



U.S. Fish & Wildlife Service

Wild Things 2000

Wading Into Wetlands

Educator's Guide

**LIVE ELECTRONIC FIELD TRIP TO
Sweetwater Marsh National Wildlife Refuge
October 4, 2000**



Co-produced by USFWS and Prince William Network

Wild Things 2000

Wading Into Wetlands

Educator's Guide

*Live Electronic Field Trip to
Sweetwater Marsh National Wildlife Refuge
California*

Grades 4-8

Wednesday, October 4, 2000

Noon-1:30 pm ET

Special thanks to Chula Vista Elementary School District, CA; Educational Service Unit #13, Scottsbluff, NE; Environmental Concern, Inc.; Friends of Blackwater National Wildlife Refuge; Project WILD; River of Words; and the U.S. Environmental Protection Agency's Wetlands Division for providing materials and program assistance.

Illustrations by Nancy Derey, Branch of Habitat Restoration, U.S. Fish and Wildlife Service.

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ADDRESS ONLY THE DIRECTOR,
FISH AND WILDLIFE SERVICE

United States Department of the Interior

FISH AND WILDLIFE SERVICE

WASHINGTON, D.C. 20240

Dear Educator:

Welcome to **Wild Things 2000**, a distance learning program for students in grades 4 through 8. We are excited that you are joining us for this year's program, "**Wading into Wetlands**," which will be broadcast live from Sweetwater Marsh National Wildlife Refuge, California. Sweetwater Marsh is one of more than 520 refuges managed by the U.S. Fish and Wildlife Service for wildlife and wildlife habitat.

During this broadcast, you and your students will learn:

- what is a wetland;
- why wetlands are important;
- what are the threats to wetlands;
- what the U.S. Fish and Wildlife Service is doing to protect wetlands; and
- what **YOU** and **YOUR** students can do to help.

There will be opportunities for your students to test their knowledge throughout this 90-minute program through an interactive game. The last 30 minutes of the program are designed to encourage students to send in their questions by fax, email or 1-800 number. Included in this educator's guide are suggested activities that you and your students can complete to prepare for this learning adventure. Some of these activities can be used after the program to reinforce the concepts learned.

So, grab your galoshes, throw away the remote and come "**Wading into Wetlands**" with us! At the conclusion of this learning adventure, please take a few minutes to fill out the teacher evaluation form in the back of this educator's guide. This will help us meet your expectations in future learning experiences.

Sincerely,

ACTING
Marshall Jones Jr.
Deputy DIRECTOR

How to Use This Guide

Each registered site receives a copy of the Educator's Guide. The guide will help prepare students for the live event and contains lessons and practical activities for the indoor and outdoor classroom. It includes the following:

- **Welcome** - Outlines what we hope you and your students will know after participating in the broadcast.
- **Field Trip Know-How** - Provides technical information and other valuable information to prepare you and your students for the live electronic field trip.
- **Meet Your Guides** - Provides biographical information on program hosts and experts.
- **Welcome to Sweetwater Marsh National Wildlife Refuge** - Introduces participants to the broadcast site.
- **The Wetlands Game** - Outlines the rules of the broadcast's game.
- **The Field Trip** - Identifies the learning objectives for the five parts of the program, provides background information for students, and learning activities for each part.
- **Resources** - Contacts for more information on wetlands.
- **Appendix** - Provides contact information for U.S. Fish and Wildlife Service regional offices; identifies helpful hints for using the Wetlands Interactive Mapper and includes a word search game.
- **Glossary** - Defines words highlighted in the guide that may be new to your students — and you!
- **Educator Evaluation** - Helps us to improve our education programs.



Field Trip Know-How

Wild Things 2000 *Wading into Wetlands*

Wednesday, October 4, 2000
12 Noon - 1:30 pm ET
Grades 4-8

Satellite Downlink

Telstar 5
C-Band
Transponder 12 Horizontal
Channel 12
Downlink Frequency 3940 MHZ
97 Degrees W
Audio 6.2 - 6.8 MHZ
Test pattern runs for 30 minutes before the show

Question Line

1-800-578-1396

Fax Line

1-800-228-6302

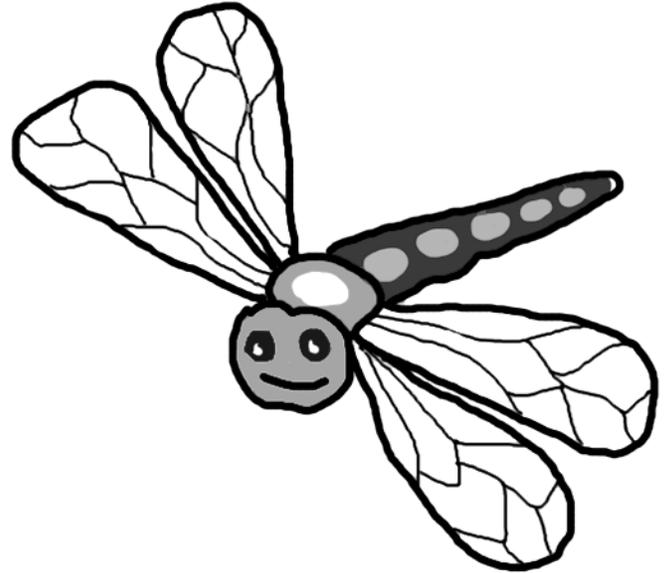
E-Mail

pwnetwk@aol.com

What Is an Electronic Field Trip? An electronic field trip is a distance learning program. The 90-minute program includes a 60-minute instructional program with clearly defined learning objectives. It is followed by a 30-minute live call-in question and answer session. Students can interact during the live program via phone, e-mail, and fax machine.

Who can view the program? Anyone with a moveable C-Band satellite dish can participate. If you do not have a satellite dish, contact your local cable company and ask if they can provide you with access to the program. Another possibility is to call your local Public Broadcasting Station affiliate. (See section on "Don't Have a Satellite Dish" for further information.)

Who developed the program? The Fish and Wildlife Service's Division of Refuges, Division of Habitat Conservation, and the National Conservation Training Center's Division of Education Outreach, in cooperation with the Prince William Network developed this



curriculum-centered electronic field trip to the Sweetwater Marsh National Wildlife Refuge. The program was developed by educators and biologists. The "electronic curriculum" makes use of inter-curricular instructional design.

What makes our Electronic Field Trips so special?

We "go the extra mile" to bring students live and on-site to national wildlife refuges where they can meet and talk with wildlife experts. This makes distance learning "come alive." Our goal is to explore the wonder of the natural world and bring that adventure into the classroom. By means of our live, interactive television broadcasts, students can appreciate these natural areas regardless of where they live or go to school.

Don't Have A Satellite Dish?

Try your local cable company!

If you do not have satellite capabilities, do the following:

1. If you have cable in your school, contact your local cable company and speak to the

programmers for your area's public access channel. Request a download of these educational programs and an airing (simulcast) on the access channel. Give them the coordinates listed on page 3 under "Satellite Downlink." Please give them plenty of advance notice so they can schedule these time slots.

2. Contact the educational programming department at your local public TV station and ask them to download and air the programs for you on their station. Again, give them the coordinates listed above.

3. Advise those you speak with that these programs are free of charge. If they have questions or concerns, direct them to the Prince William Network at 1-800-609-2680.

4. If you are unable to find a way to receive the program live, a videotape will be available for a fee. Call 1-800-609-2680 for more information.

Television Receiver

Plan your set up before the day of the event. Check the technical information page for the satellite coordinates. Tune in the satellite and make sure you can receive the satellite listed. Check to see that all other equipment is working properly. Make sure that everyone can see and hear the broadcast. Use one or more televisions depending on the number of viewers. For larger groups, a projection TV is recommended.

Plan to Interact with Us

Plan in advance for the phone, e-mail, and fax interactions with us. Read *Wetlands Game* rules with your students.

To prepare for the question and answer session, make sure the phone is in the back of the room, away from the TV. An operator will answer your phone call. When you are advised that your phone call is live on air, make sure the room is quiet and your TV volume is turned down to prevent feedback. Listen for the moderator to instruct you to ask your question. While on the phone, you will hear your voice as well as the voice of the moderator and the panelists.

Review Meet Your Guides

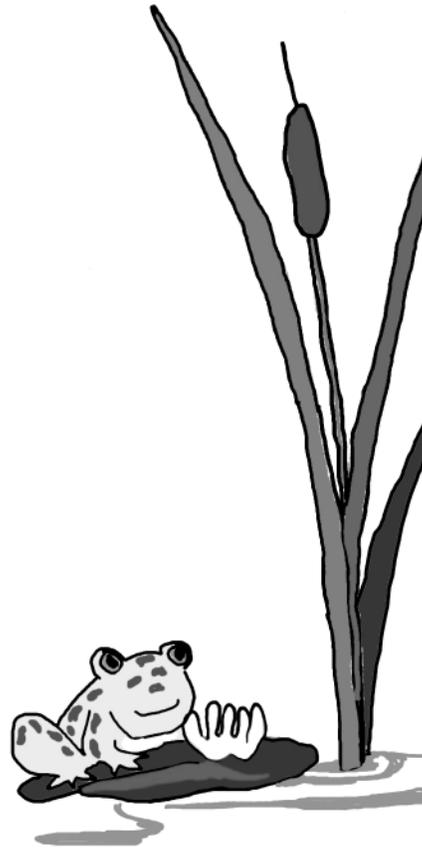
Within your classroom, decide which are the most important questions to ask and of whom. Make each question as clear and brief as possible. We want to answer as many questions as time permits. Please ask one question at a time.

Visit Our Website

If you wish to download the educator's guide, link to other resource sites, or evaluate the program, go to the Prince William Network website at: <http://www.pwnet.org>, and then to WILD THINGS 2000.

Videotaping the Broadcast

You are encouraged to tape and use the program for future lessons. If you wish to rebroadcast it over cable or open broadcast, you must get permission first from Prince William County Public Schools at 1-800-609-2680.



Meet Your Guides

Hosts



Benjamin Tuggle, Ph.D

A 21-year career employee, Dr. Tuggle is the Fish and Wildlife Service's Chief of Habitat Conservation in Washington, D.C. Prior to this position he was the Field Office Supervisor for the Service's Ecological Services Office in Chicago, IL. Dr.

Tuggle has a bachelor's degree in biology, a master's degree in zoology, and a doctorate in wildlife disease biology.



Joy Moorhead

Mrs. Moorhead is a science resource teacher for the Chula Vista Elementary School District and currently works at the Chula Vista Nature Center located on the Sweetwater Marsh National Wildlife Refuge. Through the "Young Scientists Program," over 5,000

students yearly are introduced to local habitats through classroom science study and outdoor experiences at the refuge.



Laura Jones

Ms. Jones is a training specialist with the U.S. Fish and Wildlife Service's National Conservation Training Center in Shepherdstown, WV. Her responsibilities include education and outreach training course design and

delivery, student intern and volunteer coordination, and community relations coordination. This is Ms. Jones' second year as a host for the *Wild Things* distance learning broadcasts.



Rebecca Young

As Refuge Manager for the San Diego Coastal Refuges which include Sweetwater Marsh, Tijuana Slough, and South San Diego Bay, Ms. Young is responsible for refuge management and habitat protection. She has worked with the Refuge System in San Diego for five years.

Featured Experts



Barbara Simon

With a master's degree in comparative literature and a professional background in film production, public relations, and marketing, Ms. Simon brings diverse skills and perspectives to her position as Information and Education Specialist for the

San Diego National Wildlife Refuge Complex. She has developed education programs through partnerships with the San Diego Zoo, Chula Vista Nature Center, and the San Diego Natural History Museum.



Irvin Fernandez

Mr. Fernandez is the Refuge Operations Specialist at Sweetwater Marsh, Tijuana Slough, and South San Diego Bay and manages the day-to-day operations of these three urban refuges. His responsibilities range from trail rehabilitation to

endangered species protection to volunteer coordination and refuge reporting.



Nancy Derey

Ms. Derey works in Washington, D.C. for the Service's Partners for Fish and Wildlife program. She has worked in several Federal programs and agencies that involved wetland identification, delineation, regulation, enforcement, and mitigation.

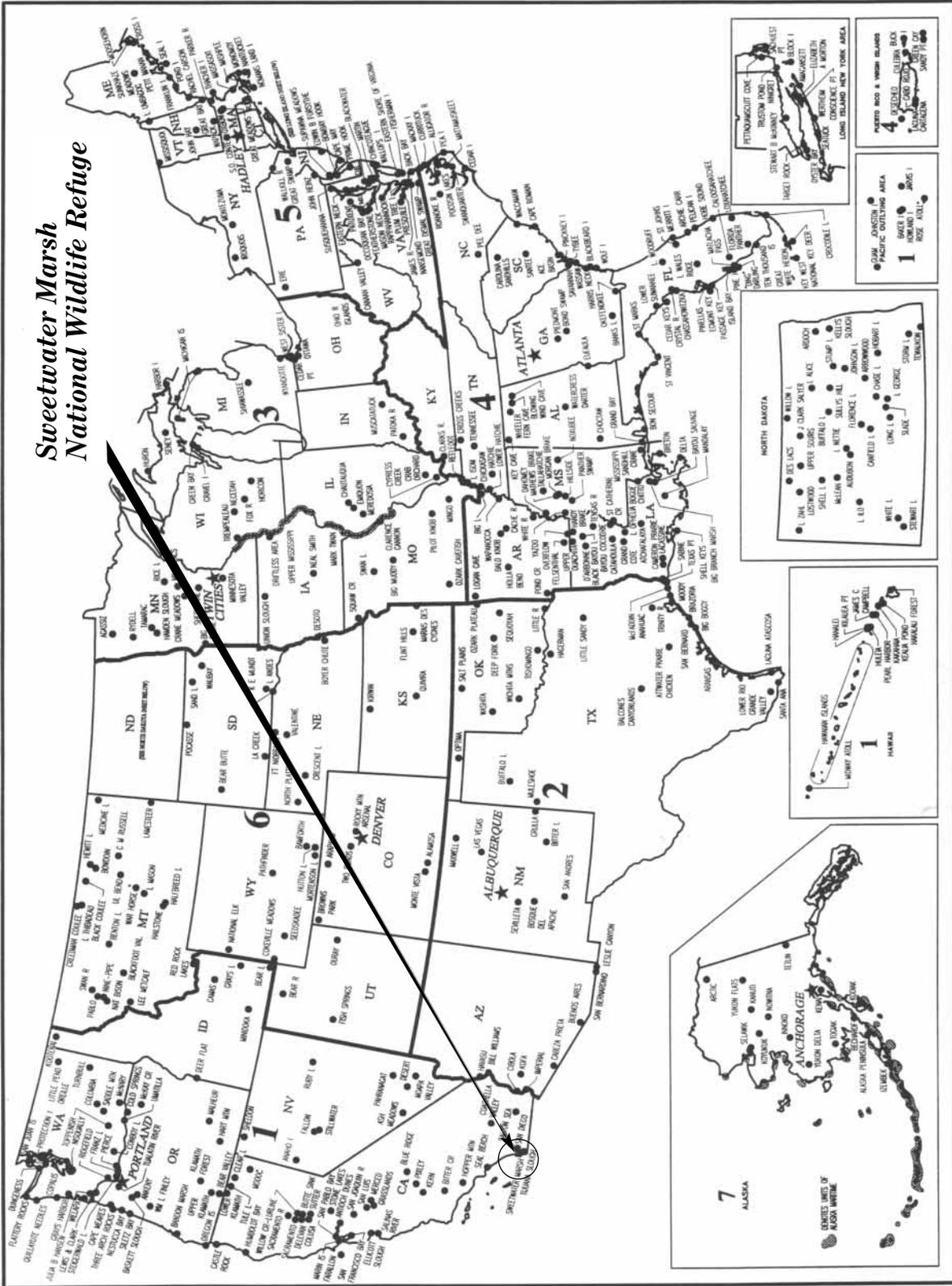
She is the creator of the Wild Things 2000 great blue heron mascot and illustrator for the Educator's Guide.

NATIONAL WILDLIFE REFUGE SYSTEM

UNITED STATES
FISH AND WILDLIFE SERVICE

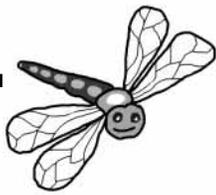
UNITED STATES
DEPARTMENT OF THE INTERIOR

Sweetwater Marsh
National Wildlife Refuge



COMPILED IN THE DIVISION OF REALTY
WASHINGTON, DC SEPTEMBER 30, 1998

★ REGIONAL OFFICE — REGIONAL BOUNDARY



Welcome to Sweetwater Marsh National Wildlife Refuge!

Come on, admit it, you've always wanted to be a scientist. Right? Well, today is your lucky day! Grab your gear, and come with us on our wild wetland adventure. Imagine becoming a scientist while you're having fun! Way cool! We're taking a trip to San Diego, California, to visit Sweetwater Marsh National Wildlife Refuge. San Diego is way down on the southern tip of California and shares a border with Mexico!

What's a National Wildlife Refuge?

A **refuge** is a special area of land or water set aside to protect wildlife and **habitat** — the places where animals live. These areas are called National Wildlife Refuges, part of the U.S. Fish and Wildlife Service, and are found all across the United States. In fact, Sweetwater Marsh National Wildlife Refuge is one of over 500 refuges in the national wildlife refuge system.

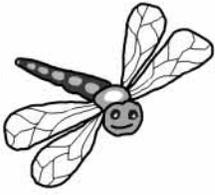
Why is it important to protect Sweetwater Marsh?

California has lost about 90% of its wetlands! Although wetlands have long been seen as places to dump waste or to be filled in for development, we now know that wetlands are extremely valuable. They are valuable not only as



nurseries for fish, habitat for many species of wildlife, but also for improving water quality and for providing recreational opportunities and open space.

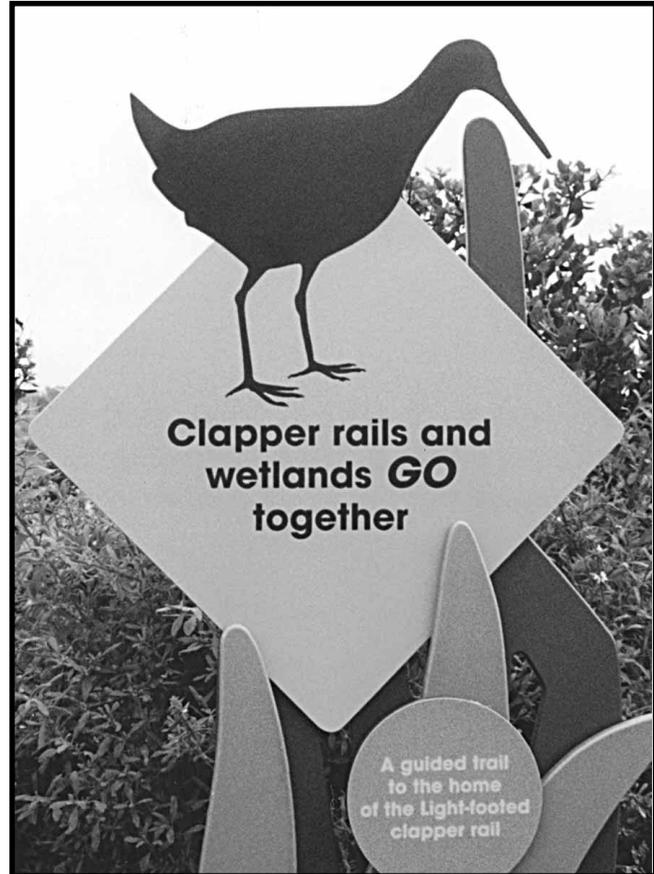
Sweetwater Marsh National Wildlife Refuge (NWR) was established in 1988 to protect the ***last remaining salt marsh*** in central San Diego Bay in San Diego County, California. A salt marsh is a type of wetland. **Slough** (slōō) is another word for wetland. Hey, you know, scientists are sort of like detectives. Want to be a wetland “sloughth”? Oops!?! I mean “sleuth”!



By protecting wetlands, this refuge also protects endangered species. How?

Well, endangered **species** are any species of plant or animal that is having trouble surviving and reproducing. This is often caused by loss of habitat, not enough food, or too much pollution. Here at Sweetwater Marsh NWR, the U.S. Fish and Wildlife Service protects the endangered light-footed clapper rail and California least tern, an endangered plant named the salt marsh bird's beak, the State endangered Belding's savannah sparrow, and the threatened western snowy plover. Without Sweetwater Marsh NWR, these species could be headed for extinction!

Let's get going. We have a lot of science sleuthing to do!!



*“Some large holes like graves were dug (...in the sand), and when the tide was high the water which trickled into them was **sweet and good**”*

Fr. Antonio de la Ascension, 1602
Original Source: Walter G. Smyth, *The Story of San Diego*

Wetlands Mystery Slogan Game

Interact with us!

Do you like the thrill of a victory? Do you like to be the first to get the answer right? Then you'll like our game! Interaction is the key to learning and fun. Not only will you be able to interact at the end of the program with live questions and answers, but you can interact during the program through the *Wetlands Mystery Slogan Game!*

The purpose of the game is to increase student interaction and learning, and have some fun! You can also win a 2000 Refuge System poster for your classroom and a special prize for the entire class if you unscramble the mystery slogan at the end of the game!

So educators, before the broadcast, please:

- get your students excited about this LIVE learning experience and their participation in the program,
- explain the rules of the wetlands mystery slogan game to your students so that they will be ready to answer the question at the end of each learning objective, and
- listen during the broadcast for the clues and when to call in your answer.

Learn the rules!

1. There are five chances to win a 2000 Refuge System poster for your classroom and one chance to win the bonus mystery slogan and a special prize for every student and teacher in the classroom — a Wild Things T-shirt! Each of the clues and the bonus mystery slogan will be based on information given in the program, so please pay attention to what the experts are saying about wetlands.

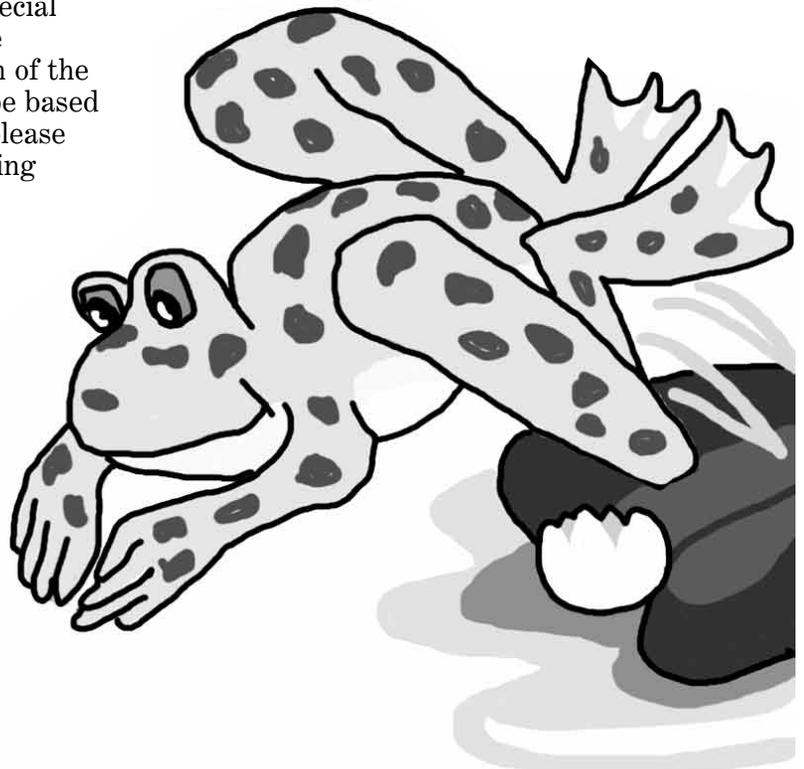
2. When you hear the clue given at the end of each learning objective and your students know the correct answer, you can interact with us in several ways:

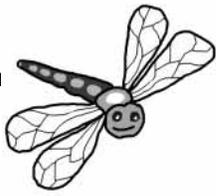
- fax us at **1-800-228-6302**
- e-mail us at **pwnetwk@aol.com**

3. Be sure to include your school name, city, and state in your faxes and emails. We cannot accept your answers unless you have included this information. After all, if you are the first with the correct answer, we need to know where to mail your prizes!

4. We cannot accept faxes or e-mails for a clue until it is given in the broadcast – no jumping ahead of the game!

5. Winners will be announced during the broadcast.





Wetlands Mystery Slogan Game

(Live, on-the-air game)

Part One: *What is a wetland?*

A wetland usually consists of these three things [] [] _____, soils, and _____ [] [] [] _____.

Part Two: *Why are wetlands important?*

One of the reasons is that wetlands act like a [] _____ and help with flood control.

Part Three: *What are the threats to wetlands?*

Wetlands are lost when they are _____ [] _____ [] for housing and commercial development.

Part Four: *How is the Fish and Wildlife Service helping wetlands?*

The Fish and Wildlife Service, in partnership with other federal and state agencies and private landowners, helps wetlands by buying, _____ [] [] _____, and protecting them.

Part Five: *What three things can YOU do to help wetlands?*

[] _____ [] _____ for a wetland restoration project, adopt a wetland, and buy a Duck Stamp.

Mystery letters

MYSTERY SLOGAN

_____ !

The Field Trip

Learning Objectives

Part 1

What Is A Wetland?

Students will be able to:

- define a wetland
- name one or more characteristics of a wetland
- identify at least two types of wetlands
- identify a local wetland

Part 2

Why Are Wetlands Important?

Students will be able to:

- list two reasons why wetlands are important to wildlife
- list two reasons why wetlands are important to people

Part 3

What Are The Threats To Wetlands?

Students will be able to:

- describe two threats to wetlands

Part 4

How Is The Fish and Wildlife Service Helping Wetlands?

Students will be able to:

- explain one or more things that the Fish and Wildlife Service is doing to help wetlands

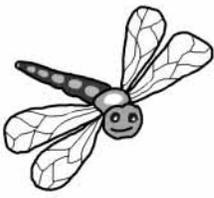
Part 5

What Can You Do To Help Wetlands?

Students will be able to:

- list one or more things they can do to help wetlands
- identify a wetland threat within their community





The Field Trip

Part 1

What is a Wetland?

What is a Wetland?

What do you think of when you hear the word, “**wetland**”? Do you picture mud swishing between your toes, mosquitos buzzing in your ear, or a good place to catch a frog? What kind of plants do you think of— trees, grass, or something in between? To understand a wetland, break the word in two. A wetland is both *wet* and *land*! Wetlands are places where water and land meet; where plants adapted to wet, soggy areas live. Wetlands are usually found in the area between deep water (a lake, pond, river or ocean)

and dry land. Wetlands are low lying places within a **watershed** where water collects. If the water is too deep for plants to grow (more than 6 feet deep), then wetland scientists call these areas **deep water habitats**. If the land is too dry for wetland plants to grow, then it is called **upland**.

Identifying Wetlands

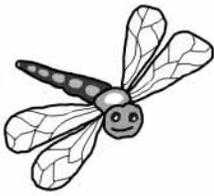
Wetlands are all about water. **Hydro** is the Latin word for water, and it can be found in the scientific words that describe wetlands. Can you find the water in the following description? (Hint: Look at the words in the parentheses). All wetlands have: 1) water (**hydrology**), 2) wet (**hydric**) soils, and 3) water-loving plants (**hydrophytic vegetation**).

Water

Wetlands get their water in several different ways including: rain water and runoff from higher ground, groundwater coming to the surface from deep underground, and flooding from nearby rivers, streams or ocean tides.

Soil

The way a wetland soil looks and feels indicates its watery surroundings. Dig up a small amount of soil in a wetland, and it will either be wet (dripping water off the end of your shovel) or **saturated**. Saturated soils will drip if you squeeze them tightly in your hand. Wetland soil is dark brown or black near the surface and shades of gray



deeper down (a foot or two). Rub the soil between your fingers, and it will feel either slick or sticky. Slick means the soil is rich in decaying plant matter or **silt** (fine inorganic material that settled out from flood waters). Sticky means the soil has a lot of clay in it. These soils hold lots of water and won't dry very fast. Some of the soils will smell like rotten eggs. Then you know you're in a really *wet* wetland!



Plants

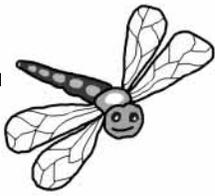
Wetland plants are **adapted** to grow in wetland soil. Some plants, such as water lilies and bald cypress trees, grow in shallow water. Others, like cottonwood trees and many grasses, grow in wetlands where the water is visible for only part of the year. Wetland plant names can sometimes

give you a hint that they grow in wet places, such as: swamp rose, pondweed, duck potato, alligator weed, river birch, water lily, northern bog orchid, salt marsh cordgrass, sea lavender, and marsh fern.

There are many different types of wetlands, and they come in all sizes. **Freshwater marshes** are the type of wetland most people think of first when someone says "wetland." They mainly have **herbaceous** (non-woody) plants such as cattails growing up out of the water. These plants are called **emergents**. Many other types of wetlands have trees growing in them and are called **forested wetlands**. Swamps are a type of forested wetland. All wetlands with fresh water are in a group called **palustrine wetlands**. All wetlands with a mixture of fresh and salt water are in a group called **estuarine wetlands**.

Wetlands can be as small as your bedroom or as large as the Florida Everglades, which originally covered 2.3 million acres! That's three times the area of the state of Rhode Island! But, we don't have room to describe them all. So, here's a sample of wetlands from around the country.

Salt Marsh - A salt marsh is a wetland that is found in or near the Atlantic or Pacific Ocean. These wetlands are flooded once or twice a day by ocean tides. The water is salty and, like a freshwater marsh, grasses and other



herbaceous vegetation grow in these areas. Salt marshes provide habitat for a wide variety of wildlife from clams and crabs to herons and hawks. They are nurseries for saltwater fish and shellfish. Our host site, Sweetwater Marsh National Wildlife Refuge, in San Diego, California, is a great example of a salt marsh.

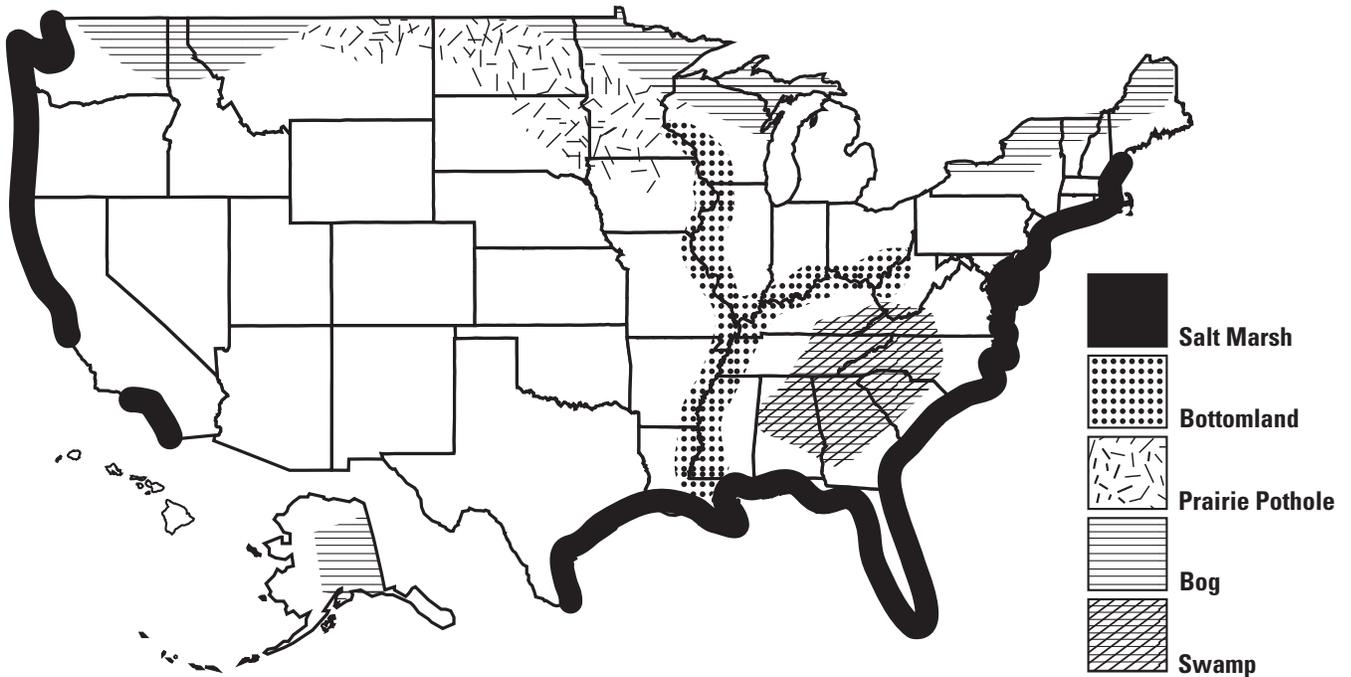
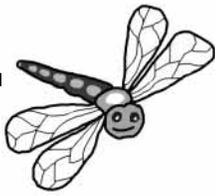
Bog - Bogs are found in northern parts of the United States where winters are cold and the ground is rocky. A bog is a freshwater wetland that has a **peat** soil, acidic water, and plants adapted to those conditions. Bogs have many unique plants adapted to the acidic and very wet conditions. Some have developed a special way to get the nutrients they need; they trap insects and digest them to “feed” the plants!

Swamp - Swamps are usually forested wetlands. The water can vary from less than one inch to a few feet deep. Some

swamps even dry up in the summer months! Common trees of eastern swamps are red maple, white cedar, and black willow. Southern swamps have bald cypress, swamp white oak, and tupelo. If the plants in the swamp are mostly shrubs (woody plants less than 20 feet tall) then the wetland is called a **shrub swamp**. Some shrub swamps, such as mangrove swamps, grow in salt water. Swamps are rich in plant and animal life.

Prairie Pothole - Prairie potholes are found in the Midwest in areas that were once covered by glaciers. When the ice sheet melted, the land was covered by many small depressions or “potholes.” These prairie potholes have thick, rich soils, and most of their plants are grasses, like cattails and other non-woody plants. Potholes have different depths, and many dry up in the spring and summer. Because of their rich soils, these areas are often farmed. Many potholes have been permanently drained to maintain their use as farm lands. Prairie potholes are critical feeding areas for shorebirds and waterfowl that **migrate** north each spring to nest and south to winter in South America and the Gulf of Mexico. The birds stop at these wetlands and “refuel” on seeds, worms, snails, and other tiny invertebrates.

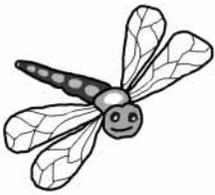
Bottomlands - These forested wetlands



are sometimes called bottomland hardwoods. They occur along large streams and rivers. These wetlands are in the **floodplain** of these streams and rivers and act as large sponges, soaking up floodwaters when the rivers overtop their banks. Bottomlands tend to dry out more quickly than some other wetlands which help them sponge up more floods. Trees dominate these wide, flat wetlands. Some common bottomland trees are cottonwood, silver and red maple, ash, elm, willow, alder, and birch. Bottomlands are also home to a great variety of wildlife, and like prairie potholes, they are often farmed.

Finding Your Wetland

Is there a wetland near your home? To find your closest wetland, first look on a map for the nearest water source. Maps will show you creeks, streams, rivers, oceans, ponds, and lakes. Some maps even have little symbols that show wetland areas. Once you have found your closest water source on the map, go out to that area and look around. Where is the ground soggy? What kind of plants are growing there? What does the soil look, feel, and smell like? If you have water, wet soil, and water-loving plants, then you have found a wetland!



Why are wetlands important -

Experiment 1

How are sponges and wetlands alike?

What you will need:

- One cup or glass of water
- One dampened sponge
- A sink at school or at home.

Gently pour one half of the water down the side of the sink. This is similar to water running down a hill. The drain at the bottom of the sink is the stream, river, or ocean that rain water would flow into. Is there any water remaining in the sink?

Next, hold the sponge flat beside the sink drain. Empty the remaining water slowly down the side of the sink so that it flows into the sponge. Is there any water remaining in the sink? Squeeze and then measure the water from the sponge to find out how much water remained in the sink.

Wetlands act as sponges, holding, storing, and slowing down the flow of water. Because of this, downstream flooding is reduced where there are wetlands. While the water is held in the wetland, silt settles out. Chemicals and nutrients are filtered out and absorbed by wetland plants or held in wetland soils and may be taken up by micro-organisms. So, not only is flooding reduced, but the quality of the water flowing out is improved for wildlife and for people.

Why are wetlands important -

Experiment 2

What do filters and wetlands have in common?

What you will need:

- Container or jar with a lid
- Water
- Dirt and small rocks
- Coffee filter
- Funnel or kitchen strainer
- Clear plastic or glass container

Mix water, dirt, and small rocks in the container. Then close tightly, and shake. This is like rain water that has a large sediment load from soil erosion.

Rate how muddy the water is on a scale of from 1 to 5, with 1 being very clear and 5 being very cloudy.

Next pour half the water through the filter in the funnel or strainer (over a sink or a closed container to avoid spills) into a clear container. How would you rate (1-5) the water in the clear container? How do the two water samples compare? How do you think this filtering action applies to a wetland?

The stems, trunks, leaves, and roots in a wetland act as a natural strainer to slow the flow of water and to filter out sediment. Wetlands greatly reduce the sediment that would otherwise flow into rivers and streams, and they protect wildlife habitat downstream.

Wetland Metaphors

Grade Level: 5-8

Subject Area Skills: Environmental Education , Language Arts

Duration: one or two 30 to 60 minute periods

Group Size: any

Setting: indoors or outdoors

Conceptual Framework Topic Reference: 1A2b

Key Terms: wetlands, metaphor

Appendices: Outdoors, Simulations

Objectives

Students will: 1) describe the characteristics of wetlands; and 2) demonstrate their understanding of the importance of wetlands to wildlife and humans.

Method

Students are presented with a selection of objects for investigation as metaphors for the natural functions of wetlands.

Materials

A large pillowcase, bag, or box; sponge; small pillow; soap; eggbeater or mixer; small doll cradle; sieve or strainer; paper coffee filter; antacid tablets; small box of cereal; 3x5 cards with pictures that could be used to show other wetland metaphors (a zoo could represent the idea of wildlife diversity in a wetland, a lush vegetable garden could represent the idea of a productive wetland in which food is abundant, a vacation resort could represent the idea of a resting or wintering place for migrating waterfowl).

NOTE: A metaphoric approach such as this allows a variety of objects to suggest some appropriate linkage to the basic characteristics of wetlands.

Background

Wetlands are many different things to many different people. Some people have never heard or thought about wetlands. Others are working actively to protect wetlands because of their importance.

Wetlands include such areas as freshwater and saltwater marshes, wet meadows, swamps, lagoons, bogs, and prairie potholes. All wetlands, whether coastal or inland, provide special habitats that serve

areas far beyond their boundaries. Wetlands are uniquely important to plants, animals, humans, and the total environment.

Because of the abundant food, vegetative cover (shelter), and water found there, most wetlands are rich with diverse wildlife species.

Coastal and inland marshes, for example, provide breeding, resting and wintering habitats for thousands of migratory birds — including ducks, geese, swans, cranes, and shore birds. Many species of fish that are important for commercial and personal use by humans reproduce and spend part, or all, of their life cycles in fertile wetlands adjacent to larger, more open bodies of water. These fish species include bass, salmon, walleye, perch, and pickerel. A wide variety of reptiles, amphibians, insects and crustaceans also breed and live in wetlands. Frogs and toads, turtles of all kinds, salamanders, snakes, dragonflies, water striders, clams, and crayfish flourish in wetland habitats. Many mammals— from muskrats and beaver to white-tail deer and moose— also depend on wetland areas.

Wetlands are often referred to as “nurseries” because they provide critical breeding and rearing habitats for countless numbers and kinds of wildlife.

Wetlands also have the unique ability to purify the environment. They act as natural filtering systems and have been shown to be extremely effective. For example, they can trap and neutralize sewage waste, allow silt to settle, and promote the decomposition of many toxic substances.

The importance of vegetation associated with wetlands cannot be overlooked. Plants absorb nutrients and help cycle them through food webs. Plants also help keep nutrient concentrations from reaching toxic levels. Plants slow down water flow, causing silt to settle out. Through photosynthesis, plants add oxygen to the system and provide food to other life forms. Of great importance to humans are the flood control characteristics of wetlands. When runoff from rains and spring thaws is high, wetland areas absorb excess water until it gradually drains away down streams and rivers and through the soil. Acting as buffers, healthy wetlands prevent flooding and erosion. In dryer periods, wetlands hold precious moisture after open bodies of water have disappeared.

The many activities that take place in wetlands make them among the most productive ecosystems in the world.

As remarkable and resilient as wetlands are, these unique areas have limits. Their destruction and/or abuse can have devastating effects on wildlife, humans, and overall environmental quality.

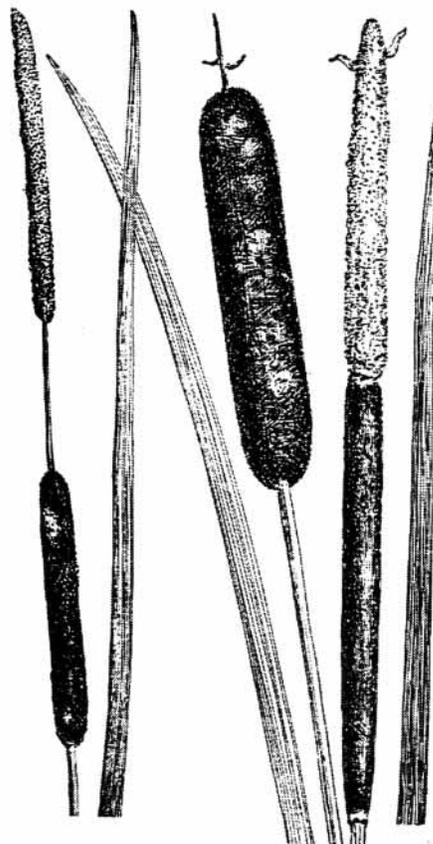
Many of the major attributes of wetlands can be explored through the use of metaphors. To use a metaphor is to apply a word or phrase to an object or concepts, which it does not literally denote in order to suggest a comparison between the two. A metaphor represents a concept or idea through another concept or idea. "A tree is a home" and "Books are window of thought" are two examples. In this activity a variety of everyday objects are used to represent the natural functions of wetlands. For example:

Object	Metaphoric Function
<i>sponge</i>	absorbs excess water caused by runoff; retains moisture for a time even if standing water dries up (e.g., sponge placed in a small puddle of water absorbs water until saturated, then stays wet after standing water has evaporated)
<i>pillow or bed</i>	is a resting place for migratory birds
<i>mixer or eggbeater</i>	mixes nutrients and oxygen into the water
<i>cradle</i>	provides a nursery that shelters, protects and feeds young wildlife
<i>sieve or strainer</i>	strains silt, debris, etc., from water
<i>filter</i>	filters smaller impurities from water
<i>antacid</i>	neutralizes toxic substances
<i>cereal</i>	provides nutrient-rich foods
<i>soap</i>	helps cleanse the environment, as wetlands do

Wetland habitats are being converted to other uses (agriculture, roadways, housing developments) or are otherwise being altered (drained for pest control or polluted) at the rate of about a half million acres per year. And although many wetlands are protected by federal and state laws, there still appears to be a

significant need to create a greater understanding of the importance of wetlands as ecosystems and as wildlife habitat.

The major purpose of this activity is for students to develop an appreciation and understanding of wetlands through the power of metaphor, linking the characteristics and natural functions of wetlands to the familiar realm of everyday life.



Procedure

1. Prepare a "Mystery Metaphor Container" (pillowcase, bag, or box). It should be possible for students to put their hands into the container and pull out an object. You may want to collect as many as one metaphoric object per student, but at least have enough for one per group of four students. Put the container aside to use later.

2. Discuss the variety of wetlands found in your local area, state, country, etc. Then invite the students to sit quietly and close their eyes. Ask them to picture a wetland. Have them examine what it looks like. Have them look carefully at the plants and animals, including insects and small creatures. What does the air feel like? How does it smell?

3. Invite the students to tell what they imagined. Compile a list of their offerings. Encourage discussion and mutual sharing.

4. With their lists as a point of reference, help the students identify which plants and animals are most likely to be found in a wetland. If possible, have them classify the plants and animals according to the kind of wetland in which they could be found. State or federal wildlife officials and representatives of private conservation or nature-related organizations can be helpful.

5. Next provide the students with background information to serve as an overview of the basic ecological activities that characterize the wetland habitat. For example, you can include the following:

- sponge effect — absorbs runoff
- filter effect — takes out silt, toxins, wastes, etc.
- nutrient control — absorbs nutrients from fertilizers and other sources that may cause contamination downstream
- natural nursery — provides protection and nourishment for newborn wildlife

Suggest that these activities and many more than they could probably think of are taking place in wetlands all the time.

6. Now bring out the “Mystery Metaphor Container.” Tell the students that everything in the container has something to do with a wetland. Have the students divide into groups of four. Announce that when it is their turn, you want a representative of each group to draw an object from the container. Then, as a group, they must figure out how the object could represent what a wetland is or does.

7. Have the designated student reach into the container and withdraw one object. When each group has an object, ask them to work as a team to describe the relationships between their metaphoric object and the wetland. Encourage the students to build on each other’s ideas. You can also assist by strengthening their connections.

NOTE: Give all the students time to discuss their ideas with each other before doing so in front of the entire class.

8. Ask each group to report its ideas to the class.

9. Following discussion and review of the functions represented by each metaphor, ask the students to summarize the major roles that wetlands perform in contributing to habitat for wildlife. List the ways in which wetlands are important to humans. Why do humans convert wetlands to other uses? Ask them if their own attitudes about wetlands are different now. If yes, how? If not, why not?

10. For the final part of this activity, encourage the students’ understanding of how the wetlands’ condition depends upon each of us. Many kinds of wildlife depend upon wetlands. Our own well being requires wetland ecosystems. Strengthen the students’ understanding of how humans are connected to wetlands. Recreation, aesthetics, utilitarian uses, environmental quality, and nature study are but a few of the connections we each have with wetlands.

Extensions

1. Visit a wetland to verify the appropriateness of the metaphors explored in the classroom. Identify and discuss any limitations to the appropriateness of these metaphors. Identify what seem to be the most compelling attributes of the metaphors in helping you understand the characteristics and nature of the wetland. Expand on your understanding of these metaphors. Identify new and appropriate metaphors.

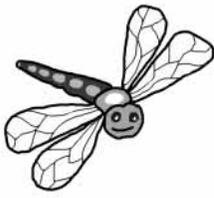
2. Investigate local, county, state, and federal regulations and laws that govern uses of wetlands.

Evaluation

1. Explain why wetlands are called one of the world’s most productive ecosystems.

2. Wetlands are important to a range of organisms in the animal kingdom, from zooplankton to humans. Select five species of animal and describe how wetlands are important to each.

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Did you also know that wetlands function as storm water systems, sewage treatment plants, zoos, **arboretums**, nurseries, supermarkets, and recreation centers? Read on!

Good water quality is important to wildlife and to you. Natural wetlands filter out chemicals and fertilizers from lawns and farms, and toxic wastes that have been discharged from businesses. These **pollutants** wash into streams and rivers and hurt or kill wildlife and are harmful to people. Wetlands help filter out this pollution. Some communities even build wetlands to help them purify the water discharged from their waste water treatment plants or contaminated sites.

The Field Trip

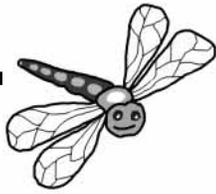
Part 2

Why Are Wetlands Important?

Wetlands serve many functions in nature. Did you know that wetlands are among the most productive **habitats** in the world? Left in place (not disturbed), wetlands act as natural sponges by capturing, storing, and then slowly releasing water over a period of time. Without wetlands, many more homes and businesses would be flooded during storms, costing our communities millions of dollars!

Wetlands are homes, too!

Wetlands serve as home to thousands of wetlands plants and animals. Waterfowl depend on wetlands to nest, feed, rest, and raise their young. Many fish live, feed, and spawn in wetlands. Frogs and salamanders depend on wetlands for all or most of their life. Wetlands are also home to animals such as beavers, alligators, mussels, crayfish, and insects. Many plants like the swamp rose and marsh marigold live nowhere else but in wetlands. Over 30% of **endangered species** depend on wetlands to survive. As more wetlands are lost, more species are becoming endangered.



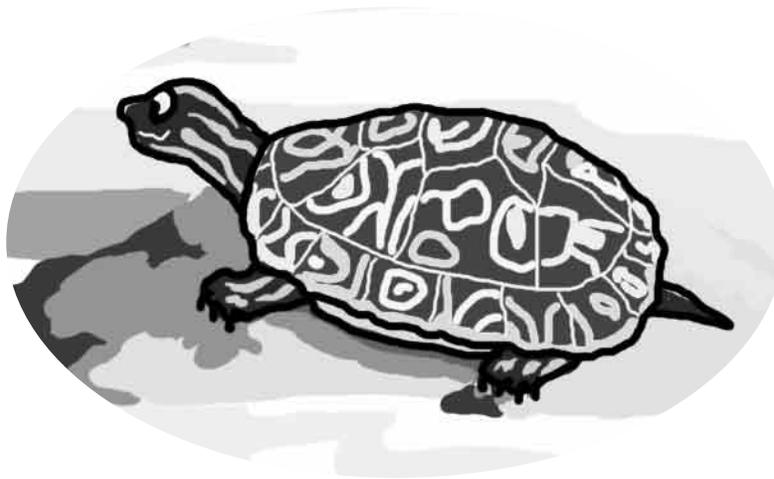
Our Food, Work, and Play!

Wetlands are good sources for food; for example: fish, rice, cranberries, clams, and shrimp. Many people and businesses earn a living by raising, gathering, or processing foods from wetlands. I bet you didn't know that more than 95 percent of the fish and shellfish (like shrimp) that you eat are harvested (or grown) in wetlands! And did you also know that plants are a key ingredient in many medicines? For example, jewelweed, a wetland plant,

contains a liquid that can be rubbed onto your skin to stop the itching of poison ivy! WOW – what a relief!

Farmers use water from wetlands in wet years to water their crops and cattle. In dry years, they may graze cattle in wetlands.

You can birdwatch, view other wildlife, boat, walk, or take photos in wetlands. Many people fish or hunt in wetlands. Wetlands are used for research and education (such as this program!). And, of course, wetlands provide open space for beauty and our enjoyment.



Marsh Munchers

Grade Level: K-4 (and older)

Subject Area Skills: Science, Environmental Education

Duration: 20 to 60 minutes

Group Size: designed for 25 students; can be adapted for smaller or larger groups

Setting: outdoors or large indoor playing area

Conceptual Framework Topic Reference: IB, IIA, IIB1, IIB2, IIB2b, IIC

Key Terms: salt marsh, food web, decomposer, detritus. **OPTIONAL:** predator, prey, producer, consumer

Appendices: Ecosystem, Simulations

Objective

Students will identify a food web in a salt marsh.

Method

Students will: 1) use body movement and pantomime to simulate the feeding motions of marsh animals; and 2) identify their interconnectedness in a food web.

Materials

Timer; construction paper for tokens in five colors: white, green, yellow, blue, red; predator feeding-behavior cards, detritus-eater cards; one envelope per student.

Note: This activity is written for an estimated 25 students. One fifth of the class will be designated predators and 4/5 will be other organisms.

Background

A salt marsh is an important ecosystem between a landmass and the ocean. It is a place where fresh water and salt water come together to form a unique habitat for wildlife. Life forms in salt marshes are often more complex and diverse than in other habitats because of the constantly changing mixture of both fresh and salt water.

Salt marshes are one of the most productive ecosystems on earth, producing up to two times as much food as the most fertile agricultural lands. The main producer for this important ecosystem is salt marsh grass, which grows and thrives in the nutrient-rich waters of estuaries where salt water

from the ocean mixes with freshwater from land drainage. A salt marsh is always producing new grass as old grass dies. Bacteria promote the decay of the marsh grass, which in turn produces detritus (di-tri-tes). Detritus is dead and decaying plant or animal matter. Fiddler crabs, snails, small shrimp and such fish as minnows feed on decomposed marsh grasses. Oysters and clams filter detritus and tiny living plants from the water. These organisms become food for crabs, birds and a variety of fish. Many marine organisms and commercially valuable fish species – including flounder, red drum and striped bass – depend on marsh ecosystems during their lifetimes.

Countless numbers of birds are also dependent on salt marshes for food and nesting areas. Ospreys, sandpipers and members of the heron family can be seen feeding along marsh creeks during the spring and summer while ducks and northern harriers are common sights in the winter months. Other animals seen wandering through the marsh in search of food are raccoons and small mammals such as shrews and mice. Deer, grasshoppers, and geese can be seen consuming the grasses at different parts of the year.

Salt marshes contribute to flood control and provide water filtration. As water flows through the marsh, much of the sediment load is filtered out to create cleaner and clearer water. Salt marsh grasses and soils also help absorb flood waters and act as natural buffers between land and ocean. These marshes protect upland organisms as well as billions of dollars worth of human businesses, homes and cities from storms.

Coastal development and pollution are threatening salt marsh environments. Salt marshes, like other wetlands, are destroyed or damaged when land is converted to agriculture production, fill for coastal development, construction of canal dredging as well as for other uses.

The major purpose of this activity is for students to learn about salt marshes and reinforce their understanding of the concept of a food web.

Note: Since this is a simulation, some of the animals' roles are simplified. In actual salt marshes, some animals have several roles. For the purposes of this activity, one dominant role for each animal has been identified.

Table of Materials to Be Prepared and Placed in Envelopes (One Envelope Per Student Representing One Predator or Other Organism)

Feeding-Behavior Cards Colored Food Tokens

Predators

1 raccoon	1 each
1 blue crab	1 each
1 red drum fish	1 each
1 egret	1 each
1 person	1 each

Other Organisms

4 fiddler crab	1 each	5 red tokens each (20 total)
4 snails	1 each	5 blue tokens each (20 total)
4 oysters	1 each	5 yellow tokens each (20 total)
4 juvenile fish	1 each	5 green tokens each (20 total)
4 shrimp	1 each	5 white tokens each (20 total)

Procedure

1. Cut the appropriate colored construction paper into food tokens, according to the table on this page. Reproduce the feeding-behavior cards (five predator cards, twenty detritus-eater cards). Place feeding-behavior cards and food tokens into the appropriate envelopes.
2. Discuss the characteristics of a salt marsh habitat with the students. Also discuss the importance of salt marshes with emphasis on their high productivity as a place for animals and plants to inhabit. Discuss the role of detritus in the marsh

food web. Mention decomposers and their importance. If appropriate, introduce the terms predator and prey, and producers and consumers. Show the students *Diagram A* and emphasize the unusual relationship between fresh water and tidal

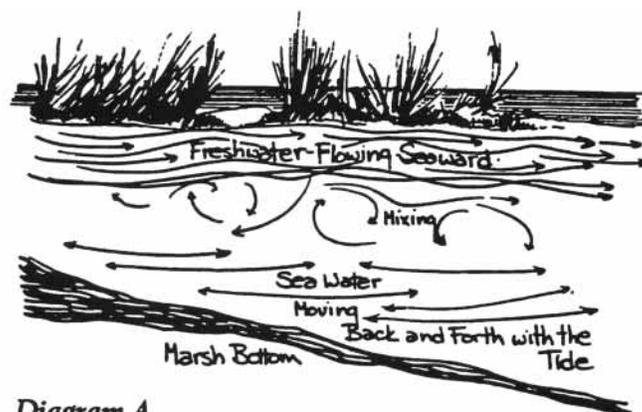


Diagram A

salt water found in this habitat.

3. Give one envelope to each student. Explain that their identities are a secret. Each envelope contains the identity of one animal that lives in a salt marsh. The only way others will know what they are is by the way they feed. When they receive their envelopes, explain that some students will be detritus eaters and others will be predators who prey on the detritus eaters.
4. Instruct the students to open their envelopes and see what animal they are and what feeding behavior they use. Remind them to keep their identities a secret from the other students. The students will indicate what animals they are by the feeding behavior.

Optional: Model each behavior first and identify it so the students will know which animal does what. However, it may be more productive to allow the students to improvise.

5. Explain the rules:
 - Each student represents an other organism or a predator
 - Each other organism has five food tokens, representing five individual marsh animals of the same species.
 - The other organism must give a food token to a predator when tagged.
 - Each predator must get 10 food tokens to stay alive during a tidal cycle
 - A tidal cycle is one laying period of the game

- Each predator can only get one token from each other organism at any one time in a tidal cycle, but needs to get as much prey as possible during the tidal cycle
- Other organisms keep eating even after preys have eaten them. They represent the remaining animals of that species, until they run out of food tokens. When they run out of food tokens, they sit quietly in place *decomposing* in the salt marsh.
- Other organisms and predators must display their feeding styles during the activity
- Other organisms will show their feeding styles from stationary squat positions, while predators will walk and display their behavior

6. Establish a play area (inside or outside) and have all other organisms take their envelopes with them, spread out on the playing field, and start pantomiming their feeding behaviors.

7. Tell predators to begin to pantomime their respective feeding behaviors, capture their prey, and secure a food token from them, placing it in their envelope.

8. Call time when appropriate (after most predators have gotten 10 food tokens.)

9. Tell students to hold onto their food envelopes so that they can participate in the discussions.

10. Discuss the results. Did every predator get 10 food tokens during the tidal cycle? If not, why not? (Some animals are more selective in their feeding preferences and therefore may have a more difficult time finding food.) Discuss the different ways the animals are connected to each other and to the detritus. Mention that decomposers break down plants and animals to produce the detritus. Be sure the supporting role of the producers, the plants that become the detritus, does not get overlooked by the high activity of the consumers.

11. Draw a food web based on the feeding interactions that took place during the game. Add the plants that the decomposers eat to produce detritus.

12. Collect the envelopes and put the color-coded tokens back into their original envelopes.

Optional: Shuffle the envelopes and redistribute them to the students. Replay the simulation and draw a second food web. Compare and contrast the food webs.

13. Summarize by emphasizing the importance of salt marshes. Salt marshes provide habitat for a variety of different kinds of animals. Salt marshes are unusually productive habitats, growing large amounts of vegetation that supports a variety of species of wildlife.

Extensions

1. Draw or paint a food web of a salt marsh as a mural. Be responsible for drawing an accurate portrait of each animal. Place each drawing in the appropriate place in the cycle. With yarn, connect each animal with what it eats.

2. If possible, visit a salt marsh.

3. Modify this activity to simulate a fresh water marsh by substituting the following freshwater animals for the previously described saltwater animals:

Other Organisms

4 crayfish
4 clams
4 dace (small fish)
4 scuds (shrimp-like crustacean)
4 mosquito larvae

Predators

1 raccoon
1 great blue heron
1 bluegill
1 northern pike
1 person

Follow the rest of the procedures as previously outlined.

Evaluation

1. Give examples of two predators and two prey species that live in salt marshes.

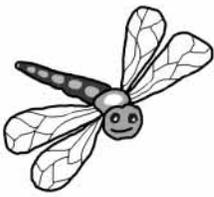
2. Use some of the organisms listed below, and others of your choice, to construct a food web that might be found in a salt marsh: people, raccoons, marsh grass, bacteria, snails, oysters, detritus, young fish, egret.

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Master for Marsh Muncher

 <p>Person Fishing Student walks forward casting line, and tags prey by grasping on the shoulder.</p>	 <p>Blue Crab Student walks sideways, waving arms like claws and grasps prey.</p>	 <p>Raccoon Student walks forward washing hands and grasps prey.</p>	 <p>Red Drum Fish Student walks with hands held forward like a mouth, and grasps prey</p>	 <p>Egret Student struts with hands on hips, so elbows are like wings. Nearing prey, arms become a beak to grasp prey.</p>
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 <p>Juvenile Fish Gulps down detritus particles in the water or on the bottom. (Student puckers lips and makes sucking noises while feeding.)</p>	 <p>Juvenile Fish Gulps down detritus particles in the water or on the bottom. (Student puckers lips and makes sucking noises while feeding.)</p>	 <p>Juvenile Fish Gulps down detritus particles in the water or on the bottom. (Student puckers lips and makes sucking noises while feeding.)</p>	 <p>Juvenile Fish Gulps down detritus particles in the water or on the bottom. (Student puckers lips and makes sucking noises while feeding.)</p>
 <p>Shrimp Stirs up mud and detritus with walking legs which lifts particles to mouth. (Student makes stirring motions with both arms.)</p>	 <p>Shrimp Stirs up mud and detritus with walking legs which lifts particles to mouth. (Student makes stirring motions with both arms.)</p>	 <p>Shrimp Stirs up mud and detritus with walking legs which lifts particles to mouth. (Student makes stirring motions with both arms.)</p>	 <p>Shrimp Stirs up mud and detritus with walking legs which lifts particles to mouth. (Student makes stirring motions with both arms.)</p>
 <p>Snail Licks up detritus with specialized tongue called radula. (Student displays licking motion, using one hand as the radula.)</p>	 <p>Snail Licks up detritus with specialized tongue called radula. (Student displays licking motion, using one hand as the radula.)</p>	 <p>Snail Licks up detritus with specialized tongue called radula. (Student displays licking motion, using one hand as the radula.)</p>	 <p>Snail Licks up detritus with specialized tongue called radula. (Student displays licking motion, using one hand as the radula.)</p>
 <p>Oyster Filters detritus from water using gills. (Student waves arms back and forth in air.)</p>	 <p>Oyster Filters detritus from water using gills. (Student waves arms back and forth in air.)</p>	 <p>Oyster Filters detritus from water using gills. (Student waves arms back and forth in air.)</p>	 <p>Oyster Filters detritus from water using gills. (Student waves arms back and forth in air.)</p>
 <p>Fiddler Crab Picks detritus from sand with one or two claws. (Students pick objects from floor with thumb and fingers of hands acting as claws.)</p>	 <p>Fiddler Crab Picks detritus from sand with one or two claws. (Students pick objects from floor with thumb and fingers of hands acting as claws.)</p>	 <p>Fiddler Crab Picks detritus from sand with one or two claws. (Students pick objects from floor with thumb and fingers of hands acting as claws.)</p>	 <p>Fiddler Crab Picks detritus from sand with one or two claws. (Students pick objects from floor with thumb and fingers of hands acting as claws.)</p>



The Field Trip

Part 3

What are the Threats to Wetlands?

How many wetlands do we have?

There are approximately 104 million acres of wetlands left— that’s 5% of the land area in the lower 48 states. One hundred and four million! That sounds like a lot, but it’s not. Especially when you consider that back in 1980, 100,000 acres were lost in just that year! Most of the existing wetlands are in the southeastern United States. Alaska is estimated to have about 45% wetland,

and Hawaii has 1% wetland. The type of wetland with the greatest losses are **forested wetlands** such as **bottomlands** and **swamps**.

What happens when wetlands are lost?

Increases in flood and drought damage are, in part, the result of wetlands destruction. As wetlands are degraded or lost, plant and animal life are hurt. Birds, fish, frogs, and other wetland species decline due to wetlands loss. Loss of wetlands doesn’t just affect plants and animals. It affects you, too. For example, poor water quality can affect our drinking water. It can also affect water-related activities such as fishing. Commercial fishermen may go out of business because of declining fish populations.

What are the greatest threats to wetlands?

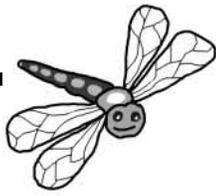
The greatest threats to wetlands are caused by farming use, commercial or housing development, **contamination** (or pollution), **invasive species**, and **global climate change**.

Farming.

In some areas, wetland trees are cut down, or **emergent** wetlands are plowed and drained, and crops such as soybeans or corn are planted. Farming directly in wetlands such as for rice and cranberries, and farming practices that allow cattle into wetlands degrades wildlife habitat.

Development.

Construction of housing developments or commercial areas sometimes includes the filling, dredging, or draining of wetlands.



Non-Point Source Pollution.

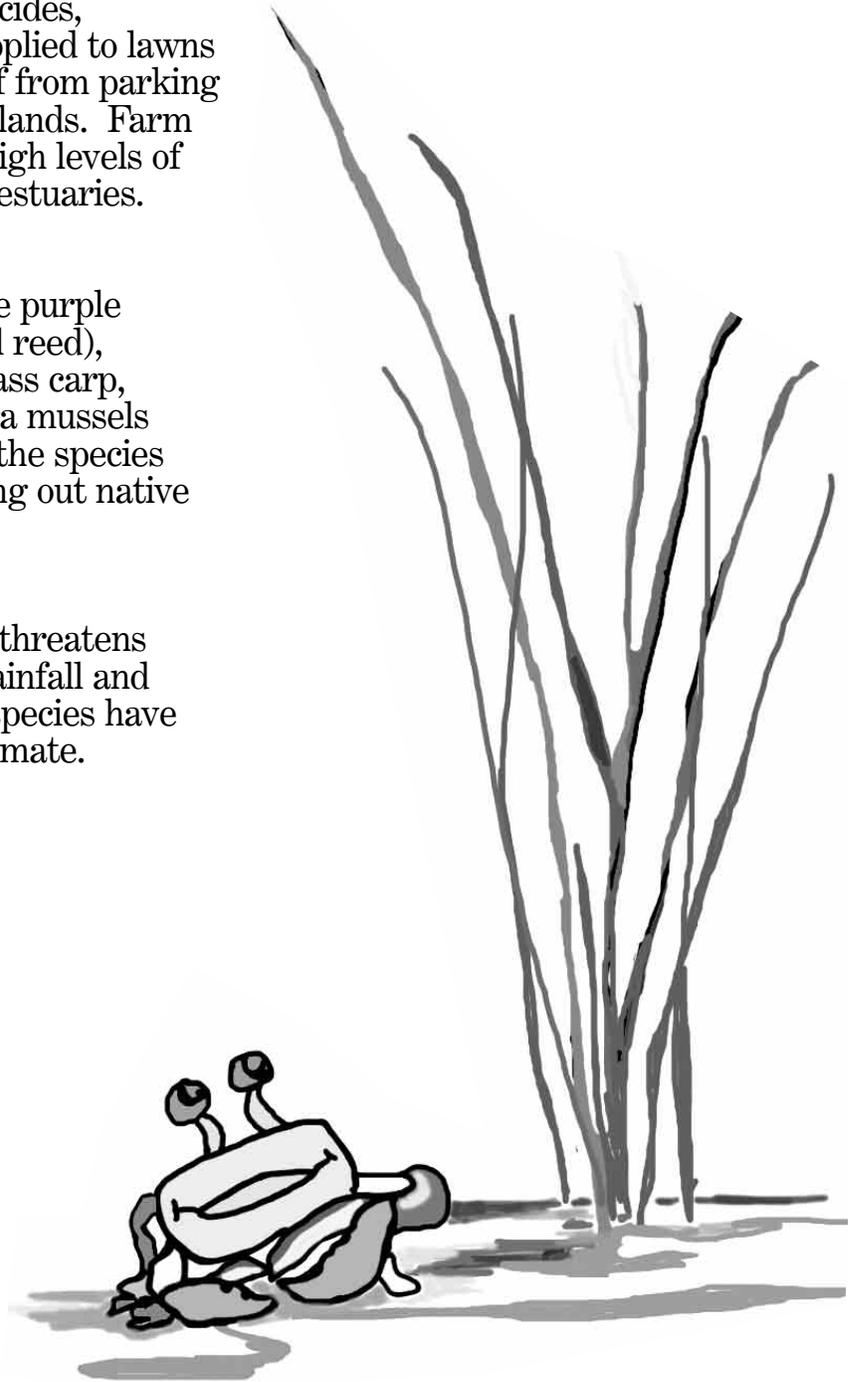
Contamination from herbicides, pesticides, and fertilizers applied to lawns and farm fields, and run-off from parking lots and streets pollute wetlands. Farm animal waste runoff adds high levels of **nutrients** to wetlands and estuaries.

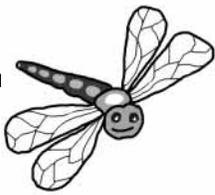
Invasive Species.

Invasive species such as the purple loosestrife, phragmites (tall reed), hydrilla (floating plant), grass carp, nutria, mitten crab, or zebra mussels are harming wetlands and the species that rely on them by choking out native plants and animals.

Global Climate Change.

Global climate change also threatens the health of wetlands as rainfall and temperatures change and species have to adapt to the changing climate.

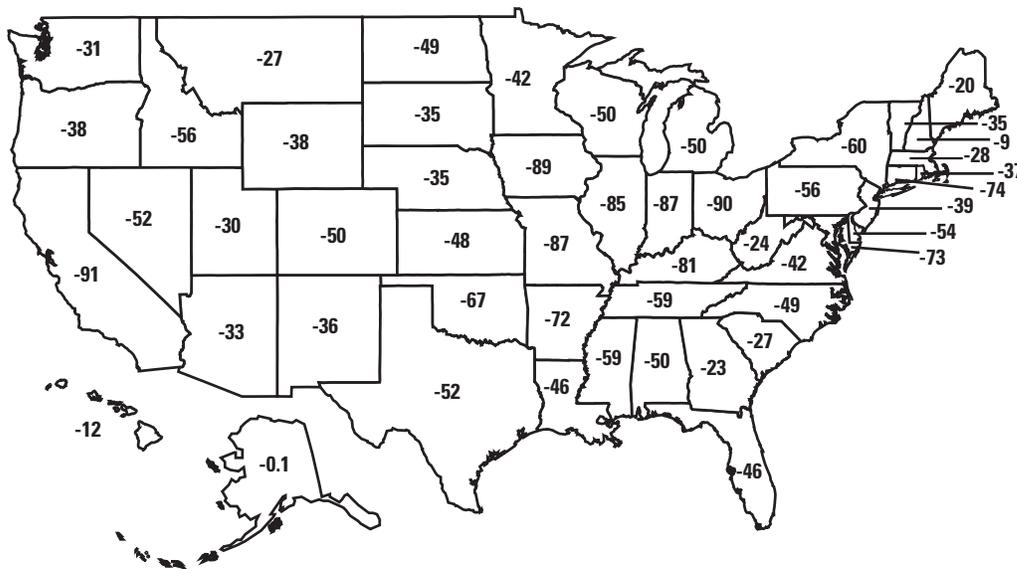




Going, Going, Gone... Wetland Losses in the United States (1780's to 1980's)

State	Est. of Wetlands (1780's)	Est. of Wetlands (1980's)	Percentage of Wetlands Lost
AK	170,200,000	170,000,000	-0.1%
AL	7,567,600	3,783,800	-50
AZ	931,000	600,000	-36
AR	9,848,600	2,763,600	-72
CA	5,000,000	454,000	-91
CO	2,000,000	1,000,000	-50
CT	670,000	172,500	-74
DE	479,785	223,000	-54
FL	20,325,013	11,038,300	-46
GA	6,843,200	5,298,200	-23
HI	58,800	51,800	-12
ID	877,000	385,700	-56
IL	8,212,000	1,254,500	-85
IN	5,600,000	750,633	-87
IA	4,000,000	421,900	-89
KS	841,000	435,400	-48
KY	1,566,000	300,000	-81
LA	16,194,500	8,784,200	-46
ME	6,460,000	5,199,200	-20

MD	1,650,000	440,000	-73
MA	818,000	588,486	-28
MI	11,200,000	5,583,400	-50
MN	15,070,000	8,700,000	-42
MS	9,872,000	4,067,000	-59
MO	4,844,000	643,000	-87
MT	1,147,000	840,300	-27
NE	2,910,500	1,905,500	-35
NV	487,350	236,350	-52
NH	220,000	200,000	-9
NJ	1,500,000	915,960	-39
NM	720,000	481,900	-33
NY	2,562,000	1,025,000	-60
NC	11,089,500	5,689,500	-49
ND	4,927,500	2,490,000	-49
OH	5,000,000	482,800	-90
OK	2,842,600	949,700	-67
OR	2,262,000	1,393,900	-38
PA	1,127,000	499,014	-56
RI	102,690	65,154	-37
SC	6,414,000	4,659,000	-27
SD	2,735,100	1,780,000	-35
TN	1,937,000	787,000	-59
TX	15,999,700	7,612,412	-52
UT	802,000	558,000	-30
VT	341,000	220,000	-35
VA	1,849,000	1,074,613	-42
WA	1,350,000	938,000	-31
WV	134,000	102,000	-24
WI	9,800,000	5,331,392	-46
WY	2,000,000	1,250,000	-38



Twenty-two states have lost at least 50 percent of their original wetlands. Seven states—Indiana, Illinois, Missouri, Kentucky, Iowa, California, and Ohio—have lost over 80 percent of their original wetlands. Since the 1970's, the most extensive losses of wetlands have been in Louisiana, Mississippi, Arkansas, Florida, South Carolina, and North Carolina.

Source: Mitch and Gosselink. *Wetlands*. 2nd Edition, Van Nostrand Reinhold, 1993

Dragonfly Pond

Grade Level: 5-8

Subject Area Skills: Environmental Education, Social Studies

Duration: one to three 45-to 60-minute periods

Group Size: designed for several small groups; can be modified to be an individual activity.

Setting: indoors

Conceptual Framework Topic Reference: IC2,IC3

Key Terms: land use planning, wetlands, trade off, lifestyle

Appendices: Local Resources, Ecosystem, Observations and Inferences, Simulations

Objectives

Students will: 1) evaluate the effects of different kinds of land use on wetland habitats; and 2) discuss and evaluate lifestyle changes to minimize damaging effects on wetlands.

Method

Students create a collage of human land use activities around an image of a pond.

Materials

For each team: scissors; masking tape; paper; two sets of Land Use Patterns (page 32); one Dragonfly Pond Map on page 33; a large piece of paper (18" x 24").

Background

Since the earliest of times, humans have deliberately planned the arrangement of housing in regular, rectangular patterns and the prominent location of civic and religious buildings along main thoroughfares. These patterns have not only given structure to American cities, but they have also affected wildlife habitat and populations. Sometimes people perceive undeveloped areas of the natural environment as raw material for human use, while others believe that the natural environment is to be preserved without regard for human needs. Still others yearn for a balance between economic growth and a healthy natural environment.

Growth is at the core of land use issues. Growth in natural systems has inherent limits, imposed by a balance of energy among all parts of the system. Energy in natural systems is translated into food, water, shelter, space and continued survival. The vitality of natural systems is expressed by the ability to be self-regulating. This capacity for self-regulation of

all the life and plant forms of an ecosystem is equally important. The microbes in the soil are just as necessary to a habitat as the plants and predators. It is this natural dynamic balance, with all its inherent and essential parts, that much of human land use has tended to disturb. Growth in human activities can often go beyond the natural limits of a setting. Humans have the ability to import energy sources and other resources that allow a system to exceed its natural limits or to remove energy sources that are necessary for a system to stay in balance.

Wetlands, for example, can be perceived by humans as swamp land that does not have any value. Yet biologists see wetlands as a nursery for hundreds of forms of wildlife. Fish, frogs, toads, migrating birds, snakes, insects, and a remarkable variety of plants all inhabit wetlands. Wetlands are highly vulnerable to development, pollution and a variety of forms of human interference with the natural flow of water. Hundreds of thousands of acres of valuable wetlands are lost each year—for example, to draining, dredging, filling, and pollution.

One of the major challenges now facing our society is how to regulate growth and conserve open spaces. How can we develop the awareness, knowledge, skills and commitment that are necessary in order for humans to take responsible actions affecting open spaces? How can we develop the necessary understanding to restore a more natural dynamic balance in places where human disturbance has existed?

Students will struggle with the arrangement of overlapping and conflicting land uses in an effort to preserve a wetland habitat. When the students reach some kind of agreement about the local issues, the activity shifts to how what they have done affects other “dragonfly ponds.” The activity ends with consideration of the idea that the planet is, in fact, a single “Dragonfly Pond.”

Procedure

1. Begin by explaining to the students that during this activity they will use “Dragonfly Pond” as a microcosm of environmental concerns involved in making land-use planning decisions.
2. Divide the class into teams of three to five, with each group representing one of the interest groups described below. Students will stay in these groups until the end of the activity. Possible interest groups to include are:
 - Residents— want to live in the area
 - Farmers— want to use the land to raise food and livestock

- Business interest— want to use the land for commerce and economic growth
- Gas station owners— want to make a living in servicing and repairing cars
- Parks and recreation department personnel— want people to have a place for recreation
- Highway department personnel— want to maintain access in the area
- Factory representatives— want to preserve jobs and commerce

NOTE: Add other interest groups that may be locally important.

3. Distribute the 18" x 24" paper that will serve as the base map for each team's pond and its associated land-use activities. Have the students cut out the Land Use Pattern and Dragonfly Pond. All the land-use patterns must be used. Patterns may be cut to smaller sizes and may touch, but may not overlap. The students may include additional land-use patterns. Suggest to the students that they may not want to adhere the land-use patterns to the base map until the team is in agreement.

4. When the students are ready to begin the process of making land-use decisions, have them create a list of pros and cons for each land use. Guide the class discussion so that they consider the consequences of each land use. Record these on the chalkboard. The following are only a few of the many possible examples:

Farms

PRO

- produce food
- economic value
- provide jobs through seasonal employment

CON

- use pesticides— (herbicides, insecticides) that may damage people and environment
- source of natural soil erosion
- sometimes drain wetlands for farm lands

Businesses:

PRO

- provide employment
- provide commerce
- create economic stability

CON

- produce wastes and sewage
- may contaminate water (detergents, pesticides)
- use chemical fertilizers (lawns, etc.)

Homes:

PRO

- provide shelter
- provide a sense of community

CON

- generate wastes and sewage
- use water
- contribute to loss of wildlife habitat

5. Have the students work in teams for 30 to 45 minutes.

6. Display each team's base map and report on its work in progress. Encourage discussion of student's choices emphasizing that:

- no land use can be excluded; and
- consensus must be built around each decision.

Look for the consequences of their proposed land-use plan. Be firm about the issues, but fair about this being a very difficult set of choices.

7. Continue the discussion by asking more teams to share their proposed plans. Again, be firm in discussing the consequences. What would happen if the factory and businesses were too close? Abandoning the farm would have what effects? Do farmlands provide habitat for some wildlife? What happens if wetlands are drained to create farmland?

8. Give students additional time working in their teams to decide on the best possible land-use plan under the circumstances. Being sensitive to their frustrations, display all the final land-use plans. Analyze and discuss the merits of each of the approaches. Point out that although their solutions may not be perfect, they can minimize the damage to Dragonfly Pond.

9. Choose one of the team's base maps and continue Dragonfly Creek downstream. The students may have dumped effluent below Dragonfly Pond and let it flow downstream. Show the route the stream might travel. On the drawing, have the downstream part of Dragonfly Creek become another pond and wetland and label the new area Laughing Gull Lake. Continue the drawing to Sea Oats Estuary and finally into Grey Whale Gulf. You may also connect several of the teams maps together, one above another, to indicate the flow downstream.

10. Ask the students to brainstorm possible problems that could be faced within each of these aquatic systems as a result of the human activities at Dragonfly Pond. Make inferences and predictions about the potential consequences of these activities. For example, you could emphasize the effluent from the factory. How will it be treated? Where? By whom? Where will it go? With what effects?

11. Ask the students to examine all of the land uses in this activity. If they had been considering any of

them as inherently bad, have them consider a different question. What could the people who are actually in charge of these various land uses do in their practices to minimize the damage to Dragonfly Pond? Have the activity end with an emphasis on solutions rather than on problems. Point out, for example, the revolution taking place in the “mining” of industrial effluents through “scrubbers” to extract wastes as profitable resources. (Perhaps the students need to make a “scrubbing filter” for the factory.) Agricultural practices are changing, reducing the use of potentially harmful pesticides and herbicides. Petroleum wastes are being recycled and industrial and community awareness regarding uses of harmful chemicals is evolving.

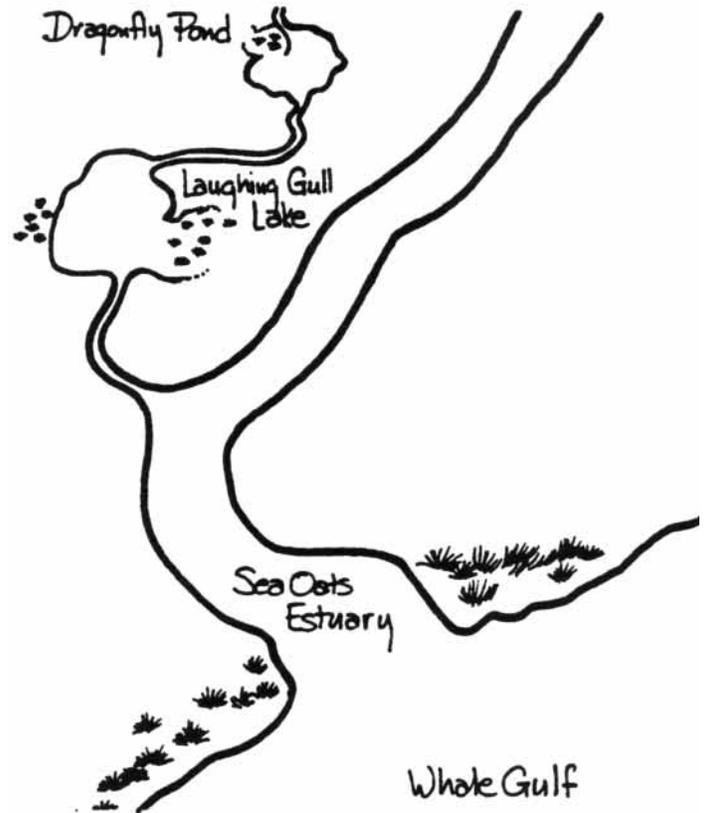
Extensions

1. Do the activity again up to Step 6. After each interest group has presented its plan, form new groups with each one having a representative from each interest group. Have the new groups devise plans that all of the interests can agree on. Discuss how, if at all, this is a realistic experience in working to balance various community interests.
2. Locate a dragonfly pond in your community. Determine the overall quality of the wetlands with which it is connected.
3. Trace any stream or river system that passes through your community from its source to its entrance into the ocean. List all the sites that you can identify that lower the quality of the waters in their journey and suggest how to reverse the process.
4. As a current events activity, collect newspaper articles concerning local water-related and land-use issues.
5. Learn more about environmental impact statements. Obtain actual copies of statements about wetlands in your area. What concerns are addressed in these documents?
6. Learn about the national wildlife refuge system. Are there any wildlife refuges in your area? What plants and animals find refuge in them? Visit a national wildlife refuge.
7. Research private organizations that work to protect wetlands such as The Nature Conservancy and Ducks Unlimited. What do their organizations do and how do they do it?
8. Research zoning laws and land use regulations in your area. Would the plan your group proposed for Dragonfly Pond be allowed in your community?

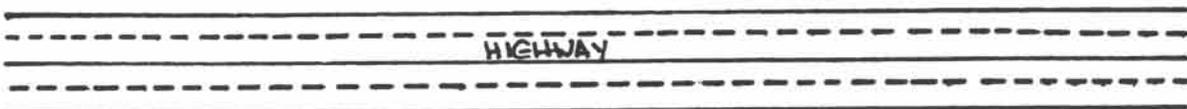
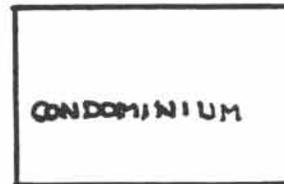
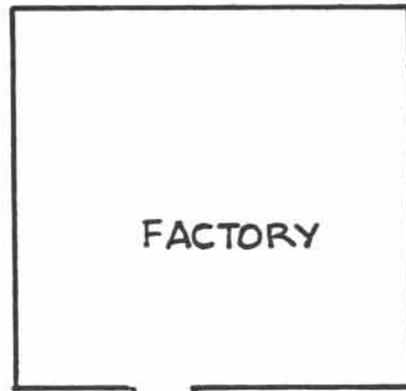
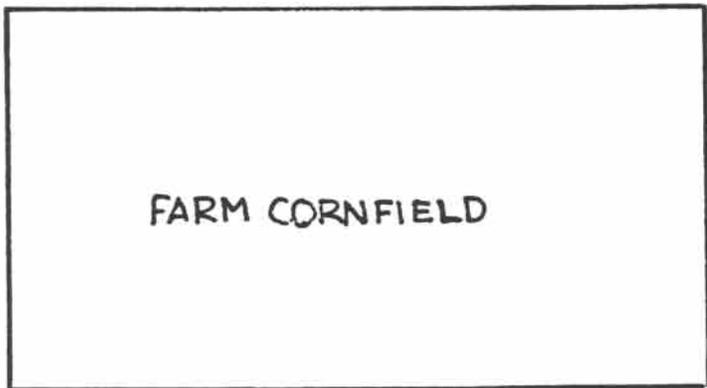
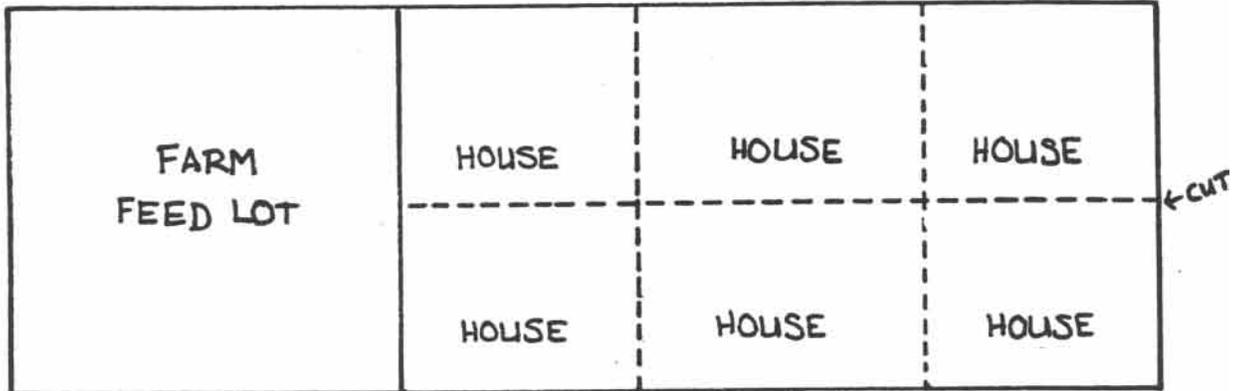
Evaluation

1. Identify three actions that people can take to reduce or prevent damage to wetlands.
2. Under what conditions, if any, do you think these actions to reduce damage to wetlands would be appropriate? Inappropriate? Select any action that you think would be appropriate and that you could take to reduce or prevent damage to wetlands. Write a one-page paper on your plan.

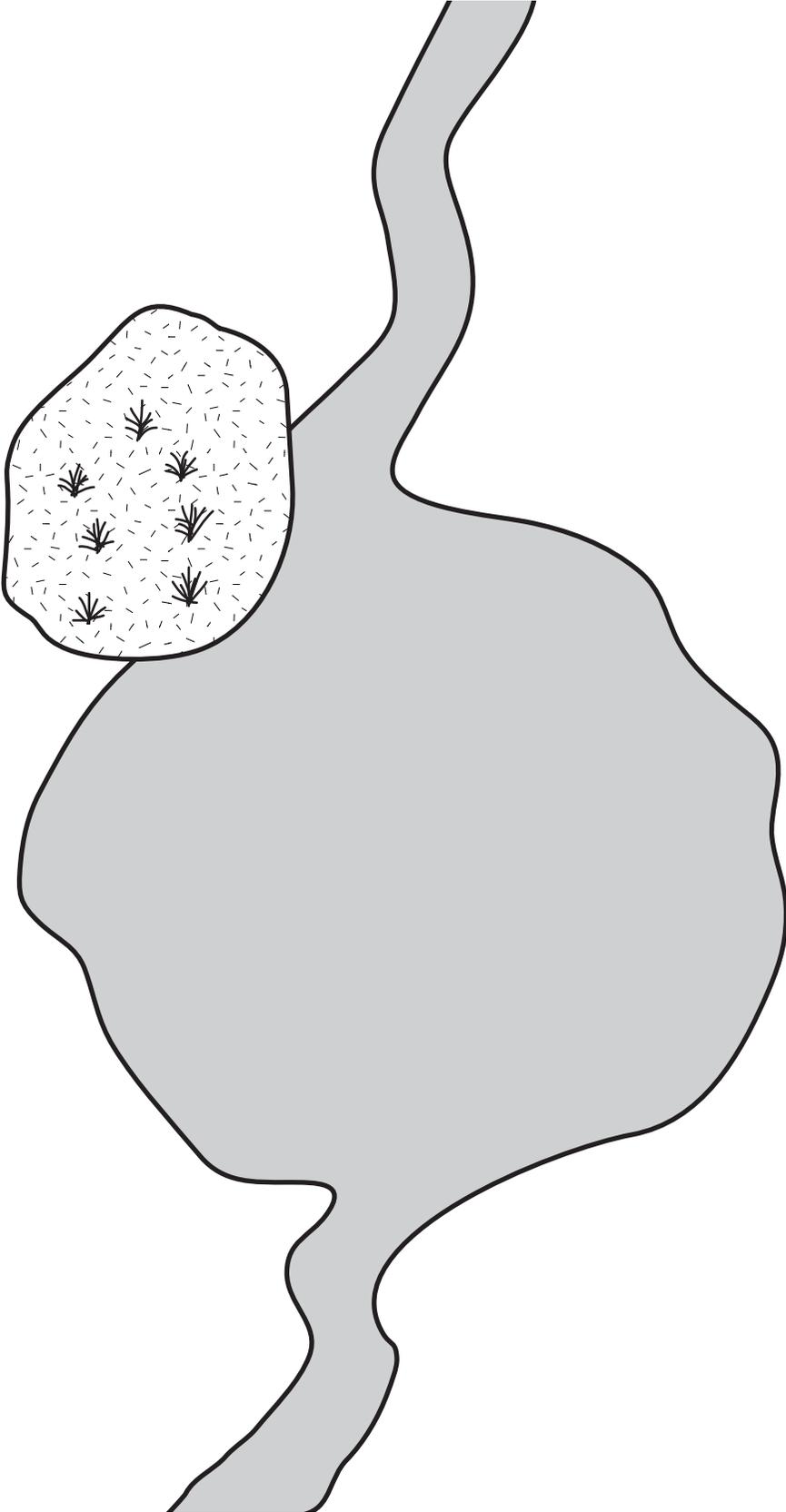
Reprinted with permission from Project WILD, Project WILD Aquatic Education Activity Guide. The complete Activity Guide can be obtained by attending a Project WILD workshop. Please contact your State Coordinator for more information by going to the Project WILD website at www.projectwild.org.

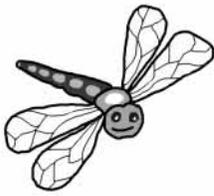


Land Use Patterns



Map of Dragonfly Pond





these lands to their natural state, the overall quality of the land can be improved.

Sweetwater Marsh National Wildlife Refuge is a good example of a wetland area right in the middle of a developed area. Protecting and restoring the habitat at Sweetwater Marsh and other coastal wetlands is the key to survival for endangered species and other fish, wildlife, and plants.



The Field Trip

Part 4

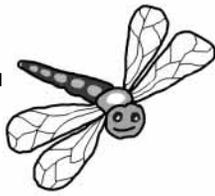
How is the Fish and Wildlife Service Helping Wetlands?

Restoring or protecting wetlands

National Wildlife Refuges play a very important role in protecting and even restoring wetland habitat. Sometimes developers fill in wetlands, or crops are planted where wetlands once existed. Many refuges are located in developed areas where the land was heavily impacted. By conserving and restoring

Partnering Up!

The Fish and Wildlife Service's "Partners for Fish and Wildlife" program works with farmers, ranchers, and other landowners who voluntarily want to restore wetlands on their land. The program benefits both the landowner and the general public (that's you!) by providing habitat for fish, wildlife, and plants, improving water quality and watershed health,



reducing pollution, and creating opportunities for outdoor recreation and education.



They're called **invasive** or alien plants and animals. Did you know that some invasive species can cause direct threats to agricultural crops and result in lower crop yield? Some of these invasives can even poison wildlife and livestock, reduce water quality, and contribute to soil erosion. So, what is the Fish and Wildlife Service doing about this big problem? Plenty. Habitat protection and restoration is a major function of the Service. Log onto www.invasives.fws.gov to find out how the Service is fighting this "invasion."



What's in a map?

Did you know that the Fish and Wildlife Service makes maps? The Service's National Wetlands Inventory Program maps wetlands and

makes the maps and status information available for free over the Internet at <http://wetlands.fws.gov>. Currently, 40% of the U.S. is mapped on-line.

Invasive who? What?

Who would have thought that plants and animals could be considered a menace or threat to our lands? It's true!



Fish and Wildlife Service Wetlands Website Quiz

Answer Sheet

What type of wetland is suffering the greatest losses?

<u>F</u>	<u>O</u>	<u>R</u>	<u>E</u>	<u>S</u>	<u>T</u>	<u>E</u>	<u>D</u>
1	2	3	4	5	6	7	8

Explore the Fish and Wildlife Service's Website at <http://www.fws.gov> to discover the answer.

1. To protect wetlands and the species that rely on them, the Fish and Wildlife Service has worked with many partners to purchase wetlands and other habitat needing protection and added them to the National Wildlife **RE(F)UGE** System. A potential partner is any organization or individual with responsibilities or interests in an ecosystem, watershed, or habitat for wildlife. Volunteers are welcome at the Service's 550 locations. Under addresses, click on the map for a list of all Service locations in your state.

2. Under the Migratory Bird Program, the Service encourages participation in the **SH(O)REBIRD** Sister Cities Program, where students can help look for and report tagged birds. See the kid's page that includes pictures to color, photographs of the birds, Gee Whiz facts, an ID guide, and a quiz!

3. The Convention on Wetlands of International Importance, known as the Ramsar Convention, adopted in Ramsar, Iran, in 1972, helps conserve wetlands worldwide. Wetlands of international significance in the U.S. include the Okefenokee Swamp, a National Wildlife Refuge in Georgia. Some are National Parks, such as the **EVE(R)GLADES** in Florida.

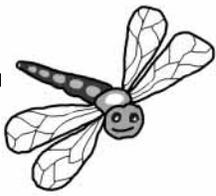
4. The Service uses money from Duck Stamp sales to buy **W(E)TLANDS** as habitat for waterfowl and other species for nesting, feeding, and resting. Find information about the Junior Duck Stamp Contest and the National competition (winning prize of \$2,500 and a free trip to Washington, DC). See the 1999 winner, Bonnie Latham, age 16, from Minnesota.

5. Schools and their partners can seek small **GRANT(S)**, with a 1 to 1 dollar match, under the North American Waterfowl and Wetlands office, to restore wetland habitats for migratory waterfowl and other species in the U.S., Canada, and Mexico.

6. The Service's Fisheries program funds fisheries and habitat restoration work, including wetlands restoration in Texas for hydrilla (an invasive wetland plant) removal and replacement with **NA(T)IVE** plants.

7. Habitat restoration for wetlands is important for 30% of **(E)NDANGERED** species, which are species that are threatened with extinction throughout all or a significant portion of their range. See a list of what you can do, other neat websites, a crossword puzzle, and a list of protected species in your region.

8. Can you name the plants in a wetland near your home? The Service's National Wetlands Inventory provides software, called MARSH, to help people **I(D)ENTIFY** wetland plants. The Service also maps wetlands, maintains a list of wetland plants, and has an educator's page with teacher resources plus federal, state, and other wetland websites.



things that the Service is doing, but what can YOU do to help?

Volunteer to restore wetlands or buffer areas for wetlands on Refuges or other public lands. See <http://www.fws.gov> for the Refuge nearest you (www.blm.gov for Bureau of Land Management lands,



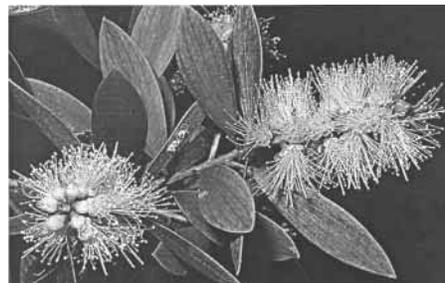
Volunteers knee deep in water cutting Melaleuca, an invasive species, at Loxahatchee National Wildlife Refuge, Florida

The Field Trip

Part 5

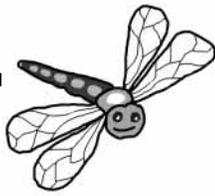
What Can You Do to Help Wetlands?

There are many things students and teachers can do to help wetlands. The Fish and Wildlife Service and other agencies responsible for wildlife conservation are dedicated to doing everything possible to protect, enhance, and restore lands back to healthy habitats — and this includes wetlands! In Part 4, you read about some of the



Melaleuca

www.fs.fed.us for Forest Service lands, or www.nps.gov for National Parks), or visit your state or local website for the parks or wildlife areas near you. You can also work with private landowners to restore wetlands on their properties.



Work may include planting native vegetation or damming ditches or channels.

Volunteer to remove invasive plants in or around wetlands from public or private lands. Adults at the site can help you with this activity. In projects like these, many hands make light work!

Identify a wetland in or near your community. Adopt a wetland for water quality or wildlife monitoring. Pick up trash. Raise funds for signs or boardwalks. Research information on how to clean up or maintain your wetland. Start a Friends of the Wetland group for your adopted site. Partner up with other groups to join you.

Through the Fish and Wildlife Service's Federal Duck Stamp Program you can help save America's wetlands. For \$30.00 you will help purchase as much as 1/10th of an acre of wetlands, and you'll receive a beautiful 8"x10" personalized "Save the Wetlands" certificate. For further information, visit www.savewetlands.org.

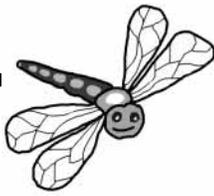


Duck Stamp Contest. Bonnie Latham, 16, of Hastings, MN, won first place in the 2000-2001 Junior Duck Stamp Contest. Bonnie has also won several regional awards for her artwork, including the Minnesota State Fair Champion Award. According to Bonnie, "The balance of nature is so delicate. I only hope that through my paintings more people will realize that, unless we do our part, nature won't be here for us to enjoy. I enjoy helping wildlife and nature programs in any way I can." For further information about the Junior Duck Stamp Program and how you can participate, visit their website at www.duckstamps.fws.gov.



Bonnie Latham, Junior Duck Stamp winner

Are you an artist at heart? Then you may want to participate in the Junior



River of Words

The annual River of Words Contest is part of an international poetry and art project designed to nurture respect and understanding of the natural world by encouraging children to learn their “ecological address” and to describe through poetry and art their own “place in space.” Co-sponsored by International River Network, The Library of Congress Center for the Book and United States Poet Laureate (1995-1997) Robert Hass, the project hopes to foster responsibility, imagination, and action in young people and to publicly acknowledge their creativity and concerns.

Deadlines are February 15 (North America) and March 1 (international) each year. There is no charge to enter.

For information or to order a Teacher’s Guide or other curriculum materials:
 River of Words Project TM
 PO Box 4000-J
 Berkeley, CA 94704 USA
 Tel: 510-848-1155
 Fax: 510-848-1008
 Email: row@irn.org
 Website: <http://www.riverofwords.org>



Here are a few award-winning poems:

Marsh

*The wind tickles the mirror of the water:
 A forgotten branch arches over its own reflection.
 The cry of a gull echoes through the pickleweed,
 it soars away, kidnapped by the wind.
 An egret prances through the mud, head
 bobbing, feathers ruffling.
 A plover plows into the cold, taunting the cold
 to chill its feathers.
 Yellow blossoms of sorrow hang toward the
 ground, begging to fall.
 A crow has a conversation with the trees,
 warning them of our human presence.
 Suddenly, the sun peeks out from behind a
 rain cloud.
 This beauty is here every day, yet it goes by
 unnoticed, untouched.*

Mairead Donahey, Age 11
 Mill Valley Middle School
 Mill Valley, CA
 1998 River of Words Contest™
 ©River of Words

Willow in the Wind

*A crashing wind dashes through our wetland
 I begin to sway,
 Forced down with each burst.
 But I am caught,
 Saved from plummeting all the way into the
 cold water,
 And snapping.
 Trust is what catches me,
 The trust from the other trees around the pond
 Suddenly, I stop swaying,
 And another willow begins.*

Beth Dickinson - Grade 6
 Logan School for Creative Writing
 Littleton, CO
 Teacher: Barb Butler
 National Finalist
 1997 River of Words Contest™
 ©River of Words

WET WEBLIOGRAPHY

(better known as a directory for the Internet!)

Learning about wetlands is fun - especially with all the information out there on the Internet. For starters, check out:

<http://www.epa.gov/owow/wetlands/> (Environmental Protection Agency (EPA) - Office of Wetlands, Oceans, and Watersheds (OWOW). The wetlands web page covers: what are wetlands; wetlands and nature; wetlands and people; wetland status and trends; wetlands protection; and discussions and photographs of types of wetlands. The website also covers watersheds and their protection and restoration.

<http://www.epa.gov/owow/wetlands/scinfo.html#Kids> (Environmental Protection Agency) Has numerous links to other sites: Poetry and Art, Wetland Reading List, Wetland Science Lesson Plans, Curriculum Guide, Coloring Book, Activity Guide, Crossword Puzzle, and Word Searches and much, much more.

<http://www.epa.gov/owow/wetlands/restore/> (Environmental Protection Agency/OWOW) Restoration guide - everything you wanted to know about restoration (but were afraid to ask). Includes "Add your Project".

<http://www.epa.gov/owow/adopt/resources/wetlands.html> (Environmental Protection Agency/OWOW) A list of resources for citizens interested in wetlands restoration and project ideas. "A World in our backyard: A wetland Education and Stewardship Program" (free) Suggests ways of studying wetlands and how students and teachers can "adopt" a local wetland.

<http://www.epa.gov/owow/showcase> (Environmental Protection Agency/OWOW) National Showcase Watersheds, Stream Corridor Restoration. Seven federal agencies are showcasing twelve exemplary stream corridor restoration projects for their stream corridor restoration technology and their improvement of the community, environment, and water quality. The sites represent a variety of geographic locations and conditions; a balance of management and design; strong local, tribal and state leadership; public and private land use mix; and partnerships in stream corridor restoration.

<http://wetlands.fws.gov> (U.S. Fish and Wildlife Service) The Service has a National Wetlands Inventory (NWI) website. The NWI website has wetland maps that can be printed using the new Interactive Mapper (free), as well as the digitized data that these maps are based on that can be

downloaded (free) for use with GIS systems to overlay other data sets that you might have for your local area. It also has an educator's page and a link to a long list of other wetlands sites. Contains names, addresses and email addresses to "Ask Doctor Wetlands" in each Service region.

<http://wetlands.fws.gov/reports.htm> (U.S. Fish and Wildlife Service) Use this site to understand the wetland mapping classifications on wetland maps. An on-line copy of "Classification of Wetlands and Deepwater Habitats in the United States" by Cowardin et.al. Also included is the guide "A System for Mapping Riparian Areas in the Western United States" for riparian areas on selected maps.

<http://partners.fws.gov/FAQs/faqs.html> (U.S. Fish and Wildlife Service) This site answers questions about the Service's "Partners for Fish and Wildlife" program. For example: how is restoration done, informal technical assistance that can be provided to design restoration projects, and who can get funding.

<http://wetlands.fws.gov/bha> (U.S. Fish and Wildlife Service) Contains list of wetland plants of the U.S. Also includes free software with an electronic key for identifying wetland plants.

<http://invasives.fws.gov> (U.S. Fish and Wildlife Service) Has a page on the its website for invasive alien plants and animals. It includes native wildlife habitat restoration, threats from invasive species, and examples with photographs; partnerships; other links; and link to the Weed Fact Book (Invasive plants, Changing the Landscape of America: Factbook) with detailed information including: understanding the problem, with section on wetlands and waterways including discussion and photographs, and some states. More facts about invasive plants by State.

<http://www.wetland.org> (Environmental Concern, Inc.) is a non-profit organization dedicated to wetland restoration, research, and education. All about wetland hydrology, soils, and plants. Friendly for students and teachers.

<http://www.wetland.org/education.htm> is a great link for educators and kids.

<http://www.wetland.org/wow.htm> for "WOW! The Wonders of Wetlands", a 330 page educator's guide available for purchase.

<http://www.audubon.org/campaign/wetland> (National Audubon Society) Defines wetlands, describes types of wetlands, good list of wetland types, and reasons for saving wetlands. Links to other wetland sources. From their homepage, use the Kids & Education button to link to a virtual tour of a south Florida swamp.

<http://www.nwf.org/nwf/wetlands/index.html> and <http://www.nwf.org/wetlands/learnmore.html> (National Wildlife Federation) Wetland types, benefits and threats, glossary and acronyms, wetlands and population, articles and education list.

<http://www.ficus.usf.edu> (University of South Florida) Defines uplands freshwater, and marine habitats, provides pictures and describes characteristics of different types of Florida swamps, freshwater marshes, and salt marshes. Discusses water source, hydro period, organic matter accumulation, biotic environment, and species, benefits of wetlands, and dollar value of wetland values/services.

<http://h2osparc.wq.ncsu.edu/info/wetlands/> (North Carolina State University) Defines wetlands. Importance of wetlands, functions and values, importance by wetland type, watershed roles, human impacts, wetland loss and degradation, wetland protection, government programs, wetland mitigation, wetland management, and links to other wetland information sources.

<http://members.aol.com/goswampy/> SWAMPY. Gary Hahn, Professional Wetlands Scientist. Site under development. Ask SWAMPY wetland questions. goswampy@aol.com

<http://www.lta.org/news.html> (Land Trust Alliance) Guide to Estuarine Restoration Funding. Funding for Habitat Restoration Projects: A Citizen's Guide, a comprehensive guide to federal programs funding estuary habitat restoration projects, is available free from Restore America's Estuaries, a national coalition of 11 organizations dedicated to resource protection. The guide describes habitat restoration programs in various federal agencies. The guide is available via e-mail at raecoalition@estuaries.org or by calling 202-289-2379.

<http://www.state.va.us/~dcr/vaher.html> (State of Virginia, Natural Heritage Program) Search for a Natural Heritage Program on your state government website. For example, the Virginia Department of Conservation and Recreation has a website for the Natural Heritage Program. It contains a list of native plants for riparian planting, and which ones to pick based on their uses on the site, sunlight requirements, wetness of the site, and region of state. Discusses invasive alien plants. Includes lists of rarest elements of natural diversity, by county.

<http://www.vnps.org> (Virginia Native Plant Society) Your state may have a Native Plant Society. For example, the Virginia Native Plant Society is listed

here. Website has a list of invasive species by region of the state; lists nurseries which supply native plants (from various states). Many of the invasive species listed here are common throughout much of the United States, but may not include some specific to your area.

<http://www.statlab.iastate.edu:80/soils/hydric/> (Iowa State University) Overview, introduction, criteria, national state and county lists, and field indicators of hydric soils.

In addition to the above wetland information, learn about the National Wildlife Refuge System and other Federal Land Management Agencies:
<http://refuges.fws.gov> U.S. Fish and Wildlife Service, National Wildlife Refuge System
<http://www.npw.gov> National Park Service
<http://www.blm.gov> Bureau of Land Management
<http://www.br.gov> Bureau of Reclamation
<http://www.ocrm.nos.noaa.gov/nerr> National Oceanic and Atmospheric Administration (NOAA), National Estuarine Research Reserve System
<http://www.epa.gov/nep.html> Environmental Protection Agency, Office of Water, National Estuary Program

Now that you're equipped with all this information, find out what YOU can do with it!

<http://www.savewetlands.org/html/index2.html> (U.S. Fish and Wildlife Service/Duck Stamp Office) Junior Duck Stamp contest and purchase of Duck Stamp Certificates.

<http://www.fws.gov/~r7enved/sssp.html> (U.S. Fish and Wildlife Service) Shorebird Sister Schools Program.

<http://www.epa.gov/owow/watershed/earthday/earthday.html> (Environmental Protection Agency/OWOW) 15 things you can do for your watershed.

<http://www.epa.gov/owow/wetlands/scinfo.html#Kids> (Environmental Protection Agency/OWOW) Numerous projects and activity links.

<http://www.wetland.org/kids/youcando.htm> (Environmental Concern, Inc)

<http://www.iwla.org/SOS/index.html> (Izaak Walton League of America) Participate in Save Our Streams; participate or start an American Wetlands Month (May) celebration.

What's happening in your state? Check out: <http://wetlands.fws.gov/educator.html> List of state websites.

Appendix

U.S. Fish and Wildlife Service Regional Offices

Region 1

(CA, HI, ID, NV, OR, PI, WA)
911 NE 11th Avenue
Portland, OR 97232-4181
503-231-6118

Region 2

(AZ, NM, OK, TX)
P.O. Box 1306
Albuquerque, NM 87103-1306
505-248-6282

Region 3

(IA, IL, IN, MI, MN, MO, OH, WI)
Federal Building, 1 Federal Drive
Fort Snelling, MN 55111-4056
612-713-5301

Region 4

(AL, AR, FL, GA, KY, LA, MS,
NC, PR, SC, TN, VI)
1875 Century Blvd.
Atlanta, GA 30345
404-679-4000

Region 5

(CT, DC, DE, MA, MD, ME, NH,
NJ, NY, PA, RI, VA, VT, WV)
300 Westgate Center Drive
Hadley, MA 01035-9589
413-253-8200

Region 6

(CO, KS, MT, ND, NE, SD, UT, WY)
P.O. Box 25486
Denver, CO 80225
303-236-7920

Region 7

(AK)
1011 E. Tudor Road
Anchorage, AK 99503
907-786-3542

For information about educational programs offered by the U.S. Fish and Wildlife Service contact:

National Conservation Training Center,
Division of Education Outreach
Rt. 1, Box 166
Shepherdstown, WV 25443
304-876-7319
<http://www.fws.gov>



How to Use the Wetlands Interactive Mapper

U.S. Fish and Wildlife Service—National Wetlands Inventory

NOTE: The Mapper is a baby, only a few months old. We are changing it constantly to improve it. Your suggestions and comments are requested. Click on Input Comments or Issues under map, or write us at wetlands@fws.gov

At any point, you can click on [?] for more detailed information about the mapper or Help [i] in the Map Utilities window.

*Required: Netscape 4.05 or higher; or Internet Explorer 4.01 or higher; or AOL 5.0. The Mapper **WILL NOT WORK** with lower versions of browser software. (Update your version by clicking on your browser name on the Mapper page, see #6.)*

WHEN ALL ELSE FAILS, READ THE INSTRUCTIONS BELOW.

To get in:

1. Using your mouse or pointer, click on the icon for your web browser (ex: Netscape).

2. In the Address text block type in: <http://wetlands.fws.gov> then press the Enter key.

3. To see if wetlands in your area can be viewed through the Mapper, check on the map here or click on [Map Status](#), then click [NWI Map Status - Continental U.S.](#) (area with digitized maps). (If not available, a paper map can be purchased through 1-888-ASK-USGS.) Click on “Back” twice to return to the homepage.

4. Click on [Wetlands Interactive Mapper](#).

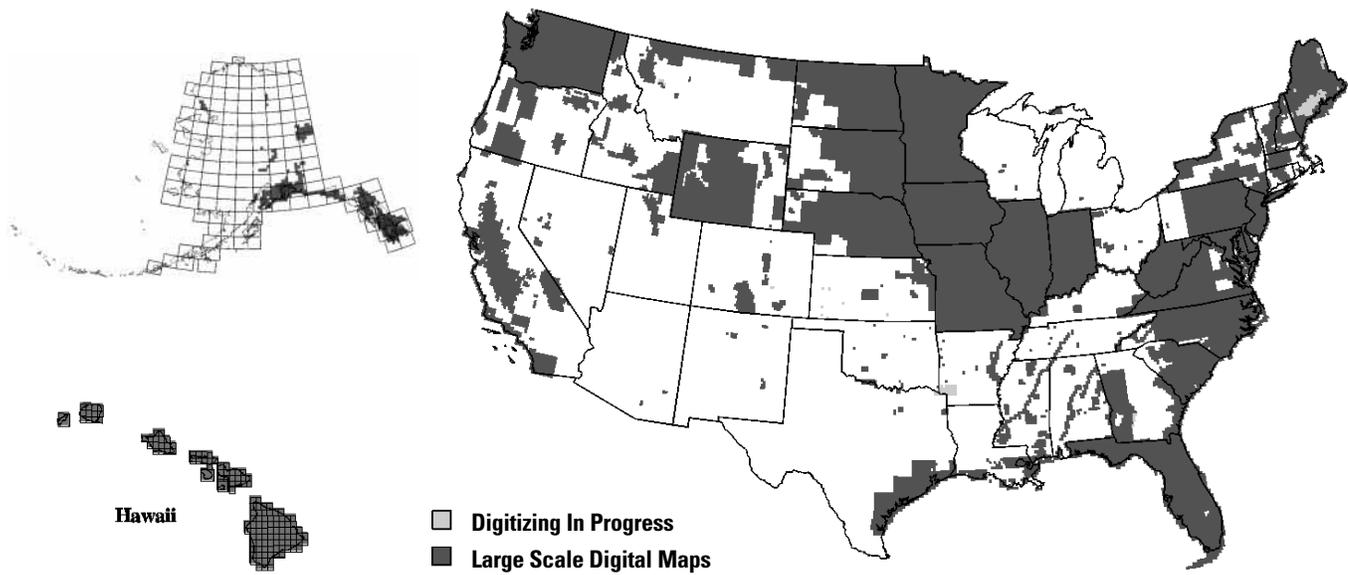
5. Read what you can do with the Mapper.

6. (Click on the browser name if you need to update your browser; then follow instructions.) Click on the brown Mapper button at the bottom of the page.

7. To view the map of your choice, under Area Query, select (click and highlight) either county, city, Zip Code, or USFWS Refuge. Then type in the name or number of the area in the block below. Click the Submit button. Or, if you have questions, click the [?] button.

8. A list of one or more matches is displayed. Click on (highlight) your choice. Click on the Submit button. Or, if you have questions, click on the [?] button. The Mapper will now process your request. BE PATIENT, IT TAKES AWHILE.

National Wetlands Inventory Digital Status



September 30, 1999

NOTE: If your map takes longer than two minutes, the network may be busy, the server may be down, or your software may not meet the requirements in the NOTE above.

9. View your map. If the map background is gray, that means that your area does not have wetland maps available through the Mapper, or you have selected a large county and need to zoom in to a smaller area.

What you see:

- a. **Map** in the middle of the screen.
- b. **Spatial Themes** pop-up window. Click [X] in the upper right corner to close.
- c. **Slide bars** at the right and bottom to move the map on the screen.
- d. **Key** to the colors and lines on the map in a window on the right, in abbreviated form (ex: PFO) (more detailed information under Map Utilities).
- e. **Map Utilities** window at bottom of screen (may be barely visible on smaller screens) which must be expanded by clicking/holding on the thick gray line between the slide bars, then dragging it up, will give you information about the map. For information on what Map Utilities can do, click its Help button [i].
- f. A [**Globe**] button will return you to the original map you selected. [?] will answer your questions. Other buttons at the top of the map are described below (#3 and #7).

What you can do:

1. **To select new themes**, when a Spatial Themes window pops up, select a new theme or close the window.
2. **To move your map on the screen**, use the slide bars at the right and bottom of the frame.
3. **To see a smaller or larger area or re-center map**, use the buttons at the top of the page. Zoom in [+] [click the button and then (on the map), click-and-hold, and drag to create a rectangle the size you want, then release]. Zoom out [-] (click the button, then click the location on the map). Using the button with a [hand] will recenter the map. (See #7 below for using the [i] button)

4. **To see full names of wetland types** (which are abbreviated in the Key) go to Map Utilities window, click on More Descriptive Wetlands Legend. Can be printed in color; clicking File then Print.

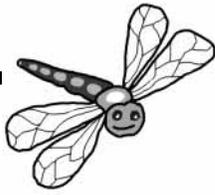
5. **To view wetland acreage summaries** for entire map displayed, go to Map Utilities window, and click on the desired level of information you want. (Be patient if there are many kinds of wetlands.) Print list displayed by clicking on File then Print in upper left corner.

6. **To print the color map you are viewing**, go to Map Utilities and click on Format Map for Printing. Once formatted, print map by clicking on "File" then "Print" in upper left corner. (Prints best in "Landscape" position under "Properties".) NOTE: You may have to wait in a print queue.

7. **To identify a specific wetland, river, National Wildlife Refuge, or road**, click on the [i] button then, with your arrow cursor, move the spot where the two red lines cross to the item to be identified. Information will appear in the Map Utilities window (item name, class, location, map name, acreage). Click on class (ex: PFO1R) to see definition.

8. **To see or print an aerial photograph or USGS topographic map** of the area, click on Microsoft TerraServer view under Map Utilities (use File/Close to return to Mapper).





Word Search

R	P	H	Q	G	H	U	M	E	A	Y	S	L	N	L	F	B	D	X	F
E	I	R	C	B	V	S	C	X	U	G	W	G	B	P	W	O	K	F	N
F	Q	D	U	I	X	W	F	N	P	F	A	I	O	A	Z	G	V	S	R
U	T	F	A	R	M	S	K	J	L	P	M	N	R	L	E	P	G	P	G
G	X	R	P	D	N	R	V	Y	A	S	P	V	T	U	M	W	C	R	Y
E	S	Y	Y	S	C	Q	P	E	N	V	I	A	K	S	E	F	F	A	M
S	Z	N	I	M	K	K	A	S	D	V	W	S	S	T	R	D	E	I	N
Z	B	O	T	T	O	M	L	A	N	D	K	I	Y	R	C	U	X	R	F
E	X	T	L	S	G	Y	P	S	F	A	D	V	P	I	O	C	O	I	E
M	F	S	P	O	N	G	E	X	Z	B	C	E	O	N	E	K	J	E	U
E	V	P	V	A	B	O	Y	G	P	O	E	Y	L	E	F	S	P	P	B
R	N	P	L	J	V	R	V	I	P	Y	A	S	M	Y	E	T	H	O	W
G	Q	N	Q	R	Q	P	M	X	U	J	H	A	B	I	T	A	T	T	J
E	L	W	A	T	E	R	S	H	E	D	O	L	O	V	A	M	O	H	W
N	U	X	W	H	M	S	N	C	B	X	C	T	O	K	S	P	F	O	Z
T	K	V	A	T	X	D	K	N	L	Y	J	M	Y	H	F	I	X	L	J
S	N	A	T	I	V	E	V	E	G	E	T	A	T	I	O	N	W	E	N
K	K	U	F	N	U	X	X	Z	R	Z	B	R	M	N	M	G	Q	O	O
K	E	T	R	E	S	T	O	R	E	L	Y	S	H	P	L	A	N	T	S
N	K	O	W	E	T	L	A	N	D	S	A	H	U	G	Z	Q	R	C	D

Words to find:

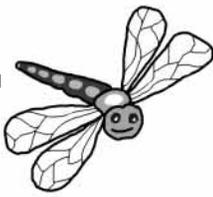
BOG
BIRDS
BOTTOMLAND
DUCKSTAMP

EMERGENT
FARMS
HABITAT
INVASIVE

NATIVE VEGETATION
PALUSTRINE
PLANTS
PRAIRIE POTHOLE

REFUGES
RESTORE
SALT MARSH
SPONGE

SWAMP
UPLAND
WATERSHED
WETLANDS



Word Search Answer Sheet

R										S					B				
E			B					U		W			P		O				
F			I					P		A	I		A		G				
U		F	A	R	M	S			L		M	N		L				P	
G			D					A		P	V		U					R	
E			S					N			A		S					A	
S								D			S		T		D			I	
	B	O	T	T	O	M	L	A	N	D		I		R	U			R	
E												V		I		C		I	
M		S	P	O	N	G	E					E		N		K		E	
E														E		S		P	
R												S				T		O	
G											H	A	B	I	T	A	T	T	
E		W	A	T	E	R	S	H	E	D		L				M		H	
N												T				P		O	
T												M						L	
	N	A	T	I	V	E	V	E	G	E	T	A	T	I	O	N		E	
												R							
			R	E	S	T	O	R	E			S		P	L	A	N	T	S
			W	E	T	L	A	N	D	S		H							

Words to find:

BOG
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BOTTOMLAND
DUCKSTAMP

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REFUGES
RESTORE
SALT MARSH
SPONGE

SWAMP
UPLAND
WATERSHED
WETLANDS

Wading into Wetlands

Wild Things 2000: Educator Feedback Form

Dear Educator: We need your feedback to improve the broadcast and to determine future topics. Please complete the following information and return it via mail or fax. The first 50 responses will receive a really neat prize that the entire class can enjoy! It's **YOUR** Wild Things distance learning broadcast future. **DON'T LEAVE IT BLANK!**

Name: _____ Address: _____

School: _____ City, State, Zip: _____

e-mail address: _____

Audience:

Number of students viewing the broadcast: _____ Grade level(s): _____

Your students live in an area that is: (check all that apply) urban suburban rural

You would really help us by responding to the following questions:

1. My students' **favorite** part of the broadcast was: _____

Why? _____

2. My students' **least favorite** part of the broadcast was: _____

Why? _____

3. What changes could make this a more useful event? _____

You're almost finished! Please take a moment to circle the number that best matches your opinion. (on a scale of 1-5 with 5 being the highest)

learning objectives met	5	4	3	2	1
live student activities	5	4	3	2	1
interactive game during broadcast	5	4	3	2	1
Q&A's following the broadcast	5	4	3	2	1
educator's guide	5	4	3	2	1

What topic(s) would most interest you for next year's event?

- | | |
|--|--|
| Endangered Species <input type="checkbox"/> | Schoolyard Habitat <input type="checkbox"/> |
| Habitat Restoration <input type="checkbox"/> | Water Quality <input type="checkbox"/> |
| Invasive (exotic) species <input type="checkbox"/> | Role of fire in habitat <input type="checkbox"/> |

Okay, we're almost there. Last, but not least: What was your overall impression of the broadcast? _____

Thank you for completing this evaluation. Please return to:
LDII, Attn: Evaluations, 4707 Lehigh Court,
Woodbridge, VA 22193
or fax to: 703-590-0506

