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SPECIAL SECTION: Biking Wisconsin's State Park Trails

WISCONSIN NATURAL RESOURCES

May/June 1988

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John Muir's Wisconsin days
A dry corner of dairyland
A waterfowler's legacy



Common loons.

Photo by Stephen J. Lang

Share the lake with loons

Dr. Paul Strong

Wisconsin residents and summer visitors have a love affair with loons. But boaters, water-skiers, anglers and canoeists are also a prime threat to loons, particularly during their nesting and early chick rearing period from about May 1 to July 15. Even unintentional disturbance during this time can destroy loon nests or lead loons to abandon chicks. So learn to understand loons and practice some "lake etiquette."

First, never approach a loon nest. Loons build their nests at the water's edge and prefer secluded islands or marshy coves. People who poke along the shore in canoes, or anglers who work the same shoreline area for hours can force an adult loon to leave its nest, exposing the eggs to predators and the weather. Boats that create large wakes can actually wash the nest away. If you suspect loons are nesting on your lake, steer clear of the area.

Second, avoid loon nests on Me-

morial Day weekend. The holiday usually falls in the middle or near the end of loon egg incubation.

Third, watch out for loon chicks. Throughout June and early July, the chicks will be on the water with their parents and are susceptible to high-speed boats and water-skiers as well as curious canoeists. Loon chicks can get exhausted trying to avoid boats, and some are killed when fast boats or skiers run over them. Be on a special lookout for loon chicks over the Fourth of July weekend.

Usually, loons' calls and body language will let you know when you're too close. If you hear the "tremolo" call, which sounds like a maniacal laugh, or see a loon with its head held up and neck elongated, you've been given the first warning. If the tremolo calls continue or the loon starts dramatic "dancing" or "rowing" displays, it has been pushed to the limit. Most loons won't abandon their nest or chicks after one disturbance, but continued harassment is often too much for them to bear.

Around its nest, a loon may give you other warnings. As an intruder makes a loon uncomfortable, the bird

may hang its head over the edge of the nest so its bill almost touches the water. If the loon leaves the nest, it may come off excitedly, calling and running across the water, or it may slip away silently. In either case, it's best simply to avoid nest areas.

Loons are protected from harassment and destruction by state and federal laws. If you witness harassment or find a dead or injured loon, contact the nearest conservation warden or call the hotline: 1-800-WDNR-TIP. Your name will be kept confidential. Be prepared to offer descriptions or boat registration numbers.

One way to prevent harassment is to educate other lake users about loons. Wisconsin Project Loon Watch (WPLW) has "loon alert" signs to post at public landings and educational materials like films, slide-tape shows, brochures and a "Loon Ranger" handbook, which suggests how loons can be protected. WPLW also annually monitors loon populations and needs volunteer observers on many lakes.

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JOHN MUIR'S WISCONSIN DAYS

Dave Leshuk

Our wild places, plants and animals awakened this budding conservationist.

Photo courtesy of the State Historical Society of Wisconsin and John Muir Papers, Holt-Atherton Center for Western Studies, University of the Pacific, © 1984, Muir-Hanna Trust

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John Muir's Wisconsin days

The naturalist's Wisconsin roots anchored his later actions.

Dave Leshuk

If you stood on the north shore of Fountain Lake in Marquette County on a summer day in 1849, you would have likely seen an 11-year-old boy hopping barefoot through a boggy, green, lake meadow. He'd probably shout to his brother in a Scottish brogue now and then, having discovered a snapping turtle or a frog. Fascinated, he'd peer into and poke at the fresh Wisconsin landscape.

Springtime a couple years later would find him wrestling the head-high handles of a large moldboard plow behind a team of oxen. He'd spend the next decade of his life "getting the grain from the ground" by the kind of work that in the end either strengthens or cripples. Still, he managed to teach himself science, mathematics, mechanics, and he read widely in his spare time.

The boy grew strong and left for a bigger world. He became a farmer, "engineer," botanist, geologist, adventurer, writer and philosopher. He advised and debated the leaders of his country. He made conservation a popular cause in the United States and changed the way people around the world think about the natural environment.

Dave Leshuk is a free-lance writer working in Madison and Chicago.



John Muir at Yosemite. Hard, physical labor as a Wisconsin youth toughened Muir for later western adventures.
Photo courtesy of the State Historical Society of Wisconsin (from *John of the Mountains*, Linnie Marsh Wolfe, Houghton Mifflin Company, 1938)

The boy, of course, was John Muir, and throughout his life he acted on his beliefs. Today, 150 years after his birth on April 21, 1838, part of his Fountain Lake boyhood home is a park and hundreds of other "glorious wildernesses" are protected from

development.

Muir landed in Wisconsin in 1849 with his father, Daniel Muir, his older sister, Sarah, and his younger brother, David. This first contingent of the Muir family settled on virgin land, which they called Fountain Lake Farm, while John Muir's mother, Anne Gilrye Muir, and remaining four siblings waited in their native Dunbar, Scotland for word that the Wisconsin home was ready for them.

Pioneer Wisconsin lit a fire of passion for wild things in Muir. The diverse landscape of Fountain Lake Farm held oak woods, prairie, wetland and glacial lake waters. Muir wrote about the experience in *The Story of My Boyhood and Youth*, an autobiographical account of his life in Scotland and Wisconsin. "This sudden splash into pure wilderness — baptism in Nature's warm heart — how utterly happy it made us!" Muir writes. "Nature streaming into us, wooingly teaching her wonderful glowing lessons, so unlike the dismal grammar ashes and cinders so long thrashed into us. Here without

knowing it we were still at school; every wild lesson a love lesson, not whipped but charmed into us. Oh, that glorious Wisconsin wilderness!"

The whipping Muir alludes to was done with a wooden switch, mostly by his father, a strict Calvinist who

followed his religious convictions to often illogical extremes. "The old Scotch fashion of whipping for every act of disobedience or of simple, playful forgetfulness was still kept up in the wilderness, and of course many of those whippings fell upon me." By the time Muir was 11, he had learned most all of the New and Old Testaments "by heart and sore flesh," and though Muir rejected the religious fanaticism of his father, his spiritual roots would profoundly influence his thinking and writing in later years. He would take issue with the Christian concept of dominion over natural resources. In fact, he adopted a kind of pantheism, seeing the spirit in everything: plants, animals, water and soil.

Harsh also was the work of building a farm from scratch on the untilled and tree-studded savanna. "Men and boys, and in those days even women and girls, were cut down while cutting the wheat. The fat folk grew lean and the lean leaner, while the rosy cheeks brought from Scotland and other cool countries across the sea faded to yellow like the wheat. We were all made slaves through the vice of over-industry. . . . We were called in the morning at four o'clock and seldom got to bed before nine, making a broiling, seething day seventeen hours long loaded with heavy work, while I was only a small and stunted boy."

In Wisconsin, Muir got "grain from the ground" and love lessons from nature.

Perhaps the best known example of the hardships Muir suffered was the 90-foot well Muir's father directed him to chisel through fine-grained sandstone over an entire summer.

Despite such difficulties, Muir biographers, including Linnie Marsh Wolfe and Wisconsin's own Millie Stanley, have written that his Wis-

consin experience was an important key to his future. The hard labor forced on his body made him strong enough for his later adventures. The self-discipline he developed in working and in his coveted 1 a.m. study sessions made him the master of his body and his mind. So much an inde-

tween the ages of 11 and 22. Though he managed to be well-read, it was a constant struggle for him to find enough good books and, once found, to get them past his father, who believed that the only book a person needed was the Bible.

But Muir had an incredible talent



The Fountain Lake home in Marquette County. John Muir lived here from 1849 until 1856. The family homestead was sold to Muir's sister, Sarah, and her husband-to-be, David Galloway. This 1860s photo shows the young Galloway family. The home burned to the ground in the early 20th century. Photo from the Holt-Atherton Center for Western Studies, University of the Pacific, © 1984 Muir-Hanna Trust

pendent learner was he that after leaving the University of Wisconsin at Madison without receiving a degree, he educated himself in his own "University of the Wilderness." He later received honorary degrees from the universities of Wisconsin, California, Harvard and Yale.

In Muir's own hands, the religious fanaticism of his father changed into a new way of viewing the natural world. Muir became a pioneer of the idea that wilderness should exist for the value of its existence alone, independent of any worth people might place on it for their own satisfaction.

On the family farms, Muir was relatively isolated from the world of cities and nations. He rarely ventured outside a 15-mile radius around Fountain Lake Farm and was only able to attend school for two months be-

for inventing that would open the door for him to the University of Wisconsin and, eventually, to the larger world. When Muir was 15 or 16 years old, he began to study algebra and later continued with trigonometry and geometry. He also started to invent with simple tools — with a vise, some files and chisels, a hammer and other items he found. The machines he built from wood and scrap steel — a self-setting sawmill, clocks and thermometers — are famous today, partially because they were made by a teen-ager with no technical or scientific training, but also because of the curious traits he gave them. One of his clocks was shaped like a scythe to represent the scythe of "Father Time." Another clock was designed to be read by workers in the fields and had hands 14

feet long. A thermometer clearly showed the difference in temperature created by a person standing four or five feet away. At the urging of a neighbor, Muir took his "early rising machine" — a combination bunk and clock that would dump its occupant out of bed at a pre-set time — to the 1860 State Fair in Madison. The *Wisconsin State Journal* reported that his inventions were a star attraction. Over the next several years, he worked stints as a mechanical and industrial "engineer" in Prairie du Chien, Indianapolis and Canada.

While in Madison with his inventions, Muir enviously eyed students at the University of Wisconsin.

"I thought that if I could join them it would be the greatest joy of life. I



Eyes to the future, Muir was the driving force behind Sequoia and Yosemite national parks. Photo courtesy of the State Historical Society of Wisconsin (cabinet view by C.E. Watkins Art Gallery, San Francisco)

was desperately hungry and thirsty for knowledge and willing to do anything to get it." Scraping together what money he could from odd jobs, he enrolled and studied chemistry, math, physics, Greek, Latin, botany and geology. This wasn't a "regular course of studies" and didn't lead to a degree. After four years, Muir "wandered away on a glorious botanical and geological excursion" that would last the rest of his life. He wrote, "I was only leaving one university for another, the University of Wisconsin for the University of the Wilderness."

As Muir began his studies at the University of Wisconsin, the football



The Muir family moved four miles away to Hickory Hill farm in 1856. A year later they built a frame house on a long, high slope with a commanding view of the countryside.

Photo from the Holt-Atherton Center for Western Studies, University of the Pacific, © 1984 Muir-Hanna Trust

stadium in Madison now called Camp Randall earned its name as the site of a Civil War military camp. Muir's pacifist, religious upbringing naturally found him opposed to war. But, his letters show his was more than a knee-jerk reaction. He mourned for friends who went off to face "the well-directed grape shot, the exploded mine rending hundreds limb from limb in a moment, the dreadful shell thrown precisely into the thickest crowd. . ." In his second spring at the university, Muir saw Camp Randall filled with hundreds of sick and dying Union soldiers and Confederate prisoners shipped back from the battlefields. Later, Muir called war "the farthest-reaching and most infernal of all civilized calamities." When Muir's number was not called up in the early drafts, he left Wisconsin to wander in Canada.

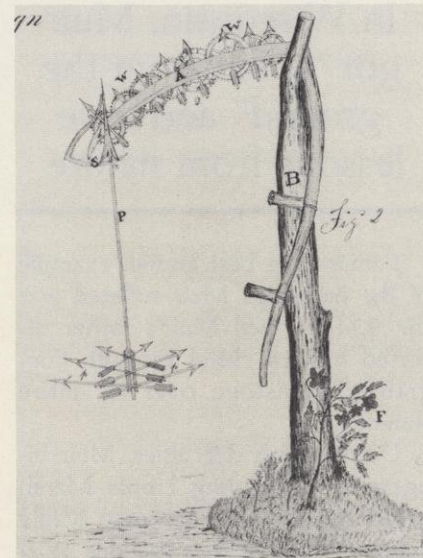
Though Muir's natural inclination to invent and study was exceptional, he was like most of us when it came to writing and politicking. Writing was tedious and difficult for him. He said, "I find this literary business very irksome, yet I will try to learn it." Politics, too, he found distasteful.

"John Muir detested politics as much as he detested war," writes Wolfe. "In it he saw self-interest obstructing every effort toward the common good. 'Political Quag' he named the whole dark and treacherous business carried on in the name of government." Fortunately, Muir be-

lieved the struggle for conservation was a battle between right and wrong, and he couldn't ignore it. Despite its drawbacks, the process brought Muir much personal happiness. He was able to make friends out of potential enemies like Edward Hariman, a railroad magnate who backed Muir's wilderness preservation efforts. Other "political" friends included President Theodore Roosevelt and Robert Underwood Johnson, an editor of the then-prominent *Century* magazine and a lobbyist for conservation.

When Muir was a teen-ager, he began to invent sophisticated machines with simple materials and tools. One of his famous creations is this clock, shaped to represent the scythe of Father Time.

Photo courtesy of the State Historical Society of Wisconsin



As a founder and first president of the Sierra Club, Muir is also considered a founding father of the modern conservation movement. As pointed out by Steven Fox in *The American Conservation Movement, John Muir and his Legacy*, Muir began the pattern of vested development interest being opposed by committed, zealous "amateurs," people who wished to protect wilderness for its own intrinsic value and who had no economic stake in its preservation, nor special training in advocacy. Muir's legacy is best embodied by the organization he helped launch, which today is still primarily volunteer run and led.

Muir, of course, was the driving force behind the creation of Yosemite and Sequoia national parks. He also had a direct hand in the establishment of Mount Rainier, Petrified Forest, and Grand Canyon national parks. It was after meetings with Muir at Yosemite that President Theodore Roosevelt embarked on a course of action that established 148-million acres of national forest, five national parks, and 23 national monuments during his term of office. Muir also worked as a publicist for these efforts, writing articles for many major magazines and newspapers as well as five books — most of which remain in print.

A legacy of mercy for things wild, natural and free.

But Muir's Wisconsin days are often considered the beginning of the national park system, because a portion of wet, sedge meadow on Fountain Lake Farm was the first piece of wilderness he tried to preserve. In an 1896 speech to a meeting of the Sierra Club, Muir said, "The preservation of specimen sections of natural flora — bits of pure wilderness — was a fond, favorite notion of mine long before I heard of national parks. . . . On the north side of [Fountain] lake, just below our house, there



Muir built machines from wood and scrap steel — a self-setting sawmill, clocks, thermometers. Many of his works — like this clock/writing desk — had curious traits.

Photo by Deb Grossfield, reprinted with permission of the Madison Art Center.

was a Carex meadow full of charming flowers — cypripediums, pogonias, calopogons, asters, goldenrods, etc. — and around the margin of the meadow many nooks rich in flowering ferns and heathworts. And when I was about to wander away on my long rambles I was sorry to leave that precious meadow unprotected; therefore, I said to my brother-in-law, who then owned it, 'Sell me the forty acres of lake meadow, and keep it fenced, and never allow cattle or hogs to break into it, and I will gladly pay you whatever you say. I want to keep it untrampled for the sake of its ferns and flowers; and even if I should never see it again, the beauty of its lilies and orchids is so pressed into my mind I shall always enjoy looking back at them in imagination, even

across seas and continents, and perhaps after I am dead.' "

Another Wisconsin conservationist, Aldo Leopold, was aware in the 1940s of the significance of Muir's statement. In his *A Sand County Almanac* he described how "John Muir offered to buy from his brother [-in-law]. . . a sanctuary for the wildflowers that had gladdened his youth. His brother [-in-law] declined to part with the land, but he could not suppress the idea: 1865 still stands in Wisconsin history as the birth year of mercy for things natural, wild, and free."

Though Muir failed to preserve the land in his lifetime, Fountain Lake Farm has begun again to feel the caring touch of his hand in the last 30 years. The process began in 1957 when Marquette County acquired the first parcel of land adjoining Ennis (Fountain) Lake to form the John Muir Memorial Park. The county continued to acquire parcels of land until all the land immediately surrounding the lake was included. In 1985, the Sierra Club spearheaded a drive to acquire 27 acres north of the lake, and in 1986 a landscape architect and Muir researcher, Erik Brynildson, bought 17 acres on which his research concludes the original Muir homestead stood. He intends to eventually transfer control of his land to the National Park Service. The park service will become a caretaker of the entire site if the land is named a National Historic Site, sometime in 1989, according to plans. For now, approximately 180 acres on and around Muir's Fountain Lake Farm are under some sort of protection.

So if you wander in the area of Fountain Lake Farm this summer, you're likely to see a modern 11-year-old discovering snapping turtles and blue jays in this piece of preserved "glorious Wisconsin wilderness" that Muir traipsed as a boy. Those who visit, who learn, will become in some small ways what John Muir was. There they can feel "nature streaming into them, wooingly teaching her wonderful glowing lessons." ■



A dry corner of dairyland

Here in our own southwestern corner lies a small pocket that looks every inch a desert.

James F. Drought

Desert — thanks to cowboy movies, the very word conjures images of scorching heat, vivid rock and sand formations, and desolate lands far from home.

Grant County, Wisconsin, lies nearly 2,000 miles from the moviemakers' favorite southwestern deserts of Arizona, California and Mexico. But on a few sandy acres of America's Dairyland, lizards scurry from view and the prickly pear cactus blooms. It's the Blue River Sand Barrens — home to resilient prairie grasses and scrubby evergreens that thrive on the crests of creeping sand dunes where surface temperatures frequently exceed 140°F in midsummer.

How did it happen?

The sandy soil of the Wisconsin River Valley was originally deposited as outwash from the melting glaciers about 12,000 years ago, when the river was much wider than now.

In the mid-1800s, settlers in the

James F. Drought researched six-lined racerunners at the Blue River Sand Barrens for a graduate program. He's an assistant biologist with the Southeastern Wisconsin Regional Planning Commission in Waukesha.



In mid to late June, the natural area is bathed in radiant yellow as the prickly pear cactus (*Opuntia compressa*) comes into bloom.
Photo by James F. Drought

lower Wisconsin River region broke the protective sod of the virgin prairie with their plows. The fine-grained and sandy soils were loosened by the wind and carried away. Settlers soon saw that their attempts to farm the area were futile. The fields were eventually abandoned as the pioneers moved on in search of more fertile, less erodible land.

The disturbance from this early farming created a landscape that scarcely resembled the native prairie. In the open and unprotected areas,

the wind dug shallow depressions in the sand. In turn, the sand settled in dunes along windbreaks such as fencerows and clumps of cactus. The newly formed depressions, called blowouts, grew deeper and wider while the dunes grew larger.

The soil in blowouts contained a mixture of sand and small stones. Ero-

Top Left: An adult male six-lined racerunner. The lizard is common to the Blue River Sand Barrens, scurrying between grass clumps at speeds up to 15 mph. Photo by James F. Drought

sive winds had only enough energy to carry away fine sands, so the stones that remained were gradually uncovered as the strong winds dished out the blowouts about six feet deep. Without the cushioning sands, the stones tumbled and settled together, concentrating on the surface and forming a rocky shield that protected the underlying sand from further wind erosion. This layer of stones is called "desert pavement" because it resembles similar features in southwestern U.S. deserts.

During the late 1960s, the Wisconsin Department of Natural Resources recognized the need to protect the unusual natural features and fragile plant communities of this area. A 130-acre parcel was purchased two miles east of the Village of Blue River in northeastern Grant County. It's bordered on the north by a backwater slough of the Wisconsin River, on the south by private farmland, and on the east and west by state-owned pine plantations. The site was designated and protected as the Blue River Cactus and Dunes Scientific Area. Today, it's called the Blue River Sand Barrens Natural Area and is managed by the department's Bureau of Endangered Resources.

The area supports many unique plant and animal communities. Rising more than 20 feet above the prairie floor, the sand dunes are undeniably the most striking feature. Blowouts, sand dunes and rare plants cover nearly 60 acres, almost half the property.

At least five species of turtles, including the threatened Blanding's turtle, use the blowouts and dunes as nesting sites. The state's largest population of the six-lined racerunner lives here; it's an eight-inch insectivorous lizard. Wild turkeys search the dunes and prairie fringe for food. Grassland birds, including grasshopper sparrows, western meadowlarks and bobwhite quail, nest here.

By most geographic standards, deserts are areas that receive less than 10 inches of unevenly distributed precipitation per year. So the Blue River area is not a true desert. It receives



The area contains some interesting "blowouts," the dished out areas between sand dunes. Blowouts contain a mixture of sand and small stones. DNR photo

slightly more than 30 inches of precipitation each year, mostly as rain during the growing season.

Still, the climate in the southwestern corner of Wisconsin is harsh. High bluffs, visible for several miles to the north and south, force cold, dry winter air into the Wisconsin River basin. Winter temperatures often drop below -20°F because of this cold air sink. The bluffs also cause scorching summer heat by reducing air flow through the basin. Air temperatures approaching 95°F in the natural area are not uncommon in the summer.

Plants and animals adapt to beat the heat.

The combined effect of hot summer sun and sandy, highly permeable soils limits the amount of water available to growing plants.

Plants that persist in desert-like conditions are called xerophytes, a word meaning "dry plants." The plants that grow here show several xerophytic adaptations.

The most obvious adaptation is cavities in the roots, stems and leaves of some plants to store water. These fleshy tubers allow xerophytes to retain liquid and slowly absorb it during extended dry periods. The prickly pear cactus and farnesflower both do this.

In addition, the cuticle, or outer coating of the prickly pear's stem, is thickened and leathery, which conserves water by reducing transpiration. This tough stem also shields against the abrasive action of wind-borne sand. The prickly pear, like most other cacti, possesses sharp spines, whose function has always been somewhat conjectural. Such spines certainly protect the plant by repelling diners.

Some plants adapt by quickly laying down a claim to the new desert turf. Once the desert pavement has formed, one of the first plants to colonize a blowout is false heather, an evergreen shrub that also grows on the edge of the sand dunes. It has hard, scale-like leaves that resist the scouring sands. Still other plants grow on

the crest of the dunes, where they slow down the pace of dunes gobbling up the prairie. These "dune stabilizers" include the sand cherry, little bluestem, switch grass and, where its long taproot can reach water, river birch.

There are other strategies to survive the harsh conditions. Flowers and fruits of some annuals develop early in the spring when the sand is still cool and moist, then survive the



Hairy puccoon (*Lithospermum croceum* = *L. carolinense*) brings yellow splendor to the natural area in May. Note the western meadowlark nest hidden in the base of the puccoon for protection. Photo by James F. Drought

hot summer months in the seed stage. Ephemeral plants include the dwarf dandelion and the toadflax.

Unlike plants, which make a stand in one place and adapt or perish, animals can seek out suitable habitat. To better understand the activity, behavior and survival tactics of snakes, lizards and other small animals at the barrens, I set up a study with associates during the spring and summers of 1985 and 1986.

To conserve water, many animals feed only in the cool evening and early morning hours. This helps explain why the natural area looks nearly lifeless to the casual observer during the day. The masked and short-tailed shrews, meadow vole, deer and jumping mice all exhibit this nocturnal behavior. Snakes such as



In August, blazing star (*Liatris aspera*) adds its soft, magenta glow to the rugged landscape. Photo by James F. Drought

the fox, hognose and northern water snakes are usually nocturnal feeders.

The green frog and the spring peeper, a small tree frog, spend most of their time in the nearby slough and only move to the prairie border to feed during or immediately after rainstorms. Though vulnerable to dehydration, adult northern leopard frogs are occasionally seen foraging during the midday heat. Fortunately, the leopard frog's powerful hind legs help it quickly hop to the wetland edge before water loss is critical.

Emerging from the Wisconsin River slough during June are the Blanding's, stinkpot, snapping, map and painted turtles. They visit the natural area during the cooler hours of early morning, late afternoon and evening in search of sand dunes and blowouts in which to lay eggs. Despite their protective bony shells, painted and map turtles are particu-

larly susceptible prey. During their trips to and from the nest, these turtles can be attacked by raccoons, skunks and opossums. Although climate and ample nesting sites in the Blue River Sand Barrens provide a nearly ideal setting for developing turtle eggs, few hatch. Predators excavate the shallow turtle nests and eat the eggs — and occasionally the adult female turtle as well.

The six-lined racerunner, the natural area's common lizard, has adapted its behavior and lifestyle in several ways to survive in this harsh environment. Here, near the northernmost extent of its North American range, the racerunner emerges from hibernation in early May, then remains active on warm days during the midmorning and early afternoon hours until the summer heats up in late June. Then, until mid-August, racerunners mostly limit their daily activities to the morning hours, retreating to shallow burrows to escape the intense midday heat. These underground retreats stay humid and cool, which reduces water loss through the skin and respiratory passages. To further conserve water, racerunners void almost no liquid waste. Urine and feces are excreted in nearly solid form.

Isn't it wonderfully odd that in a land of abundant water and green grass, we have such an unusual ecological treasure — the Blue River Sand Barrens Natural Area — a remote corner where some of our most fascinating natural features, plants and animals rival the beauty and biology of the true deserts. ■



The gift of land: a waterfowler's legacy

A labor of love will be enjoyed for generations.

Robert Bredemus

In May 1986, Enoch Reindahl, at the tender age of 82, gave the citizens of Wisconsin what was undoubtedly one of his most prized possessions — 10 acres of marshland in Dane County along the Yahara River just north of Stoughton. His gift is an example of steps many Wisconsin landowners could take to set up living memorials to the land they nurture and care about.

Enoch Reindahl has lived nearly his entire life in the Stoughton area. He's farmed the family farm, trained as a mason's assistant and worked on the railroad, but his dearest hours were spent in the outdoors.

He's slowed down a little now, but

he was an avid duck hunter, a trapper, a skilled nature photographer and a decoy maker of great renown. In fact, the decoys he made in his early years are now collectors' items.

Unlike many waterfowlers, Mr. Reindahl faithfully kept a detailed "Waterfowl Hunting Log," featuring his exploits along the Lake Kegonsa-Yahara River wetlands from 1920 through 1951. Even nonhunters should find humor and honesty in these yearly writings. Here are a few examples:

1920. "This was the first year I had a shotgun, and I never got a duck."

1922. "I bought a new pump this fall and was able to shoot pretty good, getting 33 ducks."

1924. "Done a bit of hunting this year, made better decoys and shot 45 ducks."

October 21, 1927. "Shot pretty fair today, getting 13 ducks out of 24 shells — seven bluebills, two teal, two pintails and two mallards."

September 23, 1928. "Used 14 shells in all to get one duck. I think I'll have to blame my poor shooting on the fact that I was using a different kind of shell: Ajax Heavies." (They had excuses 60 years ago too!)

October 17, 1928. "Nothing coming into the marsh today — mud hens for supper."

November 2, 1929. "About 11:30, four mallards lit into my decoys, and one of them tried to bite a chunk out of one of my blocks. It got scared, and the whole bunch got up."

Robert Bredemus is DNR's Southern District land agent stationed in Fitchburg.

Piping plover.

Photo by Enoch Reindahl



One can only guess how long it took Reindahl to coax this blackbird onto his left hand, then trip the camera shutter with a string tied to his right hand.

Self-portrait

October 18, 1930. "We had to oversleep this morning of all mornings when more ducks were coming into the marsh than I have seen at any other time since I started hunting." (He apparently got up earlier in 1931 when the journal shows Reindahl took 96 ducks of 14 species.)

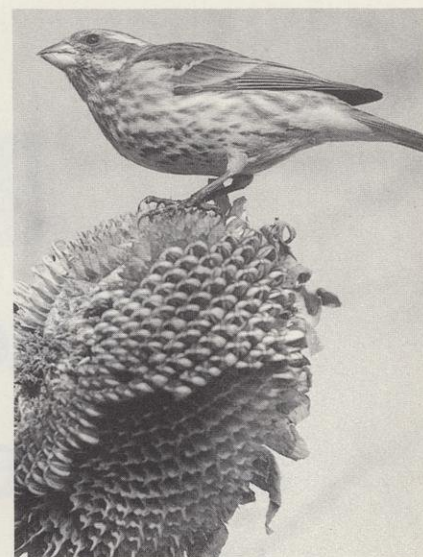
October 3, 1934. "The duck season opened this morning at sunrise and will close November 11. Shooting hours are from sunup until 4 p.m. with Mondays and Tuesdays off. The bag limit on teal, spoonbills, grey

ducks, bluebills, canvasback and red-head has been reduced to five birds, 12 being the limit on other ducks."

October 26, 1938. "Had the marsh practically to myself again today, and it was a good thing that nobody was around to see the fancy shooting I done. I used 15 shells to get five ducks."

November 11, 1940. "Rain was falling this morning, and the temperature was 55 degrees with a light southeast wind. . . About noon, the wind shifted to the southwest, and

the mercury began to drop. Soon, the wind reached a velocity strong enough to blow spray from the water's surface. By mid-afternoon, snow was falling or being driven horizontally — as were hundreds of flocks of ducks, mostly mallards. The ducks made no attempt to buck the wind, but drifted in a northeasterly direction. . . It was next to impossible to hit anything, in fact, the wind, which was gusty, would nearly blow me out of the boat if I attempted to stand



Purple finch on a sunflower.

Photo by Enoch Reindahl

up. . . By the time I managed to get down to the boathouse, EVERYTHING, including me, was coated with ice." (This is a Stoughton version of the famous 1940 Armistice Day storm.)

November 12, 1940. "The river was pretty well frozen today, in spite of the wind, which was still quite strong. Flocks of mallards were bucking the wind, headed south; all day long, flock after flock. No doubt, yesterday's storm carried many of these birds far off their regular courses down the Mississippi Flyway. I think if I say I have seen 10,000 mallards yesterday and today, it would be a conservative estimate."

November 10, 1943. "Shot well today, killing seven with seven shots. A dozen or so bunches of swans went over. . . This, with the three to four



A fledgling pied-billed grebe paddled by.
Photo by Enoch Reindahl

other flocks of swans I've seen the past few days, is the most of this species that I've ever seen in one season. Also, two white pelicans dropped into Seamonson's."

November 18, 1947. "What was undoubtedly the poorest duck season in history as far as the state of Wisconsin is concerned has been over for about two weeks now. I had not planned on taking out a license, but the geese started coming through. . . the old fever got me. I could just as well have saved my money, for I never as much as drew a bead on a duck or goose. . . I don't believe two dozen ducks were shot in the Big Marsh all season."

November 23, 1948. "Water conditions have been very poor this year with very little rain since early spring. . . Beds of sago and coontail started everywhere in the river, but between the lack of rain and the carp, which are thicker than ever, this growth had about disappeared by midsummer."

October 31, 1949. "A family of five swans saw my goose decoys and dropped in the north end of Seamonson's. Swimming into the decoys they proceeded to beat up on one of them. . . Yesterday, a flock of 17 sandhill cranes went over."

His duck hunting days fell off sharply in 1950 when Mr. Reindahl bought his marsh. He hand-built a



His portraits are equally charming. Here, young friends patiently fish for whatever's biting.
Photo by Enoch Reindahl



Common and black terns were a common sight on the Stoughton ponds.

Photo by Enoch Reindahl

dike along the Yahara River to keep out carp. He also dug three small ponds by hand.

For those readers who have never worked in wetlands, constructing a dike and ponds was a remarkable feat for one man using hand tools. Typical wetland soil is difficult to dig because it is wet, heavy and interlaced with a network of tough roots.

After digging the ponds and constructing the dike, Mr. Reindahl seeded the ponds with wild rice, sago pond weed and duck potato. He also built muskrat nests into the dike. These nests had entrances to both the river and the marsh to protect young muskrats from marauding racoons and mink.

While working on his ponds, Mr. Reindahl developed a keen interest in nature photography. In 1936, he bought an Eastman Recomar 18 camera, used to produce the photos ac-

companying this article. The camera had a double expansion bellows and used either cut film or press type film packs. Most of his photos were taken by focusing on a spot where he anticipated a bird or mammal would land. He tripped the camera by string operated from a blind some distance away. I think you'll agree, he produced some amazing photos of waterfowl, songbirds, mammals and vegetation. All shots were taken in the Stoughton area between 1936 and 1960.

Mr. Reindahl observed nature in many ways. His reputation as a decoy maker spread, and many collectors sought his work. He was featured in an August 1949 issue of *Field and Stream* in an article titled "How to Make Decoys."

His lifelong interest in waterfowl and his dedication to a small piece of marshland led to his gift of land. With



A grasshopper sparrow surveys its domain.

Photo by Enoch Reindahl

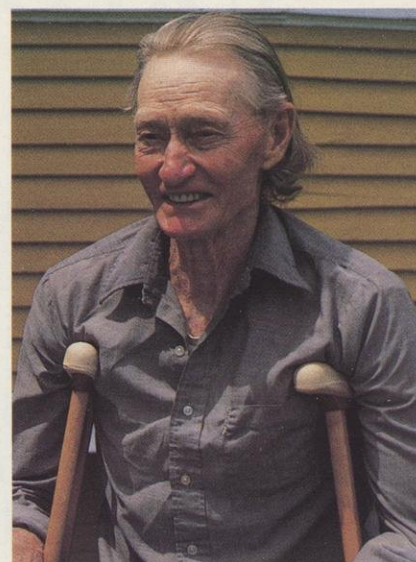
his sense of stewardship and concern for his land, Mr. Reindahl is but one among many who have entrusted the Department of Natural Resources to protect or invest their property to support conservation programs.

If you would like to consider donating land, contact your nearest DNR field station. Department land agents will be happy to discuss possible options with you. In many cases, these land gifts can be used as an income tax deduction. However, for most donors, the tax advantage is secondary to their desire to establish living memorials. Like Mr. Reindahl, they have invested years, money and energy in these precious gifts. He donated his land with the knowledge

that it will be available to future generations of Wisconsin people and wildlife.

Gifts of land, 1981-86

During this five-year period, the Department of Natural Resources received 3,368.58 acres of land from 65 separate donors. Gifts ranged in size from one-tenth of an acre to more than 1,014 acres. Gifts came from individuals, businesses, estates, corporations, organizations and municipalities. The largest acreage was given by The Nature Conservancy, a major private land preservation organization. The Department of Natural Resources uses these gifts to add acres



Enoch Reindahl today. Photo by Robert Queen

A SPECIAL PROGRAM FOR UNIQUE LAND PARCELS

Gifts that do double duty

One price of 150 years of settlement in the Badger State has been a staggering loss of native habitat.

Consider these historical developments: prairies that once covered more than two million Wisconsin acres are now 99.9 percent gone; 99.98 percent of the oak savannas once covering 15 percent (7.3 million acres) of our state is gone; 17 species of animals have become extinct or extirpated here (four birds, six mammals and seven fish). And we continue to consume the remnants of Wisconsin's biological "capital" at an accelerating rate.

Balancing the books

To protect remaining parcels of Wisconsin's rarest and most threatened natural lands, those concerned about Wisconsin's natural heritage set up a joint public-private venture to encourage private donations and increase our capability to protect significant natural areas.



A rare find now preserved: Plum Lake Hemlocks Scientific Area in Vilas County.

Photo by Michael Mossman

It's called the Wisconsin Natural Areas Match Grant Program, and here's how it works. Each dollar or parcel of qualified land donated to the public for conservation purposes will trigger a dollar-for-dollar match with state funds. Your generous gift becomes

twice as valuable in the quest to maintain the vestiges of Wisconsin's rich natural heritage.

What sorts of places do we want to set aside? DNR's Natural Heritage Inventory Program identifies unique plant communities and properties which need urgent protection.

These biologists and botanists look for high quality examples of native plant and animal communities that have not been disturbed by plows, roads, chemicals and other signs of civilization — places that are home to endangered, threatened or rare plants and animals; places we believe are valuable as a storehouse of nature's gifts.

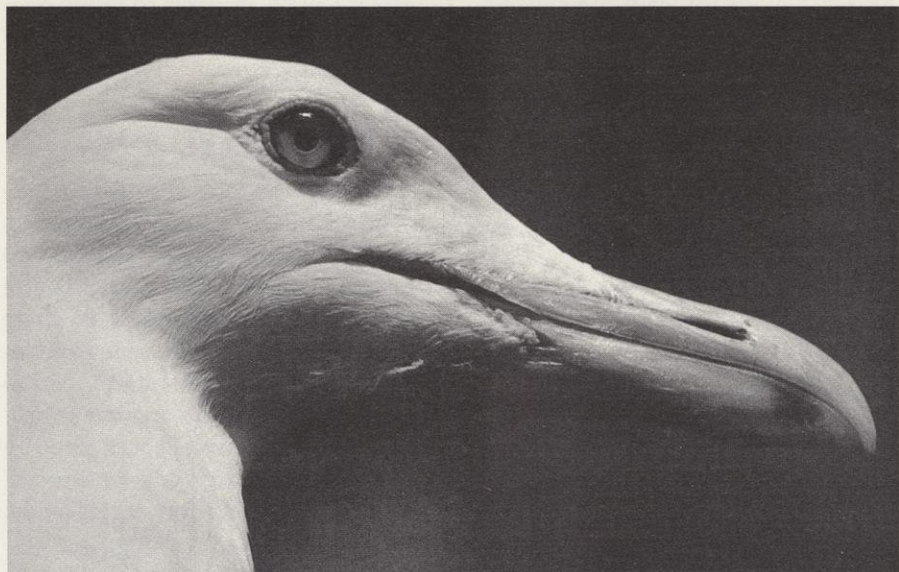
How are unique parcels protected under the Match Grant program?

Once these areas are purchased or donated, the parcels are legally "dedicated" to protect them in perpetuity. Legally dedicated par-

to existing properties, start new projects and purchase new parcels nearer currently managed properties.

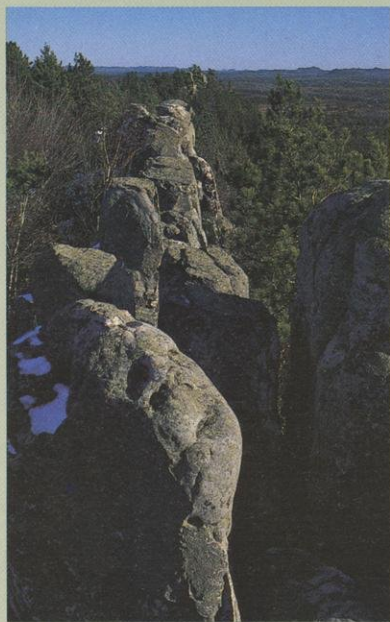
Enoch Reindahl urges others to consider a gift of land to the people of Wisconsin. Donors will gain the satisfaction of creating a perpetual symbol of their generosity and foresight.

On behalf of the people of Wisconsin, I would like to thank Mr. Reindahl for his gift, his insights and his willingness to share his memories of Wisconsin wildlife. ■



Herring gull.

Photo by Enoch Reindahl



A special place — Castle Mound in Jackson County. Photo by Robert H. Read

cels cannot be subsequently sold or developed for other purposes. To maintain the unique features on each property, the Department of Natural Resources, The Nature Conservancy, other agencies, conservation organizations, or individuals are appointed as legal land stewards for each dedicated parcel. These lands need protection from encroaching weedy plants, trees,

cattle and adverse human uses.

Natural areas are often scenic spots with tall trees, cool glades and flourishing wildflowers. But they are too fragile and valuable to use for picnicking or camping. Aside from their beauty, natural areas preserve plant and animal species that hold unknown future benefits for humans. These wild reservoirs could provide the genetic pool for important food crops, pharmaceuticals or natural pest controls and can serve as training grounds that enhance our understanding of the environment.

Natural areas are rich treasures for researching natural history, teaching conservation and preserving our natural values.

Your gift can help preserve traces of Wisconsin's natural heritage.

You can take part in the Match Grant Program:

- Donate land that qualifies as a natural area to the State Natural Areas program. Contact the DNR Bureau of Endangered Resources' Natural Areas Section, Box 7921,

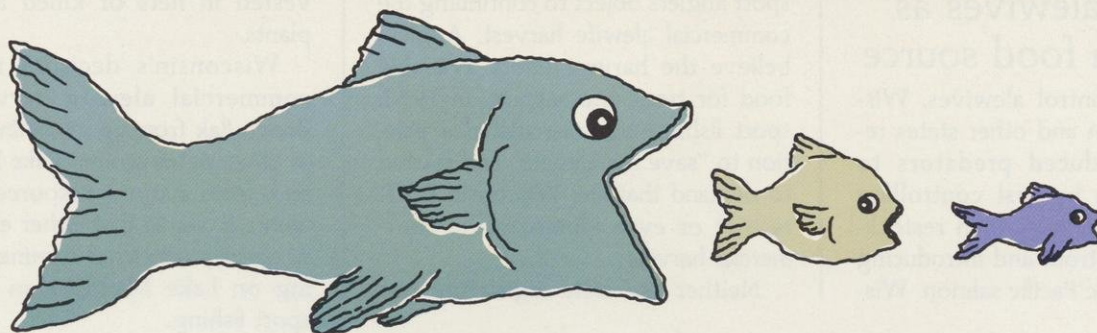
Madison, WI 53707. Paul Matthiae and his staff would be pleased to help you determine if you own a parcel that can be perpetually dedicated and preserved.

- Contribute cash or securities to the State Natural Areas program by contacting or calling The Nature Conservancy's Wisconsin Chapter, 1045 E. Dayton Street, Room 209, Madison, WI 53703, (608) 251-8140.

You can find out more about Wisconsin's natural areas too. *Wisconsin Natural Resources* published a map of natural areas in our November/December 1986 issue. Copies are available from the Bureau of Endangered Resources at the above address. The Nature Conservancy has just published an 88-page book titled *The Places We Save*. The book can be purchased from the Madison office at the above address. It describes 42 of Wisconsin's remaining natural gems — woodlands, prairies, meadows, rivers and beaches.

— Karen Crossley, Development/Communications Director for The Nature Conservancy, Wisconsin Chapter.

Great Lakes Groceries



How will today's food supply shape fishing tomorrow? DNR and university researchers are probing Lake Michigan's depths to count the fish that bigger fish eat.

Richard Hoops

Several hours after an August sunset, the University of Wisconsin research vessel *Neeskay* slid through four-foot swells on Lake Michigan several miles from the Wisconsin shore. In the darkened pilot-house of the 71-foot vessel, the *Neeskay's* captain watched the green image of Manitowoc's shoreline on a radar screen. In a dimly lit cabin amidships, two scientists monitored an array of sonar instruments. Under bright lights at the stern, two biologists pulled in a trawling net, emptied it onto a metal table and began to sort dozens of small fish into glass jars, plastic buckets and bags.

The scientists kept recording underwater echoes, pulling in trawl nets and sorting the catches until dawn, when the *Neeskay* headed back to the harbor at Two Rivers. After a new crew boarded, the boat returned to Lake Michigan and the operation resumed.

This work went on, 24 hours a



Lake Michigan larder. These silvery species of forage fish are the staple food source for Great Lakes game fish. An estimated 300,000 anglers catch 700,000 trout and salmon annually in Wisconsin waters. Commercial fishers haul in about 26 million pounds of chubs, whitefish and perch worth an estimated \$3.5 million.

Photo by Stephen Brandt

day, for 16 days last August and September as scientists trawled and electronically probed Lake Michigan. Their work was part of an ambitious attempt by the Wisconsin Department of Natural Resources to determine how many forage fish — pri-

marily alewives, bloaters (chubs) and rainbow smelt — are in the lake.

The Department of Natural Resources launched the survey to more accurately census forage fish populations and to better understand the changing effects of "alien invasion" in the Great Lakes.

For decades, sea lampreys, eel-like parasites with a jawless, raspy, sucker mouth, annihilated populations of lake trout, top predator in the Great Lakes. Sea lampreys, which migrated into Lake Ontario up the St. Lawrence River, invaded the upper Great Lakes in the 1930s, apparently through the Welland Canal between Lake Ontario and Lake Erie.


Another exotic fish, the alewife, became the dominant Great Lakes food fish after sea lampreys tore open the lakes changing food web. In the absence of predators, alewife

numbers in Lake Michigan reached astronomical proportions. In the mid-1960s, millions of the silvery little fish died and fouled waterfronts around the lake.

Richard Hoops is a science writer with the University of Wisconsin Sea Grant Institute.

Continues next page

Viewing alewives as pest, then food source

 To control alewives, Wisconsin and other states re-introduced predators to Lake Michigan by first controlling lamprey reproduction, then restocking native lake trout and introducing species of exotic Pacific salmon. Wis-

consin anglers object to continuing the commercial alewife harvest. Anglers believe the harvest limits available food for trout and salmon. In 1986, sport fishing clubs circulated a petition to "save the alewife" and started to demand that the Wisconsin DNR restrict or even eliminate the commercial harvest.

Neither the state legislature nor

vested in nets or killed at power plants.

Wisconsin's decision to allow commercial alewife harvest had drawn flak from sport fishing groups in other states around Lake Michigan and from natural resource departments in states that either eliminated or greatly restricted commercial fishing on Lake Michigan in favor of sport fishing.

"Some people thought we were sort of the bad boys of the Great Lakes because we permitted this commercial harvest," Hansen said. "The other states asked 'How can you let your commercial trawlers snatch all the prey that are so important to the trout and salmon fishery?'"



The "big three" on Lake Michigan's dinner plate are (top to bottom) alewife, bloater (commonly called "chub") and rainbow smelt. Big fish eat 'em all!

Photo by Stephen Brandt

consin put more pressure on alewives by encouraging commercial trawlers to harvest them.

The strategy succeeded. The trout and salmon gobbled up alewives, and trawlers harvested alewives to sell to pet food companies. In addition, stocked trout and salmon started to boost tourism by drawing thousands of anglers to lakefront communities. (Sport anglers now spend between \$10 million and \$20 million a year in nine Wisconsin counties along Lake Michigan, according to Richard Bishop, University of Wisconsin Sea Grant fisheries economist.)

Now, sharp disputes have erupted between the commercial and sport fishing groups, whose interests often rest on either the alewives or the fish that feed on them.

Alewife numbers have dropped significantly in recent years, and some

the department could readily accept that proposal, said Michael Hansen, DNR Great Lakes sport fishing specialist.

"Our legislature takes a dim view of putting people out of jobs on hearsay or a whim," Hansen said. "If, in fact, alewife populations are low and the fish are at a premium, the state might decide to eliminate the commercial harvest, but we won't recommend that without hard evidence."

Evidence to verify the abundance of Lake Michigan's forage fish was weak, Hansen said. Alewife numbers in Lake Michigan appeared to have fallen about 85 percent since the mid-1970s, but the reasons for the decline were not completely understood. Furthermore, current population estimates don't match the number of alewives that fisheries managers believe are consumed by predator fish, har-

A lakewide survey

To assess the state's commercial fishing policy, to resolve conflicts between sport and commercial fishing groups, and to better manage their own trout and salmon stocking programs, Wisconsin DNR fisheries managers began to survey the size, weight and distribution of Lake Michigan's forage fish. The three-year project will cost more than \$400,000 and will be funded from Wisconsin's share of the Dingell-Johnson tax money.

Fish don't respect state boundaries, so DNR managers planned to cover all of Lake Michigan. The Department of Natural Resources took the *Neeskay* on a shakedown cruise through Wisconsin's Lake Michigan waters during October 1986 and on a two-week research cruise around the whole lake in May 1987.

DNR mounted a major survey of the whole lake last August and September with the help of scientists and crew from the U.S. Fish and Wildlife Service, the Michigan Department of Natural Resources, the University of Wisconsin and the University of Maryland. Four ships, including the *Neeskay*, worked off the shores of Wisconsin, Illinois and Michigan using sonar equipment, trawling nets and underwater TV cameras to sur-



The electronic "fish" is hoisted aboard the *Neeskay*. The "fish" transmits sounds and records echoes used to census fish populations.

Photo by Richard Hoops

vey sites between Manistique, Michigan and Waukegan, Illinois on the west shore and between the Michigan cities of Benton Harbor and Charlevoix on the east shore. The department will survey the whole lake a third time late this summer or early this fall.

The two principal investigators for the DNR survey are James Kitchell, University of Wisconsin-Madison limnologist, and Stephen Brandt, University of Maryland fisheries biologist at the Chesapeake Biological Laboratory. The survey is coordinated by Brandt and Donald Stewart, an assistant professor with the State University of New York system. Brandt developed hydroacoustic techniques for assessing Lake Michigan's alewife abundance during his doctoral work at the University of Wisconsin-Madison. Stewart developed the first estimates of salmon and trout predation

throughout Lake Michigan as part of his doctoral work at UW-Madison. Both projects received support from the UW Sea Grant Institute.

Hydroacoustic technology may provide the extraordinary amount of information needed to accurately assess Lake Michigan's forage fish populations, Brandt said. An electronic "fish" is towed alongside the boat and transmits sound pulses into the water about once a second. The device digitally records echoes that bounce back from anything the sound waves hit, a video tape records the information and a computer later "counts the echoes." Millions of bits of information form a detailed picture of the size, number and location of fish. Accurately assessing forage fish abundance requires additional sampling methods, Brandt said.

"Conventional sampling techniques, such as dragging a large net

on the bottom of the lake, can give highly variable estimates," Brandt said. "Fish are mobile and tend to school in large numbers, so you might hit a school and get a lot of them, but the next time you raise the net you won't get many at all. Another limitation of trawling is that it takes a long time to drag along the bottom and pull up the net to see what's in it, so you can't take very many samples.

"The acoustic echoes cannot tell us what species we're looking at, only how many fish are there, so we use other techniques to identify the species," he said.

Trawling and sorting the catch by species help determine the percentage of each species detected by the hydroacoustic equipment, he said, and underwater television surveillance complements information from the trawls.

Making sense of the census

"The quantity of forage fish in the lake at any one time doesn't tell you the total amount of food there for predators to eat," Stewart said. "Some fish are dying; the others are growing every day. This total balance of biomass, as it's growing and dying over the whole year, estimates fish production. To know how many trout and salmon you can put in the lake, you

have to know the production of the different kinds of forage fish. Some species produce more young than other species. Some species grow faster than others. Some die at a faster rate than others."

With support from the Department of Natural Resources and the UW Sea Grant Institute, Stewart is developing computer models of fish bioenergetics, fish predation and forage fish production that will help determine how many trout and salmon

Lake Michigan can support.

"For example, when numbers of alewives decline and numbers of bloaters increase, we would like to know what that means in terms of the lake's carrying capacity for trout and salmon," he said.

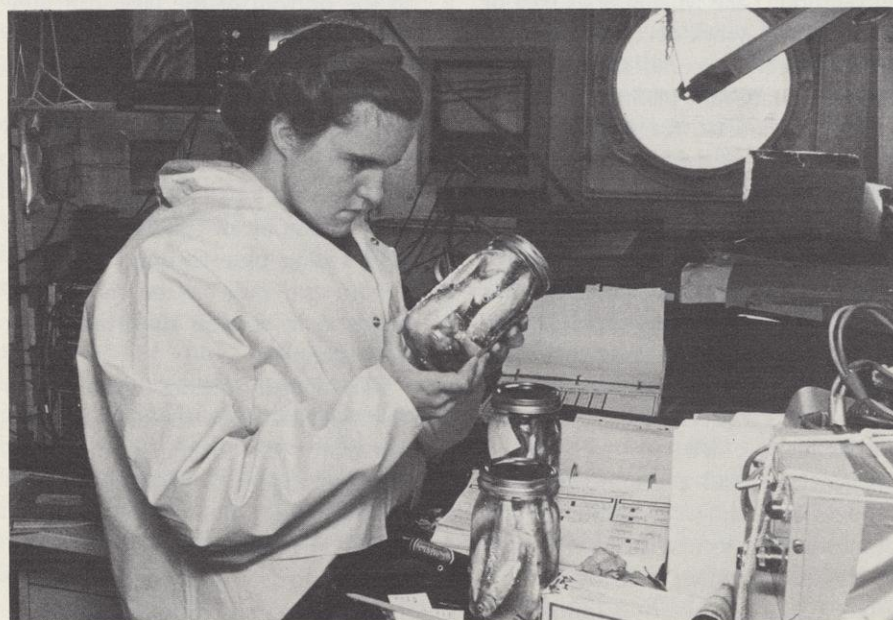
Stewart said this understanding of Lake Michigan fish production might be compared with knowing how many pounds of tomatoes are in a garden on one given day compared to how many pounds a garden will yield in an entire season.

"If you go into your garden at any one time in summer and weigh all the tomatoes there, you'll get a single estimate of the biomass of tomatoes," he said. "But if you weigh all the tomatoes picked throughout the summer, it may be 10 times as much as you had on that one day. The same holds true for fish. You look for total production, not just how many million pounds of alewife are in Lake Michigan on one given day."

The DNR assessment of Lake Michigan forage fish abundance will be completed in 1989. The intense scrutiny DNR managers are giving Lake Michigan is a tribute to remarkable changes in the fishery's health along with human knowledge and perceptions of the lake as a recreational and economic resource.

"We stocked salmon to do something about alewife abundance," Hansen said. "The fact that such a tremendous sport fishery evolved from that stocking indicates that alewives really aren't bad; they are even fairly useful."

"We look at it in terms of managing our stocking program to keep alewife abundance down but not to eliminate them," he said. "I think we view them now as a commodity of value just as we view the native forage fishes — the bloaters (chubs), yellow perch and emerald shiners." ■



(top) Janet Barnes and Stephen Brandt, both of the University of Maryland, sort the catch during a night trawl for forage fish near Manitowoc last August.

Photo by Richard Hoops

(bottom) Pickling fish for future research. Jennifer Wurzbacher examines and records information about netted fish — important links in understanding Lake Michigan's food chain.

Photo by Richard Hoops

Among friends - a new look at lake plants

"The sober citizen who would never submit his watch or his motor to amateur tamperings freely submits his lakes to draining, filling, dredging, pollution, stabilization, mosquito control, algae control, swimmer's itch control, and the planting of any fish able to swim. . .

Men too wise to tolerate hasty tinkering with our political constitution accept without a qualm the most radical amendments to our biotic constitution." — *Aldo Leopold*

*Ed Jepsen, Frank Koshere
and Mary Ellen Vollbrecht*

With approximately 15,000 lakes statewide, Wisconsinites enjoy plentiful recreation on the water. Lakes mean fun, sun and big money. Nine of Wisconsin's 10 top tourist attractions are lake related.

But, being "among friends" in and around Wisconsin lakes can mean tangling with excessive plant growth, risking swimmer's itch and enduring other aquatic nuisances. While causes are numerous, weedy lakes are often a sign that natural conditions are out of balance.

Consider that lakes are settling basins where the water stops, or at least



It's known as *Myriophyllum spicatum*, commonly called Eurasian water milfoil, an invasive lake "weed" people want to control. Smallmouth bass and panfish use it for shelter and eat insects growing on its feathery leaves.

Photo by Dave Marshall

lingers, and whatever the water carries also stops or lingers. Because of this natural catchall characteristic, some lakes in fertile watersheds, especially those draining developed areas, have huge surpluses of nutrients to grow plants.

Unfortunately, the long-term consequences of repeated short-term controls to curtail aquatic plants are not well understood. Just like a per-

son, a lake on too rich a diet shows imbalances. The plants and animals targeted for control may be — and frequently are — natural, vital parts of lake ecosystems. Moreover, indiscriminate control measures can harm fish, the insects they feed upon and beneficial plants. Ultimately, treating the symptoms does not eliminate the runoff of nutrients, sediments and toxicants that cause lake problems.

Updating Wisconsin's ANC Program

Reports of abundant plant growth in some Wisconsin lakes date from the mid-1800s. By the early 1900s, municipalities began chemically treating public waters. The City of Madison was first to apply copper for algae control, in 1918. And by the mid-1930s, aquatic nuisance control (ANC) chemicals were applied with little regulation or supervision. These treatments affected recreational wa-

Ed Jepsen is an environmental specialist with the Bureau of Environmental Analysis and Review. Frank Koshere is a water pollution biologist for DNR's Northwest District. Mary Ellen Vollbrecht is a shoreland management specialist in the Bureau of Water Regulation and Zoning.

ters statewide.

In 1938, controversy arose between sports groups and property owners about ANC treatments and water quality. Responding to those concerns in 1941, Wisconsin's legislature mandated state control over chemical treatments of algae, plants, leeches and other aquatic nuisances. For a while and for a fee, the state provided workers and equipment to do the job. Eventually, requests for ANC treatments grew too large for the state to carefully administer. Local public agencies and private groups took over the job of treating waters under state supervision.

Attitudes about chemically treating lake plants have continued to change. The number of lake acres treated with chemicals has generally declined, fewer types of chemicals are used and overall chemical dosages have also decreased. Even with these trends, ANC remains very controversial.

For one thing, people are more health conscious. They watch what they put in their bodies. Second, a growing group of people are leery of chemicals and the long-term consequences of chemical exposure. Third, people want to choose which chemicals they will risk exposure to. Fourth, people who value the outdoors but don't own wild lands are asserting their rights as users of public lands. Lakeshore property owners no longer have a sole voice in managing lakes.

The Department of Natural Resources, which specifies guidelines for implementing Wisconsin's ANC program, is redrafting the rules and administrative codes. The changes intend to base aquatic nuisance control measures on more sound ecological footing. Effective chemical controls would only be considered appropriate when no other reasonable management techniques can be used. A major challenge in revising these rules is managing interests of various lake users and numerous private shoreland owners.

An environmental assessment which recommended ANC program changes will be published this spring.

A citizen review panel representing environmental groups, ANC (chemical and harvesting) industries, Native Americans and others helped review the document and prepare recommendations. You will have a chance in June and July to comment on the proposals at informational meetings and rule hearings.



Shallow water plants harbor schooling minnows and fish fry throughout the fishing season.

Photo by Dave Marshall

Tentatively, public hearings on the rule revisions are scheduled in Madison for the last week of July.

The Department of Natural Resources is updating the Aquatic Nuisance Control Program to:

- provide a forum for discussing ANC program revisions
- clarify ANC policies, suggest changes and document the process
- offer information on lake protection and enhancement
- identify ANC data gaps and research needs
- promote ongoing ANC cooperation between public and private sectors

Copies of the environmental assessment, recommendations for ANC changes and information about the meetings can be obtained from Ed Jepsen by writing to DNR's Bureau of Environmental Analysis and Review, P.O. Box 7921, Madison, WI 53717 or by calling (608) 266-5386.

- increase understanding of the interdependence of lake and watershed
- present long-term aquatic ecosystem management concepts.
- promote understanding that human activities can cause lake problems.
- provide a procedure to balance interests and concerns of people who want to treat aquatic plants with those who do not want to treat plants.
- set an ANC fee structure which more accurately reflects the costs of supervising this program.

Who needs "weeds?"

Swimmers, boaters, anglers, hunters, trappers — almost all refer to lake plants as "weeds." That's a bum rap. Weeds are "any undesired, uncultivated plants that crowd out a desired crop." By contrast, aquatic plants provide food, shelter and protection, and their healthy variety improves water quality.

Plants, remember, support the food pyramid. Plants, and only plants — aquatic or terrestrial — convert sunlight into food. So, directly or indirectly, all animals — finned, footed or feathered — must eat plants. In the aquatic realm, bluegills, for instance, eat aquatic plants and aquatic insects that feed on aquatic plants. Even aquatic plants that die and sink to the bottom are a food source for many aquatic creatures living in the murk.

By contrast, bullrushes resist decay and remain standing long enough to fulfill another function. They become this year's spawning sites for northern pike. The stems support the sticky fish eggs, which adhere safely above



Potamogeton crispus alias curlyleaf pondweed or curly cabbage. Its long, wavy leaves provide some fish cover. It grows rapidly in early spring and dies back by midsummer. Photo by Dave Marshall

suffocating bottom sediments. Similarly, musky fingerlings depend on aquatic plant residues to survive. Without such shallow cover early in the year, young muskies cannot establish safe "home" territories and are more likely to be eaten by predators.

The sheltering effects of aquatic plants benefit land too. Emergents, like rushes, curtail shore erosion by slowing wave action year-round. These species are common along the shallow, sandy shorelines of large windswept lakes. Submergent aquatic plants also reduce erosion, but they

don't last through the fall and into the spring when high water and windy weather can cause the most damage.

Lake rehabilitators can take advantage of the fact that aquatic plants must compete for available nutrients. Stands of rooted aquatic plants consume enough nutrients to limit algae growth and keep open lake waters clear. Since many nutrients seep into lakes via stream inlets, stands of rooted aquatic plants strategically located along streams and at stream mouths can naturally filter nutrients.

In very fertile waters, the competition between rooted aquatic plants and algae can go askew. The one-celled microscopic algae reproduce and grow quickly. Given sufficient nutrients, a dense "bloom" of the tiny aquatic plants can develop within days. As they increase, algae shade out the rooted aquatic plants, which cannot survive without adequate sun shining through the water. Then, nu-

trients released during decay further fuel the algal growth.

When this happens, controls may be needed. The key to revitalizing problem lakes is to restore ecological balance. Healthy lakes have diverse populations of both rooted aquatic plants and algae. Generally, 30 percent to 50 percent "weed" cover is optimum, and shallow zone vegetation is especially significant.

Some ABCs of ANC control measures

Controlling unwanted aquatic plants usually means choosing among many possible approaches. Whatever the chosen strategies, they should be based on a lake management plan that identifies alternative control measures and considers their effects on the lake ecosystem as well as costs and time to complete them.

A new key to lake plants, "Guide to Wisconsin aquatic plants," will be available from DNR's Bureau of Water Resources Management in July. Write DNR, WR/2, P.O. Box 7921, Madison, WI 53707.

Several strategies aim to alter aquatic plant growth: *physical controls* inhibit growth; *chemical controls* slow growth or are toxic; *biological controls* increase competition or predation; and *cultural controls* reduce water pollutants that feed growing plants.

Most physical and chemical options provide short-term relief lasting several weeks to several years. They treat symptoms, not causes of lake problems. Biological and cultural options can achieve long-term improvement, but these approaches are exper-

imental, costly, and may take a long time to show improvements.

Physical Controls — The most popular physical control techniques are: plant harvesting, plant cutting, lake drawdowns, and installing light screens which smother plants. Other techniques, such as dredging and lake aeration, are very expensive and require lots of equipment and maintenance. Dilutional pumping or dyes only reduce lake plants in rare cases where the lake is tiny or there's a nearby cheap source of nutrient-poor water.

Hand weeding or raking near shore plants is inexpensive (\$10 - \$100 for equipment). Raking and cutting selectively removes undesirable plants, decaying matter and nutrients from lakes. No permit is required. However, raking and pulling even small areas can be very hard work, it won't control algae or swimmer's itch, and you may have to harvest plants several times every season.

Mechanical harvesting is becoming more popular throughout Wisconsin. Harvesters are used on more than 70 lakes to remove large quanti-

Midnight weed wars

Many lake property owners are taking aquatic nuisance control into their own hands. They are buying herbicides through the mail or over the counter and applying random chemicals without permits along lakefronts statewide.

DNR investigations show that nearly 1,000 Wisconsinites purchased lake weed killers in 1986 — but very few of these customers also obtained the required permits.

Those figures do not include nonresident offenders. One DNR water pollution biologist believes additional herbicides are being "imported" into Wisconsin. Like their Wisconsin neighbors, lake property owners from Minnesota, Illinois and other states are also illegally treating their lake frontages.

Chemically treating lakes without a permit can seriously risk disrupting pond or lake ecosystems. Using the wrong chemical, the wrong amount, treating at an inappropriate time (during fish spawning or rearing), or treating under adverse conditions can be ineffective and damaging. Property owners who consult with department staff can learn when chemical use is the most effective and sound means of improving lake condi-



Elodea provides fish cover and food. Know your plants before you decide they are weeds and don't risk harming fish, anglers and swimmers by indiscriminately dumping chemicals in our lakes.
Photo by Dave Marshall

tions. If treatment is needed, proper chemical use and application can help protect the applicator, other lake users, and the environment.

Permit applications also provide time for the department to share information with other lake users. The public has a right to know when and where lake chemicals are used. For obvious reasons,

unpermitted users don't advertise the fact they've just treated their lake frontage. Drifting herbicides can expose neighbors or anglers to chemicals and breakdown products. Since it's risky to swim, fish or swallow water where some lake chemicals are applied, responsible neighbors and citizens consider the needs and wishes of their fellow lake users as well as their own desires.

Whether people are merely unaware of the permit requirement or are consciously circumventing the process is unknown. The department is cooperating with the Wisconsin Department of Agriculture, Trade, and Consumer Protection and the Minnesota departments of Agriculture and Natural Resources to remedy this widespread problem. These agencies are working with the chemical formulators to require written directions on chemical canister labels that clearly state that permits are required in Wisconsin and Minnesota. Alerting potential customers to these requirements may help. Also, the Department of Natural Resources will continue working with lake districts and associations to detect and discourage home treatments of public waters.



Weeding the waters

- ☐ Harvesters effectively cut lake plants but can't work in very shallow waters. You'll probably have to rake or pull weeds at the shoreline.

Photo by Robert Queen

- ☐ Time cuttings to avoid harvesting small fish and fish eggs.

Photo by Robert Queen

- ☐ Newfangled water rakes do a good job of bringing in lake weeds by hand from a wide area.

Photo by Robert Queen

- ☐ Selective lake weed spraying is a job for professionals only if all other techniques won't work.

Photo by Dean Tvedt





Sediments and nutrients scouring off shorelands are a triple threat — excess food for lake plants, silt that smothers spawning fish and eggs, and eroded soil that scars landscapes.

Photo from a DNR/UW-Extension project

Lakes need a balance of underwater, floating and emergent vegetation to support fish, wildlife and healthy insect populations. Sometimes, looks are deceiving. This attractive flowering plant is purple loosestrife. Often called "the purple peril," loosestrife spreads rapidly, choking out marsh foods and shelter while clogging waterways. Special controls are warranted in this case.

DNR photo



ties of vegetation, cut boat or fishing lanes, and clear swimming areas. No permit is required but there are drawbacks. Harvesters scoop up fish fry as well as plants, the machines do not selectively remove nuisance plants, and they won't relieve algae or swimmer's itch problems. Harvesters and accessory equipment can cost \$30,000 to \$120,000 to purchase and several thousand dollars every year to use and maintain.

Drawing down lakes is inexpensive and gives homeowners and volunteers time to clean up or repair shorelands. This technique can only be used on lakes with dams that can lower and then raise water levels. Typically, the shoreland is less attractive during the drawdown.

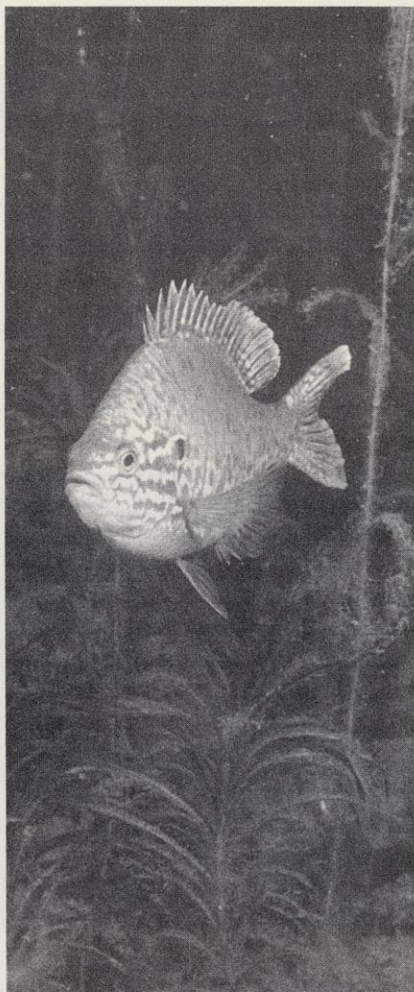
Light screens are reusable and control plant growth well. The more effective screens on the market are expensive and they must be cleaned, stored and reinstalled every year.

Chemical controls — Herbicides can provide very effective short-term relief from some plants and whole season relief for larger, rooted plants or filamentous algae. Floating algae blooms, however, are difficult to control. Weekly or bimonthly treatments are common on some lakes in Wisconsin. Swimmer's itch, a real nuisance, is very difficult to control. Copper treatments are the only viable control tool, but their effects are short-lived.

Though chemicals can be an effective management tool, they continue to be highly controversial because waters shouldn't be used for a certain period after treatment, chemicals are potentially toxic to desirable plants and animals, and many people resent exposure to chemical products whose effects have not yet been fully determined.

Chemical treatments cost approximately \$50-\$200 each season per property owner. *A permit for any chemical treatment is required.* As a rule, DNR aquatic managers believe chemical treatments should only be considered when all other options are infeasible.

Biological Options — The two



Panfish like pumpkinseed are perfectly at home in the pondweeds. Photo by Dave Marshall

most widely studied biological lake techniques in the United States are adding grass carp and "biomanipulation." Some states introduce grass carp to eat away lake plant problems. *Grass carp are illegal in Wisconsin* because fish managers doubt that their natural reproduction can be controlled. Grass carp may outcompete native fish and eat desirable plants. Biomanipulation is an interesting technique in which game fish (northern and walleye) are stocked to prey on small forage fish. Since forage fish eat even smaller fish and insects, when forage fish populations drop, more zooplankton (microscopic animals) should be available to eat algae. The concept would improve fishing and water quality. We're experimenting with this technique in Lake Mendota (Dane County).

Other biological control strategies include using insects, diseases, planting more desirable plants and stocking exotic fish species. These techniques, in general, are still in the research stage.

Cultural Controls - Controlling nutrient and sediment sources from human sources like wastewater plants, farms and cities offers the soundest long-term means to protect and improve our lakes. In complex situations, forming an efficient lake management organization can help communities assess and economically finance lake improvement goals.

A lake plan can be prepared by any group willing to devote some time to it. The best plans are prepared by those most directly affected by lake problems, people who also care enough to turn the paper plan into action — lake groups, anglers, civic organizations and lakeshore homeowners. While professional assistance from DNR and other agencies can help, it's often more effective to get your ideas on paper, then have them reviewed by agencies.

Here are two ways to start: invite residents and lake users to a session where you'll list and rank lake problems and goals, or recruit volunteers to survey people and investigate where lake problems originate. Select the best solutions, estimate a timetable and suggest which group should be responsible for completing each action.

With a proposed plan of action in hand, local groups can ask municipal officials, DNR planners, businesses and other volunteers to review the draft lake plan. DNR's Bureau of Water Resources Management can share some completed lake plans so local groups can see the kinds of information other communities built into their action plans.

Improving lake quality may come slow or fast. Costs may be insignificant or substantial, but a coherent plan to treat the causes and not the symptoms of lake problems should yield long-term dividends. ■

Sand traps improve trout streams

A trick for cleaning streams and trapping sediments.

Jay Hutchinson and Allan Taylor

A backhoe drives up to a stream, the bucket lowers and the driver proceeds to scoop out yards and yards of sand from bank to bank. It's tedious work, slowly moving down the bank and into the stream, gouging sand and silt from the bottom. The silt/sand mix is plopped along the top of the streambank. What's going on in your favorite Wisconsin trout stream? What's the operator up to? Why is that machine ruining the spawning beds of your favorite stream?

It isn't. In fact, the machine is improving fish habitat in the stream for years to come. The driver is installing a sand trap — a simple, effective method of trapping silt and sand that's being tested on some trout streams in Michigan and Wisconsin.

It works like this: Upstream from a likely trout area, backhoes dig a sediment basin across the stream about two or three times as deep as the stream is wide. As water flows downstream across this deep ditch, the current slows enough that sand and silt settle into the ditch. Yearly, this material is dredged out. In some cases, the spoil is spread along the edge of the stream. It may be planted with rye or allowed to vegetate naturally for wildlife browse. In most cases, however, it has to be hauled away or distributed on a nearby upland area to protect wetlands.

Jay Hutchinson and Allan Taylor work for the U.S. Forest Service's North Central Forest Experiment Station in St. Paul, MN.



Foresters dug fancy ditches in trout streams to trap silt and sediment and they really work. Even this 150-foot-long, 20-foot-wide sand trap must be cleaned out annually.

Photo courtesy of U.S. Forest Service

The granddaddy of stream pollutants

With all our concern over chemical pollutants, it's easy to forget the granddaddy of all stream pollution is sediment. In northern Wisconsin, most of the silt that clogged streams was caused by reckless and random logging that swept across the northern pine belt around the turn of the century. Cutting trees along the streambanks and rafting them down the rivers stripped off the topsoil and subsequently eroded the banks. We will still occasionally recover an old log buried in stream muds that shows the stamp of a regional logging company. Log drives also ramrodded trees and logs lodged along the edge of the stream or lying across it. These logs provided essential shade and cover for growing fish.

Why trap sediment?

Stabilizing streambanks will slow but not stop erosion. A little silt and sand continues to flush downstream slowly, about a mile a year. The continually moving sand covers up insects that dwell on stream bottoms. Fine soil particles fill in pools and undercut streambanks where trout like to lie in wait for drifting food. Even though the water may not be murky or muddy, the fine sand washing downstream is a kiss of death for trout. According to Ed Hansen, hydrologist with North Central Forest Experiment Station in Rhinelander, who researched northern trout streams for 10 years, this sand movement was "...like dragging a sheet of sandpaper over the bottom. It scours away aquatic insects, covers spawning areas and fills in holes on the stream bottom."

Hansen adapted a technique used to build irrigation canals so it would work on trout streams. He estimated that more than half the mobile sand could be removed by digging a trap or basin in the stream bottom to catch it.

Sand traps installed on one test stream trapped 86 percent of the sand and 10 percent of the finer sediment. That's better control than we achieve by fencing out cattle, stabilizing streambanks or planting grass seed. In a reverse test, researchers dumped sand in another good trout stream for five consecutive years. Trout production dropped by half. When investigators stopped adding sand and removed what they had deposited, trout increased to previous levels.

Sediment controls pay off soon after basins or traps have been installed. Pools deepen, providing more shelter and hiding places. Hollows around undercut banks, sunken logs and large stones remain open. Stream flow becomes more irregular because the bottom is no longer a smooth, unbroken surface of sand that rapidly shoots water over the sheet-like surface. Water crashes against stones and boulders. The bubbling, frothing turbulence oxygenates the stream and churns up food like water fleas. Mature trout rest and feed down-



A backhoe scooping silt above a spawning bed.
Photo courtesy of U.S. Forest Service

stream of rocky obstructions. By trapping moving sand, fewer aquatic insects and invertebrates trout eat get scoured off.

These sand traps are especially useful on streams feeding into the Great Lakes because healthy streams produce bigger, stronger smolt — the young trout and salmon ready to migrate into the lake.

Riffles now have ridges

Ed Avery, DNR fisheries biologist and coldwater fisheries researcher at Waupaca, has gone one step beyond the basic sand trap in one Wisconsin stream. When a sand trap on Chaffee Creek (Marquette Co.) failed to produce gravel areas necessary for trout spawning, he constructed several



Rock sills on Chaffee Creek protect this spawning riffle.

Photo by Ed Avery

rock "sills" or ridges across the stream at 20-foot intervals. Between the sills, Avery laid down a 16- to 18-inch blanket of mixed gravel. The sills keep the gravel from washing away during high water.

"We use sand traps to improve natural trout reproduction downstream," Avery says. "The trap on Chaffee Creek was constructed in February 1986, and the rock sill and gravel spawning riffle was installed last October. The sand trap will keep the gravel spawning riffle clean of sediments and help sustain natural reproduction where none previously existed."

DNR staffers are trying sand traps in three other locations. Brook trout populations have increased moderately in Hay Creek (Chippewa Co.)

two years after a sand trap was installed. Twenty-five pair of mature brown trout were transferred to the stream early last October. It's too early to judge success. A population check is slated for August.

Recently, sand traps were installed on Waupee Creek (Oconto Co.) in February 1987 and the Upper Middle Inlet (Marinette Co.) in July 1987.

Sand traps have their place, but they are not a cure-all. Some streambeds are highly erodible and may erode excessively when basins are dug. Traps also have to be cleaned out about once a year. The accumulated sand or spoil dug from a stream is unsightly and has to be spread out and seeded or hauled away. And finally, basins need to be marked as deepwater hazards to warn anglers who could take a neck-deep dip in hip boots.

Still, these simple sand traps can be more than just Band-Aids on damaged streams. They can be major medicine in the recovery from the silty ills plaguing some Wisconsin trout streams. ■

Readers Write

WATCHABLE WILDLIFE

I would like to compliment you on your special issue of *Wisconsin Natural Resources* featuring "Watchable Wildlife." A copy of this issue was routed to the personnel in our Nongame Wildlife Program, and I enjoyed it very much. It was well written, and the photographs were very good. I would like to see our department produce an issue of *Wonderful West Virginia* magazine along similar lines.

Craig W. Stihler
Wildlife Biologist
West Virginia Department
of Natural Resources

Your Watchable Wildlife issue was great, excellent, fabulous. . . In other words, keep up the good work.

On a different note, I recently was very upset to learn from several sources that although the devastating effects from DDT are so widely known and the United States has totally banned its use, it is still being produced in the United States and shipped for use to other countries. Many of our eagles, peregrines and other birds migrate to these countries.

I don't intend for you to get into the political aspects of this issue, but I see this as a serious crime. Are any efforts being made to stop this insanity? Is there anything we as citizens can do to put an end to this environmental abuse?

Wisconsin and other states spend millions of

dollars and countless hours propagating and reintroducing peregrines, bald eagles and other endangered species (many endangered because of former DDT use in the United States). Our birds don't stop at the border, yet their protection and quite possibly their survival does.

George A. Gutmann
Wauwatosa, WI

Several state and federal environmental groups are working to encourage sound pesticide use and management. Through DNR's newsletter, VOICE, you can ask state conservation and environmental groups whether their organizations are actively pursuing a certain issue. Contact Sally Benjamin, DNR, P.O. Box 7921, Madison, WI 53707. The National Coalition Against the Misuse of Pesticides acts as a clearinghouse to share information about pesticide laws, national policies and issues. Contact them at 530 7th St. SE, Washington, DC 20003.

I surely enjoy reading WNR magazine — always looking for the next issue.

In the January/February issue, I was really enjoying all the pages until I came to a "Readers Write" letter from Prairie Du Chien, making the statement that the magazine should spend less time on fishing and hunting. My wife and I love fishing and hunting. I am sure there are many more that fall in this category and think only of

NEXT ISSUE: DNR Fun at State Fair Theater in State Parks Recycling Tires



themselves. WNR magazine is for all to read and enjoy. Keep up the good work.

Almo G. Thiel
Webster, WI

Congratulations to Artist/Naturalist Virgil Beck, whose painting of women anglers, which appeared in the May/June 1987 issue of *Wisconsin Natural Resources*, won a prestigious Outdoor Writers Association of America/DuPont Stren Art Award, taking first place in the oil or acrylic painting category.

As a follow-up for your readers, I thought I'd share a photo from the 1987 Field Day held on Carl and Cathy Pulvermacher's farm in Richland County. You featured them in my July/August piece on sustainable agriculture. This photo better represents modern, low-input farming. Our Field Day shared two years of field trials of low-input corn, grown with reduced or no purchased fertilizer. Tests show no significant changes in yields, but considerable increases in net profits.

Margaret Krome
Wisconsin Rural
Development Center, Inc.
Black Earth, WI

Light, flexible fencing makes it easy to rotate grazing cattle from one paddock to another.

Photo by Margaret Krome



GO FISH, GO PLAY

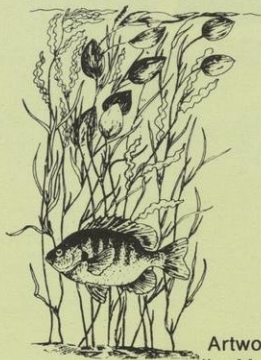
It's fun, it's free and it's a great way to enjoy a summer Saturday. Take a friend, take your whole family or just treat yourself to DNR's outdoor double feature. For one day on Saturday, June 18th, the park gates are open and the fishing is free.

The welcome mat is always out at Wisconsin's state parks, but on June 18th, all entrance fees will be waived for State Park Open House day. It's our way of encouraging you to relax and enjoy a state park. Visit one near home or take a trip and explore someplace new.

Why not wet a line while you're at the park? June 18th is also Free Fishing Day statewide, you won't need a license to fish any of Wisconsin's public waters.

You don't know how to fish? Here's a great chance to learn. Wisconsin fishing clubs are teaming up with fisheries managers and parks staff to teach the basics to anglers of all ages. You don't even need a rod and reel. Fishing clubs will be holding clinics at many state parks and will have extra rods and reels on hand to loan.

Come on! What could be better than a little picnic and panfish in a park? Lunch and lunkers at a landing? Barbeque and bluegills at Big Bay?



Artwork by
Jim McEvoy



Natural Bridge State Park.

Photo by Jim Escalante

SNAP TO IT, PHOTO CONTEST RETURNS

You think those photos from your last Wisconsin outing are something special, above the ordinary?

Why not select a favorite and enter it in the 1988 State Tourism and Parks Photo Contest?

It's easy as ever to enter and you could win one of two grand prize vacation packages — for best-of-show entry in tourism or parks — or one of 36 first place vacation-related prizes.

Your entry could get widespread exposure, too. The first Tourism-DNR photo contest in 1986 drew almost 4,000 entries. Winning entries, honorable mentions — even work that doesn't place — may be used in publications produced by the state tourism or natural resource departments or may be loaned to private publishers.

Here's how it works. The contest is co-sponsored by the State Division of Tourism Development and the Department of Natural Resources. You can submit entries from each of four state "sections": northeast,

northwest, southeast, southwest. (The sections are formed by U.S. Highway 51 running north/south and U.S. Highway 10 running east/west.)

Select one of the following nine categories for each photo submitted:

- **TOURISM** — 1) beautiful Wisconsin (scenics), 2) bountiful Wisconsin (agriculture), 3) friendly Wisconsin (people), 4) historic Wisconsin, 5) enjoying the arts, 6) enjoying sports, 7) enjoying cities (not limited to "legal" cities).

- **PARKS** — 8) enjoying state parks (people), 9) hidden treasures in state parks (scenics, close-ups).

OFFICIAL CONTEST RULES:

1. The contest is open to amateur and professional photographers 18 years or older. Employees of the Wisconsin Department of Development, its advertising agency, employees of the Wisconsin Department of Natural Resources, photo judges and immediate families of above are not eligible.

2. Each print or slide must be labeled with name

and address of the photographer, the name of the community with a post office nearest to where the photo was taken, the section in which the photo was taken (NE, NW, SE, SW), and the appropriate category. Illegible or unidentifiable entries will be discarded. There should be no other correspondence in the envelope.

3. Enter as many times as you wish, but each envelope should contain a maximum of three entries.

4. All photos and slides entered must be previously unpublished. Photos may be taken with any make of camera on any type of film.

5. Black-and-white and color prints must be no larger than 8 × 10 inches. Prints may be flush-mounted but not framed or over-matted. Color slides must be in cardboard or plastic mounts.

6. ENTRIES WILL NOT BE RETURNED.

7. All entries and rights to photos become the property of the Wisconsin Department of Development. Entrants must be able to get written consent of recognizable people in photographs to permit publication of that photo.

8. Entries will be judged on interest, appeal, attractive depiction of Wisconsin and technical quality. Judges' decisions will be final.

9. The Department of Development and DNR assume no responsibility for negatives, prints or transparencies entered in the contest.

10. Entries must be postmarked by Oct. 15, 1988 and received by Oct. 20, 1988. Mail to: Photo Contest, Wisconsin Division of Tourism Development, P.O. Box 7970, Madison, WI 53707.



Great egret nestlings.

Photo by Enoch Reindahl

