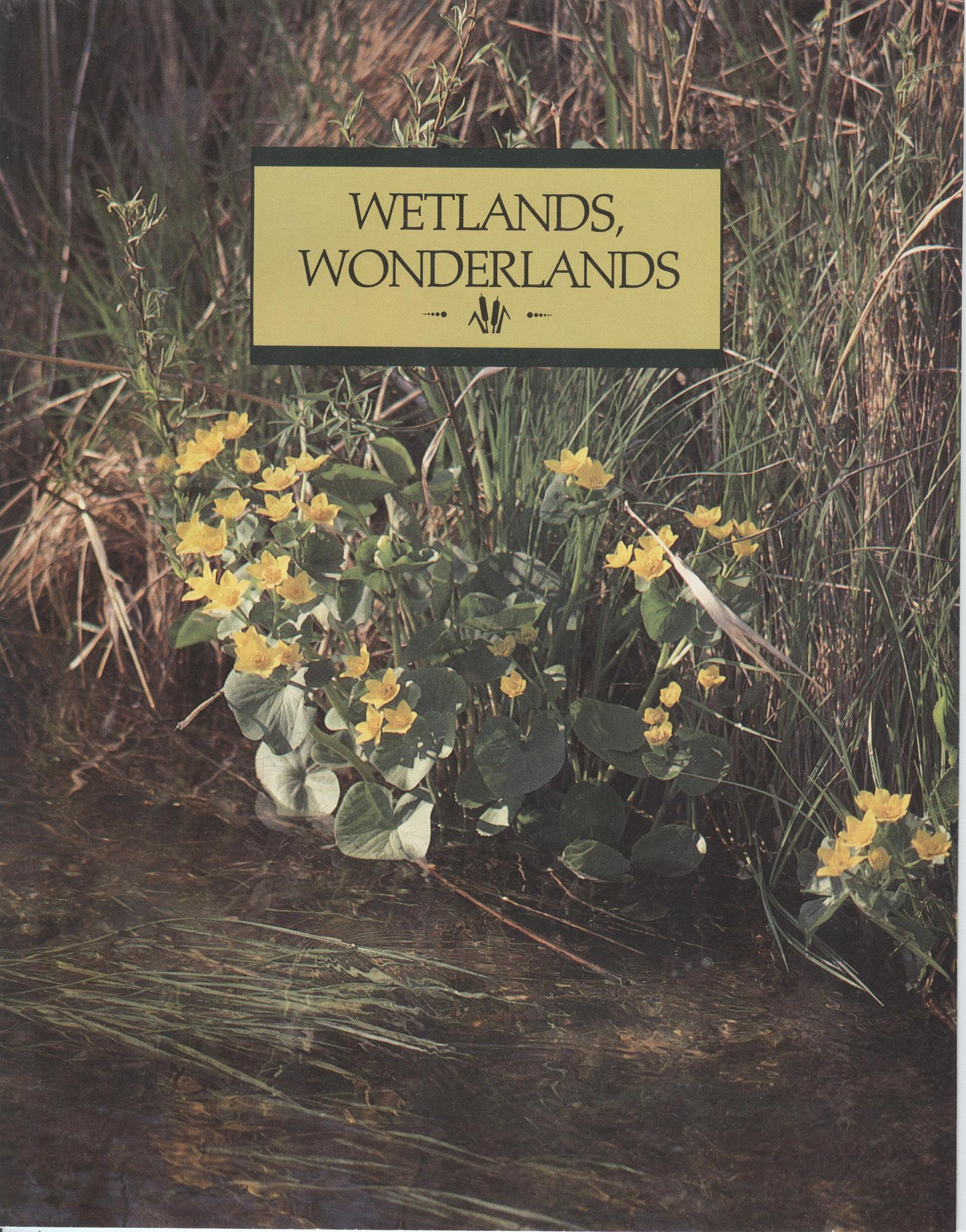


# WETLANDS, WONDERLANDS





WET IS  
WONDERFUL



THOSE SOGGY FIELDS  
AND FORESTS ARE  
UNIQUE NATURAL  
RESOURCES.

Robert H. Read

Wetlands mean contrast, both in the landscape and in our lives. They are the borders where tame meets wild. They are lands much in dispute: A public resource, say some; private property, insist others.

To a certain degree, wetlands also have been invisible. We seldom saw them for what they were; rather, we looked at what they weren't: neither dry soil nor open water. Viewed from a boat or tractor, a wetland was either an unnavigable waterway or an unplowable field. Rarely were wetlands seen as places valuable enough to exist without alteration.

Consider this publication your guide to a special wetlands excursion. In these pages, you'll see wetland sights — the golden glow of a tamarack swamp in fall, the iridescent sheen of blue-winged teal offset by creamy-white water lilies. But we'd like you to come away from this tour with insights, too — a sense of the important role wetlands play in the environment and a better understanding of how wetlands are vital to our social well-being, our economy and many of our recreational pastimes.

To begin, we'll start with a bit of wetland background.

## SWAMPED OR BOGGED?

Wetlands are amazingly diverse ecological communities and the names we've chosen for them reflect that diversity: marsh, swamp, bog, fen, muskeg, pot-hole, floodplain or bottomland forest, wet meadow, slough, conifer swamp, etc. We can use some general categories to describe wetland types in our neck of the planet:

**SWAMP** — A forested or shrub-dominated wetland (conifer swamps, bottomland forests, alder and willow thickets are types of swamps).

◀ Mineral-rich groundwater bubbles up from below, saturating a fen — a rare, marsh-like wetland. Watercress thrives in the cool water.



(top) Skunk cabbage emerges from its maroon-colored hood, or spathe, for another "scentsational" season in a swamp. The plant's musky odor attracts flies, which are gobbled up by spiders lurking inside the spathe. (bottom) The still water of a serene northern bog covers countless layers of peat — partially decomposed moss and other plant matter.



PAUL PEETERS

DENNIS YOCKERS

**MARSH** — An open, un-forested wetland dominated by herbaceous vegetation such as cattail, sedges, and native grasses (sedge meadows, wet prairies, and potholes are types of marshes); water may be up to six feet deep or may not show above the surface.

**BOG** — A peaty wetland that has no significant water movement in or out of it (muskegs and peatlands are usual alternative names).

**FEN** — A very rare marsh-type wetland whose water source comes at least in part from mineral-rich groundwater.

The terminology may be confusing, but it helps to remember these lands have one thing in common: water.

## LIQUID SOIL

To understand wetlands, we must understand the influence water has on the land. It may not always be evident, but water is present above, at and below the surface long enough to determine the type of plants that can survive and the type of soil that develops in a wetland.

Interestingly, the effect water has on a wetland depends on the small amount of oxygen present in the water. Water essentially drowns terrestrial plants by depriving their roots of vital oxygen needed to breathe. Wetland and aquatic plants, called hydrophytes, have developed special adaptations, such as distinctive oxygen-carrying, spongy tissue called aerenchyma, that allow their roots to be anchored in the oxygen-poor, water-logged or submersed soils characteristic of wetlands. In a sense, wetland plants "breathe through straws" located in their stems.

The very low levels of oxygen found in water-saturated soils have a profound effect on soil formation and chemistry. The breakdown of accumulating organic matter is slowed almost to a stop: Plants and animals that die in wetlands do not oxidize (the "slow burning" of energy-rich matter in the presence of oxygen) or decompose (usually accom-



ROBERT QUEEN

(top) Water in a marsh may be several feet deep or not even visible at the surface. (bottom) Swamps are dominated by tall trees or shrubs ranging from conifers and hardwoods to alder and willow.



DNR PHOTO

*"Always loved wetlands — grew up next to one, the Brillion Marsh. That experience influenced my direction in life. Today I teach landscapers about wetlands; I raise and sell wetland plants for big restoration projects — we did the sedges for the south Beltline restoration in Madison — and to people who start mini-wetlands in backyard ponds. We can offer 84 species of live plants plus seed from 185 species. That's where I get the most satisfaction: from learning how to grow wetland plants and harvest the seed, which my customers will put back into the earth. That's a good cycle."*

Jo Ann Gillespie, owner of Country Wetlands Nursery, Ltd. in Muskego



ROBERT QUEEN

plished by bacteria and other microorganisms in the soil). Instead, these materials are incorporated into the wetland soil largely intact and preserved.

Wetlands are energy and nutrient traps where these "goodies" are stored, sometimes for very long periods of time. If oxygen is available — if the wetland is drained, for instance — the soils become very fertile (muck is a good example) and sometimes develop into peat, which contains enough energy to be used as a fuel.

Layer after layer, year after year, the buildup of organic material makes some wetlands extremely valuable to scientists piecing together the earth's climatic and environmental past. Core samples drawn from wetlands show layers that can be correlated to past years, much like the strata in rock. Entire skeletons of long-extinct animals have been found in wetland deposits.

## THE REASON WISCONSIN IS ALL WET

In Wisconsin, wetlands are found statewide in large part because of our "recent" ice age history, which ended about 10,000 years ago. The glaciers scouring the land created extensive, poorly drained basins in which different kinds of wetlands evolved. Roughly one-quarter of the state — almost 10 million acres — was wetland in the early 1800s, prior to the arrival of European settlers.

If you sliced Wisconsin on a diagonal running roughly from St. Croix Falls to Milwaukee, you'd scribe a vegetative dividing line known as the tension zone. Wetlands northeast of the line tend to be more forested, with conifers such as white cedar, tamarack, black spruce, and balsam fir; marshes in this part of the state often grow on a base of sphagnum moss and peat. Wetlands southwest of the line are likely to be composed of strictly deciduous trees and shrubs if they are forested, while the marshes usually grow on either



TOM EVANS

(top) Blue-winged teal and other ducks depend on wetland habitat. (bottom) Tussocks carpet a sedge meadow, a wetland where water levels fluctuate; unique leaves and roots allow sedges to withstand the extremes.



ROBERT QUEEN

muck or mineral soils rather than moss or peat.

In the hilly, well-drained "driftless area" of southwestern Wisconsin — the section of the state the glaciers missed — wetlands are found mainly in the floodplains of rivers and streams.

## WHY SAVE WETLANDS?

In any watershed, wetlands moderate the land's ability to absorb and disperse the water falling on it or flowing through it. The locations of a watershed's wetlands tell us where the water will go when it rains. The water rules; it must go somewhere. Fill or ditch the wetlands and the water has nowhere to linger. It flows on faster and faster, eroding soil along the way and eventually flooding the land downstream. Build your house or plant your garden in a wetland and you run the risk of losing them when the water has its way.

Besides flood control, wetlands provide other important services to society, several of which we'll elaborate on in this supplement. Wetlands act as buffers, keeping soil and pollutants from clouding our lakes and rivers. Biologically diverse wetlands hold scores of native plant species. In wetlands, northern pike and muskies spawn, waterfowl raise broods, muskrats build lodges, sandhill cranes stage magnificent migrations, and marsh marigolds herald the spring's arrival.

Today, only half of Wisconsin's original wetlands remain. Like lakes or forests, wetlands should be allowed to exist as beneficial resources for all. As you learn more about them, I think you'll agree wetlands deserve your attention and protection. ■

*Robert Read is an ecologist in DNR's Bureau of Environmental Analysis and Review.*

# A TIME FOR WETLANDS



*"The Swamp on Sections 29 & 32 & a part of the Same on Sects 31, 28 & 33 is of a character little better than a mud lake it cannot be passed without some danger to Life..."*

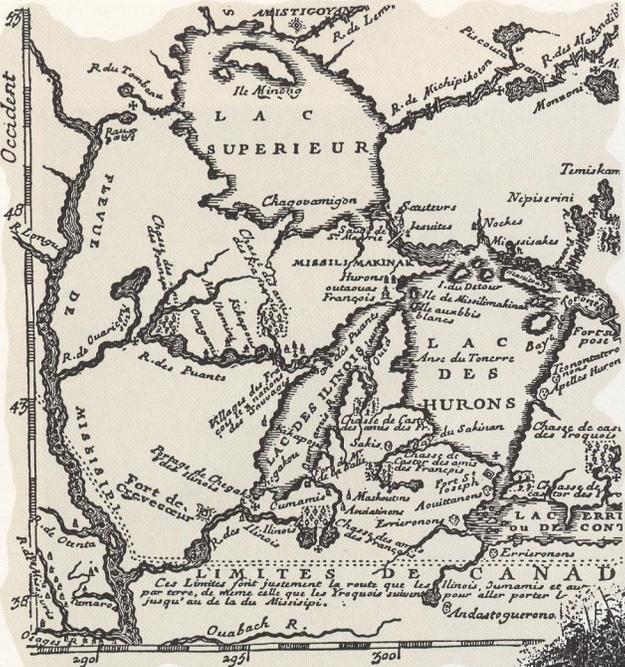
Wm. A. Burt, 1835, surveying T11N R21E of Ozaukee County, the area known today as Cedarburg Bog



Northwest Ordinance declares all navigable waters are public domain (1796)

Settlement in Wisconsin underway; approximately 10,000,000 acres of wetlands present (early 1800s)

Tamarack logs taken from the Theresa Marsh area used to construct a corduroy road, known today as State Highway 28 (early 1800s)



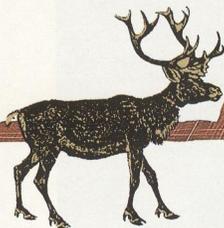
*"The country from the Ottawa Lakes to Lake Superior is very uneven and thickly covered with woods. All the wilderness between the Mississippi River and Lake Superior is called by the Indians The Mosquito Country; and I thought it most justly named. I never saw or felt so many of those insects in my life."*  
Jonathan Carver, at the head of the Chippewa River (1766-67)

*"The next morning we proceeded up the Fox River, which was very serpentine. We came to a shallow lake where we could not see water except in the canoe track. The wild rice was so thick that the Indians could hardly get one of their small canoes into the rice to gather it. Vast numbers of wild ducks fatten there on the Wild Rice every fall. When they rise, they make a noise like thunder."*  
Peter Pond, fur trader (1773-1775)



Decline of the fur trade (1698)

Radisson and Groseilliers land on the west side of Ashland, WI (1659)

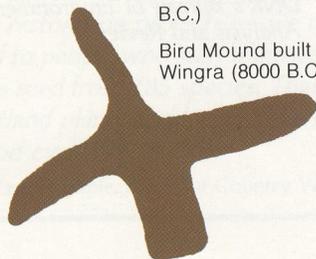


Caribou shed horns in peat bog in Wauwatosa (15,000 B.C.)

Glaciers cover the northern two-thirds of Wisconsin (10,000 B.C.)

Grand River Marsh formed from glacial meltwater lake (10,000-7000 B.C.)

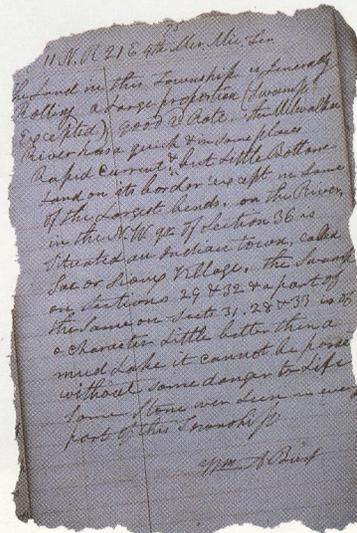
Bird Mound built on shore of Lake Wingra (8000 B.C.)



1600

1700

1800

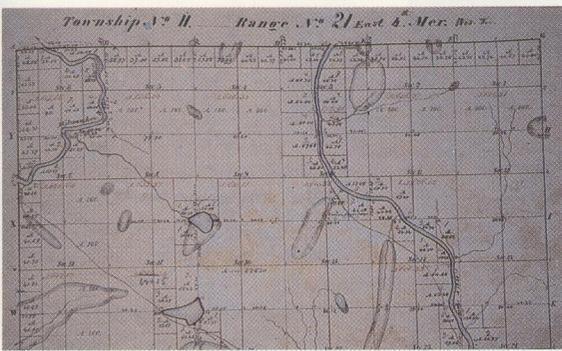


Wisconsin's population: 30,945 (1840)

Horicon Marsh dammed, flooded and renamed Lake Horicon — the largest man-made lake in the world at the time (1846)

Wisconsin's Statehood (May 29, 1848)





*"Swamps and wetlands are a necessary part of the ecological creation . . . An owner of land has no absolute and unlimited right to change the essential natural character of his land so as to use it for a purpose for which it was unsuited in its natural state and which injures the rights of others."*

*Justice Hallows, Wisconsin Supreme Court, Just vs. Marinette County (1972)*

*"Wetlands are areas of great natural productivity, hydrological utility, and environmental diversity, providing natural flood control, improved water quality, recharge of aquifers, flow stabilization of streams and rivers, and habitat for fish and wildlife resources."*

*President Jimmy Carter, May 24, 1977*

*"If there is any fact which may be supposed to be known by everybody and therefore by the courts, it is that swamps and stagnant waters are the cause of malaria and malignant fevers, and that public power is never more legitimately exercised than in removing such nuisances."*

*U.S. Supreme Court, the Swamp Land Act of 1850*



Bordner Surveys of Wisconsin's land cover completed (1930, revised 1936)

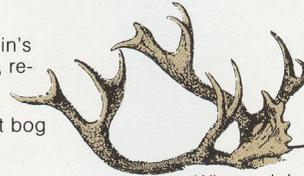
Caribou horns found in peat bog in Wauwatosa (circa 1946)

2,000 geese stop at Horicon during their annual fall migration (1948)

Federal Water Pollution Control Act passed (1948)

Theme for Wildlife Week, 1955: "Wetlands Preservation"

The Wisconsin Conservation Commission approves \$1,395,245 for acquisition of 41,401 acres of wetlands (February 1954)



*"READ MY LIPS . . . NO NET LOSS"*

*President George Bush in Sports Afield (October 1988)*

Wisconsin's Wetland Inventory begun (1978)

Half (5,000,000 acres) of Wisconsin's wetlands gone (1979)

Wisconsin's population: 4,705,642 (1980)

236,000 geese stop at Horicon during their annual fall migration (1987)

North American Wetlands Conservation Act signed into law (December 1989)

Lake Horicon reverts to marsh after dam is removed (1869)

Neenah-Menasha Dam built on the Fox River; vast wild rice beds became lakes Winnebago, Poygan, and Little Butte Des Morts (1870s)

Two brothers hunting on Muskego Lake bag 210 blue-winged teal in one day. (September 1877)

## 1900

Horicon Marsh farmed unsuccessfully (early 1900s)

*"The general surface of this Township is gently rolling. The Soil is poor and of but little value for agricultural purposes, except the swamps, which, when they shall be properly drained will be the best land in the Northern part of the State."*

*Wm. E. Dougherty, 1864, surveying T39N R10E of Oneida County*

## 1950

First Earth Day (1970)

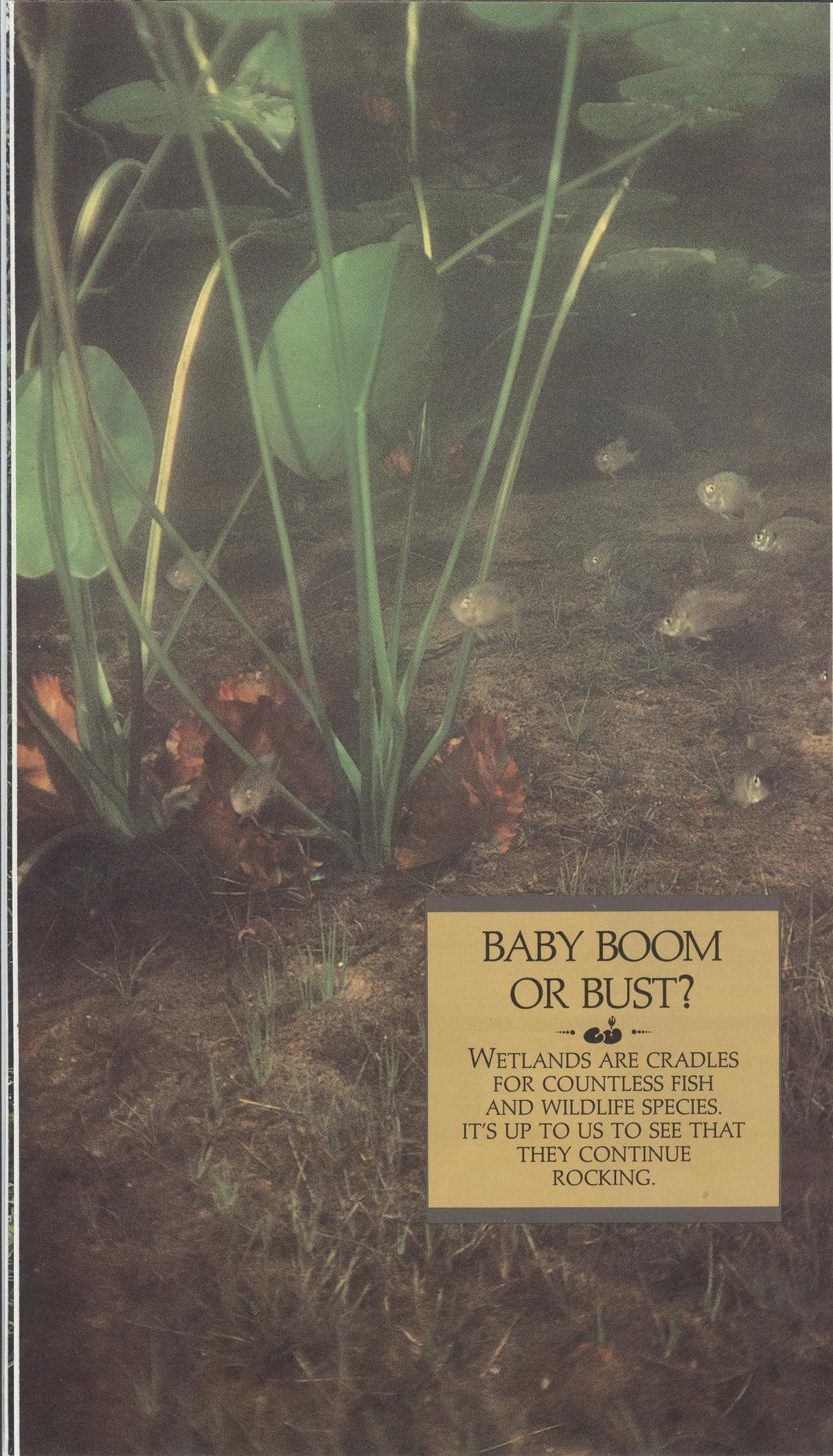
Clean Water Act Amendments to the Federal Water Pollution Control Act passed in Congress (1972)

Kakagon Slough included in the National Registry of Natural Landmarks. (April 14, 1974)



## 2000





*Paul Holtan*

A marsh or swamp may not seem like the most hospitable place to raise a youngster, but at certain times of the year, wetlands are some of the busiest nurseries around.

Within wetland borders, canvasback, mallard and ringneck ducks guard their precious clutches. Northern pike spawn amid wetland sedges; muskrat build cattail lodges for generations on the way. And untold varieties of amphibians, insects and microscopic animals reproduce, live and die in a cycle that stops only when a wetland is drained or filled.

## IN THE FAMILY WAY

A marsh with cattails or reeds in one to three feet of water and slightly higher ground with sedges and grasses is a perfect spot for waterfowl — especially ducks — to start a family.

Marsh habitat offers cover from predators, notes Jon Bergquist, Department of Natural Resources wetland waterfowl specialist. More important are the zooplankton (microscopic aquatic animals) and insect populations thriving in the dense marsh vegetation. They are high-protein food, vital to rapidly growing ducklings, “but even more critical for the hen for about a month prior to nesting,” Bergquist says.

Many wildlife species, especially furbearers, use wetlands to raise young. Mink, otter and raccoons frequent wetlands to feed on crayfish, frogs and insects, but the key furbearing inhabitant of wetlands is the muskrat.

“Muskrats thrive in wetlands,” says DNR furbearer specialist Chuck Pils. Besides being the “bread-and-butter” of Wisconsin trappers, Pils says muskrats are a special component of the wetland environment. They build lodges by cutting and piling up vegetation, clearing openings in marshes where submerged aquatic plants grow. Insects that live on submerged vegetation are an important food

## BABY BOOM OR BUST?

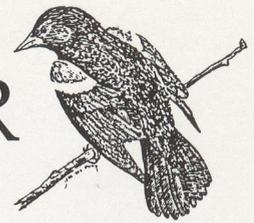


WETLANDS ARE CRADLES  
FOR COUNTLESS FISH  
AND WILDLIFE SPECIES.  
IT'S UP TO US TO SEE THAT  
THEY CONTINUE  
ROCKING.

DOLUG STAMM

◀ Lily pads provide cover for small fry.

# A SPOTTER'S GUIDE FOR WETLAND VISITORS



Look for the plants and animals listed below in the wetlands you visit. Some common species may be seen in several types of wetlands. Using one of the wetland field guides suggested, see how many different plants and animals you can identify.

## MARSHES

### Plants

Cattail  
Arrowhead  
Bluejoint grass  
Bulrushes  
Sedges  
Water lily  
Pondweed

### Birds

American and least bitterns  
Swamp sparrow  
Blue-winged teal  
Canada goose  
Great blue heron  
Marsh or sedge wren  
Pied-billed grebe  
Great egret  
Red-winged blackbird  
Sandhill crane  
Black tern  
Virginia and sora rails  
Yellow-headed blackbird

### Mammals

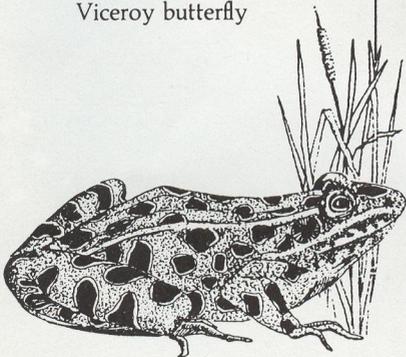
Masked shrew  
Meadow vole  
Muskrat  
Mink  
Beaver  
White-tailed deer

### Reptiles and amphibians

Spring peeper  
Bullfrog  
Northern water snake  
Painted turtle

### Insects and butterflies

Milkweed beetle  
Damselies  
Dragonflies  
Viceroy butterfly



## SWAMPS

The plants and animals found in swamps (wetlands with trees and shrubs) vary widely from north to south in Wisconsin. Northern (N) and southern (S) species are labeled accordingly; unlabeled species are found throughout the state.

### Plants

Marsh marigold  
Red osier dogwood  
Skunk cabbage  
Speckled alder  
Spotted touch-me-not  
Red and silver maple (S)  
Black ash (S)  
Hemlock (N)  
White cedar (N)

### Birds

Woodpeckers  
Belted kingfisher  
Alder and willow flycatchers  
Yellow warbler  
Black duck (N)  
Wood duck  
Barred owl  
Sandhill crane  
American woodcock  
Common yellowthroat  
Red-shouldered hawk  
Great blue heron  
Northern oriole (S)  
Prothonotary warbler (S)

### Mammals

Star-nosed mole  
Mink  
Muskrat (S)  
Black bear (N)  
Snowshoe hare (N)  
Bobcat (N)  
River otter

### Frogs and reptiles

Wood frog  
Spotted salamander  
Wood turtle (N)  
Northern water snake

### Insects and butterflies

Brown-eyed butterfly

## BOGS

### Plants

Cotton grass sedge  
Bog rosemary  
Cranberry  
Pitcher plant  
Labrador tea  
Leatherleaf  
Sundew  
Sphagnum moss  
Tamarack  
Black spruce  
Birds  
Song sparrow  
Common yellowthroat  
White-throated sparrow  
Hermit thrush  
Nashville warbler

### Mammals

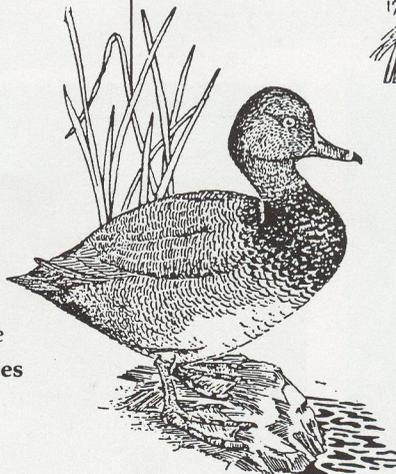
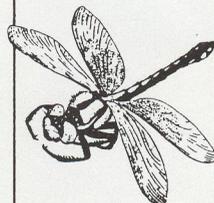
Black bear  
Bog lemming

### Reptiles and amphibians

Redbelly snake

### Insects and butterflies

Sulfur butterfly  
Bog fritillary



## FENS

### Plants

Watercress  
Shrubby cinquefoil  
Swamp thistle  
Ohio goldenrod  
White lady's slipper  
Beaked spike rush  
Bladderwort

### Birds

Common snipe  
Yellow warbler  
Common yellowthroat  
Swamp sparrow  
Red-winged blackbird

### Mammals

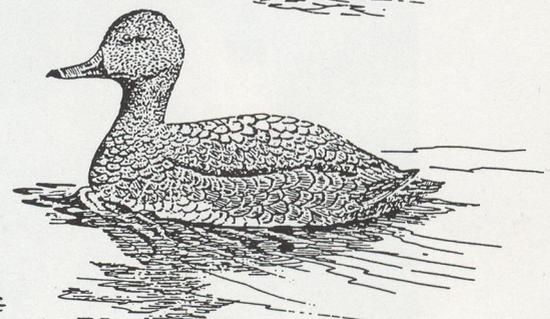
Eastern cottontail rabbit  
Raccoon

### Frogs and reptiles

Snail  
Blanding's turtle  
Pickerel frog  
Butler's garter snake  
Common water snake

### Insects and butterflies

Baltimore checker-spot butterfly  
Mulberry-wing skipper butterfly  
Viceroy butterfly  
Purple and red-bodied damselflies



# WANT TO KNOW MORE ABOUT WETLANDS?

## PUBLICATIONS:

Continue your wetlands education with these publications:

*America's Wetlands: Our Vital Link Between Land and Water.* A booklet describing wetland characteristics, values and strategies for protection. Environmental Protection Agency, Region V, 230 S. Dearborn, Chicago, IL 60604. (312) 353-2000

*The Life of the Marsh.* William A. Niering, McGraw Hill, 1966. A fine book about the biology and ecology of marshes.

*Status Report on Our Nation's Wetlands.* An illustrated publication highlighting the importance of wetlands and detailing the condition of America's most misunderstood natural resource. National Wildlife Federation, 1412 16th St. NW, Washington, D.C. 20036-2266

## FIELD GUIDES:

*Pond Life,* George K. Reid, Golden Press, NY, Western Publishing Co., Inc., Racine, WI, 1967. An easy-to-use guide to pond ecology with illustrations of plants and animals.

*Wetland Plant Communities of Minnesota and Wisconsin,* Steve Eggers and Donald M. Reed. The 200-page book including full-color photographs of wetland plants, field characteristics and ecological notes is available for \$6.50 from the U.S. Army Corps of Engineers, 1421 U.S. Post Office and Customhouse, St. Paul, MN 55101. (612) 220-0222.

*Northwoods Wildlife, A Watcher's Guide to Habitats,* Janine M. Benyus, NorthWord Press, Inc. Minocqua, WI, 1989. A handy guide that describes 18 different types of wetlands, forests and fields and tells how each habitat originated, how it changes over time and why it attracts a certain community of birds, mammals, reptiles and amphibians.

## ORGANIZATIONS:

If you're interested in protecting and preserving wetlands and their inhabitants, consider joining the following organizations:

National Audubon Society  
111 King St.  
Madison, WI 53703  
(608) 255-BIRD

The Nature Conservancy,  
Wisconsin Chapter  
1045 E. Dayton St., Rm. 209  
Madison, WI 53703  
(608) 251-8140

Wisconsin Waterfowlers  
Association  
P.O. Box 792  
Waukesha, WI 53187

Wisconsin Wetlands Association  
111 King St.  
Madison, WI 53703  
(608) 256-0565

Wisconsin Wildlife Federation  
Tranquil Acres  
Reeseville, WI 53579  
(414) 927-3131



## POSTER PHOTO CREDITS

Milkweed in winter, David L. Misterek; great blue heron, Stephen J. Lang; sandhill crane, Gregory K. Scott; salamander, Gregory K. Scott; common yellowthroat, Stephen J. Lang; fawn, Mark Wallner; monarch butterfly, John R. Baker; painted turtle, Stephen J. Lang; fringed gentian, Thomas A. Meyer; tamarack, Robert Queen; Canada geese, Gerard Fuehrer; bald eagle, Gregory K. Scott.

PUBL-WZ-016-90

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Sponsors: Dingell-Johnson Federal Aid in Sport Fish Restoration Program; Wisconsin Coastal Management Program; Wisconsin Department of Natural Resources, bureaus of Wildlife Management, Fisheries Management and Water Regulation and Zoning; U.S. Army Corps of Engineers, St. Paul District; U.S. Environmental Protection Agency, Office of Wetland Protection

Wetland scenes by Jim McEvoy



U.S. Army  
Corps of Engineers

WISCONSIN COASTAL  
MANAGEMENT PROGRAM

source for waterfowl. And abandoned lodges provide nesting islands for waterfowl. A critical link in the wetland food chain, muskrats eat mostly plants and some invertebrates and in turn are eaten by predators like mink and birds of prey such as owls and hawks.

## AQUATIC SUPERMARKET

Certain wetland plants, such as cattails, are extremely efficient at capturing the sun's energy and storing it as carbohydrates. This stored energy is the foundation of a food chain that supports large populations of waterfowl, fish and wildlife.

Seasonal fluctuations in water levels can directly affect a wetland's food productivity. In the spring, high water levels may release nutrients from organic matter that broke down when water levels were low, which in turn causes a sudden increase in invertebrate populations — a condition sometimes referred to as a "pulse." Wildlife species often produce their young during the pulse. "The great amount of aquatic insects in a deep-water marsh provide a supermarket of invertebrate foods," says Sandy Engel, a DNR limnologist.

## FISHING FOR HABITAT

Waterfowlers and trappers can draw a direct correlation between loss of wetlands and decreased numbers of ducks and furbearers, but anglers may not be aware of how important wetland nurseries are for fish.

"Wetlands provide cover and food for the fry of many species and they play a very special role for those species that have evolved with wetlands as part of their life cycle," explains Engel.

Wetlands improve water quality for fish and other aquatic organisms by filtering out nutrients and sediments that pollute lakes and cover rock or gravel spawning beds. There are limits to a wetland's ability to perform these functions: It can be overloaded with sediments and nutrients,



MARK WALLNER

(top) Dabbling for dinner: Ducks nibble on aquatic insects and zooplankton abundant in dense marsh vegetation. (bottom) Reeds and bulrushes shelter a lone loon egg while the parents are feeding. Food and cover make wetland habitat attractive nurseries for a number of species.



TOM EVANS

which are then passed on downstream or into a lake.

Bass, sunfish and other fish species do not require wetlands to spawn, but their fry often move into wetlands for cover and to feed on zooplankton. But some fish species — most notably northern pike, muskellunge and some strains of walleye — actually need wetlands for successful reproduction. Because these fish don't build nests for spawning or provide any parental care, they must deposit eggs in a protected environment with plenty of food.

Marshes are prime nurseries for northern pike and muskellunge, according to Elburne Mertz, fish operations coordinator for the DNR's North Central District.

In early spring, just after ice break-up, northern pike move into very shallow marshes with sedges and grasses to spawn. Muskellunge spawn a bit later and in deeper water, such as shallow bay marshes with cattails, bulrushes and water lilies or other emergent and floating vegetation. By spawning earlier than fish in open water, these predators help their young stay a step ahead of the minnow, sucker and panfish fry on which they will feed.

As the fish spawn, their eggs are scattered over matted-down marsh plants from the previous growing season. The vegetation keeps the eggs, which require a constant supply of oxygen, from sinking into bottom muck where decomposing organisms live, or where they could be smothered by sediment.

DNR's stocking program takes advantage of the musky's affinity for wetland spawning. Fyke nets are set in a prime wetland nursery on the Minocqua chain of lakes to capture ripe females and males to collect eggs and milt (sperm). The fertilized eggs are taken to a hatchery, where the fish are raised to fingerlings and later released in lakes with poor natural reproduction.

Loss of deep-water marshes in northern lakes is one of the factors that has reduced natural muskellunge reproduction. "Any



STEPHEN J. LANG

A new generation of mallards gets a guided tour of the marsh. Loss of wetlands has decreased duck populations nationwide; without wetland habitat, broods like this will be a thing of the past.

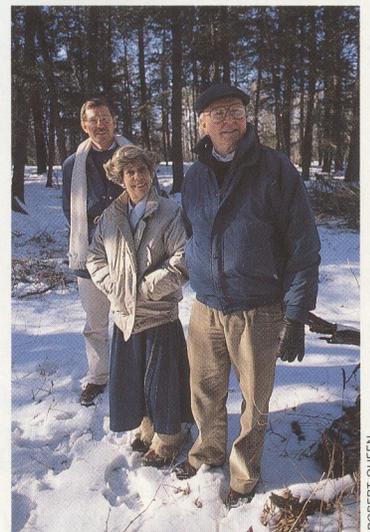
*"This mile-wide strip of wetland between I-43 and the lake is vital. The sandy hummocks and hemlock trees protect the shore from high water levels. Well, a property owner in the area wanted to build a road through the wetland for access to a higher, drier building site. But once one road was built, it would set a precedent for more roads, more development.*

*"There were lots of people up and down the shore who didn't want to see this happen. We got together, about 30 of us, and went to a meeting of the Sheboygan County Zoning Commission. We were prepared! We brought several credible witnesses from the UW, the DNR, the Audubon Society and The Nature Conservancy. The commissioners said they hadn't seen so many people at a meeting in years!*

*"The petition for the road was denied, thank goodness. We achieved our goal, but we aren't going to disband. We need to get stronger and more organized, because you never know what's coming around the bend.*

*"It's easy to think 'I can't do this by myself.' But you're not alone. There are a lot of other people who want to be wetlands stewards, too. If you get together and make a good case, you'll be heard."*

Phyllis Seymour, pictured with husband Tom (r) and Bill Wiesmueller (l). Together they organized a group of concerned citizens to protect Lake Michigan wetlands near Oostburg.



ROBERT QUEEN

marshy areas in a lake, even small ones, are important," Mertz says. "The loss of a wetland area along a shoreline can reduce fish populations. When shoreland property owners dredge or fill their shoreline for a beach, fish will no longer use the area to spawn."

The same is true for northern pike. "Unfortunately, we know of many lakes that had excellent northern pike reproduction that no longer do. In most cases, these are lakes once bordered by shallow marshes that have been mowed down or filled in," he says.

## KEEPING THE WORLD SAFE FOR THEIR OFFSPRING AS WELL AS OURS

Wetland loss is particularly significant in southern Wisconsin where many wetlands have been filled or drained for development.

To compensate for the loss, the Department of Natural Resources is experimenting with manufacturing wetlands, at least on a seasonal basis, to help boost northern pike populations in areas where natural reproduction has declined due to a loss of wetland nurseries. "We can modify other types of wetlands to duplicate the nursery environment of a deep-water marsh," says Gordon Priegel, chief of fish operations for the DNR's Southern District.

Priegel is overseeing several projects in which DNR crews construct a series of dikes with a concrete sluice gate around a meadow, a type of wetland with less water than a marsh. The gate is closed during the spring to hold the water level higher than it would be naturally. Fertilized eggs from a hatchery are then stocked in this artificial marsh. When the fry hatch, they live on zooplankton, just as they would have if they had spawned naturally.

After four to five weeks, the gate is opened, and the northern pike, which have reached fingerling size, are flushed into open water. "Our research has shown that eggs stocked in a wetland



GREGORY K. SCOTT

The muskrat is an important link in the wetland food chain. The furbearer eats mostly plants and invertebrates, and in turn is eaten by mink, owls, hawks and other wetland predators.

## WORKING WITH THE SYSTEM

*Ron Bruch offers a dramatic example of how the loss of the wetland nursery environment harms fisheries and other wildlife. Bruch is a DNR biologist for the Lake Winnebago System, composed of lakes Winnebago, Butte des Morts, Winneconne and Poygan, and their main tributary waters, the upper Fox and Wolf rivers.*

*Bruch says records from the first white explorers to reach the area indicate "the lakes themselves were nothing more than riverine marshes. They wrote of encountering a sea of wild rice which they couldn't find the main channel through." The productive marsh earned a reputation as a hunting and fishing paradise, he adds.*

*Over the years, dams were constructed to control water levels for navigation. By the mid-1950s, Bruch says, area residents began noticing dramatic changes: Sheepshead and gizzard shad replaced northern pike, bass, yellow perch and sunfish in the lakes, and fewer ducks came to nest on shore.*

*Wetland loss was identified as a critical factor in declining fish and wildlife populations in a comprehensive management plan completed for the Lake Winnebago system in 1989. The plan, which took more than three years to develop and attracted intense public scrutiny and participation, calls for a major wetland restoration.*

*"We hope to recover five square miles of wetland," Bruch says. A series of dikes will protect wetland areas from wave action and from the nutrient- and sediment-loaded currents flowing through the system, giving submerged and emergent vegetation better access to sunlight. The wetland will include upland marsh islands with sedges and grasses for waterfowl nesting and a deep-water marsh with emergent vegetation for fish spawning.*

— Paul Holtan

have a better survival rate at a lower cost than fingerlings stocked in lakes," Priegel says. The structure can be closed again to create the shallow marsh environment favored by nesting ducks.

Most of the vast wetlands lost throughout Wisconsin will never be restored. Projects to modify habitat will depend on finding suitable sites and on public support for reestablishing fish and wildlife populations. More critical, however, will be public commitment to protecting remaining wetlands.



RUTH HINE

A young green heron ready to test its wings in a wetland.

We can help build that commitment by recognizing that for fish, ducks and wildlife, wetlands aren't only a hospitable place to raise a youngster, they may be the only habitat in which they can bring young into the world.

*DNR Public Information Officer Paul Holtan writes about endangered resources, forestry and parks.*

*Bill Volkert*

During those 1,000-mile-long trips, it's comforting to know there are places where a traveler can rest and refuel before heading to the final destination. On the Interstate Highway System, these places are called waysides. On nature's flyway system, waysides have names like Horicon Marsh, Crex Meadows, Grand River, Meadow Valley and "that pond on Farmer Smith's back 40."

Wetlands offering good cover and abundant food are vital stop-over areas for migrating ducks, geese, sandpipers and plovers. Waterfowl cross the continent, flying from wetland to wetland; shorebirds make long-distance flights from wintering areas in South America to their nesting grounds beyond the Arctic Circle, landing in wetlands for a bit of R & R.

Some birds travel 8,000 to 10,000 miles each way during spring and fall migrations. The white-rumped sandpiper, for instance, spends the winter in the Falkland Islands off the coast of Argentina and cools off in summer north of Canada's Hudson Bay. En route, the long-distance flyer stops to bathe, preen and feed in Wisconsin wetlands.

To make these extraordinary flights, birds need energy — lots of it. They draw on their fat reserves for fuel, and when the supply is low, they must stop, rest and feed. The fat accumulated after "refueling" gives birds the energy they need to continue migrating. Later, some of the stored fat will be used to produce eggs during the nesting season.

## WAYSIDE RECONSTRUCTION

Wisconsin's larger wetland waysides have an interesting history: They were all altered, at one time or another, in an attempt to "improve" the land for use by a growing human population. Horicon Marsh was drained in 1910 for farming. The muck soils of Theresa Marsh were once planted in mint. After Crex Meadows was drained, its sedges

STEPHEN J. LANG

◀ Yellow warbler, just passing through.

## WISCONSIN'S WETLAND WAYSIDES



WHERE A CANADA GOOSE  
CAN GET A GOOD MEAL  
AND SOME SHUTEYE.

were harvested and woven into carpet backing. Grand River, Sheboygan Marsh, Meadow Valley and many other wetland areas were converted to agricultural fields.

It didn't take long for people to see that waterfowl populations decreased when wetlands were drained. By eliminating an essential element — migratory habitat — we prevented the birds from following their natural rhythms and routes. We discovered that some species cannot live just anywhere; they have specific requirements for survival, without which they are doomed to disappear. By 1935, for example, the sandhill crane population had been decimated by years of hunting and loss of wetland habitat; only 19 pair were counted in the state that year, down from a population of thousands.

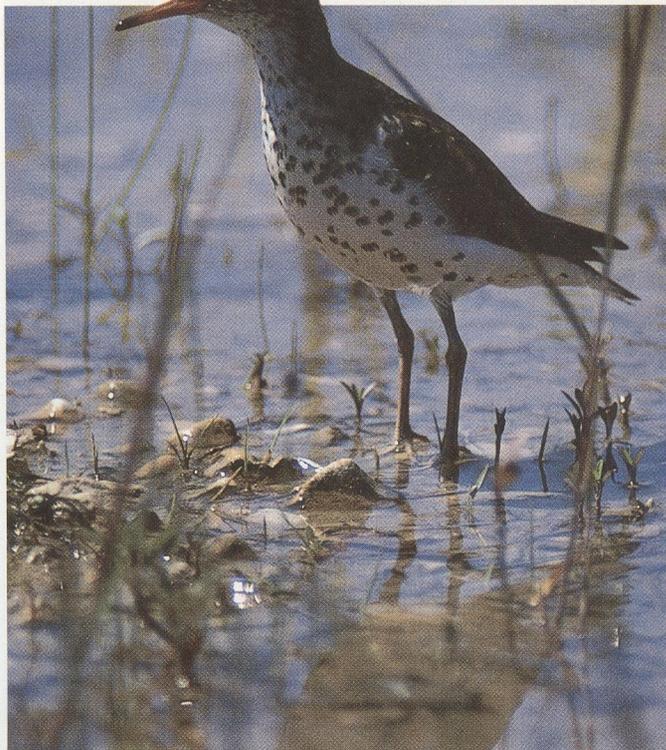
By removing drain tiles and ditches to re-establish shallow water levels and encourage the growth of native plants, wetlands can once again offer respite to migrating birds. In 1989, more than 10,000 sandhill cranes returned to Wisconsin's sedge meadows from their wintering grounds in Florida along the Gulf Coast.

Birds came back to Wisconsin when their favorite waysides were restored. Two hundred sixty five species have been sighted passing through Horicon Marsh over the years, while at Crex Meadows, birdwatchers have spied 260 different species.

## HOW TO KEEP 'EM FLYING BACK

There have been success stories in saving and restoring wetland waysides in Wisconsin. But the pressure to "improve" wetlands in the name of progress continues to grow. We need to protect Wisconsin's remaining wetlands and restore many that carelessly have been destroyed. It's a difficult and costly task, but some federal, state and private programs are addressing the problem.

The North American Waterfowl Plan, a joint effort by the U.S. and Canada to raise \$1.5 bil-



MARK WALLNER

(top) Spotted sandpipers stopover in wetlands on long flights from the Arctic Circle to Mexico. Shorebirds, waterfowl and songbirds find wetlands congenial places to rest and feed.

## HOW WE LOSE WETLANDS TODAY

Based on review of federal wetland fill permits for 1982-89. Historic conversions and losses to unregulated activities are not included.

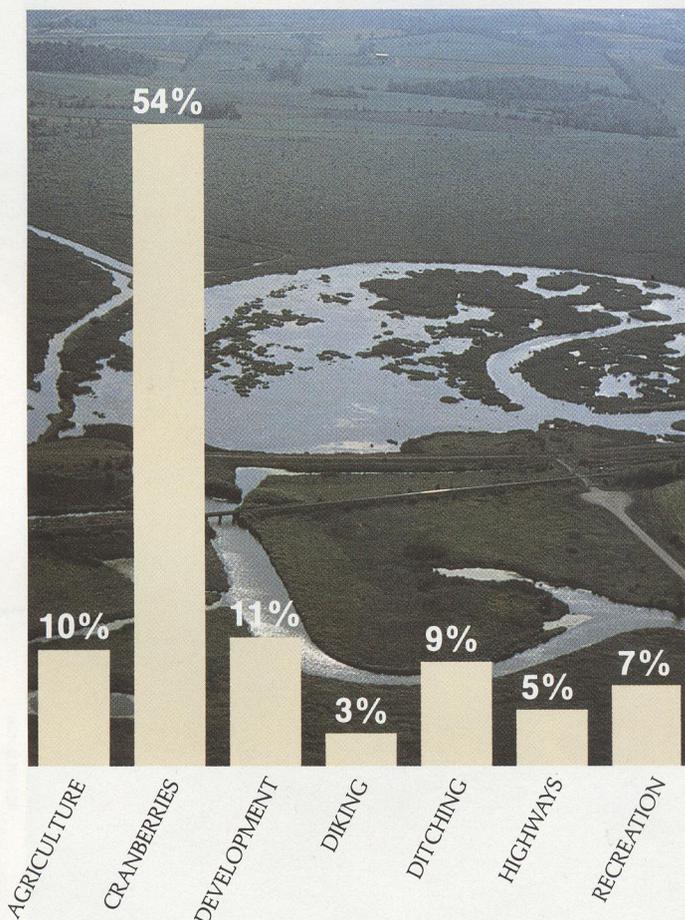


PHOTO OF THERESA MARSH BY CHARLIE KILIAN

lion from public and private sources to save or improve six million acres of wetland by the year 2000, will be a boon for ducks and geese winging to Wisconsin. "All our partners, from the U.S. Fish and Wildlife Service to The Nature Conservancy to the Wisconsin Waterfowlers Association to the Chippewa Tribe will be taking part in Wisconsin's effort," says Jon Bergquist, DNR waterfowl and wetland wildlife ecologist.

M.A.R.S.H. (Match Aid to Restore State Habitat), sponsored by Ducks Unlimited, provides privately-donated funds to state resource agencies for wetland improvement and waterfowl management. David Wesley, Ducks Unlimited group manager for conservation programs, says seven-and-a-half percent of the money D.U. raises in Wisconsin is being used on about 60 restoration projects here. "We're especially proud of the work we funded at Theresa and Tichigan marshes," he says. D.U.'s new Habitat U.S.A. program has a similar goal of habitat restoration.

Federal legislation — especially section 404 of the Clean Water Act and the 1985 Farm Bill's Conservation Reserve Program and "Swampbuster" provisions — puts muscle behind national efforts to save wetlands. Tough state and local zoning laws can help stem the tide of wetland destruction, while programs like Wisconsin's Stewardship Fund provide the money necessary to buy, restore and protect wetland habitat.

Much work is being done by smaller, private groups dedicated to ensuring that feathered travelers have a place to rest as they cross Wisconsin. As caretakers of Wisconsin's wetland waysides, it's up to all of us to maintain these special places for fish, plants, wildlife and future frequent flyers.

*Bill Volkert is a wildlife/Ice Age naturalist in DNR's Horicon Area Office.*



## WHAT'S A WETLAND WORTH?



A LOOK AT THE LEDGER  
WILL SHOW WETLANDS  
HAVE VALUE FAR BEYOND  
THE BOTTOM LINE.

*Mary Kay Judd and  
Mary Ellen Vollbrecht*

In this fast-paced, computerized, dual-income, test-tube, fast-food, consultant-laden brave new world, everything seems to have a price tag on it: products, time, land, ideas, knowledge.

So, to talk of something like wetlands in terms of intrinsic, intangible values — beauty, serenity, enchantment, rarity — doesn't quite hit home these days. Of course, a few die-hard romantics are tucked away in various corners of the earth, clinging to the intangibles and singing their praises. Unfortunately, the songs often fall on deaf ears.

For those individuals who have become slightly tone deaf over the years, we offer this attempt at price-tagging wetlands.

Just what is a wetland worth? That depends on the perspective you choose. Talk to a subdivision developer, a farmer, a highway department official, a wildlife biologist or an environmentalist and you'll get five very different answers.

From an individual owner's perspective, a wetland may be worth as much or as little as the product one can obtain from the land: the price of a condo, a year's supply of "craisins" (dried cranberries), a season's crop of corn. For the rest of us, the presence or absence of wetlands may mean a difference in our tax bill, a few cents more or less for produce at the market or a dollar or two more for fishing or hunting licenses. Bills for the loss of plant or animal species and the lack of attractive open space don't come due as quickly — but they eventually are paid by all of us.

As you can see from the ledger sheet, there are some very concrete costs and benefits associated with Wisconsin wetlands. You'll notice there's no "grand total" because it's impossible to put a price on the value of slipping through reeds in a canoe, huddling in a duck blind for the

ROBERT OULEN

Wetlands serve as water filters, helping to keep streams clean and clear.

first time with your youngster, or hearing the call of the Canada goose while waiting at a bus stop in the city.

## BOLSTERING THE ECONOMY

First of all, wetlands contribute income from recreation to the state economy. Waterfowl hunters directly depend on wetlands for their sport. Other hunters, including those who seek pheasant and deer, frequently hunt in or near wetlands. Anglers likewise rely heavily on wetlands, though they may not fish in marshes or swamps: Many gamefish species spawn in wetlands, using them as nursery grounds and a source of food. Wetlands also keep river and lake water clean for fish (and swimmers).

Manufacturers and merchants of sporting equipment such as guns, ammunition, fishing rods, fishing tackle, boats, canoes, motors, binoculars, field guides, camera equipment, film, ice chests and outdoor clothing receive income from wetland recreationists as well. So do the owners of cafes, motels and gas stations who serve wetland visitors. If even one percent of the total outfitting and hospitality revenues to Wisconsin businesses can be attributed to activities in or depending on wetlands, the value is \$9,442,153 per year.

Wisconsinites as a whole benefit when hunters, trappers, and anglers recreate in wetlands: Direct payments come to the state in the form of hunting, trapping, and fishing license fees, duck stamps, and trout stamps. Hunters and anglers pay an ex-



(top) Emergent and submerged wetland vegetation slows water flow, tempering floods and allowing pollutants and sediment to settle. (bottom) Wetlands mean business for sporting goods shops and other establishments catering to waterfowl hunters.



DNR PHOTO

SARA BALLARD

cise tax on all sporting arms, ammunition, fishing gear, boats, motors and gasoline; this money comes back to each state in the form of Dingell-Johnson or Pittman-Robertson funds for use on fish- and wildlife-related projects. Since many hunters and anglers use wetlands in one form or another, we can figure Wisconsin gets a certain percentage of the funds as a result of wetlands.

Waterfowl hunters are almost wholly dependent on wetlands. Each year 100,000 migratory bird hunters spend about \$46,000,000 to pursue their sport — that's a lot of bucks bolstering our state's economy. Waterfowlers must purchase a state hunting license, a state waterfowl stamp (\$3.25) and a federal Migratory Bird Conservation Stamp (\$12.50). About one third of the state waterfowl stamp money is used to protect and enhance waterfowl breeding grounds in Canada, where most of our waterfowl originate. The remainder is used to refurbish and maintain waterfowl habitat right here in Wisconsin. Money collected by the federal government through the sale of its stamp is returned to Wisconsin; the funds have been used to purchase thousands of acres of wetland and upland waterfowl production areas.

Birdwatchers, wildlife photographers, canoeists, hikers, skiers and campers often use wetlands in recreational pursuits. If even one percent of the equipment and hospitality expenses of non-consumptive wildlife-related activities is attributed to wetlands, then Wisconsin businesses make \$1,054,360 annually on the deal.

It's clear that many people in Wisconsin depend, at least in part, on wetlands for their liveli-



ROBERT QUEEN

*"Thirty years ago, everybody around here was farming fencerow to fencerow. Well, times have changed. Kids are growing up and leaving the farms; after a farmer retires, there's no one to work the land. But lots of farmers are reluctant to sell. CRP (the federal Conservation Reserve Program, which encourages farmers to plant trees, shrubs or wildlife cover on idled land to reduce crop surpluses and prevent erosion) helps farmers hang on to their land and do something to help wildlife, too. I enjoy working with farmers on CRP, especially on wetlands . . . I guess it's my way of making the world a better place before I leave."*

Armin Schwengel, retired DNR wildlife manager, who has worked with landowners, the Soil Conservation Service and the U.S. Fish and Wildlife Service to restore 23 wetland basins in Ozaukee County.

hood. And some tax dollars support these businesses through wetland management for waterfowl, fisheries and other recreation.

## LOWERING THE BILL FOR PUBLIC WORKS

In addition to their habitat and recreational values, wetlands help protect water quality and reduce flood levels. How do we put a price tag on these functions?

One way is to consider what it costs society to fix the damage that results when wetlands are absent.

First, let's look at water pollution. Rain water flowing over the lands picks up sediment, fertilizer, road salt, pesticides and other pollutants. Wetlands act like buffers: The water flow slows down in wetlands, allowing sediment and some pollutants to settle. Moreover, other pollutants are absorbed by wetland plants before they reach lakes and streams; plants such as cattails, water hyacinths and reeds can consume large quantities of nitrogen and phosphorus from polluted water.

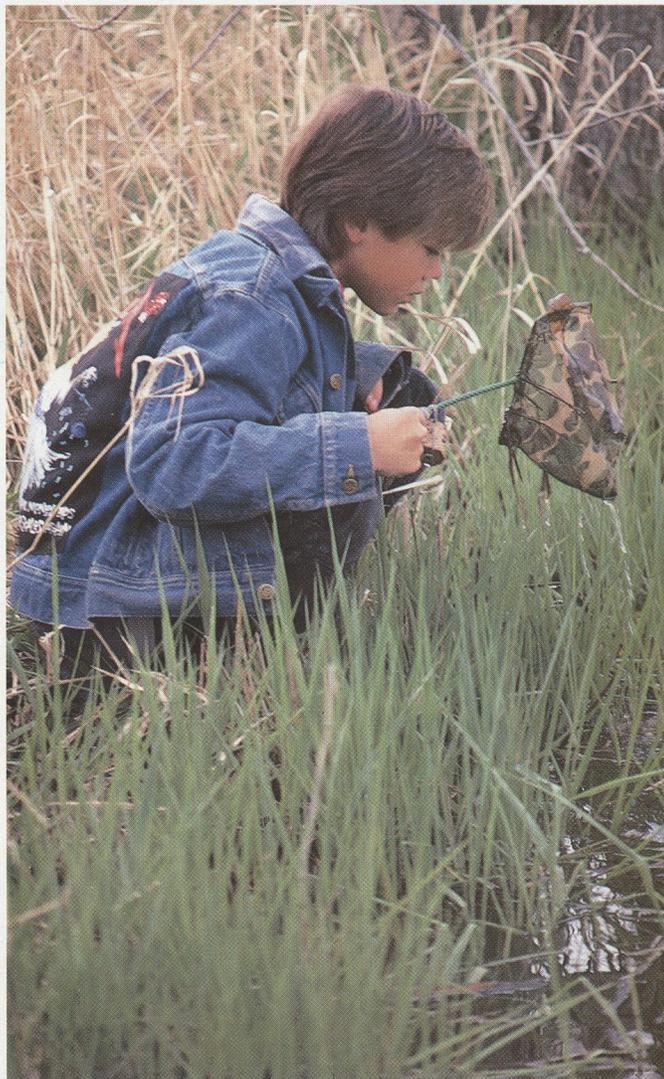
Over the past 20 years, Wisconsin has earmarked tax money to clean up lakes, control nonpoint pollution and restore wetland buffers along lakes and streams. Wetland loss certainly isn't the only cause of our water pollution problems, and we haven't developed a consistent tool for measuring the contribution of wetlands to clean water. But even if one percent of the total of Wisconsin's nonpoint, lake cleanup and wetland restoration bills could have been avoided by protecting existing wetlands, we might have saved a million dollars since 1979.

Duane Johnson, Wisconsin's top official with the United States Department of Agriculture's Soil Conservation Service (SCS) estimates that the Conservation Reserve Program (CRP) alone could result in water quality benefits to Wisconsin worth \$135 million.

Next, consider flooding. Floods certainly occurred before people altered wetlands. But wet-



(top) It's hard to put a price on perfection. The value of a single exquisite water lily may not compare to the revenue wetlands generate from waterfowl hunters unless beauty and serenity are your currency. (bottom) The wonder of nature is just a net dip away in a wetland.



ROBERT QUEEN

lands help reduce flood levels by slowing runoff and storing water so stream channels don't overflow as much or as fast. Again, wetland loss is only one of several factors contributing to flooding — and we don't have that perfect stick to measure the contribution of wetlands to flood protection. Avoiding one percent of Wisconsin flood damages would have saved about \$1.5 million each year.

## WETLANDS ARE PRICELESS

While we know that wetland protection might have helped us save on pollution control and flood relief, balancing the books isn't so easy. We should enter figures for some portion of both public and private costs of weedy lakes and wet basements, add in the property tax paid on waterfront development, plus the profit farmers and developers made — which determined in part what we paid for corn and condos.

Before we get, er, bogged down in dollars and cents, let's turn from the ledger to the landscape:

*"The real need in conservation is the protection of those commodities like solitude and sunsets which your adding machine may tell you are economically valueless but which your heart tells you are beyond price."*

— Luna Leopold ■

*Mary Kay Judd coordinates wildlife education for the Department of Natural Resources; Mary Ellen Vollbrecht works with DNR's shoreland and wetland zoning programs.*

### ACKNOWLEDGEMENT

This issue was funded by the Wisconsin Coastal Management Program pursuant to Grant #NA17020338-01 from the National Oceanic and Atmospheric Administration. The Wisconsin Coastal Management Council, which oversees the Wisconsin Coastal Management Program, strongly supports educational efforts which teach the values and functions of wetlands.

ROBERT QUEEN