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Communications Planning and Story Clips

Minnesota Conservation Volunteer meets annually with division leadership teams to develop stories for upcoming issues. Attached are two examples of story assignments I drafted following an October 2017 meeting with Fish and Wildlife's Division Management Team.

Other examples of my involvement in communications planning is evident in stories I have written. As part of the Public Lands Education Project Communications Plan, the magazine was asked to develop stories that highlight the value of public lands. Attached are two stories I wrote last year as part of that effort.

The first attached story shows the five main types of public land that the DNR administers: Wildlife Management Areas, Aquatic Management Areas, Scientific and Natural Areas, State Forests, and State Parks. To write this story, I worked with various divisions to identify users of these public lands who have a personal connection to a property. The goal was to show how public lands contribute to our quality of life in Minnesota by featuring the ways different people recreate on and enjoy various state-administered public lands.

The second story is the result of a commissioner's office request to provide information about the Strategic Land Asset Management program ahead of the 2018 legislative session. The goal was to convey how the Department of Natural Resources is striving to develop better relationships with county governments by taking a more comprehensive and qualitative approach to the acquisition and sale of public land.

To give you a better picture of the range of my writing, I've attached three additional fish and wildlife related stories.

View or download a PDF of this entire interview packet at mikallok.github.io/cv/faw.pdf

Story assignments drafted following annual meeting with DNR Fish and Wildlife:

1.) *Minnesota Conservation Volunteer* is pleased to commission you to write a story of 1,800 words about waterfowl banding and tracking. Your story is scheduled for the Sep.–Oct. 2018 issue and is due by May 15, 2018.

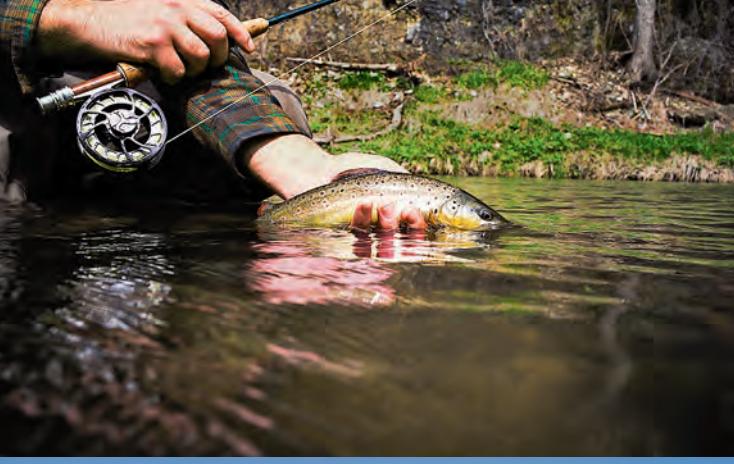
As many as 10,000 waterfowl are banded in Minnesota each year, and, until recently, most banding was conducted in northwestern Minnesota. In 2013 banding efforts were expanded to other regions of the state. These efforts are focused on mallards and wood ducks. These species are popular among waterfowl hunters, and they are ducks that Minnesotans are most likely to regularly see. Banding data provides information on where the bird was banded and where it was recovered or harvested. Alongside this new banding effort, mallards are being outfitted with telemetry units that will hopefully provide insight into mallards' habitat use, their movements, and other information that is not available from banding.

For this story, interview waterfowl researcher Bruce Davis to help readers better understand why this banding and telemetry research is being conducted and what researchers are learning. Reach out to other waterfowl experts to provide context for readers on how long banding has been going on in the state and explain why banding is important for managing waterfowl species. As part of your narrative, consider weaving in personal experiences you may have had with waterfowl bands as a hunter.

2.) *Minnesota Conservation Volunteer* is pleased to commission you to write a story of 1,800 words on the problem of small sunfish in many Minnesota lakes. Your story is scheduled for the Jan.–Feb. 2019 issue and is due by Sept. 15, 2018.

Regardless of age or ability, sunfish, particularly bluegill, are an important fish for Minnesota anglers. However, decades of liberal bag limits and a continuous season have led to overharvest and an overall decrease in size structure of bluegill in many lakes. On some lakes, concerns over small sunfish have led to reduced daily bag limits. These experimental regulations have generally improved or stabilized sunfish size. Your story will explore how changing sunfish bag limits statewide could improve fishing opportunities. You should also provide some historical background on panfish regulations and explore how attitudes may be changing among anglers in support of reduced bag limits.

Wherever possible, weave in your own experience as an angler who enjoys catching large bluegills. Perhaps your narrative could describe the experience of catching large bluegills through the ice of an unnamed, hard-to-reach or unpressured lake. This might give you the opportunity to delve into the biology of how overharvest affects a lake's bluegill size structure. Talk to fisheries biologists who are part of the panfish technical committee to help explain why researchers believe reducing how many bluegill anglers can keep will improve bluegill size structure. To support your discussion of changing angler attitudes, you may also consider reaching out to well-known anglers who have been proponents of reducing the bag limit on panfish.



ACRES for ALL of US

Minnesota's
public lands
and **waters**
are as diverse
as the reasons
we love them.

Minnesota's state parks, state forests, wildlife management areas, aquatic management areas, and scientific and natural areas provide an abundance of opportunities for outdoor recreation and enjoyment.



by Michael A. Kallok

Photography
by Mike Dvorak



Long before

Tom Landwehr became commissioner of the Department of Natural Resources, he discovered Carlos Avery Wildlife Management Area. He remembers being astonished.

"I thought I must be doing something illegal," recalls Landwehr of his first hunt at the 25,000-acre metro-area WMA. "It just opened my eyes to the reality that there is an abundance of public land. When I started working for the DNR in the late '80s, I became much more aware of the opportunities that are out there."

More than 20 percent of Minnesota's lands belong to all of us—12 million acres to hunt, fish, camp, hike, watch wildlife, explore, and enjoy. Of these lands, 2.8 million acres are tax-forfeited lands owned by the state but managed by counties, and an additional 5.6 million acres are administered by the DNR. These DNR lands include state forests, wildlife management areas, state parks,

An oak is silhouetted in the afternoon sun on the edge of a brushland in the Snake River State Forest. Trout streams, such as the Middle Branch of the Whitewater River (right), flow through five southeastern Minnesota state parks.

scientific and natural areas, and aquatic management areas.

The DNR provides opportunities to enjoy the state's public lands and waters by maintaining 1,700 public water accesses, 75 state parks and recreation areas, and thousands of miles of bicycle, snowmobile, off-highway vehicle, and ski trails. "And we do it with 4,000 people," says Landwehr. "It's a great testament to their work."

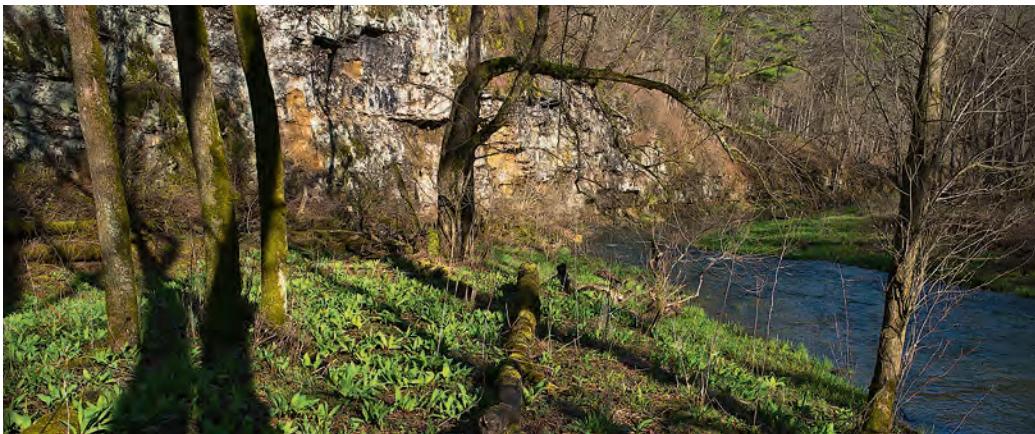
While these properties are a primary focus of Landwehr's job, public lands remain central to his life outside of work. In a typical year, Landwehr's hunting, angling, camping, wild-rice gathering, and bicycle riding take him to every corner of the state. "I'd rather be outdoors almost any day, but I don't own any land," he says. "So when I recreate, it's typically on public lands and public waters."

Minnesota has more public land than any other state in the Upper Midwest, approximately 1½ acres for every resident.

"We can't all have a cabin up north. We can't all have a back 40. As we look to the future, the population is continuing to grow, and public lands will become even more important," says Landwehr. "This is really something that belongs to all of us. It adds tremendously to our quality of life."

An annual fishing trip to Forestville State Park during trout opener has made the southeastern Minnesota park a favorite destination of Landwehr's. "The South Branch of the Root River goes through there. It's beautiful country with good trout fishing. There are some phenomenal geologic features. Occasionally we find some morel mushrooms, and there are wild turkeys up on the hills gobbling. It's a magical spot."

Minnesota's wild public places are part of our collective identity. What would up-north be without a place to launch a boat or a forest to wander? Oftentimes, these wild places, where memories are made and friendships are forged, become part of our personal identity too.





Birding Ambassador

Western Minnesota's wildlife management areas are popular with pheasant hunters such as Ken Larson. In October, he might be found wandering any of them with his German shorthaired pointers. But for one weekend every April, Larson's attention is focused on the

770-acre Salt Lake WMA and the 150 species of birds that can be seen there.

Larson leads an annual trip to the WMA for the Minnesota Ornithologists' Union. The event draws birders to the state's largest alkaline lake, which straddles the South Dakota border. This 300-

Wildlife management areas are popular with hunters, but every April birders gather at the Salt Lake Wildlife Management Area for a chance to spot bird species that aren't commonly seen in other parts of the state.

acre body of water is about one-third as salty as the ocean. It supports dense mats of sago pondweed, a favorite food for waterfowl, and abundant aquatic invertebrate populations, which attract a diverse assembly of shorebirds.

"During migration we get all these dif-

ferent birds coming through that you don't usually get to see further east and some birds that you don't get to see further west," says Larson, noting this as one reason Audubon has designated the WMA as an Important Bird Area.

Birders have been visiting the lake and



Ken Larson (top) talks about his connection to Salt Lake Wildlife Management Area. He leads an annual outing to the WMA with members of the Minnesota Ornithologists' Union. A viewing platform (above) provides a vantage point for spotting uncommon waterfowl such as eared grebes and elegant shorebirds including American avocets. Minnesota has 1.3 million acres of wildlife management areas.

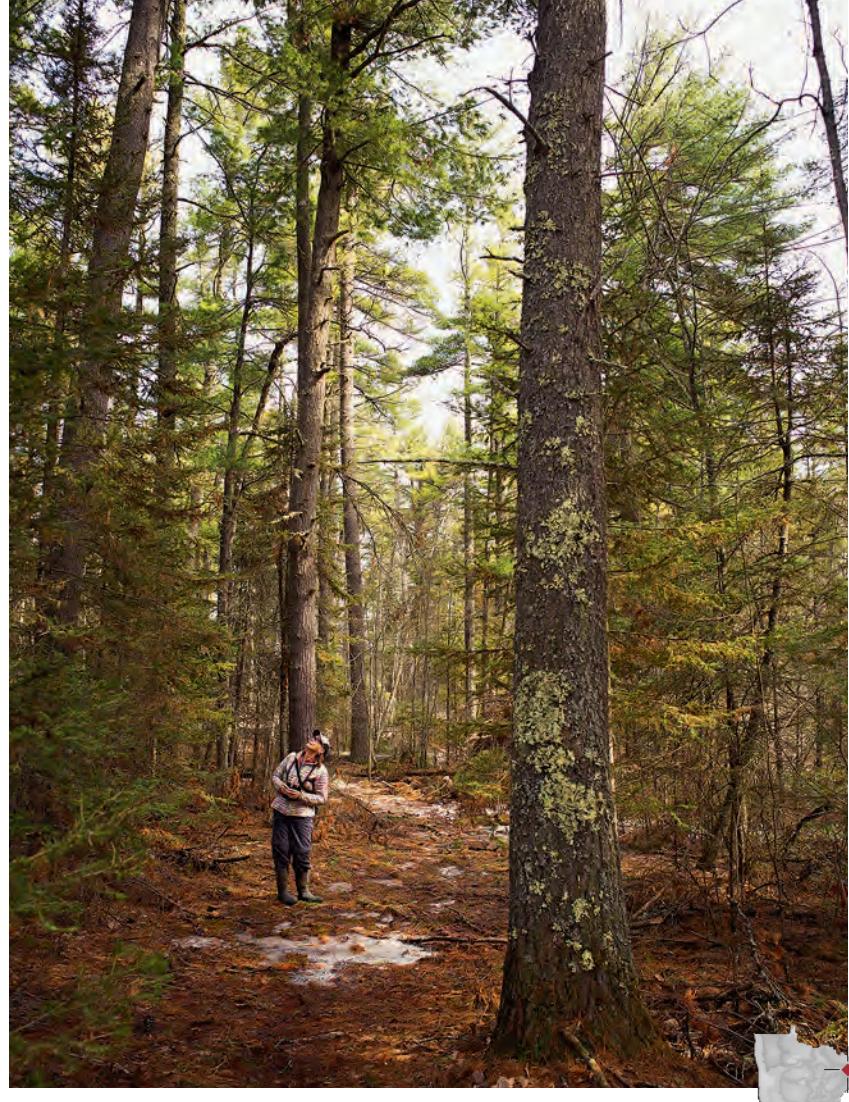
surrounding areas during spring migration since the early 1900s, thanks to pioneer bird bander Mae Peterson. She was friends with luminary naturalists and conservationists Thomas Sadler Roberts and Walter Breckenridge. She also happened to live next door to Larson's father, Goodman, who grew up in nearby Madison.

"She was my dad's mentor and gave my dad his first bird book," says Larson, who adds that exposure to these influential people inspired his father to become a U.S. Fish and Wildlife Service biologist.

By the 1950s Salt Lake had become a destination for birders, but the land surrounding it was private. In 1962 the MOU formed a committee to ask the Minnesota Department of Natural Resources to consider ways to protect Salt Lake. In 1973, the DNR purchased 300 acres surrounding the lake. Later, an additional 480 acres were added to the WMA. Much of the credit for these eventual acquisitions goes to Walter Breckenridge and Larson's father, who assured the local sportsman's club that hunting would still be allowed on Salt Lake.

In 1974 the MOU hosted its first weekend bird count at Salt Lake and the surrounding area. The event regularly draws more than 100 people and serves to reinforce the value of preserving some wild places in a region of the state dominated by agriculture.

"There is no Disneyland prairie," says Larson. "This is it."



Old-Growth Guardian

Kawishiwi Pines Scientific and Natural Area includes a 29-acre knob of land crowned by white pines that sprouted after a forest fire in 1854. This SNA near Ely

is surrounded by black spruce bog, sedge meadows, and wetlands, which means that winter, when these soggy areas turn solid, is the best time to visit.

Norma Malinowski pauses to listen to the song of a winter wren at the Kawishiwi Pines SNA.



A white pine (above) that has been growing since before the Civil War towers over birch and balsam fir in the Kawishiwi Pines SNA. Volunteer Norma Malinowski (right) is a proponent of the state's SNA lands, which protect 191,000 acres of unique habitats and the rare species they often harbor.

Those cold months are the only time SNA site steward Norma Malinowski expects any company among the towering pines. The SNA is a highlight for guests of nearby Wintergreen Dogsled Lodge, says owner Paul Schurke. He estimates that he and his wife, Susan, bring several hundred people to the pines on skis or by dogsled each winter.

"I've never seen anyone outside of the winter season back in the SNA," says Malinowski, who has visited more than 75 times since 2006, when she volun-

teered to keep an eye on the place.

She monitors the site for any illegal activity, such as ATV traffic. She also searches for any invasive species and walks the 80-acre border of the SNA once a year to make sure the signs are in good shape. A more enjoyable part of her role is documenting the SNA's plants and animals. While the old-growth pines might be the main attraction, Malinowski has helped confirm more than 50 species of native plants on her visits to the SNA, including green adder's mouth and stemless

lady's-slipper. Her observations have also contributed to the list of 44 bird species recorded at the SNA. Warblers, such as the black-throated green, magnolia, Nashville, and Blackburnian, are highlights of spring and summer. Black-backed woodpeckers are year-round residents, and evidence of wolves and moose often turns up.

Malinowski, who retired as a recreation planner for the U.S. Army Corps of Engineers in 2007, appreciates the way the SNA program works to protect areas around the state with sensitive plant and animal

communities. "Someone had to do it," she says of her decision to be Kawishiwi Pines' site steward, adding that the difficult-to-reach SNA also happened to be the one closest to her home. She checks in on the pines most months of the year.

"When I volunteered, I agreed to visit the SNA once a month," says Malinowski, who has an ambitious goal to visit all 166 of the state's SNAs. When conditions prevent her from getting to the pines, "I'll go to another SNA and report there. It's easy to come up with 12."





State-Park Trout Tradition

April 15, 2017, marked 50 consecutive years of trout openers in southeastern Minnesota for Erik Wrede. Many of those cherished weekends have been enjoyed in Whitewater State Park near Elba, says Wrede, who traces his love

of southeastern Minnesota's trout to his grandfather, who often took Wrede and his father fishing.

Wrede remembers arriving at his grandfather's house near Zumbrota as a young child. "The first thing he would say



Lukas Wrede (foreground) and his father, Erik Wrede, fly-fish for trout on the Middle Branch of the Whitewater River, just upstream from the group camp at Whitewater State Park.

is, 'When are we going fishing?' And we'd head over to the leaf pile to dig worms."

For many years, the annual gathering was a small family affair, and Whitewater State Park's main campground was often home base for Minnesota's trout

opener. Eight years ago, Wrede and his wife, Maria, began encouraging their son, Lukas, and daughter, Talia, to invite their friends and their friends' families. They began reserving the Whitewater State Park group camp. In 2016



The Wrede family: Lukas, Talia, Erik, and Maria (above) host a camping trip for friends and family during trout opening weekend at Whitewater State Park's group camp. Healthy brown trout (right) swim nearby in the Middle Branch of the Whitewater River. Minnesota has 232,000 acres of state parks and recreation areas.

more than 80 people joined the Wrede family tradition at the camp, which is nestled along the Middle Branch of the Whitewater River. Steep, pine-covered 200-foot-high dolomite bluffs rise up from the river, allowing visitors a close-up look at southeastern Minnesota's dramatic landscape.

"The whole idea was to invite kids and families that were new to outdoor recreation," says Wrede. "A lot of them have fished before but had not tried fly-fishing."

While fishing is optional, Wrede organizes fly-casting and fly-fishing instruction for anyone who is interested.

And new traditions arrive at the Wrede family opener with new friends. Four years ago, a friend started cooking paella, a communal Spanish dish. Rice, chicken, seafood, and a few trout go into the Wrede's opening-weekend version.

Wrede's desire to share these experiences speaks to his deep connection to this place. In 2016 he lost both of his parents. The 2017 opener had a different feel, says Wrede. "I was driving into the park with Lukas. It was still light out," he says. "We crossed the bridge on the way to the visitors' center, and I could see the place where my dad caught his last trout. The emotion just nailed me."





Backcountry Close To Home

Erik Jensen didn't grow up in a hunting family, but he began tagging along on hunting trips with high school friends and hunted casually after graduation. It wasn't until he was 30 that, with some help from a mentor, he harvested his first deer.

"That's really when I started," says Jensen. "My hunting activity escalated for deer and other big game." Then, in 2008, Jensen and his hunting partner Rita Juran drew a hard-to-get moose tag for a zone in the Boundary Waters Canoe Area Wilderness. They didn't bag a moose, but the experience changed his perspective. "The whole experience of pursuing a big animal in vast terrain really pulled me into public land hunting," says Jensen.

He looked to western states and began applying for elk, antelope, and deer tags. He got involved with the public-land advocacy organization Backcountry Hunters and Anglers and

Paula and Erik Jensen haul hunting and camping gear deep into the Snake River State Forest on the eve of Minnesota's firearms deer opener.



Paula and Erik Jensen pass their camping and hunting gear through a gate (top) and begin their hike (above) into a nonmotorized area of the Snake River State Forest. Jensen says public land deer hunters can find deer if they are willing to walk farther than other hunters. Hunters, hikers, wildlife watchers, and campers have access to millions of acres of forest land within Minnesota's 59 state forests.

helped found a Minnesota chapter in 2011. As his experience with planning for multi-day backcountry hunts grew, he began looking closer to home for ways to replicate the experience during Minnesota's deer season.

Jensen set his sights on the Snake River State Forest, just north of Mora. This 9,600-acre forest is bisected by the Snake River and is largely off limits to

ATVs. It's also just over an hour from the Twin Cities.

Five years ago during bowhunting season, he and Juran hiked 3 miles into the forest and set up a tent and woodstove, just like they would on a Montana elk-hunting trip. "One area where we camped in late October, there were scrapes everywhere. We were laying down one night falling asleep, and this deer walked up

and smelled the tent and just started snorting at us," Jensen recalls. "We heard coyotes right after the deer snorted, so it was interesting to be reminded that we weren't the only predators out there."

For the last two years, Jensen and his wife, Paula, have set up camp deep in the Snake River State Forest during the firearms deer season. It's not your typical deer camp, but eating fresh venison ten-

derloins cooked over a campfire while looking up at the stars is the payoff for hiking farther than most other hunters.

"For people who are willing to do the work, there are some great deer hunting opportunities on public land," says Jensen. "Once in a while, you have some competition, but the nice thing is that once you do get to know a big swath of public land, you can just walk up to the next spot."





Ray Vlasak (left) visits an aquatic management area on Bad Medicine Lake in Becker County. Vlasak and the Bad Medicine Lake Area Foundation have been instrumental in acquiring low-lying properties as the water rose on this lake that has no outlets. The lake has been returning to normal levels since the extended drought of the 1930s. This AMA (above) and seven others on Bad Medicine Lake provide public access and important habitat for fish.



Preserving Sky-Blue Waters

The vista looking south from the north end of Becker County's Bad Medicine Lake was a backdrop for the 1950s advertising campaign that touted Hamm's as the beer "from the land of sky-blue waters." Bad Medicine's waters remain stunningly clear, but this narrow, steep-banked lake looks much different than it did 70 years ago because the lake level has been rising since the end of the Dust Bowl in the 1930s.

Bad Medicine Lake is a closed-basin lake, explains Ray Vlasak, who first visited this 800-acre water body near Park Rapids in 1940. "It has no inlets or outlets, so the water changes pretty dramatically at times," says Vlasak. After many trips to Bad Medicine, he purchased a resort on the lake with his parents in 1973.

He and other people who had bought properties on the lake did not know it had a closed basin. Some cabins were completely flooded during an exceptionally wet period that began in the late 1990s. Lake levels peaked in 2002 at 6½ feet above the high-water mark.

The rising water presented both a problem and an opportunity. Bad Medicine Lake's average depth is 45 feet, and until the lake returned to its normal water level, shallow-water habitat that's important for fish species such as smallmouth bass, panfish, northern pike, and walleye was in short supply.

Vlasak, Tim Holzkamm, and three other lakeshore owners founded the Bad Medicine Lake Area Foundation in 2004

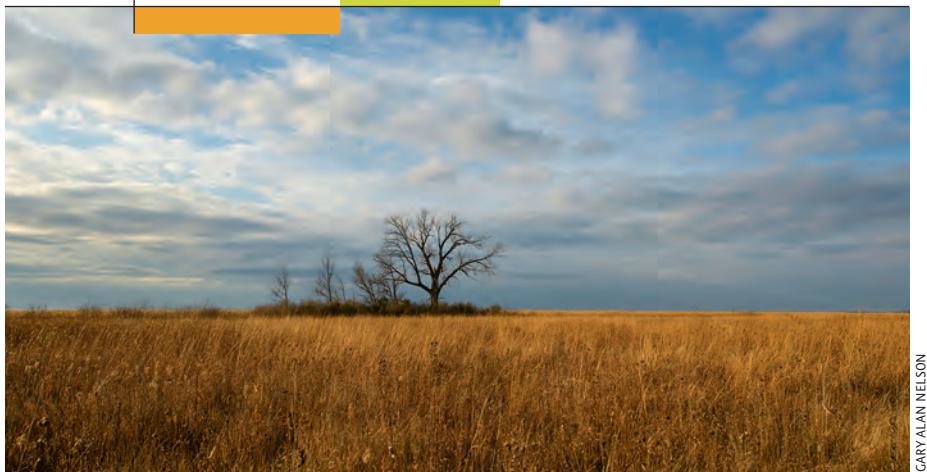
Rising lake levels have transformed some AMAs on Bad Medicine Lake from peninsulas into islands. Some 700 AMAs have been established on waters around the state.

to help purchase affected land parcels. Dave Wiest, who purchased property on the lake in 1995, joined the foundation shortly after its inception. The three of them speak in superlatives about Bad Medicine Lake: “clearest, most beautiful, most scenic.”

Between 2004 and 2012 the foundation, in collaboration with the West Central Initiative and the Minnesota Department of Natural Resources, worked to preserve Bad Medicine’s sky-blue waters by acquiring eight parcels now better suited for fish habitat than homes. These lands were purchased with \$160,000 in donations from lake-shore owners, matching grants from the Reinvest in Minnesota Program, nearly \$300,000 from the Outdoor Heritage Fund, and a generous donation from a private family foundation. Today these properties, which include 30 acres of land and 9,000 feet of shoreline on Bad Medicine Lake, are managed by the DNR as aquatic management areas.

Statewide, 45,000 acres of land are designated as AMAs, which protect critical near-shore and shoreline habitat on the state’s lakes and rivers. These public lands also provide access to walk-in anglers or anyone looking for a place to simply enjoy a view of the water. 





GARY ALAN NELSON

A 160-acre addition to the Rothsay Wildlife Management Area conserves land in the state's prairie region.

A New Plan for Managing Lands

THE DEPARTMENT OF NATURAL RESOURCES administers 5.7 million acres of public lands. It's a massive undertaking that is conducted by the divisions of forestry, fish and wildlife, ecological and water resources, and parks and trails. Managing this portfolio requires the buying and selling of lands that serve many functions, from conserving rare species or habitats to providing economic and recreational opportunities.

In 2008, the Clean Water, Land and Legacy Amendment provided an infusion of cash for the acquisition of public lands, and in 2013 the agency launched the Strategic Land Asset Management Program. This framework is designed to better manage DNR land assets. It has also brought more coordination between divisions, counties, and DNR partners, such as Pheasants Forever and The Nature Conservancy, says Trina Zieman,

who oversees the program. Under the plan, she says, all acquisitions are closely examined through the lens of six goals. The land will:

- ❖ Protect natural resources, particularly rare species, sensitive groundwater resources, or rare habitats
- ❖ Conserve prairie grassland habitat or native prairie
- ❖ Consolidate land ownership to create larger, contiguous plots of land, or the property is within an area already managed by the DNR
- ❖ Improve access to existing landholdings
- ❖ Increase recreation opportunities within 30 miles of any population center over 50,000 people, or the land is located in a county with less than 5 percent public land
- ❖ Help trust lands generate income for public schools and the University of Minnesota.

A recent 160-acre addition to the Rothsay Wildlife Management Area, for example, meets five of these goals. Great plains toads and prairie chickens, both state species of special concern, have been documented on the property, according to Fergus Falls area wildlife manager Don Schultz. The parcel, which was acquired by the DNR as a donation from the Fergus Falls Fish & Game Club, is located in the state's prairie region, where conserving habitat is one of the most critical environmental challenges facing Minnesota. The land has temporary wetlands for nesting waterfowl and cover for ground-nesting birds, says Schultz, who notes the addition "is adjacent to land we already own, and it provides better access to the existing WMA." Finally, the property will increase opportunities for outdoor recreation in Wilkin County, where only 2 percent of land is public.

The DNR is also redoubling its efforts to work with counties, which sometimes express concerns about public land effects on the local tax base. "We're reaching out to the counties for every acquisition," says Zieman. That outreach includes informing counties of payment in lieu of taxes, or PILT—money that counties and other local taxing districts receive from the state to compensate them for the loss of tax revenue.

Another important aspect of the Strategic Land Asset Management Program is to identify state lands that are not serving an important public purpose, then selling those lands and reinvesting the proceeds into more strategic landholdings. A primary focus of land sales are isolated lands that lack adequate public access, and lands that counties have identified as important for local economic development. In many cases, land exchanges can help to consolidate lands, creating management efficiencies for state and county land managers.

"Public lands provide many services, including clean air and water, outdoor recreation and tourism, and the timber, gravel, and mineral resources that drive economic development statewide," says Zieman.

Michael A. Kallok, associate editor

Golden-winged warbler
MICHAEL FURTMAN

BREEDING BIRD ATLAS ONLINE

The most comprehensive guide to birds that nest in Minnesota is now online. The Minnesota Breeding Bird Atlas is the culmination of years of planning and nearly a decade of work. The interactive atlas offers in-depth information on the status and distribution of the 249 bird species documented in Minnesota during five summer seasons.

From 2009 to 2013, survey staff members, nearly 700 volunteers, and organizations including the Minnesota Department of Natural Resources gathered more than 1 million bird observations. A snapshot of the state's breeding birds, the atlas also highlights changes in the populations of many species based on historical accounts that stretch back as far as the 1800s. Find it at mnbirdatlas.org.

A Whopper of a recovery

*Once nearly extirpated from the state,
Minnesota's largest fish species continues to
stage an impressive comeback.*

The lake sturgeon is a lumbering giant that makes a living grazing on aquatic invertebrates and mollusks with its tubelike mouth, which protrudes from beneath its nose. With five ridges of armored plates and gray, leathery skin, *Acipenser fulvescens* is a relic of the dinosaur age. Measured from the tip of its bullet-shaped head to its shark-like tail, an adult lake sturgeon can exceed 7 feet and weigh 100 pounds or more.

Lake sturgeon are to Minnesota's rivers what bison once were to the Great Plains. In the Lake of the Woods region, lake sturgeon provided a reliable source of sustenance for the Ojibwe who lived

Former DNR assistant area fisheries supervisor Anna Varian hoists an adult lake sturgeon during annual spring tagging on the St. Louis River near Duluth.

by Michael A. Kallok

Photography by Deborah Rose





This massive lake sturgeon was pulled from Lake of the Woods in the late 1800s.

along the Rainy River. Because of this abundance, early Europeans regarded these Ojibwe as difficult trading partners. But, just as wanton slaughter extirpated bison from the state, overfishing, dams, and pollution nearly wiped out Minnesota's lake sturgeon.

By the early 1900s these prehistoric fish were extirpated from the Red River of the North as well as the St. Louis River and the western basin of Lake Superior. The last known native-born lake sturgeon from the upper Minnesota River watershed washed up on the shores of Big Stone Lake in 1938.

But sturgeon recovery work by the Department of Natural Resources in cooperation with neighboring states and tribal and federal resource agencies has achieved some remarkable successes. Thanks to careful fishing regulations, dam removal, and cleaner water, Minnesota's largest fish is returning to waters around the state.

Lake of the Woods Turnaround.

In the early 1800s, commercial fishermen killed lake sturgeon simply because they got caught in nets set for walleye, whitefish, and other species. They tossed sturgeon on shore to rot or dried and piled them up like logs to fuel the furnaces of steamships.

The perception of lake sturgeon among commercial fishermen changed in 1855 when a caviar-producing plant opened in Sandusky, Ohio, creating a market for the fish roe. Lake sturgeon

Mark Paulson and Jeremy Pinkerton net sturgeon (right) as an electronic charge is sent through the water to temporarily stun the fish. Pinkerton (bottom) transfers a sturgeon to shore to be measured, weighed, and tagged.

harvest topped 1 million pounds a year at the south end of Lake of the Woods during the late 1800s. In addition to the roe, fish processors began selling sturgeon meat, skin for leather, and isinglass—a gelatinous substance in its swim bladder—for clarifying wine and beer. Over a few decades, the Lake of the Woods sturgeon population dwindled to the point where a commercial fishery ceased to exist.

When commercial fishing ended there, sturgeon populations did not bounce back quickly for several reasons. These slow-growing fish don't reach sexual maturity until about age 20, and may spawn as seldom as once every five years. Recovery of the diminished sturgeon population was also thwarted by pollution. Effluent from paper mills had covered prime spawning areas in the Rainy River. Were it not for the Clean Water Act of 1972, lake sturgeon would have likely disappeared from this border water between the United States and Canada. Regulations forced mills to clean up their act. Cleaner water and careful fishing regulations have allowed for a robust recovery of lake sturgeon in the Rainy River and Lake of the Woods.

St. Louis River Saga. In the St. Louis River and the western basin of Lake Superior, commercial fishing and pollution brought about the demise of lake stur-



geon by about 1900. But in 1979 the Western Lake Superior Sanitary District began treating domestic and industrial wastewater before it entered the river. By the early 1980s, water quality had improved enough to attempt restoring lake sturgeon.

The first sturgeon were reared from eggs taken from Wisconsin's Wolf River in the Lake Michigan watershed. Later, eggs came from a Lake Superior strain of sturgeon. Between 1983 and 2001, a total of 142,000 fingerlings and 728,000 sturgeon fry were released into the St. Louis River. Adult fish were first observed in likely spawning areas in 2007. The DNR began collaborating with Minnesota Power to control flows at the Fond du Lac dam during spring spawning. In 2009 boulders were added below the dam to restore 800 feet of spawning habitat, thanks to a partnership of the DNR, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service, and The Nature Conservancy.

Today resource managers from Minnesota, Wisconsin, the U.S. Fish and Wildlife Service, and the Fond du Lac band continue to gather evidence that this fish population is doing well. Fish are captured via electrofishing each spring when the river's water temperature reaches 50 degrees and adult fish move upstream to spawn. Sturgeon are measured, weighed, and inspected for tags. A piece of fin is also gathered for genetic testing. A small electronic tag is implanted via syringe in each untagged sturgeon, and the fish is released. If researchers catch the fish again, they will scan the tag. This monitoring has shown good growth rates, with some

Anna Varian sutures an incision (right) after implanting an acoustic transmitter tag in a St. Louis River sturgeon. Molly Wick (bottom), a habitat coordinator for the Wisconsin Department of Natural Resources, prepares to release the tagged fish.

stocked sturgeon exceeding 60 inches.

DNR fisheries biologists also implanted acoustic transmitters in 45 sturgeon captured in the St. Louis River in spring 2016. Another 40 sturgeon will receive them in 2017. The transmitters, which have a battery life of about 10 years, track sturgeon movement by sending out signals that are picked up by receivers in the river and in the estuary near Duluth.

"With that technology we can better evaluate the use of the estuary as well as specific habitat areas that might be important," says DNR area supervisor Deserae Hendrickson.

Still, more evidence of successful spawning must be gathered to determine if the river and its population of stocked fish are healthy enough to establish a naturally reproducing population. "Within the last few years, we've seen only the occasional naturally reproduced fish," says Hendrickson, who hopes test nets will show more young sturgeon in the next five to 10 years.

Waters That Flow North. In the Red River of the North watershed, overfishing and the construction of dams led to extirpation of lake sturgeon. But since the 1990s, seven of the eight dams in the U.S. portion of the river have been removed or converted into sloping rapids—providing fish passage and spawning habitat for reintroduced lake sturgeon. The DNR



is working with the U.S. Army Corps of Engineers to convert the last U.S. dam near Drayton, North Dakota, into rock rapids, according to the DNR's Henry Drewes, who supervises northwestern Minnesota's fisheries.

The last remaining dam on the Red River is near Lockport, Manitoba. Drewes says, "To date, we have restored over 400 miles of river as a free-flowing stream in the state of Minnesota."

Dam removal and modification on the main stem of the Red River and similar projects on tributaries opened the way for reintroduction of sturgeon. Beginning in 1997, the DNR trapped juvenile sturgeon from the Rainy River and relocated them to the Red River. Be-

The author briefly holds a lake sturgeon fingerling before it is released into Big Stone Lake.

cause both rivers are part of the Hudson Bay drainage, the Rainy fish were the closest genetic match, says Drewes.

In 1999, with help from the U.S. Fish and Wildlife Service, the DNR began purchasing sturgeon eggs from the Rainy River First Nations. DNR hatcheries in Detroit Lakes and the Genoa National Fish Hatchery near La Crosse, Wisconsin, typically raise the sturgeon to fingerling stage before stocking. The DNR and the White Earth and Red Lake Indian nations have released more than 2.6 million sturgeon in the Red River, five tributaries, and seven lakes within the watershed.



Otter Tail Lake, historically home to sturgeon, is one of those lakes. Just downstream, connected via the Otter Tail River, is Deer Lake, where Dave Thompson has owned a resort for 27 years. About a decade ago, he says, his guests began catching sturgeon incidentally

at one of the lake's better walleye spots.

Thompson was concerned that guests might run afoul of the law if a conservation officer suspected they were intentionally hooking sturgeon. Until recently it was illegal to target sturgeon anywhere other than the Rainy River and the St. Croix Riv-

St. Croix River Sturgeon Swim On

It's likely that good water quality helped prevent lake sturgeon from being extirpated in the St. Croix River after European settlement. But rafts of timber floating down the St. Croix River during the logging boom in the 1800s and early 1900s may have also made exploiting lake sturgeon difficult, according to DNR fisheries specialist Joel Stiras.

Whatever combination of

DNR fisheries specialist Joel Stiras and Wisconsin DNR fisheries technician Laura Schmidt insert a scannable transponder tag into a St. Croix River lake sturgeon.



factors allowed lake sturgeon to hang on in the St. Croix River, the fish began to receive modest legal protection beginning in 1920 with a Minnesota law that required sturgeon less than 15 pounds to be released. In 1947 the Department of Conservation enacted a daily limit of one sturgeon 30 inches or longer. As decades passed the minimum length for harvest increased, but one sturgeon a day was allowed until 1992, when the creel limit changed to one fish over 50 inches per year during a special fall season. In 2009 the limit was changed to one sturgeon over 60 inches.

Today the lower St. Croix River's sturgeon population is estimated at more than 5,000 fish, based on recapture data from 635 sturgeon tagged by fisheries researchers between 2003 and 2014. The fishery is especially popular with the expanded catch-and-release fishing opportunities, says Stiras, who receives reports from anglers when they catch a tagged fish.

"Some anglers are catching [and releasing] 30 or more sturgeon in a trip," he notes. "Most of the time they are smaller when they catch a lot, but fish over 40 inches are common." And every year it seems some lucky angler hauls in a sturgeon that weighs 100 pounds or more. "We had a biologist sample one like that in the spring of 2015 that was 79 inches long and estimated at 125 pounds," says Stiras.

Population estimates based on tagging are complicated by the fact that lake sturgeon can move great distances, says Stiras. In 2013 the DNR began implanting acoustic transmitters in lake sturgeon in the St. Croix and Mississippi rivers to see where the fish go and when. "We have seen a fair amount of movement between the St. Croix and Mississippi rivers," says Stiras.

er below Taylors Falls. That restriction was lifted, due in part to Thompson's initiative, notes Drewes. He says the resort owner's questions helped advance formal discussions about a statewide catch-and-release season for sturgeon.

In 2014 a fishing regulation change allowed anglers to practice catch-and-release fishing for sturgeon. Special regulations allow some sturgeon harvest on the Rainy River and the lower St. Croix River, but all fishing for sturgeon is prohibited in Minnesota between April 15 and June 15 to protect spawning fish. The new regulations allow for 10 months of catch-and-release fishing for sturgeon statewide. This change is "an acknowledgement that we have made significant progress in restoring the species in multiple watersheds across the state," says Drewes.

For Thompson the recovery effort has been a rewarding journey. In the early 2000s, he helped stock some fingerlings in Otter Tail Lake. "When I asked how many years it would be before we'd start catching them, I was told, 'Oh you won't be able to catch any in your lifetime,'" he recalls. "Now we're catching fish that are over 50 inches long. This is a phenomenal success story."

Return to Minnesota Headwaters. In fall 2014 Norm Haukos retired as DNR area fisheries supervisor in Ortonville, but he hopes the legacy of his work will be swimming in Big Stone Lake long after he's gone. Haukos grew up here near the shore of this 26-mile-long lake on the Minnesota-South Dakota border. As a kid he saw old photographs of giant stur-

geon that had been caught in Big Stone Lake, headwaters of the Minnesota River. He wondered if they could ever return. But when he started working as the Ortonville area fisheries supervisor in 2001, Big Stone Lake was too turbid to reintroduce sturgeon.

Work in the early 1980s by the Upper Minnesota Watershed District had set the stage for improved water clarity by modifying the dam at the Whetstone River to reduce the amount of silt flowing into the lake. The district and the Roberts Conservation District in South Dakota along with Citizens for Big Stone Lake told lakeshore residents about ways to reduce phosphorous pollution. The two districts and the lake association also collaborated to help farmers upgrade feed-lots and implement practices to reduce soil erosion. Those efforts, in addition to restored wetlands in the watershed and bank stabilization projects, helped to improve the lake's water quality.

Around 2005 "we started seeing more vegetation in the lake," says Haukos. "Water clarity improved, and it got to the point where we thought maybe we could reintroduce sturgeon."

Haukos said other dam removals downstream of the headwaters made a sturgeon reintroduction more likely to be successful. "We realized that if there were going to be sturgeon in the headwaters, there are going to be sturgeon downstream," he says. Some of the dams have been converted into sloping rapids that



DNR fisheries technician Jeff Malzahn releases lake sturgeon fingerlings at a public access on Big Stone Lake. Studies conducted in Wisconsin suggest about 20 percent of stocked sturgeon fingerlings will reach adulthood.

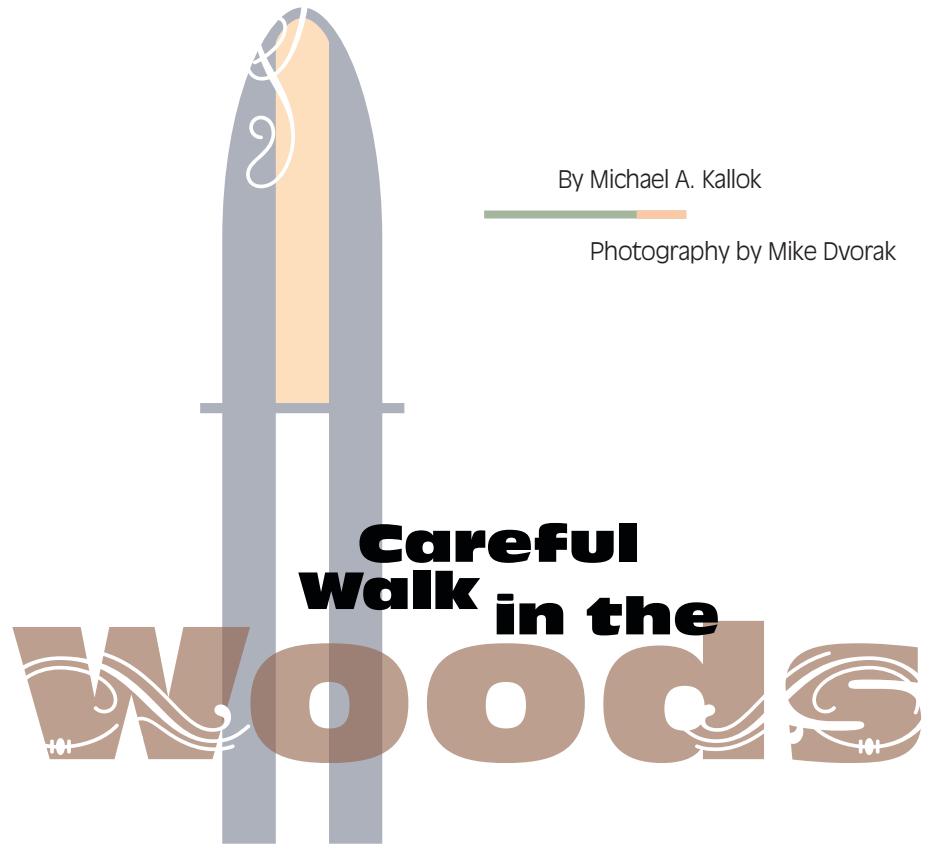
allow fish passage and provide swift water and clean gravel, which sturgeon need to spawn. “The removal of the dam at Minnesota Falls and the removal of the dams on the Pomme de Terre and Lac qui Parle rivers increased the amount of sturgeon spawning habitat that was out there.”

The reintroduction is a collaboration between the Minnesota DNR and South Dakota Game, Fish and Parks. In 2014 the first stocking included 6,500 sturgeon fingerlings. The stocked sturgeon are the progeny of fish that spawn in the Wisconsin River, which, like the Minnesota River, is a tributary of the Mississippi. These fish, reared by the U.S. Fish and Wildlife Service, were the closest genetic match to the sturgeon that once swam in the Minnesota River, explains Haukos.

South Dakota and Minnesota contributed another 7,500 fingerlings in 2015, and 3,600 were released in 2016. In fall 2016, DNR fisheries specialist B.J. Bauer reported that DNR biologists caught 12 sturgeon in test nets. He noted the fish ranged from 17 inches to 24 inches and seemed healthy.

“The initial goal is that we would see 30-inch fish within five years. To have growth like that already, we’ll easily do it,” says 62-year-old Haukos. “I’ve still got time to catch a big one.” V





By Michael A. Kallok

Photography by Mike Dvorak

Careful Walk in the Woods

A hunter
discovers
the simple pleasures
of pursuing and
eating squirrels.

John Ny Vang heads into the woods during a
late-September squirrel hunt.





M

John Ny Vang, Mike Thompson, Tong Vang, and the author look at a satellite view of property boundaries on a smartphone before heading into the woods.

Vfirst squirrel hunt happened ordinarily enough. Fresh out of firearms safety class, my cousin and I headed to an oak grove behind his family's farm and managed to drop four plump gray squirrels. We delivered our quarry, skinned with help from his grandpa, to my aunt's kitchen, where my interest in squirrel hunting evaporated as quickly as a drop of water in the hot skillet she used to fry them. But last season, after a 25-year truce with bushy-tailed, tree-dwelling game, I had the good fortune to find a flavorful reintroduction.

John Ny Vang, like many of Minnesota's 20,000 Southeast Asian-American hunters, is enthusiastic about squir-

rels. In his professional life, he runs a business that provides Hmong translators throughout Ramsey County. At home John is known for cooking wild-game dishes. So when I asked if he'd take me squirrel hunting, I also asked if he'd cook me dinner.

"Sure," John responded, adding one caveat: "If you want to make sure we have squirrels to eat, find some private land for us to hunt on."

So I called Mike Thompson, a grain farmer near Oronoco. I'd met him a few years ago when I hunted Canada geese on his property. He said his woods were crawling with squirrels and that we were welcome to help him get rid of a few.

Squirrel season was more than a month away, but John was giddy when I gave him the news. We set a date for the last Saturday in September. Our hunting party would include John's son Yeleng, his brother Seng, and his friend Tong Vang, a liaison to Southeast Asian hunters for the Department of Natural Resources.

For me, the opportunity to hunt and share a meal with John and his family held the promise of a new cultural and culinary experience. For John, the prospect of a limit of squirrels and an introduction to a landowner was just as exciting.

On the day of our hunt, we meet before dawn in St. Paul and caravan down U.S. Highway 52. With abundant oak and walnut trees, southeastern Minnesota is a natural

destination for squirrel hunters. John tells me the steep hills and lush valleys of this region are reminiscent of home for many Hmong, an ethnic minority from the highlands of Laos, Vietnam, Thailand, and China.

Like other Hmong families who began immigrating to America in 1976, John's family was granted asylum for allegiance to the United States during the Central Intelligence Agency-backed secret war in Laos.

John was 14 when his family arrived in Minnesota. A few years later, he began hunting with his father and uncle for deer and squirrels.

The sun is just making its way into a cloudless sky when we pull into Mike Thompson's driveway. After introductions, Mike shows us the road to a thick belt of hardwood trees on the edge of a field where his land tilts down to the Zumbro River. We can hunt there, provided we stay roughly between the north and south boundaries of the two 80-acre bean fields on top of the river valley.

Before Mike goes back to harvesting soybeans, Tong presents him with a traditional Hmong knife as a token of gratitude. Mike thanks Tong for the knife and wishes us all luck.

We drive down a field road, park near the edge of the woods, uncase our .22 rifles, and feed shiny brass shells into them. Yeleng and Seng decide to angle south into the valley. Tong heads to the north, and I follow John due west into the middle of the woods.

My eyes have barely adjusted to the shade of the canopy of oak, maple, ash, and elm when the crack of a .22 rings out to our left. Moments later we hear a rifle report from the other direction. Nearby, the raspy bark of a gray squirrel causes John to hold up a hand as a signal for me to stop. I wait while he walks



Tong Vang presents landowner Mike Thompson with a traditional Hmong hunting knife as a token of gratitude for permission to hunt squirrels on his property.

slowly, pausing often on his way up the side of the small ravine we've been following. I see him raise his rifle, then rustling leaves on the other side of the ravine draw my attention.

Just above a limestone outcrop, a large fox squirrel alternates between crouching on the ground and sitting on its haunches. I hear a shot from John's rifle but keep the fox squirrel in my sights. It hops forward, flicks its tail several times, and freezes. I readjust, notice my heart pounding hard, and squeeze the trigger. By the time I cross the ravine, the squirrel is no longer moving. I pick it up by the tail, surprised by its heft and the beauty of its russet color in the morning sun.

I walk back toward John. He has unslung his backpack, and I hoist the big fox squirrel so he can see it.

"Hey, you hit one," he says as he pulls out a plastic bag for my squirrel, which he stows in his pack next to the gray squirrel he has just taken from the limb of a stately oak. "Nothing to it, right? Squirrel hunting is just a careful walk in the woods."

In other parts of the country, squirrel hunting is a big deal. Arkansas hosts the World Championship Squirrel Cook Off. In parts of Lou-



Squirrel calls are optional equipment. Tong Vang uses a commercially made call, which imitates the distress call of a young squirrel. The noise brings adult squirrels out of hiding to investigate.

isiana, the start of squirrel season is holiday enough to close schools for a day or two. But in Minnesota, squirrels are more likely to be regarded as backyard pests.

So I ask John, "Why is squirrel hunting so popular among Southeast Asians?"

His answer is straightforward: Squirrel hunting doesn't require a lot of equipment; it's not complicated; and it provides enough action for young hunters to stay engaged while they learn the fundamentals.

Of course, says John, "We like the

way they taste. It's not something Hmong people want to eat every day. But it is a special treat."

We stand silently, straining our ears. A gust of wind rakes the treetops, and I watch a trickle of bright yellow aspen leaves flutter down. A squirrel scampering across the dry duff breaks the spell, and we move toward it.

My gun doesn't have a scope, and my aim has proven lousy since my first shot of the day, so I let John shoot for a while. He tells me it's one of the best days he's had in recent memory.

Fox and gray squirrels both count toward Minnesota's daily bag limit of seven. John bags one more, and with the addition of my lone

fox squirrel, John is carrying a limit. Squirrels are less active midday, so we make our way out of the woods.

It's almost noon, and it feels close to 80 degrees in the unfiltered sunlight on the edge of the field. Yeleng, Seng, and Tong are shuffling back too. John reaches into a cooler in the back of his truck and doles out neatly folded brown lunch bags. Inside each one is a piece of boiled chicken and a ball of sticky white rice.

After lunch, we empty the backpacks onto the ground and count 24 squirrels. Because Yeleng and Seng are the youngest, they are responsible, according to Hmong custom, for cleaning the squirrels. John and Tong head back to the woods in hopes of filling the limit for the group.

I stay with Yeleng and Seng, who are now slitting squirrel bellies and removing entrails. Nothing goes to waste. Resourcefulness, I learn, is a virtue in Hmong culture. This explains why, instead of skinning the squirrels, Yeleng and Seng ignite propane torches and begin meticulously burning all the fur off the squirrels. The task takes two hours, long enough for John and Tong to return with four more squirrels.

I wonder out loud how such an acrid smell affects the flavor of the meat.

"You won't taste it at all," John says. "You'll see."

University diplomas earned by John's eight children cover an entire living room wall in his comfortable



Yeleng Vang takes aim at a squirrel from a limestone outcrop in the Zumbro River valley.



Yeleng Vang bags another fox squirrel—Minnesota's largest tree squirrel. Both fox and gray squirrels count toward the state's daily limit of seven.

split-level home in Forest Lake. When we arrive, his wife, Pa V Lee, and oldest son, Tou-sue, are busy preparing ingredients.

John plans to make two dishes. The first on the menu is a minced-meat salad called *laab*, or *larb* (pronounced *lahp*), the national dish of Laos and a common menu item at Thai restaurants. But you can't buy John's rendition of the popular dish. His version uses finely chipped, broiled squirrel instead of ground beef and slices of boiled squirrel skin in place

of beef tripe. Other ingredients, mostly from his garden, include green onions, cilantro, Thai chilies, Thai basil, and lemon grass. To this, John adds lime juice, spices, and finely ground, dry brown rice.

The other dish, *nasncuav haus* (pronounced *NAH-juh-wah how*), is a traditional Hmong preparation. "Squirrel stew in English," says John, as he wipes black char off

the singed squirrels in a tub of cold water. He then adds the quartered squirrels to a pot of simmering water, lemon grass, jalapeños, ginger, Thai eggplant, chilies, and basil, cilantro, and salt.

While we wait for the food to cook, John explains that in Hmong culture if you take something from the woods, it's only right to use every part of the animal. "We believe that if we do the right things," he says, "our ancestors who watch over us will bless us with luck."

Before long, two squirrel dishes flank a bowl of sticky rice in the center of the table. Each setting has small dishes with thinly sliced Thai chilies floating in fish oil. It's time to eat. John demonstrates how to grab a chunk of sticky rice and press it into the *laab*, which he's spooned onto his plate. I follow his lead, dipping the rice and minced-meat salad into fish oil, then take my first bite. It's savory and spicy with a hint of sour and not a trace of gaminess. In short, it's amazing, and soon I'm ready for a second helping.

John encourages me to try the stew. Without all the spice, this dish retains the distinctive gamey flavor of squirrel. The meat is tender, though, and the skin, which has the texture of calamari, is not unpleasant.

Comparing this hunt with my usual upland bird hunting pursuits, I am taken by the simplicity of our day in the woods and



A portrait of John Ny Vang's father hangs above the dining table.

New Hunting Heritage

John Ny Vang's father commanded 1,200 Hmong men who disrupted North Vietnamese supply lines during the Vietnam War and rescued U.S. pilots shot down behind enemy lines. When the United States withdrew all support for this unofficial conflict in 1975, the Communist Pathet Lao government waged genocide against the Hmong people in retaliation for their collaboration with U.S. forces. John's family escaped to Thailand and spent five years in a refugee camp before finding passage to America in 1980.

Like other Hmong hunters, John and his family were drawn to the rolling hardwood hills of the Whitewater Wildlife Management Area. Because of the focused hunting pressure on the limited public lands in this region of the state, bagging squirrels can often prove difficult. Yet, according to John, knocking on a stranger's door to ask permission to hunt is out of the question for many Southeast Asian-American hunters.

"What happened in Wisconsin set everything back," he says, referring to the 2004 murder of six white hunters by a Hmong hunter who was trespassing.

Three years after the Wisconsin tragedy, John helped found the St. Paul-based Capital Sportsmen Chapter of Minnesota Deer Hunters Association in an effort to bridge the divide between Southeast Asian hunters and the state's largely white hunting establishment. He also heads up the newly formed Asian Outdoor Heritage group, which represents the interests of Southeast Asian-American hunters and anglers.



the fine meal in front of me. I tell John I'd hunt squirrels again, provided he'd do the cooking. We agree to find time next season, but my reintroduction to squirrel hunting was not yet complete.

"I think you need to try a squirrel brain," says Yeleng.

"It's a delicacy," John assures me.

So, with a bit of instruction, I pluck out a small, gray morsel from the head of a squirrel. Its texture is soft and dense like a dumpling, and the taste is not unlike the rest of the stew.

"Not bad," I say casually, under the quizzical gazes of everyone at the table.

"Eat your heart out, Andrew Zimmern," says John to everyone's ap- proving laughs. "That's how we do it."

I take a sip of melon-infused water. It's bland but strangely refreshing and cools the sting of the Thai chilies.

Looking above the table at a large portrait of John's father, dressed in a white military uniform, I wonder briefly if he would find my presence odd. Then my mind wanders back to the last time I ate squirrel. I think of my aunt who prepared it for me. She passed away more than a decade ago. To this day, my mother believes the sight of a northern cardinal is a sign that her twin sister is checking on her. With the day's events still bright in my mind, the notion that our ancestors watch over us and bring us luck no longer feels foreign. V

John Ny Vang (opposite page) ladles quartered, skin-on squirrels into a simmering broth of fresh herbs and vegetables. A squirrel that has been singed and washed in cold water (below) is ready to be cut up and added to the stew. John's version of laab, a popular Southeast Asian minced-meat salad (bottom), uses broiled squirrel meat and thinly sliced squirrel skin.



By Michael A. Kallok

Changing Waters

One of the state's most famous fishing destinations is low on young walleye. Fisheries biologists are exploring why.

IT'S HOT INSIDE the cramped Department of Natural Resources lab room in Aitkin. The odor of putrefied fish is thick enough to cut with a fillet knife, but the smell doesn't bother fisheries specialist Brian Beyerl. "The batteries in the air freshener died a month ago," he says while squinting at a tiny, scythe-shaped bone he tweezed from bile-colored goo inside a dissected walleye stomach. The bone, called a cleithrum, can be used to identify the species of fish it once belonged to, and this one has him stumped at the moment.

"You want to call it an unknown?" asks DNR fisheries biologist Tyler Ahrenstorff. He's teasing Beyerl, who reminds Ahrenstorff that he doesn't give up easily. Intern Michael McMahon knows the routine and hands Beyerl a ring-bound stack of laminated cleithrum images. After a minute of close comparison, Beyerl determines the bone belongs to a burbot. This native cold-water species is no longer common in the waters where this fish became a meal. Ahrenstorff records the unusual find next to a more common prey item, which was

Fisheries specialist Brian Beyerl cuts open the stomach of a walleye as part of a two-year study of the diets of walleye, northern pike, and smallmouth bass in Mille Lacs Lake.

DEBORAH ROSE, DNR





A walleye is removed from a gill net in Isle Bay for a two-year study into the diets of Mille Lacs Lake's predators.

less digested and easy to recognize as a perch.

The burbot, the perch, and the walleye that ate them came from the southeastern corner of Mille Lacs Lake, where we had spent a July morning using gill nets to haul in northern pike, smallmouth bass, and walleye. The work was part of a two-year study examining the diets of these three species—the most abundant predators in the 132,500-acre lake in central Minnesota. The research, led by Ahrenstorff, was prompted by a troubling trend: Plenty of walleye hatch in Mille Lacs each spring, but not enough survive to adulthood. Why? Are they being eaten?

In October, after sorting through the stomach contents of some 3,000 walleye, 1,000 northern pike, and 500 smallmouth bass, Ahrenstorff found that the lake's three main predators do consume a share of the lake's juvenile walleye. However, he says, "It is not the only, and perhaps not even the most important, factor influencing the survival of young walleye." Changes—such as clearer water, in-

vasive species, and a warming climate—may be affecting Mille Lacs Lake's ability to sustain as many walleye as it once did.

Popular Catch. In the communities that surround Mille Lacs, the economic importance of walleye is hard to miss. The town of Isle has a walleye painted on the water tower. A walleye is printed on the flag of the local newspaper. A statue of the state fish watches over Main Street. Hang around long enough and you'll discover the jargon of fisheries biologists is part of the local vernacular. At cafes and bars, resorts and boat ramps, one might hear talk of *year-classes* and *recruitment*.

Year-class refers to all the walleye that hatched during a particular spring. If a walleye survives three years in Mille Lacs, it will have grown to a length of roughly 13 inches. At that size, natural mortality from predation sharply declines, and the fish is considered recruited into the population.

When a lot of walleye hatch, it's considered

good reproduction. If a high percentage of those walleye survive to age 3, a good year-class has been recruited. When several good year-classes are present, the result is a surplus of fish. In a perfect world, people enjoy some of that surplus, and enough is left to replace what has been depleted from other year-classes. But Mille Lacs is big and complex. Just a two-hour drive from the Twin Cities, Mille Lacs also attracts a lot of anglers, and its walleye are always in high demand. During an average year, state-licensed anglers collectively spend more than 3 million hours trying to hook walleye. During peak years, some 500,000 pounds of this species end up in frying pans. In 1992 anglers hauled a record 1.2 million pounds of walleye from Mille Lacs.

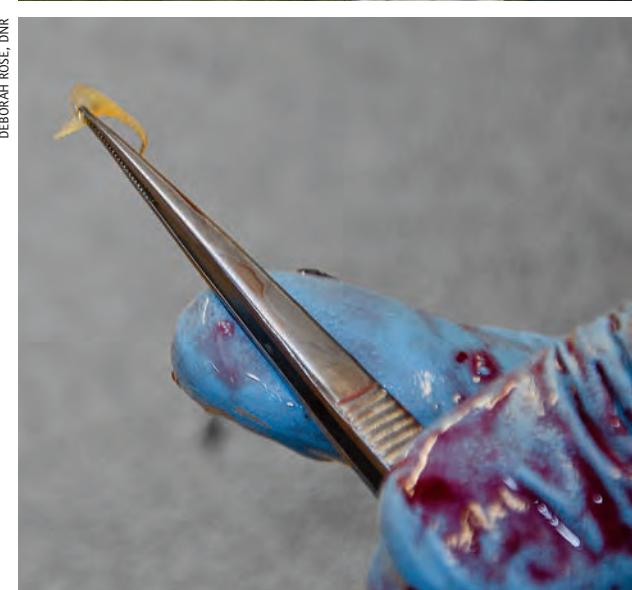
Since 1997, in response to a federal court ruling to uphold the rights of eight Ojibwe bands to harvest fish from Mille Lacs, an annual cap has been placed on the number of pounds of walleye that can be taken from the lake. That cap, known as the

Top right: Tributes to walleye, such as this statue in Isle, are common in the communities around Mille Lacs Lake. Bottom: A cleithrum is a bone that can be used to identify a fish species. This one, from a perch, was found in the stomach of a walleye.

DEBORAH ROSE, DNR



CHELSEA EUL



DEBORAH ROSE, DNR

safe harvest level, averaged 460,000 pounds through 2013. For the 2014 season, the harvest level was slashed to 60,000 pounds because the walleye population had declined more than 50 percent since 2008.

Mille Lacs Lake's popularity rises and falls with its walleye population, but its status as the most studied lake in the state is uncontested. Since the 1980s, intensive monitoring, long-term research, and novel research, such as Ahrenstorff's, have been directed at ensuring a sustainable walleye fishery. All of it involves sophisticated statistical models. But in basic terms, recruitment is like revenue. Natural mortality and harvest are like expenses. The current problem with the lake's walleye is a lack of revenue.

Sizes and Ages. Poor recruitment is making it difficult to restore one cornerstone of the fishery's health: a good distribution of walleye of all sizes and ages. From the mid-1990s to present, the population of male walleye dropped, according to DNR regional treaty coordinator Tom Jones. The magnitude of the change, he acknowledges, was an unfore-

seen consequence of both state angling regulations and tribal netting, which focused harvest on small, predominantly male walleye.

During the same period, the lake's population of large female fish increased but has since started to decline. The glut of large female walleye drove reproduction up to record levels, but those offspring have been disappearing long before they might end up in a livewell or a tribal gill net. Are the lake's growing populations of smallmouth bass and northern pike to blame?

The answer, according to Ahrenstorff's research, is mostly no. He found that the lake's smallmouth bass eat very few walleye. Smallmouth eat some perch but dine mostly on crayfish and small fish species such as madtom and slimy sculpin.

Northern pike eat juvenile walleye, and in 2014 they ate quite a few. "But there aren't that many pike in the lake," Ahrenstorff says, "so it doesn't really make up a big proportion in the grand scheme of things."

Ahrenstorff discovered that an individual walleye eats about as many juvenile walleye as a pike does. An estimated 50,000 pike longer

than 20 inches ply the waters of Mille Lacs. But because the lake holds many times more walleye, the biggest predator of juvenile walleye is the walleye.

Ahrenstorff's research, which is in the field of bioenergetics, essentially looks at how much food is consumed in the lake and which species eats the most of it. After two years of carefully examining, measuring, and weighing stomach contents of walleye, northern pike, and bass, Ahrenstorff was able to calculate that walleye ate 90 percent of all the food eaten by the three species. Northern pike accounted for 8 percent, and the lake's smallmouth bass ate only 2 percent.

What bioenergetics research can't do is determine whether or not the lake has enough food to sustain all its fish populations.

Too Clear. Mille Lacs has all of the physical attributes of a walleye factory. It has diverse habitat that provides ideal cover for prey fish and clean, rocky shorelines for walleye to spawn. The lake's vast open waters harbor tullibee—a high-calorie fish and a staple for big walleye. Slightly

The stomach contents of a smallmouth bass reveal a preference for crayfish. In 2013, researchers found that crayfish made up about 70 percent of the diets of smallmouth bass that were longer than 12 inches.

MIKE HENNER/LINDNER IMAGERY



Priorities at Mille Lacs

Mille Lacs isn't the only large walleye lake that has weathered tough times. In the mid-1990s, the walleye fishery at Red Lake collapsed due to overfishing by tribal netters and state anglers. Though fisheries managers believed Red Lake's walleye would have come back on their own, they used aggressive stocking to help speed the recovery, according to DNR Fisheries section chief Don Pereira.

Around 2003 the Leech Lake walleye population began to decline. In 2005 a decision was made to begin reducing the number of fish-eating cormorants around the lake. Walleye fry were also stocked, mostly to satisfy a public demand for it, says Pereira. Today, both Red and Leech lakes have healthy walleye populations.

Minnesota's large walleye lakes are resilient. Because Mille Lacs Lake has adequate numbers of spawning walleye, Pereira says conserving those fish is the DNR's priority as it works to recover the lake's walleye population. Additionally, a panel of fisheries experts is reviewing decades of data collected at the lake.

"If we want to say that our management is science-based, then we need to be open to having it scrutinized by our professional peers before it is all finalized," says Pereira. "A fresh set of eyes, particularly from internationally renowned experts, will be useful as we seek an optimal management plan for the future."

The panel's recommendations will be made public on Jan. 16 at the annual DNR Fisheries Roundtable. Though Pereira will not speculate on the results of this peer review, he does say sustainable management will likely include regulations that spread harvest over a wider range of walleye sizes.



murky water is another characteristic of an ideal walleye lake.

But in the mid-1990s, the lake's water began to get clearer. This was likely the result of improvements to septic systems around the lake, following passage of the Clean Water Act in 1972. Walleye do well in low-light conditions, and better clarity might give a competitive advantage to the lake's other predators such as northern pike. Clearer water has also allowed invasive Eurasian watermilfoil to grow in new places, providing more ambush cover for pike.

The change in clarity also points to a decrease in algae, or phytoplankton, a fundamental ingredient for producing lots of walleye. These small one-celled plants provide food for tiny critters known as zooplankton. Small fish, in turn, eat zooplankton. "If you have enough algae, it can reproduce faster than the zooplankton eat it," Jones explains. "And if enough zooplankton are produced, they can

DEBORAH ROSE, DNR



Top: Intern Michael McMahon and researcher Tyler Ahrenstorff set a 300-foot-long gill net in Isle Bay.

Bottom: Once the net has been in the water for about an hour, McMahon and Ahrenstorff remove walleye and northern pike. The technique, known as short-term gill-netting, allows for the safe release of species that aren't part of the study.





DEBORAH ROSE, DNR

reproduce faster than the little fish eat them. And when that happens, you're going to have lots of little fish."

In 2005 Jones discovered invasive zebra mussels in Mille Lacs. Since then, he has studied their spread and estimates the lake may now contain some 2.5 billion pounds. Collectively, the tiny mussels filter large amounts of water, which depletes phytoplankton and the nutrients it relies on. This means less food for zooplankton.

More bad news for the backbone of Mille Lacs' food chain arrived in 2009 with the discovery of spiny water fleas. This large invasive zooplankton eats native zooplankton, leaving less to go around for the lake's larval fish including yellow perch, the walleye's primary prey. According to Ahrenstorff's research, yellow perch account for 50 percent of a walleye's diet in Mille Lacs.

Invasive species and warmer

Clockwise from top: Tyler Ahrenstorff measures a northern pike to record data along with a GPS location and water temperature. Michael McMahon inserts a numbered label into the mouth of a walleye so additional data can be recorded about the fish back at the lab. A smallmouth bass is removed from a gill net before being measured and recorded. Most of the fish killed during the study were donated to local nonprofit organizations.

waters also threaten tullibees—the second most important prey item for walleye. Like burbot, tullibees depend on cold water to survive. During extended warm spells, large die-offs of tullibees occur on Mille Lacs. Trends such as later ice-up and earlier ice-out suggest the climate is warming, which could further stress the tullibee population, according to Jones.

Protect Little Ones. The good news, says Jones, is that “given the right conditions, Mille Lacs’ walleye population can recover pretty quickly.” He points to the lake’s last population low in 2004. “In 2008 we had recruitment, and the population almost doubled,” he says. “If we can get some year-classes to recruit, then the population could increase in a hurry.”

Twenty years ago Oneida Lake, a popular walleye fishery in upstate New York, went through changes similar to those on Mille Lacs. Between 1990 and 1998, Oneida’s water got clearer as a result of an infestation of zebra and quagga mussels, according to Lars Gosta Rudstam, a fisheries researcher at Cornell University. Consequently, the walleye population declined. Restrictive fishing regulations, along with reductions in the number of fish-eating cormorants, helped Oneida’s walleye fishery improve. Today, Rudstam estimates, Oneida supports about two-thirds as many walleye as it once did.

Whether the recovery of walleye on Mille Lacs will be diminished by the presence of invasive species and a warming climate can’t be predicted. The priority at Mille Lacs, says Jones, is protecting the lake’s current walleye population. Beginning in 2013, the DNR reduced the walleye limit to two fish between 18 and 20 inches with one over 28 inches al-

Mille Lacs Lake’s walleye population has declined from historic highs. But a good crop of young walleye, which hatched during the spring of 2013, offers hope for future fishing seasons.

lowed. Until some year-classes recruit into the population and a healthier age distribution of walleye returns, he says anglers can expect similarly tight slot and bag limits.

“We need to protect the little fish coming into the system,” says Jones, who notes that the Great Lakes Indian Fish and Wildlife Commission agrees with the DNR’s assessment. In 2013 the commission recommended that band members spear more fish instead of relying entirely on gill nets, according to Jones. “Netting tends to focus the harvest on spawning males, which can be as small as 15 inches. Spearing spreads the harvest out over more of the population,” says Jones. “So both sides are trying to shift their harvest to include more fish that are bigger and older.”

Jones emphasizes, “Our plan is for Mille Lacs to always be a good walleye lake. Our goal is to keep our walleye population as strong as conditions will allow. That’s what we’re after.”

In the short term, meeting that goal may mean less traffic around Mille Lacs. On the sunny July day when I met Ahrenstorff, the Isle Bay public access was unusually quiet. A pair of anglers at the dock was trying to coax a cold-blooded outboard into starting. They paused to ask Ahrenstorff some questions, which he answered in a practiced manner, filling in the details and purpose of his research.

“I hope you guys find some answers,” said the captain of the fishing boat before the stubborn outboard revved to life. “Of course, we wish we could keep a few. But hey, it’s a beautiful day, and we’re going out anyway.” *V*

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