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Wisconsin NATURAL RESOURCES

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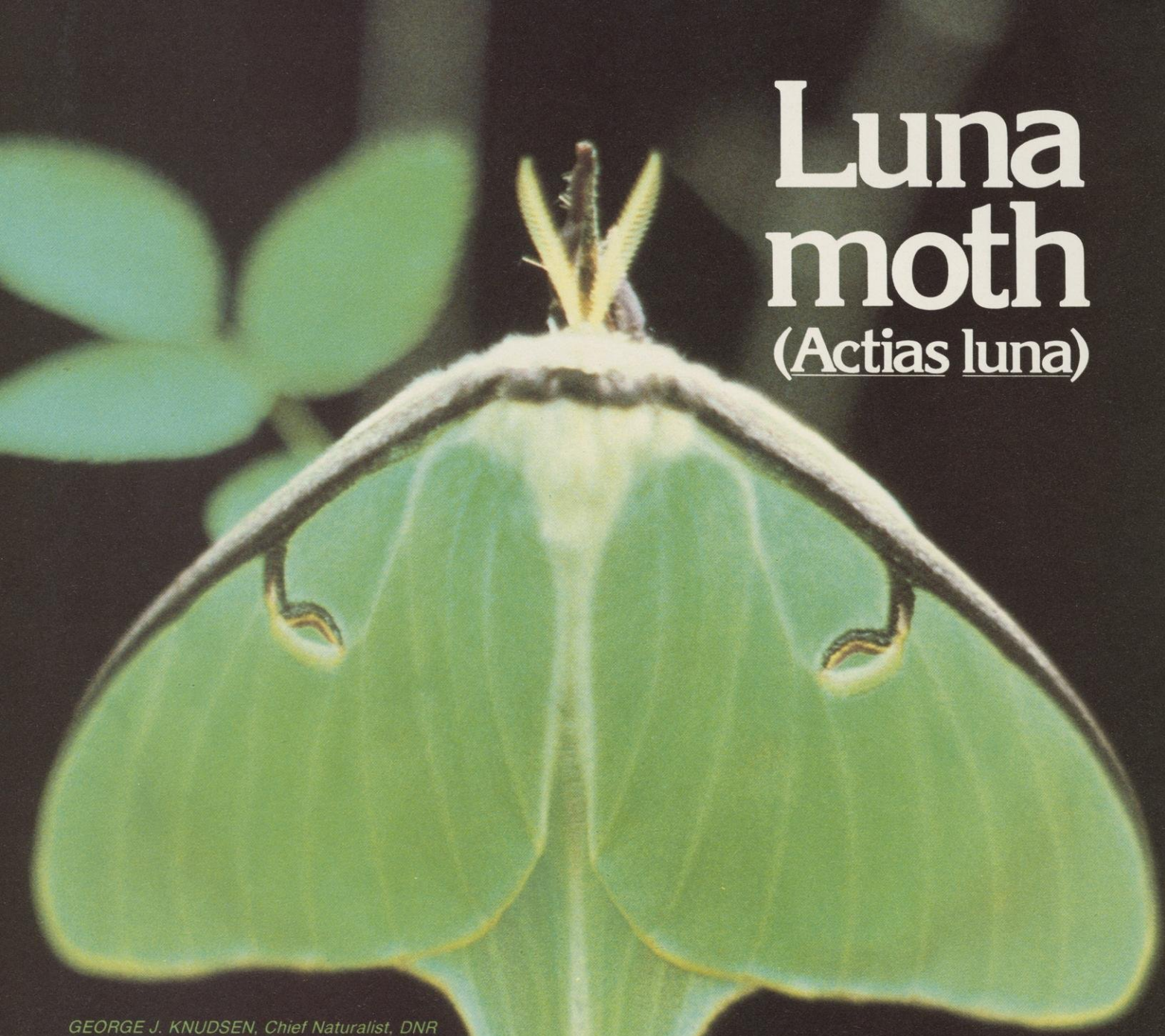
Luna moth (Actias luna)



GEORGE J. KNUDSEN, Chief Naturalist, DNR

Wisconsin boasts six relatively common species of "silk-worm" moths, belonging to the family Saturniidae. They are the medium-size, bright yellow Io, the black and white Buck moth, and the four giants: Promethea, Polyphemus, Cecropia and Luna. The Promethea, Polyphemus and Cecropia moths have complex, very colorful patterns, with tans, browns and pinks predominating.

The Luna moth, pictured here, stands alone in having nearly immaculate, jade green wings. Its forewings are edged with purple; its hindwings taper to long, curved, "swallowtails." Its fully spread wings span 3½ inches; its total length exceeds four inches.

Found statewide, Lunas are commonest in forested areas. Flying at night, in June and July, they are sometimes attracted to bright lights. If you are camping, one might show up at your camping lantern! Try to catch it and look at it, then release it. No, it can't bite! Usually, however, you'll see its ghostlike form fluttering across the road, illuminated by your headlights.

The Lunas' pale green, thumb-size caterpillars have yellow stripes, one on each side of their bodies. Eating leaves of walnut, hickory and other trees, the caterpillars spin silken, egg-shaped cocoons on the ground, where they lie during winter.

All six species are beautiful, the favorites of collectors! I think the Luna is the most striking of all! Cars and birds kill great numbers of these moths each summer. It's not uncommon to see only the wings of the moths on the forest floor, mute evidence of the deaths of these handsome insects in the beaks of birds, or the sharp-toothed mouths of bats!

Now, look again at the picture! Is it really a moth, or is it a charging, green, sleepy-eyed African elephant?

Photo by Barbara Mulvaney

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Special Supplement

Life tracks II: Wisconsin's endangered reptiles, fish and molluscs — Inga Brynildson at page 16

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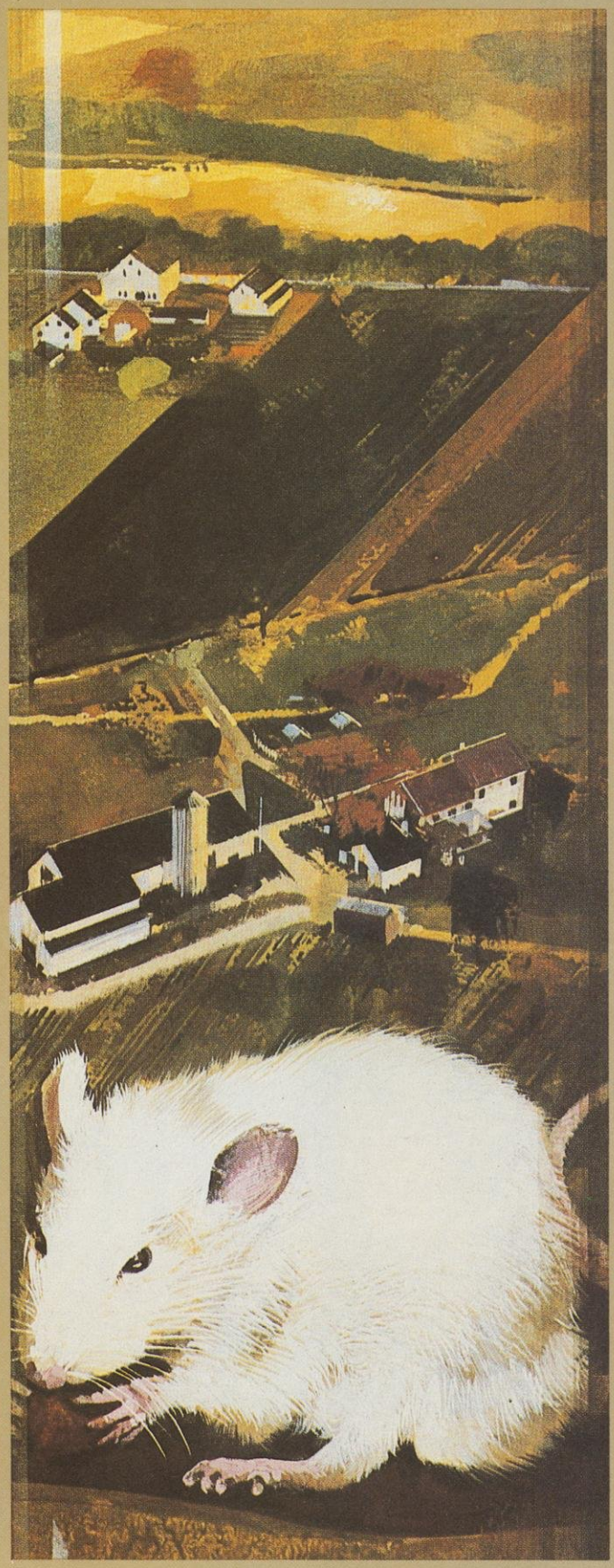
Front cover:
The ornate box turtle is an endangered species in Wisconsin. A special magazine supplement starting at page 16 deals with reptiles, fish and molluscs. Photo by George Knudsen

Back cover:
This brook trout by Tom Rost, Cedarburg, Wisconsin, won the 1981 trout stamp competition. Second place went to Dennis Gorczany, Green Bay, third to William J. Koelpin, Hartland. In all, there were 55 entrants.



Are chemical tests on white rats valid for people? See story on page 21.

WISCONSIN DEPT. OF NATURAL RESOURCES

A place to put some trees

Ernie Brickner is a one man band when it comes to managing his woods. If everyone with a few acres played his tune the music would never end.

PEGGY HOLMES, Stoughton

It's hard to believe Ernie's 68. Especially when you're trying to keep up with him in the woods.

"Let me know if you want to take a breather," he says over his shoulder as he clomps on up the steep, tree-covered slope. Your goal is the ridge, and when you finally reach the top, you stand catching your breath and looking out over a narrow wooded valley.

This hilly pocket of Buffalo County land represents Ernie Brickner's dream — his desire to turn barren land into woodland.

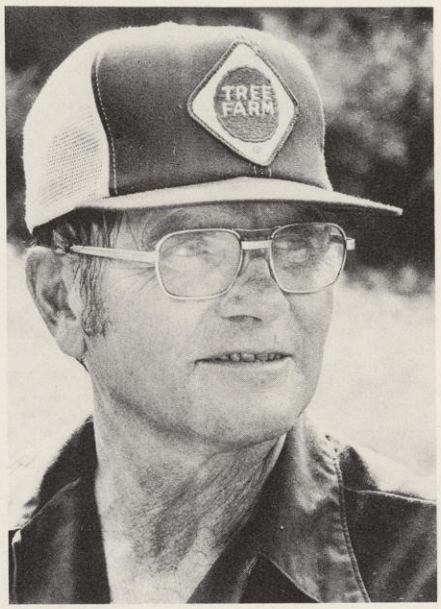
Twenty years ago, he says, you'd stand on the ridge and look down on bare hillsides eroded by decades of unwise farming — on 230 acres of some of Wisconsin's hilliest land. Today the slopes and valley are cloaked with trees — with the green of pine and spruce and the white and brown of birch and other hardwoods awaiting spring.

"It wasn't easy," Ernie admits, looking out at the pine plantations greening the slopes. "I planted 125,000 of them by machine and carried another 35,000 up and planted them by hand."

Ernie knows those trees like a good farmer knows his livestock. He culls the spindly, the ill-formed, the diseased, to give more space, sun and water to the healthy trees. He lops off lower limbs so pine and walnut will grow more valuable, knot-free wood. He takes out a few rows in the pine plantations when the trees start to crowd. It's never-ending work. "I could work 'til I'm 90 and not finish," he says.

But that's the way it is with dreams. And Ernie's dream has been to reclaim some dying land, reforest it and make it valuable. Valuable not only for the timber it can produce, but for wildlife, for recreation, and for education.

Ernie and his wife Marie live in Whitehall. Son Tom is a major in the Air Force, and son Tony teaches math in Whitehall. A former teacher himself, then principal and superintendent, Ernie is retired now, but is more active than ever — church and civic organizations, and conservation groups. He's the president of the new Wisconsin Woodland Owners Association. But his first calling is his woodland.



Ernie Brickner. "Too many people take from the land and fail to put anything back."

"I've always had a fascination with trees," Ernie says, trying to explain why he devotes so much energy to this land. Born in 1912, the youngest of 12, Ernie was introduced to the value of the woods early in life. "As a kid, I picked up butternuts and sold them for $1 a bag. I suppose a bag's worth about ten bucks today."

The dream began to take shape in 1959 when Ernie returned to Whitehall after a stint as education officer for a Job Corp program in Superior National Forest. "I was looking for a place to put some trees," he recalls.

Now, twenty years later, Ernie stands on top of a tree-covered ridge counting hardwood logs — the first timber harvest from his land. Sure, he's sold smaller trees — about 1,000 cords of pine plantation thinnings this winter, but they went to the pulp mill. These big hardwood logs will be cut into railroad ties and lumber.

Ernie leads you into a pine plantation through a path packed hard by snowmobiles. The trees grow in long, straight rows. Piles of dead branches lining every fourth row are evidence of thinning. "Grouse and rabbits use the brush piles for cover," Ernie explains, adding that owls perch above the brush waiting to swoop down on any small creature that ventures beyond the cover.

How does one man manage to keep up with all the pruning and thinning necessary in a plantation this size?

"Oh, I get lots of help. Whenever I get a visitor, I hand him a chainsaw," he chuckles. "I keep 15 of them on hand." Local farmers help Ernie in the woods in exchange for help at planting and harvest time.

Besides help with the work, Ernie is quick to acknowledge the guidance he's had over the years from DNR Forester Ed Godel. He advises every woodland owner to draw up a solid plan with the assistance of a professional forester.

Beyond the pines, at the bottom of the slope, Ernie takes you along a ravine where he's planted 1,000 walnut trees. He started them from seed in his back yard and transplanted them in 1965.

"Might as well do a little work," he says as he lifts his pruning shears and

"A place to put some trees." Photo by Gordon Cunningham

Ernie Brickner of Whitehall, Wisconsin is the first president of the Wisconsin Woodland Owners Association. The non-profit organization was launched last year to offer a collective voice for the 160,000 private individuals who own 60% of the state's woodland. The WWOA promotes good management of Wisconsin woodland by distributing educational materials, holding workshops and field days and informing legislators about woodland problems.

The woodlot owners will hold their annual meeting on August 22 and 23 in Port Edwards.

For more information about the organization or the meeting, write Wisconsin Woodland Owners Association, Box 188, Madison, WI 53701.

lops off some walnut branches. He says knot-free walnut can bring at least $500 a tree at harvest. Of course, Ernie doesn't plan on being around for the harvest. He figures it'll be another 40 years before his walnut are ready for the saw. This walnut grove symbolizes the stewardship ethic that guides Ernie's efforts here.

It's an ethic that puts protection and preservation above profit. You see this value system in the way Ernie makes provisions for wildlife. The gnarled old white oak over there is what Ernie calls a "wolf" tree. It doesn't have any commercial value, and it takes up space that more valuable trees could use. But it's a den tree for a lot of animals, and its acorns feed countless squirrels. So Ernie leaves it. He also spares the many apple and plum trees scattered across the old farmland. "The apples are a little wormy, but the deer love them."

In fact, Ernie's forest is a wildlife paradise. Hickory and walnut are the squirrel's delight. Then there are raccoons, fox, ring-necked pheasant, hawks, even eagles. Ernie has counted at least 35 songbird species.

Of course, the wildlife draws hunters. Under the Forest Crop Law, Ernie agrees to open his land for hunting in exchange for a tax deferral break. But with or without the Forest Crop Law, Ernie has no inclination to hoard his woodland. It's open year-round to the public: hunters, snowmobilers, skiers, hikers, berry-pickers and bird watchers.

Ernie talks a lot about the importance of trees for soil conservation. He takes you down a steep path the farmers once used to haul grain from the fields. "It's so steep they had to rest the horses three times just to get an empty wagon up the hill." And this was the hill where a succession of farmers tried to grow corn, oats and alfalfa. Tried, that is, until most of the exposed topsoil had washed down slope.

Water can't do much damage now. Ernie explains how the forest floor acts as a giant sponge, soaking up rain that would otherwise run down the hill. And the canopy of leaves breaks the force of the falling rain before it strikes the earth.

Through a clearing, Ernie points out a section of slope across the valley where livestock in years past had tromped line upon line of terraces. In his opinion, woodland is no place for grazing livestock. They compact the soil, greatly reduce its ability to soak up runoff, he says, and as they clip away the undergrowth, they destroy wildlife habitat and kill young trees. "Cattle get more exercise than nutrition grazing on a woodlot."

Ernie's tour takes you into a beautiful stand of white birch. He stops by one giant among the other trees. "This one should be cut. It's mature and will deteriorate if I leave it here much longer."

Queen Anne's lace in the firelane is one of the amenities. Brickner has planted 160,000 red pine and thousands of white pine.

He explains that some woodland owners mistakenly think the best management is to "let nature take her course." But a forest, he says, is like any other living thing. It grows up, ages and dies. You can stand by and watch this happen, or you can remove the mature trees and sell them before they start to deteriorate. This way you realize a profit from the land and at the same time promote young, vigorous growth.

"Many owners think they'll destroy the beauty of their woodland by selectively harvesting trees," Ernie says. "But those treetops and branches make good firewood, and what you leave will eventually decay and regenerate topsoil. Meanwhile, it makes good wildlife cover and helps control erosion."

Ernie probably gets the greatest joy out of the educational value his woodland provides. "I really get a lot of pleasure out of walking through here and telling people what little I know about forest management . . . especially the kids." Ernie remembers the thank you letter he received from one young visitor who had trekked the hills and firelanes with his 7th grade classmates. "I really like your woods," the boy wrote, "especially your fire escapes." Another student thanked Ernie for taking him "mountain climbing."

Ernie's willing to share every inch of

Firewood helps heat the house.

his property with neighbors and friends and with groups of all sorts — environmental organizations, church groups, community clubs, 4-H'ers, farmer groups, professional and student foresters, conservation classes, grade school classes. They all come to enjoy and learn from these 230 acres of model woodland.

From down in the draw the forest seems to go on forever. But from the ridge it's different. Ernie's woodland is a small island amidst farm fields and pastures that spread in waves on all sides.

Ernie points to an outcropping across the valley. "See that rock. There's a cave that goes in 15 feet. It's sandstone capped with limestone. Shows this land was once under water."

The scope of Ernie Brickner's view of his land obviously transcends the years of his ownership. He has a broad sense of its history and an unselfish concern for its future.

"I have a feeling of stewardship because I've enjoyed the woods throughout my life — hunting and fishing. I'd like to have my kids and grandkids enjoy the same things I did."

Brickner inspects new aspen growth after a clearcut.

Ice age summer: the 1,000 mile trek

The scenic wonders of Wisconsin's ice age trail beckoned and the author responded. In addition to beauty he also found adventure.

Rock debris at the base of the Baraboo quartzite cliffs on the south face of East Bluff at Devil's Lake.

At the end of the trail. Gorge of the St. Croix River at the Dalles, looking north from Summit Rock. Photo by George Knudsen

JAMES J. STAUDACHER, Shorewood

It was 4 a.m. and I was sleeping soundly in shelter No. 2 in the Northern Kettle Moraine State Forest. Suddenly, there was a loud, rattling sound right outside the open window. I jerked awake. There were two metal garbage cans out there, probably being raided by raccoons.

I switched on the flashlight expecting to see the bright eyes and bandit's mask. But the animal was huge with a long dark nose, large, glowing eyes and an unmistakable head. A black bear!

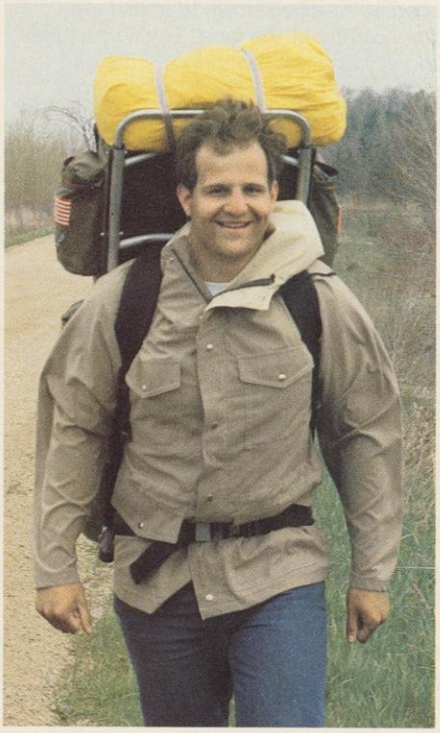
I got out of there in a hurry, didn't bother with the zipper but slid out of my sleeping bag quick, the long way. I dove out the other window and raced up the muddy trail.

About 200 yards away I found a large tree and scrambled up high as I could get. The garbage cans continued to rattle noisily. Suspenseful minutes passed. There weren't supposed to be any black bears within 40 miles, but there he was! He must have weighed 200 pounds and was as big as I. He seemed twice as big. Finally the noise stopped. Black bears are billed as shy and unaggressive but I was taking no chances. I didn't budge but sat cramped in that tree until dawn.

The incident was my first encounter with adventure on the Ice Age Trail after nearly two weeks and a 130-mile hike.

The trail is a footpath that follows the terminal moraines of the Great Glacier looping and twisting for a thousand miles through Wisconsin. The diverse terrain is a source of wonder and inspiration. For historians, the Ice Age Trail is steeped in adventure from the freshwater ports of Algoma and Kewaunee to the railroad towns of Milton Junction and Janesville. It goes by the site of Père Marquette's 1673 portage to the Wisconsin River, goes through our northern forests and includes the breathtaking beauty of the St. Croix waterway.

Twenty-five years ago there was no recognized trail, only a dream. Back then Milwaukee lawyer Raymond Zillmer envisioned an 800-mile long national park to tell the story of how Wisconsin's land was formed and also to provide recreational enjoyment. He talked to many people. By 1958 the National Park Service was interested and in 1961 U.S. Supreme Court Justice William O. Douglas hiked a portion of the



The author on the trail.

There are 113 miles of Ice Age Trail within an hour's drive of major population centers in southeast Wisconsin. They include the Kettle Moraine State Forest and a 60 mile stretch on private land.

The Northern Unit of the Kettle Moraine State Forest encompasses 27,000 acres and offers 25 miles of Ice Age Trail and five trailside shelters available by reservation. For more information contact: Kettle Moraine State Forest, Northern Unit, P.O. Box 426, Campbellsport, WI 53010. Phone: 414-626-2116.

The Southern Unit encompasses 17,000 acres and offers 28 miles of Ice Age Trail with three trailside shelters. Contact: Kettle Moraine State Forest, Southern Unit, Route 1, Box 87, Eagle, WI 53119. Phone: 414-594-2135 or 414-594-2743.

For information on the 60 mile section of Ice Age Trail between the Northern and Southern Kettle Moraine Units, as well as the rest of the trail contact. Sarah Sykes, Ice Age Trail Council, 2834 West Kilbourn Ave., Milwaukee, WI 53208. Phone: 414-931-7894.

trail. Three years later legislation establishing the Ice Age National Scientific Reserve became law. In August, 1973, Interior Secretary Rogers Morton dedicated nine units of it. Because an 800-mile park would be difficult to manage, Zillmer's original concept was altered slightly to become nine miniature national parks administered by DNR.

During my first 130 miles I had hiked through three of these nine reserve units. About noon on the third day I reached Two Creeks Buried Forest. A local tavern owner directed me to the windswept beach where remnants of spruce and hemlock trees long buried in the slick, red clay were still perfectly preserved after more than 11,000 years.

Continued...

The Ahnapee Trail between Algoma and Sturgeon Bay. Photo by Lyle Gorder

That night on the beach nearby, I tried to imagine the ancient forest and the forces of nature that buried it. Interpretive facilities will eventually be built at the 25-acre Two Creeks Unit with a large exhibit to highlight the unique buried forest.

Early in 1978, I became interested in the trail and reserve system as a way to see Wisconsin, experience its people and discover its lore. I talked with Congressman Henry Reuss and his staffers Laurie Hansen and Sarah Sykes. Little by little a unique and challenging adventure took shape. I would walk the entire trail compiling information, mapping, photographing and making recommendations for future trail segments. We thought the walk across the terrain left by recession of the Great Glacier would cover about 850 miles.

On May 14, 1979 a mile south of Sturgeon Bay, I started the hike carrying a pack that weighed 55 pounds, full of equipment, food and water. The first miles were a thrill. Walking the abandoned Ahnapee and Western Railroad grade, I photographed wood ducks, red-tailed hawks, deer, redwings and a variety of other birds.

When the trail reached Lake Michigan at Algoma, weather turned nasty. High winds, high waves and cold temperatures made hiking miserable. At Two Rivers the trail turned inland and temperatures rose from 45 to 85 degrees. Near Branch, a nasty cold front produced a crashing electrical storm that sent me diving into a water-filled ditch after lightning struck a nearby silo.

Horicon Marsh, formed by the glacier, drained by man and now restored.

When I entered the reserve unit at Northern Kettle Moraine State Forest, trail conditions changed from smooth lakeshore and farm to a rolling, rocky, glacial landscape.

The Kettle Moraine is known worldwide for the abundance of its glacial features. Numerous kettles, kames and eskers dot the interlobate moraine of the State Forest. They were formed as ice of the Green Bay and Lake Michigan lobes of the Great Glacier came together, grinding the landscape between. The Ice Age Trail winds through the moraine climbing numerous ridges and descending into countless kettles.

The stretch between the northern and southern units of the Kettle Moraine State Forest is constantly evolving as new housing developments are built and the trail has to be rerouted.

I passed Holy Hill and climbed a lookout tower at Lapham Peak. It provided an impressive view of the Holy Hill glacial kame and of Pewaukee Lake to the north. My hike through the southern unit of the Kettle Moraine State Forest took place just in time to enjoy the spring panorama of prairie and wildflowers.

It was the second week of June and the weather had turned hot and muggy when I began to walk the abandoned Milwaukee Road grade. It connected with the Sugar River Trail, an exceptionally scenic stretch that followed the floodplain of the Sugar River.

Near Albany on June 9th, sweeping rains and burning sun alternately tormented the landscape all day. I camped there along the Sugar River. I suddenly heard a deep, menacing rumble. A tornado! The funnel cloud raced in, touched down in a field and tore violently at the land. Taking pictures furiously and not realizing the danger, I later learned that a Dairy Queen store and McDonald's restaurant in nearby Monroe were flattened. (Unfortunately, I forgot to reset the camera in my excitement and all the pictures came out underexposed.)

A few days later, traveling straight north, I arrived at the Cross Plains Ice Age Reserve Unit which has yet to be developed for public use. This section records the glacier's farthest penetration into the "Driftless Area," that part of the state never covered by ice. Huge limestone bluffs, well-defined river drainageways and a large pre-glacial valley are features that will be highlighted and explained in future exhibits.

Here once again the trail suffered from urban sprawl just as it did between the two Kettle Moraine units.

At Merrimac, I boarded Colsac II, the ferry across the Wisconsin River. Next day, I recrossed on a bridge at Portage.

North of Portage at Ennis Lake is the site of the boyhood home of John Muir, father of America's national park system. The clear, glacial lake, which is spring-fed, nestled into the surrounding hills. There is a picnic area, boat ramp and softball diamond.

Two days south of Ringle in Marathon County, I had the most dangerous experience of the entire hike. Weather was oppressively hot and muggy. All along the trail, hundreds of ticks infested the grasses and eagerly fastened themselves to me. Each evening I laboriously removed each one and entrusted it to the campfire.

That evening I camped on the only high spot in a swamp 15 miles from the nearest road. Earlier that day a black bear eyed me cautiously as I waded the Little Eau Claire River. Deer were plentiful and so were porcupines, skunks, squirrels, raccoons and other small mammals.

I had just lit my campfire and was cutting up additional firewood when I saw them. They appeared out of nowhere, a snapping, snarling pack of wild dogs. A couple were German Shepherd types, the rest farm-collie mongrels. The leader grabbed the heel of my boot and tried to drag me down.

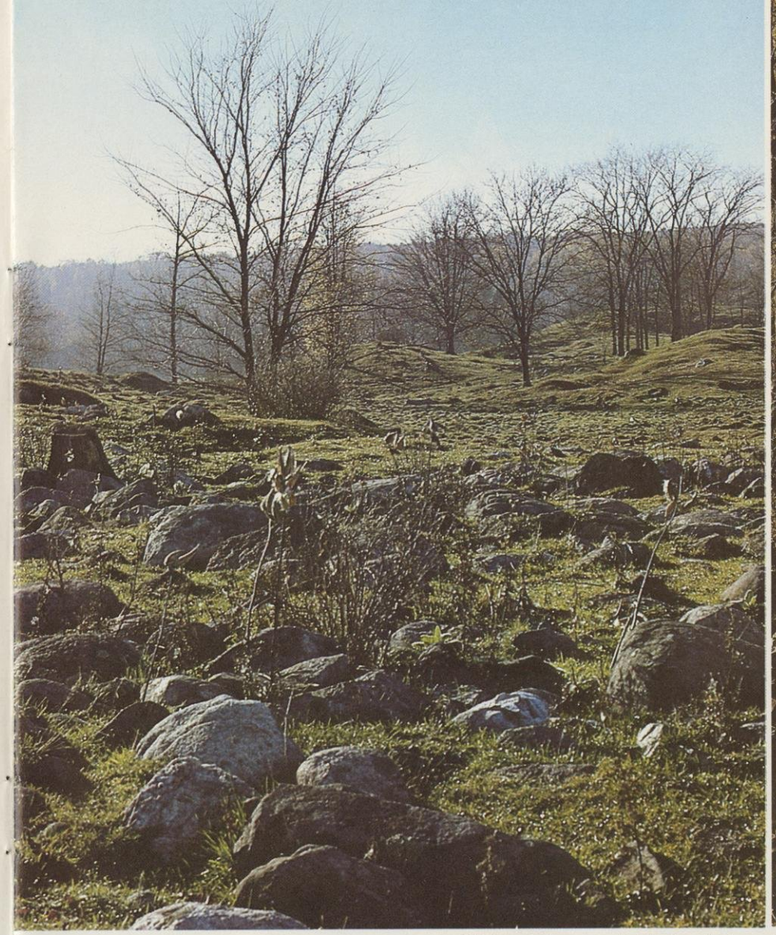
I swung at him with a chunk of firewood and missed. He came leaping back at me.

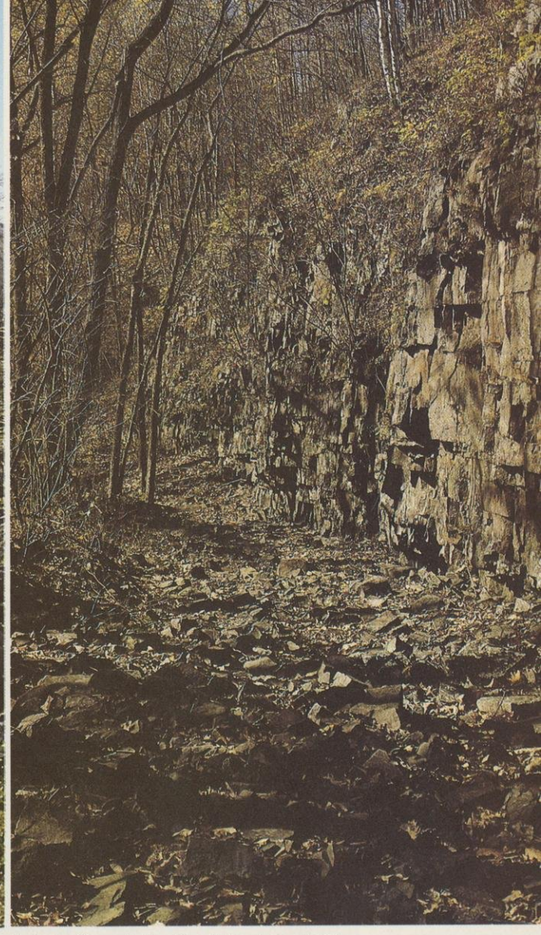
The second time I felled him with a crashing blow. With this, the pack disappeared into the swamp as mysteriously and suddenly as it had come.

This experience should deter no one from the trail. It is unlikely to ever happen again, but it happened to me, so I tell it.

A particularly beautiful segment of the hike led me through remote portions of heavily forested Langlade County, which has its own special charm. I saw more black bears there than anywhere else. I spotted two mature bald eagles and dozens of every variety of hawk. Small animals were everywhere busily foraging for food beneath poplar, beech and maple trees.

At Rib Lake, I replenished supplies and entered the Chequamegon National Forest a day later. Animals appeared and disappeared as if by magic. I felt more alone in the Chequamegon than anywhere else. As I emerged from the forest, I realized I had been on the trail for 57 days. I had an estimated three





Dundee Mountain, a kame in the Northern Kettle Moraine State Forest. It can be seen from the new Ice Age Scientific Reserve Interpretive Center scheduled to open soon.

Cluster of stones carried by the glacier, called "erratics" by geologists. The background shows typical "knob and swale" country of eastern Chippewa County. This Chippewa Moraine forms a 120-mile loop that stretches from southeastern Washburn County to northeastern Taylor County. Photo by Adam Cahow

Scene in the Blue Hills where glacial meltwater deepened a canyon to form a quartzite cliff. Photo by Robert Read.

Glacially transported boulders in the Jump River near the Chequamegon National Forest portion of the Ice Age Trail in Taylor County. Photo by Adam Cahow

weeks to go.

Two days later, I walked into Cornell. There I visited Brunet Island State Park, located on an island in the Chippewa River north of town. It is so arranged that almost all campsites are on the water. I camped there one night and found it delightful.

The next day I headed for a cabin in the wilderness owned by my friend, Gil Tanner, a professor at the University of Wisconsin-Eau Claire. By then mosquitoes and deer flies made life miserable. I was short of water again, too, but found the cabin and settled down.

En route I passed the Chippewa Moraine Unit of the Ice Age Reserve. Located on Plummer Lake, it preserves the dead ice formations created when great isolated chunks of the glacier melted. The many small kettles are set in a jumble of hills, smaller and more rolling than the hills of the Kettle Moraine. I found the walk through this "knob and swale" country invigorating.

It was here I realized the trail was going to be a great deal longer than the 850 miles at first estimated. It would be closer to 1,000. I pressed on, ignoring as best I could the hordes of insects that buzzed around my head.

With still a week to go, I entered the "Blue Hills" east of Rice Lake. Here the Ice Age Trail traverses what were once the highest mountains in North America, a fact everywhere evident as the trail twists and climbs steeper than anywhere else in its 1,000-mile length. I came to it after 59 days of hiking and was tired, but every step through the hills was exciting.

A few days later, three weeks ahead of my schedule, I walked into spectacular Interstate Park, the last reserve unit where the trail ends. Park Director Bernie McGaver welcomed me warmly and his personnel were mightily helpful.

The park itself is located at the Dalles of the St. Croix River, an ancient glacial waterway created by melting ice 10,000 years ago. Natural rock formations and the dramatic gorge through which the leaping river rushes fascinate and inspire.

At park headquarters, I received a long distance congratulatory telephone call from Congressman Reuss who had been following my progress. The next morning, Sarah and Richard Sykes, my mother and father and I, gathered in the park to celebrate.

Members of the press began to arrive. Asked how I felt about my adventure, I had mixed emotions. The trip had been exciting, exhilarating, dangerous, tedious, exhausting, all rolled into one. In my mind I kept seeing all the places along the trail and the people who went with them. All were truly magnificent.

As I sat at the picnic table in Interstate Park, my final reaction was one of fulfillment. I was the first and only person to walk the 1,000-mile Ice Age Trail end-to-end and the first to experience its unique perspective of Wisconsin. Even today, I feel again that pleasant sense of achievement. There are other challenges ahead, but I will never forget the special feeling of my Ice Age summer.

Lake trout: the second time around

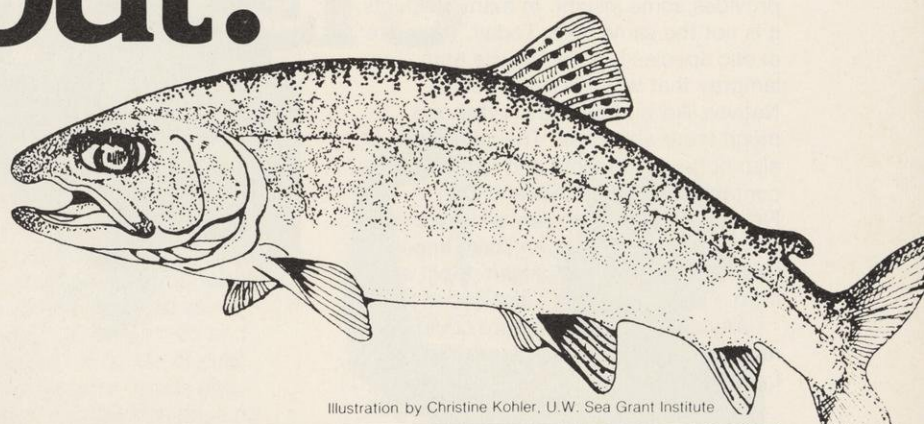


Illustration by Christine Kohler, U.W. Sea Grant Institute

Lake trout used to be a bread and butter commercial fish. The lamprey, overfishing and chemicals clobbered it. Now there's hope for a revival in Lakes Michigan and Superior. Science and old commercial fishermen are helping.

LINDA WEIMER, Assistant Director
UW Sea Grant Institute

The University of Wisconsin-Madison research vessel Aquarius rides gently at anchor over Green Bay's Horseshoe Reef. It is a calm, overcast day in July. The gunmetal grey of sky and water blend, relieved only by a splash of color on deck. Divers in bright blue wet suits recheck their orange and yellow air tanks before descending to the reef.

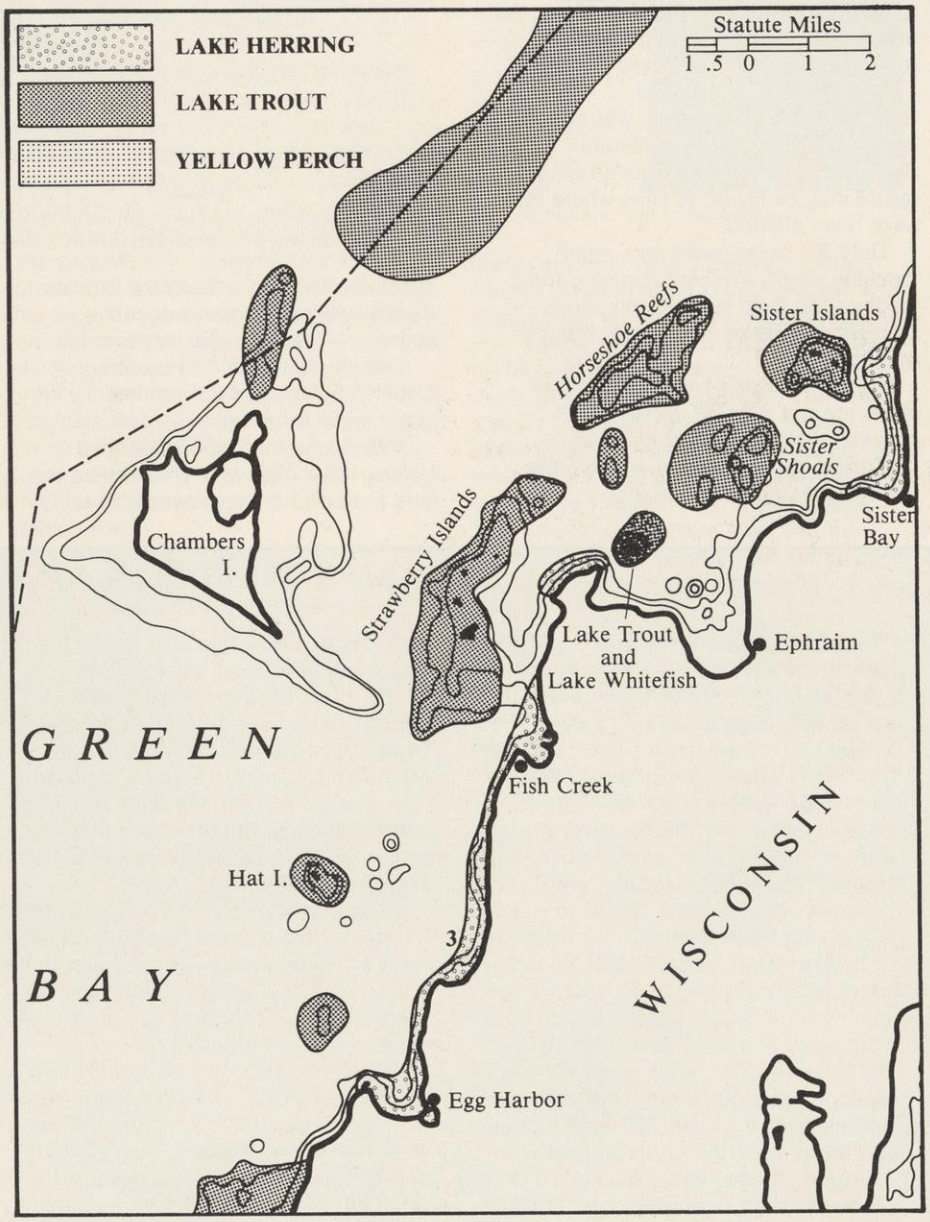
Located just offshore near Sister Bay, Horseshoe Reef was once the area's most productive lake trout spawning ground. The two divers are there, in part, to find out why it isn't anymore. In an hour on the bottom with diver propulsion vehicles, they'll run a survey and take pictures and notes. Thickness, size and type of rock, algae cover, silt deposition and the presence of possible lake trout egg and fry predators will all be recorded. These are conditions that could influence spawning success.

The lake trout was once Lake Michigan's apex predator, king of the ecosystem. But in the 1950's, the sea lamprey pulled a biological coup d'ētat. It completely wiped out native populations of lake trout, then moved on to Lake Superior and came close to destroying them there, too.

It took until 1965 to bring the sea lamprey close to control. At that time, state and federal hatcheries began stocking yearling lake trout in Lake Michigan.

Today, 15 years and nearly 30 million trout later, the fish have failed to take hold. For the most part, the only lake trout in Lake Michigan are those born and bred in a hatchery.

Why aren't they reproducing? It is an enigma — a question university and



Close-up of a map of Green Bay showing the sites where old-time commercial fishermen say lake trout and lake herring used to spawn. Maps like this have been compiled into an atlas of fish spawning grounds in Wisconsin waters of the Great Lakes. Map by Jana Fothergill, UW-Madison Marine Studies Center

Continued next page...

government scientists are working hard to answer.

Comparing the Lake Michigan of 1980 to the Lake Michigan of the 1940's provides some insight. In many respects, it is not the same lake. Today, there are exotic species like the alewife and lamprey that weren't there before. Natives like burbot and crayfish are much more abundant. The lake today is also richer in nutrients and higher in contaminants like PCBs and DDT. Finally, there are the planted lake trout themselves: very few can claim ancestors native to Lake Michigan. Most are from a strain native to Lake Superior.

Any or all of these factors could be reasons for the failure to reproduce in Lake Michigan.

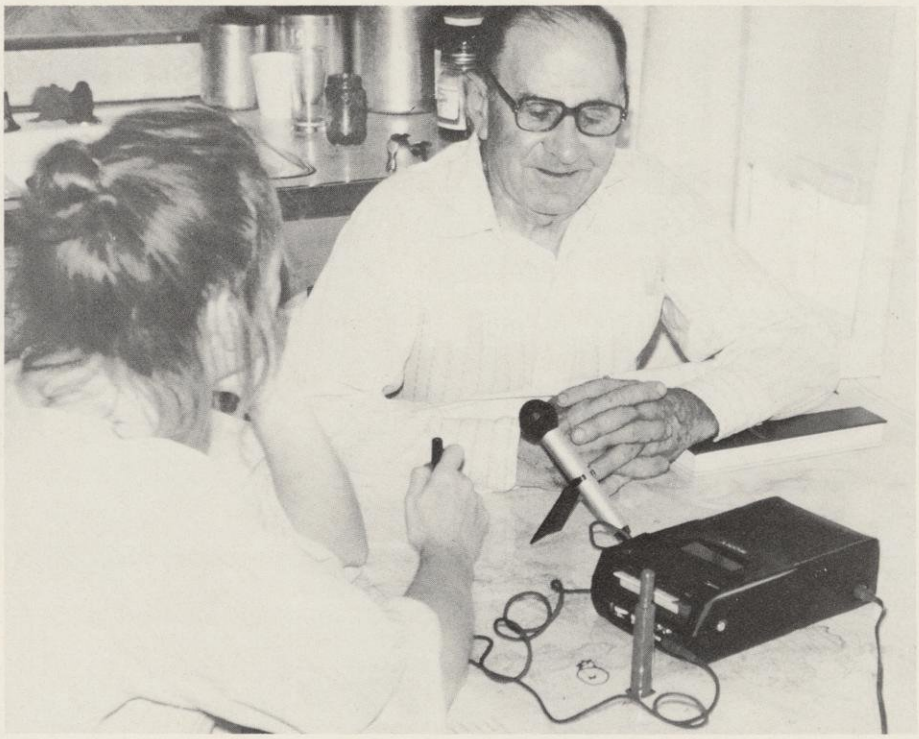
As young fish, lake trout are thought to be imprinted to their surroundings. As adults, they use these memories to return to their home grounds to spawn.

UW-Madison limnologist Ross Horrall and biologists with the Wisconsin Department of Natural Resources feel the lake trout's breeding failure may be linked to sites where fish have been planted.

Until five or six years ago, much stocking simply involved dumping truckloads of fish from spots along shore — off piers and jetties or near the mouths of rivers.

Horrall believes conditions in those areas are not suitable for lake trout spawning or for egg and fry survival.

To find out what areas are suitable, Horrall and Catherine Coberly, a specialist with the UW Marine Studies Center, went to a knowledgeable source — commercial fishermen.



Catherine Coberly interviews commercial fisherman Russell Nelson to find out where lake trout once spawned in Green Bay. (Photo courtesy of UW-Madison Marine Studies Center)

Over the course of 18 months, Coberly interviewed 85 old-time commercial fishermen.

"We found men who had fished before 1940; men who knew where the lake trout had once spawned," said Coberly.

Armed with lake charts and tape recorder, Coberly went into their homes and sheds and listened. She came out with locations of about 35 lake trout spawning sites in Lake Superior and over 60 in Lake Michigan, all in Wisconsin waters.

Coberly says these sites are reliable

LAKE TROUT DÉJÀ VU

Watching scientists fret over the lake trout's failure to reproduce in Lake Michigan, Vernon Hacker must be experiencing a case of déjà vu.

Hacker, now the DNR's Fish Control and Boundary Waters Specialist, researched lake trout in Green Lake in the 1950's. He grappled with many of the same questions facing biologists today and his answers have shed light on the perplexing Lake Michigan situation.

It all started, recalls Hacker, when sport fishermen began to catch large lake trout in Green Lake. Though lake trout were planted there from 1886 to 1944, not until 1952 were anglers equipped to catch them. That summer, they cleaned up. Over 700 were landed and some weighed up to 34 pounds.

Aging these fish, Hacker found none less than nine years old. Further experiments convinced him there was no natural reproduction in Green Lake. All the fish being caught had been stocked.

After searching the literature and the lake, Hacker found the fish in 60-100 feet of water. He also found them spawning over mud, sand and gravel.

To give Mother Nature a hand, Hacker sank several four-foot square boxes of crushed gravel and rubble over the spawning beds in 1954 and was rewarded that fall with fertilized lake trout eggs. But then he found that, as fast as the lake trout laid eggs, mud puppies ate them.

"I found as many as 79 eggs in the stomach of one mud puppy," recalls Hacker. "The divers we sent down said you could tell where the spawning areas were by the mud puppy tracks leading right to the spots."

The next year, Hacker and his team planted fertilized, live lake trout eggs in screened boxes and the fry survived. These experiments led to the establishment of a 6,000 square foot artificial spawning ground — made from 210 tons of granite rock, dragged out onto the ice and sunk.

Within a few years, the biologist was finding native lake trout in Green Lake, though in modest numbers due to the relatively small area of spawning substrate.

Nothing succeeds like success and soon, says Hacker, fishermen were flocking to Green Lake to take lake trout. Unfortunately, as the years went on, the size went down — a fact Hacker attributes to overfishing the adults and overstocking the young trout.

"The young fish were stunted because there were too many for the lake's food supply," explains Hacker. "They feed on opossum shrimp which are limited in numbers."

Today, he says, the lake trout population in Green Lake is in very good shape and scaled-down stocking efforts keep the population in check. DNR crews plan to monitor the population again this fall.

If lake trout do reproduce again in Lake Michigan, they will owe a debt to Green Lake — not only for Hacker's pioneering research, but also for the preservation of the last remaining genetic strain of Lake Michigan lake trout — called, fittingly, the "Green Lake" strain.

because commercial fishermen used to collect lake trout spawn in the 1920's and '30's for the old Wisconsin Conservation Department.

Fishermen also identified historic spawning sites of other species. Coberly and Horrall have compiled all this information in an atlas of Wisconsin's Great Lakes spawning grounds, published by the UW Sea Grant Institute.

Fishermen repeatedly identified Horseshoe Reef or the "Frying Pan" as an important lake trout spawning site — a tip that led divers to explore it so thoroughly.

Horseshoe Reef is a complex shoal of Niagaran dolomite bedrock and fields of honey-combed boulders. Its crevices and pock-marked surfaces protect lake trout eggs and fry. Three major areas of rubble were discovered that are particularly well-suited to spawning, according to UW Oceanographer Phil Keillor.

Biologists all stress the importance of this spawning substrate. Under ideal conditions, the female's eggs drift down onto the reef and fall into crevices and holes in the rock. Once fertilized, they quickly "water-harden," swell and become lodged in their tiny hiding places, safe from currents and predators.

In all, the diving research team, led by Horrall and Keillor, has surveyed over 30 million miles of reef in Lakes Michigan and Superior. They have made four detailed surveys.

Supported by the DNR, Wisconsin Coastal Management and the UW Sea Grant Institute, the effort has helped promote more rational fish planting. In 1976 and '78, DNR made plants over Horseshoe Reef and has also planted over other historic sites. Divers plan to return to Horseshoe Reef this fall to monitor lake trout returns. The fish come back to spawn at the age of five or older.

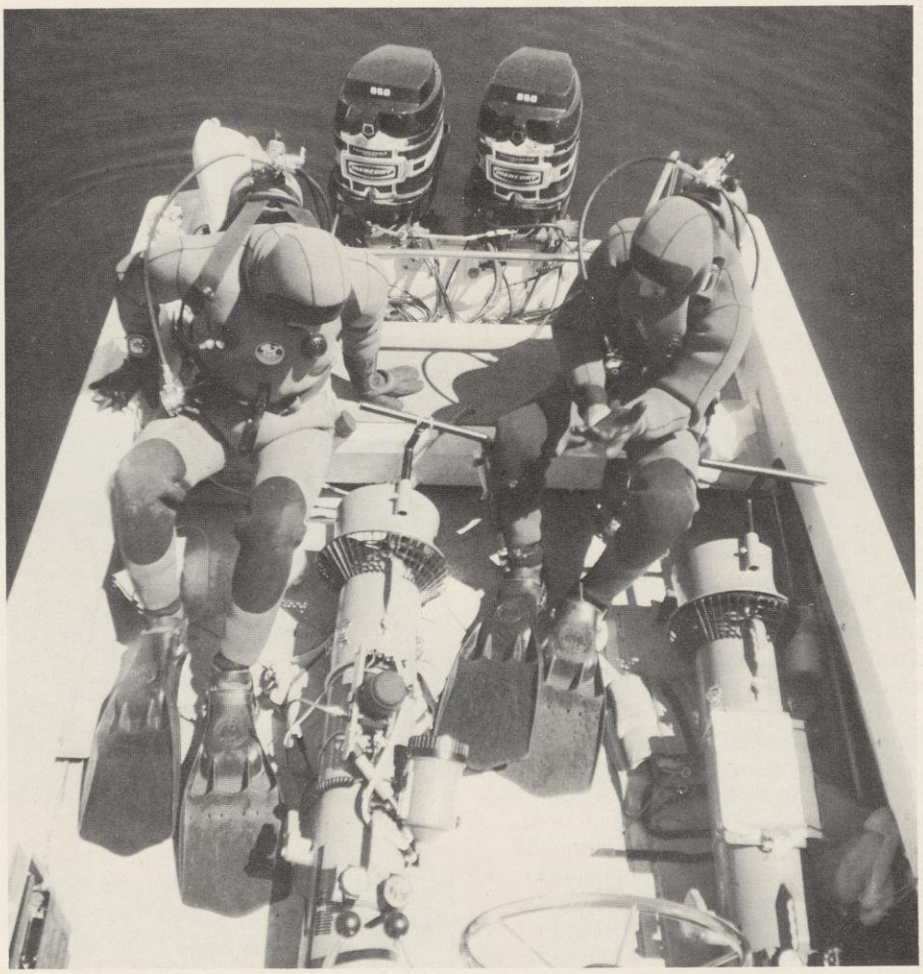
But even if they do come back to areas like Horseshoe Reef, other obstacles may hinder successful reproduction. Contaminants, predators and the small size of the spawning population are a few.

Studies in the 1960's showed that DDT inhibited the hatch, while more recent research has shown that PCBs can reduce the survival of lake trout eggs and fry by 20%. But biologists don't blame the trout's reproductive failure on contaminants.

"It couldn't totally account for the lack of reproduction unless there are synergistic effects we don't know about," explains Horrall.

Says Ron Poff, DNR Great Lakes Commercial Fisheries Manager, "The evidence is inconclusive. We know that lake trout eggs from Lake Michigan do hatch out and survive and, besides, PCB levels in the lake are declining."

Asa Wright of the Michigan DNR is still more skeptical. "I don't think contaminants are a major problem at this point; other fish in the lake do alright," he says.



Divers prepare to survey a lake trout spawning reef in Green Bay. Photo by Phil Keillor, UW Sea Grant Institute

All three of them give more weight to predation. They agree that if any trout at all are managing to spawn successfully in Lake Michigan, numbers are very small.

"And predation is a major factor when you're dealing with such low densities of spawners," says Wright.

Jim Moore, DNR fish manager in Sturgeon Bay, has evidence that egg predation is serious.

"We have found stomachs of burbot and perch gorged with lake trout eggs," he reports.

Horrall notes that alewives and smelt are known to prey on sac fry at certain times of year and that crayfish are another important predator. His reef surveys revealed that crayfish, sculpin and burbot are the most common inhabitants of Horseshoe Reef. Coincidentally, divers also found smallmouth bass, walleye and burbot most abundant at sites of lake trout plants.

Horrall points out that predation can be minimized by getting trout to spawn over suitable substrate.

These theories on predation are supported by DNR's Vernon Hacker, who did pioneering work on lake trout in Green Lake in the 1950's (see box).

There is another important lake trout predator, not to be overlooked — the fisherman. Ron Poff has estimated that between lamprey predation, natural mortality and exploitation, the mortality of stocked fish in Lake Michigan is close to 50% per year.

The Wisconsin sport catch in Lake Michigan averages about 50,000 a year. On top of that are incidental catches by commercial fishermen. This situation is especially bad in northern Green Bay where lake trout prowl the prime whitefish fishing grounds, says Jim Moore. It is a situation that recently led the agency to pull their lake trout stocking program out of Green Bay and plant yearling lake trout on the reefs between Algoma and Sturgeon Bay instead.

Human predation on lake trout is even more serious in Michigan where there is an unrestricted Indian commercial fishery. In 1979, Indian fishermen took more than 400,000 pounds of lake trout from the Michigan waters of northern Lake Michigan.

"Unless meaningful regulations are put into effect, the lake trout rehabilitation program will be out of business there within a year," says Asa Wright.

Partly due to this predation and

partly due to the relatively small numbers being planted (only about one-tenth the number of yearlings the lake once harbored naturally), scientists feel there are simply not enough fish in Lake Michigan to reestablish the population.

"There used to be seven or eight year classes spawning on a reef, now there are maybe two or three," says Horrall.

"I think it's a numbers problem," says Poff. "We need massive plants to put enough spawners in an area to produce enough eggs and fry to survive."

In a bold experiment designed to mitigate this problem, DNR planted more than 300,000 yearlings — roughly a third of the Department's 1980 plant — on reefs north of Algoma. Historically a lake trout spawning area, these waters aren't as heavily fished as those in Green Bay and it is hoped that the hatchery fish can take hold there. Moore says data shows good numbers of lake trout already in the area. DNR may eventually establish a refuge there.

It has also been suggested that planting fertilized eggs and fry might be a good strategy since researchers are uncertain as to when young lake trout become imprinted to the home ground. It may be that yearlings (18-month-old fish) have already become imprinted in the hatchery and will not home to any planting sites in the lake, according to Horrall. He and his team plan to experiment with egg and fry plants over the next few years.

DNR biologists will try an egg plant in Lake Superior next fall using a novel method. The eggs won't be lodged in rock crevices, they will be sandwiched between sheets of astroturf, one-foot wide and three-feet long.

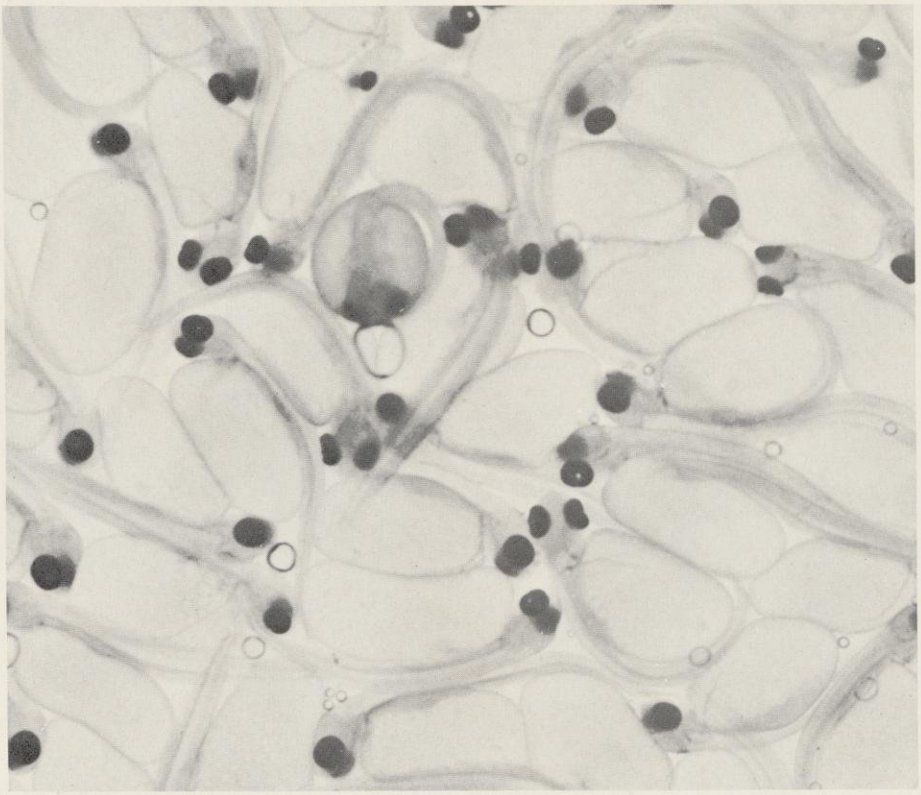
Bruce Swanson, DNR fish manager in Bayfield, has already successfully experimented with this technique in the hatchery. He plans to anchor about 75 of these egg and astroturf sandwiches over reefs around the Apostle Islands.

Each of the mats will be roughly equivalent to one spawning female. Swanson predicts that with eggs snugly out of reach of harsh currents and predators, there will be almost no mortality. Both he and Horrall hope the tiny animals will imprint to the reef or to the mats.

Horrall believes that genetic considerations also play an important role. He notes that most of the lake trout being planted in Lake Michigan are from a Lake Superior strain.

"There's a chance that the fish being stocked don't have the right adaptations to get good survival in Lake Michigan," he says.

Horrall has learned from the commercial fishermen that, years ago, there were actually five or six major groups of lake trout in Lake Michigan — each distinguishable from the other.



Lake trout fry in a hatchery.

By luck, one deepwater strain of trout, the "Green Lake" strain, has been preserved in the hatchery. In the spring of 1976, DNR planted 266,000 of these fish over the Sheboygan Reef, a deep reef complex in south central Lake Michigan.

Recent assessment catches by the U.S. Fish and Wildlife Service and incidental catches by chub fishermen in the area indicate that these lake trout are surviving well and are sticking close to the area. Some will reach sexual maturity this fall and scientists hope to find evidence of natural reproduction.

Tentative signs point to a possible comeback in Lake Michigan. A small group of hatchery-reared fish has managed to reproduce successfully in Grand Traverse Bay. First discovered when baby lake trout were sucked in through a water intake pipe, the fish were found spawning over the intake structure, an old crib of rocks and rubble.

The Michigan DNR hunted further and found lake trout spawning at other sites in the bay too — around marinas and over rock breakwaters. Curiously, all sites so far discovered are man-made.

In Lake Superior there has been a dramatic revival. A few native lake trout around Gull Island Shoal managed to survive the lamprey onslaught. Bruce Swanson recalls years when no spawners at all were caught in the area. But then came lamprey control and lake trout plants. Spawners reappeared, but in the mid-1970's, a sharp drop in spawning population led to establishment of a refuge that protects lake trout within a 270 square mile area from fishermen.

"For the fall of 1979, we estimated 11 to 12,000 spawners, the biggest return since the late '50's," reports Swanson.

In other areas around the Apostle Islands, there are also signs of natural reproduction both of hatchery trout and remnant natives.

But will lake trout come back in Lake Michigan?

"Hard to tell," says Ron Poff. Jim Moore says he is disappointed that there hasn't been more progress to date. Ross Horrall is guardedly optimistic but says, "It may take a long time." All the biologists involved agree that it will take a long time to build a large enough population to be self-sustaining.

A key to success is the creature that gave rise to the whole situation in the first place — the sea lamprey. Ironically, as the tributaries of the Great Lakes were cleaned up over the past few years, the lamprey found new places to spawn. It has surged back in areas like Green Bay and the St. Louis River. Keeping it in check will depend on continuing the costly treatment programs of the Great Lakes Fishery Commission.

For all the efforts of scientists and resource managers, the lake trout's fate still lies with the two predators that helped annihilate it in the first place — the sea lamprey and man.

"DNR buys all that land"

ORAP means a lot to fish. A man who knows about it gives his personal perspective.

VERN HACKER, Bureau of Fish Management

I've worked for the people of Wisconsin for 28 years, first as a field fisheries biologist and now as a staff member in DNR's Bureau of Fish Management. One of the complaints I've heard a lot is how the department "buys all that land!" I've attended town and county board meetings where the subject was discussed in a vigorous way with DNR on the short end.

Looking back at all the good public land does, I can hardly believe some Wisconsin citizens still have the same complaint. This is land that will be available forever, or at least as long as this gorgeous blue planet keeps spinning. Sure, DNR holds title to about a million acres. But nearly every square foot is devoted to public outdoor recreation or to some activity that enhances outdoor recreation. Wisconsin's prettiest and most productive places for wildlife have been preserved for public use.

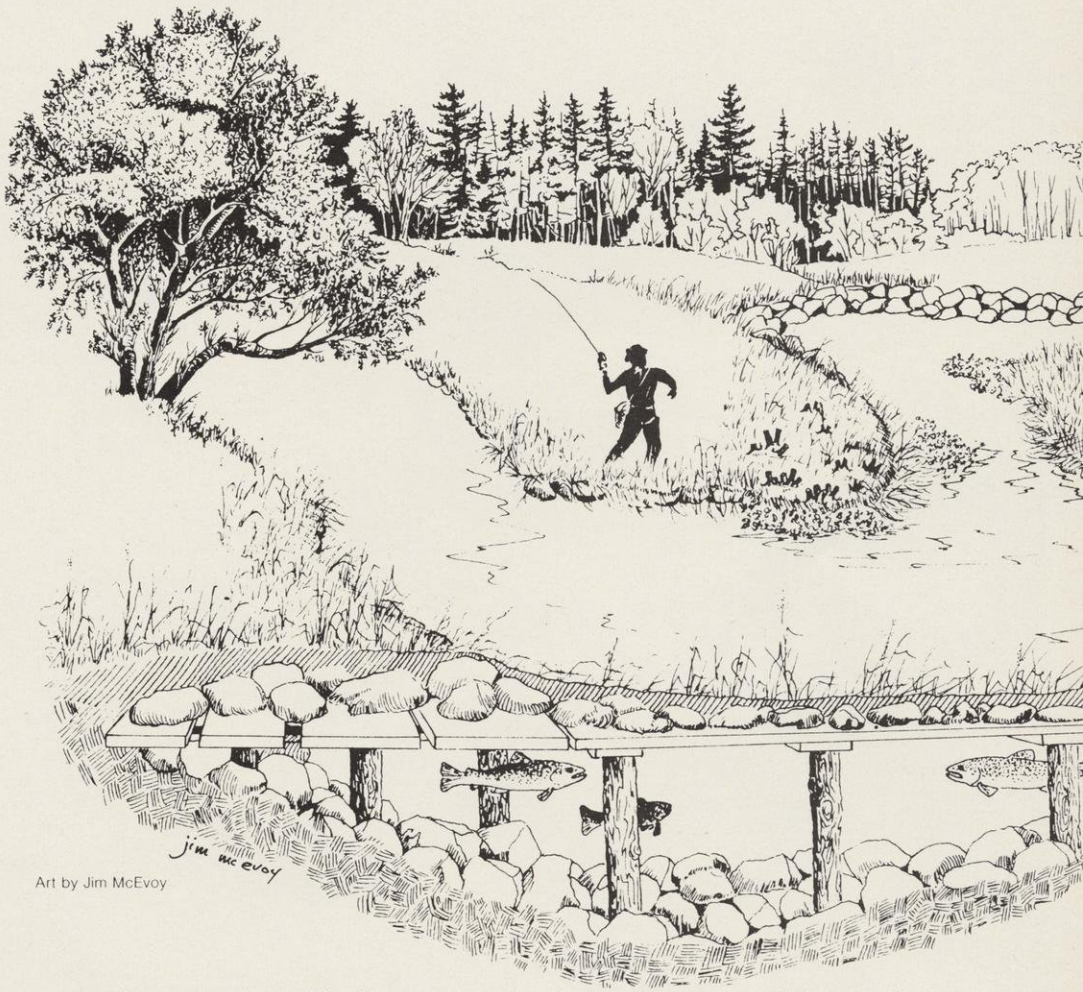
And it didn't just happen willy-nilly. It took money, effort, planning, and most of all, public support.

Of the million acres, some 430,000 were purchased in the past 18 years under the Outdoor Recreation Act Program (ORAP) and its successors. ORAP laid the plans and paid the bills. When a question came up 10 years ago about whether buying land for public use should continue, Wisconsin citizens gave a firm "Yes" in a referendum.

But because of inflation, ORAP ran out of money while still 300,000 acres short of its original goal. Recently, former Governor Warren Knowles, head of a citizen task force studying the imminent end of funding, recommended that ORAP be renewed as ORAP 2000. The task force plan is to purchase the remaining 300,000 acres over the next 20 years and finish up by the year 2,000.

Those who complain about DNR buying all that land will ask "What use can we possibly make of *1.3-million acres?"*

I, like a lot of other people believe in these answers: to fish, hunt, help game and non-game animals, protect endangered and threatened species, meditate, pick berries and mushrooms, picnic, swim, trap, go on nature hikes, camp, photograph, look at toads and butterflies, cross country ski and grow more trees. The idea is to fulfill the needs of the public in a personal and individual way so that you and your friends can relax and escape for just a little while from what can sometimes be a really hectic life.



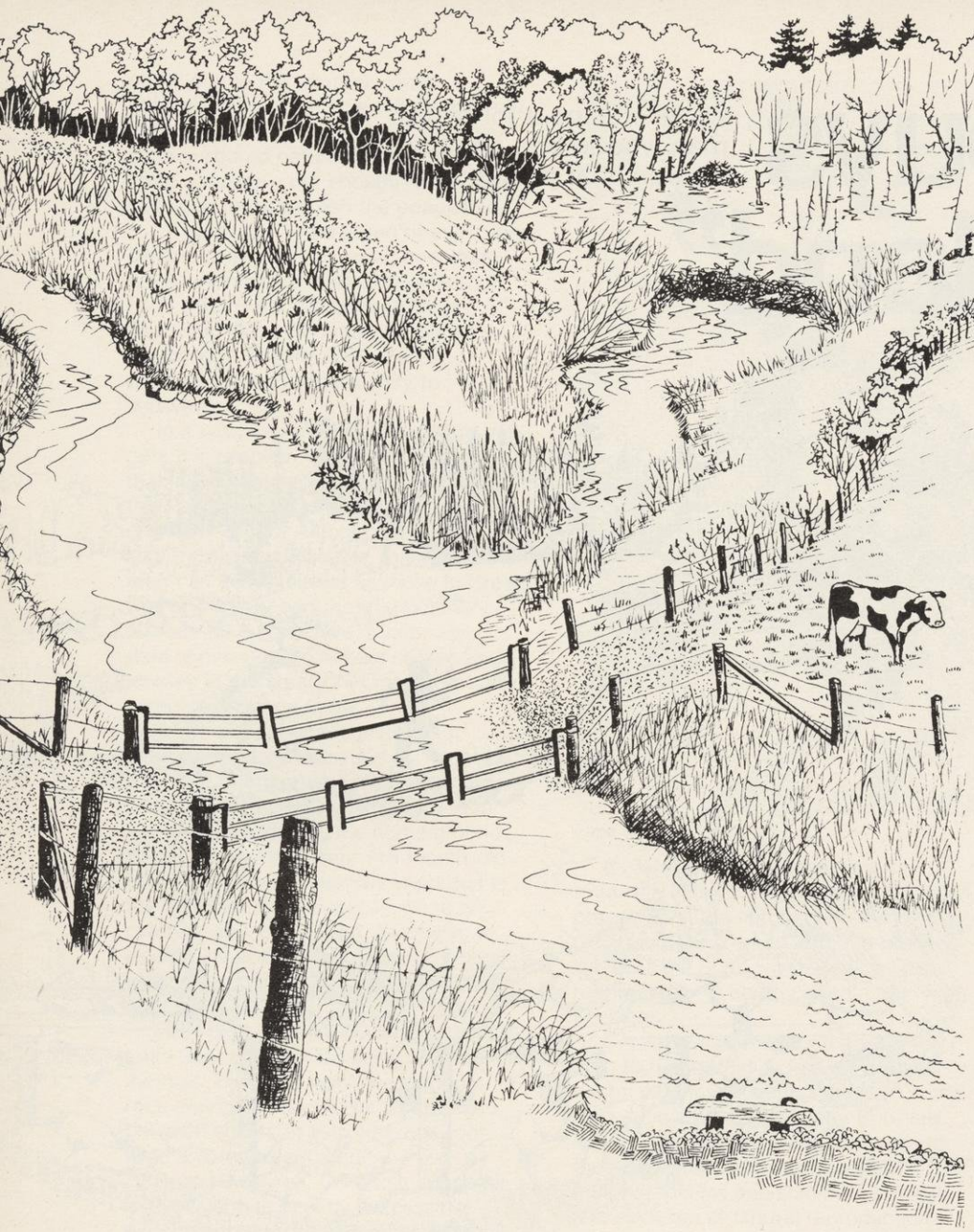
Art by Jim McEvoy

I know this is a pretty standard response. But it's full of truth and the kind you'd get from any thinking citizen who looks at human population growth and Wisconsin in the year 2080. As a fish manager, though, I have a more specific perspective, and it tells me that saving these lands is not simply desirable, but imperative.

Trout are one of the reasons. They have several major requirements, resources that are necessary to ensure natural reproduction but resources that are very fragile: high quality spring water that has a constant temperature plus proper bottom materials. With these in public ownership, vital springs and gravelled spawning grounds are protected from man and the animals that accompany him.

As an example, let's take a look at brook and brown trout which spawn in November each year. The rule of thumb for successful hatching is that at the best possible temperature of 50 degrees Fahrenheit, it will take a fertilized brook or brown trout egg 50 days to hatch. It is also known that the trout embryo within the egg is extremely sensitive to rapid temperature changes at four separate stages of development. The springs that so urgently need protection flow constantly from the ground, winter and summer, at the average annual air temperature for any given location: 50 degrees in mid-Wisconsin; 52 in southern Wisconsin; and from 46 to 48 degrees in the north. Note that all are close to that important 50 degree optimum required for natural trout reproduction.

Thus, when it is 20 below in January and trout embryos are ready to hatch, springwater temperatures are as much as 70 degrees warmer than the air. Embryos develop because water



temperature stays constant despite extreme fluctuations in air temperature.

When trout eggs are deposited in springwater on a gravel stream bottom at the optimum 50 degrees, a very high percentage of the eggs hatch. The further temperatures vary from 50, the higher the percentage of dead eggs. When the water in a stream drops close to freezing, the kill of trout eggs is almost complete.

Thus, the influence of springs in winter is vital to success of the hatch. If springs are untrampled, and the sources protected, they continue to flow, spreading their influence downstream. Eventually however, the temperatures of winter make their claim and usually trout eggs do not hatch in the lower sections of streams far from the spring.

A gravel bottom is also important to the hatch, particularly when it's near the springs. Female trout deposit eggs in pockets dug into the gravel. The cluster of eggs in each pocket is protected with a covering of gravel and bathed in the warm spring water. When the embryo hatches into a fry, it is comparable to a human baby born prematurely. Almost unrecognizable as a fish, mouth parts of the helpless fry are unusable and it is burdened with the huge yolk sac that contains its only source of food. It is now that the proper consistency of gravel is vitally important because the fry must burrow into the gravel to hide while it absorbs nutrients in the yolk sac.

Soon it develops a usable mouth and can feed on tiny micro-organisms. The yolk sac diminishes in size and it can swim actively. Then, and only then, does the young fish, now called a fingerling, emerge from the gravel and begin its active life in the stream, eventually to become an adult and also reproduce.

Often, gravel in spring-fed spawning areas is smothered by sand and silt from man's activities. When lands are acquired by the department, trampling of banks and widening of the stream that causes siltation and sanding of spawning gravel ceases. Nature starts healing the scars. Sometimes, when the source of sand and silt pollution is eliminated, gravel beds re-emerge to again become productive.

When they don't, ORAP and trout stamp funds are used to remove brush, narrow the stream, expose gravel beds, and create hiding places for trout. Net result is an increase in the ability of the stream to produce native trout and an increase in numbers of trout within the stream section being repaired.

Recent records show that since 1978, $243,963 in ORAP funds have been used to repair and rehabilitate portions of 38 trout streams in 26 counties of Wisconsin. The work is supervised by trained department personnel and designed to be long lasting, effective and aesthetically pleasing.

ORAP funds have also helped purchase two hatcheries capable of supplying 100,000 pounds of trout a year. Lake and stream access and easements that furnish 100,000 angler days per year on previously private waters have also been financed by ORAP. Sanitary facilities have been installed at many of those same public access sites.

A total of 47 spring ponds that had been silted in have been hydraulically dredged and restored to productivity. They now provide 25,000 angler days of trout fishing, often in wilderness settings, thanks to ORAP.

Mechanical and electrical barriers have been placed on a number of outlet streams to prevent carp or other migrant species destructive to fishing from re-entering waters that had been chemically treated.

The ORAP list goes on and on. It extends to parks, local ball diamonds, tennis courts, swimming pools and much more. ORAP's land and recreational benefits touch every citizen. But I hope I have conveyed the imperative I feel for it as a fish manager: ORAP preserves the basic resource. Without it there's no way to work toward improvement. From my point of view, another 300,000 acres is a modest amount. When the time comes to be counted, I hope you'll agree.

Nightcrawlers

Big fish need big nightcrawlers and big nightcrawlers need tender lovin' care. Now Wisconsin's own expert on TLC for worms tells you how.

GEORGE SRODA, Amherst Junction

To collect nightcrawlers, you need proper equipment. First you need a good light. You've got to be able to see these worms. It's dark. You're picking them up in the evening, probably around midnight. They're up to mate or to migrate, and you want to harvest a nice number. So what do you use? Instead of a flashlight which you'd have to hold in one hand, I suggest a light that fastens around your head with a headband, like a miner's lamp. This will free both hands. A miner's lamp can be moved in any direction to focus on the area where the worms are. Then you can hold a container in one hand, and pick up worms with the other. Most lights come with a white lens, which has a tendency to send the worms down. (They're very sensitive to white light.) So I suggest that you tape a piece of red, plastic cellophane over the lens so you have a red light instead of a white light.

Next, you need a container in which to put them. Too many people use a tin can with no bedding. They overpack or overstock the container, and by the time they get back home, the worms are damaged or overheated. These people wonder why their worms die.

For the proper container, I recommend one with tiny holes for aeration, a good handle for carrying ease, and one large enough to accommodate many worms temporarily. It must also have proper worm bedding.

Be sure that you wear soft-soled shoes, rubbers over your shoes or a pair of tennis shoes. Or, if you'd rather, go bare-footed. A heavy step from a hard-soled shoe will often send nightcrawlers down. They're very sensitive to sound. They do not have senses like you and me, but they do have a group of cells that are sensitive to taste, touch and light. Even though earthworms have no ears, they are very sensitive to vibrations.

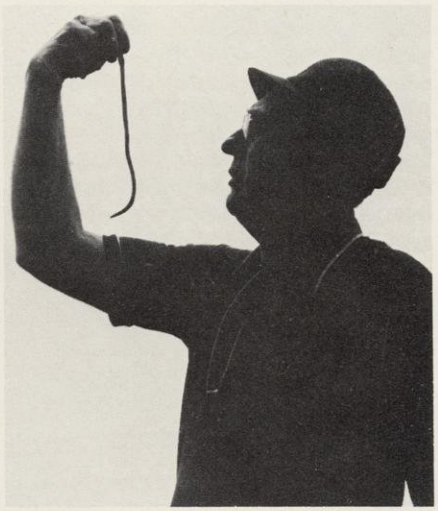
I have often been asked if I believe in using electricity or chemical solutions to drive nightcrawlers out of the ground. These methods will work, but I don't recommend them. Why? The electric method forces the nightcrawler out of its burrow too quickly. So fast, in fact, that in the process the crawler's crop can rupture. This method can also injure other segments and cause death, especially with baby crawlers. As for chemical solutions, they kill too many baby worms while they are still in the soil. Chemicals also pollute the soil and change its characteristics. And incidentally, chemicals destroy the natural odor of nightcrawlers, so important to catching fish.

You can attract them to the surface by driving a stick into the ground and striking it several times to cause vibrations. This will sometimes drive them out of their burrows. But do not risk disturbing them, once they are up, by wearing hard-soled shoes.

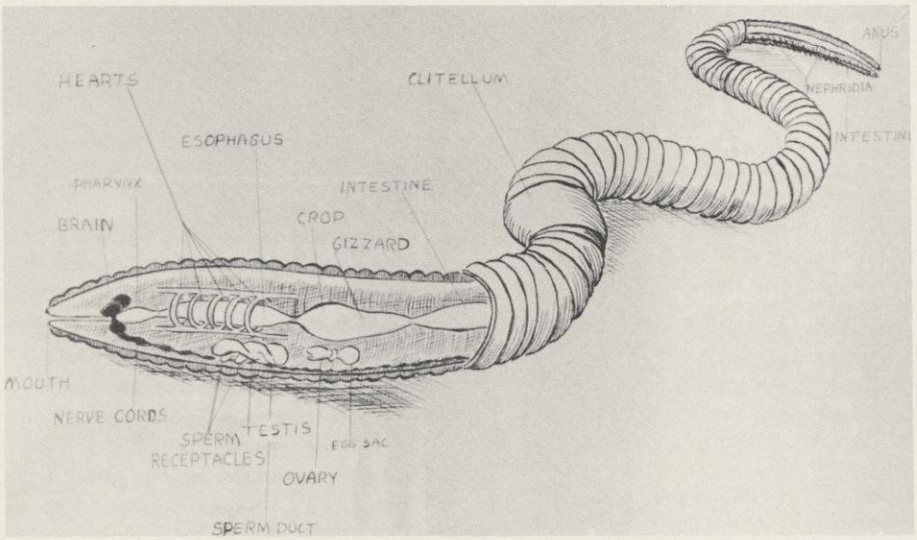
Now you're ready to harvest nightcrawlers. You've got the container, you've got the proper light, and your hands are free. Here's one more thing. Have a piece of cloth in your pocket somewhere, so you can keep drying your hands. Worms have a slimy solution on them and the more you catch, the more slippery your hands get. You reach a point where you cannot grasp the nightcrawlers properly or you cannot hold them because they slip away from you. If you pinch too hard, you'll injure them. You'll rupture the crop and the worms will die. So, keep your hands dry by wiping them on a cloth as you harvest.

When you get a fairly decent number in the container, I would suggest that you empty them into a larger worm container. Then you can go back out and get more.

If the nightcrawlers are not coming up to the surface in the evening, it may be



The author and one of his giant pets.



Structure of a nightcrawler.

Information for this story was gleaned from two books by Author George Sroda: "No Angle Left Unturned: Facts About Nightcrawlers," and "Herman the Worm," the life story of one of Sroda's pets.

Sroda, who bills himself as the nation's "Worm Czar" has appeared numerous times on national TV in The Tonight Show, The Mike Douglas Show, To Tell the Truth and What's My Line. Most of the shows feature Herman and his exploits with the author preaching what he calls "the gospel of the earthworm."

Both books are available from Sroda at Amherst Junction, WI 54407. Cost of "Facts About Nightcrawlers" is $4.95, including postage.

due to dry conditions in your area. So sprinkle your lawn heavily all afternoon. That evening they should come up for air and to mate, and you can harvest them then. (Usually they will not appear above the surface if it's under forty degrees or over eighty or during daylight.)

Try to grasp the nightcrawlers just below the collar, the raised portion located one-third the distance from the head. Get them just below that collar, and give a slight tug if they don't come.

Nightcrawlers are mostly muscle and nerves. They have two kinds of muscles. One lies along the length of the body, and the other circles the body. When they spread their tails, it is impossible to pull them out without injury. So don't pull too hard if they don't come. Just hold on, and in a second or so they'll relax and you can gently pull them out. If they still don't come, let go. You'll probably get them the next night.

If you don't want to find your own nightcrawlers, or if you have a sore back, you can go to a bait dealer. If you purchase nightcrawlers harvested by youngsters, be sure the crawlers are in excellent condition and not injured. Injured worms can cause a number of problems in your worm holding boxes.

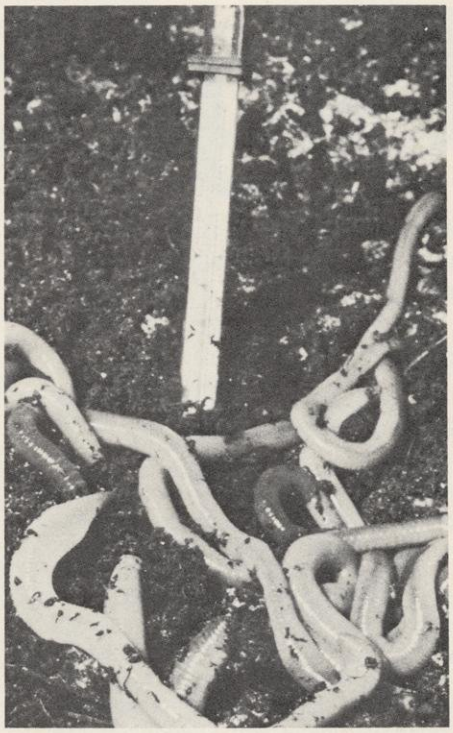
Naturally, worms cost practically nothing if you go out there and do a little bending and gathering yourself. Then you can have the satisfaction of picking your own. But remember, in this phase, many nightcrawlers are damaged or injured. Wait for the right time and be careful.

I think 90% of nightcrawlers and other worms are injured or lost due to improper management while transporting them. In the summer, some fishermen travel hundreds of miles. They leave home with healthy, conditioned worms. They put them into a closed container that is too crowded and too hot. When they get to where they're going, they discover their worms are sick and dying, and blame it on everything but their management program. So, let me explain the proper way to transport worms.

First of all, take along only as many as you'll need. Handle them as little as possible. Your hands leave a human scent on the worms. Wash clean of any insecticides, detergents, sprays or chemicals that you might have touched prior to handling your nightcrawlers.

Many worms are dead before they get on the hook and into the water. It is a fact that many fish will bypass a sick, dying worm. Therefore, use a proper container. Too many people buy a styrofoam container because it's cheap. They put their worms in it and put the cover on. The cover closes off the oxygen, and the worms die from lack of air. And these people wonder why they lose the worms! A tight cover allows too much heat to generate inside. Once the worms are overheated, there's nothing can save them.

When harvesting, grab the crawler below the collar and don't pull when it tightens. Wait a second or two. Relaxed crawlers come out undamaged.



High temperature kills nightcrawlers. Don't let it go above 50 degrees Fahrenheit (10 Celsius). Good idea to use a thermometer and ice cubes if necessary to cool the bedding.

Put a cooling agent on top of the bedding. Use either ice cubes in plastic bags or plastic containers, or refreezable picnic units. And have a thermometer in the container also, so that you can check the temperature every time you stop. If it's a long trip, you might want to pull over at a roadside from time to time to check the temperature of your container. If it's getting above 50, you'd better get some more ice cubes or some other agent to cool it down.

The next question is where are you going to set your container in the car? Too many people put their worms in the trunk. That's the worst place! And by all means, do not put them on the floorboard above the exhaust pipe. Regardless of what cooling agent you use, exhaust has a lot of heat and it can overheat the container and kill the worms. Put the container on the back seat of your car, out of the sunlight. If you have an air-conditioner, put the container of worms near that. That'll keep them in very good condition. Then, when you reach your destination, your worms will be as healthy and as lively as when you left home.

Another thing to consider is vibration. Vibration has killed a lot of worms. A car travels very fast and often over rough roads. Vibration will shake the worms, causing uneven distribution, and making them nervous. (Worms have a well-developed nervous system.) I suggest you set your container on the seat, which will absorb some of that vibration, or on an inner-tube, pillow or anything that will reduce the shaking while traveling. You want the best, healthy conditioned worms you can have when you go on a fishing trip. You deserve it. After all, it's going to take the best worm to get the best fish.

TIPS FOR ANGLERS

1. Cool the bedding in your container to 50 degrees or lower before adding worms. Make sure there is ventilation.
2. Take only the number of worms you will need. Don't overcrowd your portable container.
3. Remove sick or injured worms from the container.
4. Take along a thermometer and check the temperature of the bedding frequently.
5. Cushion the container from vibration while transporting it.
6. Take a cooling agent with you.
7. Wash your hands before handling worms.
8. Hook the worms through their heads so that they look natural.

Confused by all the fluff about whether giant doses of chemicals fed to rats really relate to people? This should shed some light.

Chemical rat rates

*JUDITH RANDAL, Science Reporter, New York Daily News**

Pick a chemical, any chemical. Feed in whopping quantities to rats, mice or both for a year or two. By then, if they haven't already died, most will have cancer. Right?

Wrong. Despite the popular belief that anything in sufficient amounts will cause cancer in laboratory animals, most compounds actually have been found innocent in this regard. Indeed, of some 7,000 that have been tested (some admittedly more adequately than others), all but about 500 have gotten a clean bill of health.

A finding that about 7 percent of the compounds cause cancer in animals does not exactly support those who think "everything seems to cause cancer" or those who would like to diminish our reliance on animal tests. That would, in fact, be a grave error.

As Dr. Marvin Schneiderman of the National Cancer Institute puts it, "Some historical perspective may be in order here. During the 19th century when germs were being discovered thick and fast, much as carcinogens are today, the same sort of skepticism prevailed as this or that microbe was reported as the cause of one or another disease. And there were the same kinds of arguments about whether, in the face of scientific uncertainties, it would pay to clean up the environment.

"Yet when the public water supplies of northern Europe were, in fact, cleaned up — and remember this was long before the advent of antibiotics — epidemics of cholera and other gastrointestinal infections virtually disappeared."

If popular or highly profitable substances are found to be cancer culprits, of course, there is bound to be strong resistance to the findings, and researchers have not gone out of their way, as some seem to think, to pick on them.

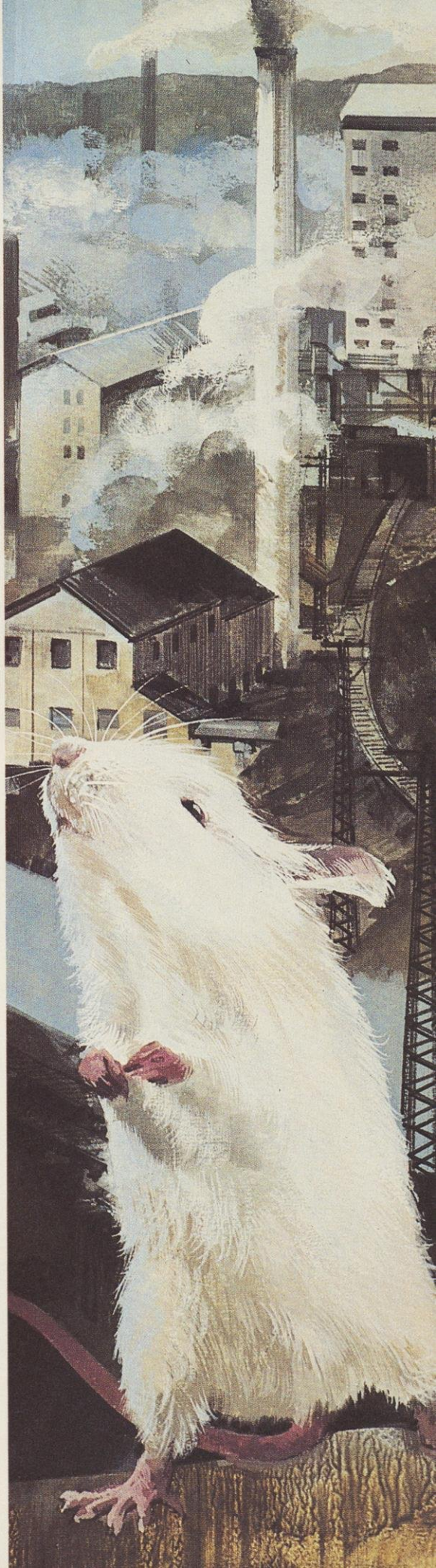
When saccharin began to come under increasing suspicion, for example, some scientists thought orthotoluene sulphate, a frequent contaminant of the artificial sweetener, might be the villain, rather than saccharin itself. But it didn't work out that way. Animals fed large amounts of saccharin-free orthotoluene sulphate developed cancer no more often than similar, undosed control animals. Pure saccharin, by contrast, produced an excess of bladder cancer in male animals, particularly when their exposure to the sugar substitute began — via their mothers' diet — during fetal life.

But sugar itself causes cancer in laboratory animals if enough of it is injected under the skin, which is not exactly how people ordinarily take sugar. That is why animal tests for cancer have to be physiologically appropriate.

As Dr. Schneiderman suggests, the testing of chemicals for their cancer-causing potential is so recent an enterprise that bad news is bound to come in a rush. There are now about 63,000 untested compounds in commerce, with 700 to 1,000 new ones introduced each year. But as the backlog diminishes and there is more pre-market testing, the pace of discovery and unpleasant surprises is likely to slow.

Meanwhile, there are two other reasons why "everything seems to cause cancer" (neither of them traceable, as one wag has put it, "to the failure of

*Judith Randal writes a weekly syndicated column on health and science policy for more than 90 newspapers. It is distributed by Princeton Features. This story first appeared in The Washington Post "Outlook."



science to breed healthier laboratory rats.")

One lies with the media process, which naturally focuses on holes in the dike rather than reporting how well the rest of the dike is doing. On a recent Tuesday, for example, all three television networks reported on their evening news shows that both reserpine, a drug used in the treatment of high blood pressure, and methapyrilene, an ingredient of, among other things, many non-prescription sleep-aids, had been found to be animal carcinogens. They did not report, of course, that malathion, an insecticide dear to the hearts of home gardeners, had at the same time come through the test with its reputation for safety unscathed.

The other reason stems from the fact that testing chemicals for cancer in animals is enormously expensive. Typically, it costs $450,000 to $500,000 per compound, up from $150,000 to $200,000 as recently as 1975 — and that only if rats and mice serve as the test animals. If larger species more closely related to man are enlisted, the price rises substantially because it costs more to house and feed them and they have longer life expectancies.

Given all this, it would be profligate to test chemicals at random. Instead, it makes sense to concentrate on compounds with suspicious molecular structures, such as the chlorinated hydrocarbon family to which dozens of solvents, pesticides, drugs, anesthetics and other products belong. It is also wise to focus on those produced in large quantities (although chemicals produced in less volume to which certain groups of people are extensively exposed are generally included, too).

Even at that, educated guesswork is not always correct. A study performed for the National Cancer Institute by Litton Industries Bionetics Laboratories of 120 common herbicides, pesticides and fungicides is illustrative.

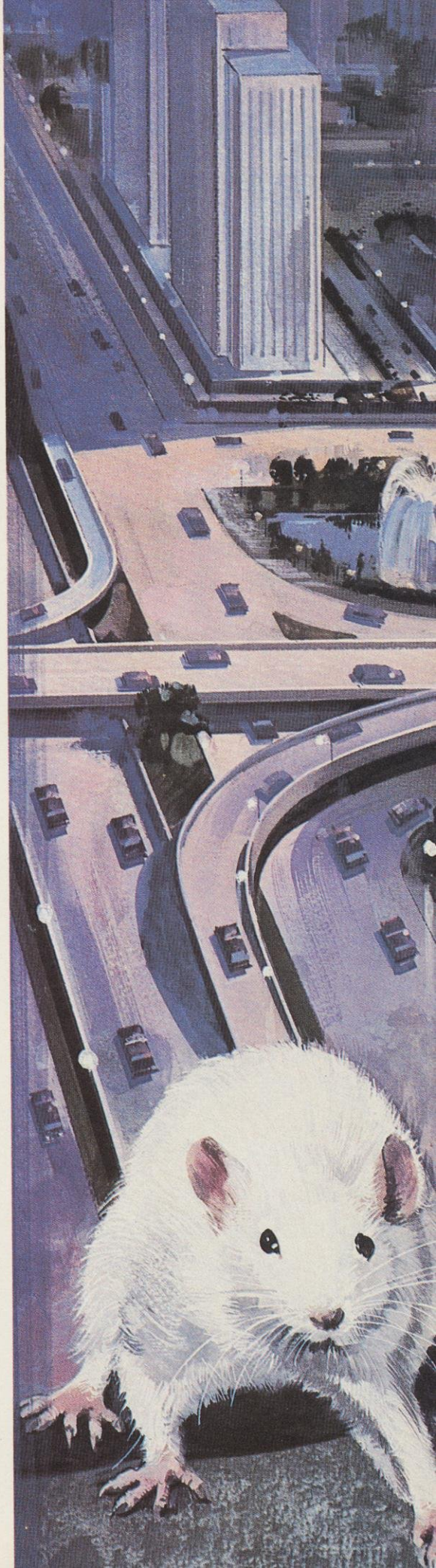
Each of the 120 compounds was fed to mice from infancy through age 18 months in the largest doses that would not quickly kill the animals outright, and all of 120 could have been expected to be carcinogens. Yet only 11 of them — fewer than 10 per cent — resulted in a "significant" number of tumors — more cancers than occur by chance alone in treated animals than in undosed controls.

Nonetheless, many people see no reason why animal tests should have any relevance to humans when such heavy doses of chemicals are used. Again, the explanations are not as farfetched as is popularly supposed.

One is that people, unlike laboratory animals, are exposed to more than one carcinogen in their everyday lives and that — through the interactions of body chemistry — exposure to a variety of carcinogens can be cumulative. In fact, some agents "cooperate" to produce a greater harmful effect than either can produce alone. Both smoking and asbestos, for instance, can cause lung cancer independently. But the rate of lung cancer among smokers who are also exposed to asbestos is higher than mere double jeopardy would suggest.

Accordingly, 1) larger doses than man encounters in the environment are justified in the laboratory when the aim is to discover whether a particular substance is capable of causing cancer at all and 2) no dose of a carcinogen, no matter how small, can be relied on to be safe for every individual. Contrary to what much of industry would have people believe, the concept of a "threshold" or "no effects" dose has no practical validity.

Worth bearing in mind, too, is that, because of the costs, only a few animals — generally no more than 100 — can



Cancer chemicals

Following are the 26 chemicals or industrial processes identified by the International Agency for Research on Cancer as associated with, or strongly suspected to be associated with, the occurrence of cancer in humans:

Aflatoxins
Aminobiphenyl
Arsenic compounds
Asbestos
Auramine (manufacture of)
Benzene
Benzidine
Bis (chloromethyl) ether
Cadmium-using industries (possibly cadmium oxide)
Chloramphenicol
Chloromethyl methyl ether
Chromium (chromate—producing industries)
Cyclophosphamide
Diethylstilbestrol
Hematite mining
Isopropyl oils
Melphalan
Mustard gas
2-Napthylamine
Nickel (nickel refining)
N,N-Bis (2 chloroethyl) -2-Naphthyllamine
Oxymetholone
Phenacetin
Phenytoin
Soots, tars and oils
Vinyl chloride

be used to study any one compound to which millions of people of varying sensitivity are exposed. An example having nothing directly to do with cancer may make the principle clear.

When trials of swine flu vaccine were conducted in 5,000 volunteers, there were no cases of Guillain-Barre paralysis. But when 42 million people later were inoculated, more than 200 became paralyzed. By the same token, each animal in these cancer experiments has to represent many millions of people, making it essential to use large doses if there is to be a prayer of detecting a compound's relatively rare effects.

"Relatively rare," however, is a term to be used with care. Even what scientists call a "weak" carcinogen can lead to many thousands of cancers if hundreds of millions of people are exposed. And the earlier the exposure begins and the longer it continues the greater will be the risk, whether the doses are large or small.

More fundamentally, it should be remembered that although rats and mice are not little people, they are like people in being collections of mammalian cells organized into tissues that undergo the same biological processes. By giving large doses of a chemical to a small creature with a rapid metabolic rate, a short life span and comparatively few cells, one can get a reasonable approximation of what will happen in a larger creature whose metabolic rate is slower and who has many times more cells and a longer life expectancy.

Of the 26 chemicals from aflatoxins (by-products of food molds), asbestos and benzene to vinyl chloride gas (used in the manufacture of polyvinylchloride plastics) that are proven causes of human cancer, all — with the possible exception of arsenic, which has yet to be thoroughly tested — also cause cancer in animals. Is the reverse true? The National Toxicology Program, for instance, has so far completed tests of 194 compounds and identified 92 of them as animal carcinogens and 19 as borderline — this because scientists could not be 95 per cent or more confident that their findings were not just coincidence. Are all these compounds also cancer risks for man?

While it would be nice to have a clear-cut answer, that is currently impossible. An occasional chemical such as DES (diethystilbestrol) produces a type of cancer — in this case a cancer of the vagina in young women — which otherwise is almost unheard of and so enables scientists to track down its source. (That proved to be DES use by expectant mothers to prevent threatened abortion.) But the cancers that furnish such clues are few.

The more usual state of affairs is for a carcinogen to increase the rate of cancers that, for any number of reasons, commonly occur anyway and take 10 to 30 years to do so besides. Thus it is well nigh impossible to roll back the clock those decades to trace an increase in cancer to its origins.

As if all of this weren't sufficiently complex, no one knows how to determine from animal tests the degree of risk to humans. For example, it was found after the thalidomide tragedy that humans are 60 times as sensitive to the baby-deforming tranquilizer as mice, 100 time as sensitive as rats and 700 times as sensitive as hamsters. But there is now no way to reverse the order of such calculations so that quantitative risk assessments can be made in advance. It simply has to be assumed for the sake of prudence that humans are at least as vulnerable to carcinogens as the rats

Quick, cheap tests

Bacteria, mammalian cells grown in glassware and simple organisms like fruitflies that can be inexpensively maintained in little space are beginning to help science identify hazardous substances in the environment.

When exposed to a carcinogen, they quickly undergo changes in their genetic material that can be observed and quantified. In the presence of a cancer-causing chemical, for instance, irreparable breaks may occur in the chromosomes of mammalian cells. Or in the case of bacteria, the introduction of such a compound into their environment may render their offspring no longer dependent on the special nutritional requirements of their parents.

To date, any one such test is thought to be no more than 85 percent reliable. But crosschecks can be made by running the tests in batteries, and these batteries can pinpoint chemicals that appear dangerous enough to warrant full-blown testing in intact animals.

The beauty of these tests is that they can be completed in hours, days or weeks rather than years, and many can be performed for as little as $2,000 each. In addition, they promise to make it possible not only to tell if a substance is a carcinogen, but also if it can damage human eggs or sperm.

and mice that serve as their surrogates.

In fact, both the causes of cancer and the frequency of certain kinds of cancer are subject to shifts that probably reflect previous changes in custom and technology. The widespread introduction of refrigeration and the consequent reduction in food spoilage during the World War I era, for instance, may well have been responsible for the decline in stomach cancer which began about 1930, at least so the evidence suggests.

In the same way, there are those who think that because cigarettes are not as strong as they used to be, something similar may be in the offing where lung cancer is concerned. If the scenario is correct, there will not only be less lung cancer attributable to cigarettes a decade or so down the road, but also more caused by such other influences as air pollution and occupational exposure to carcinogens.

No matter. What can be said with confidence is that animal tests have more often proved prophetic than not. The vinyl chloride gas already mentioned is a case in point. Granted, the tumors that were produced by the gas in animals before it was known to cause a rare form of liver cancer in humans occurred in the zymbal glands of hamsters, facial structures that man does not have. Nonetheless, the premonition was there, confirming the principle that once a carcinogen circulates in the bloodstream it is free to attack whatever organ or organs may be most vulnerable.

Similarly, tests conducted on several species beginning in the 1930s accurately predicted that the chronic estrogen replacement therapy subsequently prescribed for millions of women to ease them through the menopause and retard the aging process would significantly increase their risk of getting uterine or breast cancer.

An equally dramatic example is provided by the chlorinated hydrocarbon Kepone. It is a decade or more too soon to know whether the employes of the now-defunct Life Sciences plant in Hopewell, VA., who were heavily exposed to this pesticide in the course of its manufacture will have more than their share of cancer, as rodent studies suggest. But it should have come as no surprise that many of them would be subject to tremors, other nervous symptoms and sterility as a consequence of that experience. Experiments conducted on quail in 1964 resulted in exactly those injuries.

When it comes right down to it, then, animal tests are meant to function as an early warning system, and their biggest drawback is that people fail to take them seriously. Given the fact that at least 70 percent of cancer is thought to come from exposures 10, 30 or even more years earlier, the really pertinent question is what this is doing to our future selves. With one in five Americans dying of cancer, often prematurely, the public's scorn of animal tests should be seen for what it is: playing with fire.

Photos and art courtesy of Harlan-Sprague Dawley

The readers write

I read and appreciated "ORV's Can be Awful" in *Wisconsin Natural Resources*. I have seen and understand the environmental problems they cause. But throughout the article I looked for the writer's solution: law enforcement? education? what?

I love the outdoors, and am as active in it as possible. I like wildlife photography, and I have many places to do it. I hunt and fish, and have hundreds of places to do that. I hike, backpack, camp, play tennis, golf, swim, ride bicycles . . . and for every activity, there are many places to go, and most are supplied by DNR or County Government.

But I also love to ride trails on a motorcycle. I would really enjoy riding hundreds of off-road miles a day seeing whitetails, porcupines, and giant virgin hemlock trees deep in the forest. And I would love to have a place nearby just to practice riding techniques: spinning around, climbing hills or obstructions, riding ruts, and crossing creeks.

But for those activities, I do not know of one place to ride legally. Not one.

And why isn't there such a place? Is trail riding not just as legitimate a sport as golfing, hunting, bicycling or boating? If so, shouldn't there be places to do it?

Many people are interested in off road recreation, as revealed by the damage being done. Manufacturers have been making off road cycles and jeeps for years. But the DNR, which supplies land and lake access for every other kind of recreation, hasn't had the foresight to open up land for off road recreation.

By now, southeastern Wisconsin, the heaviest populated area of the state, should have many places for riding, but there are none. So riders look for any open field, any woods or hill, where they can ride and not be bothered.

The solution to this problem is to open up land for riding, a solution that keeps being passed over. Instead, I see more new trails for bicyclists, more boat launches, more parks for picnicking and camping. Fine, we appreciate them. But what about off road vehicles? Ignore them?

Open up some areas to motorcyclists and you'll find that ORV's don't have to be awful.

GERALD C. JOHNSON, Racine

DNR has tried, ever since money from motorcycle license fees was first set aside for ORV Parks. Each time DNR proposed a trail-riding park, local residents responded angrily. It seems nobody wants ORV's for a next-door neighbor.

The program has now been handed over to the counties. The money's theirs if they can convince residents to approve an ORV park. Meanwhile, ORV's continue to travel where they don't belong.

One state park will allow trail bikes, though. When Bong recreation area opens near Racine, it will include space for off-road motorcycling, and many other activities.

Your article on off-road vehicles describes well an inexcusable situation. This misfit behavior could be controlled very soon if people witnessing these acts of ORV (off road vehicle) vandalism would immediately report license numbers, times, and other pertinent facts to law enforcement personnel. With citizen prodding, judges might levy maximum, not minimum, fines and the ORV would be confiscated to use for apprehending other irresponsible operators.

Let's do it now and end this cheapening of our resources and the mockery of our protective laws.

JACK BATES, Stoughton

The January-February issue was an excellent example of environmental reporting at its best. It is a most refreshing switch from the shoddy, indifferent attitude and performance of much of the mass commercial media, which has no conception of the need for a broad environmental ethic.

As a follow-up to your article on ORVs, or "roving vandals," your readers might be interested in additional reports about the wholesale destruction of millions of acres of delicate and often irreplaceable ecosystems by off-road vehicles. They are:

"Off-road Vehicles on Public Land"
Council on Environmental Quality
US Government Printing Office
Washington, DC 20402

"Effects of Off-road Vehicles in Arid and Semi-arid Regions"
US Geological Survey
Desert Protective Council
Box 4294
Palm Springs, California 92263

Either report will convince readers that man, himself, is little more than a questionable experiment.

J.S. WALWORTH, Appleton

In the March-April issue you gave an address for the Boone and Crocket Club to get the necessary forms and instructions for measuring a whitetail deer rack. I mailed my request to the address given and had it returned to me by the post office as undeliverable. Please advise.

CHARLES W. MOEDE, Bonduel

Oops, small typographical error there. Inadvertantly, 97th street became 79th street. Sorry. The correct address should read:

Arnold Kreuger, President
Wisconsin Buck and Bear Club
3726 S. 97th Street
Milwaukee, WI 53228

The article "Toward a North Country Winter" in a recent issue was beautifully written. The author signs himself, "Justin Isherwood, farmer, Route 1, Plover." Is Mr. Isherwood also a poet? May we anticipate more writings by this author?

MR. AND MRS. CLARENCE CHESKY, Beloit

Readers are invited to express opinions on published articles. Letters will be edited for clarity and conciseness and published at the discretion of the magazine. Please include name and address. Excerpts may be used in some instances. Letters to the editor should be addressed to Wisconsin Natural Resources magazine, Box 7921, Madison, Wisconsin 53707.

My curiosity is so piqued by that wonderfully gifted writer, Justin Isherwood, that I am moved to write my first fan letter.

Couldn't you give your readers a thumbnail sketch, like age, marital status, family, education, books? (Anything but a photo. I have this mental image of him I wish to keep intact.)

MARTHA T. PIERCE, Sparta

One biographical sketch, alá Isherwood:
Isherwood, Justin
species: *homo sapiens.*
subspecies: *americus de nord farmerus.*
identification: *more a shrub than a tree. Found chiefly on a great outwash plain in the vicinity of potatoes, corn, sawmill, and sugarbush. A blue-eyed, red-whiskered, pipe-smoking mutant, given to bouts of whittling and staring into space.*
height: *17 hands.*
diameter: *out-of-round tube.*
fruits: *two small berries to be scattered by the wind and the ability to read. Known to have crossed with a green-eyed weaver and bread-baker.*
beliefs: *oatmeal, children and laughter, wood heat, canoes, ash paddles, books, tea, wide-brim hats, sauna, maple sugar, gooseflight, various women of the species, pup tents, briar pipes, white pine, rain, winter, #3 lead pencils, and night.*
remarks: *a meandering and primitive type, difficult to observe, impossible to domesticate.*
articles: *others will follow.*

By the way, a picture of Justin Isherwood accompanied "Woodlot," his first article for this magazine in November-December 1977. But you don't have to look.

I have increasingly appreciated reading your magazine. The articles are thoughtful and well-considered. Thank you and keep it up.

Not long ago you ran an article entitled "Wisconsin Has Big Doubts" about Great Lakes winter navigation. The twelve points you covered show that you rigorously question and investigate issues. You came up with some very critical questions and problems with the Corps of Engineers proposal. Through such detailed analysis, difficulties can be avoided. Seeing this and other such articles, I feel assured you will consider my next point.

I was somewhat dismayed when I read the article "Wisconsin's Hazardous Wasteline" in the same issue. You totally avoided any mention of radioactive waste — trying to avoid an issue? You mentioned four steps DNR will take to manage hazardous wastes. I'd like to suggest a fifth: reduce the generation (production) of hazardous wastes. If industry is going to produce hazardous wastes, we must thoroughly research the alternatives. For instance, I think we should give priority to solar over nuclear power.

Keep up the good work, ever changing, improving, adapting.

THEODORE S. "TED" MAY, Pewaukee

Author Larry Sperling replies:

Federal and state laws specifically exclude radioactive waste from state hazardous waste programs. Radioactive waste requires special handling, storage, and disposal, even more so than hazardous chemicals. The federal Nuclear Regulatory Commission handles the production and disposal of radioactive materials. In Wisconsin, the Division of Emergency Government takes care of radioactive waste disposal matters. DNR will continue to advise Emergency Government on ways to best protect the environment from radioactive waste, but these wastes will not be covered by our hazardous waste management program.

I'd like to respond to something that appeared in "Wisconsin's Coasts," the supplement by William S. Becker. On the last page was a chart indicating budgets for various projects. The monies indicated there for the Oneida Tribe of Indians were incorrect.

The Oneidas have received three Coastal Management grants totalling $58,233. Even adding on the amount contributed by the Oneidas, the total would come to much less than $101,623 reported in the story.

The figures you listed have caused some unfortunate ill feelings. An amend would be appropriate and appreciated.

MICHAEL SCHAEPE, Oneida Tribe of Indians, Oneida

The office of the Wisconsin Coastal Management Program checked their figures and arrived at much the same conclusion.

Part of the problem arose because the '79-'80 figures in the story were taken from budget requests. Between the time the article was compiled and the magazine mailed out, the federal office pared down the Oneida request along with many others.

For the record, the correct figures are:

		WCMP Grant (80%)	*Oneida Matching Funds (20%)*	*Total Budget*
1978-79	*Duck Creek Floodplain*	*$17,708*	*$4,494*	*$22,202*
1978-79	*Trout Creek Floodplain*	*19,241*	*4,819*	*24,060*
1979-80	*Environmental Corridor Duck-Trout Creek*	*21,284*	*6,764*	*28,048*

Thanks for pointing out the error. Hope this helps correct any misunderstanding.

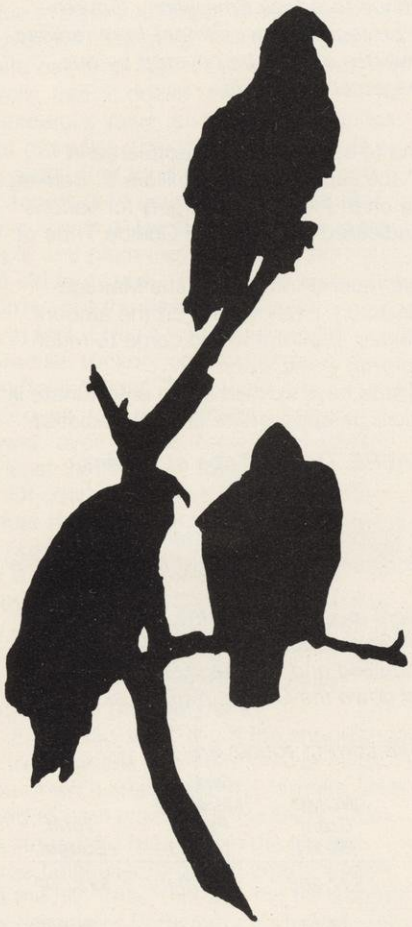
Just a short note to say "Thanks" for the way my subscription was handled.

The problem was a mix-up in my expiration date. But after calling your office and discussing it the problem was resolved very efficiently. My personal thanks to you for putting together a thorough magazine. I wish it was published monthly! I enjoy camping and fishing in Wisconsin, and your magazine has helped me appreciate the outdoor life even more.

PAUL RZASA, Oak Park, Ill.

Thanks for the bouquet! We try to give good service but we're not perfect. Right now we're in the middle of switching to a new computer subscription service and a few problems are bound to arise. If we ever happen to goof on your subscription, please write. We'll set things straight.

Turkey vulture



Every TV cowboy who ever drew a six-gun knew that when the buzzards started circling, his end was near. Behold the effortlessly soaring angel of death — grotesque, majestic, and superbly efficient. Wisconsin has a good population.

MICHAEL MOSSMAN, DNR Bureau of Research, Madison

It's a damp and chilly predawn in a lonely part of the Baraboo Bluffs. Only the call of a barred owl breaks the silence. Above the forested bluffside, a dark form rises and glides like an ill omen over the misty valley and into the abandoned pasture where I crouch in my blind. With a slight rustling, the form alights on the upper branches of a solitary dead tree. Gradually more of these foreboding forms arrive and soon the tree is filled with huge black birds, six feet in wingspread — turkey vultures!

Each morning at dawn these birds leave their nighttime roost and coast a quarter of a mile to this morning perch. Here they while away the early morning hours until the sun warms the air and sets the currents rising. Then the birds will soar off to spend the rest of the day in flight, foraging for their main food: carrion. A dead calf sufficiently rotted so the hide softens and rips easily open, a rat thrown from a manure spreader, a skunk flattened by a carload of tourists — nothing is too ripe for these ambitious scavengers. Local farmers generally consider them welcome but peculiar guests. The vulture's feeding habits give it its scientific name — *Cathartes aura,* the cleanser. Their diet also explains the vulture's naked, turkey-like head, featherless for easy cleaning after feeding inside large carcasses.

This is the same species — often called a buzzard — which frequents the southern states and the deserts of the southwest. In four southeastern states its numbers have dwindled to where it is now considered an endangered species.

But the turkey vulture is apparently doing fine in Wisconsin. It was scarce here until the late 50's when its numbers suddenly began to rise. Perhaps the advent of modern agriculture in the South pushed some birds north looking for better habitat. Maybe as the deer herd increased in Wisconsin, it meant more road kills and more vulture food. Although, unlike crows, vultures are not often seen feeding along roadsides. Or it could be something as simple as people not shooting vultures here in the North. No one really knows.

Despite this increase in recent times, vultures are not newcomers to Wisconsin. Fossil records from the Baraboo Hills show they were here as long ago as 3,000 to 4,500 years, perhaps fluctuating with changes in climate.

Figuring out exactly how many vultures are around now can be tricky. As they fly to their roost here in the evening, they land singly or in small groups over a period of three to four hours. On breezy evenings when air is warm and rising, up to 60 may circle the roost at one time, preparing to land. Another roost three miles away usually holds another 20 to 30 birds. Roosts have also been spotted in Oconto, Waukesha, Juneau, Jackson and Vernon counties, as well as along the Mississippi River.

As I watch the birds at their morning perch — preening, stretching, regurgitating pellets of undigested hair and bone, occasionally arguing over a perch site — the sun slides bright and warm from behind a cloud and several vultures respond. Turning their backs to the sun, they spread their wings out wide and stand as if crucified or hypnotized,

their white beak tips and bare, blood-red heads glowing in the sun. This stereotyped behavior exhibited by all turkey vultures has been called the "sunning posture" by ornithologists. Reasons for it are largely a mystery. Perhaps it helps to warm the birds or to rid their feathers of the previous night's condensation.

Another mystery is where our buzzards go when they migrate south in late October or early November. In 1973, I banded my first vulture nestling in the Baraboo Bluffs. The following March, the band was returned from San Sebastian, Honduras, cause of death unknown. It's probably a fairly good guess that this bird was on its way north after wintering in South America. Since then I've banded a dozen or more nestling and adult vultures, but have received no more returns.

It is now illegal to put leg bands on turkey vultures. These birds have the odd habit of excreting on their legs, especially when they're overheated. The chalky excreta builds up under the band and can cut off circulation to the foot.

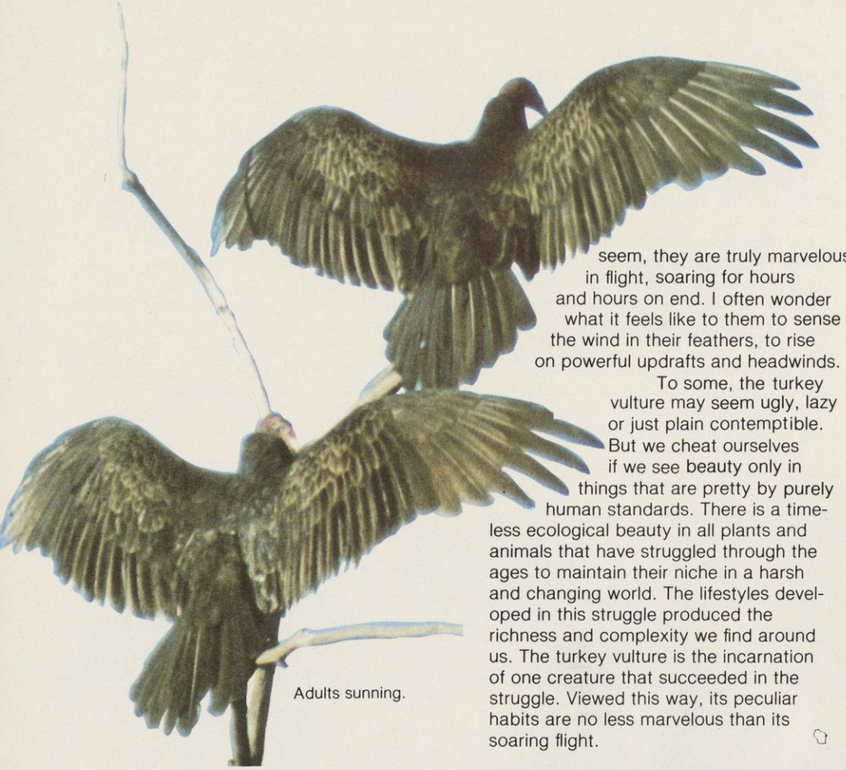
A closer look at the birds on the perch reveals a few with gray heads, black beak tips, and a bit of white fuzz on the tops of their heads. These are juveniles which recently fledged and joined the communal roost. Clumsy in their new fraternity, they strike strange sunning postures, chase about after each other, violate the personal territory surrounding each perching adult, and consequently get themselves chased off.

The young hatch around the first of June. Unlike other birds of prey, turkey vultures nest in places such as hollow logs, brush piles, caves and abandoned shacks. Nests are hard to find in Wisconsin, partly because they're usually in such remote wooded areas. In the Baraboo Bluffs, vultures lay their eggs on the ground, sheltered among tumbled quartzite boulders. For eight to ten weeks the nestlings live in the dark, damp spaces between the boulders and thrive on partially digested carrion regurgitated by their parents. If approached by an intruder, the nestlings let out a frightful, roaring, undulating hiss, low and throaty like wind among the rocks. Often they'll stamp their feet ominously, the sound thudding and echoing throughout their little cave.

As the ultimate insult, sometimes they'll back up their threat by disgorging their rotted, vile-smelling breakfast or lunch.

Sometimes if I got within three feet or

Photo by Mike Wallace



Adults sunning.

seem, they are truly marvelous in flight, soaring for hours and hours on end. I often wonder what it feels like to them to sense the wind in their feathers, to rise on powerful updrafts and headwinds.

To some, the turkey vulture may seem ugly, lazy or just plain contemptible. But we cheat ourselves if we see beauty only in things that are pretty by purely human standards. There is a timeless ecological beauty in all plants and animals that have struggled through the ages to maintain their niche in a harsh and changing world. The lifestyles developed in this struggle produced the richness and complexity we find around us. The turkey vulture is the incarnation of one creature that succeeded in the struggle. Viewed this way, its peculiar habits are no less marvelous than its soaring flight.

so the nestlings would try another intimidation I call the "scare jump." The young bird would thrust its head and neck up and flap its wings once loudly as it lunged forward menacingly. As startling and effective a maneuver as this scare jump is, never once did a bird actually touch me. Even a stick held within inches of the bird was usually not touched.

When incubating, the full-grown bird defends itself a little differently. Usually when I enter a nest chamber the nesting adult will regurgitate up to a cup of smelly, partially-digested carrion. It lays limp, still and silent, beak partially open, eyes glassy. It looks and smells so much like death even a possum must be envious.

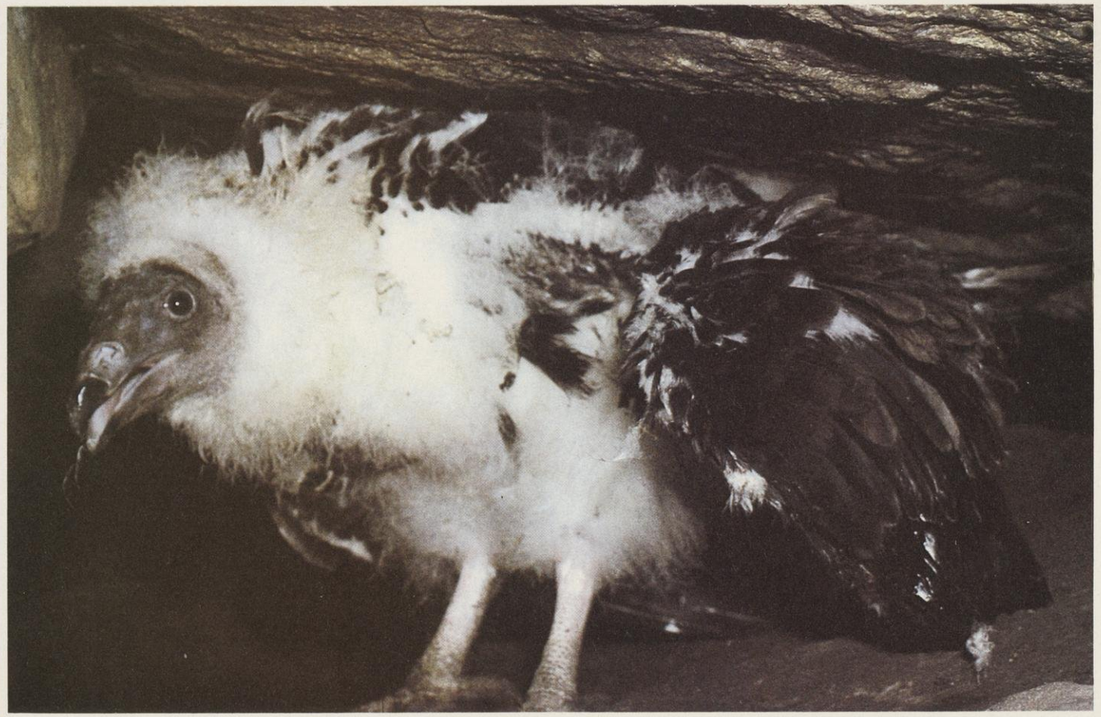
In fact, this "death feint" is so convincing that when a fellow observer visited one of the Baraboo nests, he returned insisting the vulture was "deader than a door nail . . . smelled like it'd been dead a couple days." He had even poked it with a stick to be sure. How effective this behavior is against other intruders remains unknown. Information about the vulture's natural enemies is scant.

Vultures also regurgitate when disturbed at other times, especially while feeding. But then it may serve to lighten the bird for a fast take-off.

I like to watch the vultures rise from their morning perch and soar gracefully away to disappear over the hills. As repulsive as their personal habits might

Vultures feeding on a carcass. This photo was taken in Florida. Photo by Mike Wallace

In flight. Photo by George H. Harrison



Nestling seven weeks old.

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