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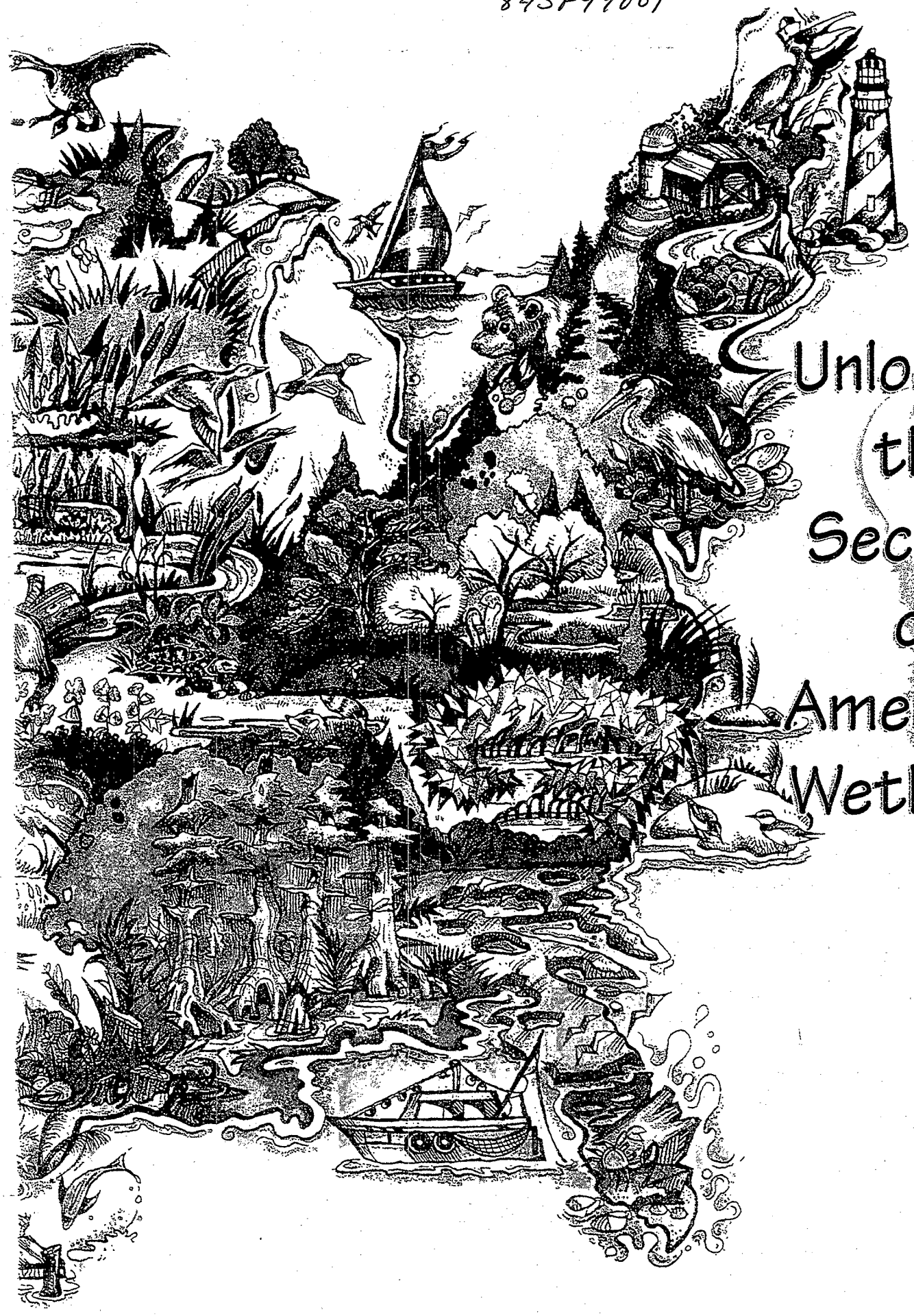
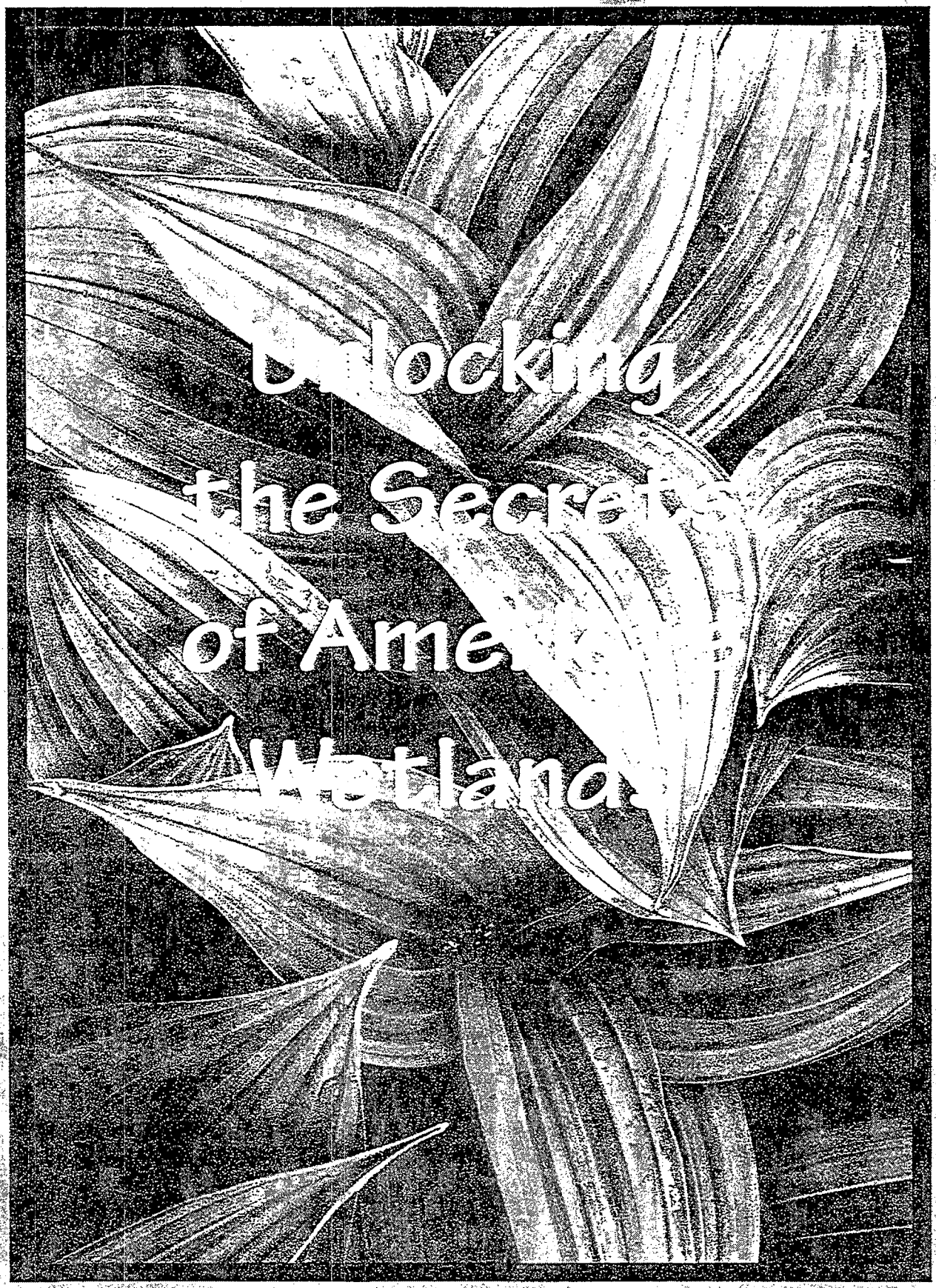


Unlocking the Secrets of America's Wetlands


Unlocking
the Secrets
of American
Wetlands

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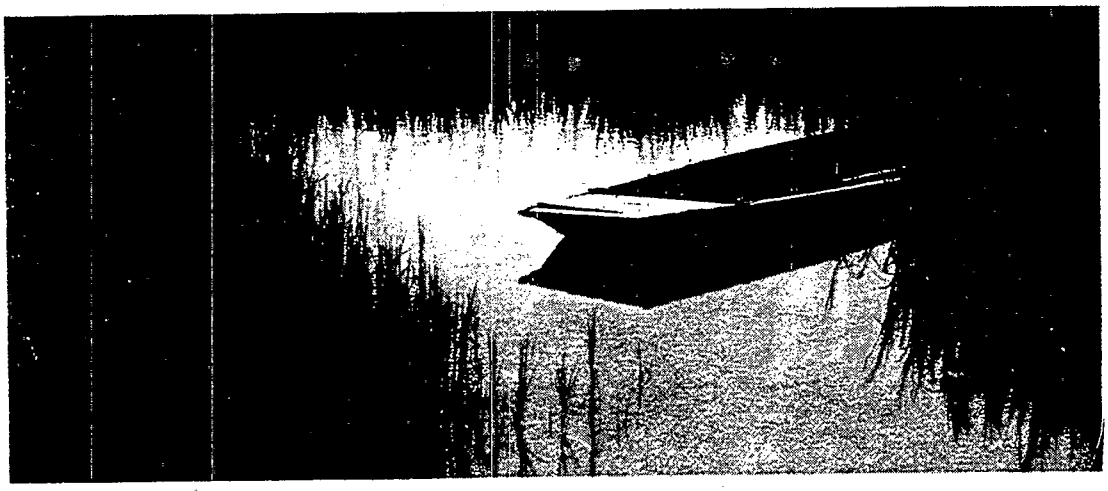


Kiptopeke State Park (Virginia). Photo by Jack K. Holcomb, Reading, Pa.

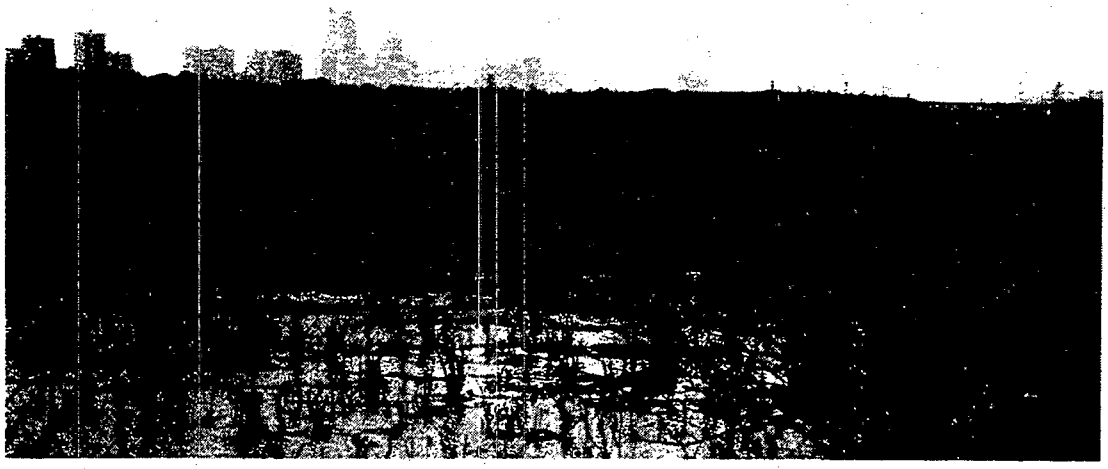
Contents

Foreword v
Just a muddy swamp? 1
Wetlands up close & personal 3
How to know a wetland when you see one 7
- Name that wetland! 8
- Palustrine wetlands 8
- Lacustrine wetlands 8
- Marine wetlands 13
- Estuarine wetlands 14
- Constructed wetlands 14
- Location, location, location 15

Look back to move forward 17
Making no-net-loss work 21
- Mitigation – what to do when you lose a wetland . . 22

Who's in charge? 25
- You're in charge! 25

Wetlands of International Importance: U.S. Ramsar Sites . . . 29
Glossary 31
Resources for Wetlands 33
- Federal Agencies 33
- National Organizations 39
- Programs 41



The skyline of Portland, Oregon — and its wetlands. Photo by Linda Pattison, who teaches in the city's Llewellyn School.

Foreword

Turn the tap — and you've got water! To drink, to shower in, to cook with. A simple process we take for granted. Until turning the tap gives us bad-tasting water, or none at all.

So we blame the water company. And maybe a pipe did break, or treatment malfunctioned.

But the delivery system alone does not guarantee our water supply.

We do. The way we live, how we use our land — our own actions dictate how much water we have, and whether we can drink it or even fish in it.

America's water suffered as we destroyed what we dismissed as useless swamps. Now we know, as you are about to discover in unlocking these secrets, that wetlands hold the key to good water. They

- purify our water,
- control its supply by giving us more during a drought, absorbing the excess when floods threaten,
- nurture the plants and animals we photograph, hunt and fish (and eat), and, overall,
- enrich the quality of our lives in many ways.

So the next time you turn the tap, think of wetlands as your not-so-secret partner for clean water.

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Great Swamp in Morris County, N.J. Photo by James A. Nardi, North Plainfield, N.J.

Just a muddy swamp?

Do you know what a wetland is? Do you know what it does? Or do you think it's just a muddy swamp? You might be surprised by the secrets that muddy swamp holds — and what it really means to you.

- Have you ever swung a baseball bat? Or sat in a wooden chair? Do you write on paper?
- Do you hunt? Or bird-watch? Do you eat fish?

If you answered yes to any of those questions, wetlands mean more to you than you ever dreamed.

Because they're not just muddy swamps. In fact, some of them are even dry during part of the year.

But it's not how they look, but what they do, that make wetlands important to us. Wetlands put fish on our plates and clean water in our glasses, and give us deer to hunt, birds to watch, and wood for paper, chairs and baseball bats.

Our environment and our economy — the very quality of our lives — depend on healthy wetlands. In short, wetlands help make America a better place to live.

Bald cypress trees on the Ohio River bottom wetlands in southwestern Indiana. Photo by Susan Fowler, Evansville, Ind.

Wetlands up close and personal

Wetlands slow flooding. They're nature's sponges, absorbing water during heavy rains so all of it doesn't run directly off the land into rivers and streams. This helps prevent flooding and protects stream- and riverbanks from losing soil. Wetlands along floodplains are especially valuable.

Wetlands control erosion. The roots of wetland plants hold the soil to prevent its being washed away by runoff and coastal waves and tides.

Wetlands help maintain our beaches. Because wetlands hold soil in place, they can help build land, particularly along coasts that regularly lose land to the ocean.

Wetlands give us cleaner water — and more of it. Like giant kidneys, wetlands filter pollutants out of water as it passes slowly through these sponge-like systems. And because they hold water, wetlands give us water during dry seasons by gradually releasing it.

Wetlands are homes for wildlife. Most fish, nearly 200 kinds of amphibians and well over 200 kinds of birds could not survive without wetlands. And even though they cover only about 5 percent of the continental United States, wetlands are lifelines for nearly half our endangered species.

Wetlands help us build. Much of our furniture, wood paneling and structural supports originate in wetlands — from the oak, gum, cypress and elm trees found in our eastern wetlands, the cedar trees in the West.

Wetlands link our food webs. The special plants and bacteria that grow in wetlands are the first link in a chain that goes on to such creatures as snails, whirligig beetles and gnats, which in turn are gobbled up by fish or birds, which end up in large reptiles and mammals, including us. Nearly all the fish and shellfish harvested commercially — and half of those we catch for fun — depend on wetlands for food and a place to live during at least part of their lives.

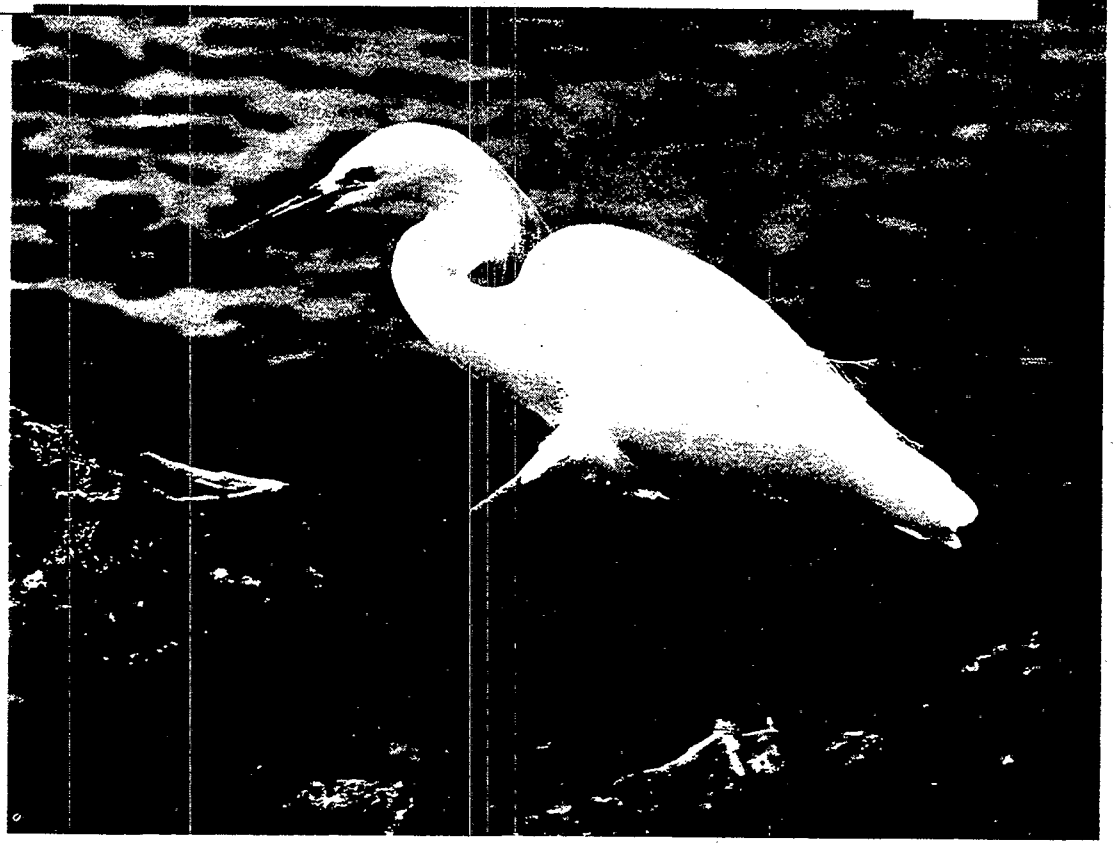
Wetlands give us places to play. Figures compiled in 1997 show that nearly 100 million of us hunt, fish, crab, hike, walk and boat in our wetlands, spending almost $60 million annually. Hunters spend $600 million alone stalking ducks and geese. And the 50 million people who observe and photograph wetland birds spend more than $29 billion a year on their hobby — did you know bird-watchers outnumber golfers?

Wetland Metaphors

OBJECT	FUNCTION
Sponge	absorbs excess water; retains moisture for a time even if standing water dries up (e.g., sponge placed in a bowl of water absorbs water until saturated, then stays wet after standing water has evaporated)
Pillow or bed	resting place for migratory birds
Mixer or egg beater	mixes nutrients and oxygen into the water
Cradle	a nursery that shelters, protects and feeds young wildlife
Sieve or strainer	strains silt, debris, etc., from water
Filter	filters smaller impurities from water
Antacid	neutralizes toxic substances
Cereal	provides nutrient-rich foods
Soap	helps cleanse the environment

Reprinted with permission from Project Wild Aquatic Education Activity Guide (1992), Council for Environmental Education.

The "ripple effect" of watching, photographing and feeding birds: $85.4 billion — more than a million jobs (income = $24.5 million) paying $323.5 million in state income tax and $3.8 billion in federal income tax. And $1.04 billion in state sales tax.



A snowy egret in Punta Gorda, Fla. Photo by Thomas K. O'Neill, North Port, Fla.

Wetlands build our economy. As big as recreation is, wetlands also support an annual commercial fur and hide harvest of $300 to $400 million and such major industries as cranberries and rice. Livestock graze wetland grasses and ranchers bale swamp hay and grasses to feed cattle during the winter.

Wetlands teach us. From preschoolers to their grandparents, we're all learning from wetlands. Communities build boardwalks through nearby marshes so everyone can enjoy the birds and the frogs and the flowers. And more and more schools are creating outdoor learning labs where we can experience how all living things connect with each other.

Wetlands enrich our quality of life. Did you ever read the *Swamp Thing* comic books or see the movies and TV shows? Look at Monet's and John Singer Sargeant's paintings and Audubon's wildlife and read Thoreau's classic *Walden*. You'll see wetlands through the artist's eyes.

So, if wetlands are so important to us, where are they? How do we find them?

The Payette River begins in these Squaw Meadows in Idaho's Payette National Forest about 5,700 high in the Salmon River Mountains. Photo by Kathy Criccle, Richland, Wash.

How to know a wetland when you see one

Look for land that holds water at least part of the time — and where plants that like water thrive. Because, whether we call them ponds, marshes, swamps or prairie potholes, all wetlands have three elements in common:

They're wet. The soil is thoroughly wet for a significant part of the year. But even though some wetlands may look like small lakes, others may appear dry because they're wet only beneath the surface: in the plants' root zone. And some look wet only during certain seasons.

And because they're wet, ***their soils contain very little oxygen*** — oxygen moves through water 10,000 times slower than it moves through air. Thus, wetland soils don't have enough oxygen to support many plants. Those that do live in wetlands may eventually decay in the soil to become peat: sphagnum moss is one of these.

- Most soils found in wetlands are either organic (like peat) or clay.
- Most bacteria can't live without oxygen either. But those that can live in these anaerobic (oxygen-less) soils produce either sulfur or methane gas — that's why wetland soils sometimes smell!

Alaska has 170 million acres of wetlands; Hawaii, 52,000 – and the continental U.S., 103 million.

Only plants that love water (hydrophytic types) can live in wetlands, because, like us, plants need oxygen to survive. These water-loving plants have special adaptations — such as air spaces in their stems — to carry oxygen to their roots. That's why they may feel spongy.

- The U.S. Fish & Wildlife Service lists nearly 7,000 plants that live in wetlands, including cattails, bulrushes, cordgrass, bald cypress, willows, mangroves, sedges, rushes, arrowheads, tupelo gum and water plantains.

Name that wetland!

Just like us (we're male and female, babies, boys and girls, teens and adults), wetlands can be grouped in a number of ways. And, like *homo sapiens*, wetlands can be scientifically classified. You will learn those methods should you decide to study wetlands further.

But our next step now is to find out what kinds of wetlands we can expect to find where we live (and travel). So, we're using the U.S. Fish & Wildlife Service system that groups wetlands by where they're located and the plants and animals that live in them.

Palustrine: Forested wetlands (you might call them "muddy swamps") and many kinds of freshwater marshes.

Lacustrine: Wetlands found in lakes and reservoirs.

Estuarine and Marine: Wetlands found along seashores and in nearby basins (estuaries) where seawater mixes with freshwater.

Palustrine wetlands

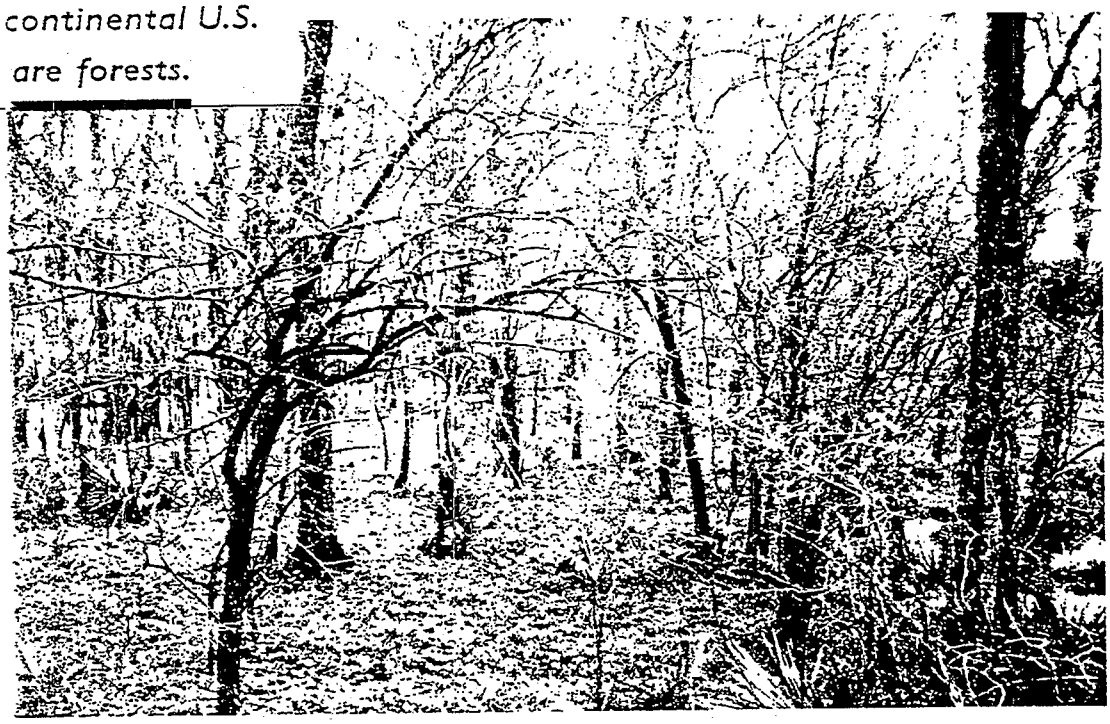
Most of the wetlands around you — more than 90 percent of those in the lower 48 states — are palustrine. These freshwater wetlands bear many fascinating names — from pocosins to potholes to playas, depending on where they're located.

To ask a not-so-trivial question — did you know that some of our most important wetlands are also forests?

Forested wetlands make up about half the wetland acreage in the continental United States.

- You've surely heard of the Okefenokee Swamp — you may even have visited it or Florida's Big Cypress Swamp. They're **bottomland hardwood forests**, one of our most important wetlands. The hardwood forests on the lowlands of the Southeast span the floodplains from the Mississippi River to the Piedmont. Cypress,

Half the wetlands in the continental U.S. are forests.



Bottomland hardwood swamps in the Catoma Creek watershed south of Montgomery, Ala. Photo by Deborah Hendrix, a second grade teacher in Montgomery.

below left: **Spanish moss drapes a Louisiana cypress.** Photo by Celeste Bordelon, Baton Rouge, La.

swamp-tupelo, water-tupelo, red maple, sweet bay, ash and black willow grow here — frequently festooned with Spanish moss. And among those grandiose trees, you'll find countless insects, fish, amphibians, snakes, birds and mammals.

- The western riverside forests in the semi-arid states of Colorado, Montana and Wyoming are extremely important habitats for neotropical migrant songbirds.
- In the wetter Pacific Northwest, river forests contribute to the regional economy, especially the logging and commercial fishing industries. Typical trees found here are western white cedar, Oregon ash, willow and red alder.

Tidal freshwater marshes are most common in low-lying lands along the middle and southern Atlantic and Gulf coasts. Here you'll find soft-stemmed plants such as arrow arum, spatterdock (yellow water lily), wild rice, cattails, bulrushes and sawgrass. And, if you're lucky, you'll see invertebrates, fish, birds and other wildlife feeding on these plants.

Millions of migratory ducks and geese winter in flooded rice fields along the Gulf Coast and in California.

Nontidal freshwater marshes can develop in isolated basins, and around lakes, streams and rivers. In those that almost constantly flood during the growing season, water can be 3 to 6 feet deep. Others are shallower because they flood only occasionally.

- In these marshes, look for (but don't dig!) plants that gardeners treasure: the brilliant cardinal flower, the familiar forget-me-not, swamp rose, mallow, cattails — and waterlilies, grasses, bulrushes, arrowheads and sedges.
- Migrating birds find sanctuary in freshwater marshes — and some sport fish feed there and use them as nurseries for their young.
- Fish feed and spawn in the deeper marshes and those connected to large bodies of water, such as the Great Lakes. Fewer fish live in shallow marshes because the oxygen levels and temperatures fluctuate too much.

(left) **Water lilies (with cypress trees behind them) in the Lutcher-Moore Swamp between Baton Rouge and New Orleans.** Photo by Nancy Webb, Zachary, La.

(below) **Fishing for dinner in New Mexico's Bosque Del Apache.** Photo by Harvey Augenbraun, New Rochelle, N.Y.

About 80% of America's ducks depend on prairie potholes.

A prairie pothole in rural southern Minnesota; photo by Susan Slater, Willow Creek Intermediate School principal, Owatonna, Minn.

Fens and bogs are wetland systems — found mostly in Alaska, Wisconsin, Michigan, Minnesota and the Northeast — where plants have decayed into peat. Because its water comes from rain and snow — not from runoff or groundwater — a bog contains few nutrients. Water enters a fen, however, from groundwater fed by mineral soils, so you'll find more minerals and nutrients in these wetlands.

- Unusual and attractive plants grow in fens and bogs, most notably insect-eating pitcher plants and many lovely orchids. Mosses and sedges dominate fens.
- Cranberries and blueberries, important crops in several states, grow in bogs.
- Bogs produce the peat moss we use in our gardens.
- Many endangered species live in fens and bogs. And some birds — like olivesided flycatchers — nest there. A few reptiles and amphibians, along with large mammals such as caribou, moose and bear, also make their homes in these wetlands.

The pocosins in the Southeast resemble bogs and fens. Certain evergreen shrubs and trees like maple and gum grow there. In North Carolina, pocosins regulate the flow of freshwater to nearby coastal estuaries, and thus help maintain the commercial fishing industry based in Pamlico Sound.

Prairie potholes are small, marsh-like wetlands found mostly in the Dakotas and Nebraska. These depressions may be wet for only a few weeks or after a heavy rain. However, they teem with plant and insect life, making them important resting and breeding places for migrating ducks, geese, cranes and pheasants.

Playa is another type of occasionally flooded pool found in the Southwest. These shallow, bowl-shaped depressions are common to the southern High Plains (eastern Colorado, western Kansas, New Mexico, Oklahoma, Texas).

Wet tundra (tundra meaning black, mucky soil) is found on treeless plains in arctic or subarctic regions.

- Flowering dwarf herbs and willow grow profusely on wet tundra.

Grassland marshes with water at or near the surface are called wet prairies, meadows or vernal pools (shallow, occasionally flooded meadows), depending on how often they flood — and how long it lasts and the soil remains soaked.

- Imagine the Florida Everglades as a wide, grassy river moving to the sea — the River of Grass.

Vernal pools are seasonally flooded shallow wetlands generally found in California and the Northeast. As the name suggests, they're usually wet in the spring and dry during the summer.

- California's vernal pools are wet meadows — but in Connecticut, Massachusetts and other northeastern states vernal pools are most often found in forests and shrubby areas.

- A unique group of amphibians (animals that live in water and on land) and invertebrates breed only in vernal pools: among them, wood frogs, toads, spotted salamanders and spring peepers. Their young leave the pools to live in surrounding lands.

Canada geese and their young perch on a muskrat lodge in a southern Minnesota freshwater marsh. Photo by Susan Slater, Owatonna, Minn.

Swamps are wetlands dominated by trees or shrubs. Unlike marshes, which tend to be wet much of the time, swamps may be waterlogged in winter and early spring but dry during the summer. They develop in upland low spots, at the edges of lakes and ponds, along river- and streambanks on floodplains.

- White cedar, black ash and red maple trees grow in northern swamps, bald cypress and tupelo gum in the South.

Riverine wetlands develop in freshwater rivers and streams, particularly through the Mississippi River Valley, the South Atlantic Coast and along Alaska's waterways.

- They're also very important in the West. Arizona Game & Fish estimates that over 75 percent of the state's wildlife rely on wetlands along stream- and riverbanks for food and shelter at some point in their lives.
- Riverine wetlands have two principal functions: food and habitat for wildlife, including birds and fish — and holding the soil along river- and streambanks to prevent erosion.
- They harbor a variety of aquatic plants, as well as plankton, flying insects, mussels and crayfish.

Lacustrine wetlands

These wetlands are found in lakes and reservoirs. Their rocky or sandy soil beds host such plants as water lilies, bladderwort, coontail, watermilfoil, pondweeds and pickerelweed.

- Breeding grounds for frogs and other amphibians, they also support sponges, mollusks and crayfish. Mammals such as raccoon and beaver feed at the edges of lacustrine waters.

Marine wetlands

Look for these wetlands in shallow ocean waters and on the beaches and rocky shores that edge all our seaboards — and their coral reefs, harbors and barrier islands.

- Turtle grass and kelp grow here.
- Commercial fish such as the red drum, the Great Alaskan tellin and the Atlantic deep sea scallop are found in marine wetlands.
- Seal and walrus breed — and nurture their young — in Alaska's marine wetlands.

About 75% of the nation's commercial fish and shellfish use wetlands for at least part of their lives.

Black needle rush and saltmeadow cordgrass in a saltmarsh adjacent to the Gulf of Mexico in Cedar Key, Fla. Photo by Carol Karhu-Grynewicz, Largo, Fla.

Estuarine wetlands

Estuarine wetlands appear where seawater and freshwater mix in basins (estuaries) along the coasts. You'll find a great many kinds of animals — invertebrates, birds and reptiles — in these wetlands.

- About 75 percent of the nation's commercial fish and shellfish — including scallops, oysters, crabs, shrimp and quahog — depend on these wetlands.
- Louisiana, with 41 percent of the nation's coastal wetlands, supplies us with oysters, shrimp and crabs that live in wetlands.
- And the Chesapeake Bay — the largest estuary in the United States —furnishes 90 percent of the nation's striped bass that feed in wetlands.
- Nearly three-quarters of our estuarine wetlands are salt marshes. Grasses grow there, and in warm climates, mangroves, the only tree that can tolerate salty conditions.
- Waterfowl need the grass beds found in about 4 percent of estuarine wetlands. For example, canvasback ducks feed on vegetation that grows just beneath the surface in the Chesapeake Bay. These grass beds are also important spawning areas and nurseries for striped bass, blue crab, shad and herring.

Beavers are builders, too, and their expertise often supports or even restores wetlands. That's what happened along Interstate-66 where it curves to enter Washington, D.C. When U.S. Fish & Wildlife Service employees looked out their windows to see beavers hard at work, they organized annual 5-K runs to raise money to protect (and, of course, enable) the beavers' efforts.

Constructed wetlands

People also build wetlands, usually for the following reasons:

- Cities and smaller entities, such as parks and interstate highway rest stops, build wetlands to treat wastewater, stormwater and sewage.
- Developers and builders whose projects unavoidably destroy wetlands build other wetlands to compensate for that loss.
- Livestock producers build wetlands to treat animal waste.

Location, location, location

Location makes a big difference in a wetland, doesn't it? You won't find the same wetland in Arizona that you find in Hawaii — or in Alaska or Massachusetts.

But no matter where it is, every wetland is part of a larger land and water system known as a watershed — a basin that drains everything lying on the land (from pet waste to oil and dirt) into a common body of water, like a river or lake (or even the ocean).

A watershed may be tiny (a few acres), or it may be huge — the Mississippi River watershed drains two-thirds of the United States into the Gulf of Mexico.

We all live in watersheds — you can locate yours by looking at the map on EPA's web site (see directions in Resources).

Everything happens in a watershed

Wetlands link the land and water within the watershed. They make the transition from the river bank to the river — from lowlands to the sea — from wildlife nurseries to fertile cropland.

But wetlands also interact with groundwater, and with drinking water — with all natural and human resources.

Of course, we expect to drink and bathe and swim in clean water; we expect to breathe clean air.

We also expect to eat shrimp and fish (certified by food inspectors) — just as we expect our traffic lights to work, and our fire and police departments to protect us. And our roads to be smooth and free of potholes!

Natural and human activities continuously interact within watersheds. And sometimes we don't know the results for many years.

Crops have always thrived in the fertile Missouri and Mississippi river bottoms. But in 1993, massive floods wiped out the farms, the homes, the businesses built on those floodplains.

A wetlands scientist later calculated that if 3 percent (13 million acres) of the Mississippi River's upper watershed had been in 3-foot-deep marshes, the Mississippi would not have flooded in 1993.

And now, studies are predicting that rising sea levels may wipe out many of our coastal wetlands early in the next century. What will that do to those watersheds — and those who live there?

Just a reminder — to think of the whole watershed — its people and their needs, its resources and their needs — as we make decisions about development and zoning, treating our water and preventing pollution.

Eagle River Valley in Alaska's Chugach State Park. Photo by Rosemarie TG Lombardi, Palmer, Alaska

This boardwalk leads visitors through Cedarburg Bog, the largest peatland in southern Wisconsin. Photo by Merrie Schamberger, Ozaukee County, Wisc.

Look back to move forward

When Europeans first arrived on this continent, wetlands covered some 220 million acres (9 percent) of their country-to-be's total land. **Today, less than half of those wetlands remain.**

What happened to them?

As pioneers building a new nation, we needed food and shelter and a way to make a living — so we drained what we thought was useless swampland to grow our food, and build homes, shops and factories.

America thrived. We built our nation into the world's leading producer of food and industrial products.

But the very science that had helped our nation develop soon began to point to the importance of protecting our natural resources. We began to understand that in filling in lowlands to plant crops and build roads and towns, we had unknowingly destroyed a natural resource we needed to sustain this country we had built.

The federal Swamp Land Act of 1850 that had deeded wetlands to the states for conversion to agriculture began to look like a mistake — prompting a backlash that eventually developed into a national conservation movement:

Since colonial times, 22 states have lost at least half their original wetlands – California, Iowa and Ohio have lost about 90%.

- In 1890, western naturalist John Muir helped establish Yosemite National Park.
- In the first decade of the 20th century, President Theodore Roosevelt placed millions of acres of forests and wetlands off limits to private developers.
- In 1918, the United States and Canada signed the Migratory Bird Treaty to conserve 800 species of migratory birds that live in both countries.
- The Duck Stamp Act in 1934 authorized the sale of stamps to raise money to protect or buy wetlands important to waterfowl.

A restored wetland, this Oregon Marsh Wildlife Area had been used as pasture until 1988. Photo by David Bronson, LaGrande, Ore.

Wetlands Legislation — a brief synopsis

1960s: The first states require individuals and companies to obtain permission before changing a wetland.

1971: The United States signs the Ramsar Convention, an international treaty in which member nations promise to develop wise wetlands use policies and to designate internationally important wetlands for preservation. By 1999, the United States had designated 17 wetlands (see the map on pg. 30).

1972: The Coastal Zone Management Act offers federal matching grants to conserve coastal wetlands.

Mid-1970s: The U.S. government issues executive orders that require every federal agency to consider wetlands and floodplain protection in its policies.

1977: The Clean Water Act (Section 404) requires a permit before draining or filling wetlands.

1982: U.S. Coastal Barrier Resource Act removes federal flood insurance subsidies and prohibits federal funding of roads and other improvements on sensitive coastal wetlands.

1985: The Food Security Act's "Swampbuster" eliminates subsidies for farming wetlands.

1986: The Tax Reform Act eliminates most tax advantages enjoyed by farmers and developers who invest in wetlands.

The Emergency Wetlands Resources Act requires states to develop a wetlands plan for entire regions and watersheds.

1990: The Farm Bill creates the Wetland Reserve Program to restore cropland with hydric (wet) soil to its original wetland state.

1996: The Farm Bill reauthorizes the Wetland Reserve Program.

But other federal policies conflicted directly with early conservation attempts. For example,

- The Rivers and Harbors Act of 1899 required the U.S. Army Corps of Engineers to maintain U.S. navigable waters — but this often led to dredging and filling of wetlands.
- The government still paid farmers to grow crops on converted wetlands.

By mid-century, a growing number of us had become interested in protecting our environment — and that interest triggered a second look at wetlands.

In 1987, the federal government convened a National Wetlands Policy Forum that recommended not only that wetland loss be halted, but also that steps be taken to increase their number and quality. And the "no-net-loss" policy was born —committing us to at least maintain our total number of wetland acres.

Originally part of Laramie County's Poor Farm, this wetland has been restored for migratory birds and wildlife habitat — with a nature trail and viewing blind for human visitors. Photo by Patricia A. Ley, Cheyenne, Wyo.

Making no-net-loss work — or bring back our wetlands!

Pushed by two Presidents — Bush and Clinton — and aggressively put into practice by federal and state agencies, the no-net-loss policy is paying off: Our rate of wetland loss has been cut in half in the past decade.

During that period, the Agriculture Department has turned its incentive programs around.

- The Natural Resources Conservation Service Wetlands Reserve Program offers farmers financial incentives to improve wetlands on their land, in exchange for not farming wetlands. By the mid-'90s, farmers had restored 200,000 acres of wetlands.
- Taking Wings – a public/private partnership to restore habitat and protect wetlands — and the Stewardship Incentives Program are Forest Service programs to restore wetlands.

By 1995, the North American Waterfowl Management Plan had invested more than $500 million to conserve over 4.5 million acres of wetland habitats.

The Fish & Wildlife Service has several programs to protect wetlands:

- Partners for Wildlife has worked with nearly 10,000 landowners to restore over 200,000 acres in wetlands.
- The North American Waterfowl Management Plan is an agreement between the U.S., Canada and Mexico to ensure the survival of migrating waterfowl. Its Prairie Pothole Joint Venture is the largest single effort ever to protect wetlands, waterfowl and other wildlife.

Private organizations — such as Ducks Unlimited and Delta Waterfowl — also help landowners conserve wetlands.

In the prairie pothole region alone, these combined public/private efforts have restored more than 500,000 acres.

But we're not all farmers. Most of us live in towns and cities. We're still building, still destroying wetlands. How does that figure in this no-net-loss equation?

Mitigation — what to do when you lose a wetland

If we have to destroy an existing wetland, the federal government requires that we replace it by either restoring or creating a similar wetland adjacent to it or in the same watershed.

The person or company proposing to eliminate the wetland must first go through three steps (note the key words — **avoid** and **unavoidable**):

- Avoid destroying the wetland, if at all possible.
- Minimize the unavoidable destruction.
- Restore another wetland or create one to compensate for this unavoidable loss.

Laws often require developers and others to compensate for the wetland loss by restoring more acres than they actually destroyed.

This is called "mitigation." You can mitigate a wetland loss by building a wetland nearby — but that requires hiring a wetland consultant, buying land and overseeing a complicated project that may require many years of monitoring.

This wetlands mitigation bank serves both the Snohomish County, Wash., airport and the world's largest aircraft manufacturing plant, owned by Boeing. Photo by Lennie Rae Cooke, Everett, Wash.

So a whole new "banking" system has developed. Mitigation banks restore — and assume responsibility for their long-term maintenance — large tracts of wetlands and sell them as "mitigation credits" to developers and others who must compensate for having destroyed wetlands.

Because the banks have already been permitted, the purchaser avoids delay — and is relieved of all responsibility for maintaining the restored wetland (he doesn't have to worry about what future homeowners' associations will do!)

State transportation departments began developing these banks in the 1970s to compensate for the many small wetlands destroyed by highway construction.

By 1993, entrepreneurs had begun to establish banks that sell credits to anyone needing to mitigate a wetland loss.

The five federal agencies involved with mitigating wetlands — the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, USDA Natural Resources Conservation Service, the U.S. Fish & Wildlife Service and the National Oceanic & Atmospheric Administration — first issued guidance for mitigation banks in 1995.

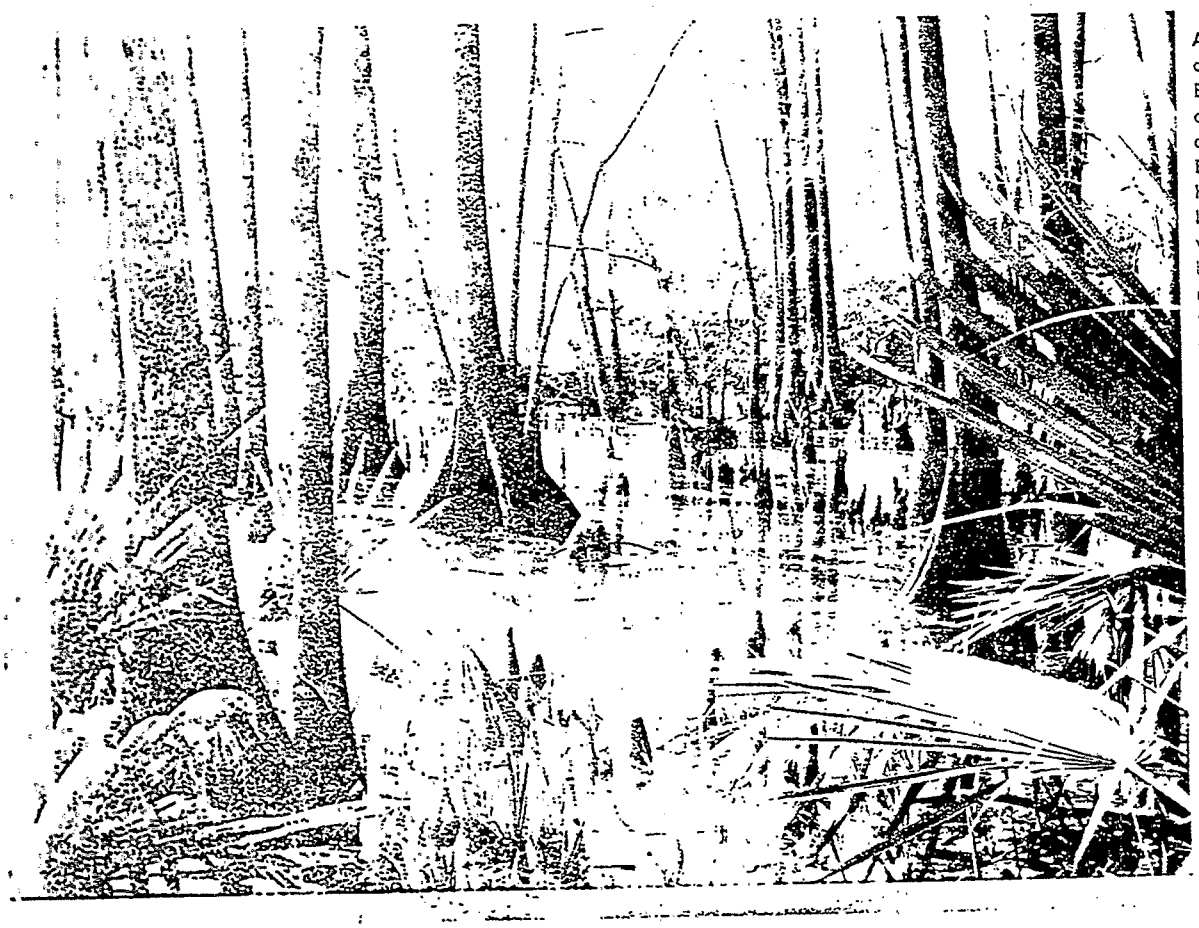
Adopt A Pothole by donating $50 (or more) to Delta Waterfowl, who will give you the name and address of the landowner who, in exchange for your contribution, has agreed to grow duck-nesting habitat there (and protect the pothole wetland for 10 years). Contact Delta Waterfowl, P.O. Box 3128, Bismarck, ND 58502; 701/222-8857.

Still in its infancy, the mitigation banking industry is growing carefully, mindful that the wetlands it restores or creates must meet the most severe test: they must function forever as healthy wetlands.

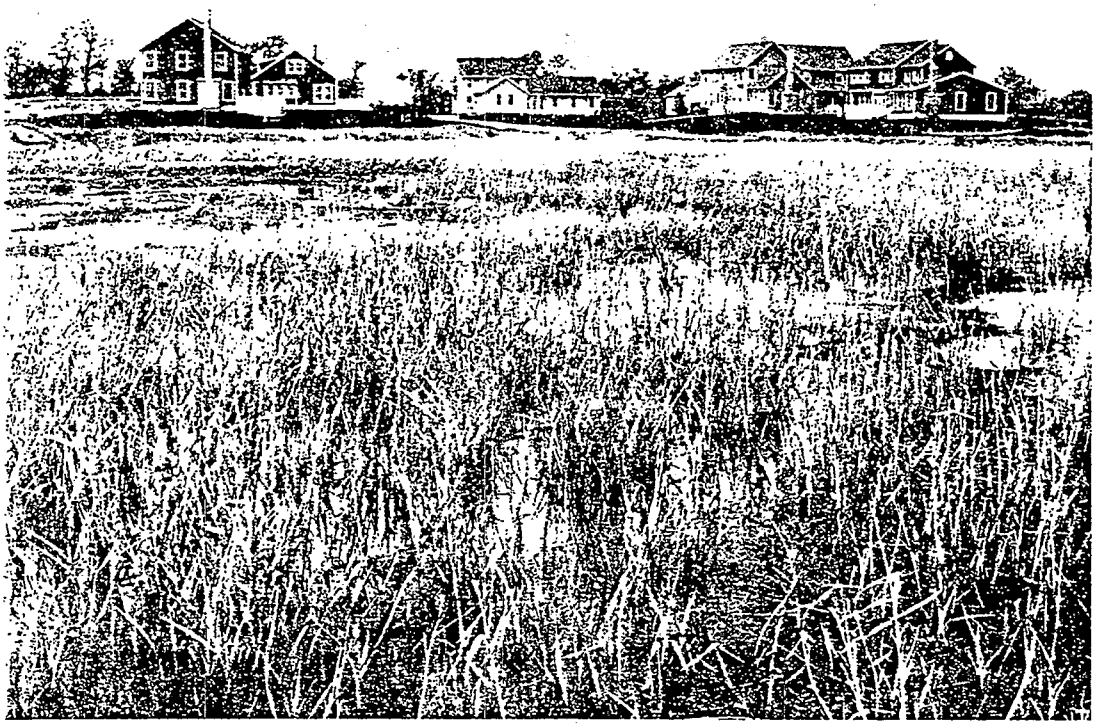
Critics question bankers' ability to guarantee long-term maintenance — and they also fear that wetlands will disappear from cities to be concentrated in large rural tracts of land.

So the dialogue continues on how mitigation should work.

But we have learned a great deal about wetlands in our 200-plus years on this continent — enough to take responsibility for them.



An outdoor classroom in Bayou Castine — on the south side of Woodlake Elementary — helps students learn about wetlands. Photo by Sandy Scott, a resource helping teacher in Mandeville, La.



Chicago suburbia lives in harmony with wetlands. Photo by Terry Evans, Chicago, Ill.

Who's in charge?

Today, most wetlands are privately owned: the small wetlands in the West essential for preserving waterfowl, valuable waterfront properties up and down the East Coast, riverside forests controlled by lumber companies, the resorts that infuse big dollars into local economies from the Great Lakes to the Everglades.

And that wetland in the woods at the back of your property or the marsh along the lake (where everybody wants to build a cabin).

Yes, it's people like us — and people we know — who control the wetland resources of this nation. It puts the responsibility for conserving those wetlands squarely on our shoulders.

While government policies and support are important, all of us must play a part in keeping wetlands with us forever. In fact, that's already happening.

You're in charge!

Every May since 1991, communities all over America celebrate American Wetlands Month — with wetland walks, bird watching, picnics and special events. Civic groups help schools build wetlands on school grounds, and

plant saplings in degraded wetlands. Children and adults alike build nest boxes and take other steps to give wetlands' wildlife a helping hand.

But American Wetlands Month is more than just a "month" — it's the celebration of working for wetlands year round.

- It's driving the first nails into a boardwalk built over a community's restored wetland;
- It's sixth graders leading their parents through a school wetland they planned and planted.

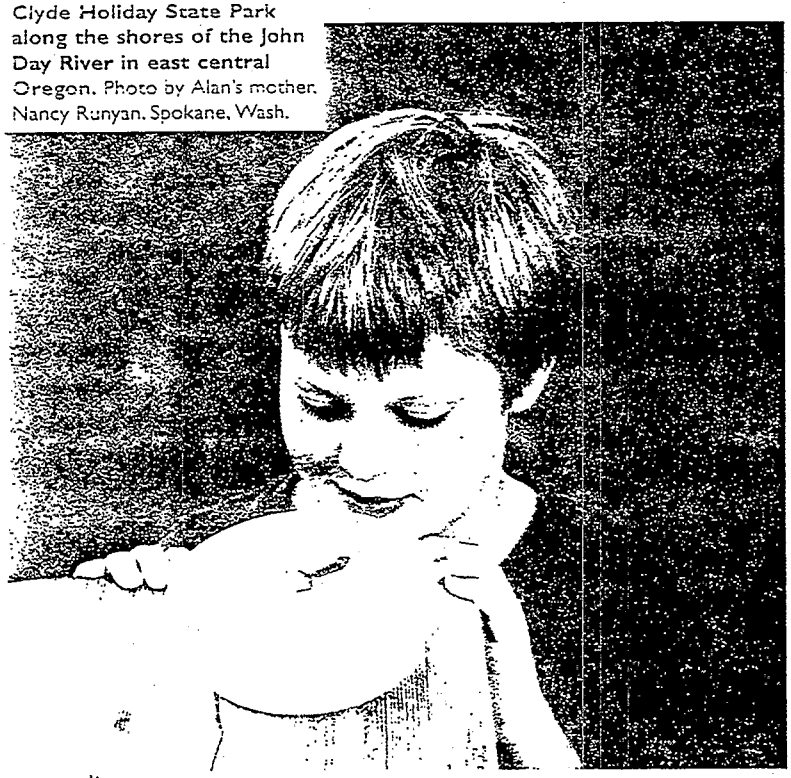
So how can we "work for wetlands?"

- **Ask your Mayor or the Governor** to declare May as American Wetlands Month.
- **Run (or walk) for wetlands.** New Jersey fifth graders used this familiar activity to raise enough money to help Bridgewater's Hillside School build a backyard wildlife habitat. U.S. Fish & Wildlife Service employees do it, too. Their annual 5K run protects a beaver pond nestled next to their building. Contact: Hillside School, 844 Brown Road, Bridgewater, NJ 08807. USFWS, 703/358-2468.

Delta, Ohio middle schoolers creating a living wetland laboratory on a 7.8-acre site given the school by North Star BHP Steel, a Cargill subsidiary. Photo by Jeff Bindas, North Star environmental manager.

It's up to us — you and me, and our friends and neighbors — to ensure that wetlands function for us not just today, but forever.

- **Sponsor photo/art/poetry contests** to celebrate the beauty of wetlands. Ask your Chamber of Commerce or local businesses to donate prizes and display the entries.
- **Offer Discover Wetlands guided tours.** Follow the example of a Maryland group that takes people to (1) watch birds; (2) see beavers ("makers of the marsh"); (3) find wildflowers and butterflies — concluding with (4) a night hike. Contact Patuxent Research Refuge, 410/674-3304.
- **If you live near a Ramsar wetland** (see page 30), learn why it's a "wetland of international importance." Visit it, or organize a group trip there.
- **Show off your wetland project.** Maybe it's your fourth graders' collection of wetland plants, or a boardwalk through a community wetland. Call Jim Amburgey at 419/822-2339 about the outdoor classroom North Star BHP Steel built for Ohio middle schoolers — or the New Hanover (NC) conservation district (4141 Chestnut, Wilmington, NC 28401; 910/762-6072) about the Living Lab they built for Alderman Elementary School.
- **Throw a community picnic.** Organize a bring-your-own-picnic get-together near a wetland, complete with tours, storytelling and hands-on activities.



This tiny grass frog lives in Clyde Holiday State Park along the shores of the John Day River in east central Oregon. Photo by Alan's mother, Nancy Runyan, Spokane, Wash.

- **Plant saplings or plants — or pull weeds.** Planting might be the first step in a wetland's restoration — pulling weeds part of its maintenance. Contact Jeff DePew, 314/918-7019; jcdepew@icon-stl.net.
- **Start a project to fill a community need.** Folks in New Orleans "bundle" Christmas trees and place them in wetlands to give fish a place to live. Contact Jefferson Parish Environmental Development & Control Department, 504/838-4230.
- **Participate in the River of Words** international environmental poetry and art contest. "Watersheds" is its theme. Contact River of Words, c/o International Rivers, P.O. Box 4000-J, Berkeley, CA 94704; 510/433-7020; row@irn.org.

- **Organize a wetlands group.** Bring together others in your community who are interested in conserving your local wetlands to strategize on building community awareness and connecting with appropriate government officials and programs.
- **Publicize American Wetlands Month.** Tantalize your local newspaper and radio/TV stations with interesting facts about nearby wetlands.
- **Join a volunteer monitoring group** — or organize one. Contact EPA Headquarters, 202/260-7018.
- **Read about wetlands.** You can do this all by yourself, then you can prepare a reading list for your school — or to post in the library. Begin with Thoreau's *Walden*!
- **Observe International Migratory Bird Day** — usually early in May. Contact 703/358-2318; imbd@fws.org; www.americanbirding.org.
- **Join nations across the world in celebrating World Wetlands Day Feb. 2,** the anniversary of the Ramsar Convention. It may not be May, but it's summer someplace — use this international observance to do something special with your own project. Contact www.ramsar.org.
- **Hand out American Wetlands Month stickers.** Give them to your friends and neighbors, classmates, mall shoppers — and explain why wetlands are important. Contact the Terrene Institute; www.terrene.org; 4 Herbert Street, Alexandria, VA 22305; 703/548-5473; terrinst@aol.com.
- **Become a PAW.** Support American Wetlands Month by becoming a Pal of American Wetlands. A PAW's financial contribution helps the Terrene Institute develop and distribute American Wetlands Month action kits used by schools and community organizations nationwide to educate Americans about our wetlands and how they fit into our world. Contact the Terrene Institute; www.terrene.org; 4 Herbert Street, Alexandria, VA 22305; 703/548-5473; terrinst@aol.com.

And wear your ***Celebrate Wetlands*** button proudly!

Always remember, American Wetlands Month is just the one time each year we celebrate our year 'round work to conserve these precious resources. What's really important is that we understand what wetlands are all about and why they matter to us all.

Cheyenne Bottoms, a Ramsar-designated wetland in central Kansas. Photo by Edward Carney, Lawrence, Kans.

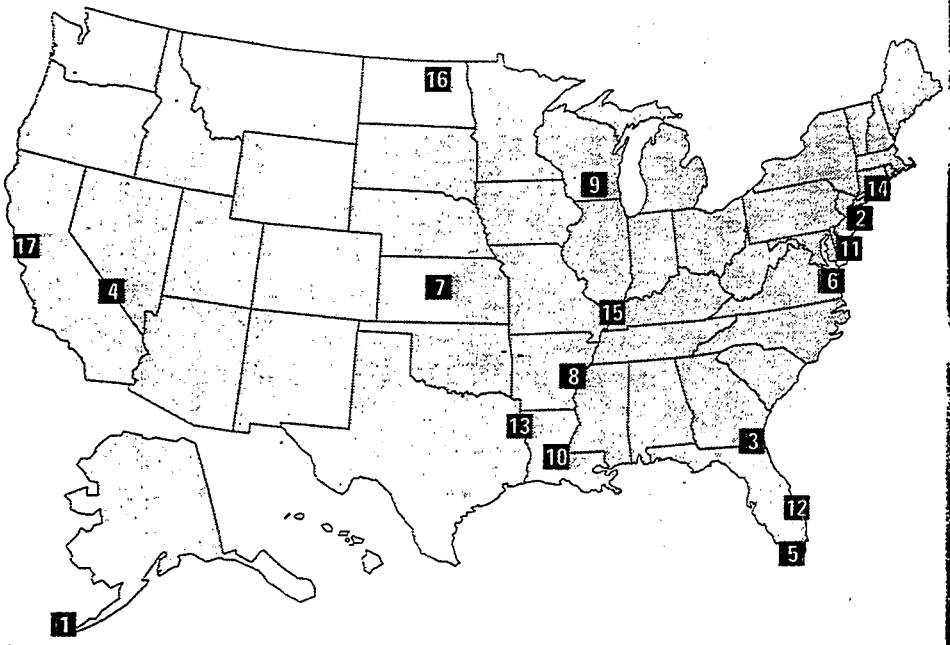
Wetlands of International Importance: U.S. Ramsar Sites

Ramsar — perhaps the newest word in the wetlands' vocabulary — is actually the name of the place in Iran where, in 1971, the Convention on Wetlands of International Importance — especially as waterfowl habitat — adopted an intergovernmental treaty to conserve wetlands.

How does the Convention define wetlands? *As areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six meters . . . may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within the wetlands.*

Well over 100 countries are now Contracting Parties to the Convention. Member countries are obligated to (1) include wetland conservation in their natural resource planning and promote the wise use of wetlands within their territory; (2) designate wetlands for inclusion in a "List of Wetlands of International Importance"; (3) establish nature reserves to promote the conservation of wetlands in their territory.

The U.S. Ramsar sites
(in order of designation):



1 ***Izembek Lagoon National Wildlife Refuge and State Game Area, Alaska:*** in 1986, the United States' first Ramsar site. Features largest eelgrass beds in North America and an extraordinary volume and diversity of wildfowl.

2 ***Forsythe National Wildlife Refuge, New Jersey:*** habitat for several endangered species, including the bald eagle; annual waterfowl use is very high, and the area is popular with East Coast bird enthusiasts.

3 ***Okefenokee National Wildlife Refuge, Georgia and Florida***: large regional wetland complex with a significant diversity of habitats, plant and animal species. Excellent for public education and scientific research.

4 ***Ash Meadows National Wildlife Refuge, Nevada:*** a genuine North American desert oasis with great species diversity, including the Ash Meadows pup fish and other endangered species.

5 ***Everglades National Park, Florida:*** nearly synonymous with the term "wetlands"; a valuable area for scientific research and species diversity.

6 ***Chesapeake Bay Estuarine Complex, Maryland and Virginia:*** vitally important wintering and staging area for migratory birds; a rich and diverse area with a wide range of economic, recreational and environmental values.

7 ***Cheyenne Bottoms State Game Area, Kansas:*** contains an exceptional volume and diversity of shorebirds; this high plains wetland complex demonstrates the practicality of conservation and wise land use management.

8 ***Cache-Lower White Rivers Joint Venture Area, Arkansas:*** features some of the larger remaining Mississippi bottomland hardwood forests; valuable for endangered species and a wintering area for migrating ducks.

9 ***Horicon Marsh, Wisconsin:*** represents wetland flora and fauna of upper Midwest; habitat for endangered species and critical staging and feeding area for the Mississippi Valley population of Canada geese.

10 ***Catahoula Lake, Louisiana:*** seasonal water level fluctuations support large numbers of migratory waterfowl; helps maintain the ecological diversity of Louisiana lowlands.

11 ***Delaware Bay Estuary, Delaware, New Jersey and Pennsylvania:*** critical resting and feeding area for migratory shore and wading birds; exceptional for research and recreation.

12 ***Pelican Island National Wildlife Refuge, Florida:*** our first national wildlife refuge; nursery for juvenile endangered marine turtles.

13 ***Caddo Lake, Texas:*** unique inland, freshwater wetland; provides critical habitat for migratory and resident wildlife, including waterfowl, raptors, colonial waterbirds and neotropical songbirds.

14 ***Connecticut River Estuary and Tidal Wetlands Complex, Connecticut:*** extraordinary assemblage of natural and relatively undisturbed biotic communities.

15 ***Cache River – Cypress Creek Wetlands, Illinois:*** critical breeding and wintering area for migratory waterfowl and shorebirds using the Mississippi flyway; also home to mammalian predators and native hardwood forests.

16 ***Sand Lake National Wildlife Refuge, South Dakota***: a 22,000-acre cattail marsh; breeding ground and habitat for many different bird species, reptiles, amphibians, fish and mammals.

17 ***Bolinas Lagoon, California***: critical staging ground and stopover for migratory birds; open water, mudflat and marsh habitat for marine fishes, mammals and waterbirds.

For more information about the Ramsar program, contact the U.S. Fish & Wildlife Service, Office of International Affairs, 860 Arlington Square, Suite 730, Washington, DC 20240; 703/358-1754. ■

Glossary

Amphibian: A plant or animal that can live both on land and in water.

Bog: A nutrient-poor, precipitation-fed, acidic wetland formed over an accumulation of peat with no inflow or outflow and characterized by a distinctive plant community of peat mosses, shrubs, sedges, orchids, pitcher plants, sundews and coniferous trees.

Bottomland: Lowlands along streams and rivers, usually on floodplains.

Coniferous: Cone-bearing trees, such as pine.

Converted wetland: Wetland converted to land that can be farmed or built on.

Depressional wetland: Wetland occurring in a depression in the landscape, usually with a small basin.

Ecosystem: A community of plants and animals interacting with one another and with their physical environment.

Facultative species: Plant species that may grow in either wetlands or uplands.

Fen: A peat-accumulating, groundwater-fed wetland that receives water from mineral soils, usually vegetated with mosses and sedges.

Fringe wetland: Wetland that fringes an ocean or lake and is affected by tidal action.

Herbaceous: A leaf-like plant with little or no woody tissue that usually disappears after a single season.

Hydric soil: Soil that forms under saturated, flooded or ponded conditions long enough during the growing season to develop anaerobic (low-oxygen) conditions in the upper part. (Current [1998] federal definition.)

Hydroperiod: The period during which a soil area is flooded or waterlogged.

Hydrophyte: Plants that grow in water or in soil too waterlogged for most plants to survive.

Invertebrate: An animal with no backbone or skeleton.

Lacustrine: Wetlands in lakes or reservoirs.

Lentic: Relating to or living in still waters.

Lotic: Pertaining to or living in flowing water.

Marsh: Wetland characterized by frequent or continual flooding and herbaceous vegetation such as cattails and rushes.

Mesocosm: An artificial water system that is larger than an aquarium but smaller than a pond.

Mitigation: The federal requirement that if an existing wetland must be destroyed, it be replaced by either restoring or creating a wetland of similar size (often larger) either in the same watershed or adjacent to it.

Mitigation banking: Creation or restoration of a large tract of wetlands, ensuring its maintenance in perpetuity, for sale as "mitigation credits" to developers and others who must compensate for having destroyed wetlands.

Montane: Wetlands in the mountains, usually on the cool, moist slopes below timberline.

Neotropical birds: Native to South America, the Caribbean and southern North America.

Obligate wetland species: Plant species that almost always occur in wetlands under natural conditions.

Palustrine: Freshwater wetlands dominated by trees, shrubs and other vegetation.

Peat: Deposit of intact or partially decomposed plant material; accumulates in wetlands that are wet enough to retard decomposition.

Peatlands: Generic term for all types of peat-accumulating wetlands such as bogs and fens.

Playa: Shallow depression similar to a prairie pothole found in the Southwest; becomes a wetland after a rain and is alternately wet and dry.

Pocosin: A type of bog found in the southeastern United States dominated by shrubs and small trees.

Prairie pothole: Shallow, marshlike pond found mostly in the upper Midwest.

Restoration: Return of a damaged ecosystem to a close approximation of its original condition.

Riparian forest: A wetlands populated with woody plants along the banks of rivers and lakes.

Riverine wetland: Freshwater wetland existing within the channel of a river or stream, and distinct from the riparian ecosystems that line the banks.

Saturation: Condition in which all available spaces are filled with water, as in the case of plants growing in waterlogged soil.

Swamp: Wetland characterized by periodic flooding or soil saturation and dominated by trees or shrubs.

Tidal marsh: Salt, brackish or freshwater marsh dominated by herbaceous vegetation and subject to tidal flows.

Tidal subsidy: Support of water tables and exchange of organic materials by tidal action.

Vernal pool: Shallow, intermittently flooded wet meadow, usually covered by water during the cool season but dry for most of the summer. Characteristic of the Pacific Coast. Also used to describe temporary wetlands in eastern forests.

Water budget: Balance between inflows and outflows of water.

Watershed: The area that drains to a common body of water, such as a lake or a river.

Wet meadow: Wetland characterized by waterlogged soil and herbaceous vegetation, generally without standing water.

Wet prairie: Herbaceous wetland dominated by grasses, sedges and forbs, and with waterlogged soil near the surface for most of the year.

Zonation: Distinct bands of vegetation; common in wetlands because of different elevations, wetness and salinity.

Resources for Wetlands

Federal Agencies

Army Corps of Engineers, Headquarters (CECG), 20 Massachusetts Ave., NW, Room 4113, Washington, DC 20314-1000; 202/761-0001; Fax: 202/761-1683; www.usace.army.mil.

Water Resources Support Center
7701 Telegraph Road, Casey Building
Alexandria, VA 22315-3868
(703) 428-8250
Fax: (703) 428-8171

Great Lakes and Ohio River Division
P.O. Box 1159
Cincinnati, OH 45202-1159
(513) 684-3002
Fax: (513) 684-2085

Mississippi Valley Division
P.O. Box 80
Vicksburg, MS 39181-0080
(601) 634-5750
Fax: (601) 634-5666

North Atlantic Division
90 Church Street
New York, NY 10007-2979
(718) 491-8805
Fax: (718) 491-8879

Northwestern Division
P.O. Box 2870
Portland, OR 97208-2870
(503) 808-3700
Fax: (503) 808-3706

Pacific Ocean Division
Building 230
Ft. Shafter, HI 96858-5440
(808) 438-1500
Fax: (808) 438-8387

South Atlantic Division
60 Forsyth Street, SW
Room 9M15
Atlanta, GA 30303-8801
(404) 562-5003
Fax: (404) 562-5002

South Pacific Division
333 Market Street, Room 1101
San Francisco, CA 94105-2195
(415) 977-8001
Fax: (415) 977-8316

Bureau of Land Management, 1849 C Street, NW, Washington, DC 20290; 202/452-7752; www.blm.gov

ALASKA
222 West 7th Avenue, #13
Anchorage, AK 99513-7599
907/271-5080
Fax: 907/271-4596

ARIZONA
222 N. Central Avenue
Phoenix, AZ 85004-2203
602-417-9200
Fax: 602/417-9398

CALIFORNIA
2135 Butano Drive
Sacramento, CA 95825-0451
916/978-4600
Fax: 916/978-4620

COLORADO
2850 Youngfield Street
Lakewood, CO 80215-7076
303/239-3700
Fax: 303/239-3934

EASTERN STATES
7450 Boston Boulevard
Springfield, VA 22153
703/440-1700
Fax: 703/440-1599

IDAHO
1387 S. Vinnell Way
Boise, ID 83709-1657
208/373-4001
Fax: 208/373-3899

MONTANA
Granite Tower, 222 N. 32nd Street
Billings, MT 59101
406/896-5012
Fax: 406/255-2995

NEVADA
1340 Financial Boulevard
Reno, NV 89502-7147
775/861-6400
Fax: 775/861-6634

NEW MEXICO
1474 Rodeo Road
Santa Fe, NM 87505
505/438-7501
Fax: 505/438-7452

OREGON
1515 S.W. 5th Avenue
Portland, OR 97201
503/952-6024
Fax: 503/952-6390

UTAH
324 South State Street, Suite 301
Salt Lake City, UT 84145-0155
801/539-4010
Fax: 801/539-4013

WYOMING
5353 Yellowstone Road
Cheyenne, WY 82003
307/775-6001
Fax: 307/775-6082

Bureau of Reclamation, U.S. Department of Interior, 1849 C Street, NW, Washington, DC 20240-0001; 202/208-4442; judy.troast@bor.gov; www.usbr.gov.

Denver Office
Building 67
Denver Federal Center
P.O. Box 25007, Denver, CO 80225
303/445-2692

Lower Colorado Region
P.O. Box 61470
Boulder City, NV 89006-1470
702/293-8411

Pacific Northwest Region
1150 N. Curtis Rd., Suite 100
Boise, ID 83706-1234
208/378-5012

Great Plains Region
P.O. Box 36900
Billings, MT 59107-6900
406/247-7600

Mid Pacific Region
Federal Office Building
2800 Cottage Way
Sacramento, CA 95825
916/978-5580

Upper Colorado Region
125 S. State Street
Salt Lake City, UT 84138
801/524-3785

Environmental Protection Agency, Headquarters, Wetlands Division, 401 M Street, SW (4502F), Washington, DC 20460; 202/260-6531; www.epa.gov/owow/wetlands

Gulf of Mexico Program Office
Building 1103
John C. Stennis Space Center
Stennis, MS 39529-6000
228/688-3726

Region 1 (CT, ME, MA, NH, RI, VT)
Water Quality Unit
John F. Kennedy Federal Building
One Congress Street, Suite 1100
Boston, MA 02114-2023
617/918-1622

Region 2 (NJ, NY, PR, VI)
Wetlands Outreach (DEPP-WPB)
290 Broadway
New York, NY 10007-1866
212/637-5000

Region 3 (DE, DC, MD, PA, VA, WV)
Marine and Wetlands Policy Section
(3ES30)
841 Chestnut Street
Philadelphia, PA 19107
215/814-2715

Region 4 (AL, FL, GA, KY, MS, NC, SC, TN)
Wetlands, Oceans and Watersheds
Branch
345 Courtland Street, NE
Atlanta, GA 30365
404-562-9410

Region 5 (IL, IN, MI, MN, OH, WI)
Wetlands and Watershed Section
Water Division (P-19)
77 West Jackson Boulevard
Chicago, IL 60604
312/886-0241

Region 6 (AR, LA, NM, OK, TX)
Wetlands Outreach (6WQ-AO)
1445 Ross Avenue, Suite 1200
Dallas, TX 75202
214/665-6722

Region 7 (IA, KS, MO, NE)
Wetlands Protection Section
726 Minnesota Avenue (WRPB)
Kansas City, KS 66101
913/551-7569

Region 8 (CO, MT, ND, SD, UT, WY)
Ecosystems Protection &
Remediation (8EPR/EP)
999 18th Street, Suite 500
Denver, CO 80202-2466
303/312-6673

Region 9 (AZ, CA, HI, NV, AS, GU)
Wetlands and Coastal Planning
(W-3-3)
75 Hawthorne Street
San Francisco, CA 94105
415/744-1969

Region 10 (AK, ID, OR, WA)
Aquatic Resources Unit
(ECO-083)
1200 6th Avenue
Seattle, WA 98101
206/553-1226

EPA Wetlands Information Hotline
800/832-7828

Watershed locator
www.epa.gov/surf2/locate

Federal Highway Administration, Washington Headquarters, 400 7th Street SW, Washington, DC 20590; 202/366-5004; fred.bank@fhwa.dot.gov; and 555 Zang Street, Lakewood, CO 80228; 303/969-5772 ext. 332; www.fhwa.gov.

Fish & Wildlife Service, 4401 N. Fairfax Drive, Arlington, VA 22203; 703/358-2201; www.fws.gov.

REGION 1 (WA, OR, CA, NV, ID, HI)
Regional Director
911 NE 11th Avenue
Portland, OR 97232-4181
(503) 231-6118
Fax: (503) 872-2716

REGION 2 (NM, AZ, OK, TX)
Regional Director
P.O. Box 1306
Albuquerque, NM 87103
(505) 248-6282
Fax: (505) 248-6910

REGION 3 (MN, IN, MO, MI, WI, OH, IL)
Regional Director
Federal Building, Fort Snelling
Twin Cities, MN 55111
(612) 713-5301
Fax: (612) 713-5284

REGION 4 (KY, AR, TN, NC, SC, GA, AL, MS, LA, FL, VI, PR)
Regional Director
1875 Century Boulevard
Atlanta, GA 30345
(404) 679-4000
Fax: (404) 679-4006

REGION 5 (VA, WV, MD, PA, NY, DE, NJ, CT, ME, MA, VT, NH)
Regional Director
300 Westgate Center Drive
Hadley, MA 01035
(413) 253-8300
Fax: (413) 253-8308

REGION 6 (CO, MT, NE, UT, WY, IA, KS, ND, SD)
Regional Director
P.O. Box 25486
Denver, CO 80025
(303) 236-7920
Fax: (303) 236-8295

REGION 7 (AK)
Regional Director
1011 East Tudor Road
Anchorage, AK 99503
(907) 786-3542
Fax: (907) 786-3306

North American Waterfowl Management Plan
4401 N. Fairfax Drive, Room 110
Arlington, VA 22203
703/358-1784; www.fws.gov

Partners for Wildlife
U.S. Fish & Wildlife Service
Division of Habitat Conservation
Attn: Private Lands Coordinator,
4401 N. Fairfax Drive, Room 400
Arlington, VA 22203
fax: 703/358-2232; www.fws.gov

Forest Service, U.S. Department of Agriculture, P. O. Box 96090-6090, Washington, DC 20090-6090; 202/205-1093; www.fs.fed.us.

REGION 1
Northern Region
Federal Building
P.O. Box 7669
Missoula, MT 59807
406/329-3316

REGION 2
Rocky Mountain Region
P.O. Box 25127
Lakewood, CO 80225
303/275-5450

REGION 3
Southwestern Region
517 Gold Avenue SW
Albuquerque, NM 97102
505/842-3300

REGION 4
Intermountain Region
Federal Office Building
324 25th Street
Ogden, UT 84401
801/625-5605

REGION 5
Pacific Southwest Region
630 Sansome Street
San Francisco, CA 94111
707/562-9000

REGION 6
Pacific Northwest Region
P.O. Box 3523
Portland, OR 97208
503/808-2200

REGION 8
Southern Region
1720 Peachtree Road, NW
Atlanta, GA 30367
404/347-4177

REGION 9
Eastern Region
310 W. Wisconsin Avenue
Room 500
Milwaukee, WI 53203
414/297-3600

REGION 10
Alaska Region
P.O. Box 21628
Juneau, AK 99802-1628
907/586-8863

Taking Wings Program
Ducks Unlimited Nationall
Headquarters
One Waterfowl Way
Memphis, TN 38120
901/758-3722; www.ducks.org

National Marine Fisheries Service, National Oceanic & Atmospheric Administration, 1315 East West Highway, Room 12622, Silver Spring, MD 20910; 301/713-2325; brenda.rupli@noaa.gov; www.noaa.gov.

Office of Sustainable Fisheries
1315 East West Highway
Silver Spring, MD 20910
(301) 713-2334
Fax: (301) 713-0596

Office of Habitat Conservation
1315 East West Highway
Silver Spring, MD 20910
(301) 713-2325
Fax: (301) 713-1043

Office of Protected Resources
1315 East West Highway
Silver Spring, MD 20910
(301) 713-2332
Fax: (301) 713-0376

Office of Science & Technology
1315 East West Highway
Silver Spring, MD 20910
(301) 713-2367
Fax: (301) 713-1875

Alaska Regional Office
P.O. Box 21668
Juneau, AK 99802-1668
(907) 586-7221
Fax: (907) 586-7249

Northeast Regional Office
One Blackburn Drive
Gloucester, MA 01930-2298
(978) 281-9260
Fax: (978) 281-9371

Northwest Regional Office
7600 Sand Point Way, NE
BIN C15700-Bldg. 1
Seattle, WA 98115-0070
(206) 526-6150
Fax: (206) 526-6426

Southeast Regional Office
9721 Executive Center Drive N.
St. Petersburg, FL 33702-2432
(813) 570-5301
Fax: (727) 570-5300

Southwest Regional Office
501 West Ocean Blvd., Suite 4200
Long Beach, CA 90802-4213
(562) 980-4001
Fax: (562) 980-4018

Natural Resources Conservation Service, U.S. Department of Agriculture, P.O. Box 2890, Washington, DC 20013; 202/720-3210; www.nrcs.usda.gov.

ALABAMA
665 Opelika Road
P.O. Box 3311
Auburn, AL 36830-0311
334-887-4535
Fax: 334-821-0250

ALASKA
949 East 36th Avenue
Suite 400
Anchorage, AK 99503-4302
907-271-2424
Fax: 907-271-3951

ARIZONA
3003 North Central Avenue
Suite 800
Phoenix, AZ 85012-2945
602-280-8808
Fax: 602-280-8809

ARKANSAS
Federal Building, Room 5404
700 West Capitol Avenue
Little Rock, AR 72201-3228
501-324-6621
Fax: 501-324-6208

CALIFORNIA
2121-C 2nd Street, Suite 102
Davis, CA 95616-5475
530-757-8255
Fax: 530-757-8382

COLORADO
655 Parfet Street
Room E200C
Lakewood, CO 80215-5517
303-236-2886
Fax: 303-236-2896

CONNECTICUT
16 Professional Park Road
Storrs, CT 06268-1299
860-487-4017
Fax: 860-487-5054

DELAWARE
1203 College Park Drive, Suite 101
Dover, DE 19904-8713
302-678-4160
Fax: 302-678-0843

FLORIDA
2614 NW 43rd Street
Gainesville, FL 32606-6611
352-338-9525
Fax: 352-338-9574

GEORGIA
Federal Building, Box 13
355 East Hancock Avenue
Athens, GA 30601-2769
706-546-2272
Fax: 706-546-2120

GUAM
Director, Pacific Basin
Suite 601, FHB Building
400 Route 8
Maite, Guam 96927
11-671-472-7490
Fax: 011-671-472-7288

HAWAII
300 Ala Moana Boulevard
Room 4316
P.O. Box 50004
Honolulu, HI 96850-0002
808-541-2601
Fax: 808-541-1335

IDAHO
3244 Elder Street, Room 124
Boise, ID 83705-4711
208-378-5700
Fax: 208-378-5735

ILLINOIS
1902 Fox Drive
Champaign, IL 61820-7335
217-398-5267
Fax: 217-398-5310

INDIANA
6013 Lakeside Boulevard
Indianapolis, IN 46278-2933
317-290-3200
Fax: 317-290-3225

IOWA
693 Federal Building
210 Walnut Street
Des Moines, IA 50309-2180
515-284-6655
Fax: 515-284-4394

KANSAS
760 South Broadway
Salina, KS 67401
785-823-4565
Fax: 785-823-4540

KENTUCKY
771 Corporate Drive, Suite 110
Lexington, KY 40503-5479
606-224-7350
Fax: 606-224-7399

LOUISIANA
3737 Government Street
Alexandria, LA 71302-3727
318-473-7751
Fax: 318-473-7771

MAINE
5 Godfrey Drive
Orono, ME 04473
207-866-7241
Fax: 207-866-7262

MARYLAND
John Hanson Business Center
339 Busch's Frontage Road, Suite 301
Annapolis, MD 21401-5534
410-757-0861, x315
Fax: 410-757-0687

MASSACHUSETTS
451 West Street
Amherst, MA 01002-2995
413-253-4351
Fax: 413-253-4375

MICHIGAN
1405 South Harrison Road, Room 101
East Lansing, MI 48823-5243
517-337-6701, x1201
Fax: 517-337-6905

MINNESOTA
600 F.C.S. Building
375 Jackson Street
St. Paul, MN 55101-1854
612-602-7869
Fax: 612-602-7914

MISSISSIPPI
Federal Building, Suite 1321
100 West Capitol Street
Jackson, MS 39269-1399
601-965-5205
Fax: 601-965-4536

MISSOURI
Parkade Center, Suite 250
601 Business Loop 70 West
Columbia, MO 65203-2546
573-876-0901
Fax: 573-876-0913

MONTANA
Federal Building, Room 443
10 East Babcock Street
Bozeman, MT 59715-4704
406-587-6813
Fax: 406-587-6761

NEBRASKA
Room 152, Federal Building
100 Centennial Mall, North
Lincoln, NE 68508-3866
402-437-5300
Fax: 402-437-5327

NEVADA
5301 Longley Lane
Building F, Suite 201
Reno, NV 89511
775-784-5863
Fax: 775-784-5939

NEW HAMPSHIRE
Federal Building
2 Madbury Road
Durham, NH 03824-1499
603-433-0505
Fax: 603-868-5301

NEW JERSEY
1370 Hamilton Street
Somerset, NJ 08873-3157
732-246-1205
Fax: 732-246-2358

NEW MEXICO
6200 Jefferson Street, NE
Albuquerque, NM 87109-3734
505-761-4400
Fax: 505-761-4462

NEW YORK
441 South Salina Street
Suite 354
Syracuse, NY 13202-2450
315-477-6504
Fax: 315-477-6550

NORTH CAROLINA
4405 Bland Road, Suite 205
Raleigh, NC 27609-6293
919-873-2101
Fax: 919-837-2156

NORTH DAKOTA
Federal Building, Room 278
220 East Rosser Avenue
P.O. Box 1458
Bismarck, ND 58502-1458
701-250-4421
Fax: 701-250-4778

OHIO
200 North High St., Room 522
Columbus, OH 43215-2748
614-469-6962
Fax: 614-469-2083

OKLAHOMA
USDA Agriculture Center Building
100 USDA, Suite 203
Stillwater, OK 74074-2624
405-742-1200
Fax: 405-742-1201

OREGON
Federal Building, Room 1640
1220 SW Third Avenue
Portland, OR 97204-2881
503-414-3201
Fax: 503-414-3277

PENNSYLVANIA
One Credit Union Place, Suite 340
Harrisburg, PA 17110-2993
717-237-2202
Fax: 717-237-4469

PUERTO RICO
Director, Caribbean Area
Federal Building, Room 639
150 Carlos Chardon Street
Hato Rey, PR 00918-7013
809-258-1731
Fax: 809-258-1754

RHODE ISLAND
60 Quaker Lane, Suite 46
Warwick, RI 02886-0111
401-828-1300
Fax: 401-828-0433

SOUTH CAROLINA
Strom Thurmond Federal Building
1835 Assembly St., Suite 950
Columbia, SC 29201-2489
803-765-5681
Fax: 803-253-3670

SOUTH DAKOTA
Federal Building
200 Fourth Street, SW
Huron, SD 57350-2475
605-352-1200
Fax: 605-352-1270

TENNESSEE
675 U.S. Courthouse
801 Broadway
Nashville, TN 37203-3878
615-736-5471
Fax: 615-736-7135

TEXAS
W.R. Poage Building
101 South Main Street
Temple, TX 76501-7682
254-742-9800
Fax: 254-742-9819

UTAH
W.F. Bennett Federal Building
125 South State Street, Room 4402
Salt Lake City, UT 84103
801-524-4550
Fax: 801-524-4403

VERMONT
69 Union Street
Winooski, VT 05404-1999
802-951-6795
Fax: 802-951-6327

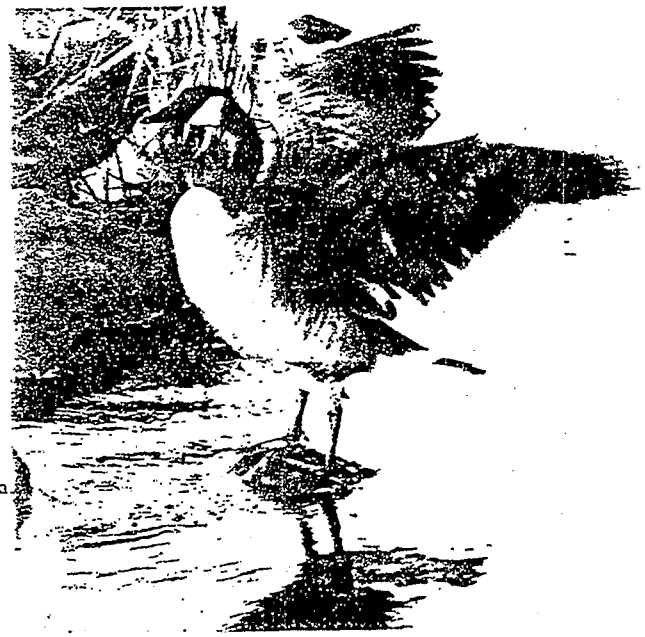
VIRGINIA
Culpeper Building, Suite 209
1606 Santa Rosa Road
Richmond, VA 23229-5014
804-287-1691
Fax: 804-287-1737

WASHINGTON
Rock Pointe Tower II
West 316 Boone Avenue
Suite 450
Spokane, WA 99201-2348
509-323-2900
Fax: 509-323-2979

WEST VIRGINIA
75 High Street, Room 301
Morgantown, WV 26505
304-291-4153
Fax: 304-291-4628

WISCONSIN
6515 Watts Road, Suite 200
Madison, WI 53719-2726
608-276-8732
Fax: 608-264-5483

WYOMING
Federal Office Building
100 East B St., Room 3124
Casper, WY 82601-1911
307-261-6464
Fax: 307-261-6490



An open water wetland in urban Wayzata, Minn. Photo by Nancy Campbell of Wayzata

A tiny critter tags along with visitor to a wetland preserve. Photo by Lucy Cesar-Jecacek, Brunswick Hills, Ohio.

National Organizations

For a more comprehensive list that includes regional and state organizations, contact Terrene Institute.

American Bird Conservancy, 1250 24th Street NW, Suite 400, Washington, DC 20037; 202/778-9666; abc@abcbirds.org.

Ducks Unlimited, One Waterfowl Way, Memphis, TN 38120; 901/758-3825; www.ducks.org.

Environmental Concern, Inc., P.O. Box P, St. Michaels, MD 21663; 410/745-9620; www.wetland.org.

The Izaak Walton League of America, 707 Conservation Lane, Gaithersburg, MD 70878; 800/BUG-IWLA; www.iwla.org.

National Audubon Society, Education Division, 700 Broadway, New York NY 10003; 800/813-5037; www.audubon.org.

National Wildlife Federation, 8925 Leesburg Pike, Vienna, VA 22184; 800/822-9919; www.nwf.org.

Pocono Environmental Education Center, RR2, Box 1010, Dingman's Ferry, PA 18328; 717/828-9281; www.peec.org.

Society of Wetland Scientists, P.O. Box 1897, Lawrence, KS 66044-8897; 785/843-1221; www.sws.org.

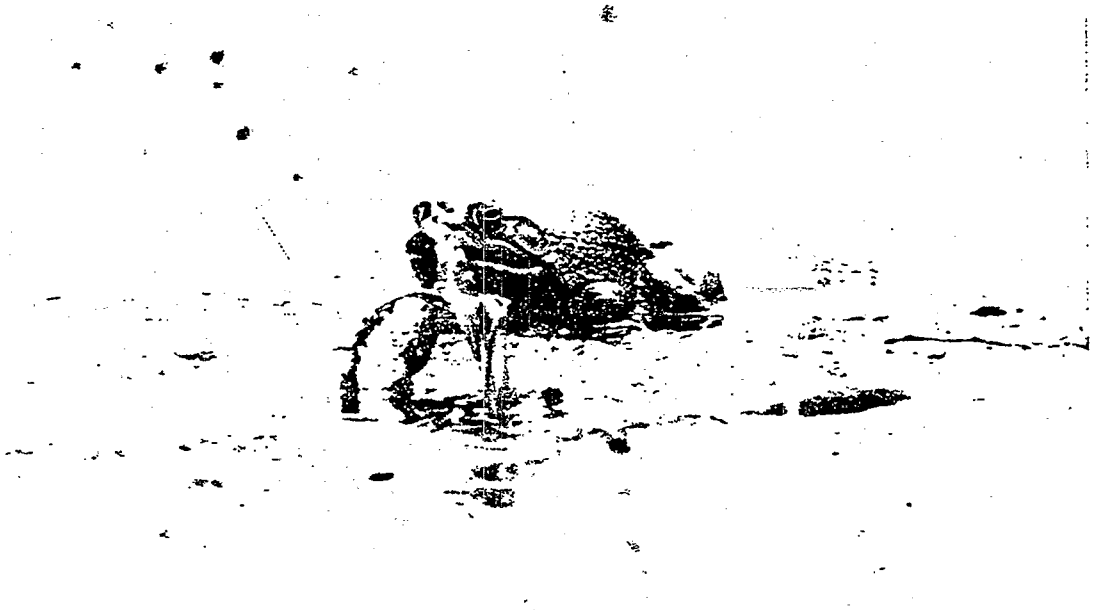
Terrene Institute, 4 Herbert Street, Alexandria, VA 22305; 703/548-5473; www.terrene.org.

Wildfowl Trust of North America. Horsehead Wetlands Center, P.O. Box 519, Grasonville, MD 21638; 410/827-6694; wtna@shore.intercom.net.

Wildlife Habitat Council. 1010 Wayne Avenue, Suite 920, Silver Spring, MD 209'0; 301/588-8994; whc@wildlifehc.org; www.wildlifehc.org.

The Wildlife Society. 5410 Grosvenor Lane, Bethesda, MD 20814-2197; 30: 897-9770.

Texas fourth graders gather catch from seining in saltwaters in the Brazoria County National Wildlife Refuge. Photo by Sandra L. Krampota, fourth grace teacher at Elisabeth Ney Elementary, Lake Jackson, Tex.



A familiar face surfaces at Nebraska's Pioneers Park Nature Center. Photo by Wayne Hathaway, Sterling, Neb.

Programs

For a more comprehensive list of programs that includes publications, audiovisual and graphic materials, contact Terrene Institute.

American Wetlands Month: Activity Packs for schools and community groups, videos, books, stickers, buttons, brochures, fact sheets and posters are available from Terrene Institute, 4 Herbert St., Alexandria, VA 22305; 703/548-5473; www.terrene.org; terrinst@aol.com. List serve: Wetlands-AWM@peach.ease.lsoft.com.

Animal Tracks: Wetlands Action Pack: Activity guide for K-8 educators to help students understand wetland ecosystems. Includes guidelines for student projects to conserve local wetlands. $10 (plus $1 s&h) from National Wildlife Federation, P.O. Box 50281, Hampden Station, Baltimore, MD 21211; 703/790-4100.

EnviroScape® Wetlands Curriculum: An interactive, portable model demonstrates this curriculum; available from either Terrene Institute or JT&A, inc., 14524-F Lee Road, Chantilly, VA 20151; 703/631-8810; www.enviroscapes.com; info@enviroscapes.com.

International School Grounds Day: Started by Britain's Learning Through Landscapes organization, International School Grounds Day celebrates and draws attention to the natural resources available on school grounds. Coordinated in the U.S. by the National Wildlife Federation as part of its Schoolyard Habitats Program. Contact Stephanie Stowell, 703/790-4582, at NWF, 8925 Leesburg Pike, Vienna, VA 22184-0001; www.nwf.org/.

Migratory Bird Day: This annual event, usually during the first week of May, celebrates the return north of the migratory birds. Contact IMBD at 703/358-2318; imbd@fws.gov; www.americanbirding.org.

Internet List Serves: Two List Serves connect individuals and groups concerned with wetlands: ***Schools and community groups*** will be interested in the American Wetlands Month List Serve; to join, send an e-mail to LISTSERV@PEACH.EASE.LSOFT.COM with the text message: SUBSCRIBE WETLANDS-AWM Your Name.
Mitigation banking is the focus of the second List Serve; to join, send an e-mail to LISTSERV@PEACH.EASE.LSOFT.COM with the text message: SUBSCRIBE MITIGATION-BANKING Your Name.

POW! The Planning of Wetlands: A manual and a course designed to guide educators and students in creating, restoring and improving wetlands in or near schoolyards. Complements WOW!, also created by Environmental Concern. To schedule a POW! Course or order the manual, contact Karen Ripple, Education Director, Environmental Concern, Inc., P.O. Box P, St. Michaels, MD 21663; 410/745-9620; educate@wetland.org; www.wetland.org.

Project Learning Tree: Activities designed to increase environmental awareness by illustrating the interrelationships among all living things. Cosponsored by Western Regional Environmental Education Council. Available from the American Forest Foundation, 1111 19th Street, NW, Suite 780, Washington, DC 20036; 202/463-2462; www.plt.org.

Project Wet: A curriculum organized by states. Available from The Watercourse, 201 Culbertson Hall, Montana State University, Bozeman, MT 59717-0057; 406/994-1917. Please call for information about workshops in your state.

Project WILD: A K-12 supplementary conservation and environmental education program emphasizing wildlife — a joint project of the Council for Environmental Education and the Western Association of Fish & Wildlife Agencies. Contact Michele Campbell, Project Wild, 707 Conservation Lane, Gaithersburg, MD 20878; 301/527-8900; natpwild@igc.apc.org; http://eelink.umich.edu/wild/

Todally Wetlands: A cross-curricular guide for K-12 educators from Adopt-A-Pond Program at the Metro Toronto Zoo. Contact Kimberly Baily at the zoo, 361A Old Finch Ave., Scarborough, ON M1B 5K7; fax 416/392-4979.

Wetlands: Critical Issues/Critical Thinking — Experiences for Youth. Four activities for ages 12-14 and adults designed to help participants learn about wetland issues. Order from National 4-H Council, 7100 Connecticut Ave., Chevy Chase, MD 20815; 301/961-2934; $2 (plus $5 s&h).

PAW: Pals of American Wetlands: PAWs support American Wetlands Month by contributing $15 and more to the Terrene Institute for use in preparing and distributing wetland educational materials. PAWs receive a subscription to *Wetlands Celebration*, the American Wetlands Month newsletter. Contact Terrene at 800/726-5253, or send your contribution to 4 Herbert St., Alexandria, VA 22305.

WOW! The Wonder of Wetlands, the wetland module of Project WET, is a comprehensive guide of wetland information and learning activities for K-12 students, with over 50 classroom and outdoor lessons. Created by Environmental Concern and available from The Watercourse, Culbertson Hall, Montana State University, Bozeman, MT 59717-0057; 406/994-1917; $15.95 (plus $4.50 s&h).

NESTING