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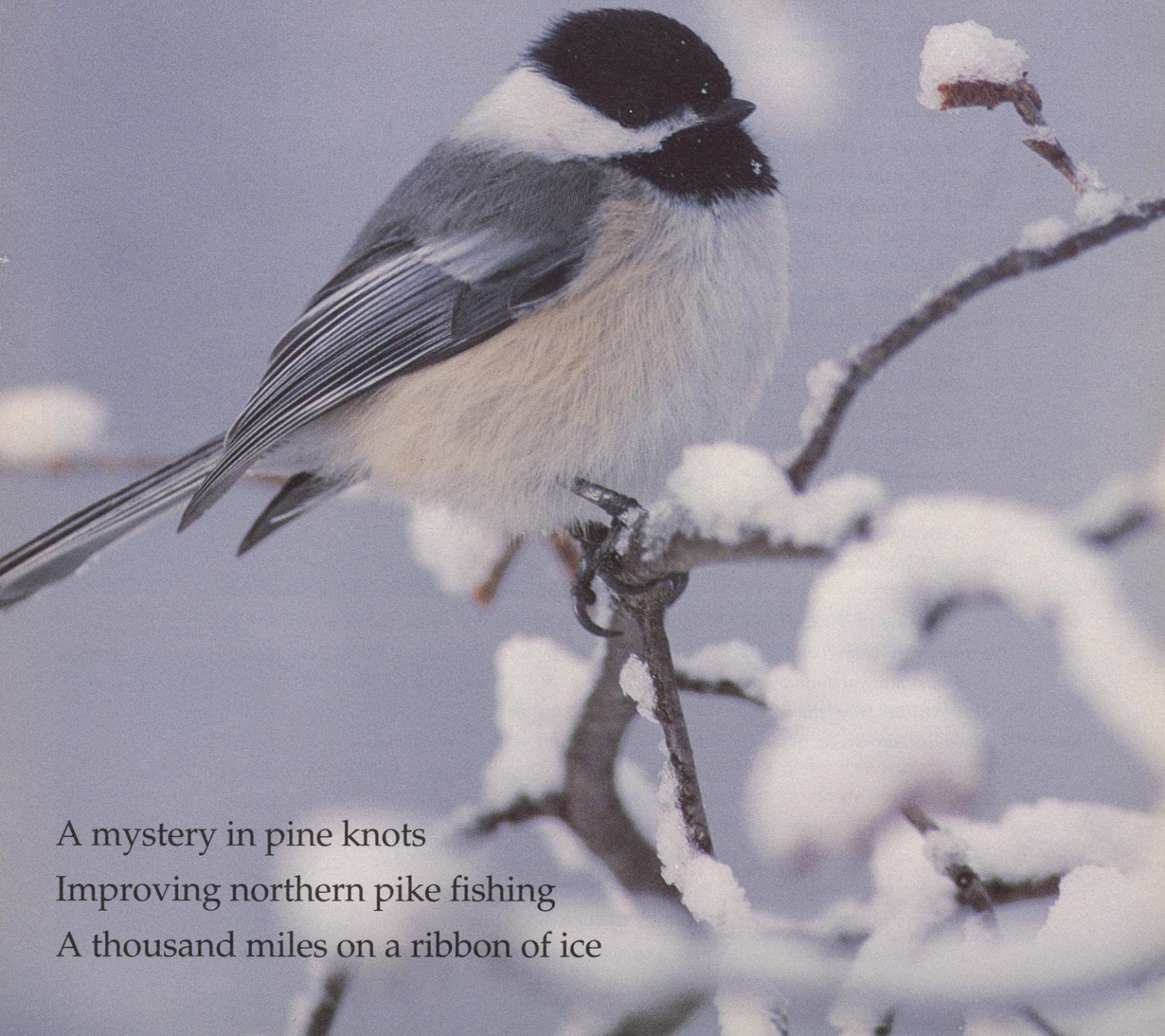
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WISCONSIN

NATURAL RESOURCES

December 1993 \$3.00



A mystery in pine knots
Improving northern pike fishing
A thousand miles on a ribbon of ice

A bird called

SNOWFLAKE

**From the North
Pole to a roadside
near you.**

Anita Carpenter

A long a windswept country road where fingers of flowing snow undulate across my path, snow buntings search for seeds on the exposed gravel shoulder. With my approach they burst into flight, banking, swirling, tilting as if the flock were one bird. Their black wingtips contrast with the white background. Once I have passed, they return to the same spot. I am but a minor intrusion into their routine.

The 6½ to 7 inch snow buntings (*Plectrophenax nivalis*) are wandering winter visitors from the rocky, windswept arctic. If they



EDWARD PRINS

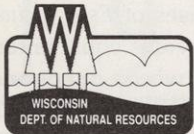
For a few months, snow buntings leave their arctic clime to enjoy the balmy winter weather in Wisconsin.

make the long southern journey to Wisconsin, snow buntings are likely to be found in open, barren places such as lakeshores, roadsides, or short grass fields. They are unlikely to be found in the same place on succeeding days.

In their winter plumage, which we are most likely to observe, snow buntings are primarily white with brownish caps and touches of light brown on their backs. As spring approaches, the brown feather tips wear away exposing the white head and black back of the male in breeding plumage. The female in breeding plumage has a brown back with tinges of black and white. She has a few light brown streaks on the back of her head.

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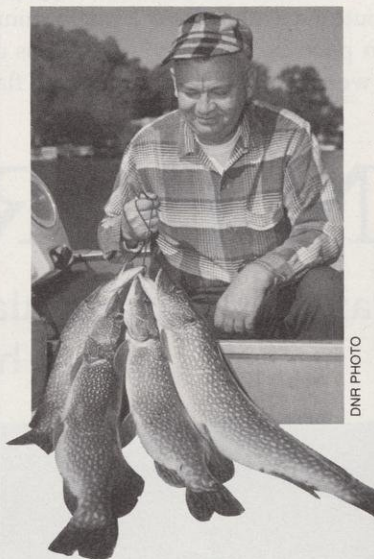
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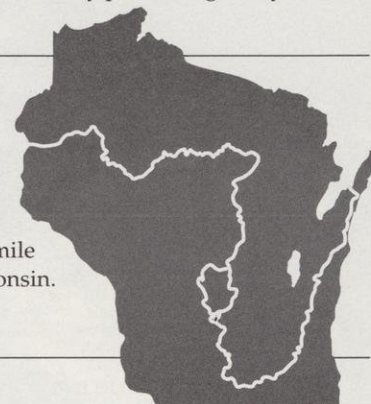
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BARBARA MULVANEY, MAPLE GROVE, MINN.

Northern pike get no respect. Their cousin, the muskellunge, rules as kingfish and monarch of the inland seas. The musky/northern hybrid is referred to as a tiger musky. So what glorious title do we bestow on the venerable northern? Hammer handle! Jack! Snake! Any wonder that outdoor writer Dave Otto calls northern pike the "Rodney Dangerfield of the weedbed?"

Well, the flak stops here and now. Let us sing the praises of *Esox lucius*. What other fish provides equal entertainment in shallow, weedy ponds and big, open waters? What other fish will nab your bait at midday when the wall-eye are burping and picking their teeth? What other fish will smack a bobber-held minnow or trolled spoon? Which fish tips up both the human spirit and the red flag on a cold winter day? What

other fish is enough of a sport to enthusiastically inhale darn near any lure in your tackle box, even that pathetic rubber frog with the gimpy leg? And what game fish has just enough of a sneer to both frighten and fascinate any five-year-old fisher?

The northern pike's bum rap has masked its importance as a lake predator and consistent lake performer for anglers. Unfortunately, the bad rep also

Northern pike populations dropped dramatically in southern Wisconsin lakes sampled in the last 40 years. (Opposite) Opening day on Cox Hollow Lake, 1960. Pike populations have been vulnerable for many years as anglers kept large catches of big fish.



A PLAN FOR THE

The maligned but popular northern pike needs help and respect.

The powerhouse that has saved many a slow fishing day.



"PEOPLE'S FISH"

David R. Lentz, Paul K. Cunningham and David L. Sperling

masked a gradual, continual population drop. The northern pike needs some careful tending, and here's the reason and strategy for that TLC.

A bottomless supply of fish is bottoming out

Today, the northern pike is a very popular game fish. DNR Research Biologist Terry Margenau calls pike "the people's fish" due to its year-round popularity. Pike are relatively easy to catch, fun to play and give most anglers their best shot at catching a really big fish. Moreover, northern pike make truly delectable table fare whether fried, pickled, broiled or boiled for so-called poor man's lobster.

The decline of northern pike populations may have been masked by their willingness to bite. Now, anglers are saying that pike fishing isn't as good as it used to be 20 to 40 years ago. Research shows the anglers are right, for a variety of reasons.

Northern pike numbers are especially dwindling in southern Wisconsin. Randy Schumacher, a DNR fisheries biologist at Eagle examined netting surveys of 25 southern Wisconsin lakes between 1951 and 1992. Thirteen of these 16 lakes were surveyed more than once and showed an average 72 percent drop in pike populations during this time. The largest declines were noted in round-bottomed kettle lakes that were carved by the glaciers throughout southeastern Wisconsin. The lakes un-

der study that showed serious declines were Buffalo, Rock, Koshkonong, Big Elkhart, Crystal, Nagawicka, Pewaukee, Okauchee, Camp, Como, Delavan, Lac LaBelle and the Sheboygan Marsh.

"We were surprised to find the extent of the decline, especially how far north it extended and the range of water it covered," Schumacher said.

Not only are the numbers down, but the average size of caught fish is getting smaller throughout the Midwest. The same size trends have been noted for panfish. "The average panfish in Wisconsin right now is a half-inch smaller than fish were 20 years ago," said Fisheries Director Lee T. Kernen. "It has been a gradual but consistent change. And that's something to be concerned about."

Better equipment, more knowledgeable anglers and more fish kept

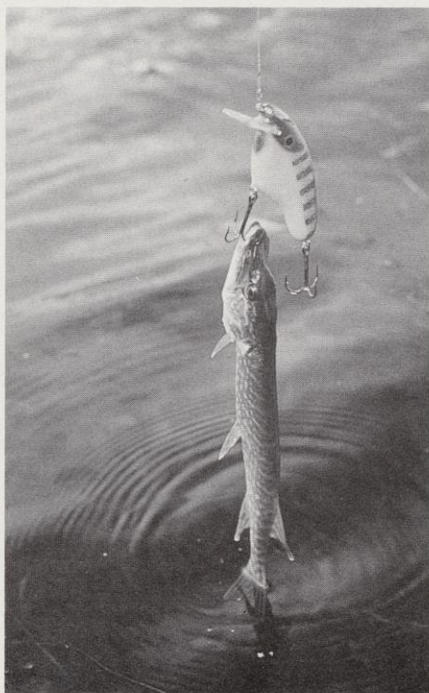
Clearly, anglers are catching and keeping more northern pike than nature can replace. Human populations have grown tremendously near our large cities and boating is increasingly popular.

Fishing techniques are getting more relaxing and much more efficient. Almost no one fishes today in wooden row boats using the old heavy rods with

thick, braided lines. And you don't stop every few minutes to drop a heavy anchor line and gauge the depth. Today, it's pretty effortless to fish pike all day making anglers the fish's number one predator. Sleek, sturdy boats are equipped with big motors, electric trolling motors and electronic depth locators. Lightweight graphite and boron rods rigged with hair-thin monofilament line and sophisticated reels make retrieves easy and backlash-free. Topographic maps chart underwater contours, channels, gravel and weedbeds that can hold fish. A flood of fishing TV programs interpret fisheries research, hawk gear and teach angling techniques. Lightweight, warm clothing makes even cold and wet days more bearable on the water. Even ice fishing is much more comfortable in portable heated shanties using modern drills that make it simple to punch holes through the ice and move around without tiring.

Northern pike don't help their cause much: They are very vulnerable to angling. Pike have a reputation for eating anything they can surround with their toothy jaws. They are among the few fish that feed actively throughout the winter. In northern Wisconsin nearly

Pike are scrappy but voracious eaters. Even small northern pike willingly strike bait in search of a meal.



TERRY MARGENAU

two thirds of the pike harvested each year are taken through the ice. In the absence of size limits, anglers can usually find a reason to keep smaller northern pike. If they are too small for the fry pan, they can always be pickled or tossed into chowder.

Natural differences between lakes and habitat loss take their toll

The growth rate and abundance of northern pike as well as the size distribution of the population vary widely from lake to lake. One end of the spectrum produces hammer handle pike. These small, marshy lakes are loaded with aquatic plants and shallow shorelines ideal for spawning pike. These lakes produce a lot of small, slow-growing fish. Typically, these lakes have abundant bass and small bluegills, but pike prefer to eat perch, ciscos and whitefish — tubular fish with softer dorsal spines. Consequently, lots of small pike are chasing a small number of prey fish. Our research shows that changing the catch on such shallow, weedy waters by adjusting the bag limits or increasing size limits does little to improve fishing.

At the other end of the spectrum are large, deep, cooler lakes with well-oxygenated waters. These deep lakes with steep shorelines have fewer shallow, marshy areas that pike would use for spawning. Here, the pike are much less abundant, but those that survive eat heartily on a rich diet of cisco, white sucker, redhorse and yellow perch. The pike grow big here and their reputation swiftly spreads among anglers. On these lakes, bag and size restrictions limiting what anglers can take can be an important factor in sustaining larger fish in the population.

The loss of spawning habitat along shorelands in southern Wisconsin has contributed to the pike population drop.

"Northern pike have stringent spawning requirements," notes Randy Schumacher. Northern pike spawn as soon as the ice melts in icy 33 degree water. They move into the really shallow weeds, sedges and marshes where the water is only four to 18 inches deep to

lay their eggs and deposit milt. The eggs cling to the underwater plant stalks for a few weeks until the embryos emerge.

"They need that vegetation," Schumacher said. "Eggs that fall into the muddy bottom are lost. Eggs stranded if water levels suddenly drop won't survive either." Within two to four weeks, the remaining young northern pike are swimming and feeding on minnows.

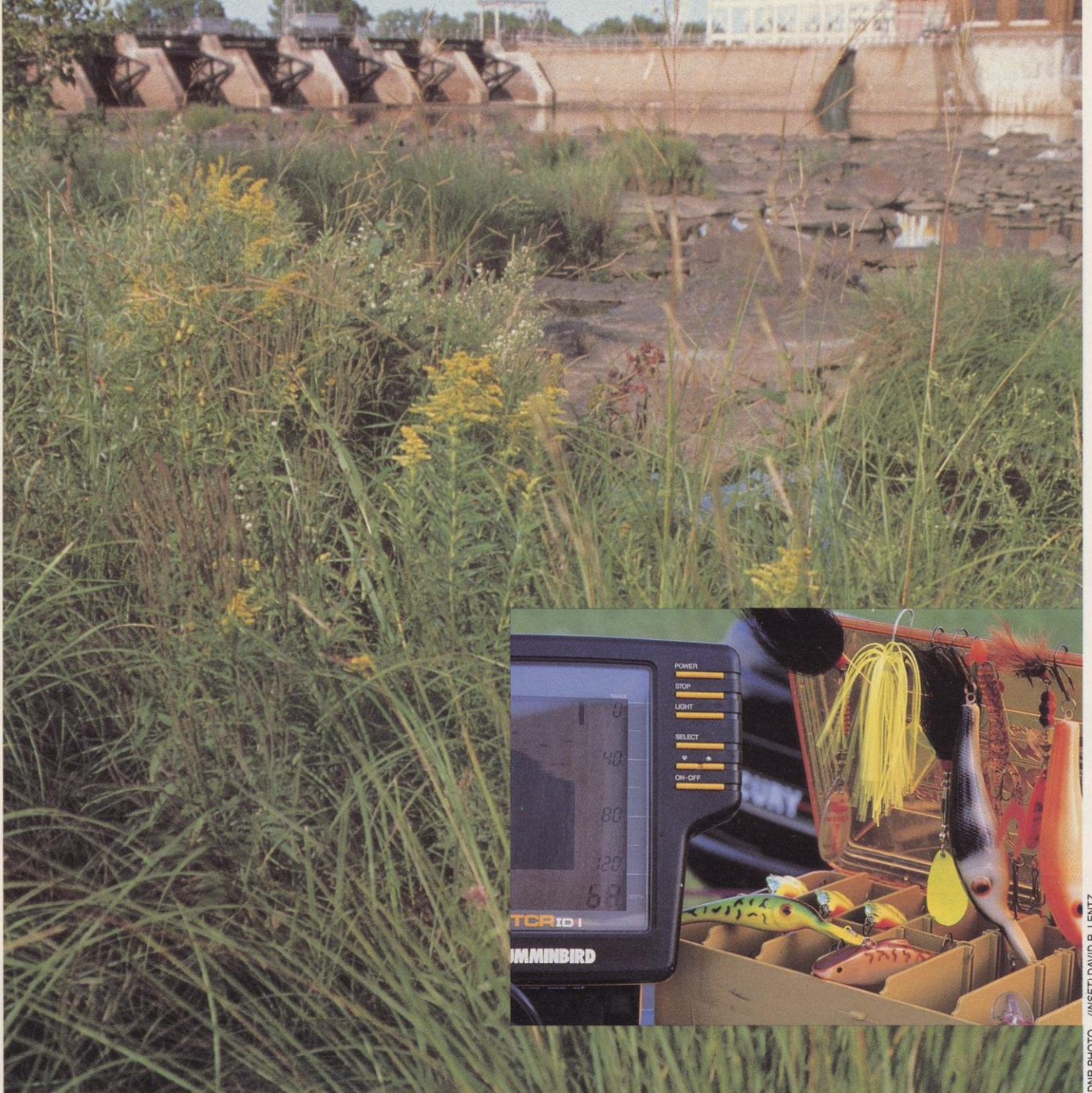
The need for stable water levels as the ice melts can put northern pike at odds with those who operate hydropower dams. During snow melt, just when pike eggs are vulnerable, power companies need to start passing large quantities of water through dams to minimize spring flooding. Fluctuating water and swifter currents can sweep the fragile eggs off of aquatic plants before the eggs develop a sucker-like head to hold on. If water levels drop after eggs attach to vegetation, the immobile fry can be stranded high and dry and they die.

One strategy for improving northern pike survival on riverine systems lies in monitoring spring spawning and working with dam operators to slow the water flow during the critical spawning period.

"The spawning period may be as short as a week," Schumacher said, and stable water for two weeks thereafter is critical for northern pike survival.

Flooded wetlands and shallow aquatic plants provide an important nursery as the young pike develop. Drawdowns can force young northern pike from their nursery areas into open water where they are vulnerable to predators.

The push by lakeshore property owners to fill in swampy areas, lengthen piers, drain wet areas and find other ways to extend their shoreland grasp on a watery world are all devastating to northern pike. Whether the intent is to yank aquatic weeds to form a better swimming beach, ditch a wetland to dry out a shoreland farm field or develop homes in marginal areas, each little change on the shore harms pike populations when they are most vulnerable.



DNR PHOTO (INSET) DAVID R. LENTZ

Northerns are vulnerable as people manipulate fish habitat and fishing technology improves. Pike spawn in flooded grasses and wetlands during spring snow melt. During the same time period, hydro dam operators may need to increase flow to prevent flooding.

(inset) Technology allows anglers to fish longer hours and more efficiently without tiring.

Developing solutions

A Northern Pike Planning Team of 10 fisheries biologists and four members of the Conservation Congress' Warmwater Study Committee assembled last fall. They aim to assess pike populations and suggest ways to improve pike fishing experiences.

The team proposes a multi-faceted approach to rebuild northern pike populations by decreasing the number of fish that are killed while improving fish habitat.

Fisheries managers statewide have been holding many meetings with northern pike anglers to better appreciate angler preferences and to explain why fish populations have been dropping. Anglers explained that they fish pike for different reasons — some want table fare, some just want a good fight before releasing fish, other want the chance to tussle with a really big fish. Obviously all lakes can't produce all these experiences for anglers. So a different combination of solutions will have to be applied to each water where

northern pike fishing needs improvement.

In most southern Wisconsin waters, the team proposed setting a 26-inch minimum size limit starting in 1995 and allowing anglers to keep only two fish a day. More restrictive measures are already in effect on a few southern state lakes. The size limit would protect female pike that grow much faster than the males, eat more voraciously and are three times more vulnerable to being caught. A 26-inch female is about four years old, so the intent is to assure



STEPHEN J. LANG

(above) Clearly, size limits and bag limits need to change in heavily-fished southern Wisconsin waters. Lakes in northern Wisconsin are so variable that some may sustain current harvest while others need a variety of strategies to improve fishing.

(below) Letting pike grow in northern lakes that are populated with plenty of prey fish is more important than stocking to produce real lunkers.

she has spawned at least twice before being caught and kept. The bag limit would slowly rebuild populations in the heavily-fished southern lakes.

The second proposal recommends retaining current rules that set no size limits and allow a daily bag of five northern pike in northern Wisconsin — at least for the moment. It's very clear that pike fishing in the North needs improvement. However, due to the diversity of upstate waters, the team realizes additional studies are needed to determine the best prescription for controlling harvest and managing pike in northern waters.

To provide anglers the opportunity to catch really big fish, a third proposal would establish larger minimum size limits on 40 to 50 lakes. If fish are handled carefully, these lakes could provide years of quality catch-and-release fishing until the fish grow to hefty proportions.



SCOTT NIELSEN



TERRY MARGENAU

Ice fishing with a treble hook instead of this pike hook would help more released northerns survive.

Ice gear for catch and release

Fishing gear can be as important as prompt, gentle handling in increasing the survival rate of released fish. Studies last winter show why.

Some people still rig their tip-ups with large so-called Swedish hooks or "pike hooks" baited with dead smelt. These hooks were designed centuries ago when fishing lines might only be tended once a day and it was critical that the catch didn't get away. These large hooks act more like fish gorges, hooking the pike deep in the mouth, gill, esophagus or stomach.

It's more common today to ice fish with strong monofilament line rigged with treble hooks that are baited with shiners or minnows. These rigs tend to hook the fish in the lip or jaw.

Studies show that less than one percent of the northern pike caught and released while ice fishing with #4 treble hooks died within 48 hours; a third of the pike caught on Swedish hooks died within two days of their release. The kind of gear anglers choose to use will be important if minimum size limits are instituted statewide during the ice fishing season.

Habitat improvement

"Regulating water levels and protecting wetlands to improve spawning habitat is a task fisheries managers will have to carry out acre by acre and lake by lake," says Fisheries Director Lee T. Kernen. "Fisheries biologists working closely with power companies will monitor river conditions and determine whether water levels can remain stable during spawning without running the risk of flooding upstream communities."

Northern pike management provides one more factor in a growing list of reasons to protect shoreland wetlands.

What about stocking, you say?

Fisheries research is discovering more genetic and ecological consequences from supplemental stocking and introducing new fish species. The research questions how stocking

changes the population dynamics where fish have already formed a balanced population in lakes. Also, does stocking disrupt other species in the aquatic community? Research in neighboring Minnesota presents prime examples.

Thousands of foot-long and bigger northerns were stocked in Horseshoe Lake in Crow Wing County, Minnesota three times during the 1970s. The pike ate perch of all sizes. Bass and walleye had fewer perch for prey, so their numbers dropped. Bluegills filled in the void left by perch.

"The end result of this chain reaction was the near disappearance of yellow perch, smaller and fewer large-mouth bass and walleye, and a proliferation of stunted bluegill. By any measure the fishing deteriorated. Only the northern pike population benefitted — and it too declined only two years after stocking," according to a 1988 Minnesota DNR publication on northern pike management.

Even manipulating pike populations

by removing large quantities of hammer handle-sized pike appears fruitless. In a six-year Minnesota study starting in 1986, fisheries researchers removed 3,500 pike shorter than 24 inches from a shallow, weedy 350-acre lake during the pike's spawning run. The lake was then stocked with yellow perch to provide ample food for remaining pike. It didn't work. When the study ended in 1991 "the lake's fish size structure was the same as it had been," according to research biologist Tim Goeman.

"We found that small northern pike were so abundant in the lake that removing them didn't significantly reduce pike densities," he said. "Stocking perch didn't work either, because pike ate them as fast as they were stocked."

Goeman believes the experiment failed because in lakes with lots of small pike, 60 percent of the adult fish die from old age or disease, rather than from angling. Compared to that natural mortality, the fish removed by researchers didn't alter the population much.

Stocking does not appear to be as important a tool in restoring quality northern pike fishing.

Anglers make choices

As fisheries biologists continue to listen to anglers' needs and learn more about ecological interactions in fish communities, changes in the way northern pike are managed are evident. Adjusting regulations can improve pike fishing in the future. However, the more difficult steps of convincing anglers to release part of their catch and restore fish habitat will be critical to rebuilding populations of the people's choice — northern pike. □

David R. Lentz and Paul K. Cunningham are DNR fisheries biologists working on the northern pike planning team. David L. Sperling edits Wisconsin Natural Resources magazine.

P i n e k n o t s



STORY PHOTOS BY ROBERT QUEEN

Kurt Sroka

It was raining, a steady downpour thrumming against the roof of my tent, popping and splatting in the undergrowth surrounding my campsite. The rich, moist air smelled clean and green. Outside, the thirsty forest drank its fill while a red squirrel chattered at some real or imagined annoyance. Inside, I settled comfortably within my downy cocoon to read *The Singing Wilderness* and ponder the words of Sigurd F. Olson. That's how I discovered pine knots.

I read about their morphology, how they formed where branches left the tree trunk, bent the resin ducts and constricted the flow so surrounding wood

The campfire released the vivid colors and imagined tales trapped in old wood.



fibers become saturated with golden, aromatic fluids.

I marveled that natural history could be read in the knots. I was fascinated with a vision of the magic in burning a knot, its concentrated energy released at last. My imagination had been kindled. I knew that I had to find some.

The following morning blossomed sunny and blue, a perfect day to search for knots. Where to begin? I needed to find an ancient pine downed long ago by a forgotten storm. The tree I was seeking would be well rotted and buried beneath the duff, its presence revealed as a long, narrow ridge on the

forest floor.

I sipped my steaming coffee and gazed absently into the woods. Wet, glistening greens of the understory contrasted sharply with the soggy, silver-gray pine stumps: brooding, silent memorials to the forest and the lumberjacks who chopped them.

White pine stumps.

My mind yawned, stretched, then snapped to attention. I could search for pine knots right where I camped.

Breakfast finished, I struck out to begin the hunt.

I wish I could tell you the quest was long and arduous, the adventures glorious, the deeds brave and bold. The truth is, I found what I was looking for within sight of my tent.

The pine stump that drew my attention was weathered and gray just like its companions. Where the others were equal height and relatively flat from sawing, this stump was taller than the rest, its top splintered and ragged. A search below the underbrush revealed the long mound of earth I had been hoping to find.

As I gazed downward, I imagined that long-ago day when the force of a north-west gale became too much for the towering tree to bear. Weakened by disease, its branches laden with wet snow, the pine's pinnacle whipped and bucked in the wind. Its great trunk snapped and burst asunder. Slowly at first, the broken giant plummeted to earth, its long life ending in an explosion of shattered branches and spewed snow.

For years, the fallen conifer remained relatively sound despite inevitable invasions of carpenter ants and bark beetles. Generations of red squirrels used the pine regularly as a convenient runway.

Over time, the organisms of decay

performed their function. The wood fibers began to grow punky and break down. Early one morning, a black she-bear and her cubs tore at the rotting wood and were rewarded with a nutritious snack of beetles and grubs. The trunk remains were gradually buried beneath moss and fallen debris, leaving the long bump that lay before me on the forest floor.

Beneath the shallow duff, the tree was soft,

Digging knots

We know you're not the sort to start bulldozing the forest looking for pine knots. If you are going to search, get permission from landowners first, only look for a few knots, and be mindful that fragile flowers and fungi grow around rotting wood. Also stay alert as bees and small mammals nest in old, punky wood just underground.

spongy and the color of mahogany. My shovel clanked against something solid. Reaching into the pulpy, wet wood, I pulled out an object hard, black, 10 inches long and shaped like a winged carrot. I had just uncovered my first pine knot.

Then, I waited for nightfall. Evening crept over the forest calm, clear and cool. A sliver of moon hung low above the opposite lakeshore. I carefully arranged the tinder and sticks for the night's campfire, then placed the pine knot near the fire ring. The color drained from the sky. I struck a match and held it to the kindling.

The night deepened. Beyond the soft circle of firelight, small, nocturnal creatures rustled beneath the understory. The fire dwindled to a bed of red coals, like a shimmering cluster of polished rubies in the dark wall of a mineshaft.

It was time.

I placed the knot on the hot embers. At first it lay there, a shadow floating on a glowing pool of lava, then slowly, the resin-laced node came to life. Tiny blue tongues of fire licked the edges, receded, then appeared again. Now colorful flames darted across the knot's surface: blue, green, orange and yellow. The accumulated pitch within the knot boiled, bubbled to the surface, vaporized, and flames leapt.

A penetrating evergreen fragrance emanated from the knot weaving aromatic tales. Timber wolves howled in haunting harmony. An Anishinabe hunting party stalked silently along

the ancient game trail. Across the lake came the boisterous songs of voyageurs plying fur-laden canoes, red paddles flashing in the morning sun.

The wolf music faded. Lumberjacks, smelling of wet wool and sweat, mowed the pine forest. Wildfires devoured and raged. Weary farmers grubbed stumps, piled boulders, then watched their dreams die on nutrient-poor, thin soils.

At last, all of the energy and stories the pine had known were expended; the flames waned, flickered, and died. The wolves were silent. Ghosts of history vanished in the haze.

When I returned home, a small bag of pine knots and amassed history went with me. They are stored in a safe place, reserved for special occasions. When the night is still and filled with stars, and the owl calls from the forest, then I will place a pine knot on the crimson coals and call forth the ghosts and stories of the north. □

Writer Kurt Sroka lives in Somerset, Wis.



Will traders in the Board of Trade pits find a bull market for air emissions?

(inset) By cutting sulfur dioxide emissions to meet state acid rain controls, Wisconsin utilities are well positioned to make deals.

BULLISH on clean air

Trading pollution credits in the marketplace is touted as an economical way to clean up the air, but not everyone is sold on the idea.

Sandra J. Roethler

The Chicago Board of Trade — famous for moving pork belly, soy bean and wheat futures — is gearing up to auction a new kind of option: air pollution allowances. Brokerage firms in southeast Wisconsin, whose clients trade stocks, bonds and funds might also handle a new commodity — pollution offset credits. The push for cleaner air is exploring the

strengths of the marketplace to encourage businesses to restore the environment economically.

While some people are outraged by the idea that companies could speculate and pay for the “right to pollute,” there’s more to it than that. So, hold onto your futures contracts.

“We’re experimenting with new options because the costs of curtailing air pollution may be very expensive in

some situations,” says Don Theiler, director of DNR’s Bureau of Air Management. The Committee for Economic Development, a group of about 250 top U.S. business leaders, estimates the costs to implement the Clean Air Act at \$30 billion per year nationwide and the price tag will likely rise another \$20 billion to \$30 billion a year by the end of the decade. Keeping America economically competitive in the face of en-

Environmental regulations is challenging, but Congress' message in passing the Clean Air Act amendments was clear — clean air and a healthy work force are vital parts of a healthy economy.

How trading works

Emissions credits were designed to give businesses more flexibility in choosing economical methods of reaching clean air goals. The basic premise is that companies regulated by air laws can reduce their emissions and earn credits that can be traded or sold to other companies. Currently, the Clean Air Act allows trading of two commodities: sulfur dioxide "allowances" and "offsets" to reduce pollution in areas which are already highly polluted. Trades of other air pollutants are expected to follow.

Emission credits provide an environmental currency that can be readily traded in the business community, Theiler says.

How can free trade of credits benefit both environment and economy?

Trading provides flexibility — Companies are free to choose whatever pollution controls or methods meet their needs. The more efficient their system, the cleaner the air and the more credits they can bank.

The market sets the price — The value of credits will change as technology and ingenuity develop more economical ways to meet clean air goals.

Trading puts a dollar value on environmental improvement — Just as bottle deposits encourage some to see the value in recycling resources, emission credits create a fiscal reason to do right by the environment. The price tag on each ton of emissions gives companies a gauge to weigh their options for reducing air pollution.

Sulfur dioxide allowances

Sulfur dioxide, (SO₂) the acid-maker in acid rain, is mainly emitted by utilities that burn coal to make electricity. The Clean Air Act caps sulfur dioxide emissions at 8.9 million tons a year by January 1, 2000 — a 10-million-ton cut from 1980 levels. These cuts are being

phased-in in two steps from now until 1995 and then from 1995 to 2000.

Power utilities commonly use three methods to reduce SO₂ emissions: First they give customers incentives to reduce the demand for power. Second, they treat coal smoke with a scrubber. Third, they switch to low-sulfur coal or cleaner fuels like natural gas. Utilities that make the expensive investment in scrubbers know that the air will get substantially cleaner — cleaner even than is required.

By emitting less sulfur dioxide than their permits allow, these firms can earn allowances for each ton per year of pollution they curtail. These allowances can be sold in the marketplace to other firms. Two conditions must be met. First, each company's emissions will be monitored and measured to verify when emissions have been permanently reduced. Second, no business can merely buy allowances and emit so

much air pollution that public health is endangered. Companies cannot pollute more than is allowed by local restrictions, regardless of the number of allowances they buy.

What happens if a utility's emissions exceed the credits they hold? The Clean Air Act sets penalties of \$2000 per additional ton of sulfur dioxide emitted.

What's happening in the emissions marketplace?

The law gives utilities a variety of ways to reach the year 2000 goals. In the short term, utilities can buy or trade credits until research produces other options.

For example, Illinois Power bought 433,000 sulfur dioxide allowances paying about \$170 for each, according to Air Quality Week newsletter. This buys the utility several years of time to track how pollution controls become more

Keeping trail of each sale

How will the state keep track of offset and allowance trades to make sure air quality improves?

The Department of Natural Resources proposes to keep a list of companies interested in buying, selling or trading offset credits, but DNR air management staff don't propose to act as brokers. Once companies negotiate and the deals are sealed, the DNR staff would ensure that companies are buying and selling legitimate allowances and offsets. These credits would be transferred from the seller's to the buyer's air emission permits.

"We have no intention of controlling the price of credits," said DNR air management engineer Mark Harder. "We simply aim to minimize the transaction costs."

Milwaukee city officials are working with representatives from area communities and businesses to establish a regional air pollution credit "bank" to simplify credit trades and sales, according to Steven J. Hiniker, Milwaukee environmental policy coordinator.

The opportunity for new business is not going unnoticed by private industry. Brokerage companies may develop in unlikely places. For example, Harder said, electric utilities may want to become brokers to attract new electricity users. Local brokers may target small businesses, buying up a few credits from each to offer to a larger client.

Nationally, Enron Power Services, a gas company, has paired up with AER*X, a Washington D.C. emissions credit brokerage firm, to offer a unique service: innovative gas supply deals involving sulfur dioxide allowances, according to Air Quality Week. Mark Frevert, Enron vice president said, "by switching to gas, the companies would earn credits with market value. The utilities didn't know how to calculate the market value." Enron does that for them.

efficient and more economical in the next few years.

"Flexibility is important. It keeps utilities from getting locked into an existing technology or an existing way of controlling pollution," said Joseph Goffman, senior attorney with the Environmental Defense Fund in Washington D.C. "The flexibility allows much more innovation to take place."

Wisconsin power utilities are ideally situated to make the most of this flexibility. When our state acid rain law took effect in 1986, Wisconsin power companies began reducing sulfur dioxide emissions seven years before the Clean Air Act mandated similar controls nationwide. Now, the five major utility companies in Wisconsin will have a total of about 100,000 extra SO₂ allowances to sell or trade per year.

Why wouldn't utilities merely save the credits they earn? Right now, state utilities don't need them, others do, and

ing for the nationwide marketplace in air emissions to develop at the Chicago Board of Trade. Several Wisconsin utilities have brokered their own deals. WEPCo and Illinois Power have signed an unusual contract: they are selling allowances back and forth. WEPCo is selling credits to Illinois Power before 1995. Illinois Power then plans to build a scrubber and sell the credits back to WEPCo between 1995 and 2000.

Some environmental groups are concerned about nationwide trades in sulfur dioxide allowances. They believe preventing a ton of sulfur dioxide emissions in one part of the country may be more important than curtailing emissions in regions without acid rain problems. In particular, environmentalists don't want Wisconsin companies to sell credits to Illinois, Indiana and Ohio whose sulfur dioxide emissions might drift back to Wisconsin as acid rain. That could negate the SO₂ reductions

like baseball cards," said Bock.

Some argue this view is shortsighted. "No matter how much trading occurs, sulfur dioxide emissions will still be cut by 10 million tons," said Joseph Goffman with the Environmental Defense Fund.

"Trading will account for a minuscule part of the overall 10-million ton reduction nationwide," said DNR air chief Theiler. "Eventually, every utility will have to do something different to reduce emissions, whether they scrub, fuel switch or use credits," Theiler added. "Trading just allows a few years of time to explore new technology."

Allowance trading has been praised by private industry in the trade press as being "an unparalleled environmental success story," and "a grand success." Goffman said the sulfur dioxide cuts are "tougher than just about anything in environmental law" and called the trading "ground breaking and dramatically successful."

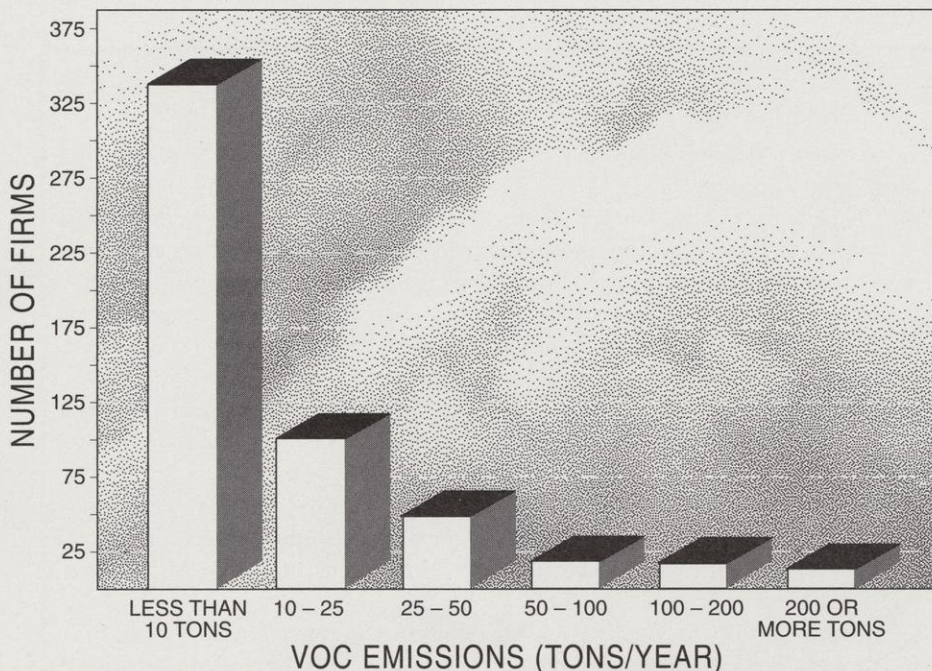
The biggest benefits are that prices are dropping for control technologies and utilities are reducing emissions — which means cleaner air sooner than later. "The cost to control emissions is much lower than anticipated," said Theiler. "We believe the utilities are finding more cost-effective ways to reduce emissions than buying allowances."

Trading offsets to reduce ozone

A separate marketplace is developing to sell or trade offset credits in highly polluted regions.

In eleven counties in southeastern Wisconsin, emissions of volatile organic compounds (VOCs) and nitrogen oxides (NO_x) are sufficiently concentrated to create ozone pollution on hot, sunny days. VOCs are emitted as fumes from fuels, paints, varnishes, cleaners, thinners and other products. NO_x are emitted in car exhaust and other engines.

To reduce these pollutants while accommodating new businesses or business expansions, the Clean Air Act requires an offset system. A company earns a credit for each ton of emissions



Offsets to reduce regional air pollution used to apply to the few firms that emitted more than 100 tons of VOCs annually. Now, southeastern Wisconsin businesses will have to reduce emissions before new enterprises like printers, parts coaters, paint shops and dry cleaners that emit 25 tons of VOCs can open or expand in the region.

the price is right to sell. As a Wisconsin Electric Power Company (WEPCo) brochure explains, "Simply banking the allowance would be like burying your money under a tree in the back yard and ignoring the facts that you could invest that money and earn a return."

The Wisconsin utilities are not wait-

state utilities have made in the last seven years.

State Rep. Peter Bock (D-Milwaukee) has proposed legislation to limit sulfur dioxide credit trading by requiring an environmental impact statement and state approval for each trade. "Our clean air should not be bought and sold



TOM ROUSHAR

Environmental controls and techniques to prevent pollution are significantly reducing air contaminants from traditional "smokestack industries" like this foundry in Green County.

it permanently reduces. New businesses can get air pollution permits only if they can find a business willing to reduce its emissions. The catch? Every one ton of added emissions must be offset by an even larger reduction in the same region.

The task for overseeing sales and trades of offset credits will fall to DNR air management professionals. They will track that offset credits bought and sold are legitimate and that air quality improves as a consequence of the transaction. Credits and sales will be tracked and recorded as part of both the buyer's and the seller's air quality permits.

Small companies that want to expand must now seek offsets

The concept of capping and offsetting air pollution in a region is not new. The few new large businesses which located in southeastern Wisconsin and emitted more than 100 tons of air pollutants in a year have been required to offset VOC emissions since 1977. The

new feature under the Clean Air Act amendments is that smaller new companies (emitting as few as 25 tons of pollutants per year) will have to meet the same requirements. So now several hundred businesses like printers, dry cleaners, parts coaters and paint shops will have to learn the offset bartering/trading system as they plan expansions and increase production.

The southeastern Wisconsin communities where air pollution reaches unhealthy levels are especially concerned that new enterprises or expanding small firms will pursue their business future elsewhere. Environmental groups, such as Citizens for a Better Environment are sympathetic. They don't oppose economic growth, but they want assurances that air quality won't suffer as a consequence of creating new business opportunities.

Making breathing room for businesses to grow or reorganize is a real concern for any region, but there are few cases we can document where environmental restrictions in the ozone

nonattainment area contributed to business decisions to relocate to another county.

Who owns credits if businesses close?

A controversial policy issue revolves around credits created when a company shuts down a plant. Should these companies retain the right to sell emission credits from their factory? Are emission credits one of the company's assets if the plant closes?

Some believe that answering "yes" to these questions hurts workers by providing company management with one more reason to cease operations. "The core of our concern is that we do not want to create *any* incentive for a firm to close a facility," wrote David Newby, Secretary-Treasurer of the Wisconsin State AFL-CIO in a letter to the Department of Natural Resources.

The companies themselves want to sell their offset credits to settle outstanding debt. "Closing a small business like



How less waste pays dividends

As long as companies must cut their emissions to meet Clean Air Act requirements, some firms are going even further and will make money in the process.

Companies commonly meet stricter pollution limits by treating their wastes or by preventing pollution. Treatment removes emissions after they are created by using technological controls such as scrubbers. Pollution prevention creates fewer emissions in the first place.

By using less hazardous, less volatile chemicals; by re-using chemicals; or by developing a nonchemical substitute, manufacturers can lower production costs. They will consequently lower disposal costs and potentially earn offset credits they can sell.

Spic and Span, Inc., a commercial dry cleaner, did just that by installing equipment that could clean clothes effectively using a solvent that emitted fewer volatile organic compounds (VOCs). The company offset part of the cost of its \$700,000 system by selling offset credits as its pollution levels reduced.

In September 1993, the Natural Resources Board honored Spic and Span with the Prevention/Environment/Prosperity (PEP) Award for its success in reducing VOCs beyond permitted levels and for the firm's willingness to share its technological improvement with other businesses.

The October 1993 award recognized Northern Precision Casting of Lake Geneva for substituting a citrus-based cleaner for solvents thereby cutting emissions by 18,000 pounds per year.

ours is a devastating experience," argued Eugene Hintz, president of the now shutdown MASCO Corporation. "In our case, there was no motivation to 'abandon' Wisconsin. We are struggling to ensure that all of our creditors are paid off and that all continuing obligations toward our former employees are met. Confiscating these credits would be a spiteful last kick at the cat."

This issue will be resolved soon. A committee of about 40 members from the DNR, development companies, environmental groups, local governments, industries, the AFL-CIO, and the Department of Development meet about once a month to discuss the various business issues posed by new air regulations. Draft administrative rules on offsets are due in December.

Businesses and utilities nationally are anxious to see how the market forces will play out. They are equally curious whether the concept of trading air emission credits will create new business opportunities for the companies that curtail air pollution and a new future in brokering air pollution credits as a marketable commodity. □

Sandra J. Roethler oversees a program to assist small businesses that must meet air pollution regulations. She works for DNR's Bureau of Air Management in Madison.

Industries, environmentalists, utilities and government officials hammer out a vision of the marketplace for trading pollution rights.



DAVID L. SPERLING



ROBERT QUEEN

Ed Stouffer significantly cut metal wastes from his welding shop in Iron River.

An ounce of prevention...

Companies show how preventing pollution keeps them clean, green and in the black.

Lauranne J. Bailey and Donna J. Knauf

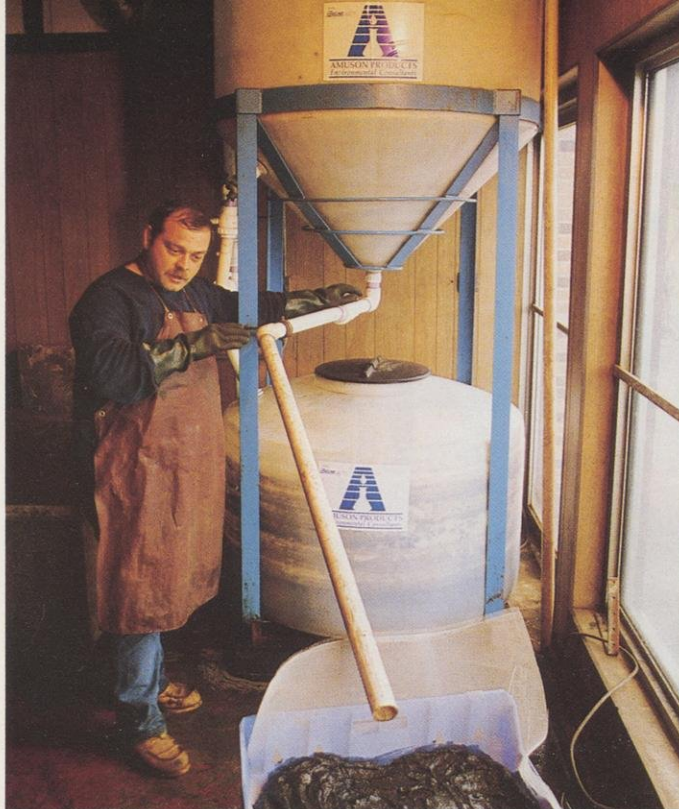
Cars, trucks, appliances and newspapers — goods we consider indispensable that come with wastes we consider unavoidable.

We accept the fact that each product creates a side stream of wastes in its manufacture, use and disposal. New cars create metal wastes and paint residues. Autos need tune-ups, gaskets, fluids and fuels. If we're lucky enough to keep them whole for 10 years, our cars will be ripped apart by salvagers to separate fluff from useable stuff.

We accept that, just as we know that many of these wastes end up in a smokestack, out a drain-

pipe or buried in a landfill. Yawn. Life goes on.

Well, maybe not. Today, businesses of all sizes are taking a fresh, hard look at their wastes. Disposal costs are rising, the long-term liabilities of producing hazardous wastes are risky, and the public is getting an attitude about firms that create toxic wastes in their hometowns. To stay ahead of the waste gambit, businesses are developing ways to prevent pollution by reducing and preventing waste at its source. These same companies are proving that a green attitude can save money and resources in the marketplace.



ROBERT QUEEN

Stouffer precipitates welding residues and metal sludges washed from old radiators. Clean water is decanted off and the pasty mix is dried to a powdery residue that is compact and valuable to a recycler.

Green rewards from this award

The Clean Bay Backers aren't the burly, tough guys who kick and pass a pigskin around a field. They are the tough companies with the foresight to clean up their wastes and protect the waters that flow into lower Green Bay.

This year's winner was Astro Industries, Inc., Green Bay. The company plates chrome on items as small as half-inch screws and as large as commercial paper machine rollers.

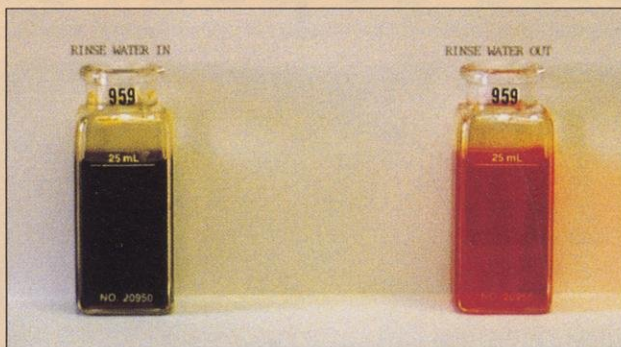
Astro took the initiative to recover leftover chrome from its plating processes. Previously, used chrome solutions were considered a waste. The company bought equipment that captures leftover chrome and continuously reuses treated, clarified rinse water.

"By extracting and recycling the chrome, we stay ahead of our competitors, continue to improve environmental conditions and save money," notes Peter Lemke, chemistry and hazardous materials manager.

An up-front investment of about \$500,000 dollars has saved money formerly spent testing wastes, buying pre-treatment chemicals, purchasing raw material and paying for hazardous waste disposal. In the first six months of 1993, the company produced less than a cubic yard of

hazardous waste and has cut the need to treat wastewater by 90 percent. The waste volume shrunk sufficiently that the firm is now considered a small quantity hazardous waste generator and is subject to fewer environmental mandates.

Lemke says, "Any type of shop that plates or finishes metal parts could use this system to recover single types of metals. Currently, we're working on getting a 100 percent, closed loop plant," one that produces no wastes from its manufacturing processes.



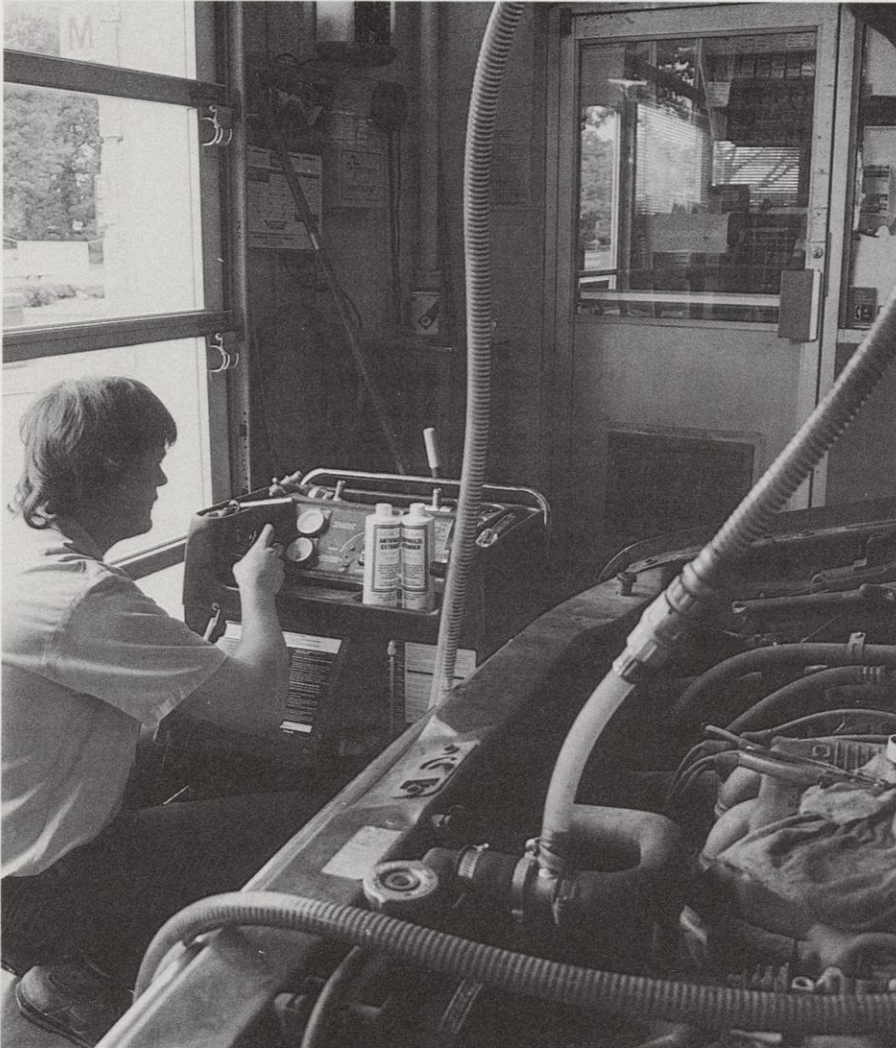
Astro Industries, Inc. of Green Bay now recovers 90 percent of the chromium from its metal plating solutions.

ASTRO INDUSTRIES, INC.

Astro Industries was also honored with the 1993 Governor's Award for Excellence in Hazardous Waste Minimization for the firm's innovative programs. The Clean Bay Backer runner-up, Krueger International, a metal office furniture manufacturer, in Green Bay perfected a system to reduce nickel wastes discharged in wastewater.

The Clean Bay Backer is awarded annually in January by a committee advising restoration plans to stem the flow of toxic materials into Green Bay. Nominations are sought between October and December each year. Contact Dreux Watermolen, Wisconsin Department of Natural Resources, Lake Michigan District, P.O. Box 10448, Green Bay, WI 54307.

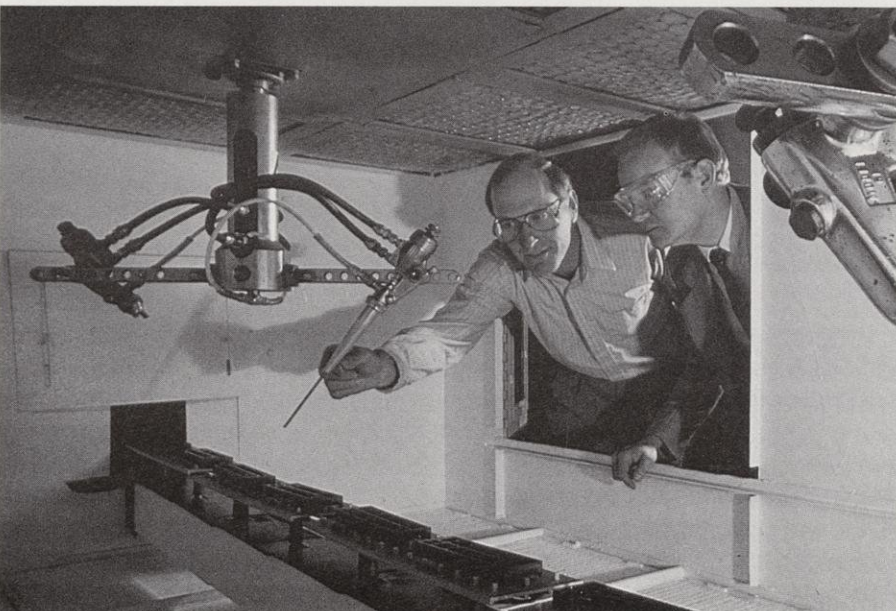
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ROBERT QUEEN

(above) Taking antifreeze out for a spin. Parkwood Mobil Service Center in Madison removes old antifreeze, filters it, cleans it, rejuvenates it with additives and returns coolant good as new to your car.

(below) Wayne Pferdehirt consults with Ralph Swanson of Phillips Plastic on ways to minimize pollutants. The free consulting service from the Solid and Hazardous Waste Education Center offers any size business a review where wastes and costs can be trimmed.



BRUCE FRITZ, COURTESY OF UW-MADISON COLLEGE OF ENGINEERING

A green solution to flush and fill

Consider one common chore: flushing your car's radiator. Most auto manufacturers recommend changing antifreeze every two years. Pull out your calculator. Wisconsinites own nearly 2.5 million cars (excluding trucks, buses, RVs and the like.) Since some car owners are lax about following manufacturer's guidelines, let's estimate that a third of us have our car radiators flushed each year. This adds up to nearly 1.7 million gallons of used antifreeze, enough to fill 15 athletic club-sized swimming pools.

Where does the waste antifreeze go? If it's changed by a service station, the spent solution could be shipped for treatment or disposal. It might be pre-treated with chemicals and expediently drained into the sewerage system. These options manage the waste, but don't prevent it.

Several small businesses are taking pollution prevention a step further. Ed Stouffer, owner of Ed's Welding and Auto Repair in Iron River, started a program to reduce waste before it left his shop. Part of his work includes flushing and cleaning radiators. Used radiator fluid contains metals such as lead, zinc and copper — all considered hazardous to the environment in large amounts.

During his first year of business, Stouffer flushed spent antifreeze into his private septic system, a practice which could contaminate groundwater. Stouffer was concerned about the environmental consequences of his habits, and he wanted to stay ahead of regulatory burdens.

Two years ago, he installed a \$10,000 "closed loop" recycling system. It treats and separates all the waste into usable products. Metal residues are precipitated from the antifreeze solution. Remaining water is decanted and pumped into tanks for reuse in cleaning and flushing other radiators.

Heavy metals trapped in the filters are the consistency of toothpaste. This pasty mix of metals is dried again into a powdery residue that has enough metal to make it valuable to a recycler,

Stouffer said. When the first barrel is full, it will be collected by a firm that recycles lead and tin solders.

If he did not thoroughly dry the sludge, Stouffer estimates the business would produce five 55-gallon drums of hazardous waste a year. That would raise his disposal costs by \$3,500 annually.

"I'm reducing and reusing while someone else is recycling what's left over," Stouffer says, "It's the right thing to do."

It's also economical. His initial \$10,000 investment should pay for itself in three years.

Consider the source

John Morris, the DNR hazardous waste specialist who worked with Ed Stouffer, likes working with companies to prevent wastes, cut their environmental liabilities and keep Wisconsin firms more competitive in their markets.

Beyond his regulatory duties, Morris

and other DNR inspectors meet with businesses to provide on-site assistance, share case studies of businesses that have resolved similar problems, distribute pollution prevention guides prepared by the Environmental Protection Agency and provide contacts with other environmental expertise.

When the State Legislature created the Pollution Prevention Act in 1989, lawmakers funded a service at the University of Wisconsin-Extension to offer businesses free consultation with trained pollution prevention specialists. The specialists visit the business, review operations and suggest practices that could reduce waste streams.

Wayne Pferdehirt, Madison, one of three pollution prevention specialists with UW-Extension's Solid and Hazardous Waste Education Center (SHWEC), has worked with a variety of businesses. Most recently, Pferdehirt developed options to cut costly waste practices for the printing industry — one of the state's dominant trades.

Printing operations emit volatile or-

ganic compounds (VOCs) as inks and coatings dry. Solvents are also used to clean presses and other equipment.

"We emphasized switching to water-based inks and non-alcohol fountain solutions on the presses to drastically cut VOCs," explained Pferdehirt. "In other cases, solvents were used to clean machinery and the company ended up with solvent-soaked rags, which often ended up in the garbage."

As an alternative, Pferdehirt suggests simple centrifuges which work like the spin cycle on a washing machine to extract solvents from rags. These chemicals can be reused in-house and the rags can be sent to a professional cleaner.

Pferdehirt also recommends simple housekeeping measures that can substantially cut chemical usage and prevent pollution. For example, one company uses squirt bottles to lightly dampen rags with solvents rather than soak the cleaning rags before use. By applying solvents sparingly, employees discovered they could still clean

Farnam Sealing Systems uses water and dryers to spray a fine teflon coating on its gaskets. Water replaced a toxic solvent in the manufacturing process and will reduce air pollution from this plant by two-thirds. The process might help other companies develop solvent-free coatings.



ROBERT QUEEN

the presses while exposing themselves to fewer solvent fumes.

Another printing company purchased a low-cost (less than \$100) computer software program to develop custom ink recipes. The company was able to reuse mixtures of leftover inks that might otherwise have been disposed of as hazardous waste.

Solving a sticky situation

Farnam Sealing Systems of Necedah, a division of Coltec Industries, was looking for a nonhazardous way to give gaskets more slip. The company was using a solvent, methylene chloride, to apply a Teflon coating that kept gaskets they produced from sticking together. Although methylene chloride dries quickly, its vapors are toxic. Company officials were also concerned about higher costs to meet environmental waste and air pollution laws. Janet Ganther, a process engineer, and others at Farnam worked with their suppliers to develop a less toxic, but equally effective coating for the company's gasket line.

Farnam now applies water-based Teflon coatings and runs the gaskets through drying ovens. Barry Brodt, environmental engineer, projects that the new process will reduce air emissions from the facility by two-thirds by the end of 1994.

"So far, 25 major customers have tested and accepted the gaskets produced with the new coatings," Brodt says. The process may have many other applications when coatings are applied to release rubber or plastic parts from their original molds.

Farnam Vice President Al Gumz estimates that the \$50,000 investment in capital equipment will pay for itself in four years.

"We always look to try and improve the environment. Even without the cost savings, we would have undertaken this venture," Gumz asserts.

Sharing successes

What works for one business may work for another, as long as patent rights are protected. "Here at the De-

LIMELIGHT

To inspire creative solutions and encourage businesses to share those innovations with their peers, the Department of Natural Resources sponsors a monthly award. It's called PEP, for Prevention/Environment/Prosperity.

Honorees are firms that successfully practice what green lifestyles preach: that the bottom line and the green line walk hand in hand, not toe to toe. PEP winners are chosen by Secretary Meyer and are recognized at monthly meetings of the Natural Resources Board.

Winners also help prepare case studies to share their practical tips for cutting pollution and costs with other businesses and communities.

Another award, the John Brogan Environmental Achievement Award annually recognizes an outstanding organization, firm or municipality for exceptional environmental accomplishments. Candidates include companies that effectively minimize or eliminate pollution; nonprofit organizations and communities that provide leadership in resolving environmental issues. The award is presented each May at the Natural Resources Board meeting.

For information on other DNR programs that recognize pollution prevention, call (608) 267-9700 or (608) 267-7568.

Two awards from the governor honor business achievements in pollution prevention: the Governor's Award for Excellence in Hazardous Waste Minimization (Contact Timothy Lawless, Department of Development, (608) 266-3208) and the Governor's (Solid) Waste Reduction and Recycling Award (Contact Pam Cucunato, Bureau of Information and Education, Department of Natural Resources, (608) 264-9258).

partment of Natural Resources, we're committed to technology transfer, to developing exemplary case studies and passing the information along to other industries that can benefit," says Ken Wiesner, director of the Office of Pollution Prevention.

During his two-plus years as director, Wiesner has detected a considerable change in the business climate. Companies used to install pollution controls that would just meet environmental requirements, he said. The pollution prevention practices they are starting today take them much further.

"As one business sees competitors increasing profits by reducing or eliminating wastes, these innovations become viable options," Wiesner says. "Lower costs from smaller permit fees, savings from waste recycling, smaller waste volume, as well as a healthier working environment can easily outweigh the up-front capital costs of equipment.

"Many of these technologies and processes to reduce pollution can be applied almost everywhere in Wisconsin," Wiesner adds. "Most communi-

ties are home to small machine shops, printers and auto service stations. Our biggest challenge in the next few years will be to spread the word on pollution prevention methods to the thousands of Wisconsin businesses that may unnecessarily create waste."

Wiesner credits DNR Secretary George E. Meyer as the driving force behind these changes. "A Toxics Reduction Initiative was one of his top five priorities after his appointment as Secretary," Wiesner says. "Secretary Meyer believes we can't afford to continue spending money cleaning up toxic spills and improper hazardous waste disposal. We have to stop the pollution before it starts. Introducing clean technologies can only lead to a cleaner environment, healthier workers and a stronger economy for Wisconsin." □

Lauranne J. Bailey edits publications for DNR's Office of Pollution Prevention and is a Hazardous Waste Minimization Specialist for DNR's Bureau of Solid Waste Management. Donna J. Knauf is a planning analyst with DNR's Bureau of Water Resources Management.

A thousand miles on a ribbon of ice

The work of piecing together the Ice Age Trail continues.

Barbara Timmel

In the 1950s, Milwaukeean Ray Zillmer dreamed of a parkway to protect and link portions of Wisconsin's glacial landscape. Attorney Zillmer was an avid outdoorsman, and he envisioned a continuous footpath that would take hikers step by step along the winding edges of Wisconsin countryside where the great glaciers advanced and then retreated. Cutting through fields, forests and towns, hikers could follow this unique trail that

to begin building a trail on public lands that skirted examples of these geologic features in the Kettle Moraine State Forest.

Today, approximately 475 miles of the 1,000-mile Ice Age Trail is open for public enjoyment.

"Completing the first half was relatively easy," said Bill Moorman, state trails coordinator for DNR's Bureau of Parks and Recreation in Madison. "A lot of the finished trail is on public land in parks and forests managed by the state, counties and the federal government," he added. Securing rights for public travel on the remaining 500 or so miles will be more challenging because the majority is on privately-owned land, Moorman said. "Now we're in the business of trying to buy the remaining lands from willing sellers."

When completed, the winding Ice Age Trail will stretch from Potawatomi State Park on Green Bay to the dalles of the St. Croix River at Interstate Park on the Minnesota/Wisconsin border.

Through the combined perseverance of Zillmer's Ice Age Park and Trail Foundation (started in 1958) and former Wisconsin Congressman Henry S. Reuss, Congress recognized the value of preserving the geological features that glaciers left in Wisconsin. In 1971, the Ice Age National Scientific Reserve was created as an "affiliate area" of the National Park System. This designation provided the funds to buy



GARY WERNER

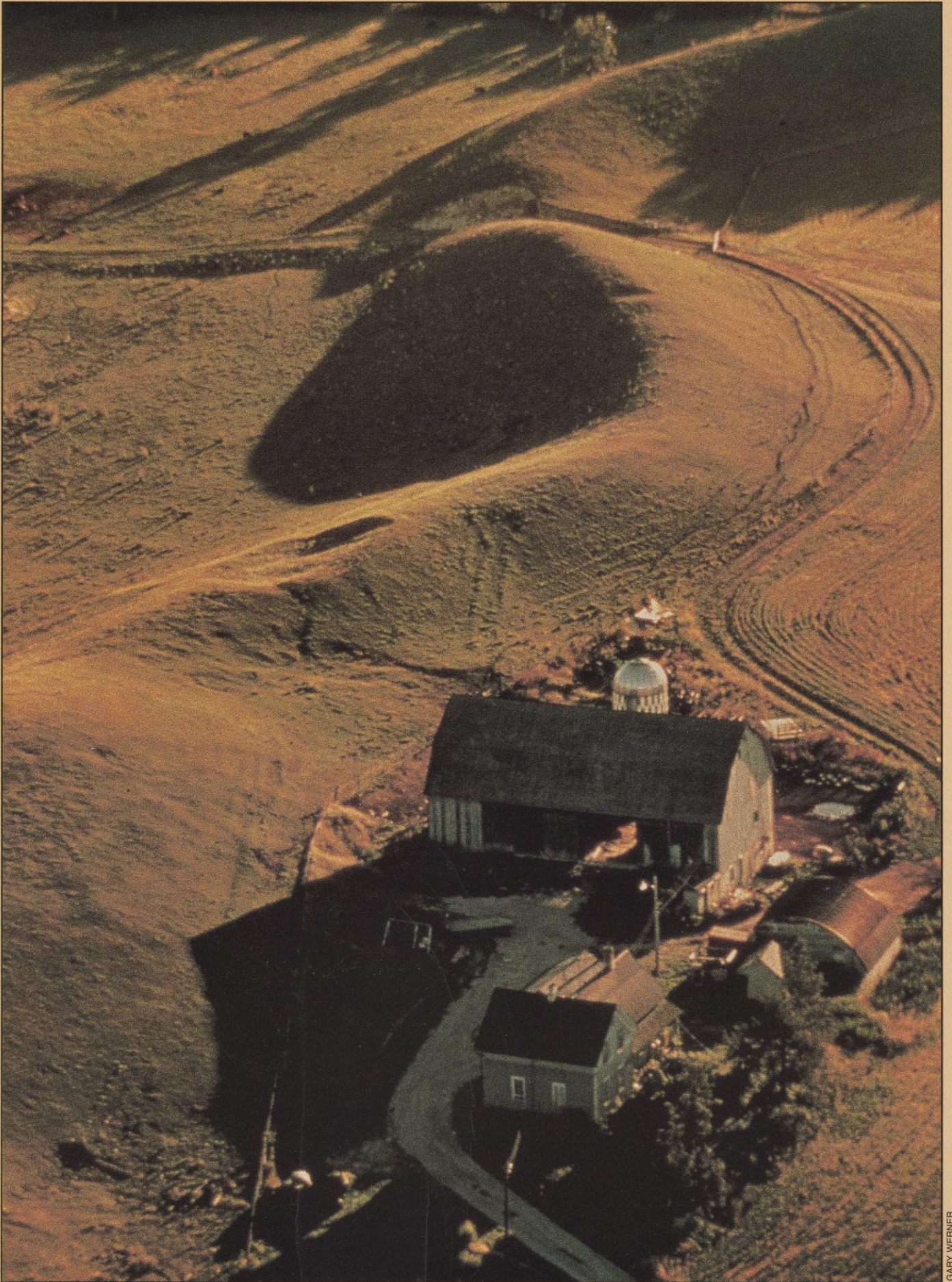
Hiking the Chippewa Moraine portion of the Ice Age Trail.

(right) An esker on a private farmstead just west of the Northern Unit of the Kettle Moraine State Forest.

no road journeyed.

Here, on a 1,000-mile course, six massive lobes of glacial ice had pushed earth, pulverized rock and then melted, leaving a pocked landscape of serpentine ridges, conical kames, pothole lakes, rounded hills and rocky rubble.

Zillmer was at home tramping the woods of southeastern Wisconsin. His vision and enthusiasm inspired others



GARY WERNER





GARY WERNER

(above) The look and feel of the trails changes with each season. This is the Harrison Hills area in Lincoln County.

(below) The Ice Age is one of the eight trails in the nation whose scenery, vistas and unique geologic formations form a corridor that will be protected for public use.

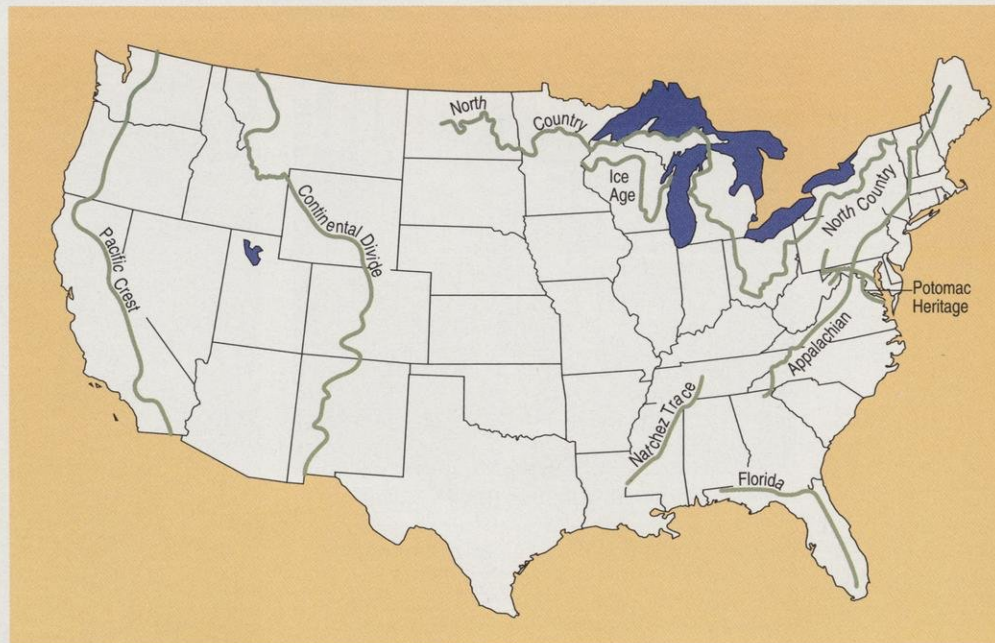
and maintain nine national scientific units along the trail that preserve outstanding glacial features. In establishing these reserves, Congress challenged the citizens of Wisconsin to complete the trail that would connect these special places.

"The trail provides the necklace that links these pearls together," Moorman explained.

Then in 1980, Congress saw the value in preserving the whole trail for all Americans by designating the Ice Age as one of the nation's eight Scenic Trails. Overall administration was assigned to the Department of Interior's National Park Service.

The Park Service, the Ice Age Park and Trail Foundation and the Wisconsin Department of Natural Resources cooperatively work to build and manage a trail system. County and city managers also tend public portions of the

(left) The Parnell esker path in the Kettle Moraine State Forest. Most of the trail running through public lands is complete. Linking parcels to allow public travel along private property is the challenge ahead.



trail. Cooperative easements and purchases will fill out trail segments on private land holdings.

Pamela Schuler, with the National Park Service in Madison, explains how government works with private landowners to link the trail segments.

"First, we identify the glacial edge and the significant features we want to preserve. Once a corridor about a half-mile wide has been identified, everyone living within that corridor is invited to come to a series of meetings," Schuler said. The Park Service describes the pro-



TIM MALZHAN

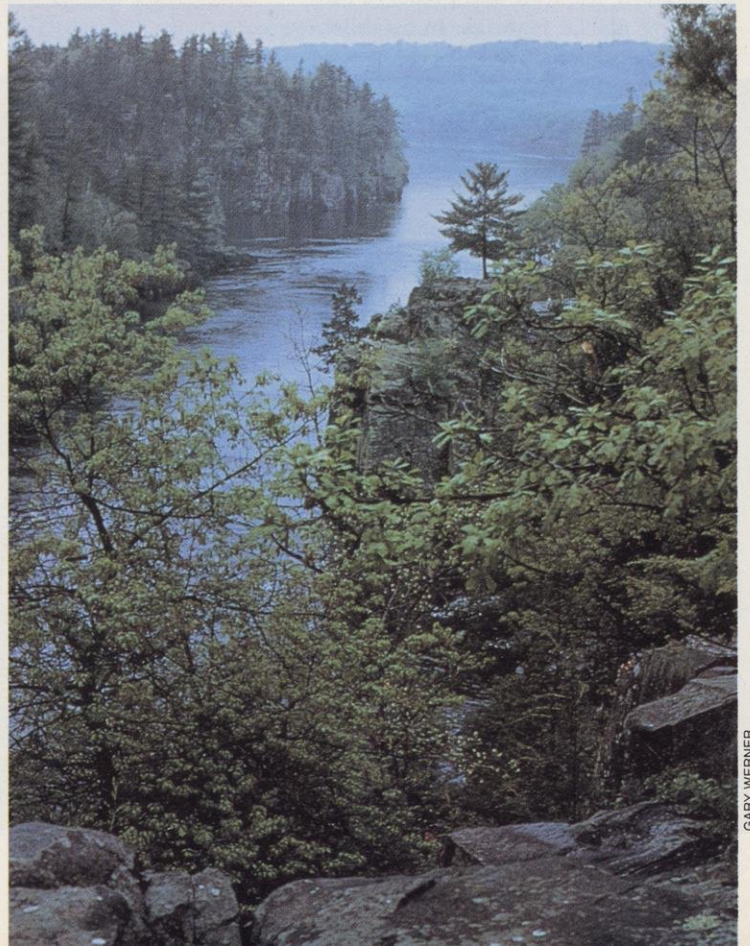


GARY WERNER

(top) Fall along the trail in the Blue Hills area of Rusk County.

(bottom left) Some portions of the route have signs, other are merely marked with yellow blazes on trees.

(bottom right) The dalles on the St. Croix River where the Ice Age Trail ends dramatically where a glacial lake cut gorges through glacial basalt rock.



GARY WERNER

On the trail

Sit back in your easy chair, slide on your favorite slippers and take a couch potato tour of the Ice Age Trail from east to west.

Naturally, we'll start with a climb. The trail heads at a 75-foot observation tower in Potawatomi State Park in Door County. The commanding view of the glacially-sculpted Green Bay and rocky coast sets the stage for the journey to come.

Once you leave the park, the next developed segment is the 15-mile Ahnapee State Trail that travels the old railroad grade along the Ahnapee River.

Another gap brings you near Two Creeks Buried Forest, one of the scientific reserves along the route. In this 25-acre parcel near Two Rivers, a boreal forest of pine, spruce and hemlock was leveled by the glaciers, leaving massive stumps. Exhibits and interpretive signs haven't been developed yet.

The trail continues south across the Northern Unit of the Kettle Moraine State Forest past eskers, kames and kettle ponds, south to a small segment west of West Bend then through Pike Lake State Park and along private lands to Holy Hill, a beautiful kame with a panoramic view.

In the Southern Unit of the Kettle Moraine State Forest, a 28½-mile segment traverses forests, wetlands, prairies and hillsides with beautiful vistas. On to Janesville, the route heads west toward the Sugar River Trail through the rocky hills and swales of Rock County before heading north again. It skirts Madison's west side and heads north through the beautiful state parks of Devils Lake, Mirror

Lake, Rocky Arbor, Roche a Cri, Hartman Creek. On through county forests of Langlade County the trail swings west through Lincoln and Taylor counties.

The Chippewa Moraine Scientific Reserve east of New Auburn houses a beautiful interpretive center and hosts a colorful 23-mile segment that passes more than 20 glacial

lakes, kames and eskers. The trail journeys through the Blue Hills of the Rusk County forests, to the Tuscobia State Trail, on through Barron and Polk counties. A final gap ends at Interstate Park where the glacial Lake Duluth cut steep-sided gorges through basalt rock to form the dalles on the St. Croix River.

"When the trail is completed, it's going to have a patchwork quilt of uses and ownership," Moorman said. "It will also provide a variety of vistas and experiences for hikers, bikers, skiers and other recreationists as it traverses city parks, fields, forests and wilder areas of the national forests."

"It's the scenery that sells the trail. Our first priority is to make the route really pleasant to walk," Moorman

said. A hiker on the Ice Age Trail may choose to travel through spruce bogs, tamaracks, marshes, remnant prairies, oak-hickory forests or expanses of boreal firs. The diversity of plants and animals along the way is equally eye-opening. You might see loons, wild turkeys, Canada geese, snow geese, sandhill cranes, red and grey foxes, badgers, ruffed grouse and a host of songbirds including eastern bluebirds, scarlet tanagers, northern orioles and indigo buntings.



Solid segments show completed trail segments; dotted lines show the eventual route if private landowners and communities can be convinced to form a continuous 1,000-mile hiking trail along the edge of glaciers' final reach.



TIM MALZEHAN

A rest shelter along the trail in Waupaca County. By and large, national trails are kept primitive. Hikers look for food, amenities and shelter in communities that adjoin the trail.

cess that's been used nationwide to establish scenic trails. Then landowners talk with members of the Ice Age Park and Trail Foundation.

"They are the true worker bees in building this trail," Moorman notes. The foundation purchases lands for the trail and arranges development and maintenance.

Before the end of the meetings, the foundation will meet with nearly every landowner within the proposed corridor to learn who is interested in selling parcels, who would grant easements and who is not interested.

The public review process takes about 10 months in each county, Schuler said. After meetings are completed, the foundation approaches willing sellers to buy the 200- to 300-foot-wide corridor needed for the trail. In places where people don't want to sell their land, the trail may bypass onto a roadway for a few miles, Schuler said.

"Some people think because the Park Service puts this proposed corridor on a map that someone is going to come in and condemn their land," Schuler said. "The corridor is a planning tool, a zone of opportunity within which we would make purchases. We only approach people to find out who is interested in selling part of their land. The whole trail is a grassroots effort. If we were to condemn land to form the trail, that would kill the whole process," Schuler said.

In addition to managing trail segments that cross state lands, the Department of Natural Resources administers the state Stewardship Program, which provides the foundation up to \$500,000 annually to purchase lands for the Ice Age Trail. The foundation holds events like the annual Hike-a-thon each October to raise matching funds needed to qualify for state aid.

Local businesses provide trail services

During the planning process, surrounding communities consider business opportunities that such recreational trails bring. The national trails themselves are not developed to provide the amenities most people seek on their vacation. An important part of a relaxing vacation includes finding rest areas, drinking water, bathrooms, campgrounds, fancier lodging, parking lots, restaurants, grocery stores, and interesting places to take side trips. Many different members of a community, in addition to land owners along the proposed trail, have a stake in determining the recreational route.

The actual corridor has not been identified statewide, Schuler said. Segments have been identified and approved in Dane, Waukesha and Washington counties.

"We've just started identifying the corridor in Waupaca and Portage coun-

ties, then we're going to start in Marathon County," Schuler said.

Once the route is approved it can take years to develop a segment. The National Park Service certifies that each segment is usable, and will be maintained as a permanent trail by a caretaker. Only then will the trail be marked with the distinctive logos that designate the route of a national trail.

Recent acquisitions to the Ice Age Trail include two prime tracts in Dane County, according to Nancy Sandstrom, executive director of the Ice Age Park and Trail Foundation. The two tracts total 111 acres and add 1.5 miles to the protected trail corridor, Sandstrom said.

One of the additions is a 73-acre parcel that includes both sides and the floor of a steep-walled valley at the edge of the Driftless Area about two miles west of Cross Plains and 1½ miles north of Festge County Park. The trail will wander through an oak and hickory woods, a small prairie on a steep slope and a scenic farmstead.

The other is a 38-acre parcel in the Town of Roxbury which completes the protection of an open ridge whose crest gives hikers a dramatic view of the Wisconsin River valley all the way to the Baraboo Hills, Sandstrom said.

The foundation is currently emphasizing purchases that maintain an open corridor through some of the most populated counties. Those lands will be equally valuable to animals that use the trail for homes and travel routes in developing areas Sandstrom said. She added, "It will also provide needed space for relaxation and recreation people can access close to their homes."

Sandstrom stressed that the foundation is not anti-development. In fact, "development can co-exist [and increase in value] as the proposed recreational trail passes through urban areas. The Ice Age Trail fills a niche for a continuous, permanent green space in Wisconsin," Sandstrom said — Another good reason to connect the remaining links of Wisconsin's icy footpath. □

Barbara Timmel is a free-lance writer from Oconomowoc who also works for DNR's Lakes Management program in Madison.

1993 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.

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Readers Write

DECEMBER READERS WRITE

Editor's note:

The ol' mailbox has been pretty empty lately. I can't remember the last time we received too few letters to put together a page. We sure like to hear your reactions to our stories, field your questions and share your letters with other readers. Write us at Wisconsin Natural Resources magazine, P.O. Box 7921, Madison, WI 53707.

We have received several entries for our proposed story about unusual visitors to your bird and animal feeders. As long as we have the room, here are the ground rules again:

We enjoy your letters describing the mammals, birds and other creatures that stop by your homes for a visit. Some of you keep a loaded camera by your window just in case something unusual drops by for a nibble.

We'd like you to share those photos with us. We'll select the best entries submitted by January 31, 1994 and share them with all our readers in the June 1994 issue.

1. Color slides, color prints, and black and white photos are all welcome.
2. Only send photos that are in clear focus and are well lit. Try to capture photos showing the front of the animal including the faces and eyes of mammals, birds, insects, reptiles and amphibians.
3. We're most interested in photos of unusual visitors to your yards and feeders. To give you an idea, so far readers have sent us photos of ermine, deer, pileated woodpeckers, turkeys and bears eating from bird feeders.
4. Enclose a self-addressed stamped envelope if you would like your photos returned. All photos selected for this article will be returned by March 31, 1994.
5. Identify the animal you've photographed. Feel free to write a paragraph or so describing how and when the photo was taken.
6. Mail photos and narratives to Readers' Feeders Photos, Wisconsin Natural Resources magazine, P.O. Box 7921, Madison, WI 53707.



BARBARA MULVANEY

Buddying up to buntings

It's challenging to get close enough to snow buntings to take a photo because they are skittish. Photographer Edward Prins of Racine offer these tips for attracting snow buntings.



EDWARD PRINS

A mix of finely ground corn and millet holds the skittish snow buntings long enough to take some photos.

I look for wide open spaces. In the country, I'll scout for fields with weeds that produce small seeds or fields where manure is applied. Nearer the city, I look along dead end roads or parking lots that don't see much traffic. I know I've found a good spot if I see horned larks either feeding or pecking along the road edge for fine gravel.

I prepare a special feed mix of white millet and cracked corn that is ground to the same size as the millet. A mix of about two parts corn to one part millet works fine.

It takes a while for buntings to get accustomed to your presence. I spread the feed in the gravel of a roadside, on top of a snow pile and along a fence top.

These photos were taken near a golf course on the edge of a parking lot that is

plowed every winter.

In the warmer days of early November, I scatter the bird seed and then park my car about 20 feet away. The birds won't let me get any closer. Later in cold, snowy weather, snow buntings will come to a fence line for feed and I can park on that same side of the road to observe them. The birds also perch in nearby trees for some time after feeding.

Buntings are strong, fast fliers who maneuver in close formation turning at precisely the same time and motion.

Snow buntings usually stay in our area until the second week of April, but in warmer years, they'll be gone by the end of March. Twice I have seen flocks of about 200 birds for a few days around Christmas time. Evidently, they are still moving south in late December.

continued from page 2

In all plumage phases, the most characteristic feature of the species is the large white wing patches tipped with black. No other flocking bird in this area has that feature. The birds appear entirely white from underneath when flying overhead.

Snow buntings seem oblivious to weather conditions that send other birds searching for the security of shelter. These hardy visitors may be observed flying during snowstorms, their flight resembling giant swirling snowflakes. Perhaps this is why they received the nickname "snowflake." To escape bitter cold temperatures or blustery winds, snow buntings do not roost in trees but burrow into an insulating cover of snow.

In March the flocks begin returning to their arctic breeding grounds. The sparrow-like snow buntings, members of the finch family, have the distinction of nesting further north than any other land bird species.

By June the birds have set up individual territories. The nest, built by the female, is placed in a cavity or rock crevice. Three to nine cream-white eggs streaked with grays and browns are laid in a nest of mosses and sedges that is lined with fur and feathers. The young hatch after a 10-15 day incubation, depending on the attentiveness of the female. Snow buntings are primarily seed eaters. However, during nesting season, both young and adults feed on insects. In the long days of a short arctic summer, snow buntings raise one brood or possibly two depending upon favorable weather conditions.

After nesting responsibilities are completed, the now gregarious birds begin to flock. Occasionally, lapland longspurs will join them. As long winter darkness envelops the arctic, snow buntings wander in search of food. They sojourn to Wisconsin and stay until March. Then we must wait seven to nine months to see if they will once again grace Wisconsin's wintery countryside. □

Blustery or balmy weather, Anita Carpenter tracks the comings and goings of wild things near her Oshkosh, Wis. home.

Buntings will burrow right into a snowbank to seek refuge from bitter temperatures and biting winds.



EDWARD PRINS



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