WISCONSIN NATURAL RESOURCES

wnrmag.com
October 2010 $3.50

The Dirt on Badgers

Shoring up Lake Superior lakers

High-tech hatchery improves the fish we raise

A look at The Ledge

The wood ducks sat, preened and made no special effort to come ashore and feed as daylight started to fade.

AL CORNELL

When duck constitution matters

A warm tale of banding woodies on a cold night.

Al Cornell

If you do it right, you don't have to heat up ducks in your pickup.

It was my first year of banding wood ducks and while I never got it all right, years of experience and sage advice from others helped me correct some of the flaws we made that night.

My sidekick, Craig Kopacek, and I were out on a cold September 30th trying to add a few ducks to our tally. We had banded 72 woodies at this same site two weeks earlier.

After years of trapping and relocating turkeys, we had the gear and some of the know-how we needed for duck banding. Our turkey net was folded into a rocket box and we had piled cut grass over the box to hide it. A load of corn dumped six steps in front of that grass pile served as bait. We had not overcome the problem of getting the ducks to feed far enough onto land to keep the net and everything under it dry. We knew our net would shoot out about 70 feet but the box was only 50 feet from the shoreline. Therefore, the rockets and about 20 feet of net would arc over the water.

When we had launched our nets two weeks earlier, our plan worked well. We donned hip boots, waded out and rescued the ducks that bobbed up under the net. Most of them laid there quietly with just the top of their beaks sticking out of the water. Some dove a couple times and a few of those escaped. There were no casualties. We banded and released them.

So, we came back to try our luck again. Craig and I set up a blind concealed a hundred feet away and we waited until about 15 wood ducks arrived and eventually swam to shore near the bait. Then we watched, but the ducks did not come out of the water to feed. They just sat and preened at the pond's edge.

Dusk made no special effort to wait for man or duck. A silvery sheen on the water contrasted more sharply as the skies darkened and few ducks came ashore. We whispered about our options and decided to take a shot because the

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WISCONSIN NATURAL RESOURCES

October 2010
Volume 34, Number 5

DNR LAKE SUPERIOR FISHERIES TEAM

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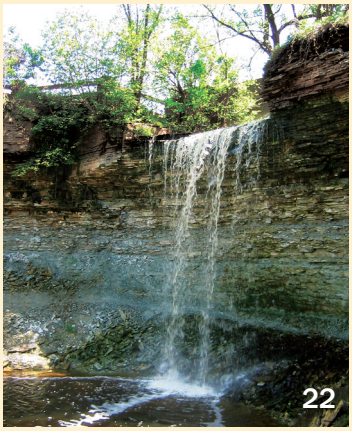

ERIC FOWLE

FRONT COVER: Though American badgers have been recorded in every Wisconsin county, the nocturnal animals are not often seen. Two research studies are exploring where badgers live, how they use habitat, and how far they roam and range.

SHANE RUCKER, Pittsville

BACK COVER: Tamaracks and deciduous trees reflect autumn colors at Page Creek Marsh State Natural Area in Marquette County. Inset: Sandhill cranes use the marsh as a stopover during migration. For more information, or to order a guidebook to State Natural Areas, contact the State Natural Areas Program, Bureau of Endangered Resources, DNR, P.O. Box 7921, Madison, WI 53707 or visit dnr.wi.gov/org/land/er/sna.

Marsh photo: © BILL PIELSTICKER, Lodi
Inset photo of sandhill cranes: © THOMAS LYNN, Milwaukee

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PUBL CE-012
ISSN-0736-2277

Wisconsin Natural Resources magazine (USPS #34625000) is published bimonthly in February, April, June, August, October and December by the Wisconsin Department of Natural Resources, 101 S. Webster St., Madison, WI 53702. The magazine is sustained through paid subscriptions. No tax money or license fees are used. Preferred Periodicals postage paid at Madison, WI. POSTMASTER and readers: subscription questions and address changes should be sent to Wisconsin Natural Resources magazine, P.O. Box 7191, Madison, WI 53707. **Subscription rates are: $8.97 for one year, $15.97 for two years, $21.97 for three years. Toll-free subscription inquiries will be answered at 1-800-678-9472.**

DIGGING UP dirt ABOUT BADGERS

Genetics research will shine light on Wisconsin's mysterious animal.

Kathryn A. Kahler

Perhaps the popular UW fight song would be more accurate if the words read, "If you want to *see* a badger, just come along with me by the bright shining light of the moon." That's when you're more likely to catch a glimpse of one and why they're such elusive creatures.

Two research studies — one underway and the other planned to take up where the first leaves off — are designed to tell us more about these solitary, nocturnal animals for which our state and UW mascot are known.

"There are a number of good reasons to study badgers, but if for no other reason, why not because we're the Badger State?" asks Dave Sample, grassland community ecologist with DNR's Bureau of Science Services.

With a wedge-shaped head and sharp claws on powerful short legs, a badger can make quick work of excavating five bushels or more of sandy soil in digging burrows and searching for a meal.

SHANE RUCKER

"Other than a few studies mostly from western states and Canada, we don't know much about badgers — how many are out there, where they live, how they use Wisconsin habitats and what they eat. They've been protected from harvest in Wisconsin since 1955 but we would like to know if a decline in observations over the last decade means we should do more. We would like to determine if there's good reason to upgrade them to a Species of Greatest Conservation Need. Right now badgers are identified in the Wisconsin Wildlife Action Plan as a species for which more information is needed."

Sample has been a "badger fan" since the mid-1980s when his research of grassland birds took him to Conservation Reserve Program (CRP) lands across the state. When the federal program — designed to convert marginal cropland back to more natural grassland — was first instituted in the mid-1980s, he saw very little sign of badgers in the new CRP fields. Twelve years later, he was surprised by the number of burrows evident on the increasing number of acres that had been converted from corn and soybeans to grasses.

"Badgers play an important role as predators in the grassland system in Wisconsin," says Sample. "Predation is the largest cause of nest failure for declining populations of grassland birds and one of the major predators of those birds is the 13-lined ground squirrel. And it just so happens that one of the badger's favorite foods is the 13-lined ground squirrel."

Badgers are also amazing diggers, capable of displacing five bushels of soil at a single site while searching for prey. "It almost looks like they sink into the ground as they disappear after their prey," says Sample.

Badgers spend most of their lives on the same home range — up to a square mile for females and two square miles for males, according to an Idaho study. In Wisconsin, a study led by LeRoy Peterson in 1975 concluded that badgers are more commonly found on light, sandy soils in agricultural areas covered with grassy vegetation, and where there is an abundance of 13-lined ground squirrels. Peterson and his team surveyed trappers, Conservation Congress delegates, field biologists and wardens, and appealed for public reports of badger sightings. The study found badgers in all but a few counties in the northeastern forests where the heavier, wetter soil is not favorable to their digging. They were more commonly reported in the central and west central parts of the state. Their population was roughly estimated at 8,000 to 10,000 animals.

Two decades later, DNR summarized the "Status of Badgers in Wisconsin 1987-1998" by compiling badger observations from field personnel who regularly report sightings of mammals like American marten, black bears, bobcats, coyotes, fishers, foxes, wolves, jack

Badgers are important predators especially in sandy soils, savannas and grasslands where they keep populations of rodents like pocket gophers and woodchucks in check.

BELOW: A favorite prey species is the 13-lined ground squirrel.

JACK R. BARTHOLMAI

SHANE RUCKER

rabbits and otters. The 12-year analysis showed badgers were present in every county except Milwaukee, with highest observation rates in northern and central Wisconsin where sandy soils and jack pine savannas are prevalent, especially Douglas, Burnett, Bayfield, Langlade and Dunn counties. The report concluded that this broad statewide distribution suggested the badger population was relatively healthy.

In the decade since, annual mammal surveys show a slight decline in the long-term average of badger sightings. That's one of the reasons that Sample and other DNR researchers have been partnering with the University of Wisconsin-Milwaukee since spring 2009 on the Wisconsin Badger Genetics Project. The study hopes to answer such questions as where badgers live, how many badgers there are in Wisconsin and how badgers move across the landscape.

The study employs an up-and-coming method called genetic sampling that is increasingly used to study challenging species. A report from British Columbia explains why it's such a challenge to census badger populations.

- Many wildlife species can be counted from the air or by other traditional methods. Since they're mostly active at night and spend most of their time underground, badgers can't easily be directly counted.
- Burrows attest to the presence of badgers in an area, but because they might dig one or several burrows in one night, the number of burrows can't be used to predict the number of badgers.
- Scat counts used to census other species don't work on badgers because they usually defecate within their dens.
- Harvest surveys that could be used to estimate population trends don't exist because badgers are protected in Wisconsin.

Emily Latch, the UW-Milwaukee professor heading up the project, is confident that genetic sampling will help bridge the information gaps.

Her team's study relies on reported sightings of badgers, their burrows and road-killed carcasses. Roadkills are sampled by clipping a small triangular piece from the animal's ear. When a burrow is reported, Latch or her assistant travel to the site and install a hair snare that snags tufts of hair as the animal leaves or enters a den. Back in the lab, DNA extracted from these sources is used to generate a unique genetic profile for each individual animal and allows subsequent identification if the animal is encountered again or can establish if a live animal was related to one of the roadkilled specimens. Coupled with spatial information for each sample (like GPS coordinates, or other mapping information) researchers will be able to get a better handle on distribution, the kinds of habitat badgers oc-

Liz Kierepka, genetics researcher with the University of Wisconsin-Milwaukee Department of Biological Sciences, inspects a burrow reported to the Badger Genetics Project website. The site will be pinpointed with GPS coordinates and she will set a hair snare (BELOW) to collect a sample as the badger returns to the den. DNA analysis will provide information on badger breeding habits and distribution.

LIZ KIEREPKA, UW-MILWAUKEE

UW-MILWAUKEE BADGER GENETICS PROJECT

cupy across the state and perhaps identify features of the landscape that may prohibit or facilitate gene flow among Wisconsin's badgers.

"Genetic information is useful for wildlife conservation in a general sense," says Latch, "because it provides a detailed picture of animal behavior, natural history and movement patterns that can't always be recognized through observation. Genetic information is particularly useful for elusive species such as the badger where it is difficult or impossible to observe the animal for extended periods."

Latch and her graduate student assistant, Liz Kierepka, built on work started by Brian Sloss of UW-Stevens Point. They currently have collected about 110 samples. "The response from citizens has been wonderful," Latch reports. "Since we first asked last March for people to report sightings, we've gotten 150 to 200 phone calls, e-mails and photos. It seems everyone is really excited about badger research in Wisconsin."

When a report is received and a badger is positively identified, Kierepka follows up with an on-site investigation.

"The best identifications come from trail cameras," says Kierepka. "In those cases, I pretty much drop everything and drive to the site. Early on, most burrow sightings came from Dane, Iowa and Marquette counties, and mostly from prairie habitats. But we found as the seasons changed and more people were out enjoying nature, the reporting areas expanded. There were more reports from northern counties like Ashland and Douglas from people vacationing in places like the Chequamegon and Nicolet National Forests."

Once on-site, Kierepka checks out the area, trying to be as loud as possible to announce her presence. Badgers are well known for their ferocious disposition. If cornered they will fiercely defend themselves and their young, but if they're given room, they will retreat to their burrows.

"A badger burrow is pretty conspicuous and almost always found on a hillside," Kierepka explains. "If I can

BE A BADGER BOOSTER – REPORT BURROWS AND ROAD KILLS!

Badger genetics research relies on the help of anyone who sees a badger, its burrow, or a carcass on the side of the road. Here's what you can do to help:

- **Call (414) 229-4245.** **Be ready with the following information: your name, contact information, what type of activity you observed (live sighting, burrow or road kill) and when observations were made. You will receive a call back for more specific information on where researchers can find the specimen, if necessary.**
- **E-mail badger@uwm.edu.** **Provide your name, contact information and what type of activity you observed (live sighting, burrow or road kill) and when. Give as detailed a description as possible of the location (e.g., GPS coordinates, landmarks, proximity to city, road name, intersections). If reporting a burrow, it's helpful if you can send a photo.**

For more information about how to identify badgers and their burrows, or how to collect an ear sample yourself, visit badgerresearch.uwm.edu

pull hair or feces out of a burrow, that's the easiest way to get a sample. But nine times out of 10, that doesn't happen so I set up a hair snare. I try to set up snares on multiple entrances, but especially the main entrance, which tends to be dug out better, has more dirt piled up and stinks. The snare is made of metal fitted with a strip of carpet gripper and two large spikes, which are shoved into the ground over the hole."

Kierepka returns the next morning to check for hair, marks the sample and takes it back to the lab for analysis.

Kierepka remembers the first badger she saw in Marquette County.

"She was an itty, bitty pregnant female. In the photo that was sent, she looked like a beach ball. The landowner said, 'We've got a hole in our yard, can you come catch it?'

"I had heard stories of them growling and when I got there it was early in the morning and had just rained. I found the badger redigging her hole. When she saw me, she backed into her hole and started growling. The best description I can come up with is that she sounded like an old man snoring."

The study is still in its infancy, but preliminary findings suggest that badgers may be less specialized than originally thought.

"Prevailing thought out west is that they're a grassland animal," said Kierepka. "In Wisconsin we're finding they will use other kinds of habitat like forest edges — like those in the Nicolet and Chequamegon National Forests — as well as dirt roads or driveways. There's an extensive burrow complex just off I-94 at a busy interchange in Dane County. And of course there was the now famous badger photographed and videotaped on YouTube who wandered into the post office in Milwaukee. With that confirmed sighting, we can now say badgers are present in every county in the state."

Building on the four-year UW-M genetics project, Dave Sample and other DNR and UW researchers plan to continue the genetics study statewide. In addition, they will set up an intensive ecological study of badgers in an area of southwest Wisconsin and perhaps another region where traditional methods of capture, following marked animals and observation will paint a better picture of how badgers live, their age structure and reproductive output, what they eat and how they interact with plants and other animals within their habitat.

Latch says the badger genetic database will be combined with GPS locations for all samples and overlaid onto ArcGIS maps to create a complete picture of the distribution and relative abundance of badgers throughout Wisconsin.

"Also, the genetic data will tell us whether or not badgers exist in Wisconsin as one large connected population, or a number of smaller, isolated and genetically distinct populations," she concluded. "In the end, we'll have a better handle on this amazing mammal for which our state is named."

Kathryn A. Kahler writes for Wisconsin Natural Resources *magazine in Madison.*

RON TOEL

A BADGER NEAR YOUR TAILLIGHTS

The American badger, Wisconsin's official state animal, prefers open grasslands and hillsides including endangered oak savanna habitat. You can show support for badgers, savanna preservation, and protection of other rare plants and animals by purchasing an endangered resources license plate for your vehicle. The colorful new plate features photos of a badger, eastern meadowlark, tiger swallowtail butterfly and prairie sunflower with an oak savanna background.

The badger plate was chosen in online voting from four potential designs depicting native wildlife and their habitat. During the 11-day poll, more than 23,000 voted and the badger design received 68 percent of the balloting. The plate was designed by Nan Rudd of Rudd Designs at no cost to the Department of Natural Resources. Wisconsin photographers Shane Rucker (badger), Mike McDowell (meadowlark) and Thomas Meyer (flowers and savanna) also donated their time and talent.

NATASHA KASSULKE

LEFT TO RIGHT: Photographer Shane Rucker, designer Nan Rudd and photographer Mike McDowell contributed their talents for the badger license plate that supports endangered resources projects.

License plate purchase includes a one-time $15 issuance fee and an annual $25 donation to the Endangered Resources Program, which is added to the cost of the annual vehicle registration (fee varies by vehicle type). To get a plate, visit the DMV's Special Plates Unit website at dot.wisconsin.gov/drivers/vehicles/personal/special/endanger.htm or visit select Division of Motor Vehicles service centers. If you have questions call the Wisconsin Department of Transportation, Special Plates Unit, at (608) 266-3041 or e-mail special-plates.dmv@dot.wi.gov

The donation portion of the fee may be deductible if you itemize your income tax returns. Endangered resources license plates can feature regular numbers or a personalized message.

For more than 25 years, the DNR's Endangered Resources Program has worked to conserve Wisconsin's biodiversity for present and future generations. Your donation helps identify, protect and manage native plants and animals and the natural communities they depend on.

Recovery and

Lake trout hold on as a prominent force in the Lake Superior fishery.

FOREGROUND: DNR LAKE SUPERIOR FISHERIES TEAM / BACKGROUND: DNR PHOTO

FOREGROUND: Fisheries Biologist Mike Seider handles a large lake trout that was measured, tagged and released during seasonal sampling and census work on Lake Superior. BACKGROUND: The lake trout harvest has been shared among sport anglers, commercial netters and tribal fishers. Monitoring the harvest is important as populations rebound from overuse and predation.

d redemption

"The great abundance of fish and the convenience of the place for fishing have caused the Indians to make a fixed settlement in those parts. It is daily manna, which never fails."

- Antoine Cadillac,
French explorer of the Great Lakes region and a founding father of Detroit, 1695

"What of the great lakes…And where are the fish?"

- Chicago Times, 1881

Lisa Gaumnitz

Coming just two hundred years apart, those quotes bookend the sobering story of the Great Lakes fisheries. These inland seas once teeming with whitefish, lake sturgeon, lake herring and lake trout were severely damaged by the carelessness, even ruthlessness of settlers and commercial fishing enterprises who used and abused the fisheries, says Margaret Beattie Bogue, author of *Fishing the Great Lakes.*

Now, a new chapter is being written. Lake trout, one of the four signal species in Cadillac's day are showing strong signs of recovery in Lake Superior, with Wisconsin waters boasting some of the strongest populations. That's good news for the overall health of the Lake Superior ecosystem and for anglers and commercial fishers.

In perhaps the most telling sign for the first time in a half-century, artificial stocking of lake trout has ceased in almost all parts of the lake. It's a direct and hopeful reversal of what Bogue says brought the fisheries down in the first place: overfishing, pollution, political squabbling among Great Lakes states and provinces, poor public policies, commercial exploitation and the kicker — rampant populations of an invasive species that literally sucks the lifeblood out of the fish.

"This is the greatest lake in the world and we brought its most important fish to virtual extinction. Now we've brought it back through everybody working together," says Mike Hansen, a University of Wisconsin-Stevens Point professor who is a commissioner on the Great Lakes Fishery Commission. "This is an enormous story that never gets appreciated."

The challenge is keeping the lake trout fishery strong, Hansen says. "One of the problems is that people now say, 'we want to fish Lake Superior harder. But what we know is we can crush it if we're not careful — the world's story is we've crushed fish populations time and again."

Matt Symbal, a fish and wildlife biologist for the Red Cliff tribe adds, it's important for people to understand that the various agencies around the lake are constantly monitoring the lake trout and adjusting allowed harvests, "but there's still a fine line where the fishery can slip. Everyone seems reluctant to say (the lake trout recovery plan) has fully met its mark."

A top predator brought low

Lake trout have long been critical to the health of the Great Lakes and its people. They are the top predator in "the big lake," keeping things in balance. They hunt independently and eat everything in sight. They consume both young and adult fish, but they are slow-growing and long-lived, and they don't need to eat constantly.

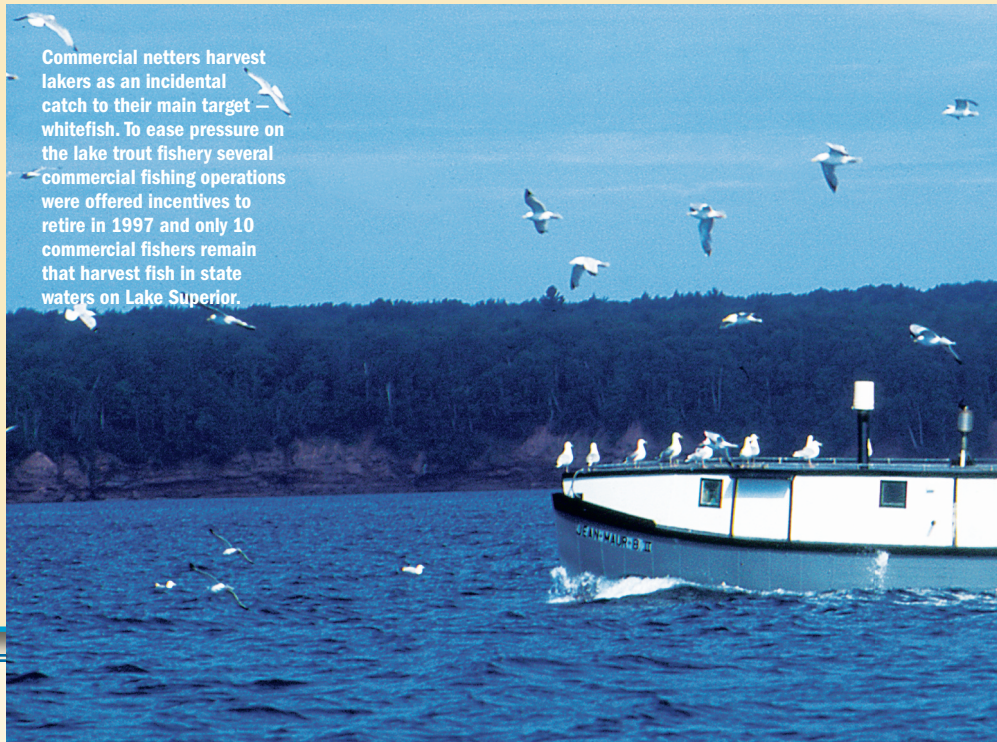
While whitefish have long been a more popular meal, lake trout have been a staple for people living along Lake Superior for thousands of years. Native American tribes fished for lake trout and other Great Lakes species before 3000 B.C. and have used nets to haul them in since about 300 B.C., according to *Fishing the Great Lakes*.

Jesuit missionaries described giant trout 50 to 90 pounds in the 17th century. The coming of European explorers, traders and missionaries in search of empire, wealth and Christian converts changed the patterns of subsistence culture somewhat in the 17th century and more so in the 18th century, Bogue writes. European policies encouraged U.S. and Canadian settlers to carve farms out of the wilderness as nations raced to expand their boundaries. Prevailing religious belief held that man had dominion over the land, water and their creatures, a departure from Native American concepts that man was a part of the ecosystem, not its master. Fish were considered a common public good, free for the taking. And the Great Lakes region was carved up into eight states and two provinces that precluded unified and effective regulation of the fisheries, Bogue writes.

Improvements in technology, boats, nets and other gear allowed commercial crews to fish more intensively. Harvests climbed from 39 million pounds of fish in 1874 to more than 146 million pounds by 1889. The great decline in fish stocks was on.

Lake trout lasted longer in the Great Lakes and particularly in Lake Superior for a variety of reasons. Their biological behavior — living in deeper water and living rather independently instead of in large schools — gave them far greater chances of survival than whitefish, which were preferred by commercial fishers and were found in big schools. The relative remoteness of Lake Superior meant it was the least polluted of the lakes.

Staff from the Red Cliff Fisheries lift nets, measure fish and take samples during summer surveys. The lake trout fishery on Lake Superior is cooperatively managed by state, federal, tribal and provincial biologists and conservation wardens.



Commercial netters harvest lakers as an incidental catch to their main target — whitefish. To ease pressure on the lake trout fishery several commercial fishing operations were offered incentives to retire in 1997 and only 10 commercial fishers remain that harvest fish in state waters on Lake Superior.

MATT SYMBAL

ROBERT QUEEN

But lake trout could not survive the sea lamprey, a parasitic, jawless, eel-like fish native to the North Atlantic. The lampreys found their way to Lake Ontario in the 1800s, and reached the Upper Great Lakes in the 1930s after reconstruction of the Welland Canal in 1921 effectively removed Niagara Falls as a natural barrier.

By 1962, harvest of lake trout on Lake Superior had declined more than 90 percent from the previous decade, and the lake's management agencies closed commercial harvest. The era of plenty was over.

Partnerships to restore a fishery

The sea lamprey delivered the jolt jurisdictions needed. The Convention on Great Lakes Fisheries, between Canada and the United States ratified in October 1955, created the Great Lakes Fisheries Commission (GLFC) and gave it two charges: eradicate or control the sea lamprey and secondly, coordinate research and recommendations to sustain productive fish stocks shared in common.

Initial recovery plans focused heavily on stocking. By the 1960s, lake trout populations had increased sharply along the Wisconsin and Michigan shores, but not elsewhere. By the 1980s, abundance of stocked lake trout in Great Lakes waters off Wisconsin had declined due to increased fishing pressure, continued sea lamprey predation and reduced stocking rates, according to "A Lake Trout Restoration Plan for Lake Superior," produced by the GLFC and edited by Mike Hansen. That plan laid out a blueprint that moved away from relying on stocking and instead called for prudently managing the remaining wild fish.

Hansen explained the change in approach. When you first start out stocking fish, there are typically fewer predators and nothing to eat the fry. As the program matures, survival rates from stocking drop off as the number of adults increase. Fish stocked in later years have much lower survival rates and eventually no survival. In Lake Superior, we documented that decline, and by the time we drafted the recovery plan in 1996, we decided we needed to count on factors other than stocking to restore the fishery. Stocking in the Apostle Islands area was suspended. The commission's technical committee determined that to sustain the fishery, the annual lake trout mortality should not exceed 45 percent. The plan called for the agencies lakewide to reduce mortality due to sea lamprey, to better protect habitat for remaining wild trout, and to more tightly control the total harvest taken by anglers and commercial fishers.

That plan has been carried out in Wisconsin by the Department of Natural Resources, the Red Cliff tribe and the Bad River tribe, which collectively manage fisheries in state waters of Lake Superior, and by the U.S. Fish & Wildlife Service. The federal agency carries out lamprey control in U.S. waters as the agent for the GLFC. In the past USFWS also stocked lake trout in Minnesota, Wisconsin and Michigan waters.

"For 35 years, the parties have been able to find ways to manage the fishery, and it's generally been successful," says Wisconsin Fisheries Director Mike Staggs. "They have negotiated three 10-year agreements, and I think a lot of credit goes to the three governments for trying to avoid federal litigation."

Their collective success is distinct from managing inland fisheries, where federal courts had to intervene to resolve issues of Native American treaty rights in Wisconsin and other states.

Protecting remnant stocks of wild trout

The key to the lakewide recovery for lake trout lies in Wisconsin waters. "We have some of the best spawning habitat and natural reproduction in all of Lake Superior," says Mike Seider, DNR fisheries biologist in Bayfield.

In the 1950s, while lake trout populations crashed lakewide, remnant stocks persisted off Gull Island Shoal, Cat Island and Devils Island in the Apostle Islands in Wisconsin. The area continued to provide harbor and sanctuary for lakers that spawned on these shoals. "It was a matter of maintaining and continuing to build on those remnant stocks," Seider says. Two areas adjacent to those important spawning shoals were protected as fish refuges, both of which DNR continues to maintain.

The partners, with help from UW Sea Grant scientists, worked together to bolster natural reproduction by stocking fertilized eggs on Devils Island

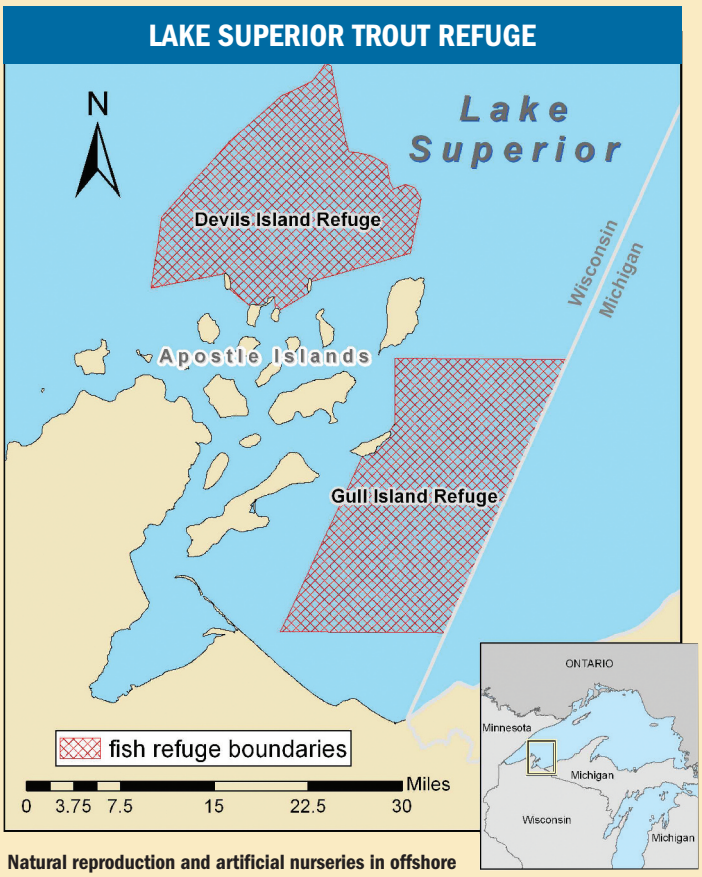
Shoal. The eggs were held in AstroTurf "sandwiches" suspended a few feet above the shoals. The AstroTurf protected the eggs from predators and allowed the fry to escape after hatching. The idea is that hatched fish would imprint on the shoal, and return to spawn one day. This biological head start seemed to have succeeded. Stocked trout had trouble finding the offshore reefs but fry raised in the AstroTurf nurseries successfully colonized them, Seider says.

"That really was a shot in the arm for the northern part of the Apostle Islands," he says. "Now there is a population of spawning adults building up with bigger fish showing up."

Wild trout caught in spring assessments increased from 30 percent of the catch in the 1980s to greater than 95 percent in 2006-2010, Seider says.

Hansen's studies are evaluating how effective the Wisconsin refuges are, and finding ways to better account for fish movements between management units so the harvest quotas can more accurately reflect the lakewide picture.

"Without the Gull and Devils islands refuges, we couldn't afford to have the commercial fishery we do out there," Seider says.



Natural reproduction and artificial nurseries in offshore fish refuges of the Apostle Islands allowed lake trout populations to escape invasive predators and other threats nearer shore.

Preventing overfishing

Managing the people who fish for lake trout is another critical factor in the species' recovery.

"The biology of lake trout works against us because they take 10 years to mature," Seider says. "They don't just come back in a year or two, so you have to manage very conservatively." The partners carefully monitor the fish populations each spring and fall, keeping close counts on harvests and feeding the results into computer models that estimate how many fish can safely be taken out every year. The total allowable catch in Wisconsin waters is divided among tribal commercial fisheries, state commercial fisheries, tribal subsistence fishers, and state sport anglers. Whitefish is the main target of commercial fishers, but lake trout are caught incidentally in their nets and provide income as well.

"Lake trout historically have been a primary food source for the tribe," says Symbal. "Right now it's of huge economic importance to Native American families. We have one of the largest commercial fisheries on Lake Superior, and families can also obtain a license to fish short small gill nets offshore for subsistence purposes."

Tribal interests receive 50 percent of the total allowable catch. The Red Cliff monitor and manage their own anglers, whether they are in Wisconsin or in Michigan, or as part of the ceded territory. Red Cliff Fisheries Department personnel are placed onboard some of the tribal commercial fishing vessels to count fish brought aboard the vessel. This data is used to estimate the accurate catch rate to provide adequate information for decision-making, Symbal says.

The Department of Natural Resources has allotted 75 percent of the state's portion of the quota to sport anglers, and 25 percent to commercial fishers. To ease pressure on the fishery, the state offered several commercial fishers incentives to retire operations in 1997, implemented more conservative harvest regulations on the remaining 10 commercial fishers, and set limits on the sport angler's harvest, including a three fish daily bag limit with only one fish over 25 inches in length.

"The result of cooperative fisheries management has been a gradual increase in wild lake trout abundance since the 1970s, but these population increases have leveled off recently," Seider says. In the mid 2000s, managers increased the quotas in response to the highest wild lake trout catch rates recorded in almost 50 years. "Then the population was fished harder, especially by commercial netters, and we had higher than expected mortality rates from sea lampreys," Seider says. The result was a drop in fish population.

So in fall 2009, based on projections, managers agreed to lower overall harvest by almost 32 percent over the next three years.

That big sucking sound

For fisheries managers, sea lamprey predation remains a big challenge to future lake trout populations, Symbal says. Though lampreys will feed on all species of large Great Lakes fish, they prefer trout and salmon. Lampreys attach to fish with a sucking disk and sharp teeth. They feed on the body fluids, scarring the host or killing it.

Considerable effort and expense has gone into trying to contain the losses, but, until recently, sea lampreys have killed more lake trout in Lake Superior every year than all commercial fishers and anglers combined.

The Lake Superior Technical Committee's goal is to suppress sea lampreys to levels that would cause only insignificant mortality of adult lake trout. That goal has only been met in the last two years, when spawning sea lampreys were estimated at fewer than 30,000, well within the 38,000 goal set

DNR work crews pay out nets to sample fish throughout the seasons. Based on survey projections fisheries staff lowered allowable harvests by almost a third to help rebuild sagging populations.

DNR LAKE SUPERIOR FISHERIES TEAM

In places where sea lampreys spawn and congregate, they can be successfully trapped, removed or sterilized.

US FISH & WILDLIFE SERVICE

for Lake Superior, according to Jessica Barber, fish biologist for sea lamprey control at the U.S. Fish and Wildlife Service's Marquette Biological Station in Marquette, Mich.

Wisconsin, unfortunately, contributes more than its fair share of sea lampreys, Barber says.

"We conduct lampricide treatments on about three to five Wisconsin tributaries per year. We also use traps and lamprey barriers."

The selective lampricide TFM remains the primary tool to control sea lampreys throughout the Great Lakes, supplemented in some areas by traps, barriers and the release of sterile males.

Lampreys are trapped on six Wisconsin tributary streams each year, and three Wisconsin tributaries have barriers built or modified to block migrating sea lampreys during their spawning runs.

The Great Lakes Fisheries Commission is borrowing techniques from the insect world by trying to harness the chemicals of love. Male lampreys shed pheromones when they are mating that attract females and the commission is experimenting to see if they can lure more sea lampreys to streams or traps baited with the scents. Once trapped, the lampreys can be killed or sterilized. If these experiments prove successful in steering lampreys to their death, control measures could become much more economical.

The stakes to find more cost-effective controls could rise as the temperature increases. Barber anticipates that both larval and parasitic sea lamprey growth rates may accelerate if water temperatures and the length of the growing season increase as a consequence of climate change.

Moving to the next phase

The continuing threat posed by sea lampreys, newer threats such as zebra and quagga mussels, and Asian carp poised to enter the Great Lakes, have Bogue feeling pessimistic about the fates of Lake Superior and its lake trout. Ten years after writing her book, and 50 years after ballast water was recognized as a major pathway for invaders, she's disgusted with the country's response to the menace.

"I look at this and I just groan. Have people learned anything at all? Do they understand what the results of this can be?"

Seider shares her concern about invasive species and fish diseases.

Seider is cautiously optimistic. "There are inherent limitations to this lake. We're probably never going to get back to where it was pre-European settlement. We've altered the system too much. But we're learning from our past mistakes.

"We'll probably have these ups and downs but as long as we can maintain these fish refuges, as long as we can protect healthy numbers of spawning fish, and continue to allocate and manage the fishery wisely, we can weather these downswings."

Lisa Gaumnitz is public affairs manager for DNR's Water Division.

HATCHERY RENOVATION IS COMING UP ROSES

Samples of the healthy lake sturgeon (left) and northerns (right) now raised at Wild Rose.

Raising fish indoors in the coolwater hatchery allows better control of growing conditions and faster growth of healthier fish.

Northerns are sorted to keep fish of the same size together, which helps reduce cannibalism.

Looking north at the coolwater parts of the Wild Rose facilities — hatchery at left, wastewater treatment at right, and the new outdoor ponds.

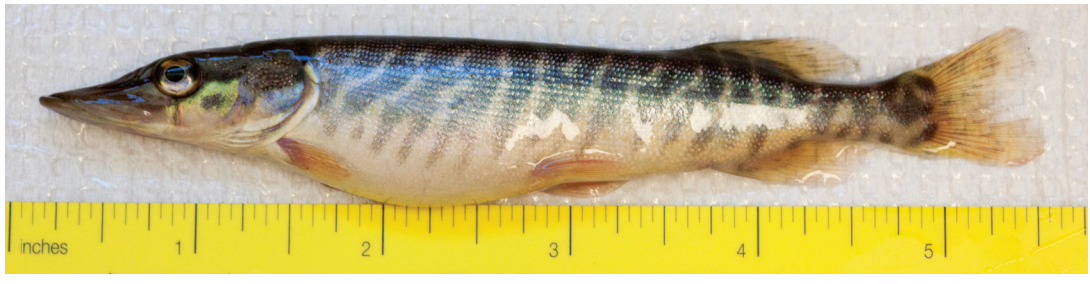
HDR-FISH PRO

The experienced staff and new redesign at the coolwater hatchery in Wild Rose are producing more fish and bigger fish more efficiently for our angling future.

Story by Lisa Gaumnitz
Photos by Michael Kienitz

Goodbye Stone Age, hello space age. Century-old Wild Rose State Fish Hatchery in Waushara County has gone high tech.

Muddy ponds once stuffed to the gills with northern pike, walleye and musky and subject to the fickle Wisconsin weather, fluctuating water temperatures and predators, have given way to more than 100 tanks and raceways in a cavernous building. It's part of the hatchery's newly renovated facilities to raise these coolwater species. A sophisticated water recirculation system sends hundreds of gallons of water a minute into the tanks, and computers tightly control and monitor all water, climate and food levels to keep them within an eyelash of their programmed levels.



On a recent summer day, Hatchery Supervisor Steve Fajfer is giving a tour of the dissection laboratory when an alarm blares and sends him scurrying into the darkened main room. He reaches a big metal control panel and touches a computer screen once, twice, three times to reach a screen pinpointing a problem in the head tank, the literal heart of the water recirculation system.

"Dissolved oxygen is one-tenth of a part per million over what it should be," says Fajfer, pointing to the screen. "One-tenth of a part per million!"

Back in the old days we never would have known, says Fajfer. The fish just would have been stressed. But today, Fafjer sends fish technician Ben Heimbach outside to check out the head tank.

"This hatchery is better for the environment, it's better for the employees, better for the fish we raise and absolutely it is better for the anglers," says Fajfer, who's been superintendent since 1987. He started the push to renovate the hatchery just a year into his tenure. "Now we are producing bigger, healthier fish, and we all believe this renovation will make a lot more fish available to the anglers of Wisconsin. But there are a lot more things that can go wrong."

Early signs of living up to its promise

The new coolwater facilities represent the second phase of a multi-year, $32 million renovation of Wild Rose, long a workhorse of the state's hatchery system that was hobbled in recent years by a deteriorating water supply and aging facilities.

The first phase, renovating the "coldwater" facilities where trout and salmon are raised and constructing a new visitors center, was completed in 2008 and is going swimmingly: Wild Rose is pumping out 2 ¼ million trout and salmon a year, mainly for Lake Michigan, and the coldwater facilities and visitors center collected a trio of national design awards.

Construction on this second phase started in 2008 and is financed by the sale of state bonds. The proceeds will be paid back with revenues from the state fish and wildlife account and federal Sport Fish Restoration funds.

Miron Construction Company, Inc. turned the keys over in December 2009

Sorting lake sturgeon fingerlings by size. More fish and healthier fish can be raised more quickly in the new facilities.

Cleaning the incubation jars where fertilized eggs start their journey. Computers monitor even minute changes in water temperature, flow, dissolved oxygen, and other parameters important to stable growth.

and Wild Rose's coolwater staff has since been working through a shakedown period, learning the new systems and appreciating just how sensitive the controls are. Automated monitors track the temperatures, flows, feed and water chemistry of 400 parameters throughout the hatchery. The multiple alarms each day have now decreased to once a week, but are more frequent when storms cause power surges or outages.

The Wild Rose crew brought northern pike and sturgeon eggs to the new building in spring 2010. They hatched them in incubation jars, and then carefully tended their young charges day-in and day-out until they sent their first fish — 23,000 northern pike about three inches long — out the door in June for stocking in three southern Wisconsin lakes.

Like doting parents sending their first away to college, the hatchery workers were relieved at that happy event.

It took time to get used to the new facilities. It set our mind at ease to realize we can produce a good product, says Rich Klett, the coolwater crew chief, who's been raising fish for a quarter-century, the last 20 at Wild Rose. "We exceeded our expectations by faster growth rates and excellent quality of fish."

They also successfully experimented with raising lake sturgeon on dry commercial feed, no small feat given that young sturgeon are notoriously picky eaters. The sturgeon hatched and survived in such good numbers that the crew had to remove some from the tanks in early July to provide more room for them to grow. The remaining fish get to enjoy their pampered lifestyle for another three months.

On this day, Ben Heimbach and Jake Seifert give the fish one last meal, then use dip nets to remove surplus Yellow River lake sturgeon from several tanks for stocking. The young fish are barely over an inch long and look to be all tail. With luck, they will grow larger and live longer than a human. Heimbach carefully empties the dip net into a box lined with a plastic bag. He fills the bag with oxygen, seals it and carries the box to the van that will deliver the young sturgeon to their new homes in three northwestern Wisconsin rivers and flowages.

Earlier that week, the crew said goodbye to surplus sturgeon they had hatched from eggs they collected from the Wisconsin River. The fish were stocked in the Baraboo River, returning that species to the river for the first time in more than 100 years. The Baraboo is running high and brown right now because of heavy summer rains. But young sturgeon are tough little guys, and the 6,000 sent into its dark waters are better prepared than most for their perilous, historic mission.

Taking it inside

Those successes show great promise for the renovated Wild Rose. "Everything is so much different from the old facilities," says Klett.

Pike, walleye and musky used to spend their earliest weeks in a cramped, 1950s-era building before being transferred into one-fifth-acre ponds outside. Used trout water from the raceways across the street used to feed into the ponds and there was no control of the water temperature or flow.

Now, the northern pike spend their entire lives indoors, can be kept at high densities in tanks and raceways where the water is exchanged frequently, and they are fed dry feed. Such a method is known as "intensive culture," compared to the "extensive" culture in which fish were raised in outdoor ponds at lower densities and fed plankton and minnows.

Hatchery innovations include automated "donut" feeders that slowly sweep food into the rearing tanks over 24 hours.

After the eggs hatch, Klett and his colleagues keep close tabs on the fish, transferring them to a series of successively bigger tanks and raceways as the fish grow. They sort them at each step of the way, putting similarly sized fish in the same tank. "Northern pike are very cannibalistic, so you need to separate the big ones from the smaller ones," he says.

The water in the tanks comes from groundwater wells and the crew can control the temperature, dialing in 50 to 65 degrees for northern pike, as well as controlling dissolved oxygen, ammonia, nitrate and other levels important to fish health, Klett says.

"One important thing we do now with the northerns is feeding them commercial dry feed, which is free of bacteria and bugs. When you raise fish extensively in ponds, they are fed plankton and minnows, which can bring in a lot of bad things like VHS."

He walks over to another control panel in the main room and touches the computer screen to set when automatic feeders will open and for how long they remain open — from one-tenth of a second to 10 minutes. That precise delivery benefits the fish and frees the staff to work on other duties once they've loaded the feeders with food. The feeders deliver the right ration at the right time. Too much food could worsen the water quality, not enough and the fish are more likely to eat one another.

"We can raise more fish in a smaller area compared to doing it extensively, and we save a lot of money by using a commercial diet. It's very expensive to raise or buy live forage," Klett says.

We used to raise about 5,000 large-size fingerlings in a one-acre pond," Klett says; here we can raise 15,000 in much smaller raceways.

Wild Rose will continue to do some extensive culture as well, raising fish at 14 new lined ponds outside. The ponds — six of which are a half-acre in size and eight of which are a

Water from hatchery tanks flows through rotating microfilter drums. Following full treatment, 90 percent of groundwater used in the hatchery can be reused saving water and energy.

full acre — are fenced for security and have special netting systems designed to keep herons, kingfishers, raccoons and other predators at bay. Counterweights and a pulley system pull the nets taut over the ponds. In the winter, snow and ice building up on the nets pull the net down closer to the water's surface, where the ponds' relatively higher temperature melts the ice and the counterweights drop, allowing the net to return to normal height.

Such accommodations to Wisconsin's winters allow year-round use of the ponds. After coolwater fish have been stocked out in the fall, coldwater fish can be transferred into the same space to grow overwinter for stocking the following spring. That allows Wild Rose to grow more trout and salmon to a larger size than if they spent their entire life in the enclosed raceways across the street.

More fish with a smaller carbon footprint

The key to raising more fish is inside this room, says Fajfer, as he continues his tour.

"This is the most important room in the hatchery. If anything goes wrong here, it goes wrong out there," Fajfer says, motioning to the main room.

All water returning from the tanks is cleaned here. It moves first through a series of big rotating drums called microfilters. The filtered solids are swept off the screening into a trough.Those wastes are piped to a clarifier outside, and the rest is sent to what Fajfer calls a fluidized filter bed. He pulls up a grate in the floor to reveal roiling water below and dips his hand in to pull up a handful of plastic beads with ridges. "These beads have a lot of surface area and bacteria grow on all those surfaces. They digest the wastes and turn ammonia, which is bad for fish, into nitrite, then different bacteria convert the nitrite to nitrate, which the fish can handle," he says.

The water then passes into UV disinfection units, then through a heat exchanger that extracts the heat from the wastewater to preheat the make-up water before discharging some to the Pine River. The rest is routed into a chamber where it's mixed with at least 10 percent fresh groundwater. The mixture of fresh new and recycled clean water is pumped outside to the head tank where oxygen is added to the water before it's returned to the building and the tanks, Fajfer says.

While he's talking, Heimbach and Seifert, who have entered the room, unscrew and remove one of the sprayer nozzles, which has clogged. The equipment is all under warranty now, but the crew members watch closely when the repairs happen so they can all learn to fix things on their own; especially important once the warranty coverage runs out.

This is also the most important room from an environmental standpoint, says Al Kaas, statewide propagation coordinator. It allows Wild Rose to reuse up to 90 percent of the groundwater it pumps to serve the coolwater side, which in turn allows the facilities to use less energy to heat the water because it's returned from the tanks at the right temperature.

"We only have to heat or cool the 10 percent that is new," Kaas says. "Clearly, for us as an agency, minimizing our carbon footprint by reusing water and reducing the amount of energy we use to heat or cool water is very important."

VHS virus creates challenges and opportunities

It's very important to the Department of Natural Resources to have the flexibility and capacity to produce different species of fish in the coolwater facilities at Wild Rose — and the chance to do it in a way that sets the standard for raising fish in the post-VHS era, says Mike Staggs, DNR fisheries director.

"VHS (viral hemorrhagic septicemia) was kind of a wake up call for us, a lot of other states and federal agencies. We really needed to look at biosecurity in our hatcheries and our overall operations," Staggs says.

"By biosecurity, I mean everything from how we handle fish, equipment, and water supply and deploy our people at a particular facility. We don't want to bring diseases to a hatchery — or likewise, if there is disease at a hatchery, we don't want to spread it elsewhere, or to other parts of a hatchery."

Wild Rose's renovation plans were developed before VHS burst onto the national and Wisconsin scenes in a big

way in 2007. The disease was diagnosed in that year as the cause of several large fish kills in the Lower Great Lakes, and in May, it was found in dead fish in the Lake Winnebago and Lake Michigan systems.

The virus is not a threat to humans, but can infect nearly 40 different native fish species and can cause them to bleed to death. VHS can spread rapidly, fish to fish and when people move infected fish and water around.

Federal and state laws and policies have changed and can restrict where fish produced from waters with VHS can be raised and ultimately stocked or whether fish from VHS and non-VHS waters can be raised in the same hatchery. Fortunately, the flexibility designed into Wild Rose will help. For example, the water supply in the coolwater building can be kept completely separate from the water supply used to raise Lake Michigan trout and salmon. That way, the coolwater building is treated as "medically separate" and can send the fish it produces to inland waters where VHS has not been detected. That's the procedure that was followed with the northern pike and lake sturgeon stocked out earlier this summer.

"Wild Rose has big facilities that can raise lots of fish, get eggs from a lot of different places and stock fish in a lot of places," Staggs says. "It represents a challenge for us, but the facilities also have such flexibility and capacity to produce fish that give us options for addressing biosecurity issues like disease transmission. We're able to operate different parts of the hatchery separately if necessary."

The timing was not right this year to bring in musky and walleye eggs to raise in the hatchery, so this fall DNR will use the outside ponds to raise trout and salmon to a larger size and plans to start raising musky and walleye at the facilities starting in 2011.

"We've taken a conservative approach so we could learn to run these new facilities efficiently and raise quality fish. We didn't fill the facilities up and start shipping fish out right away. We're bringing parts of the facilities on-line with the appropriate biosecurity precautions to make sure we don't introduce or spread diseases among fish stocks," Staggs says. "Ultimately, as we work through this process, I envision Wild Rose will produce fish for stocking across the state and we will be able to do things we don't do now, like raise more yearling trout and salmon and provide greater numbers of large fingerling walleyes, muskies and northerns."

Hatchery Superintendent Steve Fajfer shows plastic beads from the fluidized filter bed that provide a lot of surface area where cultured bacteria can digest wastewater, reducing ammonia levels and converting nitrites to nitrates that fish can tolerate.

People make it happen

As high tech as Wild Rose is, a morning spent marveling at the building, the recirculation system and the outdoor ponds serves as a good reminder that the art in running a successful hatchery is all about skillful people who are paying attention — people who know fish, can operate the machinery, and can manage living systems that keep fish, water, food, bacteria and water chemistry in balance.

That becomes readily apparent mid-morning after the lights are turned up briefly to allow photographer Michael Kienitz a better shot. Seifert walks up to Klett and says, "The fish have stopped feeding." Klett advises him to shut down the automatic feeders. The lights have stressed the sensitive fish and adding food to the tanks now would only dirty the tank, affect the water quality, and waste the food.

Klett tells Seifert to get bags of salt to calm the fish, and Seifert soon returns with a dolly laden with big bags of salt. The two scatter the salt in the tanks filled with northern pike.

Wild Rose benefits from having a mix of veterans like Fajfer, Rich Klett, Randy Larson, other staff who also raised coldwater fish as well as employing younger staff like Heimbach, Seifert and Ben Kiefer.

The veteran staff and recent retirees like Terry Carpenter, helped design the facilities. They worked with HDR-Fish Pro, the hatchery designer, to incorporate the kinds of work flow, equipment and other insights they had gained from their many years on the job. And many of the inventions and adaptations they've made over the years to keep the ailing hatchery going are still used in the new facilities.

Take the "donut" feeders created by Carpenter — round plastic discs with a 24-hour clock and a motor that spins the disc around. Kiefer carefully spoons dried food onto the disk's outer edge, all the way around; as the disk rotates once a day, a paint brush fixed to the gadget with a clip gently sweeps a little bit of food off the disk.

The younger staff, most of whom have come on board since the renovation started, were trained using similar high-tech equipment in their university classes, although on a much smaller scale.

"This is a dream job for me. This is what I went to college for," says Heimbach, who lives on the hatchery grounds and is responsible for responding to the alarms in the new building 24/7.

"The challenges are fun. You get frustrated sometimes. But you get to go out and stock the fish. That's the best part — that, and when you see kids holding big fish, and they've got big smiles on their faces."

Lisa Gaumnitz is the public affairs manager for DNR's Water Division.

From on high at Peninsula State Park the edge of The Ledge is easily seen.

A LOOK AT THE LEDGE

Celebrate the rocky ridge that cleaved glaciers, resists pounding waterfalls and forms the terroir for fine wines.

Story by Joanne Kluessendorf
Photos by Eric Fowle

Wisconsin owes a lot to its rocks, even its name. Derived from the Miami Indian word *meskonsing* meaning "river running through a red place," the state's name pertains to the red sandstone bluffs that border the Wisconsin River. Lead mined from rocks around Mineral Point attracted the first European settlers to the territory and led to statehood. Later finds of copper and iron fueled the state's economy. Lime, building stone and aggregate are the literal foundations that built its cities and towns. Soils enriched by rocks that were ground up by glaciers support agricultural bounty. And then there's the scenery — lakes and rivers, hills and valleys, bluffs and ledges — it's the rocks, the geology, that make Wisconsin such a special place.

GE

ABOVE: The pounding waves at Cave Point County Park in Door County slowly weather the fractured rock of the Niagara Escarpment.

LEFT: At Bay Shore Park along the escarpment in New Franken the tipped rock layers are easy to see and explore.

Behold the Niagara Escarpment

Though many western states sing the praises of their mountains, mines and canyon lands more loudly, Wisconsin is home to some world-famous geologic features, too. One of the most renowned is the Niagara Escarpment. This prominent rock ridge stretches nearly 1,000 miles in an arc across the Great Lakes region, forming the ancient "backbone" of North America. It extends from eastern Wisconsin through Michigan's Upper Peninsula, into Ontario, Canada (where it is designated a World Biosphere Reserve), and on to western New York where Niagara Falls cascades over it, giving the escarpment its name.

In Wisconsin, the Niagara Escarpment is called "The Ledge" or "The Bluff" locally. It extends about 250 miles through the eastern part of the state. Beginning with a few isolated outcrops in Waukesha County on the south, the escarpment then disappears under glacial sediments until it re-emerges in Dodge County. It is well exposed in Fond du Lac County. In Calumet County, it is most conspicuous at the northeastern corner of Lake Winnebago. From here it continues into Brown County where it skirts the eastern shore of Green Bay. The most prominent and highest exposures in Wisconsin rise above the bay on the west side of the Door County peninsula.

The escarpment has had a lot to do with creating the familiar landscape of eastern Wisconsin. During the last ice age, this erosion-resistant rock ridge caused the vast glacier to split into two lobes, which carved out Green Bay, Lake Winnebago and Lake Michigan. It continues to lend a special sense of place to the region, as it snakes through the countryside, affording a dramatic backdrop here or a spectacular view there. Early Native Americans revered The Ledge, using it for burials, ceremonies and other sacred purposes. As many as 500 sites are known on the escarpment in Wisconsin where Native Americans left behind structures, symbols and implements. Centuries later, when European settlers arrived, the escarpment became important economically for its natural resources. Soon, The Ledge was lined with limekilns, in which rock was burned to produce the white lime powder that settlers needed for mortar, plaster and paint. The well-

layered rock of the escarpment yielded excellent building stone for barn and farmhouse foundations, as well as for churches and business buildings in the burgeoning new towns and cities. Iron ore deposits in Dodge County were mined to produce the cast iron for kitchen stoves and many more "modern" conveniences. More recently, other important aspects of the escarpment have been uncovered. Its unique fauna and flora includes 240 rare, threatened or endangered species, such as lichens that grow on stones, crevice-clinging ferns, and species of tiny land snails — relicts of the last ice age — that thrive in the cool shaded cliff face and talus slopes. Its fractured rock and thin soil cover are important in sustaining groundwater quality. Its natural beauty attracts tourists, helping Door County to be voted one of the top 10 vacation destinations in the United States.

In recognizing its significant role in Wisconsin's natural and cultural history and to draw attention to its international scope and global importance, the State Legislature proclaimed 2010 the Year of the Niagara Escarpment to "foster awareness and education on this important and unique landscape feature." In celebration, a variety of events and activities from museum exhibits, to jazz festivals, to wine and beer tastings, already have been held along the escarpment and will continue throughout the year and beyond. Fall and winter are perhaps the best times to appreciate the escarpment for its natural beauty, as an elemental piece of our landscape, and to enjoy some of the more unique ways to view The Ledge.

Fonferek's Glen in the Town of Ledgeview, Brown County, features fractured limestone cliffs and a 30-foot waterfall.

View from above

In eastern Wisconsin, the Niagara Escarpment satisfies a longing to see above the trees and sense the lay of the land. You'll find one of the most magnificent viewscapes in the area at Ledge Park in Dodge County. This 83-acre county park lies at the southeast corner of Horicon Marsh, the largest freshwater cattail marsh in the country. Both a state wildlife area and adjoining national wildlife refuge, Horicon Marsh has been designated as a Wetland of International Importance and a Globally Important Bird Area. There is no better place to get a sense of the size and scope of Horicon Marsh than from atop the escarpment, which rises 250 feet

The views from atop the escarpment overlooking Horicon Marsh reveal a stunning, vast wetland accentuated in season by the sights of migrating waterfowl and sounds of goose music.

above the wetland. Like Lake Winnebago, Horicon Marsh is a remnant of the much larger glacial Lake Oshkosh that formed when melting ice flooded the area and was kept from flowing east by the escarpment itself.

One of the most remarkable sights to see from this vantage point on the escarpment is the spectacle of the Canada goose migration. Every fall, these birds leave their breeding grounds near Hudson Bay in Canada and congregate at Horicon Marsh between mid-September and mid-December before heading to their wintering grounds in southern Illinois. Their population peaks in late October to mid-November, when as many as 200,000 geese rest, stage and temporarily reside. The site and sound of hundreds, even thousands, of geese in orderly V-shaped formations approaching the marsh from every direction is awe-inspiring. Considered one of the most amazing wildlife displays in the Midwest, nature lovers migrate here from across the country and the world to view the event right in our own backyard. Hike the Ledge Overlook Trail in Ledge Park on a crisp autumn day to watch and hear the countless birds silhouetted against the rose-colored sunset. It is a sight you will not soon forget.

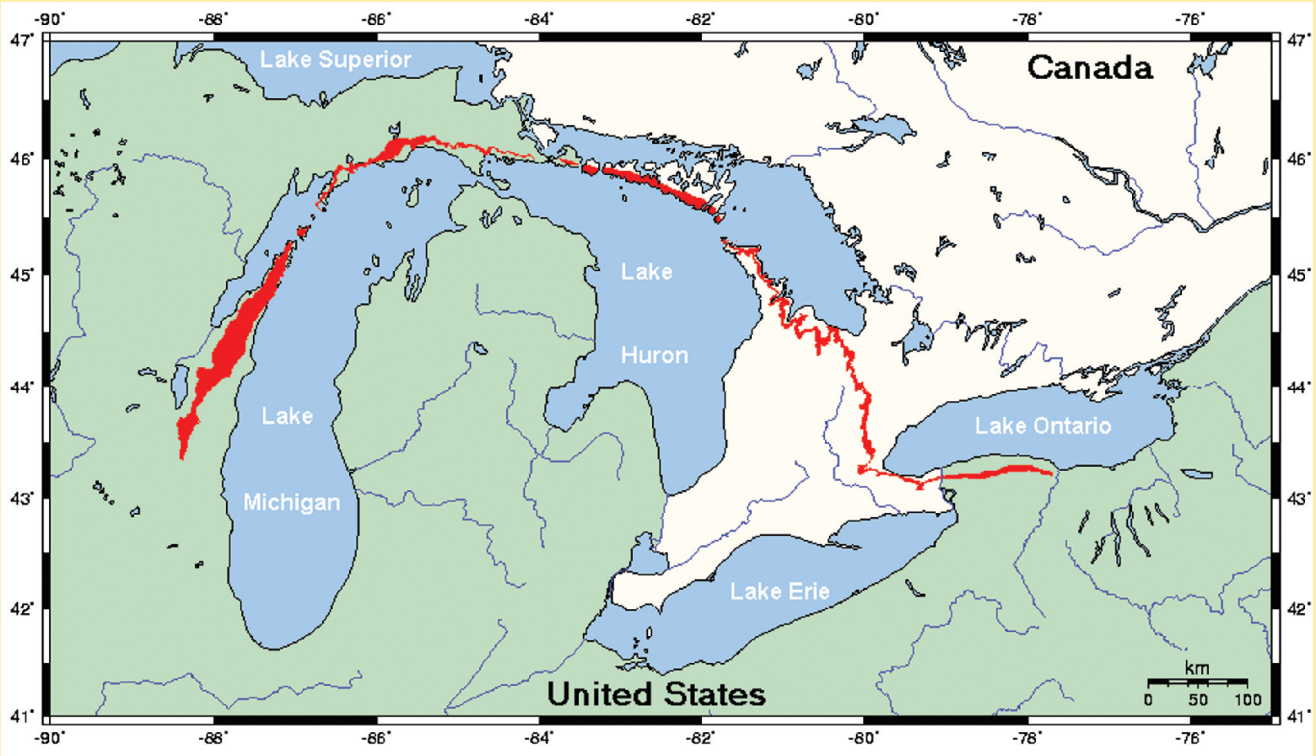
Not far from Ledge Park, iron ore was mined from the escarpment beginning in the mid-1800s, when the deposit was proclaimed "inexhaustible." By the late 1930s, all mining had ceased. The underground mine at Neda, inactive since 1914, has become one of the largest bat refuges in the Midwest, with about 143,000 bats hibernating there each winter. To learn about the iron-mining era, visit the Limestone School Museum in Mayville to view the new "Iron Country" exhibit.

View from below

This fall, get a good look at the *inside* of the Niagara Escarpment, which is home to the largest number of underground caves in Wisconsin and two of the three longest cave systems in the state. The vertical tension fractures that crisscross the surface of the dolomite bedrock in The Ledge have acted as a conduit for water flow for millions of years. Rainwater, groundwater and glacial meltwater have dissolved rock along the fractures and, with waves, ice and frost, have worn away the rock physically. Water also flows along horizontal gaps between rock layers. Together, these weathered features are called *karst*, which includes caves as well as sinkholes.

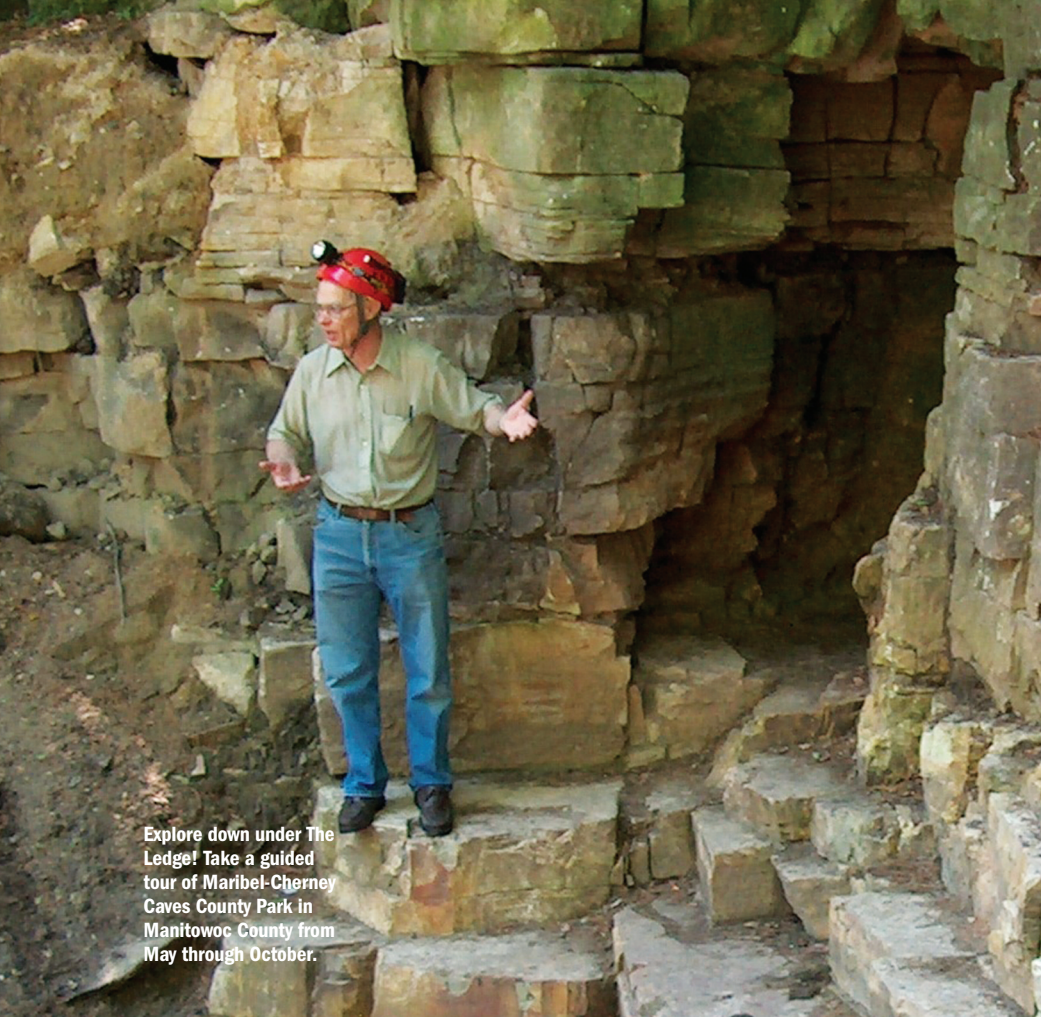
Some of the caves formed by waves are best seen in Door County. Eagle Cave in Peninsula State Park on Green Bay lies high in the bluff, formed when lake levels were much higher during the last ice age. In contrast, the sea caves at Cave Point County Park are still being created by the thundering waves of Lake Michigan. On land, most of the caves filled with sediment over time, but some have been dug out and are accessible to the public. From

WHAT IS THE NIAGARA ESCARPMENT?



WIKIMEDIA COMMONS

An escarpment is nothing more than a steep cliff face. It forms when softer rocks like shale are eroded from beneath more durable rocks like limestone or dolomite, which then break off, creating a vertical cliff. The cliff occurs at the edge of gently tilted rock layers called *cuestas*. The Niagara Cuesta formed when the Earth's crust sagged beneath what is now the lower peninsula of Michigan. The Niagara Escarpment is the weathered, exposed, upturned edge of this bowl-like depression.



Explore down under The Ledge! Take a guided tour of Maribel-Cherney Caves County Park in Manitowoc County from May through October.

May through October, guided tours are provided at Maribel-Cherney Caves County Park in Manitowoc County and at Ledge View Nature Center in Calumet County. This year, Ledge View offers its family-oriented Halloween Candlelight Cave Tour on October 22 and 23. And, remember, no matter what the weather outside, the caves maintain a fairly constant temperature around 52°F.

View the color

As Europeans emigrated to eastern Wisconsin beginning in the mid-1800s, forest and woodland were cut for fuel and lumber so the land could be plowed and planted. The rugged cliffs of the escarpment were not easily logged or farmed. Consequently, a substantial amount of native vegetation is preserved on the edge of The Ledge today. With roots delving into fractures in the rock, stunted and gnarled cedars cling to the face of the rocky cliffs. Among the oldest trees in eastern North America, these ancient cedars form a vertical forest. Even though the cedars are starkly beautiful and reveal climates of long ago, the trees growing on the ledge top attract the most attention in autumn. As their leaves turn shades of crimson, saffron and claret, the ash, beech, birch, maple, oak and other hardwoods seem to set The Ledge ablaze.

Look around, and then look up! Cedars gained a toehold, anchored roots and continued to grow as a vertical forest in cliff settings along escarpment rock.

Although you can enjoy fall foliage anywhere along the escarpment, this might be a good time to drive Wisconsin's newest scenic byway, the 66-mile-long Coastal Byway in Door County, which was established in May of this year. While on the peninsula, visit the Fall Fest in Sister Bay on October 15-17; it's the oldest and one of the largest celebrations in Door County. The Fond du Lac Audubon Society rewards children with a special patch for visiting five of nine escarpment sites listed in their free "Ledge Passport" through November 13. Bring the family to High Cliff State Park on October 30 for the free Great Pumpkin Hike, which includes pumpkin carving, wagon rides and a torch-lit hike along the ledge.

View from afar

As snow begins to fall, the escarpment presents yet another expression, with the somber gray dolomite cliff face now resembling the ramparts of a castle — a defensive wall built to thwart ancient invaders. No longer hidden by vegetation and with a dusting of white, the path and extent of the escarpment becomes most obvious in winter. Suddenly, The Ledge emerges from the middle of fallow farm fields, in stream banks, along roadways and behind subdivisions. In places, The Ledge appears to be long, continuous and knife-edged. Elsewhere it occurs as a series of isolated, irregular rock remnants that meander across the countryside. The varying height of the escarpment along its discontinuous passage also becomes evident in winter.

The sparkling solitude of a fresh snowfall presents special opportunities to enjoy the escarpment.

At High Cliff State Park, take to the snowshoe trail that passes the historic limekiln ruins above Lake Winnebago, with its colorful ice-fishing shanties. Experience cross-country skiing by candlelight at Peninsula State Park and Ledge View Nature Center. For a little more excitement, ride the snow-tubing hill at Calumet County Park, just next door to High Cliff.

Frozen in time, waterfalls in winter are especially beautiful with their glacial-blue color and extraordinary ice

formations. Many of Wisconsin's waterfalls are located along the escarpment. Fonferek's Glen and Wequiock Falls, both Brown County parks, are easily accessible and offer great views. The new boardwalk at Wequiock Falls makes for an easy walk into the ravine close to the falls.

On a winter drive it's easy to follow The Ledge from Dodge County north. Both the weather and the frozen falls are breathtaking when you reach Wequiock Falls in Brown County.

View from the vineyard

By year's end, Wisconsin may have a new federally designated American Viticulture Area (AVA) named for the Niagara Cuesta. This broad slope associated with the escarpment is blanketed with well-drained glacial sediments and influenced by unique microclimates and weather patterns moderated by the escarpment and by its proximity to the waters of Green Bay, Lake Winnebago and Lake Michigan. This combination of factors mimics some of the best grape-growing regions in the world, including that of Bordeaux, France. Wineries associated with Wisconsin's escarpment already are winning medals in national competitions. When the AVA designation is received, lift a glass of escarpment wine and toast Wisconsin's rocks.

Craggy rocks and shores are ablaze in color before the leaves spill into the blocks of rocks and crevices at High Cliff State Park in Calumet County.

Joanne Kluessendorf is founding director of the Weis Earth Science Museum in Menasha, Wisconsin's official mineralogical museum. A native of Milwaukee, Kluessendorf received her doctorate in geology at the University of Illinois at Urbana-Champaign. She loves The Ledge, and has studied its geology for many years.

Readers Write

COMMENT ON A STORY?

Send your letters to: Readers Write, WNR magazine, P.O. Box 7921, Madison, WI 53707 or e-mail letters to david.sperling @wisconsin.gov. Limit letters to 250 words and include your name and the community from which you are writing.

PERSPECTIVE ON WISCONSIN'S FISHING SUCCESSES

I want to commend you for both another great edition and the outstanding *Wisconsin Fishing Report* (April 2010 insert). It seems that fishing in Wisconsin gets better each year with new and exciting places to fish: Lake Michigan and the great fishery it provides, no end of better walleye fishing in the Green Bay area, musky fishing all over the place, the sturgeon success and the rebuilding of the Wild Rose Hatchery to increase the number of fish to be stocked in areas where natural reproduction is nonexistent.

During the 1950s, I was fortunate to have been a summertime employee of the Wisconsin Conservation Department in habitat improvement on the Evergreen River, a project that is still in progress. Wow! I was a student of the late Fred Schmeeckle in the late 1950s, a great ecology mentor! I later taught at White Lake, and from 1965 to 1990, I taught biology at South Milwaukee High School.

It was a miracle to see the success of the salmon and trout introduction into the Great Lakes. I was in Oregon when the DNR in Michigan introduced the coho to Lake Michigan and remember my friend in Oregon saying, "It won't work, the salmon need the salt water!" Surprise, it rescued a struggling DNR in Michigan. Research isn't always successful, but when it is, many people gain. We have provided thousands of hours of fishing for the average fisherman-woman, with pretty good success!

Edward C. Mueller
South Milwaukee

STAR WARS CONNECTION

I truly enjoyed your antlion story ("A tiny terror in a sandy pit," June 2010). While in Idaho I oftentimes would be thrilled by the goings-on in the cone trap of an antlion. Now I know they are in Wisconsin, so I'll definitely keep my eyes open. For those of the age that were around when the first Star Wars movie came out, you might recall the huge monster that was trying to capture Han Solo and crew in the pit. This was based on an antlion and his pit was as big as a large house. Very scary! I doubt if anyone realized that this monster was based on something real!

David Thorson
Gordon

BASS VERSUS WALLEYE

I have just two comments on the article on largemouth bass replacing walleye in many northern Wisconsin lakes ("Sustaining a fishery or fighting natural change?") in the June 2010 issue. First, the main reason anglers are only keeping 5 ½ percent of the largemouth bass they catch is the relatively poor table quality of largemouth bass, especially out of warm water. It will be hard to convince an angler to remove a limit of bass from a lake when they really have no desire to clean and consume them. And second, will the 21 study lakes in northwest Wisconsin be closed to tribal spearfishing during walleye spawning? If not, how do you plan to enforce the 18-inch size limit on walleye during the early spring spearfishing season?

Richard Reed
Colgate

Fisheries Director Mike Staggs replies: We are aware that some anglers do not like to eat bass as you mention, but over the years we have seen that many anglers do harvest bass for table fare. High angler harvest of bass was one of the reasons the statewide minimum size limit was established back in the early 90s. Given that, we do agree it is uncertain whether anglers will harvest enough bass (for whatever reason) to positively affect the walleye populations. That's why we will also be restricting angling harvest of walleyes to help rebuild their spawning stocks.

DNR does not have authority to restrict tribal spearfishing beyond what is established in the federal court decisions. However, we do not think this will be a barrier to rebuilding walleye stocks. Tribal spearfishing harvest is generally only a modest fraction of the total harvest in any given lake that is speared (generally 25 percent or less) and is controlled by quotas that are set each year; as the walleye populations decline, so do the quotas. The tribes are aware of this entire issue and have just as much of an interest in restoring and maintaining walleye stocks as the State, so I would expect to see them voluntarily lower their quotas on these lakes in the coming years to assist with rebuilding efforts. They have done this in the past on several lakes where we had mutual concerns about rebuilding walleye stocks (for example on Kentuck Lake in Vilas Co. and on Sand Lake in Sawyer Co.). They may also assist by voluntarily removing more bass through targeted spearing efforts if angling reductions are not successful.

STOCKING RINGNECKS

On page 28 of your June 2009 magazine I came across a "Readers Write" question about Manchurian pheasants. We imported the Manchurian pheasants from China in 1989 and have been propagating them ever since then.

I then went and looked at the February 2009 article about pheasants (which I had not read before). I am not entirely surprised to read comments that releasing pheasants to restore pheasant populations just doesn't work. I would like to remind Mr. Hull that pheasants are not indigenous to our country and that all pheasants in North America derive from released birds. The release concept must have worked at some point!

Bill MacFarlane
MacFarlane Pheasants
Janesville

WILD ENCOUNTER

The Creature Comforts section in June ("Keep the 'wild' in wildlife") compelled me to write. By coincidence, my family shared a situation that relates to this "Not suited for captivity" column.

While vacationing on Big Pine Lake in the Perham area of northwestern Minnesota we decided to make a quick drive into town to pick up a few items. On the way, we came upon a doe and her very young fawn crossing the road. As we drew nearer, the doe took off and strode quickly up the hill into the woods, leaving her little one behind.

We pulled off to the side of the road, determined to guide the fawn to safety. We patiently waited for her to attempt climbing the hill. Her mother stood at the top, staring at us with a watchful eye. After a few moments, we decided it best to leave and allow the doe to come back and rescue her fawn. We carefully coaxed the fawn down into the ditch and part way up the hill toward her mother. The tiny fawn clumsily made her way up the hill where her mother stood waiting, and we drove off to town, thankful for such a wonderful chance connection. It truly was the highlight of our Memorial holiday weekend.

Jim Ulwelling
Eau Claire

PETS IN CAR ARE DANGEROUS DISTRACTIONS

Referring to the February 2010 Creature Comforts, do you really advocate traveling with a mobile lethal missile in the vehicle with the driver? Just what we need — more distractions. I leave my canaries, tropical fish, cats, lizards and other pets at home where they remain safe and well cared for! Apparently the same cannot be said for many dogs. We had a recent accident on my country corner where one driver was distracted by a small dog loose in the vehicle. An SUV and a pickup were destroyed in seconds. Nobody was seriously injured. The motoring public must not be distracted while driving. If your pets cannot be entertained at home, maybe you are in over your head.

Terry Jones
Hoffman Estates, Ill.

Thanks for your note and we're sorry you witnessed what appears to have been a nasty accident. We're grateful that no one was seriously

NO ACCESS TO THE WEB?
Don't have access to a link we mention in a story? Let us know when you want to follow a link we list. We'll do what we can to get you a copy of the material if it is available free of charge and is relatively short in length.

injured. We certainly do not advocate letting pets roam in a car. They should be in safe carriers that are secured. It's a fact that more people are traveling, particularly with dogs, to exercise them at dog parks, take them along while hiking, getting veterinary care, training them for hunting field work or attending special dog events. That said, safety for the pet and driver are critical and you are absolutely right that drivers do not need more distractions. Loud music, cell phone use and texting while driving are all making the road a more hazardous place with more inattentive drivers.

UPDATES

TWO AWARDS FOR WNR MAGAZINE

- On March 30, *Wisconsin Natural Resources* magazine was honored to receive the **James Zimmerman Award for Excellence in Environmental Education and Communication** from the Madison Audubon Society. The Society annually presents four Excellence Awards to honor "individuals or groups who have worked to achieve the Society's objectives in community-based restoration, bird conservation, citizen science and achievement in environmental education/communication." The magazine was recognized for being a self-sustaining publication that covers a full spectrum of emerging outdoor and environmental topics in an entertaining fashion. The award honors James Hall Zimmerman, a naturalist, environmental educator, and newspaper columnist who established one of the early courses in wetland ecology at UW-Madison.
- *Wisconsin Natural Resources* magazine in partnership with DNR's Science Services staff and the University of Wisconsin Forest and Wildlife Ecology Program were awarded the **2010 Governor's Award for Archival Advocacy** in June for our August 2009 special insert "See Wisconsin through the eyes of 19th century surveyors." The publication used historic public land survey records and maps of pre-settlement vegetation to explain changes in the Wisconsin landscape since the Wisconsin Territory was first surveyed between 1832 and 1866. Creative Products Manager Natasha Kassulke produced the publication showing how surveying records were used to reconstruct past ecological conditions and explain changes in the landscape over time. The University's Forest and Wildlife Ecology Program spent 12 years developing and interpreting these maps. The Governor's Award annually honors outstanding works that make the best use of historical records in Wisconsin.

DEER DON'T TRAVEL FAR

White-tailed deer in south-central Wisconsin's chronic wasting disease management zone (CWD-MZ) are, for the most part, a sedentary species, according to a field study conducted by University of Wisconsin-Madison researchers.

During the course of the project, which ran from 2002-2009, researchers captured and radio-collared 165 deer from the CWD 'Core Area' of western Dane and eastern Iowa counties, a part of the CWD-MZ with the highest disease prevalence or infection rate.

"Except for young males, deer actually don't travel very far in our landscape and females tend to remain in the same area throughout their lives," said Nancy Mathews, project director and wildlife ecologist at the UW-Madison Gaylord Nelson Institute for Environmental Studies. Mathews' data also show that adult bucks have predictable home ranges, even during the rut.

"Adult males aren't bouncing around the landscape like billiard balls during the rut," she added.

The small home ranges of deer in the Core Area range from about ¼ square mile to about ½ square mile for females and from about ½ square mile to nearly one square mile for males, year-round.

The project, the largest of its kind in North America to focus on white-tailed deer behavior and CWD transmission in the wild, involved capturing and radio-collaring both male and female white-tailed deer. Researchers relocated deer over 120,000 times and used a total of 33,340 telemetry locations to calculate home ranges.

Researchers also found that deer don't change their movement behavior in response to hunting pressure. "This has very important disease management implications because it means that even if we increase our levels of hunting to control populations where CWD is present, deer don't respond by leaving the area permanently," said Mathews.

Continued from page 2

When duck constitution matters

ducks would soon depart for a roost site. Since these ducks were quite a distance from the rocket box, we thought they might outfly the net.

The net launched with a loud boom in the diminishing light and the rockets spewed long red tails. The net had outrun 12 ducks and they bobbed up under it. Craig quickly waded out and pulled ducks from under the net. I sat on a chair in the headlights of the truck banding them and recording numbers.

Everything went well until we came to the last two ducks. They, of course, had been under the net in the water the longest. Somehow that duck magic that keeps all the water out so their down feathers remain dry had been compromised. These two were thoroughly wet and cold.

Banding woodies by headlight was cold work, but it was colder for the wet ducks.

AL CORNELL

We could have just banded them and let them go, but we had made them susceptible to cold and predation, and that concerned us. I turned on the heater in the truck and the vent soon blew a strong stream of hot air to the passenger side floorboard.

The concept of letting a wild wood duck loose in the truck cab didn't seem too bright, but I placed one in the stream of hot air. When I let it go, the duck pressed its way closer to the air vent and made no attempt to escape. Soon the second duck was there beside it warming and drying in the air flow.

We had to make a decision about what to do with them before we left the site. I decided to fill the rocket box with loose grass and place the ducks inside. The plywood box was about 30 by 30 inches and 12 inches high with an open front.

We placed the two ducks in the back of the box behind the loose grass. They seemed content and did not struggle at all. I imagined if a raccoon happened by and figured out the situation, it would have a good chance of catching a boxed meal.

We arrived to pick up our stuff the next morning a bit anxious about the potential outcome. We found a little tunnel leading out through the grass from inside the box and two large morning constitutions were deposited in front of the box. The ducks had held it all night to keep the odor level low in their roost box, and had fared well.

Technical literature can describe the probability of mortality during such a capture. It's a statistic, but I will always remember the two beautiful wood ducks that did not contribute to that data by surviving.

Our report from that day contained no information other than the band numbers. All these years later, I still have an indelible image of those two special wood ducks on the floorboard of the pickup snuggling close as the warm air flowed from the heat duct.

Al Cornell retired in December 2008 after more than 25 years service as a DNR wildlife technician.

CREATURE

Comforts

Kathryn A. Kahler

SOUTHWEST AIRLINES

On the fly

We've offered advice for making road trips comfortable for both you and your pet. There may be times, however, when you have no choice but to fly. Whether it's a hunting trip to Canada, a cat show in New England, a national field trial or just an extended vacation in southern climes, the skies will be much friendlier for your pet if you do your homework ahead of time.

Government and airline restrictions

Most airlines have strict rules for pet travel, so it's best to read them carefully before booking your flight. Check out pettravel.com/airline_rules.cfm for a comprehensive, airline-by-airline list of restrictions. You'll usually have the option of carrying small dogs and cats in a carrier with you in the cabin, checking them as baggage into the temperature-controlled cargo area, or sending them as cargo.

Pets must be at least eight weeks old and weaned, and in good health. Airlines may not require health certificates, but you should check with your vet about individual state requirements or for destinations outside the U.S. All states require proof of current rabies vaccination for dogs over 12 weeks old and some also require it for cats. Refer to the U.S. Department of State's website (travel.state.gov/travel/tips/tips_1232.html#pet) for travel tips and a listing of foreign embassies you should contact for their health requirements.

JUDITH VAN NOATE

Some airlines only allow dogs and cats and all have strict rules about the size and structure of travel crates, feeding and watering instructions, temperature restrictions and the number of pets they allow per flight. Most make special accommodations for service animals.

Plan to spend more

Charges vary with each airline, but the cost to take a pet in-cabin is around $100 and as checked baggage, about $150. For pets traveling as cargo, plan to spend anywhere from $50 to $200, depending on kennel size. Some airlines require reservations for in-cabin pets and limit the total number of reservations per flight on a first-come, first-served basis — another reason to do your homework before booking your flight.

Planning tips

Consider these general guidelines before your trip to make the flight less stressful, if not enjoyable for your pet:

- If possible, book a nonstop flight. You've heard the horror stories of lost luggage — imagine if it were your pet!
- In summer, try to fly at night when it's cooler; conversely, look for daytime flights in winter.
- Never sedate your pet before flight, even if he's a nervous traveler. Tranquilizers can affect your pet's ability to maintain balance and can interfere with respiratory and cardiovascular functions at high altitudes.
- Carry a leash and try to exercise your pet as close to departure time as possible, but never inside the airport.
- Pack your pet's normal medications and food supply. Travel time is not the time to experiment with new foods.
- Never muzzle your dog during flight.
- Don't travel with short-nosed breeds (like bulldogs, pugs or Persian cats) because they are especially susceptible to breathing problems at high altitudes.
- Place an old towel or blanket and a chew toy in your pet's carrier to lessen stress.
- Follow options for providing disposable litter boxes for cats, especially if you have layovers built into your flight plans.

Staff writer Kathryn A. Kahler writes from Madison.

Have gun-dog, will travel

Boots protect this German shorthaired pointer from rough ground, sand burrs and cacti during a quail hunt.

LEO KAHNG

Most hunters who take their four-legged companions on long-distance hunting trips or field trials prefer to drive, but more are opting to fly. The same travel rules and suggestions apply to hunting dogs. Whether by land or air, here are a few tips you may want to consider when traveling with them:

- **If traveling to areas of higher elevation, try to add a day or two to your itinerary to allow your dog to condition at the different altitude.**
- **Don't forget to take spare batteries and chargers for electronic collars.**
- **Consider the temperature and terrain you will be hunting. Bring fans, cool pads, warm bedding and dog boots as needed.**
- **You never know when your dog may get a thorn in a pad or become sick or injured, so a first-aid kit made especially for him is a must. Items to consider include: muzzle, magnifying glass, scissors, tweezers, multi-tool, nail file, penlight, cotton swabs, eye dropper, petroleum jelly, gauze, first-aid tape, nutritional supplements and medicines. For a complete list, go to pawnation.com and search for "pet first aid."**

Set your sights for fall

The days are cooling off and it's light jacket weather to enjoy leisurely hikes, the long shadows and long views of early fall both outside and indoors.

Start your journey from on high. **Wind Point** juts into Lake Michigan at Racine and the view from the 108-foot lighthouse is breathtaking. Or maybe that's the result of climbing up 144 steps! Sunday, October 10 is one of just four days during the year when the historic lighthouse and museum are open for public visits. Call (262) 639-2026, or (800) 272-2463 toll-free and plan your visit to the lighthouse at 2725 Lighthouse Drive.

Wind Point Lighthouse, 3.5 miles north of Racine, hosts periodic tours. Portions of the keepers' dwelling can be rented for public gatherings.

Or maybe you're hungry for a sunset hike with sweet music? Cut diagonally across the state and set your compass for Crex Meadows in Grantsburg. Join the **sandhill crane tour** from the new Education Center starting at 5 p.m. as hundreds of the big birds fly in from their daytime feeding grounds and trill their way to nighttime roosts. Tours are planned for Saturday, October 2, 9 and 16. The first 10 callers can reserve a seat in the van for $5, everyone else follows in a carpool caravan. Call (715) 463-2739.

Rather make your own magical moment? Then come back to Crex on Friday, October 22 for the **Full Moon Series**. The free 6 to 8 p.m. event starts at the Auditorium at the Wildlife Education and Visitor Center. The evening program in October starts with a short talk around a campfire about the science and folklore of the moon phases, and seasonal changes in the plants and animals found at Crex. That's followed by an evening hike lit by the rising moon and a moon-related snack. Join us. No reservations are needed.

Up for some light-hearted fun during the fall hunt? Spend a little dough and a few bucks to see **Deer Camp, The Musical** at UW-Whitewater's Young Auditorium, 930 W. Main Street. The show about four hunting buddies cooking up a scheme to save their hunting paradise highlights corn-ball songs and comic timing. The curtain rises at 7:30 p.m. on Friday, October 29. Ticket prices range from $19.50-$29.50. Call (262) 472-2222 or order online at uww.edu/young auditorium/season/1011 deer.html

Want to try the high road to outdoor culture? Take in the annual **Birds in Art exhibit** that runs from mid-September through November 14 this year at the Leigh Yawkey Woodson Art Museum, 700 N. 12th Street in Wausau, 9 a.m. to 8 p.m. on Tuesday, 9 a.m. to 4 p.m. Wednesday through Friday, and noon to 5 p.m. on weekends. A variety of fine art paintings, drawings, sculpture and carvings celebrate all aspects of birds and their habitat. Call (715) 845-7010 or e-mail: museum@lywam.org

Through the end of October you can also enjoy **Audubon: The Art of Nature**, an exhibit about artist and amateur scientist John James Audubon at the New London Public Museum, 406 S. Pearl Street in New London. The exhibit includes Audubon artwork, letters and other artifacts. Admission is free and museum hours are Tues. 10 a.m. to 7 p.m., Wed.-Fri. 10 a.m. to 5 p.m. and Saturdays 10 a.m. to 2 p.m. Call (920) 982-8520 or e-mail: museum@newlondonwi.org

***Curlicues* by Krystii Melaine at the Birds in Art annual exhibit in Wausau.**

Finally, the Oshkosh Public Museum will offer an exhibit **Deer Hunting: Wisconsin's Autumn Tradition** from September 25, 2010, through January 30, 2011. It explores the rich history and deep tradition of Wisconsin deer hunting, including images from deer camps past and present submitted by hunting groups and families. The museum is located at 1331 Algoma Boulevard in Oshkosh. Hours are Tuesday-Saturday, 10 a.m. to 4:30 p.m.; Sunday, 1 p.m. to 4:30 p.m. Admission: adults $7; seniors (62+) $5; children (6-17) $3.50; kids under 6, free. Call (920) 236-5799 or visit www.oshkoshmuseum.org for more information.

Kick up your heels at *Deer Camp, The Musical*.

Wisconsin, naturally

PAGE CREEK MARSH STATE NATURAL AREA

Notable: Located in the lowlands along the Fox River, Page Creek Marsh harbors a rich mosaic of wetland plant communities including sedge meadows, wet-mesic prairie, bog, calcareous fen, open marsh and small seepage lakes. Page Creek flows through the site and a fringe of oak savanna and upland prairie add diversity. The boggy meadows support wiregrass sedges, cotton grass, bog aster and tamarack. The marsh is an important staging area for sandhill cranes during their fall migration and provides year-around sanctuary for a diversity of wetland birds and other animals. Recognized as a "Wetland Gem" by the Wisconsin Wetlands Association, the natural area is owned and managed by The Nature Conservancy.

How to get there:

From the intersection of Highway 51 and County Highway D just west of Packwaukee, go east on D for 3.45 miles, then north on County Highway K for 0.5 mile to a parking area on the east side of the road. See dnr.wi.gov/org/land/er/sna/index.asp?SNA=330 for a map and more information.