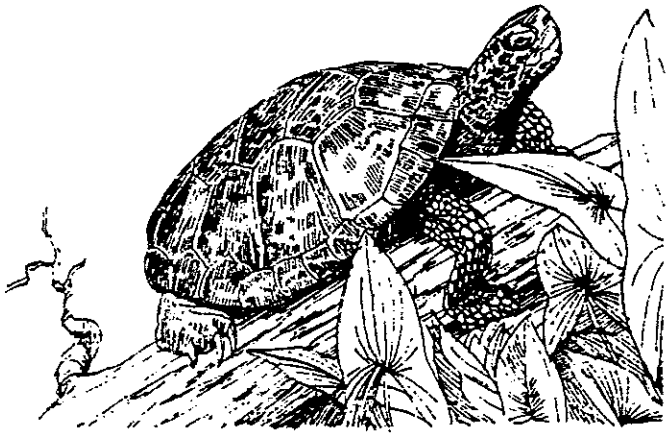




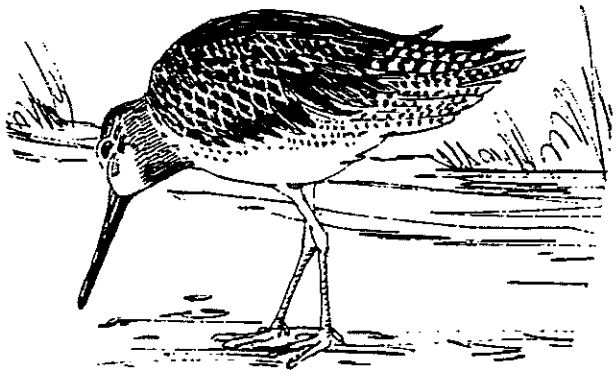
Mouse



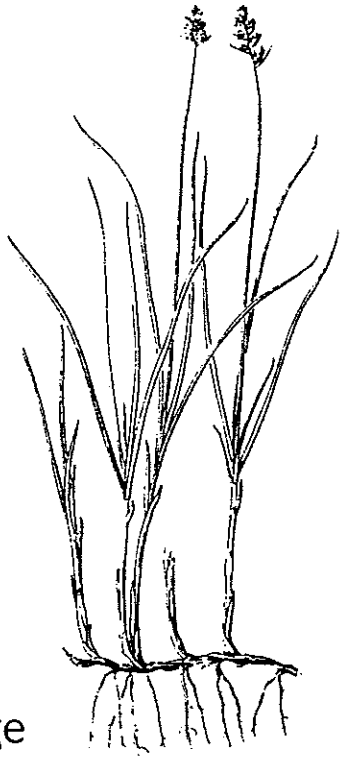
Dragonfly



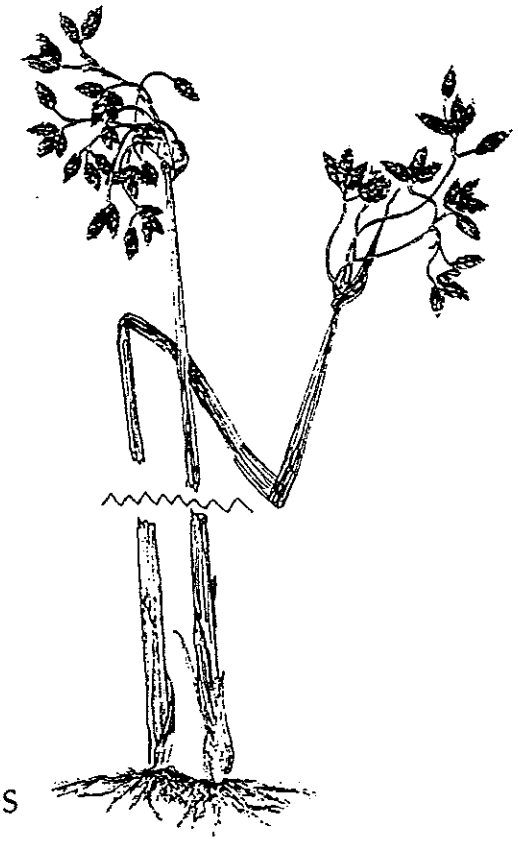
Western pond turtle



Dowitcher



Sedge



Tules



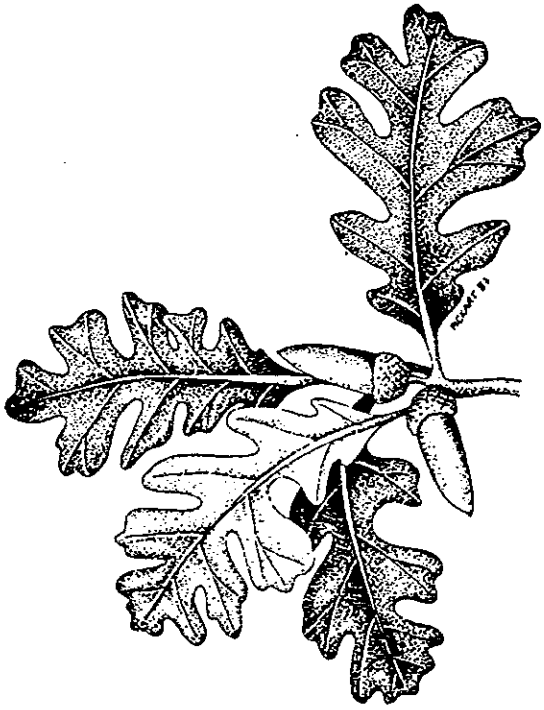
Elderberry



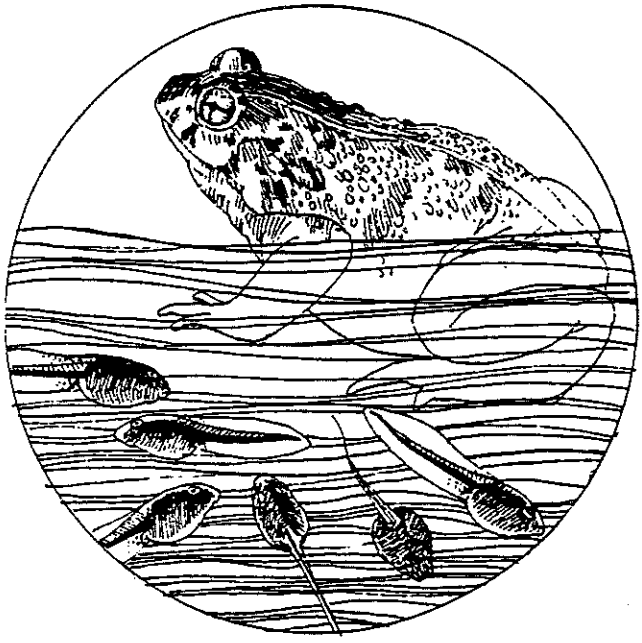
Smartweed



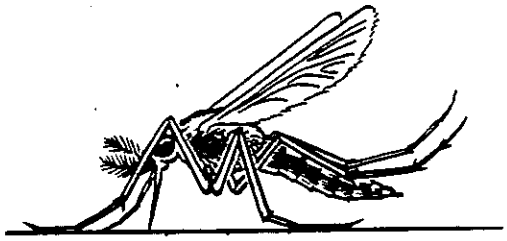
Wild rose



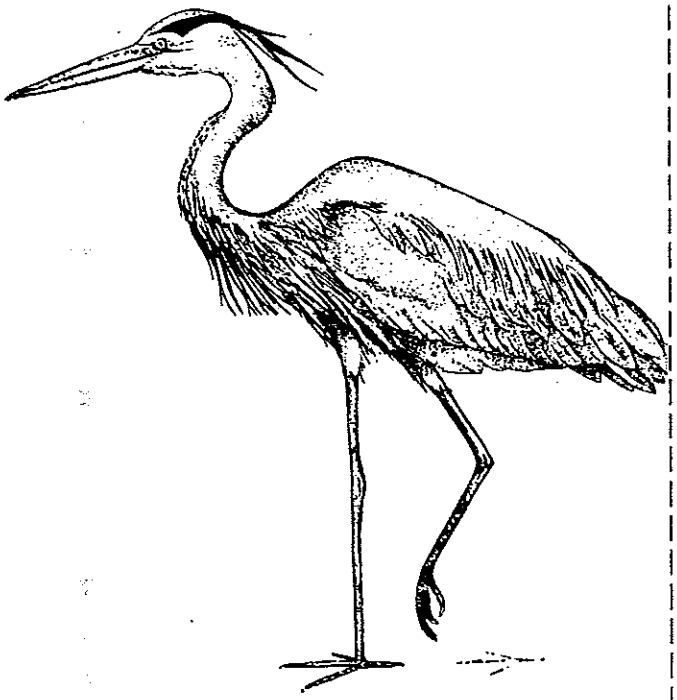
Valley oak



Bull frog (and tadpoles)



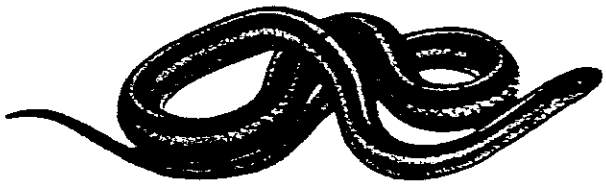
Mosquito



Great blue heron



Tree frog



Garter snake



Diving water beetle

Extensions

- Design a menu for a migratory bird restaurant. Do not forget to include a good assortment of carbohydrates (wheat shoots, tuberous plants, spike rush, sedges, etc.) for winter food, and proteins (insects, frogs, mice, even small birds) for building up fat reserves just before the birds migrate to the north where they will nest.

- Photo-copy and use the drawings as name-tags on the day you visit the Preserve.

- Request the "Birds of the Cosumnes River Preserve" species list from the staff at the Visitor Center. Use it to make predictions about what birds you will see when you visit. If you want to see a Western kingbird at the Preserve, which month would be best for a visit? During which months would you see the greatest variety of birds? When would you see the least birds? Be sure to study the outdoor interpretive exhibits on the porch of the Cosumnes Visitor Center when you arrive. What else is happening during the month of your visit?

What Makes a Habitat a Home?

Background

Careful observation is the key to knowledge and to gathering information about our environment. Practicing field observation skills at the Cosumnes River Preserve will ensure that you and your students make the most of your visit. Every aspect of the environment is worthy of note: how the air feels, what the sky is like, what sounds you hear, the texture of the soil, the colors of the fallen leaves, ripples in the water, thorns on a vine, tracks you spot in the muddy river bank, the size of the gall on the oak tree, and.... The diversity of distinct habitats at the Cosumnes River Preserve is enormous, and comparing observations about different areas will provide a rich environmental study.

In the pre-visit activity suggested above, you and your students focused on wetland plants and animals. For this activity, the seasonal wetlands along the Willow Slough trail, the valley grasslands, the oak riparian forest, tidal wetlands, and the river habitat are all within reach and we encourage you to use them with your students. (Agricultural lands are abundant on the Preserve as well, but are not convenient for up-close student observation.)

Finally, each area provides rich habitat for a host of plants and animals. As your students visit the various areas, help them recall the common aspects every home, or habitat, provides for a species: food, water, shelter or cover, and space.

Seasonal Wetlands

Wetland grasses, sedges, rushes, and wetland wildflowers dominate this environment and create habitat for amphibians, reptiles, mammals, thousands of insects and many other invertebrates. The Preserve's seasonal wetlands also attract thousands of migratory waterfowl and shorebirds, as well as providing habitat for many resident birds. More than 200 bird species frequent the Preserve. The better known migrants include sandhill cranes, tundra swans, Canada geese,

and ducks such as the northern pintail, cinnamon teal and American wigeon. Important residents include the great blue heron, great egrets, American avocets, and raptors like the Northern harrier.

Valley Grasslands

Beyond the river's floodplain, the upland topsoil is underlain by a hardpan layer of compacted clayey soil. This compacted, impenetrable barrier restricts tree growth and encourages grassland habitats. Refreshingly green during the wet season and parched brown by summer, this habitat supports various native grasses, wildflowers, and occasional trees along with insects, birds, and mammals. Some of the insect species you may find during your visit include beetles, aphids, flies, bees, wasps, butterflies, crickets, and grasshoppers.

Oak Riparian Forest.

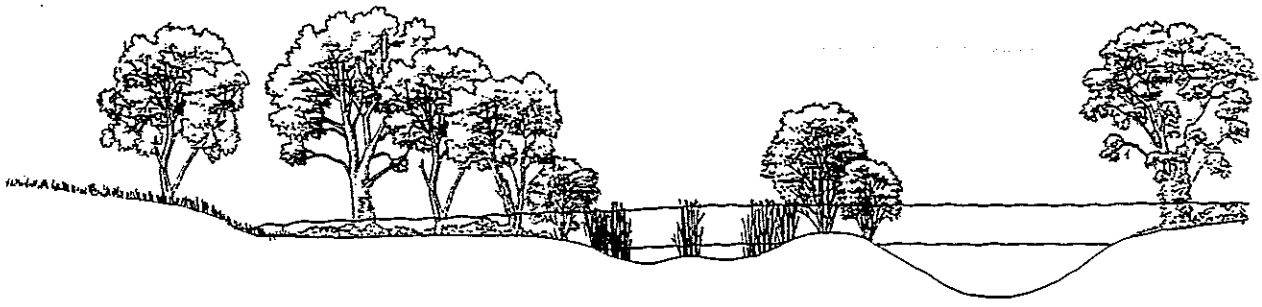
The Cosumnes River Preserve protects one of the last remaining valley oak riparian (streamside) communities. Valley oak forests were historically cleared for farming and development. Natural regeneration still occurs here, but dedicated volunteers are helping to speed the process by planting native species. In the underlayers of the forest, you can find wild grape, poison oak, berry vines, wild rose, and nettles. Cottonwoods and willows dominate the river's edge, and Oregon ash, box elder, and buttonwillow are found on the more stable lower terraces. You are likely to spot signs of wildlife in this area: holes along the trails made by burrowing mice and other rodents; nibbled young tree trunks (evidence of beaver); and various mammal tracks (raccoon, beaver, river otter). Birds you might see in the forest include wood ducks, great horned owls, cedar waxwings, rufus-sided towhees, and scrub jays to name a few.

Tidal Wetlands.

Although the Cosumnes River Preserve is nearly 100 miles from the Pacific Ocean, the river and its sloughs are subject to tidal influence. Tide waters entering San Francisco Bay push fresh water inland and up the Cosumnes River to create freshwater tidal wetland habitat. You will see tules and cattails growing together in the tidal marsh, as well as buttonbush, sedges, and marsh primrose. Again, though wildlife are present, you may only see signs left by raccoons, bull frogs, turtles, garter snakes, and blackbirds.

Cosumnes River.

The Cosumnes River is the last remaining undammed river flowing from the Sierra Nevada through California's Great Central Valley and ultimately to the Pacific Ocean. The river provides a unique aquatic habitat and supplies the lifeblood of the Preserve's various habitats—water! Here you will see valley oaks, sandbar willows, and box elders among the trees and shrubs, and wild roses among the understory plants. You may also be able to observe various fish. Carp and channel catfish, both introduced, are most commonly seen. Turtles, salamanders, frogs, and lizards are also common. Lucky visitors may catch sight of river otters or a beaver. The river is home to legions of insects—look for dragonflies, mosquitoes, and water beetles.



Grasslands Oak Riparian Forest Slough River

Objectives

Students will recognize five different vegetation zones. They will record data reflecting their observations, and they will recall the common aspects that every habitat provides.

Materials

- Clipboards with paper held on with rubber bands—one or two per small group
- Pencils
- 12" rulers—one per small group
- Plant and animal identification/field guides - available to borrow from the Cosumnes River Preserve Visitor Center
- Copies of Botany Data Sheet, Signs of Wildlife Data Sheet and General Observation Data Sheet—one each per group (xeroxed from this packet)
- Magnifying glasses, one for each group if possible.

Procedure

Many of the areas you will investigate include trees. You may want to teach the class how to measure the height of a tree before your trip to the Preserve. If so, practice the following exercise in the school yard first:

1. Choose a stick the same length as your arm held out in front of you.

2. Now hold stick upright to form a right angle.

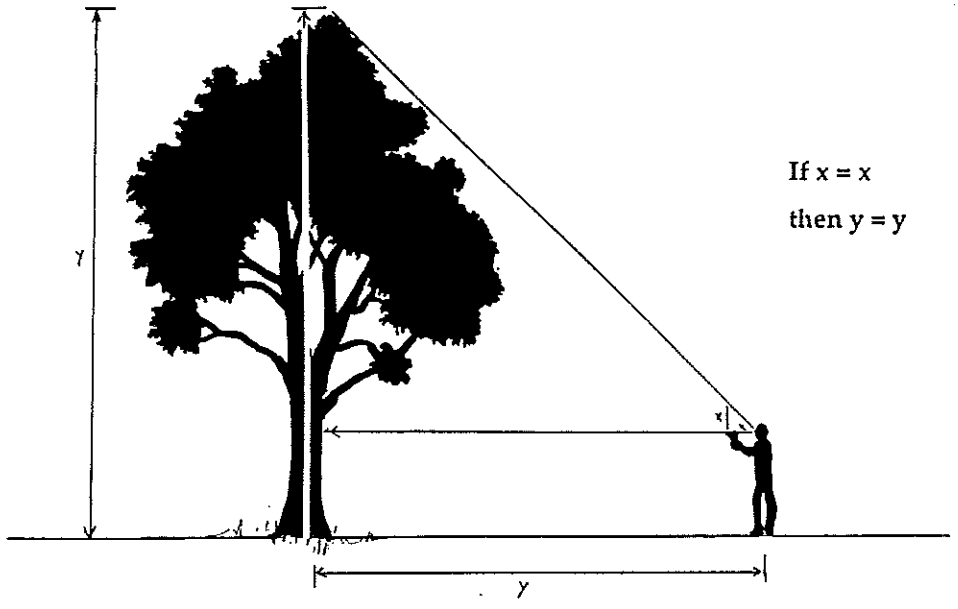
3. Walk backward away from the tree on level ground, sighting across the upper end of the stick you are holding upright and the bottom of the stick above your fist.

4. Continue to walk backward until you can see the top of the tree at the top of the stick and the bottom of the tree at the top of your fist.

5. You are now the same distance from the tree as its approximate height.

6. Measure the distance between yourself and the tree and you will have its approximate height.

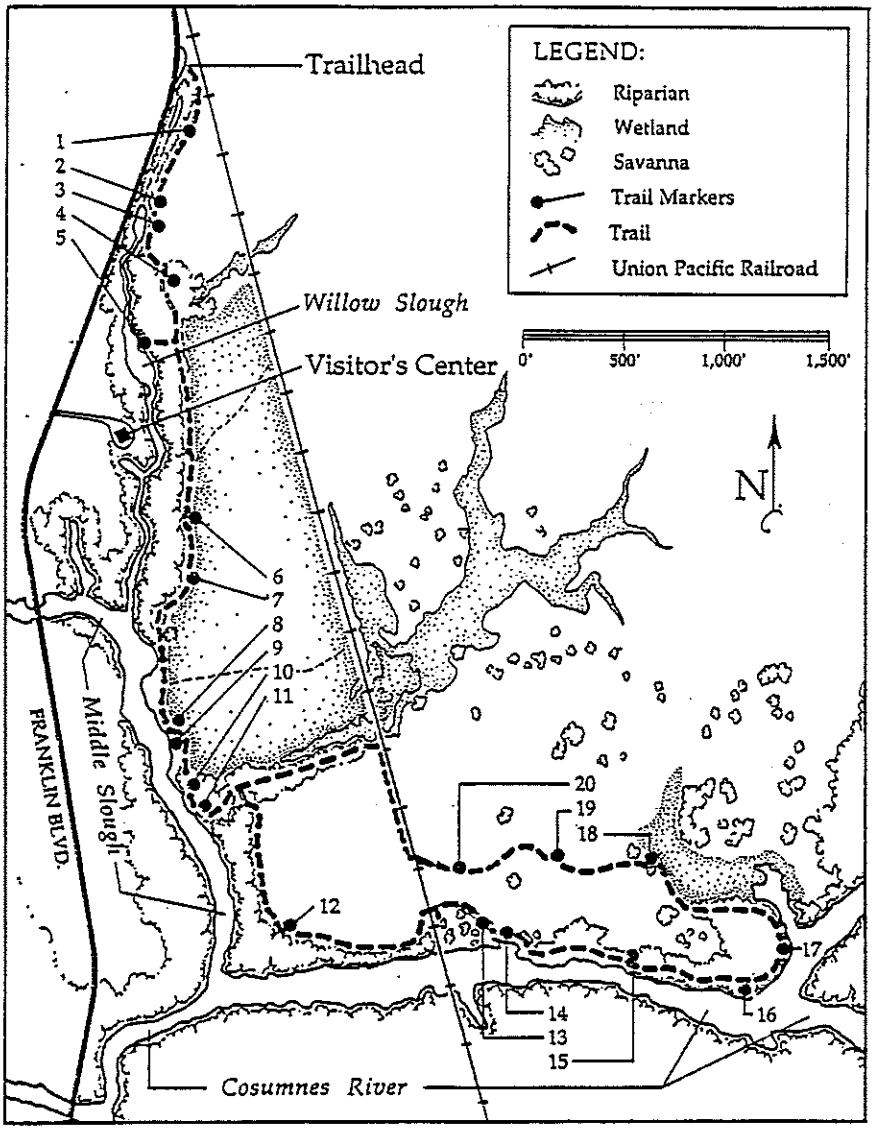
7. Number of steps _____ x length of step _____ = height of tree.



Suggested Location

Trail markers:

3, 4 or 5 (tidal wetlands)
6, 7 or 8 (seasonal wetlands)
12 (oak riparian forest)
13 or 16 (Cosumnes River)
19 or 20 (valley grasslands)



Map by Betsy Clark

Note: You may venture off the trails in these areas and choose your own study sites if you wish. Please remind students of proper outdoor behavior in every case, but especially if they will go beyond the trails.

Before visiting the Preserve, prepare students with information about the habitats they will encounter. Remind students that nature is best observed while you are still and quiet. Disturb the site as little as possible. Avoid trampling and uprooting plants. Return rocks and sticks to their original position if you move them. Never disturb nesting animals or animals with young. Remember, in natural areas you are the visitor. Act with respect and you will be rewarded with knowledge!

Decide in advance if you will ask all students to make observations about each of the four habitats, or have small groups concentrate on one habitat and then report their findings to the class. In either case, divide students into small groups, each accompanied by a chaperone. Once at the Preserve, have the students look over the study areas and make some general observations. Then distribute Data Collection sheets to each group. Suggest that the chaperone record most of the students' observations, allowing individual students to make notes or drawings about particular things they are drawn to.

Weather conditions, any special features of the area, or places where animals have gnawed the vegetation will all help students remember the site once they have returned to school. Notice human impact, like trails or litter, and be sure to note them. Please remove all litter. Personal impressions, including things students like and did not like count as well!

Note: poison oak is very common on the Cosumnes Preserve. It may appear as low ground cover in shaded areas, or as a robust shrub on sunny open areas—poison oak also climbs up into valley oak trees. The bark of a poison oak vine is smooth compared to wild grape. Get to know this plant—but only from a distance! Many people are severely allergic to the potent oils released from the leaves and stems of this cantankerous member of the sumac family. The best protection is avoidance.

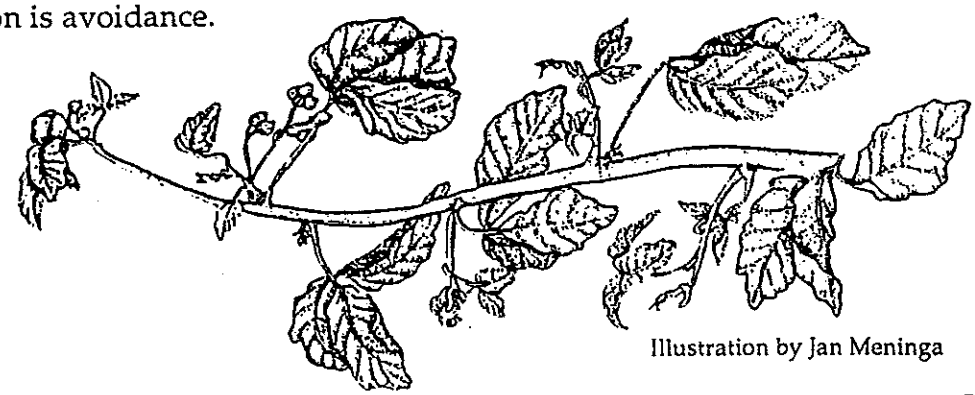
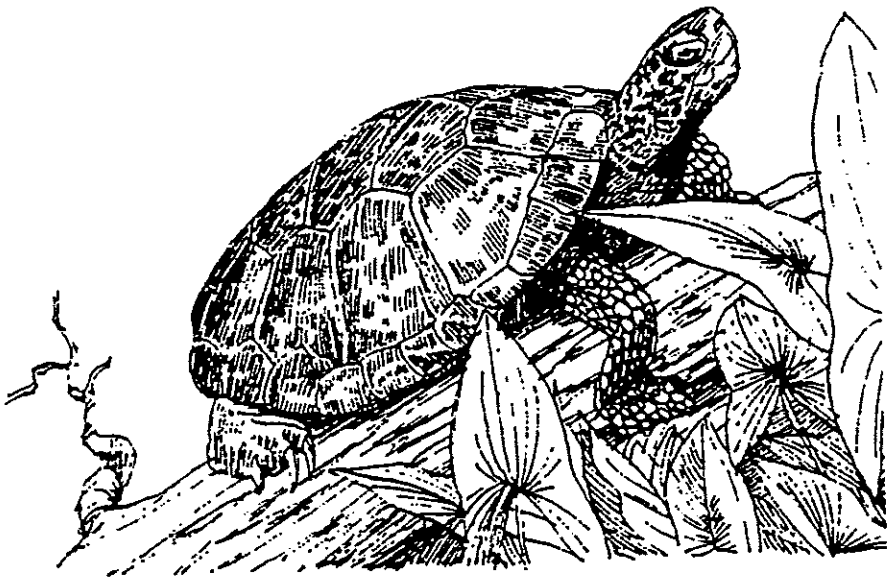


Illustration by Jan Meninga

Note: Before leaving the Preserve, be sure to point out the agricultural zone which was not included in the study area.

When the observation exercise is complete, gather all of the field equipment and reassemble the group in a circle, seated on the ground. As a conclusion, tell the group that everyone will do a listening observation. Students should remain quiet for several minutes and wait to hear both natural (bird songs, wind rushing through leaves and grasses, crickets, etc.) and unnatural sounds (planes, cars, trains, horns, etc.). You may decide to discuss what was heard, or simply leave the area with those sounds in mind.

Back at school or later at the Preserve, compare the data sheets for each section of the Preserve.



General Observation Data Sheet

Names: _____

Date: _____

Time: _____

Location (Trail Marker #): _____

Write or draw your observations about the following:

1. General description of area:

2. Weather conditions:

Clouds:
- ☐ covering entire sky
- ☐ covering partial sky
- ☐ no clouds

Wind:
- ☐ none
- ☐ light breeze
- ☐ gusty

Temperature: _____
- ☐ dry
- ☐ humid
- ☐ rain

3. Special features of the area:

4. What is on the ground?

5. What is growing above the ground?

6. What is in the air?

7. Smells we notice:

8. Sounds we hear:

9. Things we touched and how they felt:

10. Animals that might make their home here:

11. Evidence of people:

- ☐ trails
- ☐ planting
- ☐ clearing

sounds:

- ☐ cars
- ☐ trains
- ☐ planes
- ☐ jet stream
- ☐ litter
- ☐ other _____

12. Personal impressions/our favorite things:

Botany Data Sheet

Names: _____

Date: _____

Time: _____

Location (Trail Marker #): _____

Write or draw your observations about the following:

1. Number of different plants in study area:

2. Which plants are found in the study area?

Grasses:	Forbs:	Shrubs:	Vines:	Trees:
☐ absent	☐ absent	☐ absent	☐ absent	☐ absent
☐ present	☐ present	☐ present	☐ present	☐ present
☐ flowers	☐ flowers	☐ flowers	☐ flowers	☐ flowers
☐ seeds	☐ seeds	☐ seeds	☐ seeds	☐ seeds

3. Trace or draw and label a leaf from the two most common plants in the study area.

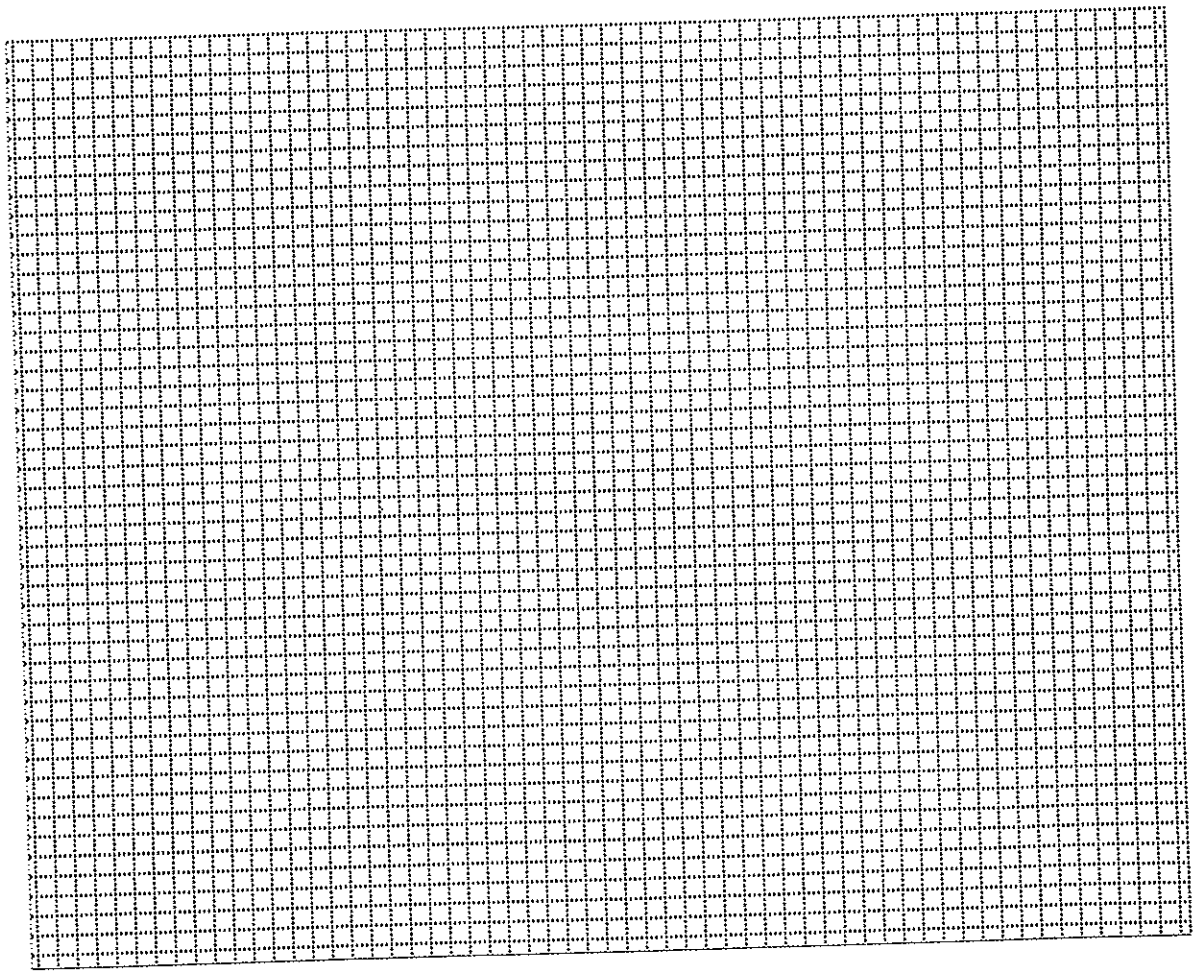
4. Measure and record the height of the tallest tree, shrub and grasses in the study area:

	tree	shrub	grasses
height	_____	_____	_____

common name
or description:

5. Evidence of flooding?

6. Draw a map of the study area.



Signs of Wildlife Data Sheet

Names: _____

Date: _____

Time: _____

Location (Trail Marker #): _____

Look for signs of wildlife in the study area. Check the ones you find and try to determine the animals that left them. In the boxes below draw or write about what you discover.

mammal track	bird track
broken or matted grass	chewed tree or sticks
pile of branches near water	hole in the ground

holes in trees	scat
broken seeds or acorns	path through grass
oak gall	nest
path through earth	leaves with holes
Other signs	Other signs

Extensions

- Do a nature walk around your school. How are the habitats here different from those you experienced at the Cosumnes River Preserve? How are they the same?

- Make a mural of the Preserve for your classroom. Include all the different habitats you observed. Invite another class to see the mural before they visit the Preserve. Give students from the other class a "mini-expedition tour" through your mural.

- Write a "mini-expedition tour guide" for someone who lives far away and probably will not have the opportunity to visit the Preserve. Write a "Looking into the Future" story about how the Preserve will change over the next ten years. Think about things like the trees that volunteers have planted. How will they look in ten years? What animals will depend upon them for habitat? How will they change the soil around them? How will they change the air we breathe?

- Organize a Parents' Night where the students report on their field trip. Have them narrate a slide show or tell stories about their adventure and what they learned.

Homing-in On Habitat*

Background

> *You cannot begin to preserve any species of animal (or plant) unless you preserve the habitat in which it dwells. Disturb or destroy that habitat and you will exterminate the species as surely as if you had shot it.*
>
> Gerald Durrell†

What does a mallard duck do when the marsh where it has been living is filled-in with soil and becomes an apartment complex? What happens to a Nuttall's woodpecker when its forest home is bulldozed and becomes a shopping center? In this activity, students will find out how changes to habitat can affect birds and other animals. They can also explore their feelings about habitat changes in their community.

Objectives

Students will be able to explain how habitat changes affect birds and other wildlife and describe three ways people affect habitat.

Materials

- Reference books/field guides

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* This activity is adapted from Birds, Birds, Birds in Ranger Rick's Naturescope (Washington DC: National Wildlife Federation, 1992), p. 35.

† Gerald Durrell, *Two in the Bush* (New York:Viking Press, 1966).

Procedure

Talk with students about the competing demand for land. Make a list of all the ways the land in your community is used (farms, roads, parks, gas stations, recreation centers, houses, shopping centers, movie theaters, apartment buildings, offices, wildlife refuges, churches, and so on). Then talk about the different types of habitat that exist in your area (meadows, deciduous forests, streams, ponds, marshes, grasslands, and so on.) Ask your students how they think their neighborhood has changed in the last 50 years. Did a forest once grow where a field now exists? Did a field once exist where a shopping center now stands? Did a park exist where a church or school now stands? Have some areas stayed the same?

Have each person become a "Community Detective" and try to find out how things have changed. Have them talk to their grandparents, neighbors, teachers, or other people who have lived in the community for a long time. Give students a few days to ask questions and do research at neighborhood libraries. Then have each person report on what he or she found. If students did not realize that habitats had been eliminated before they were born, ask them to imagine what their neighborhood might look like to their own grandchildren.

Pick out one example of a habitat change that several of the children have discovered. For example, a forest may have covered the area where the school now stands. Ask the students what types of birds might have lived in the forest that was cleared. List the different species on the board. Then ask what happened to these birds. (They probably flew away when the clearing began. They may have had trouble finding new homes. Any nestlings would probably have been killed. A few of the species probably returned after the school was built.) If every generation of human beings eliminates a little bit of habitat, what will happen?

It is important for children to understand that habitat changes involve trade-offs. When a forest is cleared and a baseball field or ice-skating rink is built, people get a recreation facility they enjoy. But most of the animals and plants that lived in the area lose their homes—and sometimes their lives!

Next divide the group into teams and have each team try to come up with five reasons why birds are important to people, other animals, and to plants. (Birds provide food for people and other animals, they help spread seeds, they eat

many pest insects, many are scavengers that help get rid of decaying plants and animals, they add variety and color to our lives, and so on.) Discuss the reasons each team came up with. Then ask how the needs of people and wildlife often conflict. Houses, shopping centers, schools, churches, libraries, and other structures often conflict with the need to protect habitat. Explain that when there is conflict it is usually wildlife habitat that suffers. Then ask how the needs of people, wildlife and natural areas can benefit one another. Answers may include:

1. bees pollinate crops (e.g. alfalfa, orchards, sunflowers).
2. waterfowl help break down crop stubble and work it into the ground, enriching the soil for the next season.
3. songbirds are tremendous predators of insects (swallows eat mosquitoes).
4. raptors prey on rodents (e.g. mice and gophers) that are agricultural pests.
5. some of the many benefits of wetlands include filtering impurities, recharging groundwater, absorbing floodwater, etc.
6. waterfowl, quail, deer etc. are hunted for food and recreation.
7. natural areas provide spiritual renewal for people (for example, studies have shown that people in hospitals recover more quickly when they can see trees from their windows.

Further, people benefit wildlife in many ways, including:

8. protecting habitat in parks, refuges, open space areas.
9. farmers flood up grain crops to attract waterfowl (for reasons listed above, #2 and #6).
10. some animals such as coyotes, raccoons, gulls, and crows thrive near humans by living off of our waste.
11. providing boxes for nesting wood ducks and bluebirds.
12. hedgerows in agricultural areas act as barriers to insect pests and provide habitat to other wildlife.

With older students, discuss some of the reasons for continuing loss of habitat:

- In many areas, human populations are growing so fast that habitat must be cleared to build houses and plant crops.

- Many people do not understand the needs of wildlife and why it is important to protect habitat. People ignorant of the issues often make decisions that do not take wildlife into account.

- People want a higher standard of living—bigger houses, more shopping centers, more roads, and other conveniences.

- As people consume more and more material goods, and use more energy, habitat loss increases too. For example, many forest areas are cleared to harvest timber that will be used to make furniture, fences, pool tables, and other consumer products. Habitat is also lost or altered as oil is drilled and coal is mined. Coal and oil provide us with energy and are also used to make many consumer products, such as plastics and paint.

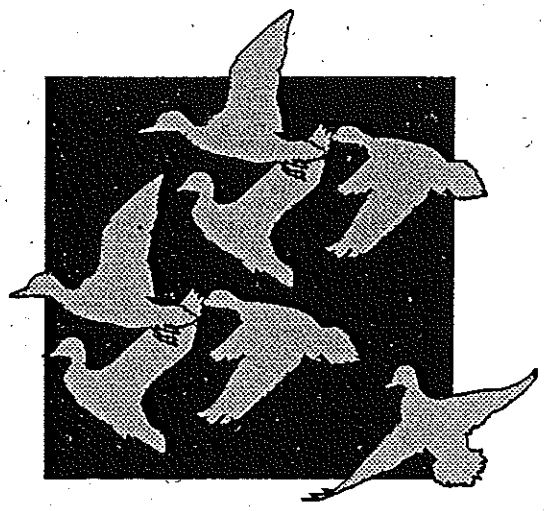
Talk about some of these problems and the need for compromise. Ask your students if they would be willing to change the way they live in order to protect habitat. For example, would they be willing to give up swimming on a section of local beach to protect seabirds or turtles that nest there? Would they give up riding mountain bikes through streams if it meant that certain animal homes would be protected? Would they not eat at fast food establishments that use plastic throw-away containers?

Extensions

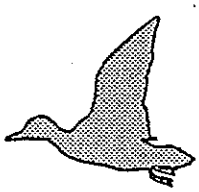
- Divide students into research teams. Have each team report on one animal in the Sacramento Valley that is in trouble because of habitat loss. Then, make a bulletin board about each of the animals selected (some California threatened and endangered animals: grizzly bear, California condor, giant garter snake).

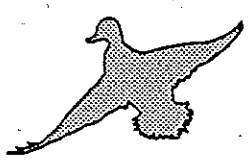
- Find old and new maps of your area or state. Are there any areas where there used to be wetlands that are no longer there? If yes, what happened to these wetlands?

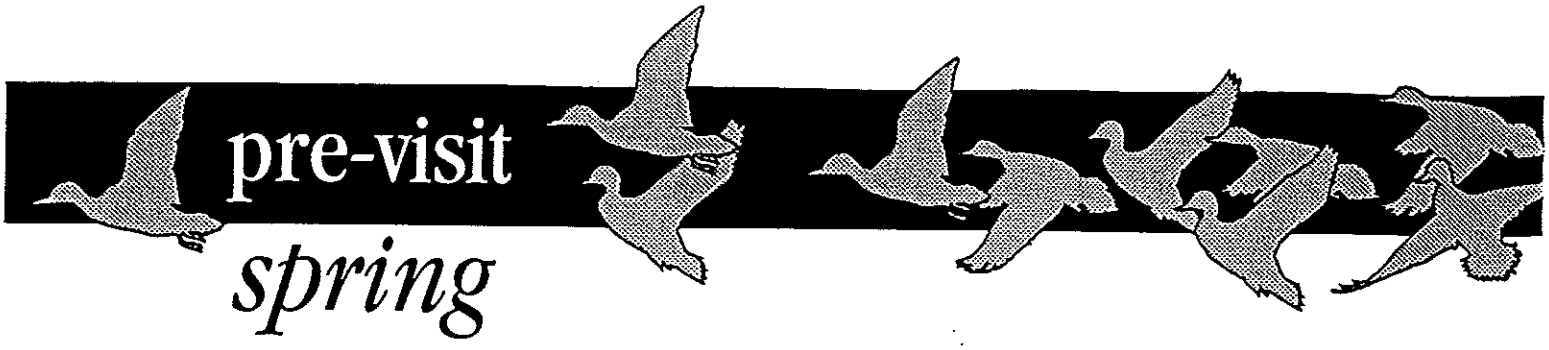
- Consider common misuses of land (i.e. dumping trash, hiking off trails, using off-road vehicles where they are prohibited). What alternatives are more compatible with natural areas? Make posters telling about the alternatives you come up with.



spring







Riparian Retreat*

Background

Riparian areas are the land/water interface at the edges of streams, lakes and ponds. They are important and valuable in many ways, because they provide habitat for complex biological communities. Riparian areas also support specialized plant communities whose root systems require that they be near the level of high ground water. These zones range in width from narrow ribbons in desert settings to wide bands on the plains and lowlands.

Riparian areas provide space, shelter, and food for many plants and animals. For example, leaf litter and terrestrial insects falling from vegetation into a stream are a source of detritus, providing nourishment for some aquatic life. Vegetation also provides shade from the sun for aquatic plants, animals, and land-dwelling creatures at the water's edge. The riparian plant community, especially shrubs and trees, provides shelter and food for many animals—some large like the deer and others as small as the acorn weevil. Trees and marshy areas provide shelter for nesting birds, and the banks provide homes for burrowing animals.

The riparian zone may also serve as a buffer between the uplands and the water. For example, rainfall on the uplands flowing downhill can be cleansed as it flows through a riparian zone. The banks of riparian areas store water during periods of peak flow from rainstorms or snow melt and release this water to the stream during low flow times. Riparian vegetation strengthens the stream banks. This tends to prevent erosion and maintains the stream channel, keeping the water clear. Among the many values of riparian areas are aesthetic and recreational values for humans. Humans use riparian areas for fishing, hiking, camping, bird watching, picnicking, and resting. The major purpose of this activity is for students to increase their appreciation of the importance of riparian areas.

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* This activity is adapted from *Project Wild Aquatic* (Boulder, Colorado: Western Association of Fish and Wildlife Agencies and the Western Regional Environmental Education Council, 1987) p. 31.

The valley oak riparian forest is one very special feature of the Cosumnes River Preserve. Although there are many thriving oak species among California's woodlands, today, with the exception of the Cosumnes River Preserve, it is rare to find examples of the magnificent valley oak riparian forest. These trees represent a special piece of California's natural history and once flourished throughout the Great Central Valley. Natural flooding of all of the region's rivers once provided perfect conditions for the valley oak (flood waters deposited rich silty soils which nourished existing trees; the herbivores which normally ate buried acorns and seedlings drowned, leaving adequate numbers of young trees behind; and weeds were scoured, cutting down on competition for soil nutrients and moisture and clearing the way for oak seedlings). However, extensive agricultural clearing, urban development, and flood control efforts have, with the exception of the Cosumnes River, brought an end to most natural floods—dramatically decreasing the numbers of valley oaks that "plant themselves."

Natural regeneration of the valley oak still occurs along the Cosumnes. The Preserve's staff and volunteers, however, jump-start nature by planting hundreds of trees every year.

Objectives

Following a guided imagery exercise, students will be able to describe habitat characteristics of riparian areas, identify animals that inhabit them, and state the importance of riparian areas to wildlife and humans.

Materials

- Art supplies such as water colors, acrylics, poster paints, or crayons.

Procedure

Ask which students have been to a stream or river bank. What was it like? Were there plants growing there? What did the area look like? Was it hot or cool? Simply encourage the students to talk and share descriptions.

Next, tell students that the kind of area they have described is called a "riparian area." These are important natural areas for people and wildlife. To learn more about these areas, the students will close their eyes and imagine the things you will be describing. They will be imagining these things from their own point of view, in the setting and circumstances you will describe. Invite the students to

get in a comfortable position, close their eyes, and do their best to imagine what they hear. Playing soft background music can heighten the imagination.

Tell your students they will be visiting the Cosumnes River Preserve soon as well, a special place that has a particularly important riparian area—one with valley oak trees—a species unique to California. This valley oak riparian forest makes its home along the banks of the lower Cosumnes River and supports one of California's most diverse wildlife communities.

Example narrative:

> It is a hot summer day. You are walking in a meadow filled with knee-high grasses. Here and there are masses of blue and yellow wildflowers. The ground beneath your feet is uneven, but you are in no hurry as you walk slowly toward a grove of trees. As you near the trees, you notice the many shades of green. A breeze whispers through, showing first a shiny green, then a dull green underside of the leaves. As you step into the grove of trees, you are surrounded with a welcome coolness. You immediately feel the protection of the canopy of green above your head. A tap-tap-tapping sound breaks into your thoughts. Searching about among the rough-barked trunks, your eyes finally spot a bird, black and white with a touch of red on its head, clinging to a vertical tree trunk and bobbing its head in time to the rhythmic tapping. Your eyes fill with the beauty of the setting. Your skin welcomes the coolness. As you breathe deeply, the very scent of "green" comes to you. The aroma of earth and growing things is strong and you detect here and there almost a memory of the sweet perfume of the flowers. Once in a while the strong but not unpleasant odor of wet soil and last seasons' decaying leaves and grasses catches your attention.
>
> As you explore further, you notice that the tree trunks are draped with vines. Grass, which earlier reached your knees, is being overshadowed by chest-high bushes. Although these bushes have no thorns, they nevertheless snag your clothing. Your arms are lightly scratched by the twig ends. Several of the bushes are covered with small berries, pink and pale green, ripening into red in the dappled sunlight. The bushes now are taller. You find yourself pulling aside thick, tangled willows

taller than your head. You carefully choose a safe path along the precarious trail beneath your feet. Suddenly your left foot drops six inches and, looking down to examine the terrain more closely, you notice that you stepped on the tunnel of a burrowing animal that collapsed from your weight. Moving on again you feel the soft threads of an abandoned spider web touch the side of your face. Brushing it aside, you notice the slope of the land is steeper. You pause, listening—listening! You hear the sharp sounds of many small birds high in the trees calling to one another. You can hear the high drone of insects... It has come upon you so gradually, you are surprised that you didn't hear it before... Now it seems almost frighteningly loud. Beneath the buzzing drone, and lower in pitch and volume, is the sound of water gently spilling over rocks. You notice stains on trunks of trees and old piles of debris on the ground - signs of last year's flooding when this riverbank was completely under water.

Above the place where the water must be, you see thousands of tiny spots moving before your eyes, the creators of that high buzzing sound. The spots are hundreds of swarming insects in a cloud too thick to imagine. A dragonfly flashes by with its iridescent pinks and greens, darting here, pausing, darting there, pausing, snatching dozens of the dots, relishing a meal in an unending insect buffet. You step aside, ducking beneath the swarming insects. You smile as your eyes come to rest on the smoothly flowing waters of the stream a few feet below. As you proceed, you use your arms to open a space to walk between the graceful grey-green willows that bounce back undisturbed in your wake.

As your eyes comb the scene for a place to rest, you notice a fallen tree ahead of you. You pause before reaching the log and bend toward the water, gathering a handful of mud from the stream bed. One leg anchors itself on the ground between two willows while the other reaches over to the water. With the mud in your hand, you swing up onto the dry perch of the log. You settle down and look at the mud in your warm hand. After you examine it carefully, you toss the clump of mud into the stream, listening to the pleasing plop as the mud falls into the water.

Then your eyes drift downward to the waters of the stream near the base of your log. In an eddy you see a fish surface and leave a circle of waves spreading out from the place where it broke the surface of the water. As you continue to look downstream you notice all kinds of small insects are now dancing across and above the water. A small ripple occurs in the water, then another and another. You realize that fish are rising up from below and feeding on the surface insects. Swallows dart in and out of the tangle of vegetation. Some fly through. Downstream a frog begins to croak. Much nearer, another frog offers a reply. You look around quickly to see if you can find the nearer frog. For a moment you think you spot it, but then realize that, unless it sings again, you may never find it. Your eyes search for a moment as more frogs telegraph their messages back and forth. But then it seems time to leave. You take one last sweeping look all around this beautiful setting. You slowly get up from your log along the riverside and head back home.[†]

Ask the students to continue sitting quietly with their eyes closed and review the whole experience. Ask them to pay particular attention to their favorite images. Tell them they are going to be asked to describe this setting as they saw it. Invite them to open their eyes.

Ask them to describe their favorite images or share personal memories that the story provoked. Once each one has done this, invite all of the students to select art materials. Each should draw or paint his or her favorite images on the paper provided. Once they are finished, have them tape up their art work on a display area.

Ask the students to identify some of the characteristics of riparian areas. What kinds of plants did they see? What kind of animals? Was the environment different near the water compared to farther away from the water? Were the wildlife different? If yes, what were some of the similarities and some of the differences? Ask the students to list, describe, and discuss some of the many

[†] This activity is adapted from *Project Wild Aquatic* (Boulder, Colorado: Western Association of Fish and Wildlife Agencies and the Western Regional Environmental Education Council, 1987) p. 31.

reasons that riparian areas are important and have value—intrinsic value as well as value to wildlife and humans.

Extensions

- Ask students to design their own field guide/observation sheets. They should include spaces to note their names, the date, time and location in addition to plant life, wildlife or evidence of it, animal sounds, soil quality, water quality, air quality and general impressions. Room to draw and space to record measurements are also useful. What else should be included?

- Visit the Cosumnes River Preserve. Look for things that you encountered in your imagery. List things that were not in your imagery. Generate a list of things that could be done to make it possible for people to visit a riparian area without damaging or destroying it.

- Play bird song tapes recorded in the spring in a riparian forest.

- Use the following vocabulary activity to introduce new vocabulary words or to review words already introduced to students. Use it with any lesson where vocabulary growth is important.

Vocabulary Bingo

1. Make a copy of the Bingo Grid Sheet for each student.

2. Review the vocabulary words and their definitions with students. Repeat the words one at a time, asking them to write one word in each square on their grid sheet in any order.

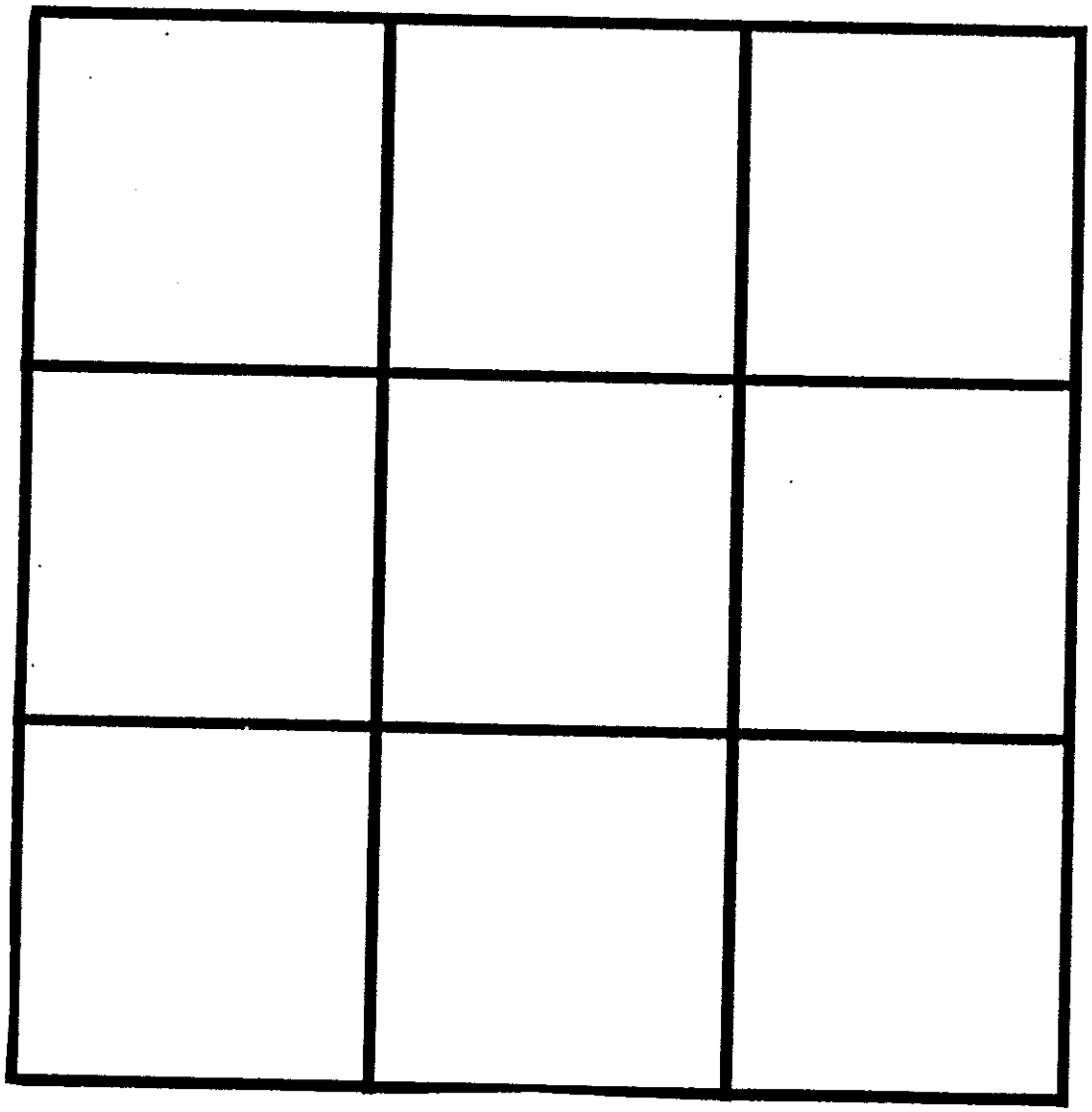
3. Have the students tear 9 small pieces of paper that are big enough to cover one word.

4. Read vocabulary definitions aloud to the class one at a time. After reading a definition, ask students to find the word on their grid that matches it. For example, if you read "a kind of animal or plant," the students must find the word "species" on their grid.

Each student finds the word independently. Once they find the word that matches the definition, he/she covers it with a small piece of paper.

5. The first student to cover three words across (or in a diagonal or vertical line) is the winner and calls out "Bingo!" After a student calls out "Bingo," check the winning grid and repeat then identify aloud which word belongs to which definition. If the students is unable to identify the correct words, the game continues until there is a new winner.

Bingo Grid





How Much Can This Soil Drink?*

Background

Soil is much more than just dirt. Soils contain different amounts of minerals, as well as decaying and living materials. This means each soil type is different in the nutrients it provides for plants, how much water it can absorb, and how much water it may store.

Seasonal flooding enriches soil by depositing rich nutrients. Because the Cosumnes River is allowed to flood naturally (unlike all other rivers in California!), the soils at the Preserve are extremely rich and support a great variety of plants. Plants also greatly affect soils. Their growing roots break-up large soil particles into smaller ones. Their leaves, stems and flowers fall to the ground and decay, adding more nutrients to the soil. Plants protect soil from water and wind erosion. They also help soils store water temporarily by slowing down runoff. Healthy vegetated banks in streamside (riparian) areas act as natural sponges. They help maintain soil structure, allow increased absorption (infiltration) and reduce erosion.

Plants, as mentioned above, are affected by the soils in which they grow. Soils which can store water support dense plant communities. A watershed with healthy plants and good soils holds onto its water and releases it slowly, allowing streams to run all year. A watershed with very compacted soils (by vehicles, foot traffic, or animals) and little plant life loses water quickly, leaving little time for rainwater or melting snow to seep into the ground. This rapid runoff increases erosion as it strips away vegetation and soils that might otherwise store water.

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* This activity is adapted from *Stream Scene: Watersheds, Wildlife and People* (Portland, Oregon: Oregon Department of Fish and Wildlife, 1992), p. 49.

Soils and vegetation in a watershed have a lot of influence over the fish and wildlife that live there. Do they provide enough food and shelter for the fish and wildlife? Does water run off too quickly? Are there enough trees growing along the banks to keep water temperature in streams cool enough?

Everything in a watershed is connected to everything else—soils, plants, fish, and wildlife. The amount of water slowed and stored by the soil and vegetation is a key element in the whole system. When one part of the system breaks down, the whole watershed is affected.

The Cosumnes River Preserve is a great place to observe the characteristics of soil, especially as they relate to plants and animals in riparian areas. Before your visit, ask students to suggest ways that soil affects plants and animals, especially in a riparian area. (Can they predict ways in which very compacted soil will interact with rainwater? What about non-compacted soil? If soil does not absorb water easily, how might animals living nearby might be affected? What can people do to help soils work best?)

Objectives

Students will compare water infiltration (absorption) in different soils and will understand the relationships between soils, plants, animals, and runoff in riparian habitats.

Materials

- Large juice cans of uniform size—two cans for every four or five students
- One 12" ruler per small group
- One board (approximately 12" x 4" x 2") per group
- One hammer
- One watch with a second hand
- Two quart containers of water per group
- Copies of "How Much Can This Soil Drink?" data sheet (xeroxed from this packet—one per group)

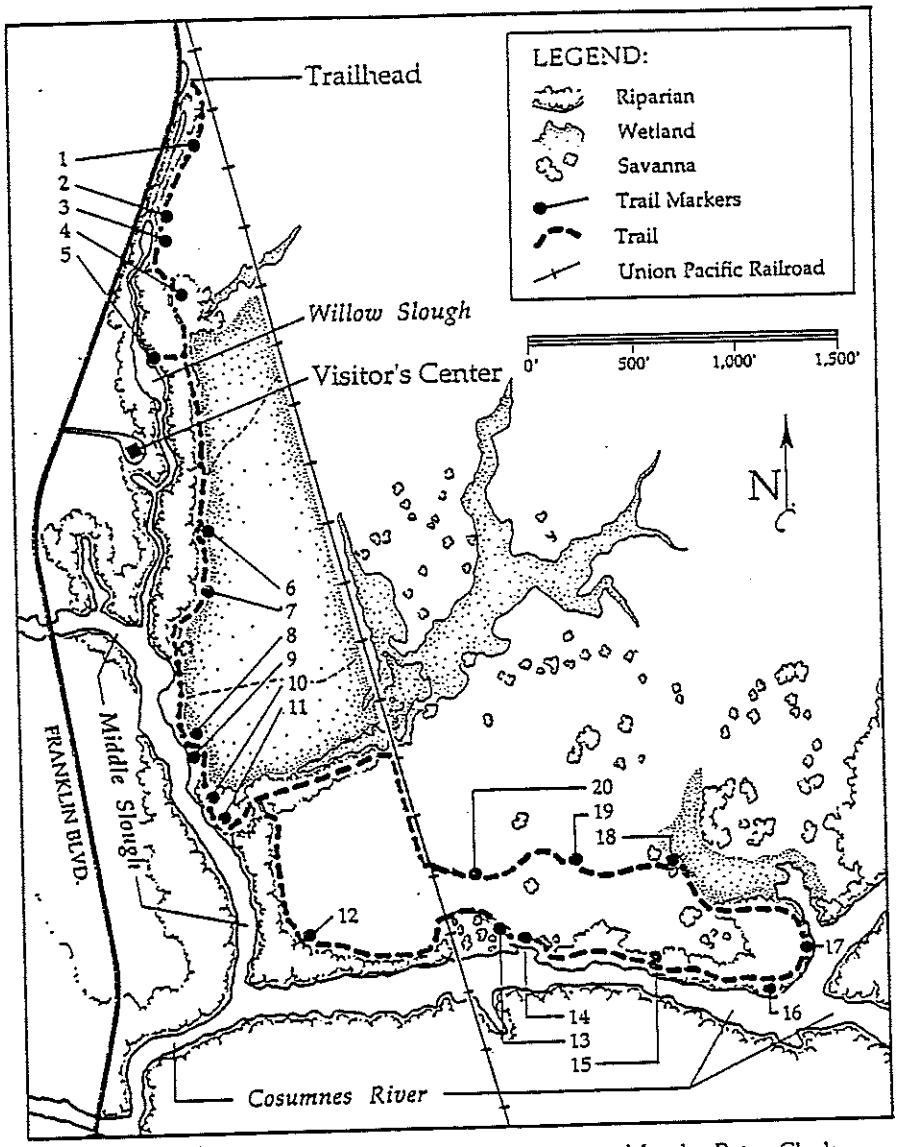
Preparation (prior to visit)

Select two cans of the same size and diameter for each group. You may want each group to color code their cans. Cut the bottoms out of each can just above the rim with a can opener. This leaves a sharp edge that will drive easily into the

ground. Cut out the other end of the can with a can opener, leaving the rim intact for added strength. Mark the outside of each can 2 inches from the sharp end.

Procedure

Find an area along the trail with compacted soil [SITE ONE] and non-compacted soil [SITE TWO] close by. Adult chaperones should drive in the cans while you introduce the activity to students. In the selected spots, they will place the sharp end of the can on the ground, place the board on top of the can and gently tap with the hammer until the 2-inch mark is reached. Be sure to place one can per team on SITE ONE and another for each team on SITE TWO.



Map by Betsy Clark

At the Preserve, students should work in groups of four or five, each with an adult assistant. Have student teams locate both of their cans first. Be certain they understand that one can has been placed in compacted soil and the other has been placed in non-compacted soil.

The teacher should coordinate so that each group begins the next step at the same time. Give students a countdown, and at the designated moment, they will pour one measured quart of water all at once into their can at SITE ONE and begin timing how quickly the water is absorbed (the rate of filtration). Students will measure the distance in inches from the top of the can to the water—at the end of every two minutes for ten minutes. Adults should record results on the data sheet while students measure. The teacher is the time-keeper and must notify students at the end of each minute. After the pouring and timing are complete, ask students to note the vegetation at the site. A space is provided for their observation on the data collection sheet.

Repeat the process, having groups pour a measured quart of water all at once into their can at SITE TWO and begin timing the rate of filtration. Again, students will measure the distance in inches from the top of the can to the water—at the end of each minute for the first ten minutes. Adult assistants record results on the data sheet. Students then record their observations about the vegetation at this site and begin thinking about the differences they observe.

Later at the Preserve or back in the classroom (using the board), create a large chart resembling the data sheet. Have each group fill-in their data using different colored chalk. Discuss the results using the following questions:

Note: teachers should be aware that if this exercise is done in a wetland site, there may be poor filtration because the soil is already saturated.

1. Why would the soil at SITE ONE absorb the same amount of water slower (or faster) than the soil at SITE TWO? (Different soil types are able to absorb water at different rates. Soils that are compacted have fewer spaces to fill with water than soils that are not compacted.)

2. What happens to the water that is not absorbed by the soil, during a rain storm, for example? (It runs off quickly to lakes and streams.)

3. What happens to the water that is absorbed by the soil? (It soaks into the ground and is stored there until it is used up by plants, animals, and evaporation.)

4. What will happen to a stream if the soil around it cannot hold water? (The stream will flood during a rain storm and dry up later because no water was stored in the ground.)

5. How could wildlife be affected by plants, soil and water that is not absorbed into the ground? (Many answers are possible. For example, if the soil at a site becomes too compacted to absorb and hold water, many plant roots will not be able to penetrate and ultimately, those plants will not thrive. Wildlife in the area will no longer be able to forage for those particular plants and if they depend upon them for food, will be forced to move to another area where those plants grow. If such an area is too far away or difficult for wildlife to find, these animals may die. On the other hand, different animals may eventually thrive in the area - animals that need a drier habitat and the kinds of plants that can survive such conditions.)

6. Why do different plants grow at the two different sites? (Soils that hold moisture can support a greater variety of plants. Compacted soil makes it difficult for roots to penetrate). Recall the general description of vegetation at the site which students recorded on their data sheets. Were trees present at the site? Was grass present at site? Bushes? Was the ground bare? If so, why?

How Much Can This Soil Drink?

Names: _____

Date: _____

Time: _____

Location: _____

Site #1 (compacted soil)					
Minutes	0	2	4	6	8	10
Inches from top of can to water						

Describe vegetation at site #1

Site #2 (compacted soil)					
Minutes	0	2	4	6	8	10
Inches from top of can to water						

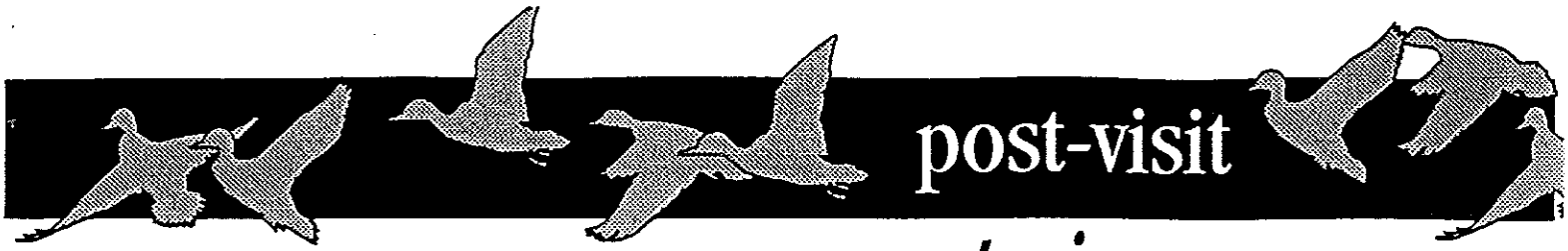
Describe vegetation at site #2

Extensions

- Repeat this filtration test in the school yard. What are the conditions that make the results different?

- Learn about how the native people of this region (the Miwok Indians) coped with seasonal flooding (they built seasonal dwellings and moved to the uplands every year before the floods.) Compare with how current residents of the region cope with seasonal flooding (we build levees, dikes, and buildings that are high above the ground (the Cosumnes River Preserve Visitor Center, for example, is built above the 100 Year Flood Plain).

- The Florin Resource Conservation District offers a traveling "Rainfall" program and simulator that demonstrates the effects of soil erosion by water. This display is designed to complement school science curricula in the areas of soil erosion and water quality, but can be used in many ways. "Who's Stealing Your Soil?" includes a thorough instructor's packet and is designed for grades 4 - 6. The free program is housed on a small trailer and can travel only within the Sacramento County area. Call the Florin Resource Conservation District at 916-682-7844 for more information.



spring

One of These Rivers is Not Like the Others*

Background

The Cosumnes River originates from snowmelt, springs, and seepage in the cool heights of the Sierra Nevada. Cascading downslope, and receiving additional water from many smaller tributaries, the stream meanders slowly through California's Great Central Valley, flowing into the Delta.

Although partially channelized and levied, especially near agricultural lands, the Cosumnes is the largest remaining undammed river flowing through the Central Valley. The river supports an extensive network of marshes and other wetlands year-round. Flooding during the wet winter months creates acres of seasonal wetlands, and is vital to the long-term health of the Preserve's habitats—especially the California valley oak riparian community.

Despite the tremendous loss of wetlands in the last 100 years (to agriculture, flood control projects, and urban development), California's Great Central Valley is the most important waterfowl wintering area along the Pacific Flyway. The few wetland acres that remain support 60% of the flyway's migratory waterfowl.

Objectives

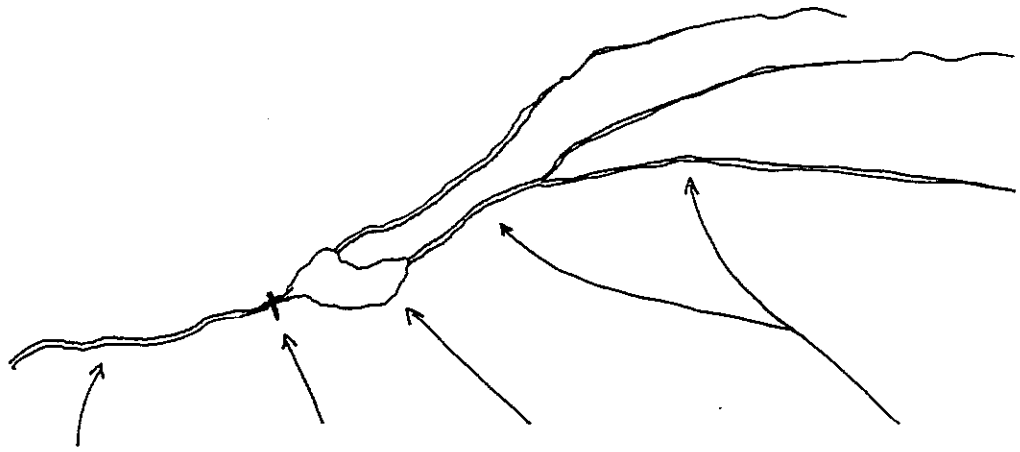
Students will observe that the Cosumnes is the only undammed river of its size in California and discuss the impact of this fact on migrating waterfowl and the valley oak riparian forest.

Materials

- Copies of the California Rivers, Dams and Reservoirs map (xeroxed from this packet)
- Bold blue, red, and black markers or crayons
- A large wall map of California

Procedure

Look at the large map of California with your students. Ask for volunteers to locate dams or reservoirs on the rivers. Provide students with a clue: large dams are usually built for flood control and water supply. Dams form a large reservoir or lake upstream where water is stored. Hand out a copy of the California Rivers, Dams and Reservoirs map to each student. First they should complete the legend on their map, choosing colors for dams, rivers above dams, and rivers below dams. Then, students should locate dams or reservoirs on their maps and circle them in black (or whatever color they have chosen). Next, they should color the rivers blue from their headwaters down to the dam or reservoir. Then, from the dam down to the river's end, they should color the river red. This will make the Cosumnes River a dramatic example as the only river which is not dammed at any point (the entire river will be colored blue!).



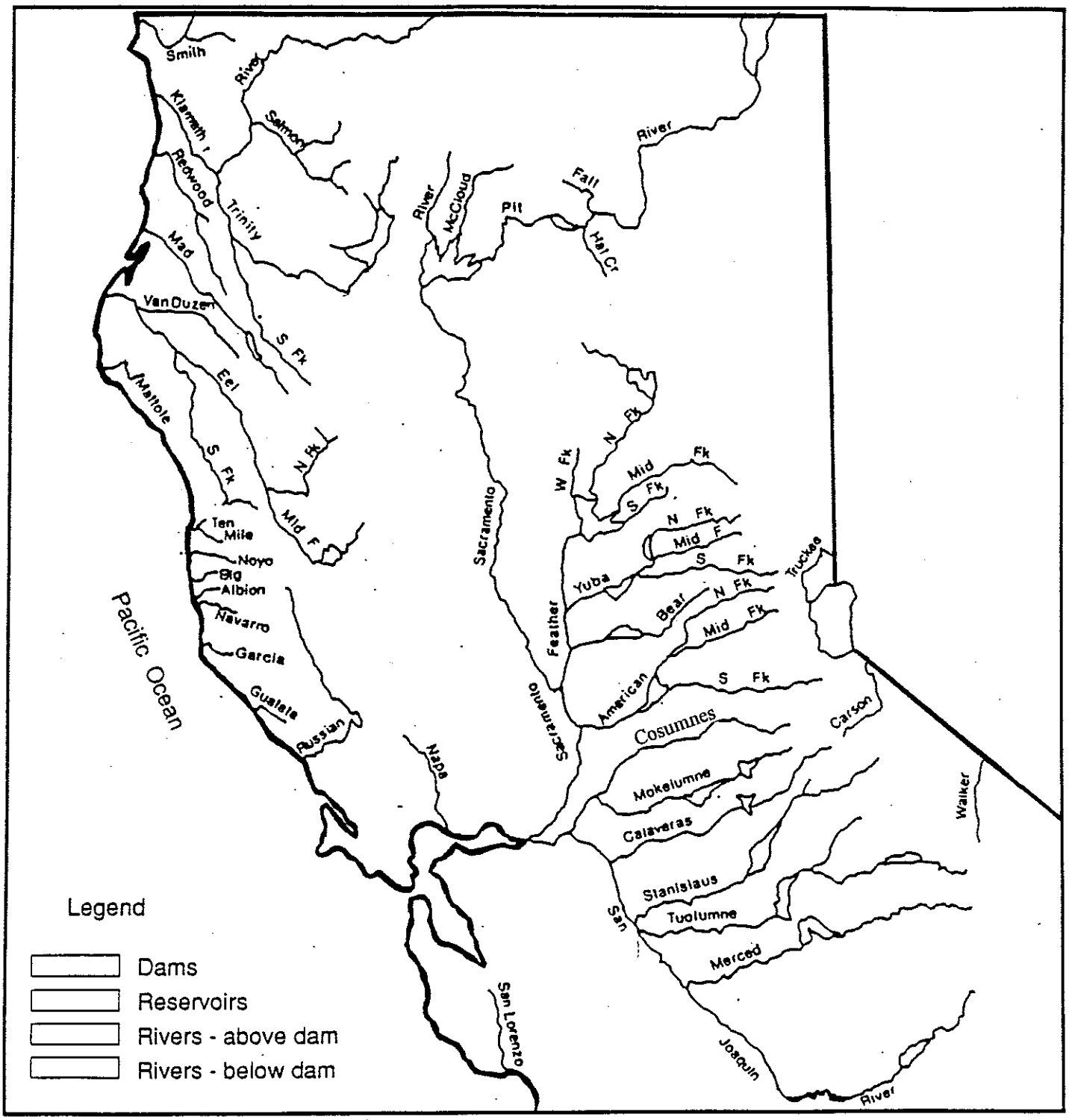
Ask students to list ways in which this unique aspect might impact wildlife. (Answers will vary, but should include: flooding during the wet winter months creates seasonal wetlands which support important habitats for amphibians, reptiles, mammals, insects, and other invertebrates; floodwaters deposit rich nutrients around the floodplain providing perfect conditions for grasses, sedges, rushes, and cattails. These wetland areas are crucial in providing wintering habitat—both for food and protective cover—for thousands of migratory birds, shorebirds, and resident birds. Flooding supports riparian forests by depositing rich loamy soils, enriching the soil, drowning herbivores that eat acorns and seedlings, and scouring weeds from the ground so that young seedlings will not have to compete for moisture.)

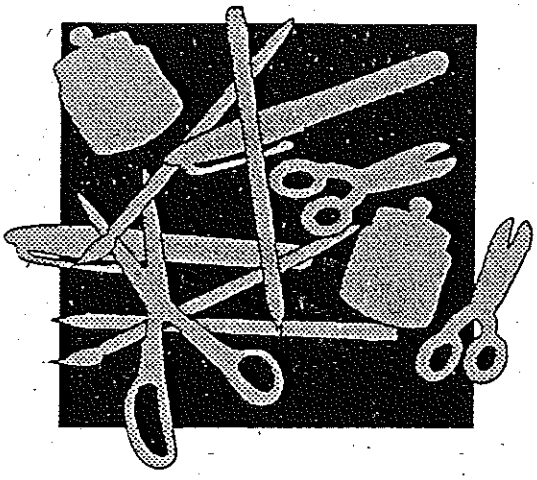
California Rivers, Dams and Reservoirs

Name: _____

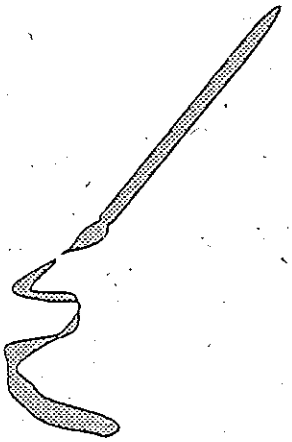
Date: _____

Choose the colors to complete the legend before filling in the map.





indoor exhibits





What are the Relationships?

Objective

Students will understand that:

1) The Preserve is made up of different habitats,
2) Different plants and animals comprise (favor) each habitat,
3) The free-flowing river has a distinct role in each habitat, and
4) People relate today and historically with each habitat

Materials

- "Habitat Relationship" cards (xeroxed from this packet)
- "Plants and Animals of the Cosumnes River Preserve" (xeroxed from this packet)
- Scissors for every two students (safety scissors available to borrow at Cosumnes River Preserve Visitor Center)

Procedure

Orient the students to the exhibit room and the mural strips. Give each pair of students two "relationship" cards—one describing a relationship between humans and one of the Cosumnes habitats and one describing a relationship between the Cosumnes River and a habitat. (Note, some cards will probably be handed out to more than one pair of students.) Ask the students to find the habitat that best fits the relationships described. Ask the students to share the information with the group.

Next give each pair of students a "Plants and Animals of the Cosumnes River Preserve" sheet and a pair of scissors. Ask them to match each illustration with one of the habitats in the wall murals and place them in a pile in front of the appropriate habitat. When everyone has distributed their plant and animals into the six habitats, designate six students to be responsible for the piles and discuss as a group what is found where.

Relationships between Humans and the Cosumnes Habitats

• On the Preserve the Cosumnes River is only partially contained by levees, primarily near agricultural lands.	• Historically humans planted the channel catfish in the Cosumnes River which today prowl the dusky depths.
• Salmon in the Cosumnes River were once plentiful enough to provide a staple food for the Plains Miwok who lived along the river.	• Hundreds of volunteers plant valley oaks and other native species—Oregon ash, box elder, willows, and cottonwoods.
• Human settlers took advantage of the rich soils of this ideal oak forest community. Men and women cleared the land for agriculture and urban growth.	• For centuries the Miwok people have gathered, dried, and stored bushels of acorns for later use as mush, bread, and meal.
• Preserve neighbors and volunteers encourage the wood ducks to nest by installing nest boxes on trees near the water's edge.	• Permanent settlement by the Spanish in the late 1700s and Euro-American pioneers in the 1850s—radically altered California's grassland communities.
• Settlers brought grazing livestock and tilled thousands of acres.	• Settlers introduced many aggressive non-native plant species, reduced native herbivores, and suppressed the grassland's natural cycle of fire and regeneration.

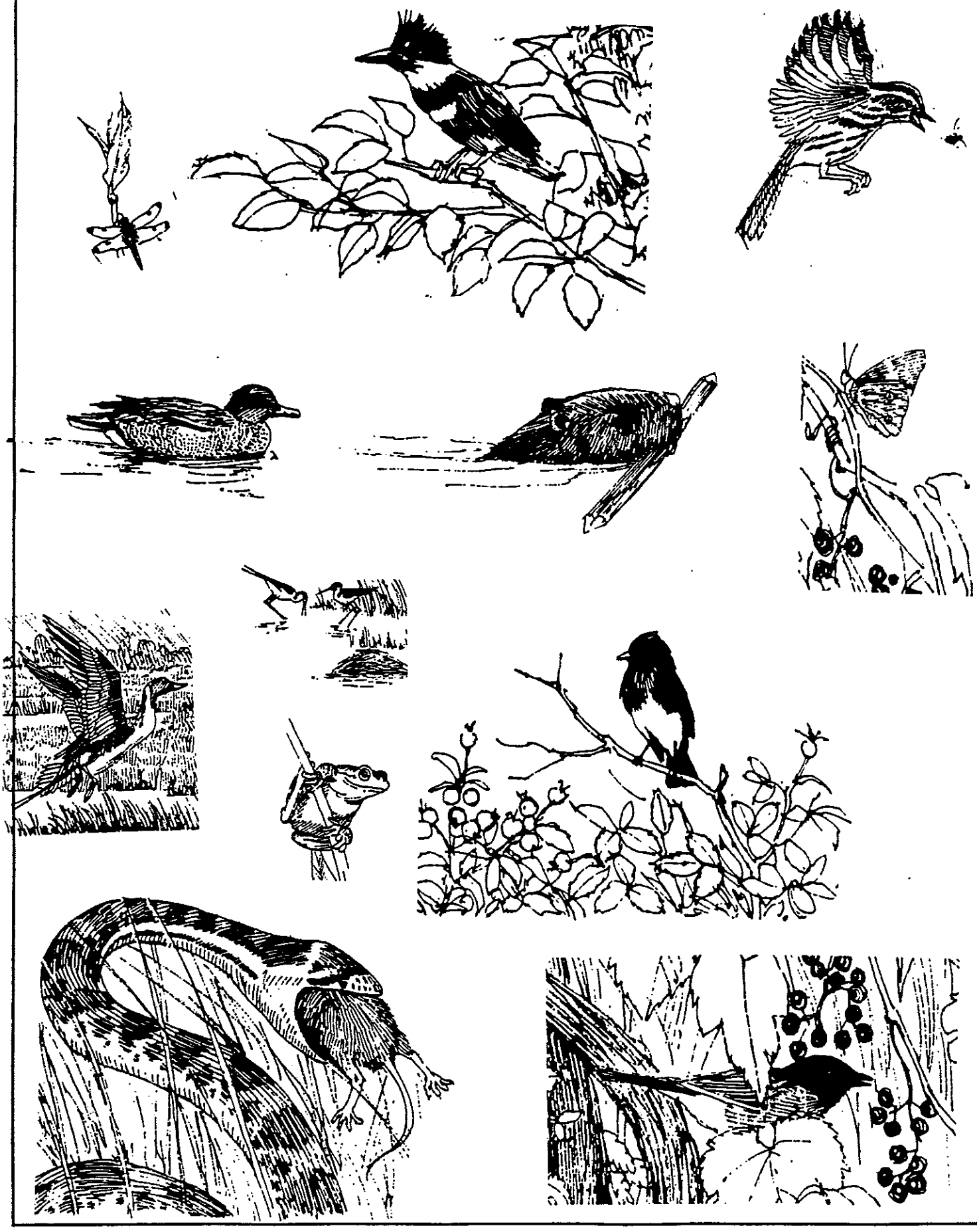
Relationships between Humans and the Cosumnes Habitats

• Construction of dams and levees (artificial high banks), the channelization of rivers, and the requirements of agriculture and of urban development have caused a severe decline in wetland habitats since the mid-1800s.	• The Cosumnes River Preserve is actively restoring, creating, and managing both seasonal and permanent wetlands in an effort to increase this dwindling natural resource.
• The Miwok lived in permanent villages on high ground near streams or above the marshy floodplains.	• The Preserve staff can replicate flooding on managed wetlands by pumping water from sloughs (backwater channels) during different times of the year.
• The Miwok people used plant materials such as willow shoots and the roots of various sedges to weave elegant baskets.	• The Miwok people collected tule and cattail roots to create household items.
• Farmers can work with nature to increase the productivity of their farm land by providing habitat.	• During winter, rice and corn fields are flooded to attract ducks, geese, and cranes which feed on grain remaining from the fall harvest.

Relationships between the Cosumnes River and its Habitats

• The Cosumnes River is the last remaining undammed river flowing from the Sierra Nevada into California's Great Central Valley.	• Natural flooding still occurs here, enriching the soils with mineral-rich sediment from the river's mountain source.
• Flood waters drown rodents, which feed on acorns and oak seedlings.	• Centuries of uncontrolled flooding along the Cosumnes River have deposited very fertile soil in California's Great Central Valley. This rich soil has been a boon to farmers. Some farm lands still benefit from winter floods that enrich the soil.
• Flooding waters deposit soil, rich in nutrients, to feed the forests and provide sites for acorn germination and seedling growth.	• At the edge of the river's floodplain, the land changes. Beneath the topsoil, a hardpan layer of compacted clay soil forms an almost impenetrable barrier to tree roots. Instead of forests, a grassland habitat flourishes here.
• Flood waters also reduce competition from weeds by scouring the land	• Expansive stands of tules, cattails, and buttonbush shrub characterize these permanent wetlands. Wildlife depend heavily on this habitat for food and protective cover.
• Once water flowed freely through California's Great Central Valley, supporting many hundreds of acres of wetlands creating mud flat habitats for migratory shorebirds.	• Tidal action, all year round, inundates a marvelous network of freshwater sloughs (backwater channels) and shallow marshes near the mouth of the Cosumnes River.

Plants and Animals of the Cosumnes River Preserve



Savannah Sparrow

Kingfisher

Dragonfly

Buckeye

Beaver

Cinnamon teal

Black necked Stilt

Pintail

Black Phoebe

Tree Frog

Wild rose

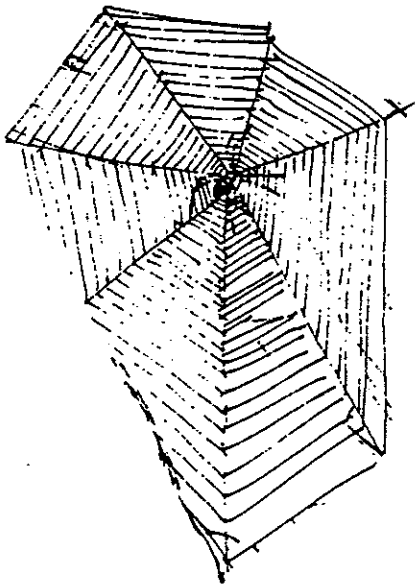
Rufus sided Towhee

Gopher snake (eating deer mouse)

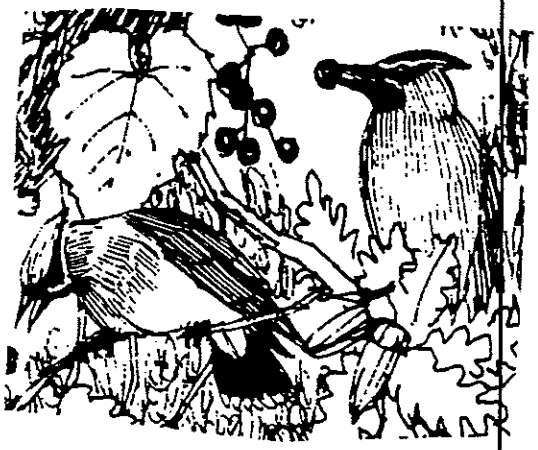
Plants and Animals of the Cosumnes River Preserve





















Red Admiral Butterfly

Garden spider (on Web)

Nuttall's woodpecker

Red-shouldered Hawk

Native Grape

Cedar waxwings

White breasted nuthatch

Goldfinch

Wrentit

star thistle

Blackberry

Gray Fox

Monarch Butterfly

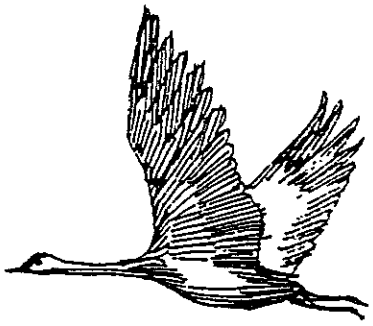
Muskrat

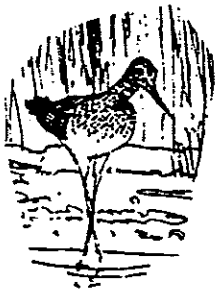
Plants and Animals of the Cosumnes River Preserve

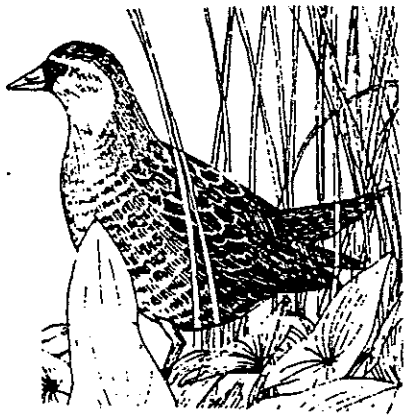


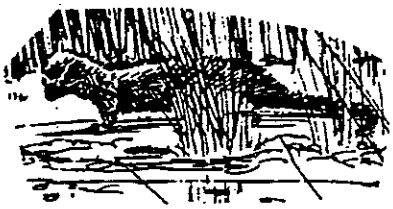


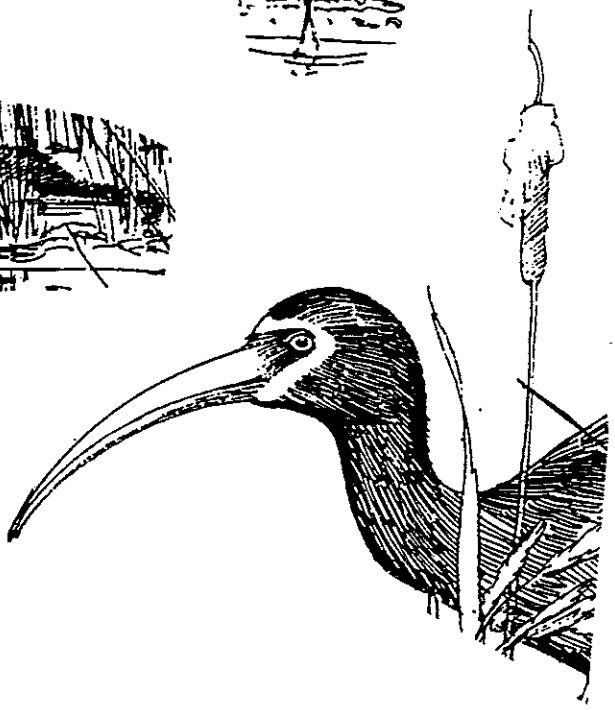


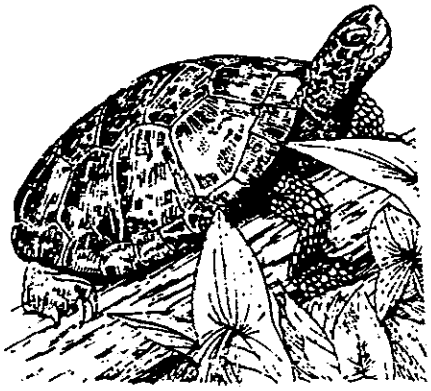












Pied-billed grebe

Green wing teal

Red winged blackbirds

Tundra Swan

Yellowlegs

Sora Rail

Cattails

Mink

White-faced Ibis

Western Pond Turtle

Arrowhead

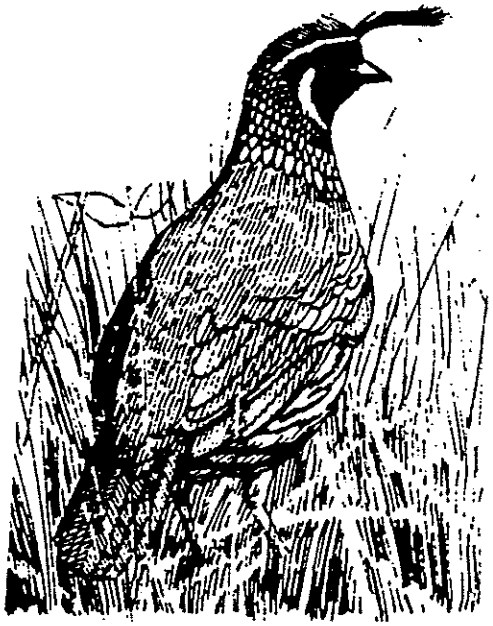
Plants and Animals of the Cosumnes River Preserve



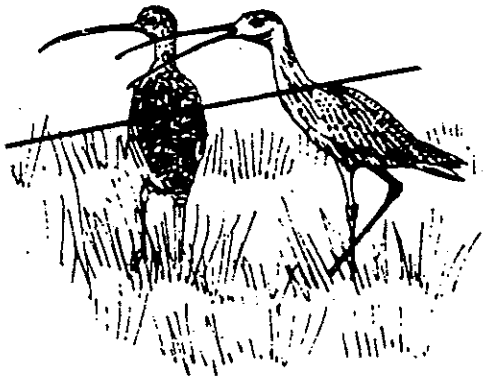




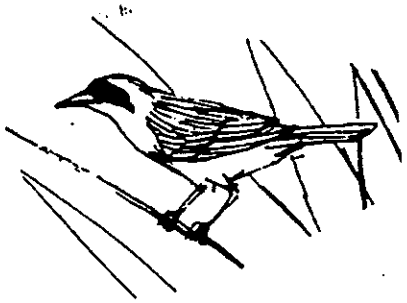












Western fence lizard

Cliff swallow

Loggerhead shrike

Sandhill crane

River Otter

Quail

Alfalfa Butterfly

Long-billed Curlew

Black-tailed Deer

Common yellowthroat

Extensions

- Have the students design their own habitat murals matching animals with appropriate plants and habitats. This could be a collage using magazines, the illustrations handed out at the Visitor Center and/or students' drawings.

glossary

Adaptation: A behavior, physical feature, or other characteristic that helps an animal or plant live more successfully.

Amphibian: A cold-blooded vertebrate that usually hatches as aquatic larva and grows into an adult with air-breathing lungs.

Aquatic: Living in water.

Arboreal: Living in trees.

Bird: A warm-blooded, egg-laying feathered vertebrate with fore-limbs modified to form wings.

Conifer: Cone-bearing tree, usually evergreen.

Data: Recorded information based on observations.

Deciduous: Trees that shed their leaves.

Dominant species: Plant or animal species which exert major controlling influence on the community.

Ecosystem: A community of organisms and their physical environment interacting as a unit.

Erosion: The process by which the surface of the earth is worn away by the action of water, glaciers, winds, and waves; the process by which water, wind, and temperature break down rock and soil into small, loose particles, which may then be swept away by wind and water. Movement of soil by water and wind.

Migration:	Seasonal movement from one region to another. For example, a hawk might migrate from southern Canada to Central America for the winter.
Native:	Having evolved in and adapted to a specific habitat or region. Native species usually have a clear role or niche in the ecosystem.
Natural community:	A collection of all species living within a given area that interact with one another.
Natural regeneration:	Healthy regrowth of vegetation, such as trees, subsequent to its elimination.
Niche:	An animal's job (role) in a community; particularly how it finds food and shelter.
Population:	A group of individuals of a certain species, in a given area at a given time.
Reptile:	A cold-blooded animal with a backbone which lays eggs that are viable in dry or extreme conditions.
Reservoir:	A human-built lake usually formed by a dam to hold water for future use or to keep back floodwaters.
Riparian:	Occurring along the bank of a creek, stream, or river.
Riparian Restoration:	The act of planting seeds, cuttings, or seedlings. to quickly reestablish a forest habitat.
Sediment:	Fine particles of soil (silt, sand, and clay) moved by wind or water from one place to another, often deposited in a body of water like a stream, river, or lake. (Some of these fine particles sink to the bottom while others are suspended in the water.)

Floodplain: The area along a stream or river that is subject to flooding.

Forb: Any broad-leaved herbaceous plant other than grass.

Food chain: A feeding relationship between living things in a natural community that feed upon one another.

Grass: Plants that usually have narrow leaves, hollow, jointed stems, and spikes or clusters of small flowers borne in smaller "spikelets."

Hypothesis: A proposed explanation about the answer to a question (problem) which can be tested in an experiment.

Infiltration: Entry of water into soil.

Insect: A small invertebrate, the adults of which have three pairs of legs, a segmented body with three parts, and usually two pairs of wings.

Introduced: Animals or plants that are not native to a region and have not adapted to the conditions there. An introduced species can increase dramatically and become a problem if it has no natural controls (such as predator, diseases, or animals that eat it.)

Invertebrates: An animal without a backbone (spinal column); includes mollusks, crustaceans, insects, and many kinds of worms.

Larva(e): The immature form of many invertebrate species (such as a caterpillar, which is the larva of a butterfly).

Mammal: A warm-blooded animal with a backbone, the female mammal produces milk and gives birth to live young.

Shrub: A woody plant with several stems and of relatively low height.

Species: A particular kind of animal or plant that can interbreed and produce offspring of the same kind.

Spider: An animal in the arachnid class that has eight legs and two body parts.

Terrestrial: Living on the ground.

Tree: A woody plant 12 or more feet tall with a single main stem (trunk) and a more or less distinct crown of leaves.

Vertebrate: An animal with a backbone (mammals, birds, reptiles, amphibians, fish).

Vine: A plant that has a flexible stem and supports itself by climbing or creeping along a surface.

Watershed: The whole region from which a river, stream, or lake receives its supply of water from rain and melted snow; all the land that carries rainfall to the same stream or river. In the largest sense, all the land on earth is the watershed for the oceans.

Wetlands: Areas that, at least periodically, have waterlogged soils or are covered with a layer of water. Wetlands include ponds, bogs, swamps, freshwater and saltwater marshes, mudflats, channels, seasonally ponded areas and tidally influenced areas.

Wildlife: Any animal that is not tamed or domesticated.

sources and resources

The California Class Project
California Department of Education
P.O. Box 271
Sacramento, CA 95812-0271
1-800-995-4099 (Bureau of Publications)
1992

A Child's Place in the Environment: Caring for Aquatic Systems and *Preserving and Restoring Healthy Ecosystems*
California Department of Education
P.O. Box 271
Sacramento, CA 95812-0271
1-800-995-4099 (Bureau of Publications)
1994

Science and Environmental Education Resource Guide
California Department of Education
Bureau of Publications
P.O. Box 271,
Sacramento, CA 95812-0271
1-800-995-4091
1991

Autumn Oaks
Carter House Natural Science Museum
P.O. Box 990185
Redding, CA 96099
916-225-4125
1994

Birds of the Shasta-Cascade Region: Ornithology Activities
Carter House Natural Science Museum
P.O. Box 990185
Redding, CA 96099
916-225-4125
1992

Energy Flow Through Spring Ponds
Carter House Natural Science Museum
P.O. Box 990185
Redding, CA 96099
916-225-4125
1995

Keepers of the Earth, Native American Stories and Environmental Activities for Children
Caduto, Michael and Joseph Bruchac
Fulcrum Publishers

WOW!: The Wonders of Wetlands
Environmental Concern Inc.
P.O. Box P
St. Michaels, MD 21663
410-745-9620
1991

Bottle Biology
Kendall/Hunt Publishing Co.
4050 Westmark Dr.
Dubuque, Iowa 52002
1-800-228-0810
1993

Wading Into Wetlands and *Birds, Birds, Birds*
National Wildlife Federation
1400 16th Street NW
Washington, DC 20036
1-800432-6564

The Stream Scene: Watersheds, Wildlife and People
Oregon Department of Fish and Wildlife
P.O. Box 59
Portland, OR 97207
1992

Salt Marsh Manual, An Educator's Guide Trekking the Refuge
San Francisco Bay National Wildlife Refuge
P.O. Box 524
Newark, CA 94560
510-792-0222
1992

Watershed Education Program
San Francisco Estuary Project
Friends of the Estuary
510-286-0769

California's Water Problems
The Water Education Foundation
717 K Street, Suite 517
Sacramento, CA 95814
916-444-6240

California's Water Story
The Water Education Foundation
717 K Street, Suite 517
Sacramento, CA 95814
916-444-6240

Investigating Your Environment
USDA Forest Service,
Public Affairs
Pacific Northwest Region
P.O. Box 3623
Portland, OR 97208-3623
1993

Sacramento Zoo Conservation Celebration Teacher Resource Guide
Sacramento Zoological Society
3930 West Land Park Drive
Sacramento, CA 95822
916-264-7714

Learning Science Process Skills
Kendall/Hunt Publishing Co.
4050 Westmark Dr.
Dubuque, Iowa 52002
1-800-228-0810

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