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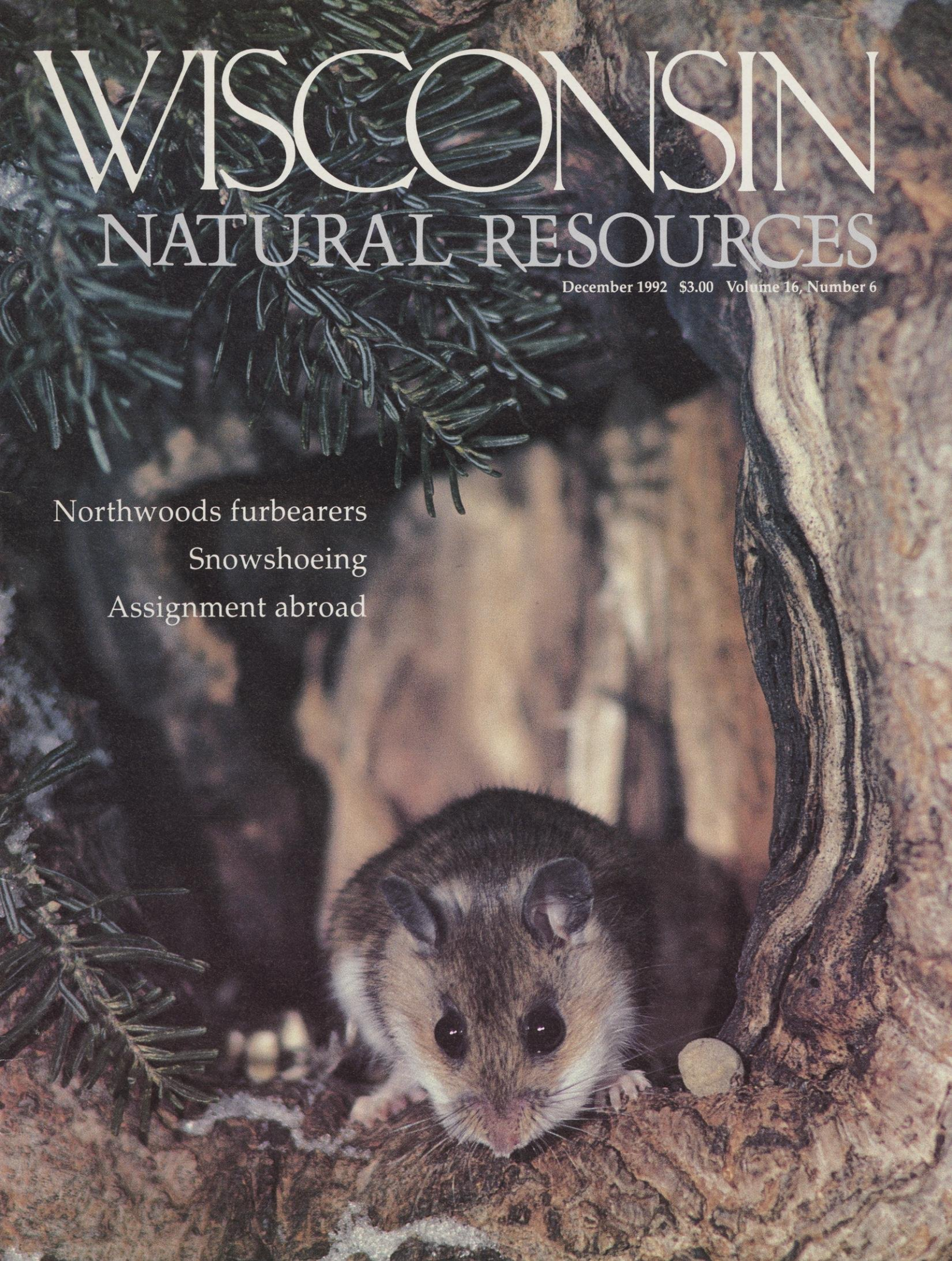
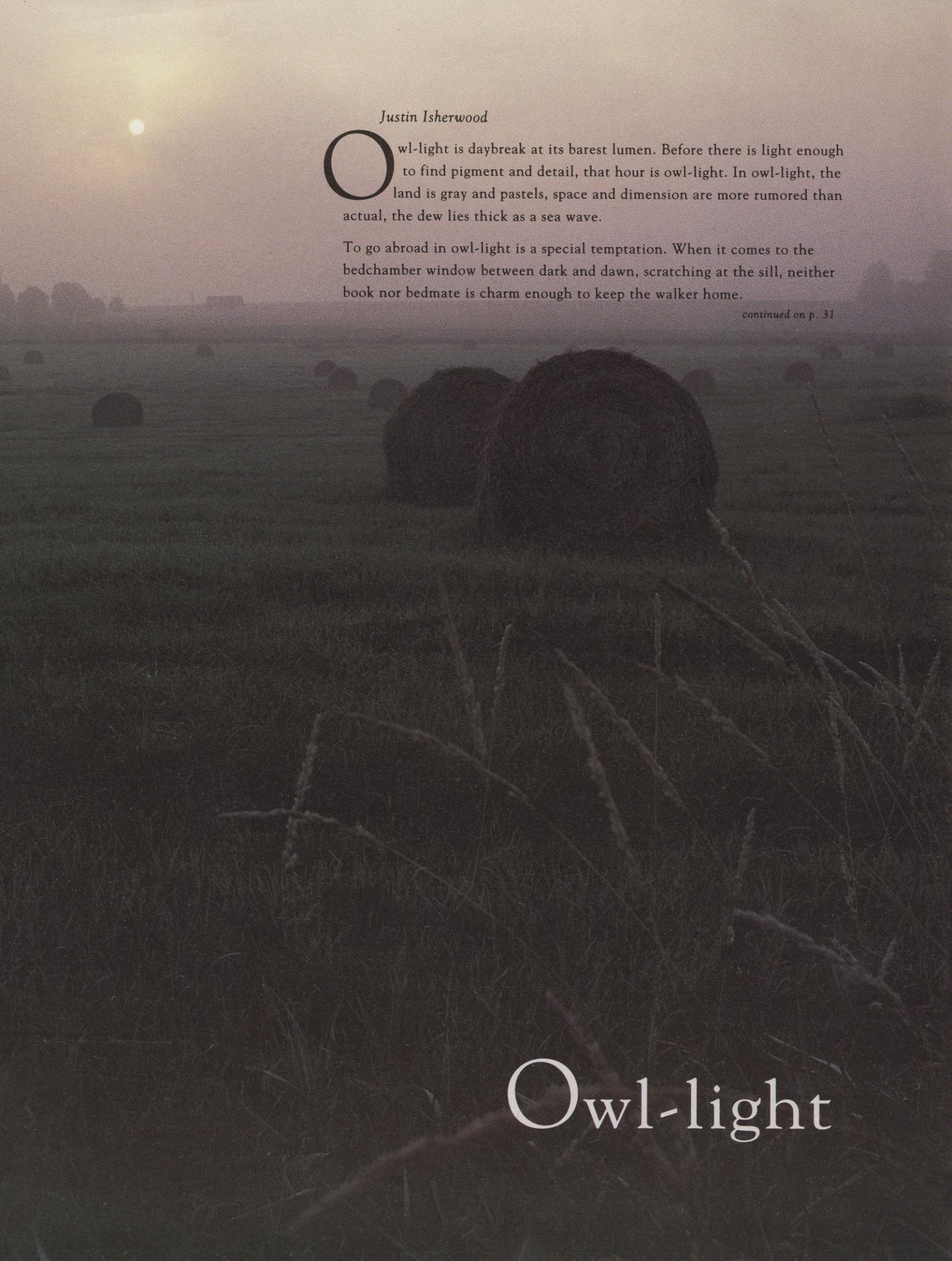


Northwoods furbearers

Snowshoeing

Assignment abroad



Owl-light

Justin Isherwood

Owl-light is daybreak at its barest lumen. Before there is light enough to find pigment and detail, that hour is owl-light. In owl-light, the land is gray and pastels, space and dimension are more rumored than actual, the dew lies thick as a sea wave.

To go abroad in owl-light is a special temptation. When it comes to the bedchamber window between dark and dawn, scratching at the sill, neither book nor bedmate is charm enough to keep the walker home.

continued on p. 31

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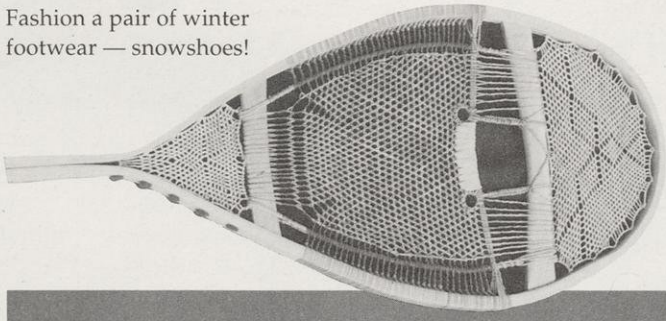

THE BLONDE

GREGORY K. SCOTT

Talking sturgeon on the Volga River. DNR PHOTO

FRONT COVER: Deer mouse. GREGORY K. SCOTT, NATURE PHOTOS, GILMAN, WIS.

BACK COVER: Snowshoeing near Rocky Run Creek, Columbia County. ROBERT WALLEN, MACKENZIE ENVIRONMENTAL CENTER, POYNETTE, WIS.

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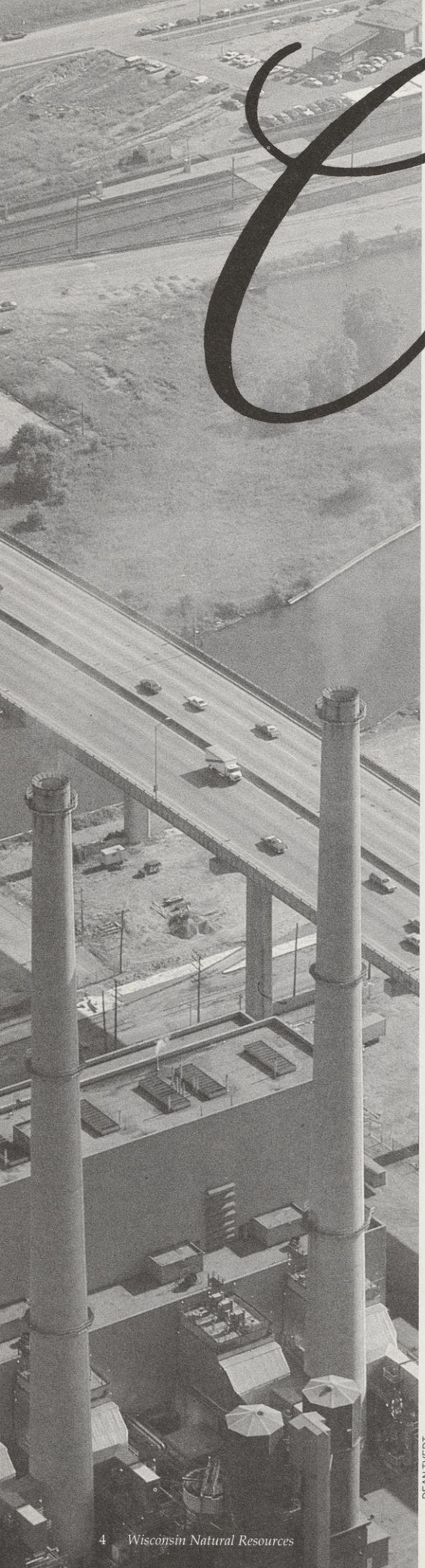
Sunrise in Walworth County. © MICHAEL WEIMER



DEAN TVEDT

CLEARING THE AIR

For 20 years, the burden for cleaning the nation's air fell on big business. It's time for small shops and homeowners to get into the act.

The nose doesn't always know. Oh sure, you can smell smoke before the fire. You can smell sulfur long after someone strikes a match. But your finely-attuned senses of smell, taste and sight may not tell you when the air is getting unhealthy to breathe. You can't smell the slow, diffuse buildup of volatile organic compounds. You get no wafts of nitrous oxides or whiffs of carbon monoxide. Many air pollutants leave our senses senseless.

Yet, we feel them in other ways: some physical, like a tightness in the chest or loss of stamina when exercising; some cultural, like premature aging of concrete or weathered paint; some financial, like higher prices for food or fuel.

As the latest wave of clean air laws moves from theory to practice, we will also be feeling the changes in our neighborhoods, our backyards and our attitudes.

Clean air laws were amended two years ago to fine-tune the process that started with the cleanup of industrial smokestacks. The process will end when a breath of healthy, fresh air is guaranteed in every community all the time. Most locations in Wisconsin meet clean air goals now, but improvements needed to enhance air quality along land adjoining Lake Michigan's shoreline will bring some changes statewide and more intense changes in eastern Wisconsin.

Currently 295 tons of volatile organic compounds are emitted each day in eastern Wisconsin by cars, trucks, small engines, industries and businesses. The Clean Air Act sets a 17-year challenge which targets residents, employers and workers in six counties — Milwaukee, Racine, Kenosha, Ozaukee, Washington and Waukesha — to cut emissions 15 percent by 1997 and an additional three percent annually until clean air goals are met by 2007. Some of these programs will also bring changes in Walworth, Sheboygan, Manitowoc, Kewaunee and Door counties.

Volatile organic compounds, or VOCs, are the fumes we associate with petroleum fuels, cleaning fluids and other solvents. On hot, sunny days, these fumes react with nitrogen oxides to form ozone near the ground. Ozone is the irritating main ingredient in smog, which may make the average person's eyes a little itchy. Individuals more sensitive to ozone can suffer scarred lung tissue or other stresses that make it harder to breathe. Prolonged high ozone levels can also damage crops and wear down construction materials. It's also irritating that despite nearly 15 years of pollution controls, ozone remains a nagging problem throughout the Lake Michigan coastal counties.

Past pollution controls primarily tightened the screws on industries and large businesses that produced lots of VOCs — machine shops, paint shops, parts coaters and manufacturers — but nitrogen oxide emissions were allowed to continue unabated. The average person was only asked to stem air pollutants from his or her car by keeping the engine tuned and testing tailpipe emissions annually. To further clear the air, large businesses, small businesses, com-

JEAN B. MEYER

You wouldn't look twice at it today, but such places are important to our clean air and transportation future — the crossroads for bus fleets, car pools and railroads.

munity managers and individual residents will have to adjust their activities and habits. Here's what's envisioned.

Measuring air pollutants from smaller businesses — Businesses like print shops, dry cleaners, auto service stations, paint and body shop each emit small amounts of air pollutants. Environmental managers will start measuring how collective emissions from these small businesses lessen air quality. Currently, approximately 400 businesses in southeastern Wisconsin each have the potential to emit more than 100 tons of air pollutants annually. Some of these firms have installed pollution controls. The Clean Air Act will lower that limit to 25 tons per year in southeastern Wisconsin and establish the 100-ton per year standard elsewhere in Wisconsin, affecting an additional 600 businesses statewide.

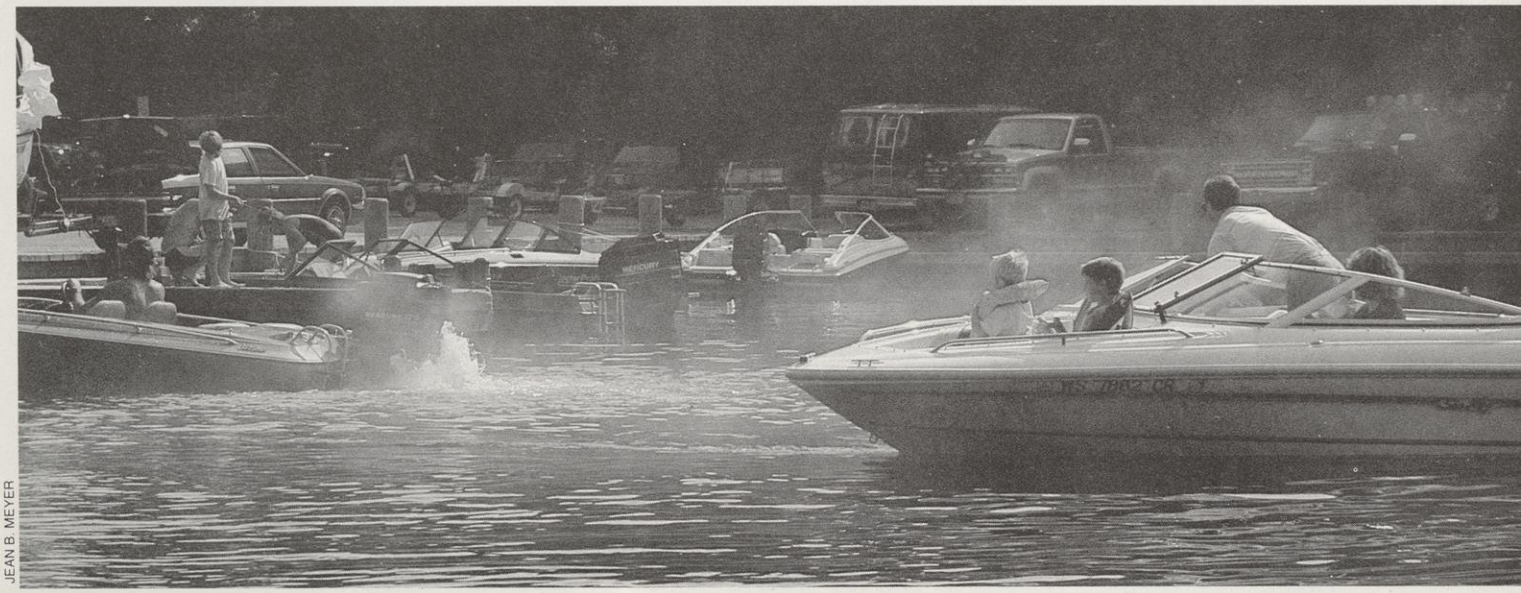
Trading pollution credits — Firms that want to expand or start businesses in southeastern Wisconsin can't add to the amount of sulfur dioxide emitted in the region. Any new source of sulfur dioxide must be offset by reductions elsewhere. Pollution "credits" from companies that have reduced emissions will be traded on the open market. Sulfur dioxide credits will be bought and sold like stock certificates at the Chicago Board of Trade. This trading system provides economic incentives to reduce pollution. Since credits are expensive, new or expanding firms benefit by limiting the amount of air pollution emitted from their facilities.

Under such a system, many Wisconsin firms are well ahead of national programs to reduce sulfur dioxide. State utilities have been drastically cutting sulfur dioxide emissions since the mid-1980s to curtail acid rain. The emissions they cut six to seven years ago are now worth plenty on the open market. On the other hand, Wisconsin firms may need to buy or barter credits when pollution credits for VOC emissions are offered.

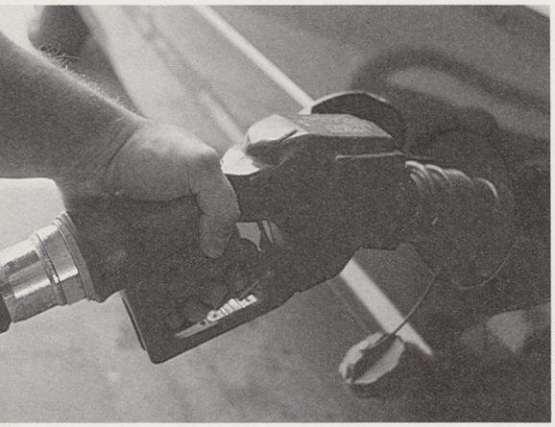
Increasing permit fees — The Clean Air Act also mandates that businesses and individuals who create air pollutants bear a greater share of the costs of running environmental protection programs. As federal funds for state environmental programs dwindle, states will be expected to cover costs by raising air pollution permit fees to $30 per ton of emissions (up to a 4,000 ton limit for any given pollutant). Current fees in Wisconsin range from $3-4 per ton. What costs do fees cover? The expenses of hiring air quality specialists, buying and maintaining monitoring equipment, preparing laws and guidances, analyzing the effectiveness of pollution controls, monitoring the environment, issuing permits, and tracking emission amounts and sources.

Ticketing violators on-the-spot — Federal environmental officials will gain the authority to write pollution tickets much as police officers can write traffic tickets for violations of transpor-

Cleaner burning engines in boats, lawn mowers, chain saws and other home products will help reduce pollutants that cause ozone smog. It's a special challenge and opportunity in Wisconsin where most of the nation's small engines are made.



JEAN B. MEYER



ROBERT QUEEN

New fuel pumps draw in fumes as they dispense gas.

tation laws. The aim is to stop pollution more quickly than prosecuting a violator through the courts.

Auto adjustments — curbing our cars

Auto emissions contribute significantly to VOC and nitrogen oxide pollution. Better driving habits can also conserve fuel and cut emissions. Cleaner cars and better habits are both needed in the name of clean air.

Tailpipe tests currently measure how efficiently car engines burn fuel in southeastern Wisconsin and Sheboygan County. Future tests will also measure nitrogen oxide emissions from cars. Owners whose cars fail the tests are expected to tune their engines to correct problems before bringing cars back for a retest. Current law requires owners to spend up to $55 on vehicle repairs to meet clean air standards. After 1993, auto owners will have to spend up to $200 to cut emissions from 1981 or newer model cars; the ceiling will rise to $450 to repair cars that fail emission tests after July 1994.

Approximately 950 gas stations in Racine, Kenosha, Milwaukee, Ozaukee, Washington, Waukesha and Sheboygan counties will equip fuel pumps with special hoses that capture gas vapors during refueling. This step will capture 3,250 tons of VOCs each year and reduce carcinogenic benzene emissions by 29 tons per year. Gas stations in the southeast will be subsidized for most of the costs to install this equipment now through fall 1994.

Experiments with new fuels and fuel combinations will determine if today's car engines need to be modified to cleanly, economically burn ethanol-gasoline blends, methanol, compressed gases or other fuels. These alternative fuels will be developed on a fast track. Gas stations selling fuels where ozone levels are high must offer alternative fuels by 1995. The Clean Air Act also requires businesses that have fleets of 10 or more cars, vans or light trucks to fuel 30 percent of their vehicles with alternative fuels by 1998; 70 percent of the fleet by 2000. Rental cars and fleets of emergency vehicles are exempted from these requirements.

Car manufacturers will have to equip new cars with catalytic converters that are guaranteed for at least eight years by 1998.

To reduce commuter traffic, the Clean Air Act makes employers more responsible for getting their work force to and from the work place. Companies employing more than 100 people at a single location have to develop carpools, mass-transit options or other incentives to reduce the number of employees driving alone by 25 percent by 1996.

Cutting back in the backyard

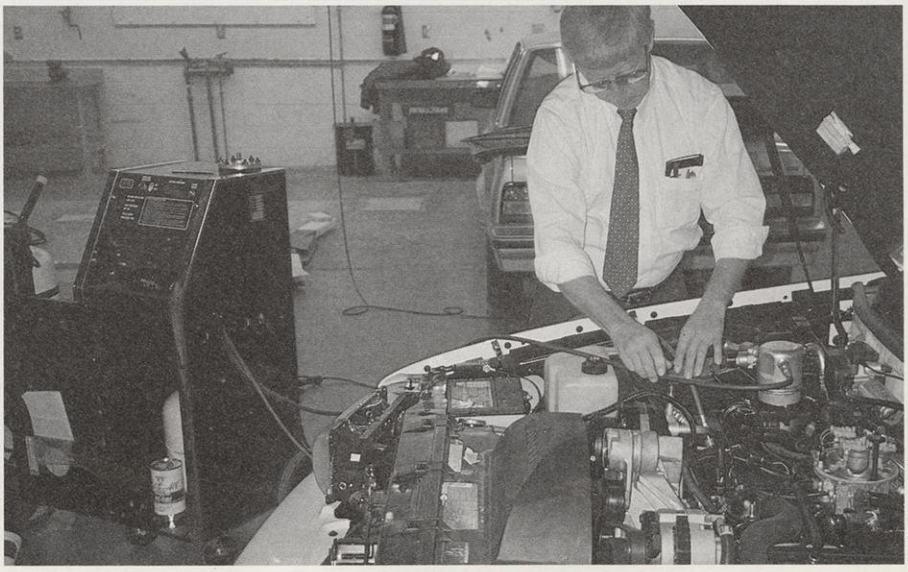
The auto isn't the only engine that needs to be retooled and re-tuned so we can breathe easier. Exhaust from lawn mowers, chain saws, weed whips, leaf blowers and small generators needs to be curtailed too. Need an excuse to flee from yard chores like mowing the lawn or blowing leaves? Running a mower for an hour emits as much pollution as driving 50 miles. Recreational vehicles like outboard engines, ATVs and Jet Skis add pollutants too.

Designing and producing small engines that burn fuel more efficiently while emitting fewer pollutants will challenge southeastern Wisconsin workers — 12,000 strong — who supply most of the nation small engines. Practical, economical designs could help this midwestern industry capture an even greater percentage of the national market that will demand clean, green engines.

Back to the village green

Our assumptions about changing lifestyles to reduce air pollution are predicated on continuing current patterns of development. Neighborhoods are typically zoned to provide homes and open space but few other amenities within walking distance. Long-range plans for future development and urban renovation must break the cycle of driving everywhere for food, shopping, medical care, recreation and entertainment. Land-use patterns must

Dick Virtue, an instructor in Madison Area Technical College's Automotive Technician program, attaches a CFC vampire to a car's air conditioner. The device captures refrigerant gases when air conditioners are recharged. Your mechanic should use one, too.



LANCE GREEN

ROBERT QUEEN

A sign in our future? Florida freeways already give rush hour commuters an incentive to use mass transit or car-pool.

Driving habits that help clear the air

Car-pool and teach your kids to do the same.

Drive the speed limit and keep tires properly inflated to maximize efficiency.

Consolidate trips. Plan your travel and errands to reduce round-trips. Restarting a cold engine several times uses 20 percent more fuel than driving a warm engine. Also, more emissions flow from cold engines as it takes two minutes to warm up catalytic converters to operating temperatures. On the other hand, turn off your engine when you stop for more than a minute. Idling engines emit pollutants while burning ½ – ¼ gallon of fuel per hour.

change so transportation methods like mass transit, bicycle and pedestrian paths can quickly and economically meet people's needs close to home.

What's coming up

For those with a nose for clean air news, here's what's hot this fall:

Plans for upgrading gas station pumps to trap vapors were approved by the Natural Resources Board in August and are currently under review by Legislative committees.

Businesses in Milwaukee, Racine, Kenosha, Ozaukee, Washington and Waukesha counties will be notified before the end of the year if clean air goals require them to modify existing pollution controls. Firms capable of emitting more than 25 tons of sulfur dioxide per year will learn the process for offsetting or trading emission credits.

Proposed rules to reduce commuting traffic will be discussed at this fall. Alternatives for employees at large companies may include alternate work schedules, ride-sharing, work-at-home policies, cooperative ventures with public transit, special parking privileges for workers who car-pool and other incentives. Employers of more than 100 people will be expected to submit trip-reduction plans by November 1994 and reduce single-passenger travel by 25 percent within two years.

How much auto owners must pay to keep their cars running cleanly will also be discussed at hearings this fall. Currently, car owners in southeastern Wisconsin must spend up to $55 to tune or repair their cars before a second tailpipe test. Proposed revisions would raise that minimum fee to $75 for cars built before 1982 and $200 for more recent models. After July 1994, car owners would have to spend at least $450 to repair autos that fail tailpipe tests. Future repair limits would be tied to the Consumer Price Index.

Early next year legislators will debate recommendations for recovering coolants from used refrigerators and air conditioners. A new program would set standards for capturing chlorofluorocarbon (CFCs) gases as cooling systems are recharged or prepared for recycling. The lighter-than-air CFCs rise into the stratosphere and can deplete the protective ozone layer that blocks ultraviolet radiation from sunlight.

To clear the air, the winds of change will continue to blow on smokestack industries, but now the breeze will also be felt at city halls, in small businesses, across parking lots, down back alleys and up the driveways of neighborhoods where tailpipes, lawn mowers and paint brushes also add to our air pollution problems. Knowing that our driving habits are as responsible for foul air as our factories challenges all members of our auto-dependent society to do right by the environment. □

ROBERT QUEEN

Snowshoes with simple, comfortable bindings made of lampwicking.

WALKING *on a* WEB

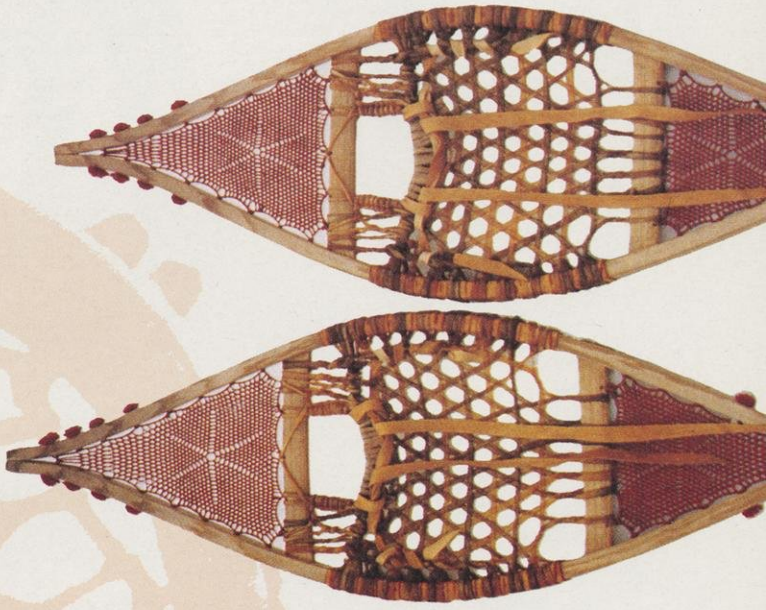
The FINE *and* ALMOST FORGOTTEN ART *of* MAKING *and* USING SNOWSHOES.

Maureen Mecozzi

For most people, getting around in winter means using one of two things: automobile or snowmobile. (Skiers, stay out of this.) The former has a disturbing propensity to find the nearest snowbank and skid right in. The latter, with its telltale buzz, could rouse Sleeping Beauty without a frog prince behind the wheel. Both require gas and oil, cast a nasty coat of sooty exhaust over pristine snowdrifts, and choose blizzards as the most opportune time to collapse.

A small but growing number of people in Wisconsin have rediscovered an ancient method of winter transport, one that predates the car, the 'snobile, dogsleds, and, yes, even cross-country skis. Use this method and you will never be stranded due to gas-line freeze, the wrong ski wax or a shortage of Milk-Bones. Just put on your shoes — snowshoes, that is — and start walking.

Snowshoeing is a happy combination of recreation, transportation, and for those that make their own shoes, craftsmanship. Although it may never regain prominence as the premier form of winter mobility, snowshoeing is becoming more popular. Slip quietly through a snow-covered forest in a pair of snowshoes and you'll find out why.



Ojibwa design by Ferdy Goode. THE BLONDE

ROBERT QUEEN

Self-taught snowshoe crafter Professor Richard Schneider learned by reading and looking at museum pieces: "Not many people, native or otherwise, make these anymore."

APOSTLE ISLANDS NATIONAL LAKESHORE

Modified Ojibwa design by Ferdy Goode.
THE BLONDE

The only way to go

One of the oldest inventions of humankind (archaeologists trace its origins to 4000 B.C. in Central Asia), the snowshoe ranks in importance with the wheel: Without it, people wouldn't have been able to migrate across the northern hemisphere.

For centuries, snowshoeing was the preferred method of winter transportation on the North American continent. Richard Schneider, a retired professor of art from the University of Wisconsin-Stevens Point who has made an extensive study of native crafts, says Native American tribes in Canada and the west, northeast and northern United States created hundreds of styles of snowshoes suited to all kinds of conditions and uses.

"Elongated frames worked better in open country and deep snow," Schneider says. "The rounded styles were meant for traveling through heavy woods, because they were easier to turn. In a crusty, coarse snow, a shoe with thick lacing and large open spaces in the weave was best, but if the snow was light and fluffy, then a nice tight weave would give better support." Each person in a band might have several types of snowshoes from which to choose, according to the day's activity and weather.

The Ojibwas called the month of March *bobakwudagimegizis*, "broken snowshoe month," because the crusted, icy snow of late winter often cracked the webbing of their snowshoes.

In the 1600s, French trappers, traders and missionaries in North America found the snowshoe essential. The webbed footgear even left an imprint on the French and Indian War, the 1754-1763 conflict for control of North America. The French applied methods of wilderness warfare learned from their Indian allies — such as making surprise raids on British outposts using *racquets*, or snowshoes. It wasn't until after The Battle on Snowshoes, a brutal skirmish which occurred in March 1758 near Lake George in the Adirondacks, that the British fully appreciated the value

of snowshoes for waging war in winter.

The snowshoeing tradition remains strong in Canada, particularly in Quebec. Numerous snowshoe clubs host hikes and racing meets; the participants wear colorful sashes and caps to indicate the region of the province they represent.

Use of snowshoes began to wane in the United States with the arrival of Norwegian, Swedish and Finnish immigrants, who introduced the young country to skis in the 1800s. Although New Englanders enjoyed community snowshoe hikes in 1920s and 1930s, in the United States few people considered snowshoeing recreation. Snowshoes were included in the kits of trappers, hunters, loggers and surveyors, but as the tools of those trades changed and as the landscape itself was altered, the snowshoe was no longer an absolute necessity.

An ancient craft rediscovered

Like the snowflakes they are designed to traverse, no two snowshoes are exactly alike. Each individual shoe bears the hand of its maker. The shape and size of the shoe frame, the lacing material, and the lacing pattern reveal more about a snowshoe-maker than he or she is likely to offer in casual conversation. Finding someone with whom to have that conversation, however, can be difficult.

"Not many people, native or otherwise, make these anymore," says Professor Schneider, holding aloft a pair of Ojibwa-style snowshoes at his pottery studio and gallery in Minocqua. "I suspect that's because they don't *have* to; it's much easier to buy a cheap pair of plastic snowshoes than to devote a week's worth of days to bending and lacing."

Unable to find a Native American tutor, Schneider learned how to make snowshoes and other native crafts, including split-ash baskets and porcupine quill embroidery, mostly by observing museum pieces and seeking out old written accounts. "It's a sad and curious thing, but few tribal members know how to make these items," Schneider says. He speculates that today's older Native American adults, who normally would have learned such skills from their parents, were part of a "lost generation" encouraged and sometimes forced to adopt white ways.

"Some of the younger people want to learn the traditional skills, though — so I, a son of German immigrants, have been up on the Lac du Flambeau reservation teaching native crafts," he says. "What a weird world!"

Snowshoe frames are traditionally made of white ash, a strong, yet light and flexible wood. First, a long strip of wood about two inches square would be hewn from a log with an ax. "Next, an Ojibwa would use a crooked knife — it's also called a man's knife — to pare down and shape the stock," says Schneider. The crooked knife leaves a smooth surface, much like a two-handled drawknife. (True to his own heritage, Schneider prefers to work white ash with a drawknife on a schnitzelbunk, a German "cutting bench.")

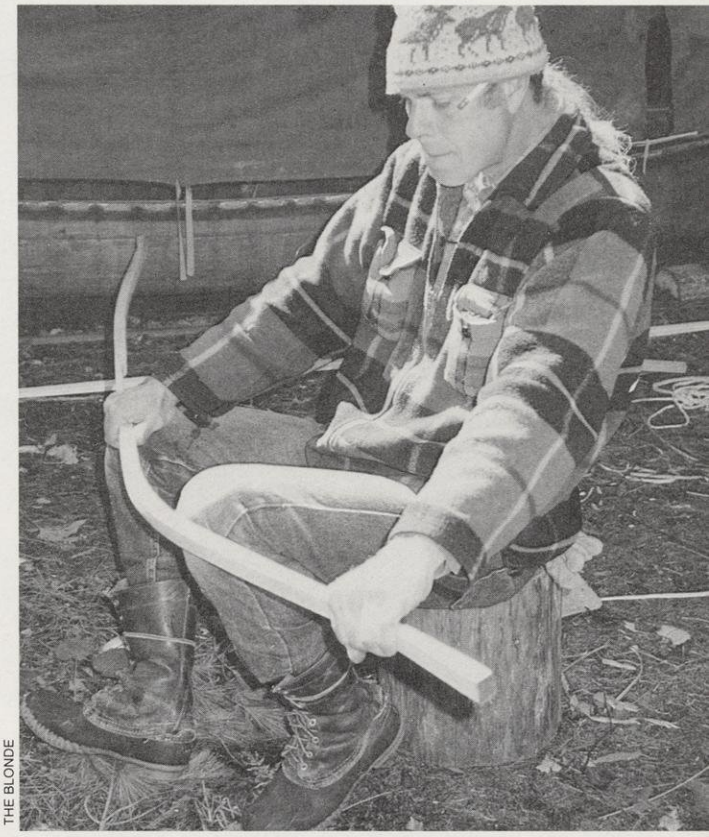
"The native people didn't steam the wood to bend it," Schneider notes. "They just coaxed it a bit. Sometimes I use a old towel soaked in hot water to keep the wood more pliable."

The whittled piece, when bent, would be about as long or a little longer than the wearer's stride. The frame might then be placed on a form or jig for a time, depending on the shape desired.

The ends of the bent frame were lashed together with rawhide, or secured with wooden pegs or nails. Holes were made in the frame for the lacing, and two flat crossbars were set in slots in the frame, one in the back near the tail and one in the front, just above the point where the toe would come to rest.

The Ojibwas generally made three kinds of frames: bearpaw, or a round style sometimes called "old woman's shoe"; an elongated style with a long tail; and an elongated style with a two-piece frame and a turned-up toe, to prevent snow from accumulating on top of the shoe.

"There was plenty of room for variation," Schneider says. "Different bands might stick to a certain shape, add some decorative yarn tufts to the frame, or weave a special pattern into the webbing. In fact, if you want to see some excellent examples of decorative lacing, you ought to visit Ferdy Goode."



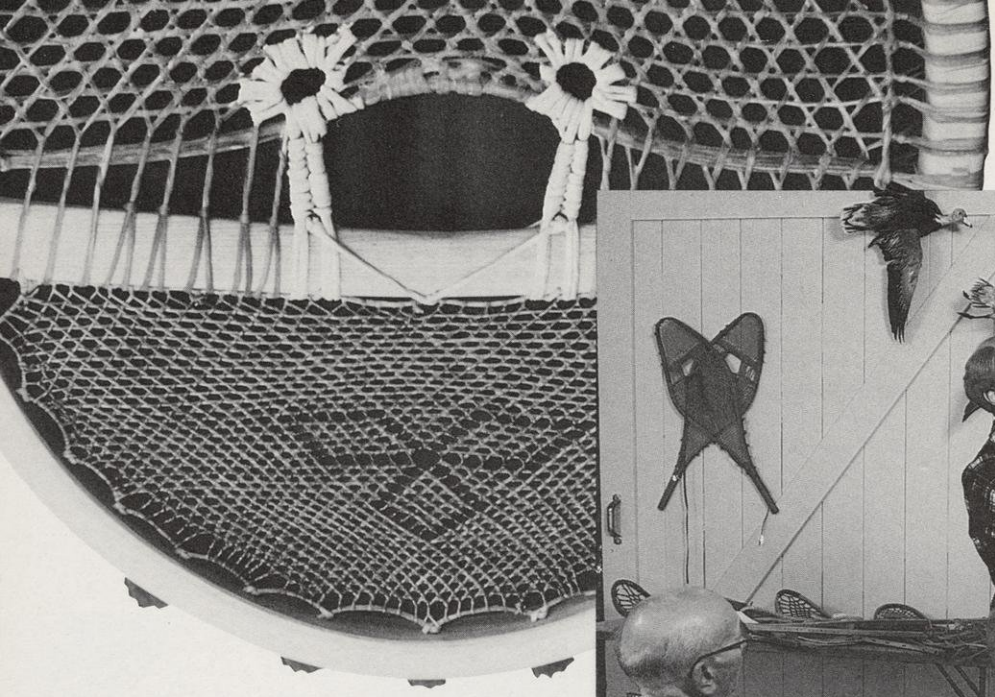
THE BLONDE

Ferdy Goode slowly coaxes snowshoe frames into shape.

Walking works of art

Like Richard Schneider, Ferdy Goode is an artisan who takes pride in knowing that he is helping keep alive an ancient tradition of woodcraft. He owns the Goode Gallery in Minocqua, where he makes and sells birchbark canoes, baskets and snowshoes as well as the work of contemporary artists.

Goode, too, learned how to weave snowshoe webbing from museum pieces and books. "I started with string, for practice," he said. "It's much, much easier to pull out when you make mistakes. And when I felt I had it down,



THE BLONDE

JEFF LOWE

(*top*) Cree-style snowshoe by Ferdy Goode.

(*right*) Jim Anderson describes lacing patterns to novice snowshoe crafters at Mosquito Hill Nature Center in New London.

Make your own

"I wanted a family heirloom."
"It's a lot of work, but the reward is worth it."
"The result is a lot of satisfaction."

These comments from students participating in a recent snowshoe building workshop held at the Mosquito Hill Nature Center in New London are par for the course, says Jim Anderson, naturalist and snowshoe builder.

"People get the boost that comes from attempting something challenging and succeeding at it," Anderson says of the workshop. At the two-day workshop, participants construct an elongated Alaskan, or pickerel-style snowshoe, designed for covering long distances with ease.

Prior to the workshop, students drill, sand and seal the already-bent white ash frames — "about three hours worth of homework," says Anderson. During the workshop, students receive plenty of personal instruction from Anderson and his volunteer assistants as they weave neoprene lacing into a tight, sturdy web. It's intricate work, but under Anderson's watchful eye no student is befuddled for long.

The total cost for the workshop, including all materials, is $90. Snowshoe building workshops are held periodically at the Mosquito Hill Nature Center in New London, (414) 779-6433; May Environmental Park in Sheboygan, (414) 459-3906; Bay Beach Environmental Center in Green Bay, (414) 391-3671; and Beaver Creek Reserve in Fall Creek, (715) 877-2212. Most of these centers offer snowshoe hikes throughout the winter season.

then I'd start over again with rawhide lacing."

For Goode, starting with rawhide means exactly that — he starts with a raw hide, usually taken from a deer he's killed himself. "No one wants to be around when I start dehairing a hide," he says with a laugh. "It's a smelly operation!" The dehaired hide is not tanned, but it is stretched and dried on a square frame. When it's time to make lacing, the stiff hide is soaked in water until it's flexible, and then Goode cuts it into thin strips 25 to 30 feet in length. The rawhide lacing, whether made from deer, cow, moose, beaver or bear, is called *babiche*.

The weave of the webbing, says Goode, is based on the triangle. "You weave in six different directions, in a triangular shape from left to right and then from right to left, back and forth, back and forth." The result is a strong mesh of six-sided holes, provided the weaver has put some muscle into the effort.

"You've got to pull that babiche tight and make good knots, so you'll end up with a taut mesh," he says. "As the rawhide dries on the frame, it will

shrink and tighten up, but if you don't do a good job of weaving to begin with, no amount of shrinkage will make it right."

Goode weaves the tail and toe sections first, then the midsection. The babiche can be spliced if necessary in the tail and toe, but Goode says there should never be any splices in the midsection: "That's where the foot puts pressure on the webbing."

Some of Goode's snowshoes are patterned after a style made by Cree people living in northern Canada. The thin deer babiche used in the toe and tail sections allows for a tighter weave, almost crochet-like in its delicacy. Using a slender wooden needle about 2 to 3 inches long with the eye in the center rather than at the end, Goode weaves decorative geometric patterns right into the webbing. He'll highlight the design with paint, then give the completed shoe a coating of varnish all over the webbing and frame.

The snowshoes Ferdy Goode makes are designed to be worn with moccasins. "A snowshoe is supposed to help you move easily and quickly, with a minimum of weight," he says. "So there's no point in strapping snowshoes onto a heavy pair of pac boots." He prefers simple bindings with few or no buckles that let the wearer get in and out of the shoe quickly. Bindings made of lampwicking, the flat braided cotton wick used in oil lamps, have been worn successfully for generations, he notes.

Whether the bindings are made of lampwicking or moosehide, it's unlikely that anyone purchasing a pair of Goode's snowshoes will actually strap them on: Prices are in the $400 range, and the thought of someone clomping around on his museum-quality specimens would make any decent curator wince. "Well," says Goode of his functional and beautiful snowshoes, "I make them to be used or to be admired. It's not up to me."

Reviving a winter tradition

For those who want the goods without the Goode, Jim Anderson is the man to call.

Anderson, the Outagamie County naturalist based at the Mosquito Hill Nature Center in New London, is largely responsible for whatever popularity snowshoeing now enjoys in Wisconsin.

"It started back in 1978," says Anderson. "We had 95 pairs of snowshoes at the center that we used for nature hikes. Someone had to learn how to repair them, and that someone was me. Making snowshoes has been a love affair ever since."

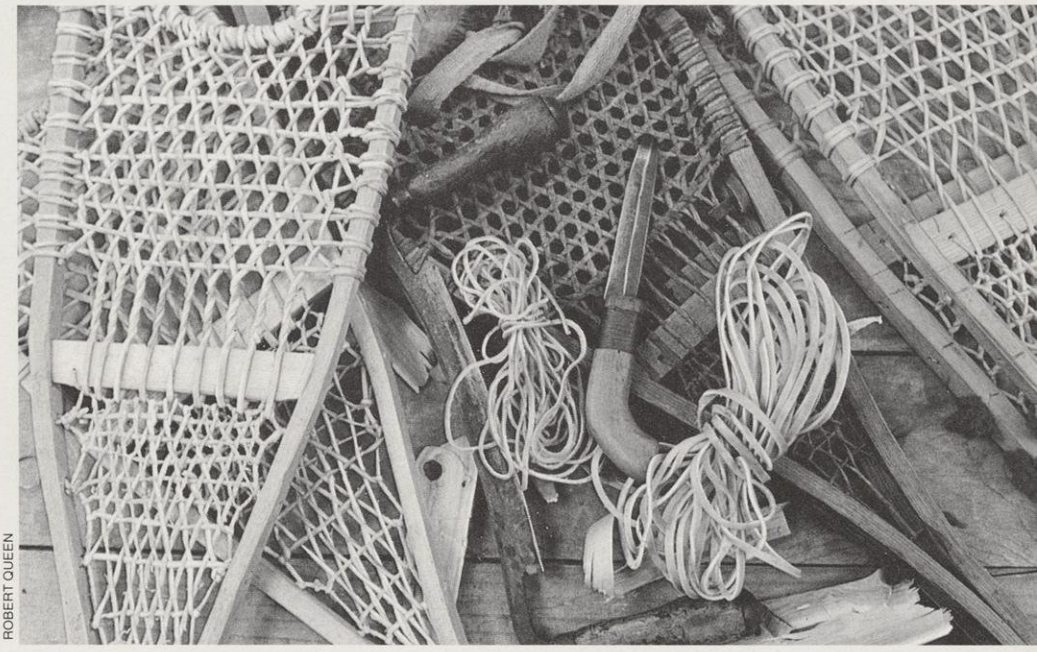
Jim decided to share his joy by hosting snowshoe building workshops at Mosquito Hill and several other nature centers around the state. To date, he figures that about 1,200 pairs of snowshoes have been built at the workshops.

Building a pair of snowshoes Mosquito Hill-style is both a solitary and social activity. "First, we send students the basic white ash frames through the mail several weeks before the workshop," says Jim. "The lacing holes are marked, but the students must drill the holes, fit the toe and heel crossbars to the frame, sand down the frames, stain, paint or decorate the wood if they desire, and seal the frames with at least two coats of polyurethane varnish."

When the homework's done, 10 to 25 students meet for nearly two full days at Mosquito Hill to weave the webbing. Many come from well outside the area to participate.

Students sit together in the main hall, weaving away, chatting pleasantly and only occasionally muttering curses when a quarter-hour's worth of work must be ripped out due to some small but crucial lacing mistake. Patience is far more than a virtue when making snowshoes, says Jim; it's a necessity.

The babiche is made of neoprene-coated nylon. Resistant to decay, water repellent, strong, and unpalatable to gnawing animals, neoprene is a good, and, some say, superior substitute for rawhide. Not that it's any easier to lace — students must contend with a 42-foot length of neoprene just for the toe portion of one shoe; they must pull and tug to get a good tight weave just as if they were using rawhide.



ROBERT QUEEN

Tools of the snowshoe-makers trade: babiche (lacing), a two-handled drawknife and a crooked knife.

"Toward the end of a workshop, there's a real feeling of accomplishment in the room," says Anderson. "The people who take part know they've made something special."

Lace by lace, step by step, snowshoeing is taking hold again in the land where it was once the only way to go. Can the Winter Olympics be far behind? □

Maureen Mecozzi, barely able to lace sneakers let alone snowshoes, is associate editor of Wisconsin Natural Resources.

Furbearers of the Northwoods

Editor's note: As a winter treat, we thought we'd give you another good reason to ease out of the easy chair, throw on a warm coat and take a hike. Winter is a great time to track the haunts and whereabouts of some of Wisconsin's most elusive citizens — furbearing mammals. We asked our wildlife specialists who study these animals to give you some tips to increase your chances of seeing them in the wild.

For those readers who would just as soon hit the trail in the thawed-out seasons, no problem! Each description tracks each animal throughout the year.

This issue we're taking a look at the elusive furbearers that live near wetlands and the wooded edge. Next issue we'll finish the series with a look at denizens of the deep woods — bobcat, coyote, pine marten, timber wolf, fisher and red fox. Enjoy!

MINK

GREGORY K. SCOTT NATURE PHOTOS

Kevin Wallenfang

Sit along the wooded edge of any creek, river or lake in Wisconsin, and you'll eventually see a mink (*Mustela vison*). No doubt about it, mink have found the abundant Wisconsin lakes and streams to their liking.

Mink are renowned for their dark, chocolate-brown fur. Actually wild mink have a small patch of white fur that may extend from their chin to their belly. They have short legs and long, cylindrical bodies from 18 to 30 inches long. Webbed hind feet and a sleek form help these excellent swimmers.

Mink prefer wooded habitats that border rivers, lakes, and marshes. They hunt along brushy shorelines, fallen trees, brush piles and rocks searching for frogs, mice, muskrats, crayfish and a host of other prey. A watchful observer may spot a mink swimming or bounding along the shoreline quickly checking every nook and cranny for its dinner.

Their den sites are usually close to the water's edge, often in hollow stumps or under tree roots. Sometimes the entrances are underwater as mink often live and raise their young in abandoned muskrat houses. Since mink search out natural locations rather than building distinctive dens of their own, dens are often difficult to locate. The males roam a larger area than females. They often use several denning sites for a short time before moving on to hunt a new area within their home range.

Winter months are primarily spent searching for food or resting sheltered from the wind to preserve heat. Mink tend to stay put in their dens in truly frigid weather, but as soon as the temperature rises, you can often see them hunting near open water. Muskrats are a favorite food during winter months, and mink spend much of their time investigating muskrat dens looking for a meal. Afterwards, mink may curl up for a nap right in their victim's home! If they find a recently vacated den to their liking, minks may decide to take up residency for the winter.

Mink breed in February and March. Males may mate with several females, while females typically mate with no more than two different males. The males get very territorial during the

breeding season. They will chase away or kill other male mink that come into their home areas looking for receptive females.

Mink have evolved a survival technique called delayed implantation. A fertilized mink egg does not attach to the mother's uterine wall and develop until the weather favors survival of offspring in March or April. Pregnant mink line the chosen den site with fur, feathers, and other soft materials. Thirty-one days later three to six kits are born. While raising the kits, the female continues to hunt near the den. The males take no part in raising the young. After mating, they return to solitary lives of traveling and hunting.

By July, the kits are weaned and begin to explore outside the den. During the summer months, if you're lucky enough to find a viewing site close to a den, you can watch the kits with their mother learning to fend for themselves. Young mink are opportunistic feeders who first capture a variety of insects, frogs and tadpoles, until they graduate to larger prey like muskrats, mice and birds.

By September, mink fur grows dense as they begin to prepare for the cold months ahead. Family units begin to break up. The kits disperse but often stay within a mile or two of their mother's home range for the first year.

By maintaining woody wetland habitats, wildlife managers insure that mink remain a part of our native wildlife. □

Kevin Wallenfang is a wildlife biologist with DNR's Bureau of Wildlife Management.

STEPHEN J. LANG

Bruce Bacon

A series of slick, dark humps undulate smoothly, effortlessly gliding across the water's surface. Wisconsin's Loch Ness Monster? Nope. It's a river otter (*Lutra canadensis*), or more likely a family of otter. If you watch closely, they'll soon stop swimming and their broad heads with small ears and eyes will pop up to survey the surroundings.

In winter, otter become the animal world's living toboggans, sliding across the snow and ice whenever the opportunity arises. Few wild creatures seem to enjoy playing as much as otter and their antics are especially enjoyable to watch.

Otter are found near water, especially lakes and rivers with abundant fish. You can also find their tracks in the sand and mud along smaller streams and ponds where hungry otter search for crayfish, frogs and minnows. Otter are well adapted to life in our icy world. They spend much of the winter in cozy, relatively warm dens. You are more likely to see them as they travel between den and feeding areas. Visit ice-free areas on or near frozen lakes. Otter often prefer to bring their catch onto the thin ice before feeding. They are much more sociable than mink or muskrat, and otter will share their ice with you as long as you keep your distance. If they get nervous and dive into the water, back off and wait. They'll probably come back out onto the ice and resume their playful antics.

Since otter are opportunists who often don't build their own dens, you won't find them by looking for a specific shaped home. They will use abandoned beaver lodges, rock and log piles near water, or will burrow into a riverbank or lakeshore.

Late winter and early spring find otter families intact with the previous year's pups in tow. Unlike many furbearers, the males often join females with older young.

March and April bring on the breeding season during which time the males get very territorial. Male otter travel up to 20-30 miles on land and water looking for females. This is the only season when you're apt to see otters loping in an ungainly canter on land far from their watery world.

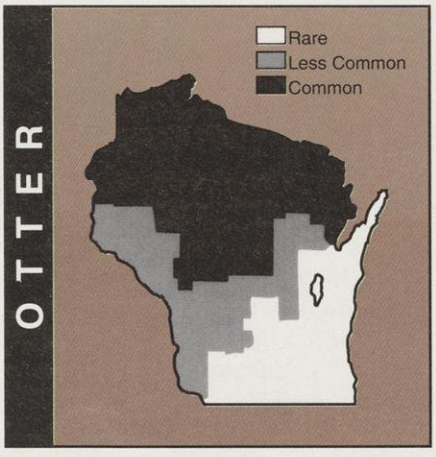
Otter are three- to four-feet long, including a 12-18 inch tail. They have sleek, tapered, muscular bodies; short legs and relatively large, webbed feet. Their check, chin, throat and belly fur is light tan. The rest is a deep, chocolate brown color, although the coat many obtain a reddish hue in summer from long hours of lounging in the sun. The fur is so dense, lustrous and durable that it's the standard by which all other furbearers are measured. Dense underfur is topped with long guard hairs that form a waterproof shield.

Warmer weather makes life easier for otter. You're more likely to see them on lakes with little or no boat traffic. Head north to a quiet lake early in the

morning. Look for telltale mud slides on shore. Otter will slide a few feet down a sloping shoreline leaving a furrow, or slide, in the muddy shore. Otter in water feel secure from humans, so you don't have to hide. You can even approach fairly close with a boat if you travel very slowly and quietly toward them. The curious otter will pop up their heads to see what you're up too.

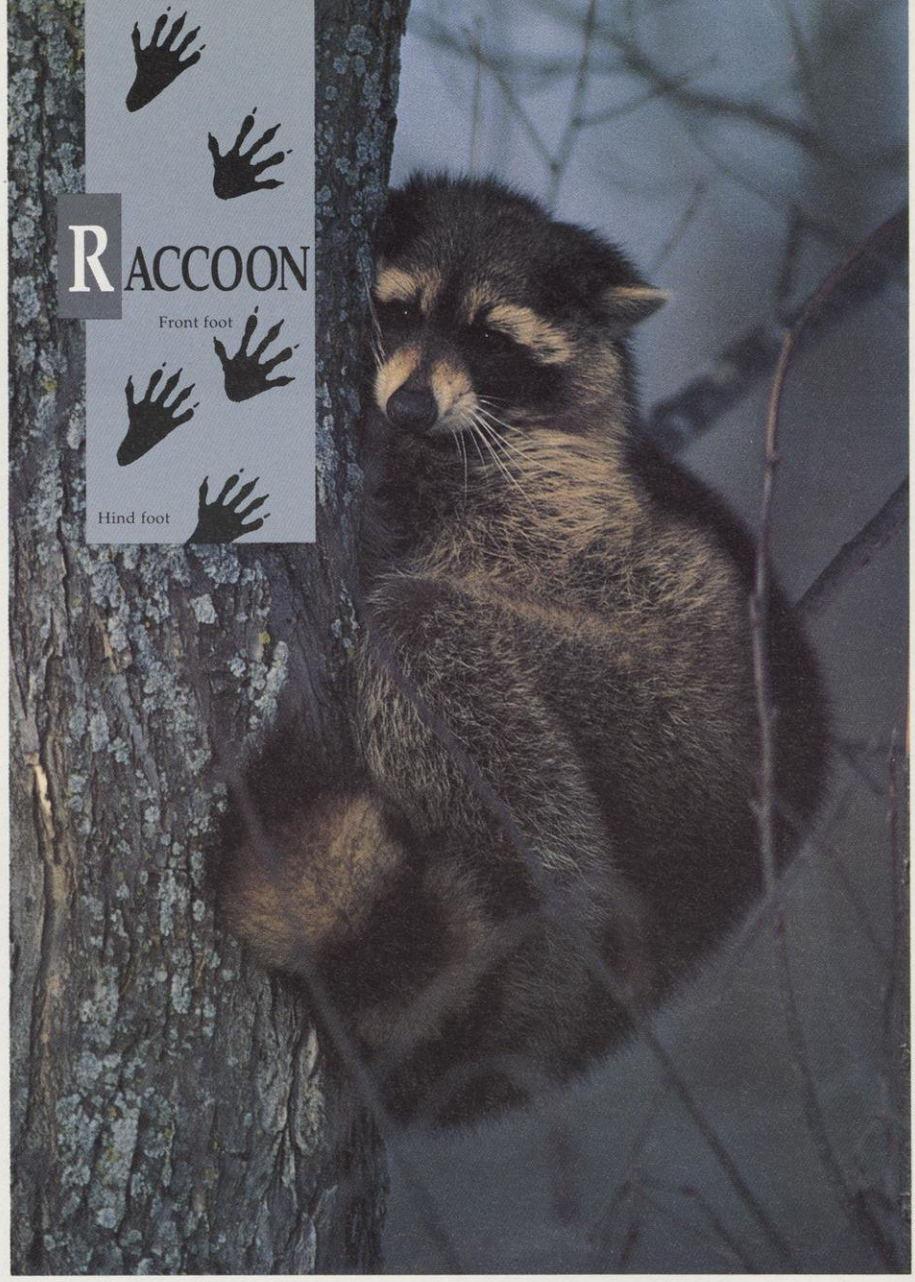
Summer is a time of abundant food. Fall will bring an urgency for winter preparations. New coats of thick underfur and long dark guard hairs are grown. Sometime in mid-winter otter pups are born in the dens. The kits stay in the den for four to five months before emerging in late spring.

Otter are abundant across northern Wisconsin and are becoming more common in central and southern areas. They are managed through a closely-monitored trapping season which limits harvest to one animal in southern Wisconsin, two animals north of Highway 64. Pelt registrations, winter tracking surveys and other field work regularly census their numbers. Waters dammed by beavers also provide abundant otter habitat. So our beaver management programs directly affect otter populations.



Whether in summer or winter, keep an eye peeled for otter as they slide and frolic in the northwoods. Seeing one is a special treat. □

Bruce Bacon is DNR's assistant wildlife manager in Brule, Wis.



Mike Gappa

Is any animal more easily recognized than the raccoon (*Procyon lotor*) with its black mask on a whitish face and a ringed tail?

Indians called it *arakou* meaning "he scratches with his hands". Our word *raccoon* derived from trying to spell the Indian word. The species name *lotor,* meaning "a washer,"sprang from the early belief that raccoons always washed their food before eating it.

Raccoons are found almost everywhere water is available. In pioneer times, they were only found in southern Wisconsin. Farming and town development extended their range northward and statewide.

Home to a raccoon is usually a hollow tree. At times it may use a large fissure in a cliff, a small cave, a vacated woodchuck hole, an old woodpile, a barn or a chimney as a den site. Raccoons are not very particular. They'll call any place home as long as it protects them from intruders.

Coons are nocturnal. Occasionally one may be seen in the early morning coming back from a night of foraging. They are extremely wary and elude pursuit. Probably the outstanding characteristic of the raccoon is its insatiable curiosity. It's particularly attracted by bright, shiny objects or anything that reflects light.

The raccoon sleeps soundly during severe winter weather but does not truly hibernate. Its metabolism is not lowered, but it does lie dormant for considerable periods.

The urge to mate comes in the mild

Continued on page 17

Continued from page 16

thaw of late January or early February. Males are polygamous, and it is not unusual for them to travel great distances looking for mates.

Raccoons gestate for 63 days. One to six fur-covered kits are born in April. From the time their eyes open, at about three weeks, the young are mischievous and curious. At about six weeks, the female starts taking her family out on short foraging trips. The female (commonly called a "sow") is very devoted to her young and teaches them to hunt, climb and be crafty in escaping enemies.

Raccoons are omnivores that eat a wide variety of plants and animal matter with equal relish. They are opportunists, consuming whatever is edible and available. Raccoons are particularly fond of crayfish, frogs and fish, and will spend hours turning over stones and patrolling the water's edge looking for these morsels. In season, they will devour hosts of grasshoppers and crickets. Their fondness for corn is well known by farmers, and coons love acorns. Fruits, grains, nuts, berries and garbage (Remember, they are opportunists!) round out their bellies and their diet.

Mother and young remain together well into the fall and often for part of the winter. By late winter or early spring, the family unit breaks up; young disperse to find dens of their own. The young of the year are full-grown before their first birthday and are usually ready to start families.

Though the demand for its pelt has fluctuated, the raccoon has long been an important fur species. Pelt quality and demand dictates price. Most raccoon pelts from Wisconsin are exported to Canada and Europe, particular Germany. Big, colorful, prime pelts are often used for trim on garments. Inferior pelts are usually sheared and dyed to imitate other furbearers like mink and muskrat.

The raccoon is also a very popular game species, primarily hunted at night with dogs. Raccoon management aims to maintain or increase the population. Laws restrict raccoon hunting and trapping to the late fall and winter to protect populations and ensure animals are only taken in prime condition.

STEPHEN J. & ANDREW LANG

Raccoons are very adaptable. Though they prefer forested and semi-open country with abundant water, some of the highest concentrations of raccoons occur in metropolitan areas like Madison, Milwaukee and Green Bay. Population levels in cities are usually dictated by natural catastrophes and disease.

Given their adaptability to changing conditions, complex management programs are not needed to maintain raccoons. Maintaining timber and curtailing grazing in woodlands helps preserve their natural habitat. Preserving snag trees for denning sites and planting or maintaining wild fruit and nut trees — especially oaks — will sustain raccoons. The Department of Natural Resources incorporates these practices in management plans for wildlife properties. In our attempt to make areas more attractive to other species of wildlife like waterfowl, we create ideal habitat for raccoons.

Considering their intelligence and adaptability, raccoons have been strangely ignored by researchers. Future research could answer questions about their social structure, behavior and reproductive physiology.

So the next time you hear your garbage can rattle late at night, see a set of eyes reflecting in your headlights or wake up to find your sweet corn patch worked over, chalk it up as a close encounter with the "masked bandit". □

Mike Gappa is DNR area wildlife manager in Eau Claire, Wis.

GREGORY K. SCOTT NATURE PHOTOS

Greg Kessler

The most common mammal in the marsh is also a valuable, influential member of nearly every wetland community. *Ondatra zibethicus*, the muskrat, thrives in any marsh, stream or lake where water does not freeze completely to the bottom.

Muskrats do best in slow-moving waterways where plants such as cattail, bulrush, arrowhead, pondweed and sweetflag grow in abundance. They feed primarily on plant roots but occasionally eat clams, crayfish, frogs or fish.

Muskrats build "lodges" with underwater entrance tunnels and chambered living quarters for winter. Mud and vegetation are woven together in a conical mound 1½ to 6 feet across. Lodges are typically located in water 6-36 inches deep. Muskrats will also burrow into steep banks to create their homes. These "bank dens" are easy to find. Cloudy trails in shallow water indicate the travel lanes muskrats use to enter and exit their homes. Most of the vegetation within 5-10 feet of a lodge or den entrance is stripped clear since it is used to build the mound and line the living quarters.

Each lodge or bank den contains two to four muskrats that share living space to keep warm and to keep the watery exit tunnel ice-free. Muskrats also build smaller temporary lodges, or "push-ups," which are 8-16 inches in diameter. They are used for breathing holes near feeding areas away from the main lodge. During ice-free periods, muskrats build floating mats of shredded vegetation for feeding and rearing young.

Muskrats are active all winter, but their actions are often hidden by snow and ice. They spend most of their time in lodges or bank dens only taking short excursions to locate food. Cut tubers and plants are brought back to the lodge or to push-ups. If a wetland freezes completely to the bottom, the muskrats are forced to leave and search for a new home. These "runners" rarely survive exposure to wintery weather and predators.

Mating season starts with ice-out and creates a flurry of activity in March and April. Pregnancy lasts 30 days. Young are born in late April in Southern Wisconsin and in late May up north. Muskrats will breed throughout the summer producing two to four litters of four to eight kits. Born blind and hairless, the kits develop quickly and are self-sufficient at four weeks old.

Lodges are built from September through November until ice cover. On warmer days, muskrats loaf and feed on floating rafts of vegetation. They will also risk leaving the wetland to eat nearby agricultural crops during fall and early winter. This is the only time of year muskrats will make daily forays from their watery environment.

Several physical characteristics give "rats" an edge in their aquatic homes. Webbed feet serve as flippers for propulsion, a flattened tail acts as a rudder for steering, and thick underfur provide insulation in near-freezing waters. Specially adapted eyes, nose and respiratory systems allow the muskrat to

GREGORY K. SCOTT NATURE PHOTOS

remain underwater for up to 15 minutes while searching for food or escaping predators. Adult muskrats weigh two to three pounds, are 18-25 inches long and are covered with chocolate brown fur.

The muskrat's position in the food chain and its prolific reproduction can be beneficial or harmful to wetlands, depending on the population. Muskrats provide a valuable food source for predatory mink, foxes, hawks and owls. By eating plants, muskrats open up dense stands of marsh. That helps ducks, geese and shorebirds.

If muskrats become too abundant, they may eat so much that marsh vegetation is changed or eliminated. That's equally bad for other wetland wildlife. These "eat-outs" also increase diseases, stress and injuries as crowded muskrats fight over remaining feeding and home sites.

Trapping seasons reduce potential eat-outs while providing a sustainable population. Muskrat pelts annually provide $3-4 million per year for trappers.

It's easiest to see muskrats during early spring and early fall. In spring, muskrats travel along shorelines calling in soft-muted cries in search of mates. From late September through freeze-up, muskrats are building up fat reserves as well as building lodges and push-ups. Look for muskrats working on their homes, feeding, or just loafing on rafts in the warm sunshine when the wind is gentle. □

Greg Kessler is DNR's assistant wildlife manager in Mercer, Wis.

GREGORY K. SCOTT NATURE PHOTOS

Bruce E. Kohn

The abandoned railroad grade runs straight as an arrow through a remote section of northwestern Wisconsin. It's a cold, moonlit night. Tracks in the snow cover a frozen beaver pond. Many animals have been here since the last snowfall. Numerous deer and coyote tracks dot the frozen surface. Three timber wolves crossed the pond to investigate the beaver lodge, then roamed off. The beavers are safe and comfortable under the ice, oblivious to most of the activity above them.

There seem to be only two seasons for beavers: winter, and getting ready for winter. The beavers (*Castor canadensis*) spent most of the previous summer and fall preparing for the long winter season.

Beavers require a permanent supply of water. They control water levels along streams and drainages by building dams. Although the abandoned railroad grade serves as the dam for this pond, several old culverts through the grade had to be plugged with mud, sticks, and rocks. This particular pond flooded well over 100 acres. Most beaver ponds are only one to five acres in size.

The cone-shaped lodge, about 15 feet in diameter and five to six feet high, was built by packing mud and sticks together, then chewing out the entrances and living quarters. Most beaver lodges consist of one or more compartments. Each compartment has two underwater openings for entry or exit. Although lodges are built to last many years, they require annual maintenance to protect the beavers from the elements and predators.

Some beavers create a lodge by simply burrowing into the bank of a stream or lake. These bank dens also contain living quarters with underwater entrances. They are much less noticeable than a typical beaver lodge, but can be found in fall by looking for the piles of branches beavers have stored for their winter food supply.

Normally, an extended family group — a pair of adults, young from the previous year, and young of the year — occupy these lodges.

As winter approaches, beavers gather and cache a large supply of small branches near the lodge. Aspen, alder and willows are preferred, but sedges, grasses and fleshy roots of some aquatic

ARVID WIDVEY *(INSET)* JOE BUTSICK

Beaver lodge.

(inset) Beaver work.

plants supplement their diet. When completed, the food cache is anchored to the bottom of the pond.

Beavers will continue to go ashore and cut fresh trees as long as they can break through the ice at the pond's edge. Once the pond is frozen over, the cache provides their only food supply until spring.

Beavers become sexually mature during their second year and are monogamous. Breeding takes place during late January through February, and the kits are born in April or May. Litter sizes range from one to eight, but typically four kits are born each year. Kits remain in the colony until they are two years old and then are driven off to find their own territories.

Beaver kits weigh slightly less than a pound when born and grow to about 20 pounds by the end of their first year. Beavers continue to grow throughout their life. Most adults weigh 45 to 60 pounds. The heaviest beaver recorded from Wisconsin weighed 110 pounds.

Major predators of adult beavers in Wisconsin are coyotes, black bears and timber wolves. Otter and mink may occasionally prey on the kits. Tularemia, a disease which is spread directly by water, greatly reduced Wisconsin's beaver population during the 1950s.

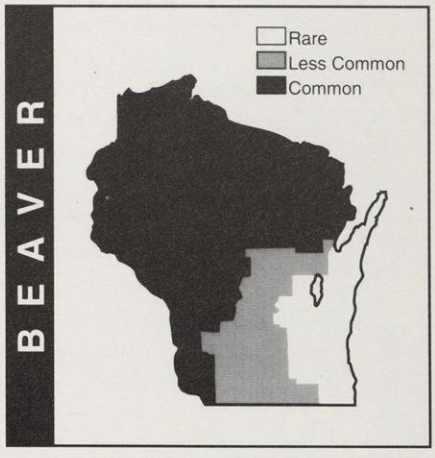
It's easy to observe activity in and around a beaver pond. Plan to visit early morning and late evening hours during spring, summer and fall. Find a spot where you can sit quietly and see the areas around the lodge and dam. Wear dark clothing so you blend into the background, and bring plenty of mosquito repellent! It is best to sit downwind from the pond to avoid detection. With a little patience, you'll watch their daily routine of gathering food and constructing or repairing their dams and lodges.

Be prepared for what you'll hear, too. The songs of frogs, toads and birds on a warm evening around these ponds can almost be deafening. And the loud alarm slap of a beaver's tail on the water will startle even the most experienced observer.

Beaver ponds are also extremely interesting places to visit in winter. They are quieter, desolate areas where flooded trees and brush jut out of the frozen pond. On cold, calm mornings you may see steam rising out of the lodge. It's a great place to brush up your skills at identifying animal tracks. Almost every animal that encounters a frozen beaver pond will spend time exploring it.

Approximately 160,000 beavers now reside in Wisconsin. Beaver management is challenging because they alter habitat to meet their own special needs. On one hand, beaver ponds provide habitat that favors a wide range of birds and mammals. On the other hand, beaver dams back up water that can extensively damage roads and surrounding timber stands. Beaver activity also decreases trout populations. Dams physically block trout migration, slow down water, increase temperature and silt in trout spawning habitat. These conflicting results have polarized members of the public into groups that either love or hate beavers.

A previous magazine story (*Tailor made for beaver*, February 1990) explains how beavers are managed in four regions to balance the natural and social consequences of their unique habits. □



Bruce E. Kohn is a mammalian wildlife biologist with DNR's Northern Wildlife Research Group in Rhinelander, Wis.

ASSIGNMENT ABROAD

The opportunity to share environmental expertise internationally has some DNR specialists packing their bags.

David L. Sperling

It hardly seems like the stuff you'd need for an overseas trip — photos of diseased oak trees, flow charts of air monitoring networks, instruments to measure algae. While some thrifty travelers pack a roll of toilet paper, these sojourners are as likely to lug along blueprints for entire wastewater treatment works.

International travel is still a rare opportunity for DNR resource managers and environmental specialists, but foreign governments are knocking at the door, or at least opening their doors, with increasing regularity. Several managers and specialists from the Department of Natural Resources have been invited guests to foreign countries to present research results, describe solutions to common problems, share approaches for tackling complex environmental issues and forge long-term partnerships.

Some of these alliances were formed to manage common resources along common borders. Cleaning up coasts and harbors along the Great Lakes and St. Lawrence Seaway, for instance, led to natural partnerships among states and the Canadian provinces of Ontario and Quebec. "I signed the first agreement with the Quebec Minister of the Environment in 1983," recalled DNR Secretary C.D. Besadny.

DNR PHOTO

Secretary Besadny (*left*) in Heilongjiang Province, northeastern China. A five-year program shared techniques for managing forests and water resources.

"It was interesting because the Canadians came to us. They saw that we had a lot in common — similar resources, similar concerns about acid rain, and a similar need to work with paper mills to issue permits and control discharges," Besadny said.

Over many years, informal working relationships and two formal agreements with Canadians resulted in cooperative management of lake levels, water quality research, acid rain research, commercial lake traffic, fisheries and water diversion.

"I've learned a lot from these exchanges," Besadny said. "Certainly the most important lesson is that countries can learn from each other's successes and mistakes. You don't build a successful program in one trip, but you can start to build relationships that will be important to both countries. The key is to keep learning from each other."

Wildlife managers across the northern United States also work with Canadian counterparts to manage habitat for migrating waterfowl, songbirds and mammals.

Other working relationships formed with international neighbors to resolve pollution that was caused by and will only be cured by regional actions. Acid precipitation, ozone and PCBs don't respect fencelines or dams. More widespread concerns like CFC reduction, mercury contamination, soil loss, suspended dust and global warming warrant global strategies.

Formal agreements

Written compacts between the Department of Natural Resources and foreign republics paved the way for other opportunities for research and technical consultation. It's unusual, as such partnerships are typically established at the federal level. Yet, Secretary Besadny formed just such an agreement in May 1991 with Tartarstan, a region of Russia east of Moscow. Tartar authorities want to assess if U.S. methods of resource management and environment regulations could help them

oversee a wide range of businesses including petrochemical industries, large agricultural cooperatives, forestry and fisheries, as well as recreational pursuits like sport hunting and national park development. The Tartars are interested in launching environmental enterprises like conservation cruises on the Volga River for foreign tourists. The republic also wants contacts with U.S. firms that manufacture environmental controls and monitoring equipment, manage large solid waste operations and operate water treatment and purification plants. And they are interested in western techniques for teaching environmental education.

Heilongjiang Province in northeastern China has a Sister State relationship with Wisconsin. Similarities in our climates and tree cover led to five-year memoranda of understanding to develop mutual forestry and water resources management projects.

As the Berlin Wall crumbled and the Eastern Bloc tumbles back into independent ethnic pieces, environmental expertise is at a premium. Many regions are clamoring for foreign help to revitalize their economies, restructure their governments and restore their environments. Eastern European countries that need to compete with international markets want to assess if U.S. methods for managing the environment offer ideas they can afford to carry out.

C.D. BESADNY

Resource managers worldwide are challenged to enhance habitat. Near Harbin, in northeastern China, Secretary Besadny visited a crane project in 1986.

The Lithuanian Department of Environmental Protection recently formed agreements with the Wisconsin Department of Natural Resources that cover a host of topics including pollution prevention techniques, environmental education methods, safe means for deriving energy from wastes, wetland protection and setting environmental standards based on how they affect human health.

Partners in consulting projects

There is tremendous interest in understanding the governmental organization, technological hardware and personnel required to maintain a cleaner environment. Many countries need to construct or revamp public works that provide adequate sewage treatment, ensure dependable water supplies, treat industrial wastes, control smokestack emissions and handle garbage. Moreover, they will be asking developed countries to help fund these improvements in the name of a cleaner global environment.

For instance, DNR Air Management Director Don Theiler has spent vacation time as a member of World Bank teams that visited Rumania, the former Yugoslavia, Bulgaria and the Ukraine. The teams were assessing whether proposed approaches for resolving environmental problems warranted financial backing from the World Bank.

Theiler and air specialists Jon Heinrich and Scott Humrickhouse conducted a workshop last January with Czechoslovakian officials from the Ministry of the Environment. The consultants described regional approaches for maintaining air quality in the United States that might be adapted in Czechoslovakia. Northern Bohemia, a highly industrialized region of northwestern Czechoslovakia, is developing a regional plan for regulating air pollution sources.

"Restoring air quality in such an intensely developed region is pretty challenging," Heinrich said. "We have so much land in Wisconsin that it's hard to conceive how many businesses and potential sources of air contaminants are squeezed into a small area of Czechoslovakia," he added. "It's as if 12 coal-fired power plants the size of Columbia II were developed in a 20-mile-wide band stretching between Madison and Milwaukee. Also add in steel mills, heating plants, petroleum refineries and pulp and paper mills in the same region. Then consider that most of these plants are fueled with brown coal — a peaty, low-energy coal that's high in ash and sulfur content."

Yet the challenges don't deter the Czech planners. "What impressed me most was the quality of the Czech people — their education and their interest in resolving problems," Heinrich recalled. They grasped the conceptual tools we shared." If the Czechs can straighten out their economy, they certainly have the ability to address their environmental problems, Heinrich added.

JOHN MELBY

John Melby, plans and specs supervisor for DNR's Bureau of Wastewater Management, traveled to Poland in 1990 while on special assignment to the Environmental Protection Agency in Washington D.C. Congress had authorized a million dollars in environmental aids to Poland. The EPA team was asked to assess land use and water quality activities in the rural Suwalki Provence of northeast Poland. The region is often called the "green lungs of Poland" since it contains 240 lakes, wetlands, peat bogs and forests that have been spared the intense industrialization in other regions.

The Poles would like to designate and develop portions of the region as national parkland, nature reserves and landscape parks. Other areas would be commercially developed for tourism, fishing, boating and forestry. The EPA team recommended investing U.S. dollars to upgrade a sewage treatment plant at the headwaters to this lakes region. The plant is a major source of nutrients and incompletely treated industrial wastes.

Business opportunities

International demand for environmental expertise creates tremendous business opportunity in places like Wisconsin where environmental leadership

The Mazurian Lakes area of northeastern Poland. Can parks, tourism, farming and logging sustain the region's natural values as development presses the "green lungs" of Poland?

has spawned new ideas, new technologies and a chance to field test new environmental solutions. In fact, one of the strategic directions that DNR's top managers envisioned is viewing Wisconsin as a global profit center for environmental enterprises. Ideas like wasteload allocation on industrial rivers allow businesses to barter and trade pollution rights while improving water quality. It's a concept that could work elsewhere too.

The search for substitutes to hazardous solvents has led Wisconsin firms to pioneer nonhazardous alternatives for furniture strippers, pesticide formulations, parts cleaners, painting applications and printing. An emerging field called *bioremediation* is testing how effectively bacteria can degrade PCB-laden soil.

DNR's trends forecasters envisioned that our environmental leadership could give Wisconsin firms an early jump on new technologies and new businesses opportunities. Nurturing fledgling companies in business incubators could make the Badger State a center for environmental innovation — a place where one can build inexpensive equipment for restoring degraded environments, perfect cleanup techniques and gain practical experience in pollution prevention and restoration.

International trade will be hottest for simple solutions that can combine equipment and expertise already available in the host countries.

Wisconsin overseas

At least 67 Wisconsin firms sell environmental services or goods overseas. Their interests include:

- air filters and filtration equipment
- biological organisms and technology to digest pollutants
- chemical absorbers
- computer software for environmental monitoring
- drinking water purification equipment
- electronic controls and environmental sensors
- environmental engineering services
- groundwater monitoring equipment
- hazardous waste compactors
- industrial chemical sales
- equipment for recovering freon refrigerants
- equipment for recycling solid wastes
- oil spill recovery products
- pumps for wastewater and water supply systems
- wastewater filters
- wastewater treatment devices and chemicals

Source: Wis. Department of Development

Learning as well as teaching

Other countries regularly prove that we don't have a corner on good ideas. International contacts provide as much of an opportunity to learn as to teach.

Julian Chazin, environmental monitoring chief for DNR's Bureau of Air Management, was looking for equipment that could sample the air for minute amounts of mercury that appear to be an important pollution source affecting fish in Wisconsin. Swedish researchers have spent more than five years investigating how metals are transported throughout their environment. They developed a mercury sampler that has no moving parts and can be left unattended for more than a week. Similar research in Wisconsin has been more costly because our sampling equipment either needs a power source to operate moving parts or has to be carefully attended every day. Moreover, our scientists have to suit up in protective clothing to avoid contaminating samples. The prototype sampler Chazin brought back will enable researchers to monitor mercury in remote locations at a fraction of the current costs.

While in Sweden, Chazin toured unusual forest test plots where all the understory vegetation is covered with

JULIAN CHAZIN

A forest under glass and under study. Plastic roofing over 6,000 square meters of forest in the Lake Gardsjon region of Sweden shields the thin, forest soils from sulfur, nitrogen and mercury in rain and snow. Swedes are studying if and how acidified soils can recover from air pollution damage.

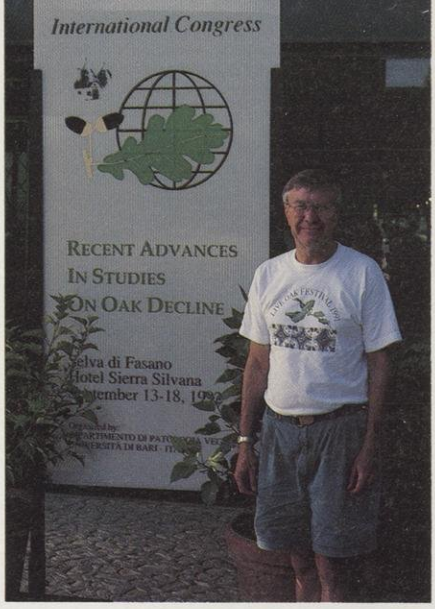
(*inset*)Swedish samplers will help Wisconsin researchers design equipment to measure small amounts of mercury in rain and snow.

transparent roofs that transmit sunlight but divert rainfall and snow melt. Swedish forests are especially susceptible to environmental damage because thin, unbuffered soils offer little protection from pollutants. Metals like mercury settle out from air, penetrate the soils and kill the fine roots hairs on valuable trees like spruce. The wooded laboratories are artificially watered and intensively monitored to determine how sulfur, nitrogen and mercury in precipitation affects the thin forest soils. Mosses and lichens are also sampled as biological indicators of air pollution. The Swedes believe the forest may be receiving ten times the mercury contamination from air pollutants that it receives from lakes and rivers.

Sharing expertise in panels and conferences

Wisconsin researchers also participate in international conferences that focus on their specialties. Carl Watras, a DNR limnologist who oversees the acid precipitation study on Little Rock Lake, was an invited member of an international panel that reviewed mercury research in Sweden in 1990. Watras brought along a computer and instruments his team uses in its Wisconsin studies. His research team perfected a method for on-water sampling and analysis of fine layers of algae and bacteria in lake water. Understanding how these small organisms use mercury is key to understanding how the contaminant moves through food chains. Algae and bacteria convert the mercury that falls as pollution into organic mercury that is absorbed by larger plants and fish. The techniques so interested the panel that Watras was asked to make a few side trips on his way home to explain the process to laboratory managers in Germany and Holland.

Watras also organized the second international conference on mercury as a global contaminant. Under sponsorship of the Electric Power Research Institute, Watras brought together researchers from 18 countries, 20 state agencies from the United States and several federal programs. Papers explored the spread of mercury as an environmental pollutant and human health concern. Researchers are measuring mercury in freshwater aquatic, marine, atmospheric and terrestrial ecosystems.



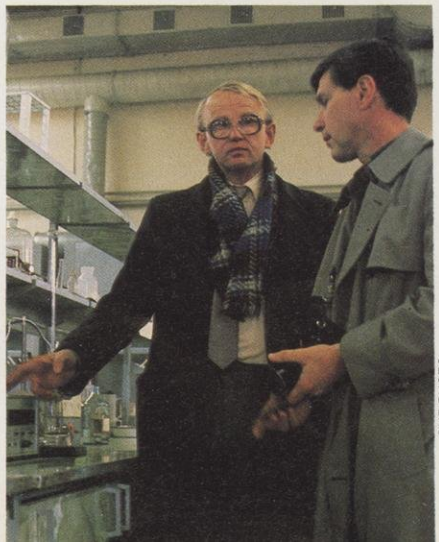
ALLEN PREY

Allen Prey shared ways to detect and halt the spread of oak wilt at a conference in Italy.

Last September Forest Pathologist Allen Prey was invited to Brindisi, on the heel of the Italian boot, to talk about the spread of oak wilt in Wisconsin. European forests are currently free of this debilitating disease, but several countries import North American oak logs. Should the fungus enter a country, despite routine fumigation and debarking, European foresters wanted to know how to spot signs of the disease and how to manage oak forests to minimize its spread.

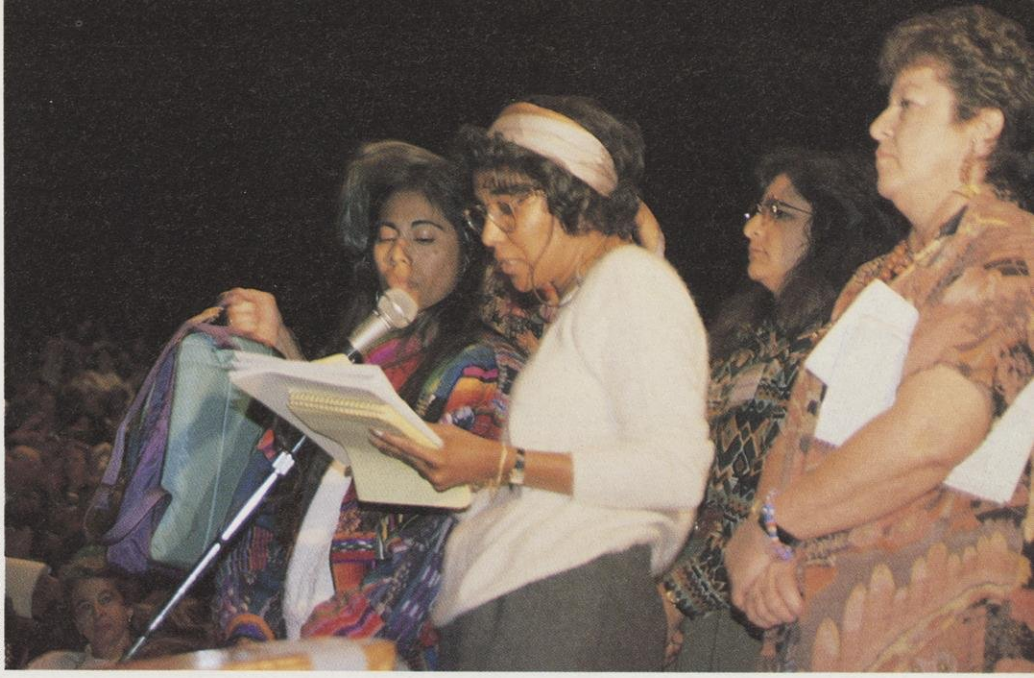
Lyman Wible, administrator of DNR's environmental quality programs, was invited by soviet scientists to speak last July in Borok, a biological research station of the Russian Academy of Science, located 150 miles north of Moscow in the Yaroslav Region of Russia. This meeting celebrated the end of a 20-year environmental agreement between the United States and the

Lab Director Albert Kasaturov and DNR's Lyman Wible discuss environmental sampling. This lab monitors air and water near a giant truck manufacturer and petroleum plants in Tartarstan.



DNR PHOTO

former Soviet Union signed by President Nixon in 1972. Wible shared the results of studies in Green Bay to measure the sources and destinations of toxic materials that are carried into the Great Lakes. (*See our story this issue.*) Wible also made a follow-up visit to the Lithuanian Department of Environmental Protection. Lithuanians sought his consultation in designing their work force to manage regional environmental programs. Wible also interviewed Lithuanians who may come to Wisconsin to study organizational structure and environmental approaches that have worked well here.



CHARLOTTE HAYNES

The World Women's Congress for a Healthy Planet. Environmental concerns and solutions come from diverse people in all walks of life.

Grassroots concerns

Concerns of individual employees for friends in foreign places and for global environmental issues have spawned international activities. Al Hubbard, air management engineer, and other environmental specialists visited Vilnius, Lithuania after Al agreed to head the Sister City program between Madison, Wis. and Vilnius.

Charlotte Haynes, planning analyst with the Bureau of Water Resources Management attended the World Women's Congress for a Healthy Planet last November in Miami and the United Nations Conference on Water and the Environment in Dublin, Ireland last January.

Haynes noted that nations in the Southern Hemisphere resent being told to control their populations by countries from the Northern Hemisphere. "The participants really made me question whether environmental degradation is caused more by overpopulation or overconsumption," Haynes said. "It's pretty hypocritical for someone from the United States to tell a Third World nation to slow its population growth when each person in the States consumes 40 times the resources of someone in a developing country."

"One of the most impressive aspects of all this international work is so much of it started at the grassroots level," said Peter Hujik, International Activities Coordinator for the Department of Natural Resources. Staff members have quietly taken the initiative to make contacts abroad, often at their own expense. Most of the remaining travel is sponsored by private institutes, consulting firms or federal agencies, Hujik noted.

International opportunity

The benefits and necessity of working jointly with Canada on mutual projects are obvious, but the agency and the state also profit from contacts around the world, said Bruce B. Braun, DNR deputy secretary. First, working with foreign colleagues is an opportunity for professional development. Our employees are exposed to new people, new ideas and they are challenged to view familiar problems in unfamiliar contexts, Braun added. That leads us to re-examine the basic premises we make in approaching and resolving environmental issues here in Wisconsin. International activities also give employees an opportunity to use foreign language skills and other talents not typically engaged on the job, he said.

Second, we learn of technology and management techniques that are working elsewhere. Some of these, like the Swedish mercury sampler, have direct applications here that can save us time and money.

Third, there's a real opportunity to introduce foreign customers to Wisconsin firms that may produce goods or provide environmental services. "The market for green goods and services is growing, and Department of Natural Resources staff can help strengthen local businesses by linking potential customers with environmental companies from Wisconsin," Braun emphasized.

The market is equally rich here for environmental talent. "This agency and our state universities have a nationwide and worldwide reputation for producing seasoned, knowledgeable environmental managers," noted Lyman Wible. It truly is part of our agency vision that Wisconsin educational institutions, the environmental services sector and entrepreneurs plan our opportunities to become a global resource for environmental solutions, Wible stressed.

A diverse mix of people are getting their environmental training here in biology, botany, wildlife ecology, engineering, hydrogeology, and social sciences like urban planning and sociology. The "Wisconsin-trained, Wisconsin-experienced" label is a career asset to future consultants, corporate environment managers, land managers and governmental employees, Braun said.

"Our businesses and industries should be packaging their environmental training, accomplishments and know-how in the bag of goods and services they have to offer foreign markets." □

David L. Sperling edits Wisconsin Natural Resources magazine.

GREEN BAY LEDGER

A SIX-YEAR, $10 MILLION ENVIRONMENTAL ACCOUNTING SHOWS WHERE TOXICS GO AND FLOW IN THIS BIGGEST OF BAYS.

GREEN BAY AERIAL. DNR PHOTO

It's a little like the story of the blind men and the elephant. Scientists groping to understand how toxic pollutants flow into, through and out of Green Bay were tackling a beast of a problem. Whether one studied land runoff, water flowing in from the Fox River, pulp and paper effluent, or sewage treatment waste, researchers always felt like they were grasping just a piece of the toxics puzzle — an ear, leg, tail or trunk — instead of getting the whole pachyderm.

To get the big picture, a diverse team of scientists just finished spending six years and $10 million taking an environmental accounting of toxic materials that are deposited, transformed and withdrawn from Green Bay.

The ambitious project used the skills of 22 environmental research institutions to measure, monitor and model toxic pollutant flow. It's a bit like sending in a team of auditors to thoroughly examine the health of a recovering S&L. They sampled bay water, river water, groundwater, stormwater, river bottoms, storm sewers, old landfills, effluents, fish, sediments, air and food chains. Researchers examined conditions on more than 34,000 acres of land that drain to the Lower Fox River below the DePere Dam and Green Bay.

Why spend that kind of effort on one waterway?

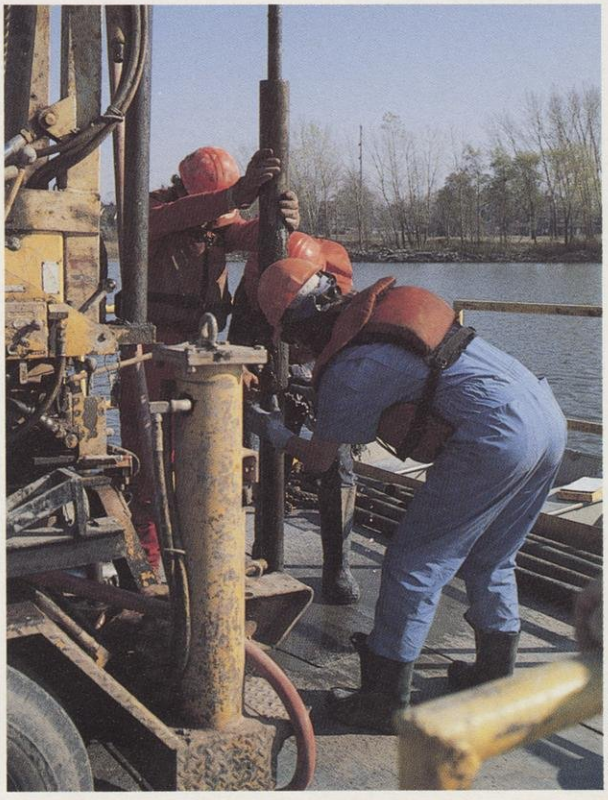
We live so close to the bay that we tend to overlook it's unique qualities. Green Bay is 1,640 square miles of fairly shallow water — the largest freshwater estuary in the world. It's also at the receiving end of 150 years of the "American Dream." On the banks of 39 miles of the Fox River flowing north from Lake Winnebago to the mouth at Green Bay lie 13 active pulp and paper factories, six municipal sewage treatment plants and the runoff from 270,000 people. Wastes from that intense development and the historical uses of refuse to fill in adjoining wetlands made the waters of the Lower Fox River and Green Bay largely unusable for recreation from the 1930s through the 1970s.

Pollution control programs have dramatically improved the dissolved oxygen levels in Green Bay and have cut pollutants from municipal sewage, mill liquors and urban development by more than 95 percent between 1971 and 1984. Walleye fishing is getting good again. Perch angling remains hot. Boating is becoming an even bigger business. Marinas and other shoreline developers are vying for coastline property.

Yet, toxicants persist. Health advisories guide prudent consumption of fish and waterfowl. And beaches still aren't deemed safe for swimmers.

Still, so much progress has been made that businesses and homeowners alike are enthusiastic about investing in their recreational future on the bay. To plan their future, community leaders need to know what they are facing: Where are toxic materials accumulating? What are the cleanup options or the consequences of leaving the materials where they lie? What will cleanup cost and when will it pay off in uncontaminated fish and

Getting to the bottom. Sediment cores drawn from 20-30 feet below the river bottom allow researchers to assess what has washed and scoured into Green Bay for the last 40 years. The drilling rig, loaned by the Dept. of Transportation, normally tests sediment and rock under proposed bridge pilings.



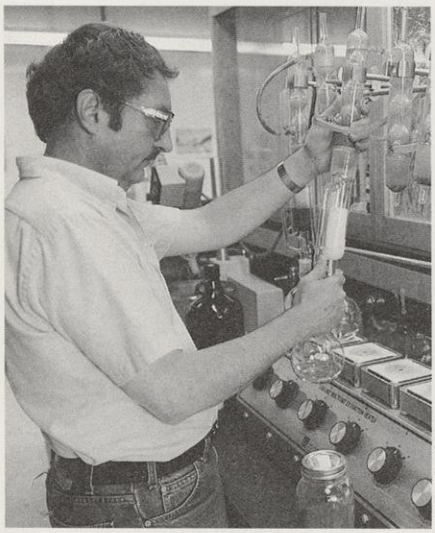
JEFF STEUER

cleaner beachfront property?

To answer those questions, researchers sampled four distinct kinds of toxic materials: PCBs — a contaminant notorious for persisting in the environment and moving through food chains, lead — a common metal that causes health problems for people when ingested or in combination with organic material in waterways, dieldrin — a pesticide whose residues were historically found in Green Bay, and cadmium — a metal that plants and animals can ingest and pass through food chains.

Sources, sinks, pathways and fate

To understand how toxic substances can be controlled, researchers construct a sort of "life history" for each compound. They look for pollution *sources*, *sinks* — places or organisms that retain toxicants, *pathways* — how toxicants move from one organism or place to another, and *fates* — how toxicants age or change when exposed to water, weather, sunlight and the digestive tracts of animals and plants that eat them. Extensive environmental sampling shows where and how each particular compound accumulates in the environment. This information suggests how pollutants can be removed or managed. Here are some findings from the recent work in the Fox River and Green Bay region.



ROBERT QUEEN

Lab samples for the Green Bay study were analyzed and cross-checked by six laboratories.

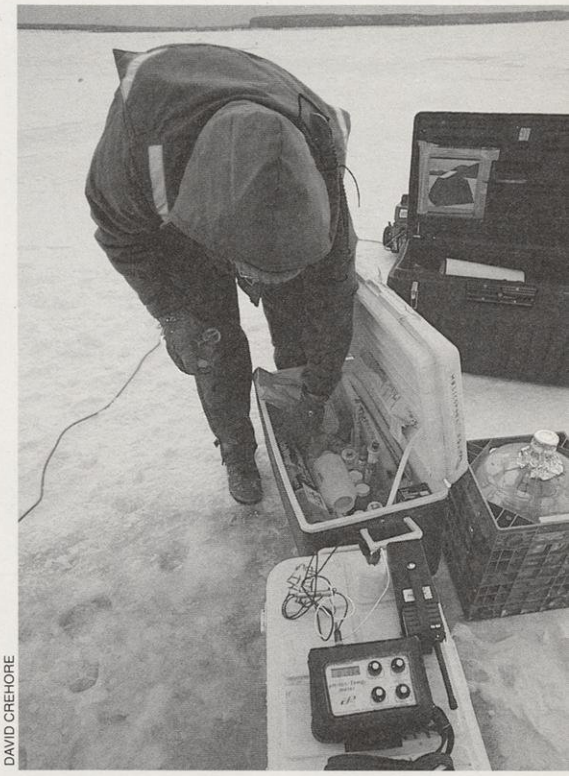
PCBs — Less than 10 percent of the PCBs found in the Green Bay area are from current pollution. Coolants, transformers and other appliances that used PCBs have contained substitute products since 1979. These days PCBs are only used as coolants in sealed electrical capacitors and transformers. They also collect as residues of paper recycling. In fact, annual loadings from all sources in Green Bay average about two pounds a year.

Past use is another matter. Through the 1970s, when PCBs were first measured in the environment, an estimated 1,180 - 2,640 pounds of PCBs washed down the Fox River into Green Bay each year. As much as 140,000 pounds of PCBs are lying in sediments in the river bottoms and bay. So currently, sediments in the river account for more than 98 percent of the yearly total of PCBs above DePere and about two thirds of annual PCB loading that reaches Green Bay.

PCBs are stable, oily compounds that adhere to sediment and soil particles more readily than they mix in water. Nevertheless, the huge amount of PCBs in sediments slowly release most of the PCBs that we now find in fish and other aquatic organisms. Very small amounts of PCBs re-suspend in water and even smaller amounts evaporate from the water to air. It appears that more PCBs evaporate from contaminated waters than fall into the water as rain, snow or air pollution. This could mean that water in Green Bay acts more like a source of PCBs to the air than a sink for air emissions.

Most PCBs are re-suspended in the summer as rainwater increases the river flow and stirs up bottom sediments. The contaminants are subsequently absorbed by algae and other aquatic plants used for food and cover.

Dieldrin — This pesticide has never been detected in the Fox River and is seldom found in a city's stormwater. Researchers wanted to test for it anyway to check if rain, river water or sediments transported pesticides to an area that acted as a sink. None were found. In fact, it proved to be difficult to analyze for small amounts of dieldrin because small levels of PCBs captured in the same samples interfered with test procedures.



DAVID CREHORE

The bay was tested year-round to learn how toxicants react in the environment. As seasons change from winter to summer PCBs are re-suspended from the muds. Growing plants and plankton can carry toxics back into food chains.

Lead and cadmium — Urban stormwater is so expensive to monitor that the Green Bay project relied on previous studies in Milwaukee as a model for Green Bay. These studies estimated both the amounts and major sources of lead and cadmium researchers expected to find in Green Bay. Samples of water and sediment show the most significant sources of lead reaching the bay come from storm sewers adjoining freeways and other heavy traffic areas. The pollution source? Cars. In the Green Bay study area, freeways account for about three percent of the land use but they produced 52 percent of the lead. Industrial storage yards and parking lots were the next largest source: eight percent of the land area and 22 percent of the lead.

The health effects and environmental consequences of lead levels recorded in Green Bay are not known. However, the amounts of lead recorded in these studies are much lower than those

found in previous studies. Researchers believe that difference is directly attributable to the removal of lead additives from gasoline. One would expect lead levels would drop even further as leaded gasoline use is phased out.

Cadmium levels followed the same pattern, dropping significantly from previous studies. Cadmium levels are much lower than lead levels, and are not considered a significant pollution threat now in Green Bay.

Options for further recovery

Metals and pesticides don't appear to be widespread environmental toxicants in Green Bay area waters. Rather, these compounds cause more intense problems for soil, groundwater and surface water if improperly disposed of. It appears more metals and pesticides are released in consumer products than from other pollution sources. Our health concerns about exposure to metals and pesticides sources may be caused more by our actions at home and on the street than from business and industrial pollution.

Clearly, programs to clean up the bay will have to focus on managing contaminated sediments. Given few current sources of PCBs to the water, PCB-laden sediments could eventually be covered over and capped with clean sediment. But that's not considered a long-term solution. Efforts to stem nonpoint pollution and soil erosion expect to cut the quantity of sediment reaching the Fox River and Green Bay. Moreover, contaminated sediments have not packed down to form a hard riverbed. High river flows, like those from a series of big storms in 1960, could scour the river bottom and flush a huge amount of contaminated sediment into Green Bay. Controlling peak river flow at the 17 dams on the lower Fox River could postpone the need to cap or remove sediments. Removing contaminated sediments above the DePere Dam could, likewise, reduce PCB loads for downstream fish. Water quality models developed as part of this study can advise community managers of the costs and likely results of each option.

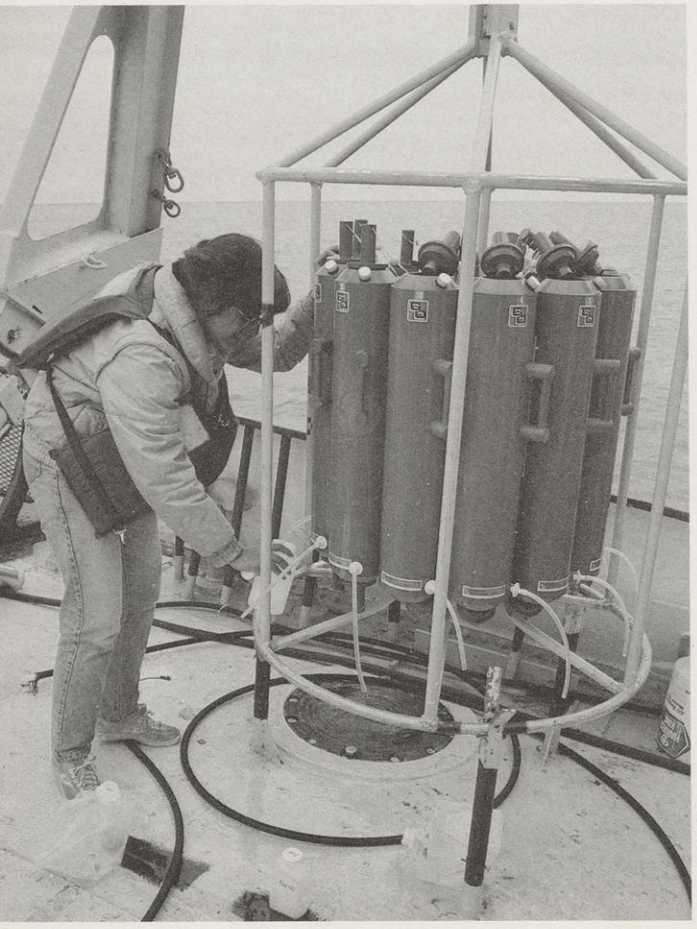
Remedial work will certainly be expensive. The Green Bay system may have 140,000 pounds of PCBs in sediments. By comparison, estimated costs to cap or remove 1,575 pounds of PCB wastes from Little Lake Butte des Morts near Neenah range from $3 million to cap wastes to $17 million to remove and incinerate wastes.

As the primary sink and future source of toxic PCBs in Green Bay, sediments need further exploration. If we can isolate more contaminated pockets of sediment, it may be plausible and relatively economical to remove these polluted pockets. By using existing dams to carefully control water flow into the bay, other less-contaminated areas could eventually stabilize. Fewer sediments would be transported downstream. As these small layers of sediment settle to the bottom, riverbeds would slowly cap over with clean sediment.

If communities choose to dredge parts of the bay or Fox River to deepen harbors, contaminated sediments will need to be carefully moved and confined elsewhere. The environmental computer models developed for this project will estimate the costs and benefits of different proposals for managing contaminated sediments.

Improving the environment in this vast, shallow estuary will remain a complex task, but we are gaining a better picture of the nature of this biggest of bays. □

Results must add up. These large-scale samplers collected water that was sent to several laboratories to compare test results and ensure accurate findings.



DAVID CREHORE

Sample where?

To understand where toxic materials come from and where they go, the following locations were sampled during this six-year study:

Water sampling

12 storm sewers
4 abandoned dumps
13 pulp and paper mills
6 municipal sewage treatment plants
60 groundwater sampling wells
27 locations in Green Bay (each sampled eight times)
5 tributary streams

Sediments

375 locations in the Fox River
165 locations in Green Bay

Fish and other aquatic life

3,500 fish combined in 685 samples

Air

3 atmospheric deposition sampling stations

1992 WISCONSIN NATURAL RESOURCES INDEX

We annually publish a subject index of our stories each December. A subject/author index of our stories from 1977-1990 is available for $1.75 including tax and handling. Send checks payable to the Wisconsin Department of Natural Resources to *WNR Magazine Index*, P.O. Box 7921, Madison, WI 53707.

Readers Write

MORE ABOUT THORDARSON FURNITURE

Your August article about Rock Island proved to be most interesting and surprising to me, especially regarding Thordarson's library furniture. The Milwaukee businessman referred to **did not** have the full set of furniture taken from the island.

My husband and I learned about Rock Island history after a camping trip there in 1974. On the way home we happened to stop in a small antique shop in Sister Bay. There we discovered all of the furniture that had once been in Thordarson's library on the island. Each piece was breathtakingly beautiful, and we knew we had to own a piece. We purchased two chairs and a dictionary stand that day, and they remain in near perfect condition in our home — highly prized pieces, believe me!

The antique shop was owned by Thordarson's ex-daughter-in-law. This furniture was her inheritance.

Virginia C. Anderson
Baraboo, Wis.

NOT AMUSED

Your otherwise excellent article on *Plants that heal* in the August issue states that "Atropa was the Greek muse who cuts the thread of life." This reference needs correction. The Muses were Greek semi-divinities who presided over the arts. None of them was ever given control over the length of life. That task was exercised by the three Fates — Clotho, who spun the thread of life; Lachesis, who measured it; and Atropos, who cut it.

Raymond K. Binder
Madison, Wis.

LOVE THOSE PARKS

I really enjoyed the August issue, especially articles featuring Rock Island and Wyalusing state parks.

The Wisconsin park system is incredible as well as beautiful. I wish the magazine would feature one state park in each issue. You could start with a story on this park and show pictures of Big Manitou Falls.

I first came upon your magazine while camping at Pattison State Park outside of Superior, I've been a faithful reader ever since.

Mindy Meyer
Madison, Wis.

We really enjoyed the article about Wyalusing State Park. We camped and canoed there this summer and took side trips camping the sand bars on the Wisconsin River. Wyalusing is a beautiful park, but then so are all the other state parks. We are avid campers and have camped them all.

Maybe you'll have an article on our favorite, Brunet Island State Park. Around October first, that park is ablaze with color. When we think of Amnicon Falls, Copper Falls, Merrick and the other beautiful parks, we feel truly fortunate to live in this most beautiful state.

Walter and Bev Banicki
Weyauwega, Wis.

SHELF ART

I particularly enjoyed the August issue. The agates on the back cover are stunning. The children and I have spent many hours collecting and polishing agates.

Page 7 had a picture of a shelf fungus. The dog and I love to walk in the woods and collect these treasures. I turn them into pieces of art. Each is different and has its own natural frame. After I paint them, I treat them so they stay sealed and clean. They make a nice gift for the person who "has everything."

By the way. I've been subscribing since 1966. I was introduced to the magazine by my father and I took over his subscription when he died. I sure enjoy it.

Doris Gardas
Hager City, Wis.

CCC, WPA AND THE DATE WHICH LIVES IN INFAMY

Having lived through the Great Depression era and long enough to see the seedling pines being harvested as the fruits of work done by the CCC boys and WPA men in both southern Wisconsin and here, in the north, I congratulate you on your well-done article in the October issue!

Walt Goldsworthy
Three Lakes, Wis.

While I enjoy the magazine and read with great interest the article about the WPA and CCC, I do wish to draw your attention to the fact that the United States entered World War II in 1941, not 1943. Some 2,500 servicemen who died at Pearl Harbor on December 7, 1941 would probably also point this out to you!

My dad was a CCC member and worked out of Ghost Creek Camp. I grew up listening to stories of the CCC and sent many of Dad's pictures of those years up to the Civilian Conservation Corps Museum in Rhinelander. The place would make a good article for a future issue.

Tom McCormick
Whitefish Bay, Wis.

We especially appreciate the opportunity to encourage readers to visit the Civilian Conservation Corps exhibit in the Logging Museum in Pioneer Park, Oneida Street in Rhinelander. The museum is open from mid-May through mid-September.
Our mistaken reference to 1943 was the consequence of combining two ideas and not catching the result. Both CCC and WPA programs were phased out in 1943. Many public and private partnerships mustered to win the war, and jobs were redirected toward that purpose. Several other readers also called or wrote about this point, as follows:

I enjoyed "*The fruits of their labor,*" by Cynthia M. Stiles and would have given it an A+ except for (that) glaring error. I remember Pearl Harbor on 7 December 1941. Some of the war's fiercest battles were the island campaigns (Guadalcanal, Wake Island, the Philippines ...) and the naval battles which took place in 1942.

Elroy T. Kuchta, Sr.
West Allis, Wis.

You generally do a fine job presenting a good publication that I always enjoy, (despite this) glaring misstatement of fact. As a Depression child and veteran of World War II, I recall the WPA and CCC vividly. Although only 16 when I volunteered into the Navy, I recall the infamous attack on Pearl Harbor on December 7, 1941, well before 1943.

Casey Edwards
Des Plaines, Ill.

GREAT RESOURCES

We enjoy the magazine now, more than ever, as we have moved to a home on the Wisconsin River in Sauk County. We find so much that's close to our home and heart in every issue. Wyalusing is indeed a treasure, but we have especially enjoyed Wisconsin's well known and little known waterfalls. Grandfather Falls near Tomahawk is one of our favorites.

How good it feels to read the magazine and see how *many* people are working to keep the state beautiful. We appreciate knowing how much help is available through the DNR and the University of Wisconsin-Extension; human resources we should be proud of and seem to overlook too often.

Joan Fedkenheuer
Baraboo, WI

DAVID CREHORE

Continued from page 2

Here, in the hour before the crow rouses and the hawk turns in for another nap, the owl prowls the sub-day edge. The right world is asleep and pious, yet the owl, its belly full and hard with a nocturnal repast, lumbers home along the tree-edge. Acrobatics demand an empty stomach.

I am better for having a stalk in owl-light begin my day. When I have walked enough to wet my shoes, I reach a log where the circle turns quite by plan. Here I sit, then reach to find where my pipe has been; put in this pocket a week ago, or was it two weeks past? Owl-light is for a corncob and navy plug if I can but find the match.

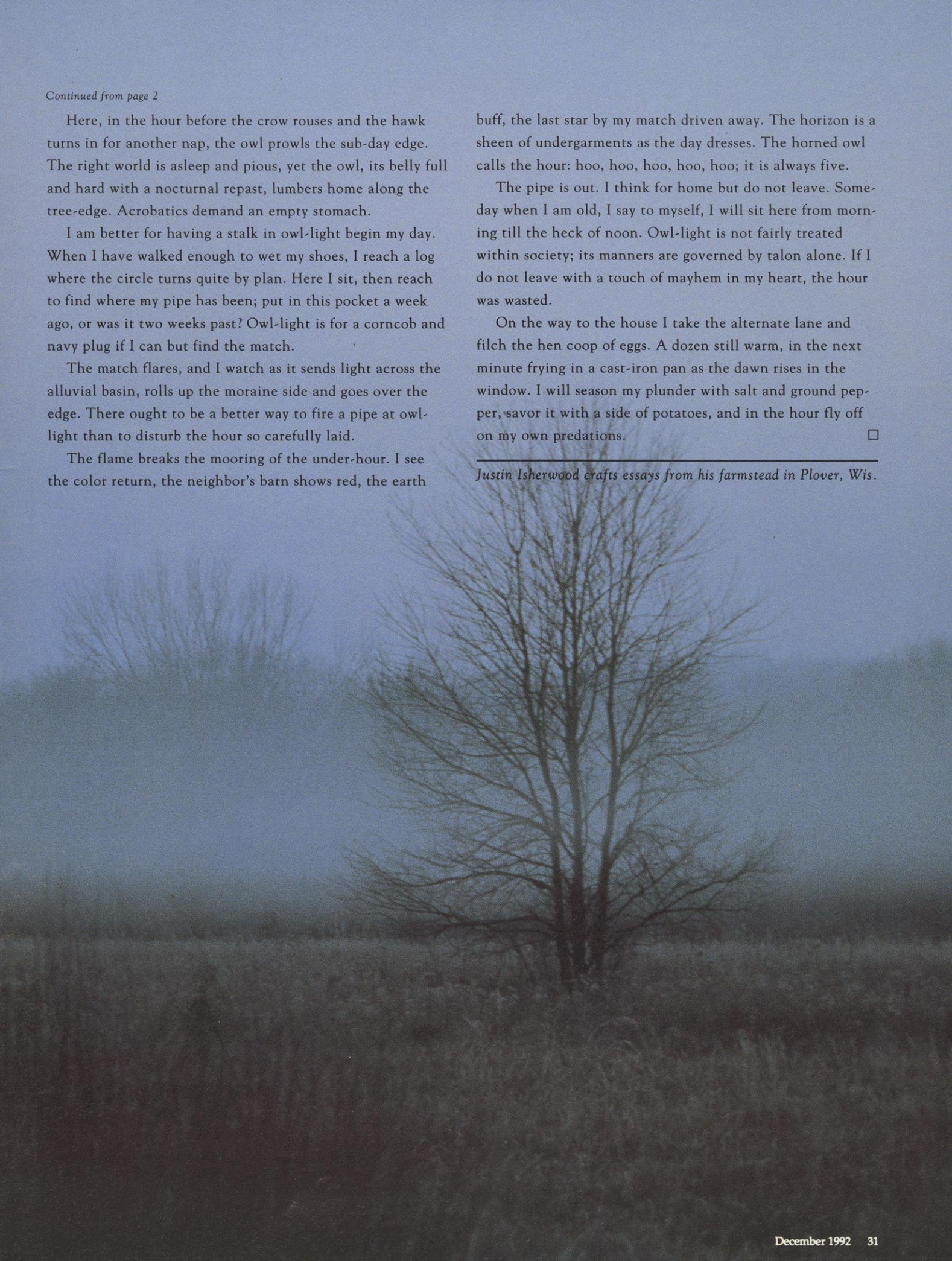
The match flares, and I watch as it sends light across the alluvial basin, rolls up the moraine side and goes over the edge. There ought to be a better way to fire a pipe at owl-light than to disturb the hour so carefully laid.

The flame breaks the mooring of the under-hour. I see the color return, the neighbor's barn shows red, the earth buff, the last star by my match driven away. The horizon is a sheen of undergarments as the day dresses. The horned owl calls the hour: hoo, hoo, hoo, hoo, hoo; it is always five.

The pipe is out. I think for home but do not leave. Someday when I am old, I say to myself, I will sit here from morning till the heck of noon. Owl-light is not fairly treated within society; its manners are governed by talon alone. If I do not leave with a touch of mayhem in my heart, the hour was wasted.

On the way to the house I take the alternate lane and filch the hen coop of eggs. A dozen still warm, in the next minute frying in a cast-iron pan as the dawn rises in the window. I will season my plunder with salt and ground pepper, savor it with a side of potatoes, and in the hour fly off on my own predations. □

Justin Isherwood crafts essays from his farmstead in Plover, Wis.



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