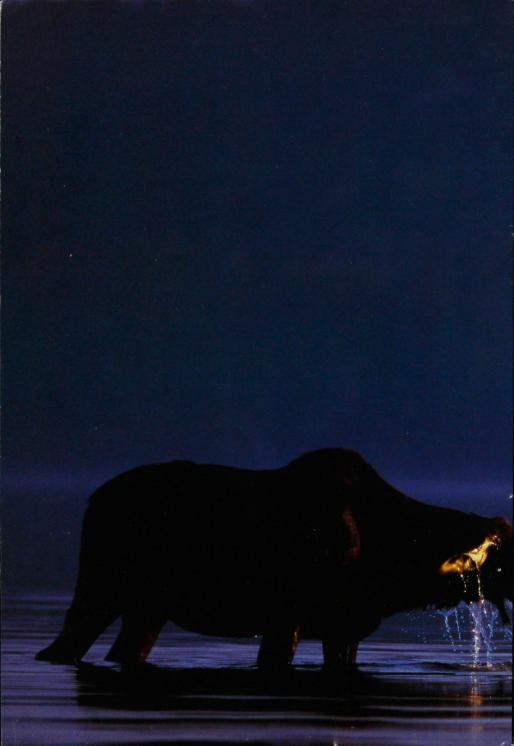
## The Minnesota OLUNTEER DEPARTMENT OF NATURAL RESOURCES SEPT.-OCT. 1997

#### **Waters Worth Saving**

15 Twin Cities trout streams are imperiled by development

**Pollination Partners** 

32



## The Minnesota OLUNTEER

DEPARTMENT OF NATURAL RESOURCES SEPT.- OCT. 1997

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#### The Pause That Refreshes

This cow snacks on succulent aquatic plants. But a moose can pick up a nasty parasite while grazing on land. See page 24. Photograph by Scott Sharkey.

The Volunteer advocates conservation and wise use of the state's natural resources. Printed on paper containing at least 10 percent post-consumer waste.







#### A Hunter's Sense of Time



RICHARD HAMILTON SMITH

I'VE NOTICED THAT OUTDOOR WRITERS often talk about time. Take Joel Vance, for instance. In this issue's A Sense of Place, he takes readers on a comic ramble around his Minnesota grouse-hunting grounds. Yet he also strikes a serious note: Stopping by a grouse drumming log at the end of his hunt, Vance muses "that this is a moment all too fleeting, all too soon gone."

A hunter's preoccupation with time should not be surprising, I suppose. A hunter can spend a whole day in a tree, waiting for a deer to come by.

Likewise, an angler sometimes passes

hours adrift in a boat, hoping a fish will take the bait. Whether or not they capture their quarry, most hunters and anglers wish they had more time.

Even wildlife paintings—with ducks winging across a dusky sky, a kerosene lantern glowing in a cabin window—reflect the hunter's nostalgia at day's end, a longing for time passed by.

Where does this sense of longing come from? Maybe it goes back to childhood. In his story on page 8, Harland Hiemstra explains the desire to save a trout stream: "To splash in its cold springs and riffles is to feel like a child again; to rest on its shady bank . . . is to forget age and time."

Do anglers go to the lake, or hunters to the woods, in pursuit of that childlike sense of time when everything but the moment at hand falls away? Outdoor writer Ted Kerasote, in an essay in the winter 1997 issue of *Orion* magazine, describes this "pure state of being" as "what well-practiced hunting and fishing is all about—focusing one's attention until the awareness of attention disappears."

No one focuses attention better than a hunter whose life depends on it. French traveler and journalist Gontran de Poncins describes the concentration of a seal hunter peering into a hole in the ice. In his book *Kabloona*, an account of life among the Inuit in 1938–39, he tells of meeting "a hunter who had spent three days motionless in that extraordinary attitude in which they stand, feet planted together, head down, bottom high, forced by the seal's acute hearing to maintain absolute silence—all to no avail."

De Poncins discovers that his European notions of time do not apply in the Arctic. Faced with simple necessity, de Poncins learns to discard "haste, worry, rebelliousness, selfishness." And the Arctic becomes for him "no longer a source of suffering but of joy." In a shadowless land, this traveler loses track of time. Like a hunter afield, he focuses on what is present.

-KATHLEEN WEFLEN, editor

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## LETTERS

#### **Turtle Crossings**

I ENJOYED THE ARTICLE ON TURTLES (July—August), and I was glad to find out I'm not the only one making my husband pull over so I can help one cross the road.

LINETTE WELSHINGER
Deer River

#### **They Cry Wolf**

JIM BOWYER'S REVIEW OF PAUL AND Anne Ehrlich's *Betrayal of Science and Reason* (July–August) criticized the book primarily for its "tone and tenor." It needs to be emphasized that Paul Ehrlich has repeatedly

cried wolf in predicting environmental doom. In *The Population Bomb*, he wrongly predicted that massive famines would occur in the 1970s. In 1981 he predicted that the real price of several metal ores would rise significantly in 10 years. In 1990 the real prices were lower than in 1980.

DAVID SIEGEL St. Paul

#### In Fargo's Shadow

ONE QUICK NOTE OF CONSTRUCTIVE criticism: Please don't forget about Moorhead. In This Issue (July–August) you refer to Fargo with no



"Any nibbles yet?"

mention of Moorhead. It seems to be a struggle for identity here in Moorhead, living in Fargo's shadow.

> JEFF PRAY Moorhead

#### **Pro Golf**

IN RESPONSE TO THE JULY-AUGUST letter of anti-golf comments: Can automobiles and their associated exhaust, highways, parking lots, roadkill, oil exploration, etc., be good for wildlife? Maybe, just maybe, golf courses provide a venue for a lot of people to appreciate wildlife.

Denny Holen Hawley

#### **Events for Teens**

I AM A 13-YEAR-OLD AND I LOVE YOUR magazine. However, I wish to ask you to put more stuff in for kids my age. Some nature events for preteens and teens in Events would be great!

TATUM FJERSTAD Brooklyn Park

#### **Prairie Home**

"REMNANTS OF PRAIRIE PAST" (JULY—August) took me back to my youth in Illinois. One tiny area on the map encompasses Hancock County. I grew up on a farm in that county. The map designates that area as one-time tallgrass prairie. I remember my father telling about prairie

chickens booming in the pasture.

The meadowlark was a familiar sight when I was a boy. Their clear, sparkling song was a delight to hear. It sickens me to know their numbers are diminishing.

Bordering our farm were the tracks of the CB&Q. The broad right of way was not mowed. Prairie roses were abundant. I would pick bunches of the blossoms for my mother.

One other memory. In the summer when the uncut growth was at its highest, I would see a woman wearing a broad-brimmed hat working her way through this dense cover. She would stop from time to time and appear to write. My parents told me she was Dr. Alice Kibbe, head of the botany department at Carthage College. She was cataloging the native vegetation. Her document may still be the reference authority on this matter. Now you know why "Remnants of Prairie Past" has such special meaning for me.

ROBERT ZINN Robbinsdale

We welcome your comments. We'll edit letters as needed for accuracy, style, and length. Send your letter and a daytime phone number to The Minnesota Volunteer, Letters, 500 Lafayette Road, St. Paul, MN 55155-4046. E-mail: kathleen.weflen@dnr.state.mn.us.

### GORP

#### Upbeat Outlook

TO ATTRACT A MATE IN SPRING, MALE ruffed grouse drum, and male sharp-tailed grouse dance. In spring 1997, re-

tailed grouse dance. In spring 1997, researchers heard and saw more of both, suggesting that populations are up over 1996.

Bill Berg, DNR's grouse survey coordinator, said that the largest increase in drumming was in the northeast, a whopping 114 percent more than 1996. Statewide, drumming has increased for four consecutive years.

Sharp-tailed grouse, a species plagued with habitat loss, had 25 percent more dancers in the northwest, and 4 percent more in the east-central range. "That's the first time since 1990 that both ranges increased," Berg says. Berg attributes some of the increase to prescribed burning and other brushland habitat management funded by license sales, the Environment and Natural Resources Trust Fund, and Reinvest in Minnesota.

#### **Truckloads of Nitrogen**

According to G. David Tillman of the University of Minnesota and several other ecologists, humans are adding the equivalent of 10 million semi-truck loads of dry nitrogen fertilizer to the environment each year. The increased nitrogen load comes from

applications of commercial fertilizer, cultivation of legumes and other nitrogenfixing crops, and use of fossil fuels. Nitrogen boosts fertility of some soils and sometimes enables non-native grasses to invade an area and reduce biological diversity.



LLUSTRATIONS BY JEFF TOLBERT

THANKS TO A RECORD \$411 million in excise taxes paid by the nation's hunters, anglers, boaters, and manufacturers of fishing and hunting equipment, the DNR Division of Fish and Wildlife will receive \$5 million to manage Minnesota's wildlife and \$10 million for sport fish. Two federal programs, known as Pittman-Robertson and Wallop-Breaux, have raised more than \$5 billion since they began in 1937 and 1950, respectively.

#### NEW BWCAW GUIDES

recently published the first hiker's guide to the 38-mile Kekekabic Trail in the Boundary Waters Canoe Area Wilderness. The 35-page pocket-size, waterproof guide includes 12 maps, tidbits on local flora and fauna, campsite descriptions, and other useful hiking information. Order for \$9.95 from

•Brad Snyder, past president of the Minnesota Orienteering Club, recently published a pocket-size guide to navigation in the Quetico-Superior canoe country and a spiral-bound trip planner. For ordering information call 612-553-2848.

#### **Refuges Vast and Small**

THE SMALLEST OF THE 508 national wildlife refuges managed by the U.S. Fish and Wildlife

Service is the half-acre Mille Lacs NWR in Minnesota. The largest is the 19.2-million-acre Arctic NWR in Alaska.

#### Get a Really Great Map

WANT TO FIND PUBLIC LANDS FOR hunting? Or trails to bike, rivers to canoe, lakes to fish? Public Recreation Information Maps produced by the DNR give you the complete picture for 2,000 square miles. For help deciding which of the 51

PRIM maps will work best for you, call the DNR Information Center, listed on page 63. PRIM maps sell for \$4.95 at sporting goods stores, local DNR offices, Minnesota's Bookstore (800-657-3757), and the DNR Gift Shop (500 Lafayette Road, St. Paul, MN 55101).

#### Lost Land

ALMOST 1 MILLION ACRES OF OPEN LAND DISAPPEAR every year in the United States, according to the Trust for Public Land, a non-profit conservation group.

Development for housing, business, and industry annually replaces open space a little larger than Cook County in

Minnesota's Arrowhead region.

## ABID TO SAVE Suburban Streams

By HARLAND HIEMSTRA

PHOTOGRAPH OF BROWN'S CREEK BY RON WINCH

Conservationists are working to protect trout streams pressured by urban development.

write about
a trout stream
is something different
from being there. To
splash in its cold springs and
riffles is to feel like a child again; to
rest on its shady bank and nibble fresh
watercress is to forget age and time as the
water speaks to your soul in its ancient
purling tongues.

For the half of the state's population that lives in the Twin Cities area, experiencing the timeless charm of a trout stream anywhere nearby could become more

of a literary exercise if losses of streams continue.

Trout Brook, for instance, which wanders along the eastern edge of downtown St. Paul, hasn't lived up to its name within anyone's memory. Most of it was channeled through a culvert long ago. Golden Valley Creek, Purgatory Creek, Nine Mile Creek—no one knows for sure how many metro trout streams have been lost, because some disappeared before anyone kept track. Today, portions of only 15 streams in the seven-county metro area remain natural enough to support trout, and most stand in danger from urban development.

Cities aren't very friendly to trout, which need cold, clean water to survive. Storm water runs off pavement, rooftops, and other impervious surfaces, warming the stream and degrading water quality. After a while—no more trout.

But it's not just the fish that suffer. Sensitive in terms of habitat needs, trout are an environmental barometer, indicating either a thriving ecosystem or biodiversity in decline.

"You have to value them not only for the fishing they provide but for their existence," says Tom Schueler, executive director of the Center for Watershed Protection in Washington, D.C. "It's harder and

Harland Hiemstra is DNR regional information officer for the Twin Cities metro region.

harder to find natural stream systems in urban and suburban areas anymore. Keeping a stream like that has enormous value to society, so they can know what a real stream is like."

**Bubbling Springs.** The Mdewakanton Dakota say that long ago Buffalo Calf Woman rose from the bubbling springs of Eagle Creek and taught them how to pray and use the sacred pipe. Much more recently, those same fresh waters gave birth to a preservation effort focused on Twin Cities trout streams.

When the city of Savage received a development proposal to build housing and offices on the banks of Eagle Creek four years ago, some citizens welcomed the project as an addition to the local tax base. Others rallied around what they saw as a life-and-death struggle for the Minnesota River valley's only stream where trout could still reproduce naturally. The controversy spread from the local level to the Legislature. Lawmakers allocated \$1.6 million for the Department of Natural Resources to purchase a narrow corridor along the stream. With funding in hand, DNR biologists set to work with the developer, local officials, and conservationists to create a management plan aimed at preservation.

Today, Eagle Creek is an experiment in progress. Surveying stakes mark future construction sites.



These rare artesian springs feed Eagle Creek. The DNR has the task of preserving the stream and this geologic feature, which provides cold, clean water to support trout and other wildlife.

Houses in various stages of completion line a suburban street that snakes along the contour of the bluff above the stream. Behind the houses, an earthen berm slopes away from the ridge, creating a grassy swale to keep storm water from running into the creek. On each bank of the creek's west branch, the DNR has purchased a 200-foot corridor to buffer the waterway from human impacts. Negotiations are under way to acquire a corridor along the stream's east branch.

The idea, says DNR fisheries biologist Jerry Johnson, is to create a mini-watershed around Eagle Creek to isolate it from development. Any rain falling outside the 400-foot corridor will be diverted away from the stream and into the nearby Minnesota River. Within this buffer zone, plantings of native vegetation and other streambank improvements will minimize the effects of runoff and erosion and re-create habitat closer to presettlement conditions.

No one knows for certain if these measures will save the stream. But the particular circumstances around Eagle Creek have Johnson feeling hopeful. The small size of the creek's watershed makes it manageable, and the housing developer has been cooperative. Local sandy soils allow for more infiltration and less runoff than heavier soils would allow. And the area's relatively flat topography lends

itself to storm water diversion.

Even if efforts should fail to preserve the fishery, the surrounding landscape will be in better shape than if development had proceeded as originally planned. And, of major significance for other trout stream preservation efforts, extensive monitoring of Eagle Creek will enable scientists to pinpoint the causes of any further degradation.

"This was an eleventh-hour decision," Johnson says. "It was an either you do it or you don't do it kind of thing. History has shown us that if we would have allowed development right up to the stream, we would have lost the stream. This wasn't our best option; it was our only option."

Top Six. Hoping to avoid such eleventh-hour decisions in the future, a group of anglers and DNR biologists issued a report last fall outlining the need for greater efforts to protect metro trout streams. They identified six of the 15 streams as deserving of special attention: Brown's Creek, Old Mill Stream, and Valley Creek in Washington County; a portion of the Vermillion River in Dakota County; Assumption Creek in Carver County, and Eagle Creek. As a result, several Twin Cities area communities are considering how to preserve this part of their natural heritage while accommodating urban growth.

Lakeville and Farmington, for instance, have launched a study to monitor the effects of storm water runoff on tributaries to the Vermillion River. Woodbury officials are wondering how they might modify plans for commercial and industrial development along Interstate 94 at the headwaters of Valley Creek. And Stillwater is looking at how to protect Brown's Creek from the effects of an 1,800acre annexation of part of rural Stillwater Township to the city's boundaries.

"It's not a question of development versus no development here," says Sherri Buss, a natural resource



Brown trout, which inhabit several suburban streams, tolerate higher temperature extremes than do native brook trout, but they still require well-oxygenated, cool waters.

#### **Threatened Metro Area Trout Streams**



Denotes trout streams of special concern because of their relatively large size, high quality, and vulnerability to development.

specialist for Bonestroo, Rosene, Anderlik and Associates, an engineering firm hired by Stillwater to conduct the environmental review. "We have to find how development can happen here and still maintain the quality of Brown's Creek. It's a question of how development is designed and where it's appropriate."

**Impervious Surfaces.** Trout start to have problems when paved roads and other impervious surfaces cover more than 10 percent of a stream's watershed, Buss explains. That's roughly the equivalent of one house per acre. A typical urban area, on the other hand, is about 30 to 50 percent impervious. Water runs off these surfaces, carrying oil, fertilizer, road salt, and other pollutants into storm sewers, which usually empty

into streams. The runoff pollutes and warms the fishery.

To reduce the amount of pavement, developers can plan narrower streets and shorter driveways. Clustering houses on smaller lots means shorter streets and more open space, which can hold water and allow it to infiltrate the soil rather than run into sewers. Woodlands, grassy swales along roads, and buffer zones of vegetation can also promote infiltration. Letting rainwater filter through the soil as near as possible to where it falls might compensate for developments that exceed the 10 percent impervious surface threshold, Buss says.

"The public preference has been for getting water off their property as quick as possible," Buss says. "Nobody was thinking about what the cumulative impact of that might

In Savage, trout in Eagle Creek are at risk from housing development. DNR fisheries biologist Jerry Johnson (*right*) devises stream preservation strategies, which include creating a mini-watershed to isolate the creek from development, planting a buffer zone of native vegetation, and diverting runoff from outside this zone.



be on resources like streams.

"The challenge for the engineers is to be able to model the effects of development and design new strategies for managing storm water. It doesn't mean no development can occur here. It means we have to be able to figure out how we can design to meet natural resource and community needs."

The strategies that Buss talks



about came out of a series of meetings that included developers, engineers, city officials, and local residents along with anglers, conservationists, and biologists. Assembling people with diverse interests and asking them to come up with local solutions are critical to finding ways to preserve natural resources, she says.

"Trout stream issues are not just

about technical considerations," Buss says. "They're about community values, and you need to bring together all the people who have an interest in it. Science and engineering just give you the options."

Will It Work? Whether the measures proposed, including a diversion of storm water away from Brown's Creek to McKusick Lake, will be adequate to save Brown's Creek remains uncertain. For one thing, the annexation area constitutes only about one-tenth of the stream's watershed. The actions of other communities in the watershed could negate anything Stillwater does. Furthermore, techniques to compensate for the influx of warm storm water into streams remain largely unproven.

"It's not easy to engineer away the effects of impervious coverage for trout," says Schueler of the Center for Watershed Protection. "Land-use limits are the only reliable and certain way to protect trout populations in urban areas."

Lee Ronning of the Land Stewardship Project agrees with Schueler. "We need to get smarter about how we're planning for growth and making use of the land," she says. "I'm convinced that without strong, sustainable planning and zoning, any other tool isn't going to be as effective at protecting what we want."

The Land Stewardship Project

has been trying to develop legal tools that would more effectively limit urban sprawl and guide growth to prevent destruction of natural resources. Legislation mandating statewide land-use planning, for instance, could encourage communities to identify significant natural areas and direct development elsewhere. Conservation easements and other techniques that restrict land use could provide landowners with alternatives to subdividing and developing their property.

While Ronning says the goal is to guide development, not stop it, she also notes that growth does not always benefit the local tax base as communities commonly believe it does. Many studies indicate that the costs of development for local government—and ultimately taxpayers—often exceed additional tax revenues. Natural areas, on the other hand, incur few expenses.

"Trout don't go to school; you don't have to build schools or roads for them," Ronning says. "One thing we've learned for sure is if you're going to grow, it's going to cost you more, and that's not necessarily equal to the added tax base."

**The Paradox.** Natural amenities such as woods, wetlands, and streams help draw people beyond city limits to build homes. As more and more people follow, though, those natural attractions can be lost

to development.

That paradox lies at the heart of the conflict between urban growth and preservation. It might also offer insight into saving metro trout streams, says Tim Popple, manager of the Kinnickinnic River Watershed Project in Wisconsin.

Regarded as one of the finest trout streams in the upper Midwest, the Kinnickinnic flows through a landscape being pressured by people who work in the Twin Cities but want to live in a rural setting.

"Most of the people moving into this area are moving here because they see this as a beautiful resource, so the last thing they'd want to do is destroy it," Popple says. "You need to educate those people and show them you can't just build houses on quarter-acre lots, all with their own septic systems."

When people understand the value of a trout stream, they're more likely to demand alternative developments such as cluster housing or new approaches to managing storm water. That's what has happened in River Falls, Wis., which has undertaken a new storm water management plan and revisions to its subdivision ordinance to minimize impacts on the Kinnickinnic River

"The biggest thing is education," says Darrin Beier, city engineer for River Falls. "If we can educate the developers in the area and the public buys into it, then the devel-

opers will have to use new techniques. If the public doesn't want that to happen, it won't."

Another effort on the Kinnickinnic suggests that the public does want to preserve the river's unique features. Since its founding in 1993, the Kinnickinnic River Land Trust has provided a measure of protection to nearly 2,000 acres within the stream's watershed. Most of the group's work has focused on getting landowners to donate conservation easements, which are restrictions on a property's deed that limit future development while allowing other activities such as farming to continue.

The trust's land registry program offers a less formal arrangement under which landowners agree to follow management practices aimed at reducing negative effects on the river. The trust is also attempting to raise funds to purchase and protect sensitive lands.

"In a conservation effort, you need as many different strategies as possible," says land trust director Rick McMonagle.

Preservation strategies still might not save all 15 remaining metro trout streams. But they will ensure a healthier environment, says Annette Drewes, one of two DNR trout stream watershed coordinators for the Twin Cities region.

"We may wind up with 10 and a better understanding of how those streams work," she says. "We're still opening people's eyes to what's out there. If you don't know what you have, you're not going to value it."

Brown's Creek in Stillwater has been targeted as one of the top six streams in the Twin Cities metro area that deserve special preservation efforts.





# Mest of the Mississippi

Society's desire to define or mark land boundaries. In 1846 Congress, in defining the limits of the newly forming state of Wisconsin, set the

By JUDY WINIECK

MAP COURTESY U.S. ARMY CORPS OF ENGINEERS, ST. PAUL. PHOTOGRAPH BY L.C. DUKE

#### **Shifting Borderlines**

limits of the western boundary as "thence down the main channel of said river [St. Croix] to the Mississippi; thence down the center of the main channel of that river to the northwest corner of the state of Illinois." Ten years later, when the people of the Minnesota Territory wanted to form a state government, Minnesota's eastern boundary was described by Congress as "thence up the main channel of said river [Mississippi], and following the boundary line of the State of Wisconsin, until the same intersects with the St. Louis River."

A recent dispute over land along the Mississippi River led surveyors to investigate the location of the Minnesota-Wisconsin boundary. Locally known as Lighthouse Island, this land at the head of Lake Pepin near Red Wing provides good habitat for migrating ducks. A few years ago, a Minnesota conservation officer advised a Wisconsin duck hunter, who did not have a Minnesota license, not to hunt on Lighthouse Island, which maps depicted to be in Minnesota. Some third- and fourthgeneration hunters from Bay City, Wis., had a different recollection of where the state line was. They guestioned which state enclosed the island and the area of Wacouta Bay. The ducks quite frankly didn't care.

**Judy Winiecki** is the principal land surveyor with the DNR Bureau of Engineering in St. Paul.



The Minnesota and Wisconsin departments of natural resources asked the Minnesota-Wisconsin Boundary Area Commission to mediate the boundary question. As the principal land surveyor for the Minnesota DNR, I worked with Doug Fendry, chief of the Wisconsin DNR's Land Management Section, to resolve the boundary issue and present the finding to the commission.

Reconstruct the Boundary. As with any land survey, the first task was to follow in the footsteps of the original survey and reconstruct the boundary from historic records, maps, and other documents.

Following the Revolutionary War, the United States was a new nation without a firm revenue base. Taxes were unthinkable, yet the federal government needed money to operate. The one thing that the fledgling country did have was land. From the original state cessions in 1781 to the purchase of Alaska in 1867, the federal government acquired some 1.8 billion acres of land and worked to turn land into hard cash as fast as possible.

An ordinance of 1785 called for the survey of these public lands, creating parcels for new landowners. Besides surveying the land to identify parcels for sale, the original government surveyors reported on the quality or arability of the land to determine its relative value, and on its dimensions to determine acreage and make it easier to relocate the corner markers.

The original public land surveys of the north side of the Mississippi River were conducted in 1848, the year that Wisconsin was admitted to the Union. The surveyors moved south from the mainland, stopping at the left bank of the main channel. They located several islands, measured them, and labeled them for future identification. These islands were all north of a channel labeled Steamboat Channel on the surveyors' plat of 1848 (page 22).

Surveyors completed surveys of the lands south of this stretch of the Mississippi in 1855. Their notes describe where they stopped along the right bank of the Mississippi. While the plat from this survey shows some of the same islands surveyed in 1848, only those islands south of the main channel were identified as a part of this township. These two surveys gave me the first clue as to the location of the main channel of the Mississippi at the time of Wisconsin statehood.

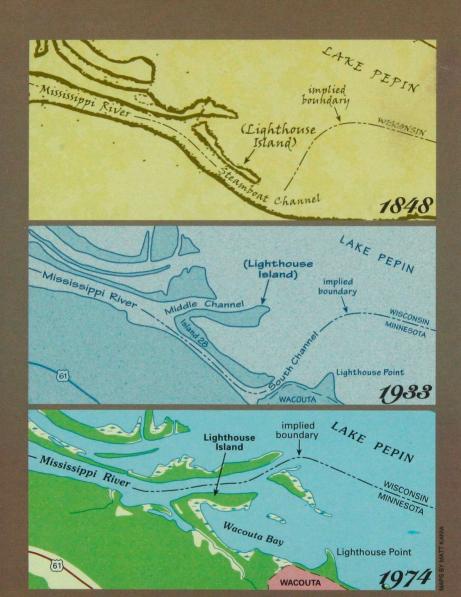
People had already moved in

and begun to develop the Minnesota cities of Red Wing and Wacoota (now spelled Wacouta) before the 1855 survey. Boats brought supplies and new immigrants up the river, the main transportation system at that time.

Looking at the 1877 plat book of Wacouta, I could almost visualize the steamboat rounding Lighthouse Point and docking in Wacouta before heading upstream to Red Wing.

Horseshoe. The 1895 survey of the Mississippi River (see pages 18-19) shows that the shape of the island across the channel from Wacouta changed from the long, thin island depicted on the 1848 survey map to a horseshoe shape. Made under the direction of the Mississippi River Commission, the map shows the extensive topography of the bluffs and the surveyors' stone lines across the river. To create the stone lines, which indicated the river's depth and bottom type (sand, gravel, mud), they dropped a stone on a line, working from bank to bank at set intervals along the channel.

Though the 1895 map shows the horseshoe-shaped island opposite Wacouta, it locates the island between the south and middle channels. A new island, labeled U.S. Light, is shown north of the middle channel. What the 1848 survey labeled Steamboat Channel, the 1895 survey calls South Channel.



#### Changing Channels

The originals of these maps, along with the 1895 Mississippi River map shown on pages 18–19, provided evidence for determining the Minnesota-Wisconsin boundary.

Within the channel and along shore, the map makes note of "mud" and "sloping mud"—clues to the future fate of the main channel and the island.

The next piece of evidence I uncovered was the 1933 U.S. Engineer Office Map of Land and Flowage Rights for Lock and Dam No. 2 in Red Wing. Here the horseshoe-shaped island is labeled Island 28 and shown to be north of the south channel and on the county line. Land parcels on this map are identified as either being in Minnesota's Goodhue County or Wisconsin's Pierce County.

A 1949 aerial photo shows Island 28 is no longer an island. The mud and sloping mud described in 1895 have filled in the channel, and the former island has joined the mainland at its southeast end near Wacouta. By 1974 U.S. Geological Survey cartographers show the boundary passing through the new main channel, which previously had been labeled as the middle channel. The south channel, that is, the original Steamboat Channel, is filled in, connecting Island 28 to the Minnesota mainland and forming Wacouta Bay.

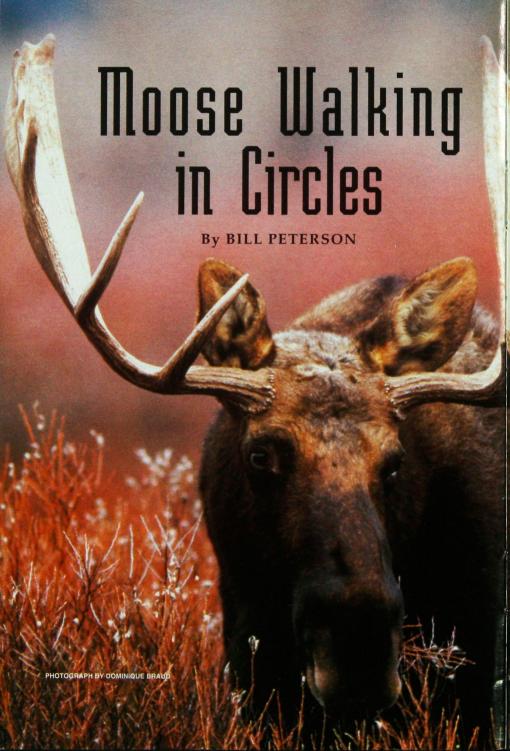
What Happens? So what happens when nature decides to change in midstream, so to speak?

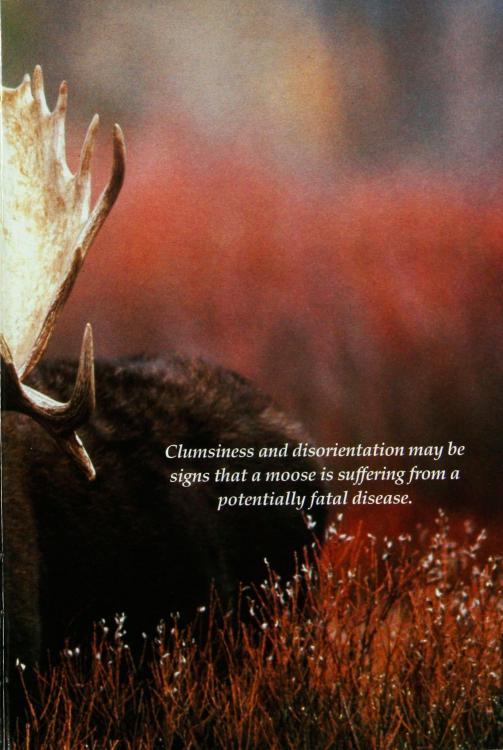
The normal rule of law for natural boundaries on a river is that the

boundary moves as the channel changes. But there is an "island exception," cited in State of Louisiana v. State of Mississippi in 1995. U.S. Supreme Court Justice William Kennedy wrote "that if there is a divided river flow around an island, a boundary once established on one side of the island remains there, even though the main downstream navigation channel shifts to the island's other side The island exception serves to avoid disturbing a State's sovereignty over an island if there are changes in the main navigation channel."

Though Island 28 is no longer an island and is now attached to Minnesota mainland west of the Mississippi, the boundary remains where the main channel ran in 1848, and, consequently, the land remains part of Wisconsin. Thus the private land stays on the Pierce County tax roles, and the public land is still managed by the Wisconsin DNR. Though the surveyor's riddle is solved, mapmakers will need years to revise all the maps to show the correct Minnesota-Wisconsin boundary.

Minnesota and Wisconsin will enter into a memorandum of understanding being written by the Minnesota Attorney General's Office. The correct boundary does not affect boaters or anglers, but mussel harvesters, commercial fishermen, and hunters must abide by the proper state regulations.





as powerful monarchs of their domain—probably because of their impressive size and the ease with which they travel through water, deep muck, and wind-thrown trees. But moose do have their problems. One of the most serious is "moose sickness," a debilitating and often fatal disease, seen in Minnesota's moose since at least 1912.

Signs of moose sickness include aimless walking in circles, holding head and ears in abnormal positions, frequent stumbling, poor coordination or balance, and apparent weakness or paralysis of a leg. Sometimes I have walked up to an apparently sick moose and shoved it; other moose have charged at me from 20 yards away. Once I tried to shoot a videotape of a moose charging someone, but the moose kept coming after me even though the other person was closer.

Animals showing such severe signs of disease will eventually die. Conservation officers and wildlife managers are often called on to end the animal's suffering. Sick moose can be a safety hazard along roadways.

People sometimes see a sick moose but do not report the sight-

Bill Peterson is the area wildlife manager in Grand Marais, where he has studied white-tailed deer, moose, and other wildlife for 28 years. ing because they do not realize the animal is sick. Some sick moose have been photographed by people who have assumed the animal was especially tolerant of people. People have reported leg or hip injuries in moose that, in fact, were suffering leg paralysis from the disease.

llose Brainworm. The cause of this disease eluded detection until 1964, when Canadian biologist Roy Anderson discovered it was caused by *Parelaphostrongylus tenuis*, a parasitic nematode, or roundworm, commonly referred to as brainworm. The adult brainworm is about 0.01 inch in diameter, 2 to 3 inches long, and is found in or near the brain.

The white-tailed deer is the normal host and is unaffected by the parasite. Severe neurological damage occurs in several species, including moose, caribou, elk, mule deer, llamas, domestic sheep, and goats. Brainworm is found only in central and eastern North America. It has not spread to the western part of the continent, even though whitetails occur in much of the West.

Brainworm evolved with the white-tailed deer. Whitetails gradually expanded their range to the West, but the parasite apparently did not survive the prairie conditions. (One reason to regulate interstate shipment of animals is to prevent establishment of parasites or disease in new areas. If someone

transported an infected deer to the West, the brainworm could become established there.)

Female worms in the deer's head deposit eggs into the blood vessels of the brain. The eggs hatch into firststage larvae while being carried to the lungs, where they leave the bloodstream and enter the air passages. Then the deer cough up the larvae, swallow them, pass them through the digestive tract unharmed, and excrete them on droppings.

The first-stage larvae then infect various species of land snails and slugs that crawl over the deer droppings or soil that contains larvae. Some species of snails and slugs are more readily infected than others, even if exposed to similar numbers of larvae.

In snails and slugs, the larvae go through second and third stages. When a whitetail, moose, or other susceptible ungulate feeds on vegetation and inadvertently eats an infected snail or slug, the third-stage larvae migrate through its stomach wall, up to the spinal column, then up to the brain.

One might think relying on deer to accidentally eat snails and slugs is an inefficient way of transmitting this parasite, but nearly all deer in Minnesota eventually become infected.

#### Peppered with snails. Over the last decade or so, I have

worked on several studies of brain-

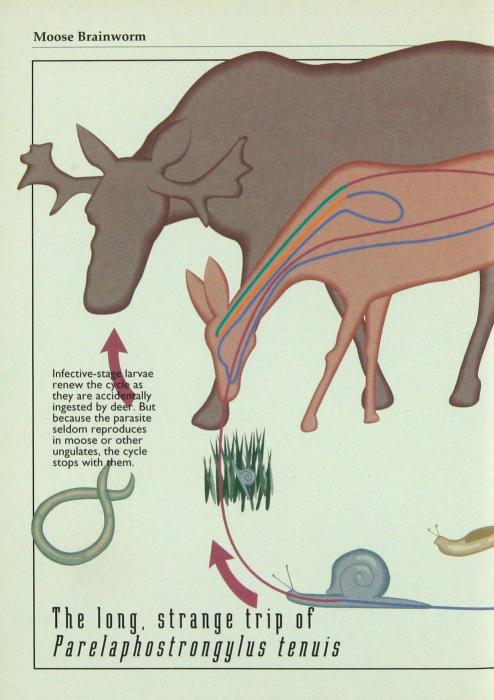
worm with Murray Lankester, a parasitologist at Lakehead University in Thunder Bay, Ontario. Of more than 12,000 snails and slugs we collected near Grand Marais during the summer and fall of 1994, only 10 contained the parasite. This suggests that a whitetailed deer or moose in that vicinity eats an average of 1,200 snails and slugs before encountering an infected one. We also found that 80 percent of the white-tailed deer in that area picked up the parasite during their first year of life. Obviously, snails and slugs frequently occur on deer foods.

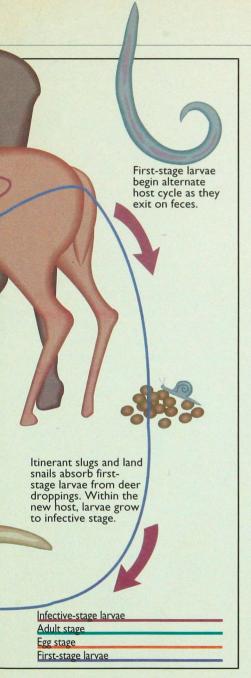
Just because deer acquire the parasite readily does not mean they continue to become infected with more worms. Our studies found that adult deer had, on average, the same number of adult brainworms as did fawns. The number is probably limited by the deer's immune system, which produces antibodies that fight third-stage larvae as they enter the body. However, the deer's

immune system does not usually

A moose infected with brainworm displays an unusual lack of fear as it approaches Roy Anderson, the Canadian biologist who discovered that a parasitic nematode causes the disease.







kill established adult worms.

Does the immune system of a moose also react to the parasite? It seems so. Lankester, in a study that has not yet been published, infected four moose calves with three to five brainworm larvae—the number believed typical of natural infections. Initially the calves exhibited slight signs of the disease, but later the signs disappeared. Upon examination of the heads, researchers recovered one adult worm from each of three of the four calves and no brainworms from the fourth calf. Apparently the calves' immune systems killed most, and in one case all, of the infective larvae. Calves infected with more larvae exhibited severe neurological signs typical for moose with this parasite.

Moose calves probably have more poorly developed immune systems than do adult moose. We rarely see this disease in moose older than 2 years, and we don't know if the few cases in moose over age 2 are new infections or merely old ones becoming active again. Determining the resistance of adults to the parasite would require further study.

**Inknown encounters**. What proportion of our Minnesota moose herd encounters the parasite? That important fact is not yet known. However, researchers are trying to develop a blood test to determine if

a moose has been exposed to brainworm. Blood serum samples from about 200 moose were collected in northeastern Minnesota and northwestern Ontario and placed in longterm storage, ready for examination if a suitable test is developed.

Moose in some areas might run a greater risk of getting brainworm than do moose in other areas. For example, 43 percent of the sick moose I have handled in Cook and Lake counties over the last few decades were within three-quarters of a mile of Lake Superior; yet the moose population along the lake is much lower than it is several miles inland (less than one moose per 4 square miles, compared with one moose per square mile farther inland). Perhaps moose along Lake Superior are more likely to contract the disease because white-tailed deer congregate along the shore in winter. Higher deer densities result in more first-stage larvae from deer pellets, which usually lead to more infected snails and slugs. Indeed, we found infected gastropods were twice as numerous, per area sampled, in a wintering area along Lake Superior as they were only a few miles inland.

**New conclusions**. The relationship between brainworm in moose, moose mortality, and whitetail numbers is unclear, though brainworm does not appear to have a major influence on Minnesota's

moose herds. A recent evaluation of current data and the historical record suggests that moose population declines once believed to have been caused by brainworm occurred only when deer densities exceeded 12 per square mile. However, moose populations did not always decline when deer densities exceeded that level. And sometimes populations declined though no one had reported diseased moose.

Most areas in Minnesota's main moose ranges (in the northeast and northwest) have whitetail population densities of fewer than 10 deer per square mile, with only a few small areas of 12 deer per square mile. Moose populations have fluctuated considerably over the years, even in areas with low deer populations. The moose population in northeastern Minnesota has been about 4,000 to 5,000 for the last 20 years. Moose in northwestern Minnesota were equally abundant until recently; at this time they have declined to about 1,200.

A research study is examining the possible causes of the decline in northwestern Minnesota. A few of the sick or dead moose examined had brainworm, but it still isn't clear what killed the others. Unless brainworm causes subtle, hard-to-recognize changes in moose—such as inappropriate courtship behavior or inadequate care of calves, which could result in decreased reproductive success—it is unlikely that it has



Moose nurslings (above) are not susceptible to brainworm. Once weaned, however, young moose appear to be more readily infected than adults. Evidence also suggests that brainworm is not a major factor in fluctuating moose populations, but should continue to be monitored and researched.

had a major impact on northwestern Minnesota's moose herd.

We still have much to learn about the brainworm: Do certain habitat conditions result in "hot spots" of infected snails and slugs? Do infected gastropods behave differently from uninfected ones, resulting in their being more likely to be ingested by a deer or moose? Do infected moose whose signs disappear succumb to the parasite later? Does the parasite cause subtle changes in behavior that may influence survival or reproductive success in moose that show only slight signs of sickness?

What we do know can help wildlife managers evaluate an area's suitability for both deer and moose and determine how many of each is appropriate. To set wildlife management priorities and population goals, managers need to recognize habitat conditions or other ecological situations likely to result in frequent transmission of this parasite. This knowledge can also help landowners who raise sheep, goats, or llamas, which are also susceptible to brainworm infection.

Due to declines in the northwestern moose population, the DNR did not offer permits to hunt moose there in 1997. Moose populations remain strong in the northeast, where the season opens Oct. 4. Applications for the 1998 moose hunting lottery will be available in March from the DNR, other license vendors, and county auditors.

# Pollination Partners

Text and illustrations by VERA MING WONG

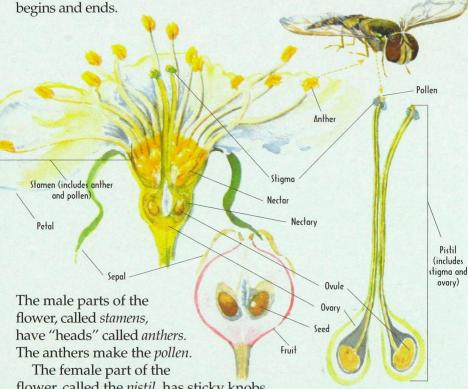
ave you ever wondered why flowers come in so many different colors? Or so many fantastic shapes? Why do some flowers smell sweet, while others have no smell at all, or even smell rotten? Why do bumblebees and butterflies fly around flowers?

Like all living things, flowering plants are designed to survive and reproduce themselves. To do this, flowers make and exchange pollen—fine, powdery, usually yellowish grains. To make seeds, plants need to send this "gold dust" from one flower to another flower, usually on a different plant, but of the same species.



#### Inside a flower

Moving pollen from one flower to another is called *pollination*. Let's look inside a flower to discover where pollination



flower, called the *pistil*, has sticky knobs or branches, called *stigmas*, at the top. The stigmas receive pollen.

Most flowers receive pollen from other flowers of the same species. This is called *cross-pollination*. Some plants can pollinate themselves. This is called *self-pollination*.

When pollen lands on the stigma, the pollen grows a long tube. The pollen drops DNA—a substance that will pass on the characteristics of this parent plant to its offspring—down the tube into a pouchlike part called the *ovary*. There the DNA enters a

female cell called the *ovule* and mixes with the ovule's DNA. Then the ovary grows into a fruit, and the ovule grows into a seed, ready for planting.

## Movers of gold dust

Plants can't walk, so how do they move pollen between flowers? Most flowers get "movers" to come and carry their pollen between flowers. Birds, bats, and insects can be pollen movers. We call them *pollinators*.



Most pollinators visit flowers to look for food. For some, such as bees, beetles, and flies, pollen is an important food. As they collect pollen water-lily with hover fly to bring to their nests, they leave some pollen on the stigmas of the flowers they visit. Many flowers get animal visitors to "accidentally" pick up pollen when they eat nectar from the flower.

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Timing. Some flowers open only when their pollinators are most active. The western prairie fringedorchid releases its fragrance at night when sphinx moths are looking for food.

Wild ginger with beetle

Scent. Some flowers aim their sweet scent at insect pollinators. Some beetles and flies lay their eggs on rotten meat or animal dung, so some flowers produce rotten odors to attract these insects.

Western prairie fringed-orchid with sphinx moth

with native bees Trickery. A few flowers attract pollinators but don't give them a food reward. The showy lady's-slipper, our state flower, entices insects into its slipperlike pouch with color and sweet smells. Once inside, the nectar guide directs the insect toward the only exit. The insect never finds nectar, but on its way out, large pollen sacs

stick to its head-usually its eyes. When the insect stops at the next lady's-slipper, the pollen transfers to the flower's stigma as the insect crawls out.

Showy lady's-slipper

Skunk-cabbage

with flies

Warmth. The skunk-cabbage produces heat in early spring to melt snow and, along with its skunky odor, attract insects.

## Burly bees

The United States has more than 4,000 different species of native bees. Many are native to Minnesota. In the language of biologists, a native plant or animal is one that has evolved over

thousands or millions of years

in the place where it lives

today.

Honeybees are not native to Minnesota. They come from Italy or England. European settlers brought

them to North America to make honey and to pollinate alfalfa, clover, and

other European plants.

Honeybees cannot pollinate many of Minnesota's native plants. For example, only

bumblebees are strong enough to force open wild lupine. Blueberries require a special method of

pollinating called buzz-pollination because their flowers face

downward. With buzz-pollination, a

bee hangs from the anthers with its mandibles and legs and buzzes. The vibrations shake pollen out of the anthers onto the bee's furry belly.

The bee then packs the pollen into

"pollen baskets" on its back legs. Many of our food plants such as tomatoes, eggplants, cranberries, and peppers need to be buzz-

pollinated by bumblebees and other

native bees.

Bumblebee, queen

Sumblebee, worker

Leafcutter bee

Green sweat bee



Blue beech, male

Cord-grass

# Other pollen movers

Not all plants use animals to move pollen. Some plants depend on wind to carry their pollen. Many of these plants have tiny flowers that produce lots of pollen. Why? Because the wind blows a lot of the pollen to the wrong places.

Pollen

Some pollen even gets lost in your nose, and, if you're allergic to it, you might sneeze.

A few plants rely on water to carry pollen. The male flower of the wild celery plant floats free on the water. The female wild celery flower also floats, but it is connected to the plant by a long stalk. When water currents or wind carry the male flower near the female, the male slides into the dimple on the water surface made by the female flower and pollinates it.

Wild celery

Cord-grass

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#### 1. Wild columbine specialist



### Picky pollinators





Some pollinators visit many different kinds of flowers. They are called generalists. Other pollinators visit only certain kinds of flowers. They are called specialists. Because specialists visit only a few kinds of flowers, they learn quickly just where the pollen or nectar is hidden and can find it quickly. They also deliver pollen to the correct stigmas more often.

The flowers that welcome many kinds of pollinators are called generalists. Flowers that

are visited by one or a few

out, what happens to its

called specialists.

partner?

kinds of birds or insects are

If a specialist pollinator or flower becomes scarce or dies 3. Anemone generalist



4. Aster

aeneralist



5. Butterfly-weed generalist



6. Western prairie fringed-orchid specialist



7. Wild lupine specialist



8. Purple coneflower



generalist



6. Western prairie tringed-orchid: sphinx moth I. Wild columbine: sphinx moth, hummingbird Quiz Answers:

7. Wild lupine: bumblebee

flower fly, lepturine beetle, monarch butterfly All generalist flowers (2, 3, 4, 5, 8, 9): bumblebee,





### Pick the pollinators

Draw lines to connect the pollinators with the flowers they pollinate. Remember what attracts pollinators to the flower: color, patterns, shape. We did the flower fly as an example for you. Answers appear below.



Sphinx moth specialist (Clue: See pages 36 and 37.)



Bumblebee generalist (Clue: See page 38.)



flower fly



Hummingbird specialist (Clue: See page 36.)



Lepturine beetle



Monarch butterfly generalist

### Three Ps for partners

Here are three things people can do to help protect pollenproducing plants and pollinators.

• Plant and care for native wildflowers, shrubs, and trees. These plants make fine food for their native pollination partners. Many plants have pretty flowers, but if you look closely at some garden varieties, you will see that the flowers don't have nectar or stamens with pollen to feed pollinators.

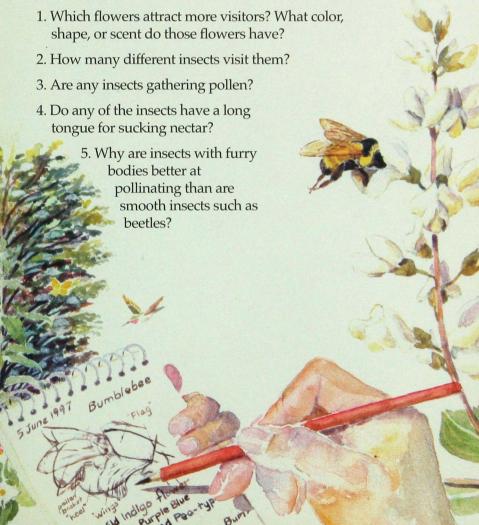
• Put away unnecessary bug and weed killers. Pesticides can kill pollinating insects. Weed killers can kill native wildflowers that provide food for pollinators.

• Protect prairies, wetlands, and forests, which provide food plants for countless birds, butterflies, beetles, and other animals.



## Watching wildflowers

Scientists spend a lot of time observing. Like a scientist, you can learn more about pollination by watching a few flowers for a while. Sit quietly and watch. You might think of some important new questions to be investigated! Take some field notes, writing your observations in a notebook.





"Hollywood finches" released in New York decades ago have reached Minnesota.

# House House Finch

By MARY LOSURE

N A NOVEMBER MORNING IN 1980, DENISE BRUGGERS glanced out the window of her house in Minnetonka and saw what she thought was a purple finch. She reached for her Peterson field guide to make sure, but the bird didn't quite fit the description of a purple finch. On the same page of the field guide was an illustration of another bird that wasn't supposed to exist in Minnesota, the house finch, *Carpodacus mexicanus*, a brownish bird about the size of a house sparrow. The visitor outside her window matched the picture perfectly.

The house finch is a remarkably adaptable species of open and semiopen habitat, from undisturbed desert to cities. It eats buds, seeds, and fruits. The male house finch has a trademark bright red breast, which can vary to orange or even yellow, depending on the bird's diet. As its name suggests, the house finch likes to nest around houses and other buildings. But, as Bruggers read in her field guide, it was native to the western United States and northern Mexico, not the upper Midwest.

The house finch at Bruggers' feeder proved to be the first of its kind officially reported in Minnesota. In the 15 years that followed, the birds spread across the state with astonishing speed. Reports in the first years came mostly from southern Minnesota, then from as far north as Duluth and Thief River Falls. By 1995, birdwatchers had spotted house finches in all of Minnesota's 87 counties.

**Roundabout.** The species found its way to Minnesota by a roundabout route. In January of 1940, a doctor named Edward Fleisher visited a pet store in Brooklyn, N.Y., and discovered a large cage with about 20 house finches for sale under the name of "Hollywood finches." He complained to the National Audubon Society, which pressured federal officials to crack down on the illegal trade. After a ban on sales went into effect that same year, New York dealers released some of the birds.

For the first few years, the birds made themselves at home on Long

Mary Losure, St. Paul, is a reporter for Minnesota Public Radio, where she covers environmental issues. Island, where people reported seeing them in the evergreens of old estates, and in tree and shrub plantations on nursery grounds. By the 1960s they had spread to Connecticut and to the southern counties of New York. By the early 1970s, they covered most of New England and were poised to enter the Midwest and the Deep South.

Birdwatchers in the path of the approaching house finches waited eagerly for the first sightings. An article in *Passenger Pigeon*, the Wisconsin bird club's magazine, predicted the house finch would "undoubtedly become a breeding species in the state and will help brighten our CBCs [Christmas Bird Counts]." It urged birdwatchers to "study all the field marks in your field guides, and let us do an excellent job of documenting the spread and population change in the House Finch in Wisconsin."

In Minnesota, *The Loon*, the magazine of the Minnesota Ornithologists' Union, documented every sighting, county by county. In letters sent to *The Loon*, birdwatchers across the state reported hearing finchlike calls they couldn't quite place, and seeing birds not quite like purple finches at their feeders.

Robert Janssen, president of the Minnesota Ornithologists' Union, calls the expansion of the house finch in Minnesota the biggest event in his birdwatching lifetime. "Prior to 1980, there was not a single house



House finches frequently visit cylindrical feeders, especially when perches are below the ports and more than an inch long. They will eat sunflower seeds, millet, cracked corn, peanuts, and bread.

finch in the state, as far as we know. Now they're in every town, at everybody's feeder." Janssen notes that other big changes in Minnesota's bird populations—the extinction of passenger pigeons, the declines of trumpeter swans and peregrine falcons, and the invasions of starlings and house sparrows—took 30, 40, 50, or even 100 years, much longer than the 15 years it took the house finch to spread throughout the state.

"We've had other species that had a natural but slow range expansion the cattle egret, for example," says Lee Pfannmuller, chief of the Section of Ecological Services for the Department of Natural Resources. "The house finch is in a class by itself. There's nothing in our generation that quite compares with its rapid spread."

**Benign Invaders.** Often a species that moves into a new territory displaces other species. The ecological havoc caused by invaders such as zebra mussels, sea lampreys, and purple loosestrife is well-known. The introduced house sparrow has hurt native species such as eastern bluebirds and purple martins by competing with them for nest sites.

"There is often a real fear about what new species can bring in," says Pfannmuller, "but not every change is an environmental catas-



A round head, smaller beak, and plain face (no eye patch or mustache) distinguish the female house finch from the female purple finch.

trophe." She says the house finch has not radically altered the environment; instead, it appears to be moving into human-created niches not occupied by other species.

In a 1993 report in the journal *The Birds of North America*, Geoffrey E. Hill sums up the main reason for the house finch's phenomenal spread—the relentless expansion of cities and suburbs. "Prior to colonization by Europeans, the entire eastern portion of the continent . . . provided unsuitable habitat (no nesting sites, too heavily wooded, too little water, etc.)," he writes. "The conversion of vast areas of forest, grassland, and desert into uniform areas of lawns, ornamental trees, and buildings created enor-

mous areas of ideal habitat for House Finches."

House finches are an appealing band of invaders. They're brightly colored and sing beautifully, with a high-pitched, melodious warble similar to the songs of purple finches or goldfinches. They nest picturesquely under awnings, on verandas, in the tops of ornamental evergreens, and in flowerpots. One of the first house finch nests Pfannmuller found in northern Minnesota was in the front porch light of a small church in Menahga. A report of one of the first nestings in the state, in Faribault in 1989, described a bird that built its nest in a hanging basket of tuberous begonias. Reports from other states describe birds nesting in parking garages and on the ivy-covered walls of a city water treatment plant, where the workers grew accustomed to seeing carloads of spectators with binoculars looking at the newly arrived birds.

House finches are not only quick to recognize new nesting opportunities, but they're also highly adaptable to extremes of hot and cold. In one study house finches captured in southern California and given six months to adjust to the climate in Colorado became just as cold hardy as Colorado house finches. House finches can also adapt to tropical climates. Introduced to Hawaii sometime before 1870, they are now widespread on

all the islands, where they are known as "papaya birds" for their fondness for that fruit.

Some bird lovers have complained that house finches muscle out other species at bird feeders—advertisements in bird magazines offer ways to "house finch proof" your feeder—but there's little evidence that house finches are hurting other bird populations. One 1983 study suggested increasing numbers of house finches on the East Coast might be the cause of a decline there in the population of the despised house sparrow, but (despite the hopes of some birdwatchers) further research did not confirm a link

**New Territory.** It's a good thing house finches don't seem to be a problem, because they have become one of the most common backyard birds in the nation. Not only have house finches spread westward from Long Island, they've also expanded eastward from their original range in the American West. Like the railroad builders who raced across the country and met in the middle to drive the golden spike, the two populations of house finches have now met each other in Kansas and Nebraska. The most recent map of house finch distribution in the United States shows a territory shaped roughly like an hourglass turned on its side, with the narrow part of the hourglass centered in the Midwest, and the wide ends on either coast.

Overall, the U.S. house finch population has been increasing by 4 percent a year since 1980. One limit to growth may be a bacterial infection that has spread from poultry to house finches. Scientists first noticed swollen, runny eyes and other symptoms caused by the bacterium in house finches in the eastern United States two years ago. Researchers have also confirmed the eye disease in goldfinches and in a downy woodpecker, but so far it has been much more widespread in house finches. Birdwatchers at feeders in the Atlantic Coast states have reported significant declines in house finch populations there; however, the disease has not spread to the center of the country, where the house finch continues to advance into new territory.

"They thrive wherever people feed the birds, which is everywhere," says Carrol Henderson, DNR Nongame Wildlife Program supervisor. The birds' territory will most likely expand through Montana and the Dakotas to the north, and the lower Mississippi River valley to the south.

As in Minnesota, people looking out their windows there may soon be reporting a bright red-breasted bird that nests in unlikely spots and gives a finchlike warbling call they can't quite place—sort of like a purple finch, but just a little different.

### A SENSE OF PLACE



# WAGON WHEEL

By Joel M. Vance

REAT SPORTING ART DOES NOT FEATURE A ruffed grouse hunter with one foot buried to the knee in a bog hole, the other painfully trapped by an alder fork, trying futilely to move a gun barrel six inches in any direction through a sprout thicket.

That, in my experience, describes Minnesota grouse hunting. Lyrical writers would rather deal with more scenic coverts. George Bird Evans writes about the splendid King Ruff, pointed by an immaculate Belton setter, in the rhododendron thickets of West Virginia. Burton Spiller took us to the golden aspens and old apple orchards of New England. Bob Abbett turns those magic words into paintings that make the hunter's heart beat faster.

Though it's relatively flat terrain, the Wagon Wheel

makes my heart beat faster too—with extreme exertion, the way a climber's heart is thumping at about 20 feet from the summit of K2.

Where is GBE, Spiller, or Abbett when I stumble through the Wagon Wheel, like someone trying to negotiate an obstacle course blindfolded at midnight? The only painting that could sum up the Wagon Wheel would be Edvard Munch's *The Scream*, or maybe some of the more lurid Gustave Doré illustrations for *Dante's Inferno*.

HE WAGON WHEEL IS 130 ACRES OF TYPICAL
Minnesota swamp, somewhere north of
Minneapolis, south of Duluth. Because it is my
discovery and my love, you could not drag its
precise location out of me with thumbscrews (although I am
open to generous bribes).

It is public land, in common with thousands of acres of taxforfeited land on the plat map of any north woods county. You can find your Wagon Wheel too if you look long enough.

The Wagon Wheel is at once an exercise in endurance and an always-productive hunting covert. I don't know of another spot that is so reliable. If I don't move grouse, there will be woodcock. Usually there are both.

The Wagon Wheel is shaped like your hand: a large area of upland from which fingers extend into an alder swamp. Woodcock filter onto the fingers that rise just above the water table. Grouse lurk on the back of the hand.

This covert is light years from those golden coverts of sporting art. The whole place is a sprawl of blowdowns, laced with tangles of alder, thickets of popple, and blackberry briars. You can go in one side of the Wagon Wheel looking like James Bond and come out the other side resembling Weary Willy.

My dogs exit the Wagon Wheel looking as if they'd been mud

wrestling with a Vikings middle line-backer. And they have a frazzled expression, as if they'd just attacked what they thought was the neighbor's cat, only to find it was Simba, king of the veldt.

"Where is GBE, Spiller, or Abbett when I stumble through the Wagon Wheel, like someone trying to negotiate an obstacle course blindfolded at midnight?"

My hunting buddies

and I named the place the Wagon Wheel because the adjacent landowner mounted his mailbox atop a wagon wheel, with a half-axle as the post. The landowner moved out several years ago, leaving a ramshackle house, which had been under construction for a dozen years but always seemed to be slipping back toward ruin. Apparently he took the wagon wheel with him when he left, which is understandable—it probably was worth more than anything he owned.

It takes about an hour to hunt the Wagon Wheel, more if you stop to catch your breath at the log by the Pine Ridge. Often there is a grouse near that log, so it almost surely is a drumming log. There is an open area in front of the log, typical of a drumming site.

Once I shot the probable drummer over a point by McGuffin du Calembour, my best friend. Guff brought the drummer to me, and we split an apple and he took a nap while I smoothed the bird's feathers and felt the regret I always feel with a warm, limp partridge in my hand.



OR SEVERAL YEARS I WANDERED BLINDLY IN THE Wagon Wheel, knowing that sooner or later I'd happen on an edge and figure out where I was. But the maze of fingers and the ever-present

swamp tricked me more than once. I'd find myself stranded on high ground—three inches above standing water—not knowing how I got there or how to get back with dry feet.

There are no landmarks in a Minnesota bog; it all looks the same. A truck on the distant highway is as good as a landmark in the Wagon Wheel. As long as traffic goes by, I know where north is, even if I can't get there except by wading.

Dozens of motorists pass the Wagon Wheel every day, and I doubt any know it is public land or that it holds grouse and woodcock. In 16 years I've never seen another hunter there. How could anything so public be so private?

I've flushed a low of one and a high of five grouse—not a super covert, but one worth working. As consistent as the grouse hunting is, it is the reliable presence of woodcock that brings my hunting buddies and me back year after year.

Some years they are resident birds, especially if the weather has been warm and they haven't been given a subarctic reason to move south. Other times, when the ground is hard from early frost, they'll be the vanguard of migrating woodcock.

Woodcock migrate singly, but often drop into a covert in bunches, a "fall" of woodcock. Then we'll find them on every little finger of the Wagon Wheel, every bog edge. Other times they'll be concentrated in only a spot or two. But always we find woodcock.

They're a wonderful bird for a dog, especially a wide-eyed youngster on his or her first trip into the brush. They hold tight, squatted to the ground immobile, relying on their mottled

Joel M. Vance is the author of many books on hunting and outdoor life, including Grandma and the Buck Deer (\$15 softcover); Brush, Bobs and Brittanies (\$22 hardcover); and Billy Barnstorm, The Birch Lake Bomber, a collection of short stories (\$17 tape). They are available autographed and postpaid from Cedar Glade Press, Box 1664, Jefferson City, MO 65102; or call 573-782-4490.

forest-duff coloring to hide them. Woodcock depend more on their camouflage than on flight. In fact, a woodcock is supposed to be the slowest bird of all in the air.

But they must be among the quickest to spring into

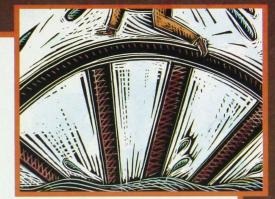
action. I've spied a woodcock on the ground, then the next instant it was eye-level and climbing, gone off the ground so fast my eye couldn't register it.

In the sprawl of the Wagon Wheel, woodcock shooting is at its best. None of the open-woods shooting of a Bob Abbett painting. Here, the birds dart among the alders like bats in an insect swarm.

Once as I tried to follow such a jinker with my gun barrel, the barrel tangled in the alder whips and the stock cracked me so hard alongside the head that I saw stars. Wagon Wheel hunting can be more injurious to hunter than hunted.

I hunt far more scenic grouse coverts, but each year I look forward to the first hunt in the Wagon Wheel. It also is the first hunt of the season after many months of not hunting. The Wagon Wheel will be hot and tangled with clinging fern. I will take my shots, if any, through a screen of alder and aspen leaves. I'll forget a water bottle and will be tempted to crouch by the dog and lap from the same bog hole when thirst grows incessant.

Then I'll stop by that drumming log on the far side where it is quiet and I am at peace with my dog and the day. No one will chance by to disturb me. I can think or not think, my choice. Usually I don't think—other than to sense that this is a moment all too fleeting, all too soon gone.  $\square$ 





### **Double in Size and Number**

ONE AFTERNOON THIS PAST MAY, while fly-fishing a small stream near Preston in southeastern Minnesota, I plucked first one and then another chubby 13-inch brown trout from a slot of deep, blue water running past an old submerged wood bridge piling. A few hundred yards farther upstream, I cast my heavily weighted mayfly nymph imitation into a log-jammed pool and watched my floating line drift, pause, then dart beneath the surface. I raised my rod and felt it throb. Five minutes later I unhooked and released the largest brown of my life-a thick-bodied trout just over 17 inches long.

Superb angling skill? I certainly thought so. Over the past several years, my fishing buddies and I

have been catching more and bigger trout in southeastern Minnesota something we chalked up to having finally mastered the mystery of trout fishing with a fly.

But when Bill Thorn, DNR fisheries research biologist at Lake City, recently evaluated 27 years of surveys of southeastern trout streams, he learned good fishing in those streams probably has had more to do with increasing numbers of large trout than with angling technique.

Though Thorn and other DNR biologists have known that trout numbers in many streams have improved during the past two decades, until recently they had never taken the time and trouble to paint an overall picture of the

Brown trout in southeastern Minnesota streams are bigger and more plentiful than they have been in years, according to a recent examination of survey records. The reasons for improvement: in-stream habitat improvement and better land-use practices.



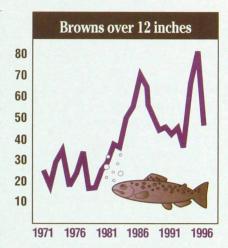
SCOTT RIPLEY

regionwide changes in trout abundance. From 1970 to 1996, fisheries biologists had taken 2,400 fish surveys at various locations on 114 different southeastern trout streams. (Fisheries crews use electric probes to stun the fish, which float to the surface. The fish are netted, aged, measured, then released.) But the information was piecemeal, showing only how certain portions of streams fared over certain periods of time.

Earlier this year, Thorn compiled those data. After two months of thumbing though yellowing folders, entering old hand-written records on his computer, then crunching the numbers, Thorn verified what many trout anglers have seen throughout the 1990s—southeastern streams are producing more and bigger trout.

Specifically, Thorn found that total pounds of fish per acre of stream more than doubled during the past two decades, from an average of less than 50 pounds in the 1970s to more than 100 in the '90s. Trout size went up too: The average number of browns more than 12 inches long increased from 26 per stream mile in the 1970s to 55 in the '90s.

"Though the number of browns 15 inches and longer stayed about the same, we saw a huge increase in the number of fish from 12 to 14 inches," says Thorn.



The last 15 years have seen a dramatic increase in the average number of brown trout longer than 12 inches per mile of stream in southeastern Minnesota.

Thorn admits that his evaluation has some statistical shortcomings. Fisheries workers didn't always sample trout populations from the same streams during the 27-year period, nor did they sample the same stream sections from year to year. Such variations create what scientists call noisy data.

But according to Charles Anderson, who heads the DNR cold-water research program, the sheer number of surveys reviewed reduced any possible bias from the choice of sampling sites and averaged out discrepancies caused by imprecise data. "In this case, the signal comes through loud and clear," Anderson says.

The signal says more and bigger trout, but it doesn't explain why the

### **FIELD NOTES**

populations are faring so well. Thorn says no one knows for certain, but he suggests several strong possibilities:

- More in-stream trout habitat improvements. Installed by DNR staff and Trout Unlimited members, these include underwater structures that create shady hiding places where fish can escape predators—including anglers—and grow larger.
- More water flow. Improved farming practices over the past 50 years keep more rainfall on the land to percolate down to aquifers that fuel the springs that feed trout waters.
- More catch-and-release. On some streams, anglers are releasing 75 percent of the fish they catch. "We don't know for certain how much this improves trout populations, but we assume it's helping," says Thorn.

What does all this mean to Minnesota trout anglers? First, we are living in what could be a golden age of trout fishing in the southeastern part of the state. Second, efforts to improve living conditions for trout seem to be paying off. And third, we can't take all the credit for the large fish we catch these days.

—Tom Dickson DNR information officer

# Foresters Prepare for Moth Wars

THE GYPSY MOTH IS THE MOST SERIOUS exotic threat to Minnesota's forest ecosystems today. Because this hardwood-defoliating insect is likely to become established in the state during the next five to 10 years, the DNR and state and federal departments of agriculture are introducing various natural controls, including parasites purposely introduced by humans and an insect-killing fungus that is also spreading naturally.

The Minnesota Legislature has been funding efforts to rear and introduce several species of insect parasites into forests. The Minnesota Department of Agriculture's Biological Control Program has released two species of non-stinging wasps at dozens of locations around eastern Minnesota. These parasites have established themselves on native caterpillars and now await the arrival of gypsy moth caterpillars.

A past introduction of an insect-killing fungus, *Entomophaga maimaga*, in Boston has recently gained renewed attention in the war against gypsy moths. First introduced in 1910 to control gypsy moth caterpillars, this Japanese fungus was regarded as a failure until 1984 when USDA workers released it in several eastern states.

The fungus spread rapidly into many areas infested by moths. During a major gypsy moth outbreak in Michigan in 1996, the fungus infected caterpillars, and the moth population showed significant signs of collapse. As of mid-June 1997, neither the fungus nor the moth had reappeared in Michigan.

Minnesota's best defense against gypsy moths continues to be keeping the pest out of the state. Most of this effort centers on detecting the presence of the moths. Foresters set sex pheromone—baited traps to attract male moths and thus locate infestations. Then they treat infested spots with the bacterial

insecticide B.t. to eradicate the pest.

Two activities increase the risk of gypsy moth invasion. First, shipments of nursery stock into the state could bring egg masses. To deal with that threat, a federal-state quarantine program inspects and treats stock from infested areas. Second, the moths could hitch a ride into Minnesota on recreational vehicles. With infestations now in Door County and other northeastern Wisconsin counties, Minnesotans need to carefully inspect their cars and RVs for larvae or egg masses after spending as little as a single night in an infested area.

—Tom Eiber, DNR forest ecosystem health specialist

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### An Enticing Guide to Minnesota

*Minnesota.* Greg Breining. Oakland, Calif.: Compass American Guides. 1997. 345 pp. Softcover: \$18.95.

If you enjoy discovering new places in Minnesota or learning more about favorite destinations, your travel pack should include *Minnesota*, a new guidebook researched and written by Greg Breining, a St. Paul free-lance writer

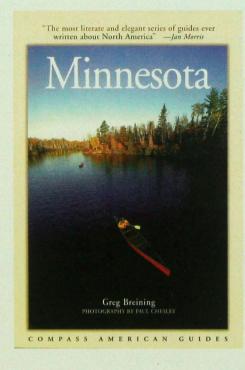
who also serves as managing editor of *The Minnesota Volunteer*.

Minnesota entices readers with an attractive cover, excellent maps, dozens of historical photos and artwork, and a variety of color photographs—from scenes, such as an aerial view of Voyageurs National Park, to portraits, such as a girl hugging a cow at the State Fair. These photos

were taken by Red Wing native Paul Chesley, a free-lancer who travels the world on assignment for the National Geographic Society.

The guidebook organizes the state into seven areas, defined primarily by their natural and geological features: Prairie Path (southwest and northwest), Southeastern Hills, St. Croix River, North Shore and the Arrowhead, Glacial Lakes, Northern Reaches (Red Lake and Lake of the Woods), and the Twin Cities. The book's organization and index make it easy to skip around to places of interest to you.

History buffs will relish Breining's offering of details about each region's past, as well as his explanations of



how history influences the character of each region today. The author also tells compelling stories, such as one about a 14-year-old who scrambled to the surface of the Milford Mine as a lake inundated it in 1924, entombing 41 miners in Minnesota's worst mining disaster.

Volunteer readers and other outdoors enthusiasts will appreciate Breining's bent toward nature and wildlife. He highlights natural areas, refuges, and other wildlife-watching spots and identifies species that might be observed there. State parks and bike trails are also well-covered.

Plus, *Minnesota* has a nice literary lean to it. Breining offers several literary extracts, such as pieces from Sinclair Lewis and Patricia Hampl, as well as quotations from authors ranging from Mark Twain to Louise Erdrich.

The book's emphasis on history and nature comes at the expense of the arts. You won't find out about Bemidji's fine summer theater or the art center in Lanesboro. Although the Guthrie gets a nod, you'd have no idea the Twin Cities area is noted for its theater. On the other hand, the guide has a two-page spread on the Twin Cities jazz, rock, and blues music scene.

Minnesota seems geared to adult travel. Though it mentions many

places of interest to kids, such as the Laura Ingalls Wilder museum in Walnut Grove, it doesn't make a point of noting places kids would particularly enjoy. Families traveling down Highway 61 along the Mississippi River, for instance, will have to find the L.A.R.K. Toys hand-carved carousel in Lake City and Winona's water slide on their own.

Also, before heading out on the road, travelers will want to check other travel information resources if they're looking for places to stay or eat. This guidebook includes a minimal listing of lodging and restaurants.

Nevertheless, whether selectively browsing or reading from cover to cover, Minnesotans will come away from this book knowing a lot more about their state, and most likely, eager to go explore it.

As the author's notes explain, Breining "has lived in Minnesota his whole damn life," and his personal remarks scattered throughout the book give you the sense that he is fondly sharing his home state with you. What other guidebook author tells you where his own house is?

Look for *Minnesota* in bookstores, or call the publisher at 800-733-3000.

—JOAN HUMMEL Minnesota Office of Tourism

# Thank you, Volunteer supporters!

We offer our sincere appreciation to everyone who has given to the *Volunteer* during the past fiscal year, July 1, 1996, through June 30, 1997. The following supporters sent gifts of \$50 or more in May and June 1997.

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# EVENTS

#### SEPTEMBER

- Fall leaf line, 612-296-5029 in Twin Cities, 800-657-3700.
- Autumn boat tours, Voyageurs National Park, International Falls, 218-875-2111.
- ◆ Lake Itasca tours aboard *Chester Charles*, call 218-732-5318 or Itasca State Park.
- 13 Deer archery opener.
- 13 Electrofishing demonstration, Whitewater State Park, Altura.
- 19–21 Watercolor and photography workshops, Wolf Ridge Environmental Learning Center, Finland, 800-523-2733.
- 20-21 Take a Kid Hunting Weekend.
  - 22 Equinox evening campfire, Heron Lake Environmental Learning Center,
    Lakefield, 507-662-5064.
  - 27 Fall festival, Minnesota Landscape Arboretum, Chanhassen, 612-443-2460.
- 27–28 Prairie seed collecting, October weekends, Wild River State Park, Center City.

### **OCTOBER**

- 12 Volksmarch, 12-kilometer hike, Fort Snelling State Park, St. Paul.
- 12–18 National Wildlife Refuge Week, events at Minnesota refuges, 612-725-3924.
- 17–19 Duluth birding weekend, Minnesota Ornithologists' Union, 218-525-6930.
  - 18 Prairie Conservation Day, volunteer work, Sibley State Park, New London.

#### NOVEMBER

- 2 Swan-watch bus trip with naturalist, Winona, 507-452-2272.
- 8, 15 Snowshoe building, two-session workshop, reserve kit by Nov. 1, Jay Cooke State Park, Carlton, 218-384-4610.



Oct. 1, the 1998 annual state park vehicle permit sticker goes on sale. Designed by local artist Scott Fadness, it features Lake Bemidji State Park and inhabitants.

If you have a question about subscribing to the Volunteer, call **612-296-0888**. E-mail: sue.ryan@dnr.state.mn.us.

For other DNR questions: DNR Information Center 500 Lafayette Road St. Paul, MN 55155-4040

E-mail: info@dnr.state.mn.us. Phone: **612-296-6157**. Toll-free in state: **800-766-6000**. TTY (hearing impaired): 612-296-5484 or toll-free in state 800-657-3929.

To reserve state park campsites or lodging, call **612-922-2200** or toll-free **800-246-2267**. TTY: 612-890-2883 or toll-free in state 800-334-7413.

# Parting thoughts

### **Hunters Could Face Unseen Threat**



G. ALAN NELSON

IN FALL 1995 A MINNESOTA HUNTER LEFT HIS DEER shack and returned home early because he thought he had the flu. Feeling better, he returned to the cabin with a hunting buddy the following weekend. During the night the second hunter awakened feeling dizzy and nauseated. He stepped outside to get some air. When he went back inside, he discovered his friend was dead. Both men had suffered carbon monoxide poisoning from an improperly vented heating stove.

Each year carbon monoxide poisoning most likely affects hundreds of people in Minnesota. A few cases result in fatalities; most cases go unreported. Hunters, anglers, and campers seem particularly susceptible because they use heating or cooking devices in small spaces. The devices typically burn natural fuels—wood, propane, kerosene—which produce carbon monoxide during combustion. In a small space without adequate ventilation, the colorless, odorless, tasteless gas can build to toxic levels.

The Minnesota Carbon Monoxide Task Force offers this advice:

- Install carbon monoxide detectors in your cabin, camper, and fish house
- Hire a qualified technician to do annual maintenance of fuel-burning appliances
- Check fireplace for debris, open the damper, and make sure the flue works before starting a fire
  - Never use a charcoal grill in a confined space
- Open a window or door to ensure ventilation when using a fuel-burning lamp or space heater.

To learn more, call 612-885-0338.

-GOV. ARNE CARLSON

From the
Algonquin,
meaning
"retreat"

Tettegouche is one of eight Minnesota state parks along Lake Superior. The rugged terrain of this 9,000acre North Shore highland preserve seesaws from scenic ridges to deep gorges of the cascading Baptism River. Wandering foot trails bring hikers through young paper birch and aspen, cedar wetlands, mature sugar maple, and remnant old-growth pine. Within the park, accessible only by a three-mile hike, a camp of restored cabins hides among the white pines on the pristine shores of Micmac Lake.



Do you have a question about your subscription? Call Sue Ryan, 612-296-0888.

### Cool, Clear Water

Can we keep Twin Cities metro trout streams wild despite suburban building booms? See story on page 8. Photograph by Richard Hamilton Smith.