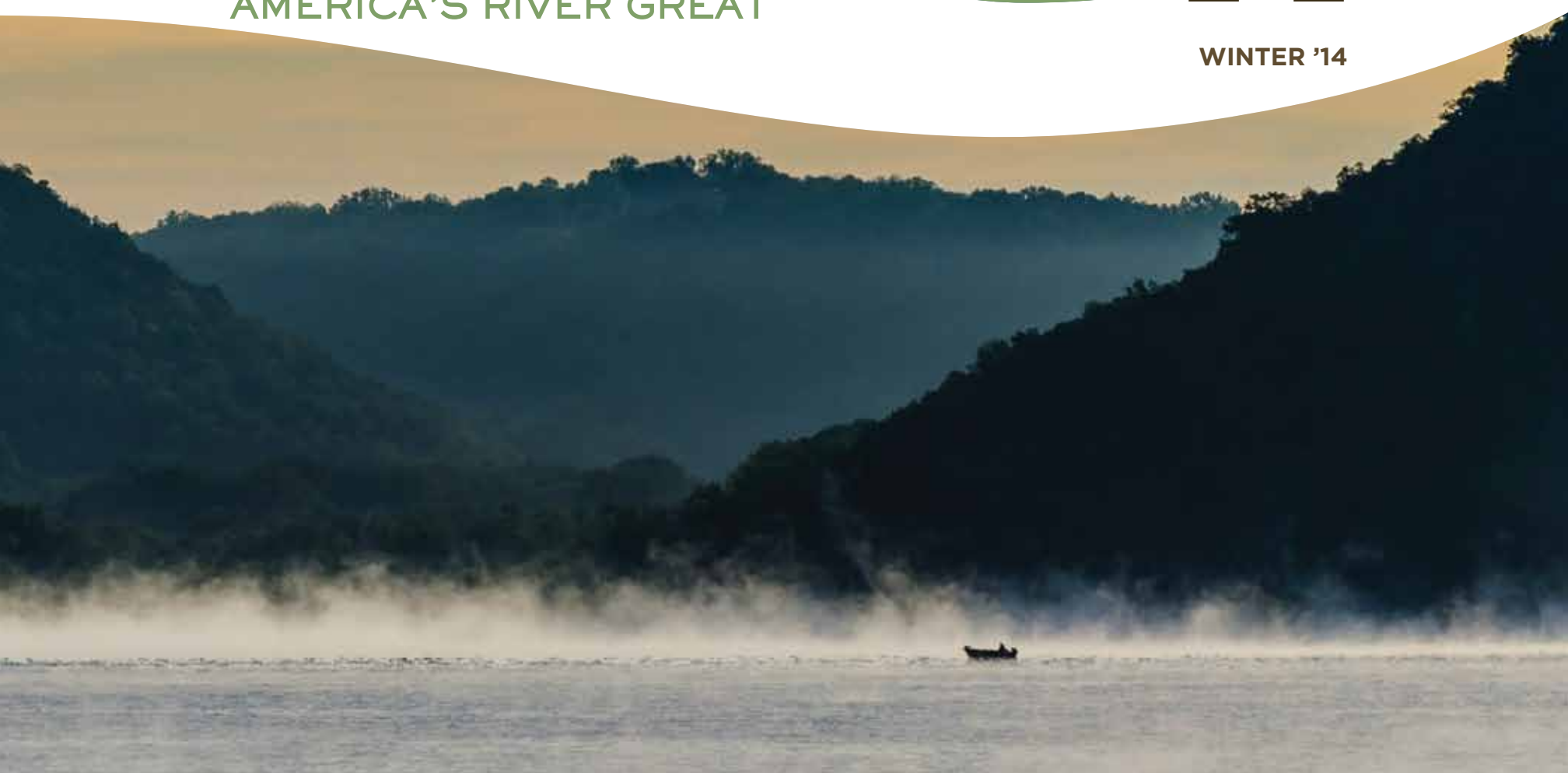


Our Mississippi

PARTNERING TO KEEP
AMERICA'S RIVER GREAT

WINTER '14



The Mayo Clinic of the Mississippi?

BROWSE THE JOURNALS of the country's early explorers, and you'll find weathered pages dedicated to the perils of the Mississippi River. The natural river—crafted by glaciers and nature's whims—consisted of a vast mosaic of lakes and islands and of pretty sandbars waiting to snag a ship, if the fluctuating water levels and rapids didn't get her first.

Alongside those tales of navigation perils, however, they penned poetic descriptions of the thick forests and abundant wildlife made possible by those natural river variations, and of encounters with riverside buffalo, passenger pigeons, rattlesnakes, abundant waterfowl and ancient paddlefish.

Today, most of those snags and hidden dangers have been addressed by political pressure to create a virtual stairway of water, the series of ever-deepening navigation channels and locks and dams through which the U.S. Army Corps of Engineers maintains today's nine-foot navigation channel, writes environmental historian John Anfinson in his book, *The River We Have Wrought: A History of the Upper Mississippi*. But in the course of that evolution, it was the wild river that suffered as the distribution of available habitat changed for fish and thickening sediment starved out vegetation key to the diets of fish and wildlife.

Then in 1986, Congress appointed a river healer, so to speak, when that year's Water Resources and Development Act created the U.S. Army Corps of Engineers-led Environ-

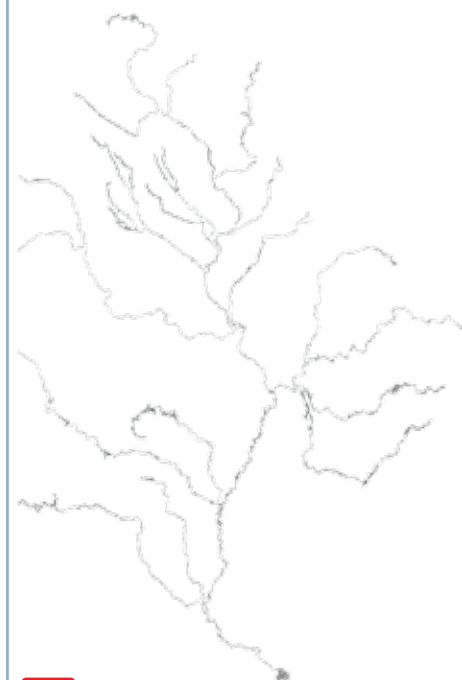
mental Management Program, now called the Upper Mississippi River Restoration Program.


Through that act, Congress ordered the river be managed as both a nationally significant waterway and a nationally significant ecosystem. This massive restoration and monitoring program was created as the agent to restore the balance, and there's almost universal praise for the way the program has crafted a strong partnership among federal, state and non-profit organizations to carry that out. The program has also amassed the most complete set of river data on any large river system in the world and pioneered restoration science on large river systems across the world.

Historian Anfinson says if the Mississippi was at first wild, then improved for navigation, then reshaped and closely managed for economic reasons, its "fourth river" future will see a balanced concern for its economics and its ecosystems, for its river pilots and its fishermen. He pinpoints the Upper Mississippi River Management Program as a key component in finding that river balance.

Many program partners have seen initial success and are optimistic for the future. Says Tim Yager, acting refuge manager for the U.S. Fish and Wildlife Service's Upper Mississippi River National Wildlife and Fish Refuge:

"It's a really important program for keeping the river functioning as a healthy ecosystem, and for me as a refuge



 **Our Mississippi** is a quarterly newsletter of the U.S. Army Corps of Engineers about its work in the Mississippi River Basin. It is published in cooperation with other state and federal agencies and other river interests with whom the Corps collaborates and partners toward long-term sustainability of the economic uses and ecological integrity of the river system.



Islands under construction in Mississippi River Navigation Pool 8. RIGHT: A bulldozer helps create a new island as part of a Capoli Slough Habitat Rehabilitation Project.

manager, it's what I'm all about. The partnership with the Corps and states has allowed us to do some great enhancement work, and every project we have built has been successful in one way or another."

Since its inception, the program has restored 100,700 acres, in 55 projects completed over 27 years. Another 35 projects are in process. But what's next for the program—and the river's future?

Crafting a vision for a balanced river

In the midst of a record winter cold snap, a strategic planning group gathered in the Quad Cities to determine a vision for success. The room held a couple of dozen people—state fisheries experts, planners from The Nature Conservancy and other non-profit groups, national wildlife area managers, engineers and biologists. When the facilitator asked attendees to picture what program success in five years would look like, Jim Fischer, the Mississippi River team leader for the Wisconsin Department of Natural Resources, was ready with some ideas. Among the favorites: "Our science and rehabilitation projects are so widely recognized and respected that we have been called the Mayo Clinic of large rivers."

At its most basic level, Fischer explains, the Mayo Clinic evaluates human health by monitoring vital signs, not unlike the way the program's long-term resource monitoring element assesses the health of various ecological components on the river—fish, vegetation, water quality and clarity and more.

To assess human health, Mayo also uses more advanced tests to evaluate illness and, based on those results, identify a course of treatment. "We do the same for the river," he notes. "The knowledge we generate is used to better understand river health problems so we can prescribe and treat in the form of a management action." The program's major component, its rehabilitation and enhancement element, builds projects to restore the resiliency and health of the river system, much the way a doctor might perform surgery to correct a patient's medical problem, and it also develops new treatment techniques to restore health and resiliency.

As the Mayo Clinic must continually monitor new health risks, so must river managers, Fischer says. "We try to better understand new stresses from invasive species, physical changes on the river and factors like climate change."

Finally, the Mayo Clinic's specialists speak to each other, interacting daily for the benefit of patients. Similarly, under the Upper Mississippi River Restoration Program, various experts with various employers routinely pool their wisdom and expertise for the sake of the river.

The River Clinic

Through the program, the Corps of Engineers has literally written the reference manual for river health, most specifically engineering solutions to ecosystem restoration. Its Upper Mississippi Restoration Environmental Design Handbook, which has been distributed throughout the United States, now shares innovative techniques developed over time for the rehabilitation of large river system habitats.

"We are continually applying lessons learned to new projects," said Marvin Hubbell, the regional program manager. "One of the lessons learned is how to translate the ecological or environmental needs of the river into terms that engineers can use as design criteria for projects." Information collected at various sites via standard protocols, says Barry Johnson, the long-term resource monitoring science director, provides a quantitative estimate of river health over time and allows for comparisons between different parts of the river. That helps determine if a population increase in a certain fish, for example, is the result of a specific restoration project or an unrelated factor that has boosted populations at other monitoring sites. Collected data have been invaluable in tracking, for example, the Asian carp invasion on the Illinois River and parts of the Mississippi.

The project's restoration component then constructs restoration projects that mimic the river's natural processes. Common tools include dredging of silted-in backwaters, water raising or lowering to mimic natural fluctuations, island building to cut down on wind and wave action and more, said Brian Markert, habitat restoration projects manager for the Corps' St. Louis District. Many projects have resulted in better wintering habitat for fish and plant growth for waterfowl and turtles.

The communication that takes place between biologists asking for the projects and engineers who build them has led to discoveries, among them that islands better break up wind when paired together, says Jeff Janvrin, a habitat specialist with the Wisconsin Department of Natural Resources.

The Quad Cities planning exercise resulted in a vision and mission statement—for a "healthier, more resilient Upper Mississippi River ecosystem that sustains the river's multiple uses." That guiding sentence is critical, Hubbell says.

"Sometimes we've stumbled over how healthy we want it to be, how resilient we want it to be, if it can or should be restored to what existed before the system was fundamentally changed by locks and dams," he said. "This is saying that from where we are today, we're trying to make it a healthier and more resilient system. If we're staying with the medical notion, you know you are going to get sick eventually. What you want to be able to do is bounce back." —K.S.

The River's Geologic/Human Transformation

- 10,000 BC** Ice dam on Glacial Lake Agassiz breaks and torrent of water becomes Glacial River Warren.
- 7000 BC** Glacial River Warren becomes Mississippi River.
- 1824** Rivers and Harbors Act leads to first debris and shoal removal for navigation.
- 1864** Congress designates river channel depth at 4½ feet, bringing dredging, snag removal and channel training structures.
- 1906** Congress defines channel as 6 feet.
- 1924** Upper Mississippi River National Wildlife and Fish Refuge established from Wabasha, Minn., to the Quad Cities.
- 1930** Congress designates channel as 9 feet, requiring locks and dams from St. Louis to Minneapolis.
- 1943** Upper Mississippi River Conservation Committee launches push to improve fisheries habitat in upper river (later expanding to wildlife, plants, invertebrates and recreation).
- 1972** Clean Water Act allows state of Wisconsin to get court injunction to stop deleterious dredging and disposal activities.

- 1975** Great River Environmental Action Team requires Corps/Fish & Wildlife Service/states to find better dredging/disposal methods on Upper Mississippi.
- 1978-1982** Master Plan developed to manage river for navigation, environment, recreation and the public.
- 1986** Water Resources and Development Act proclaims the Upper Mississippi River as both a nationally significant navigation corridor and ecosystem. Environmental Management Program is formed.
- 1998** First Report to Congress
- 2004** 67,000 acres of fish and wildlife habitat restored via Environmental Management Program via 40 Habitat Rehabilitation and Enhancement; second Report to Congress.
- 2007** WRDA authorizes the Corps to work with NGOs as non-federal project sponsors.
- 2010** Third Report to Congress
- 2011** 100,000 acres restored.



Note from the Regional Manager

BY MARVIN E. HUBBELL



THIS 2014 SPECIAL edition of *Our Mississippi* is focused exclusively on the Upper Mississippi River Restoration Program (UMRR). You're probably used to hearing it referred to as the Environmental Management Program or EMP. Several years ago, through the budgeting and appropriations process, the President and Congress started referring to the program as Upper Mississippi River Restoration. We are following their direction and embracing this new program name, not only because that's the way it's referred to in the budgeting and appropriations process, but also because we see the value of a name that is more descriptive of what the program does and its place in the world. So here's to the next chapter of this exciting program that is promoting both restoration and scientific excellence for the Upper Mississippi River.

The UMRR Program has been featured in several of the past editions of *Our Mississippi*, but this is the first Special Edition. We think the timing for a special edition is right because not only does the UMRR Program have a rich history, it has a vital future.

This year, the program is celebrating 28 years of serving the Upper Mississippi River system. During that time, the program has restored approximately 100,700 acres of critical habitat through the completion of 55 habitat rehabilitation projects. In addition, the program has collected data on key environmental attributes of the river in six key pools within the 1,200 miles of river served by the program.

The foundation of this highly successful program has been its active and diverse partnership, which is made up of five federal agencies, five states, numerous non-governmental agencies (NGOs) and an active public. These partners contribute diversity in terms of technical expertise, river-related duties, policy interests and financial capability. These collective efforts have sustained this comprehensive program for 28 years, contributing nearly \$500 million into the five-state region over those years. In addition, state partners have contributed more than \$32 million in direct cost sharing on rehabilitation projects and personnel. In addition, the partners actively participate in a large number of advisory and coordination teams.

This issue of "Our Mississippi" highlights the work of a number of those partners, some key efforts and a bit about the program's future direction. I hope that this helps to feed energy into all the restoration and scientific work being done in support of increasing the resiliency and health of the Upper Mississippi River system.

Upper Mississippi River Restoration Program

VISION: A healthier and more resilient Upper Mississippi River ecosystem that sustains the river's multiple uses.

MISSION: to work within a partnership among federal agencies, state agencies and other organizations; to construct high-performing habitat restoration projects; to produce state-of-the-art knowledge through monitoring, research and assessment; to engage other organizations to accomplish the Upper Mississippi River Restoration Program's vision.

Tribal culture takes center stage in innovative restoration partnership

Two lakes wedged between the scenic Vermillion River and the main channel of the Mississippi River—a watery 2,300-acre spread that's home to a dozen eagle nests, a rich history and plenty of potential—may soon be populated with plants, islands and other features designed to clear the shallow, silt-filled water and give the habitat a healthy boost. If some of those plants are wild rice or edible lotus lilies, credit that to an innovative partnership between the U.S. Army Corps of Engineers and a sovereign tribal nation.

The restoration of North and Sturgeon Lakes near Prescott, Minn., is one of the newest projects to be funded via the Corps-led Upper Mississippi River Restoration Program and its strong tradition of forging partnerships between multiple agencies



ABOVE: *Members of the Prairie Island Indian Community gather to help seed wild rice by forming mixtures of mud and wild rice; the planting is a way to both restore water quality and bring back a culturally significant food source.*

"The tribe has a huge stake because it's where our reservation is. It's nice to see other entities also interested in improving the area."

—Kyle Herdina, environmental program manager for Prairie Island Indian Community

and organizations. In this case, the planned \$3 million in restoration initiatives will be completed through a partnership with the Minnesota Department of Natural Resources, which manages the Gore's Wildlife Area within the project site, and the Prairie Island Indian Community, whose reservation is located there. The Audubon Society is another project partner, as is The Nature Conservancy, which contributed to a pool-wide survey of freshwater mussels.

Pooling finances and expertise only makes sense, says Kyle Herdina, the environmental program manager for Prairie Island Indian Community, especially when many people will benefit from restoration of a degraded pool that supports little plant life due to degraded water quality and altered hydrology.

"The tribe has a huge stake because it's where our reservation is," he said. "It's nice to see other entities also interested in improving the area."

The project is a partnering first for the Upper Mississippi River Restoration Program but also another step in the tribe's innovative approach to ecosystem restoration, focused around cultural heritage. That fits the sensibilities of the entire program, says Marvin Hubbell, the program's regional manager.

"We're always looking at opportunities to expand the partners we work with. By working with Native American tribes, we are not only extending partnerships but also connecting the present with the past as far as looking at our native cultural heritage."

Wild rice, for example, is not a typical species planted in a vegetative mix, he said, but could be a great demonstration

in connecting restoration with cultural issues and food sources—something the tribe has already launched in its innovative approach to restoration. Small wild rice beds have been planted to cut down on wind and wave action, and plantings elsewhere are being guided by a reservation-wide survey of culturally-significant medicinal plants on the reservation. The tribe found about 80 of a list of 110 plants once present and are looking to bring the others back as well, ideally in a way that enhances the environment, Herdina said. Additionally, the tribe has established a herd of nearly 100 buffalo that graze a new floodplain prairie developed atop what was once farmland and a source of runoff into the Mississippi. The prairie sustains the buffalo (a lean protein source for tribal members) while improving water quality.

Measures being considered include islands in North and Sturgeon Lakes to reduce wind- and wave-generated erosion, structures to reduce delivery of sediment to the lakes and a water-level drawdown to promote vegetative growth. While restoration may not take the project to its pre-lock-and-dam condition, much can be done to improve water quality and related benefits, says Tom Novak, the project manager with the U.S. Army Corps of Engineers.

"Sunlight can't penetrate the shallows," he said, "and nothing grows. Obviously, vegetation is important for birds and fish, for food and protection. It's the recurring story. Without aquatic vegetation, it's not a place we'll find birds and fish." —K.S.



Exporting river science to the world yields benefits for all

To explain the value of the fisheries monitoring program he runs on the Upper Mississippi and Illinois rivers, Brian Ickes sometimes tells the story of the Flying Dragon Fish.

What's often referred to in the Midwest as the "dreaded" Asian carp is, in China, the stuff of which gourmet meals and legends of heroism are made.

As principal fisheries investigator for the Upper Mississippi River Restoration Program's long-term resource monitoring element, Ickes has (among other things) tracked the trajectory of the Asian carp's invasion of the Upper Mississippi and Illinois rivers. But while his U.S. colleagues use that information to try to eradicate the species here, he works with his Chinese peers to bring back the carp to the Yangtze, where it's in precipitous decline.

During his three visits to that country, Ickes has helped Chinese scientists develop a standard Yangtze River fish monitoring protocol based on the Mississippi River system monitoring model. He also helped develop a fish tracking system near the Three Gorges Dam that'll help monitor carp migration patterns. Along the way, he learned of the legends of the brave flying carp making a leap up some storied waterfalls and the way the fish is embedded into both the country's culture and diet. Ironically and fortuitously, Chinese scientific research at the cellular level—designed to increase the Asian carp population in the Yangtze—has been shared through the scientific exchanges with U.S. scientists looking at poisons that might successfully eradicate them here.

It's about more than just data, he said. "You also exchange culture and issues and how different societies navigate those. The idea is that you need good data to base decisions and judgments on, but at the end of the day, the river in each of these societies is a reflection of what that society values."

The Upper Mississippi River Restoration Program, and in particular the way it has collected consistent monitoring data on the river's fish, plants and water quality over 28 years, is of interest to stewards of many of the world's major rivers, says Barry Johnson, chief of the Long-term resource Monitoring branch of the U.S. Geological Survey. The Nature Conservancy has played a key partnering role, facilitating scientific exchanges through its Great Rivers Partnership. Johnson has visited Brazil and worked extensively with the Chinese scientists as well as representatives of many of the major river systems in

the U.S. with the goal of finding a standardized way of comparing systems and sharing lessons learned.

"Large rivers are highly variable, and in many ways each is unique, but many basic processes affect every large river no matter where it is ... Any information we can get from other rivers helps us compare those processes across multiple rivers and develop a better understanding of rivers as a whole. Hopefully we can use that understanding, combined with monitoring data from a particular river, to determine how that river will react to different management actions."

Visitors to the Upper Mississippi, from Asia, Europe, Russia and South America, have expressed amazement at the resource, Johnson said, what's widely believed to be the best example of a large river floodplain in the world. "We have our issues, but in many other rivers, the basic processes are highly impaired, whereas they still operate more naturally on the Upper Mississippi River System and can be managed more effectively to improve biological conditions."

Taking visitors on a simple fishing trip or river paddle can be the best way to show what's possible on rivers like the Yangtze, Ickes said, which is at a stage not unlike where the Mississippi River was at the height of this country's industrial revolution. He saw that firsthand while hosting four young scientists and administrators from China in 2009, he said.

"We took them out kayaking one night after a lot of extensive technical exchanges. The Chinese delegation lead, Lou Weili, paddled next to me and said, 'Here, I see peace between the people, the fishes and the birds. It just hit him. Now he's gone back, and they're pushing forward.'" —K.S.

FROM TOP: *The Yangtze; Duan Xinbin, of the Yangtze River Fisheries Institute in Jinzhou City, holds an Asian carp retrieved near Alton Ill., while Xiaoming Sun, The Nature Conservancy's Yangtze River project assistant, listens to Zack Lancaster (seated center) and Eric Ratcliff of the Illinois Natural History Survey talk about these invasive fish.*



MY MISSISSIPPI

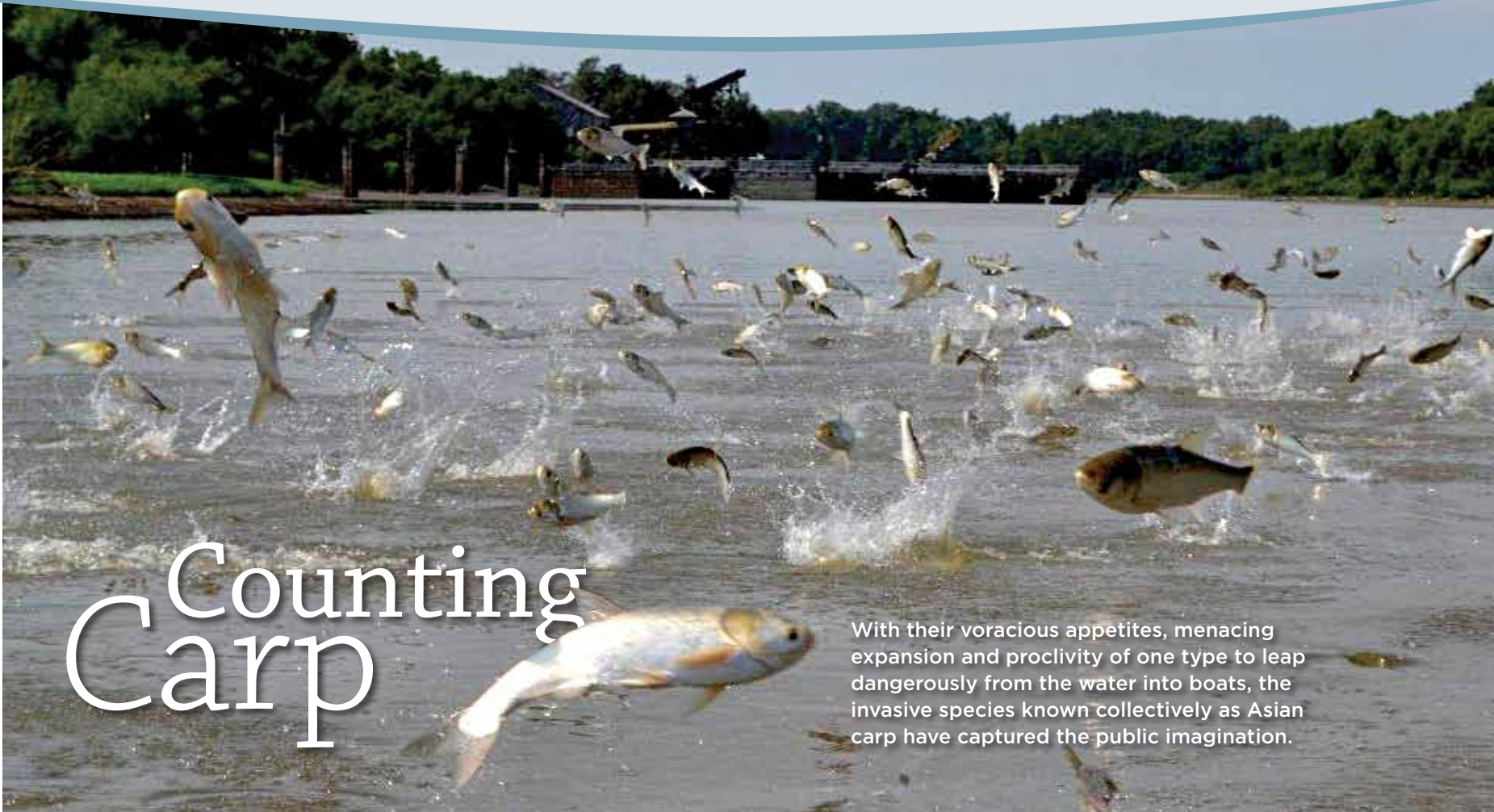
Mike Griffin, 59, Iowa DNR Habitat Rehabilitation and Enhancement Projects (HREP) coordinator

"As a wildlife biologist, I've been working on this since Congress passed the Environmental Management Program in 1986, helping and designing projects. Mostly I work on rehabilitation projects. We go into backwaters that are just about dead and make those areas deeper, to get more oxygen into the water so the fish won't die. And, we build islands. When we built the river in the 1930s, we flooded all the islands that were there. Islands cut down on wind fetch and clear up the water, making it better for fish and wildlife. Those islands become very popular nesting spots for birds.

"My family teases me that I work on the river all the time then, when it's time for a vacation, I go back there and camp for a week on an island near the Lost Mound National Wildlife Refuge, on Pool 13. I don't know its name; my family calls it Dad's Island. But I take my dog, Goose, set up a tent, have a fire — it's pretty good. I like it because I can go fishing and poke around and I'm not on the clock. It's the most relaxing place I've ever been.

"As a nation, we spend more than \$200 million a year maintaining the river's navigation system, but only \$32 million a year to restore the ecosystem. So it's lopsided, and we're just scratching the surface. When I started, there were places with six to eight feet of clear water that now I can't even get into with a boat, because of the sediment from agricultural runoff. In some places, the siltation rate is an inch a year, which means that if you bypass a beautiful spot to help one that's really hurting, by the time you're done the once-beautiful one is sedimented as bad or worse.

"But, I'm happy with anything I can do. You have to play the cards you're dealt. And for the citizens of Iowa, the Mississippi is the most-used natural resource we have."



Counting Carp

With their voracious appetites, menacing expansion and proclivity of one type to leap dangerously from the water into boats, the invasive species known collectively as Asian carp have captured the public imagination.

The research stations along the Mississippi and Illinois rivers have received visits from scores of international journalists, including a crew from Japan interested in filming a reality television show, a “desperate biologists” concept. (They were turned down.)

While those with cameras may find the flying Asian carp exciting, bug bites and sunburn are the typical thrills for the field scientists gathering the data crucial to policy decisions on the carp.

“A lot of monitoring is really dull,” said biologist Mark Cornish, chairman of the Army Corps of Engineers’ invasive species leadership team. “Collecting water samples over time isn’t quite so glamorous.”

But the mundane, painstaking work performed by the scientists at the monitoring stations is vital for policy makers trying to determine the best methods for coping with the proliferation of this exotic fish. Six state-operated field stations managed through the Upper Mississippi River Restoration Program collect data on water quality, fish and plants, offering rare insight into what an invasion of a non-native species does to the river environment, as well as how it might differently impact different river stretches.

“What a monitoring program like this is able to do is show you that when invasive species like Asian carp come in and they don’t immediately disrupt everything, but they’ve been in the system for about 20 years now, and we’re seeing the trajectory that the system was on, and it’s changing a little bit,” said Andrew Casper, director of the Illinois River Biological Station in Havana, Ill.

As the numbers of Asian carp have risen, the population of other fish species has declined. Asian Carp feed voraciously on plankton that form the base of the food chain, leading to a race among the other species to see who can capture the rest.

“There’s an idea out there that Asian carp are cutting out the lower end of the food web,” says Brian Ickes, principal investigator for the Fisheries Component of the program’s long term resource monitoring element. That eventually impacts a number of popular sport fish, such as bass. Long-term ecosystem observations will help managers identify and solve those impacts.”

Of course, as every science student learns, correlation is not causation and, in an ecosystem with many changing variables, determining the effect of one change requires more than observation and sampling. To help tease out a culprit, the scientists will run a series of laboratory experiments, usually one-year controlled studies.

“When the monitoring program shows us a problem, we figure out a couple of potential causes through observation but then we have to do a focused study to try to determine which alternative is really causing the response,” Casper said. “Most of the time we’ll have to do several different experiments.”

The scientists have decades of data that help them track changes to the river. William C. Starrett, a former director of the station at Havana, began a long-term monitoring program in the 1950s, sampling the river at fixed sites at the same times each year. His concerns were the effects of pollution and agriculture on the

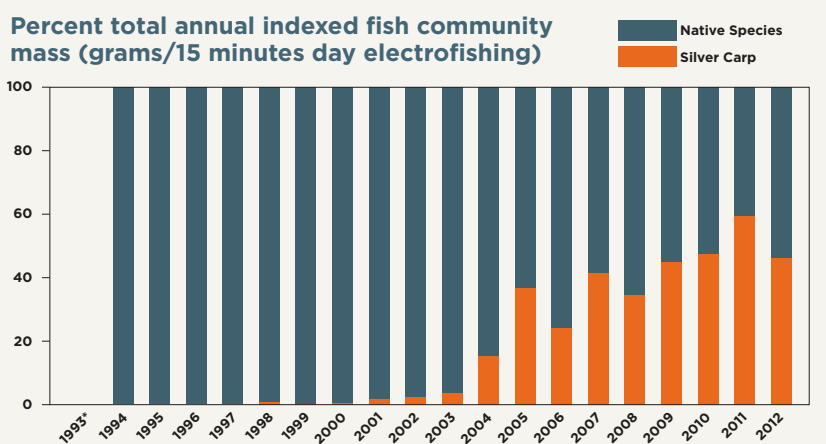
river’s fisheries; the impact of invasive species began in the 1980s.

“Because we return to the same fixed site and measure it in the same way every year, we have this long-term database that can show, for example, as zebra mussels or any other invader get more numerous over decades, certain fish get skinnier,” Casper said.

That information can be used by other agencies and policymakers as they develop responses to this and other invasive species problems. Such data sets get even more valuable, Ickes notes, as the longer-term effects play out.

“There’s been a lot of sensationalism around the Asian Carp themselves,” he said. “We’re just now starting to see some of the consequences to the entire fish community and ecosystem. These will take awhile to manifest, but the story will become clearer and clearer the further out we go in time. It could be that Asian carp don’t just affect native species production. They might impair production of the entire system. This is the power and value of the monitoring data.” —S.F.

This chart represents an estimate of the river’s fish biomass, expressed as the mass of silver carp relative to the mass of all native species as captured using standardized scientific sampling protocols from 1993-2012. While data were collected in six study reaches across the Upper Mississippi River System, this chart solely represent the La Grange reach of the Illinois River, the study reach where silver carp is currently most abundant. Each graph represents annual reach-wide estimates of indexed mass, deriving from more than 120 samples per year, collected between June 15 and Oct. 31. “Native Species” represents the combined indexed mass of nearly 100 different native species. State-operated sampling was done by six field stations overseen by USGS as part of the long-term resource monitoring element of the Upper Mississippi River Restoration program, a cooperative effort between the U.S. Army Corps of Engineers, U.S. Geological Survey, U.S. Fish and Wildlife Service and the five Upper Midwestern state conservation agencies.



PHOTOS: ASIAN CARP COORDINATING COMMITTEE.

States weigh in on the Upper Mississippi River Restoration Program

IOWA

“It’s been the greatest thing that’s ever happened to the environment of the Mississippi River. The partnership is what makes it strong; we’re all equal partners. The partnership starts in the beginning. Together we pick the projects, and we design them together. The program’s long-term resource monitoring element gives us the longest, best data set on a large river in the world. And the projects? The island projects in Pool 8 and 9 have really changed the face of that area and provided so much habitat for fishes and wildlife and all river critters. It’s just been amazing.” —Mike Griffin, Iowa DNR

MINNESOTA

“The first project built in the St. Paul District was the Island 42 project in 1987, shortly after the program was authorized, and it was something I know my predecessors were really in favor of. I can say that project is still functioning well almost 30 years later. It’s been good for a lot of different uses, not only waterfowl hunters and fishermen. Since the area has recently been designated nonmotorized, a lot of kayakers and people with canoes like to go in there, too—and bird watchers.” —Dan Dieterman, Minnesota DNR

WISCONSIN

“The river is important to us not only locally but regionally and nationally. The (Upper Mississippi River Restoration) program as a whole has helped to restore the health of the river and also helped to improve our knowledge of the river and that regional treasure. It has helped us understand baseline conditions and the variability over the years that we can expect in those conditions, and that helps point us toward appropriate management actions.” —Jim Fischer, Wisconsin DNR

MISSOURI

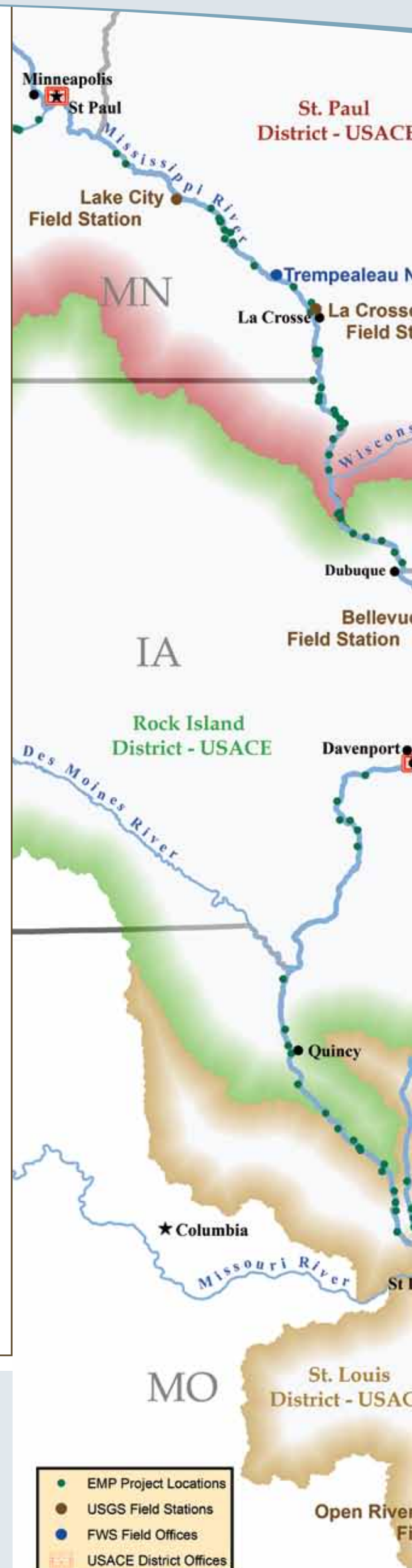
“There are just not a lot of programs out there like this. The establishment of the coordinating committee they have really helps with the interagency partnership. The states are attending on their own resources because we know that we’re going to improve the river condition for fish and wildlife and for the people that use those river resources. And we know we can’t do it alone either. The river is too big for any one agency or state to really yield the wider benefits. We really do need to work together and see what is really needed for the river system.” —Janet Sternberg, Missouri Department of Conservation

ILLINOIS

“The UMRR-EMP has helped the State of Illinois gain critical insights into the management of economically valuable recreational sport fish like largemouth bass. For instance, multiyear LTRMP element showed that in years with low or rapidly fluctuating spring water levels, the production of young fish from the floodplain was cut in half. We know that Largemouth bass are among the most sought-after experience in the state, so knowing that spring conditions affect the abundance of young fish helps the DNR set management policy and public expectation for economically important future recreational experiences.” —Andy Casper, Illinois Department of Natural Resources

Taking the river’s pulse

The medical records, so to speak, for the Upper Mississippi River system are available for use by all via a searchable database that can cover trends over time, comparisons among locations, species composition or distribution maps. The long-term resource monitoring element of the Upper Mississippi River Restoration Program has compiled some 28 years of data on fish, invertebrates, vegetation and water quality from six sample reaches. Maps of land cover types from St. Paul to the confluence with the Ohio River are also available and include historic information dating back to the late 1880s. To access the data, go to: <http://www.umesc.usgs.gov/ltrmp.html>



MAP: U.S. ARMY CORPS OF ENGINEERS.



THIS MAP shows the field stations at which the program gathers data on fish, vegetation and water quality. It also marks the location of current ecosystem restoration projects. Since its inception, the program has restored 100,700 acres in 55 projects. Another 35 projects are currently in the planning stage.

A PARTNER'S VIEW: GRETCHEN BENJAMIN

You have a diverse history in river restoration work. What is your current focus?

"What I see myself doing is trying to get programs going that would benefit the entire river, so all the knowledge I have from the Upper Mississippi I can apply to the lower thousand miles of the Mississippi."

Might the Upper Mississippi River Restoration Program expanding to the lower river?

"Restoration of the lower river is a bit different than on the upper river. The 1,000 miles of river, 3 million acres deserves a program that'll allow us to do the restoration necessary there. It will take elements of the Upper Mississippi River Restoration Program and bring them south, but it will be a different program appropriate for that portion of the river."

How do you see TNC's role in the Upper Mississippi restoration efforts?

"The Nature Conservancy recognizes the existing dynamic and viable partnership with the agencies. Our primary role is to remind Congress how important the program is and how it needs to be funded at levels like last year. TNC recognizes the extraordinary accomplishments of the UMRR program, highlighting its innovative nature. The concept of large-scale river restoration and monitoring was almost unheard of in the late 1980s when the program started. Today, everyone involved in program implementation has used past experience to continually improve outcomes for restoration and monitoring. It is a top-tier program nationally and internationally with an incredible milestone of restoring over 100,000 acres of riverine habitat. There is still much to do, but progress is notable."

You're working from a system perspective. Have the smaller scale restoration programs started to make an impact on the system yet?

"I think there are enough jewels out there that when strung together are starting to make a system impact. You do see that it's starting to cumulatively have an effect for birds, fish and other aquatic organisms."

What's a next key step?

"At TNC, we are starting to look at how a 'watershed' budget may help to provide a better balance for all elements of river management. Looking collectively at the multiple interests within a watershed is a better way to do business and provides for navigation, flood risk management, recreation and the ecosystem. For instance, we have a strong interest in making sure water-level management, known as drawdowns, moves to a more routine way of managing the upper river. By blending the needs of navigation with the needs for river restoration, we see a better way forward for the river. It only makes sense in the current fiscal climate."

THE NATIONAL VIEW: MARK GORMAN

We asked Mark Gorman, policy analyst for the Northeast/Midwest Institute, a nonpartisan organization that works on river resource issues, to share what stands out to him about the restoration and monitoring program and how he'd like to see it evolve. Here's a brief excerpt from that conversation.

"I think partnership is one of the strengths of the program. The Corps of Engineers has really entered into the program in a spirit of cooperation with federal and other partners. From that standpoint, from a national perspective, it can serve as a role model for other portions of the Mississippi River and other watersheds around the country.

"In so many situations you get isolation between agencies, some with jurisdictions over the same bodies of water, not talking to each other. It's not the case with EMP [now Upper Mississippi River Restoration Program]. You do have integration and cooperation, and it allows for more efficient and effective use of the funds they are getting.

"In 1986, when the program was authorized in the Water Resources and Development act, that was when Congress recognized the value of the Upper Mississippi basin for its ecological as well as its navigation. The next step in the evolution of the process is to get better at putting a monetary value on those ecological services. With locks and dams you can say this many tons of commodity went through; economists do well at putting a dollar figure on that. We're not as good at putting a monetary value on other services. If you reconnect the river to the floodplain, it might increase the capacity upstream of cities, reduce flooding downstream. There should be a way to place monetary value on that, or maybe it can reduce the cost of flood insurance or damages averted. Especially in an era of tight federal resources, that's the next step in the evolution."



How's that new winter home, little fish? Fish transmitters key in the systemic habitat design.

SEVERAL DOZEN CRAPPIES, BLUEGILLS AND BASS are contributing to their own survival during harsh Midwestern winters—as well as the survival of other Upper Mississippi River fish—by toting around transmitters that were either surgically implanted or attached to spiny dorsal fins.

The Upper Mississippi River Restoration Program uses fish tracking systems to test the effectiveness of habitat enhancement projects—specifically projects designed to deepen and improve backwater habitat to make them suitable winter habitats for fish.

Without help from such projects, winter often brings die-offs of fish because as their metabolism slows in colder water, they often don't have the energy to fight main channel currents, says Kirk Hansen, a Mississippi River fisheries research biologist with the Iowa Department of Natural Resources. When the fish seek warmer backwaters, out of the main channel flow, they often don't get enough oxygen, particularly since today's backwaters are often too shallow and filled with silt.

The restoration program has improved winter habitat options along several river stretches via Corps-constructed projects first developed in the 1990s and continuously improved. What fish tracking can then do is show an immediate response of fish to the improvement project, allowing for tweaks if fish don't respond as anticipated, Hansen says. That was the case in Mud Lake in Pool 11. In that project, teams deepened the backwater to allow for enough oxygen in the water column and left an opening to allow for an in-flow of oxygen-rich water.

"We noticed the fish weren't using the areas as much as we'd hoped," Hansen said. "It was because there was too much flow. We necked the flow down, and the (fish) use of the area increased. We now plan to neck the flow down even more, and we want to see how fish use changes as a result."

Telemetry data is now being used to help expand from a focus on a single project to a focus on how a series of projects might work together to improve a larger habitat area, specifically how far apart they should be placed to be most effective, said Chuck Theiling, large river ecologist with the U.S. Army Corps of Engineers.

The radio transmitters—attached to about 40 fish in the Pool 11 projects and around 200 in a similar project in pool 12—have shown that bluegills and crappies don't venture as far from the winter habitat as bass do, for example. The approximate travel distances are now being used to determine how a group of sites should be distributed so they can begin to interact with each other and eventually have a system impact as opposed to single project impact, he said.

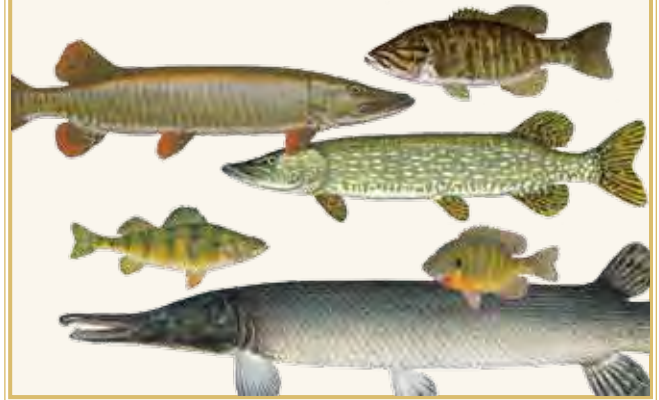
Tracking has also shown fish to be "home bodies," Theiling said, providing evidence that new projects aren't stealing fish from other areas of the river but growing new stock that gets bigger in the two or three post-project years.

Implantation timing has to be planned around battery life (around 94 days for the radio-tagged bluegill, up to 129 days for the white crappie) and susceptibility of fish at given times of year to the stress of the procedure. Ultimately, though, the tagging has been effective, the researchers say. Studies have shown that largemouth bass, for example, did winter in backwater lakes, off-channel coves, ditches and marinas where current velocity is lower and water temperatures were 2-5 degrees warmer than the main channel—information used to design future projects.

"We have models showing what fish want during different flows and temperatures, and the models are good," Hansen notes. "But the best answer comes straight from the fish." —K.S.

ABOVE: External transmitters like this one are applied to the dorsal fins of bluegills and crappies. On larger fish like Northern pike and walleye, paddlefish and bass, transmitters are surgically implanted. Transmitters run the length of their battery life—six months in smaller fish, up to three years in larger ones.

DID YOU KNOW? At least 163 species of fish live in the Mississippi River, as well as 45 species of amphibians and reptiles.



ILLUSTRATIONS COURTESY WISCONSIN DNR.

MY MISSISSIPPI

Scott Gritters, fisheries biologist, Iowa DNR



"I worked on one of the very first projects we did through the Upper Mississippi River Restoration Program. We were really learning back then how to build these things. Nobody had attempted environmental restorations. We're talking 20-plus years ago. And we look at that project now, and the fishery

has bloomed. People are still going there to recreate today because that project is there. Without it, the lake doesn't support a fishery. It's too shallow, too silted in. It's neat that it's a value to people.

"These projects weren't made for recreation. The projects were made for the habitat. But when I look and see people out there, it tells me the habitat is good for winter. That project made the area a place where fish could go, survive for winter and the rest of the year spawn and be available for fishing—be part of the ecosystem.

"I am a fisherman. As a fisheries biologist I have to communicate with people. You can hardly do this job without being a fisherman. This weekend, I probably fielded 25 calls all dealing with fishing, from where to fish to 'I've got spots on this fish. What do I do?' You have to be an angler to understand them.

"One of the projects I've worked on more than most is Mud Lake in the (Corps') Rock Island District. I love fishing that in winter because I know when I walk down there that the area that holds fish in winter is five to six times the area it was before the project. I can fish from a huge long area because we've increased the habitat so much down there.

"The biggest question I get from people wanting to fish the Mississippi River is, 'Where do I go?' You almost have to interview them to get a feel for what they can and can't do. A guy told me once he'd fished all his life on lakes and small rivers in Iowa and Minnesota. He said coming to the river to fish was like learning to fish all over again. Most of that is dealing with the current and wind and the big size of it. A lot of lakes are 200-300 acres. A Mississippi River pool can be 28,000 acres with 100 species of fish in it. There's something for everybody out there—fishing-wise, bird watching-wise and boating-wise."

The flight, flooding and island fun

BEAVER ISLAND HISTORY CONSIDERED IN ECOSYSTEM RESTORATION PLANS



The river's cultural history has always been taken into consideration in the design and construction of Upper Mississippi River Restoration Program projects. In the case of a Beaver Island Complex project, a restoration project in the design phase in Clinton County, Iowa, engineers and scientists are taking a page from history—literally—as they make “Beaver Island Remembered” and “Back to Beaver Island” by childhood resident Kathy Flippo required reading. The plan calls for dredged backwaters, nesting areas on islands, new bottomland hardwood forests, added oxygenation for fish and isolated wetlands for wildlife. The 200-some hardy residents who called the island home until shortly after World War II likely would approve—especially of what it might contribute to their one-time duck hunting grounds, described in “Beaver Island Remembered” as an annual vacation as well as welcome variation to the island diet. Following is an excerpt on that and more of island life.

Prime Hunting Grounds

Beaver Island lies in the middle of the Mississippi Flyway, the migration route for ducks and geese winging their way north in the spring and south again in the fall. With all the secluded lakes, sloughs and potholes, the ducks just can't help themselves but to stop and rest. Each year in the fall is something called “the flight” when drove after drove of ducks and geese go south in a two or three day time frame. Usually on flight days, the weather is horrid with ice, cold rain, sleet, snow and falling temperatures. The flight was early in 1947; a hundred flocks were seen in a half hour.

BELOW: *Early Beaver Island residents gather on the ice.*



Island fun

Winter brought ice skating, shinny, coasting, snowballs and snowmen. Everyone had ice skates; they were passed around to whoever could fit in them. ... When the lakes froze, someone would carry a big coffeepot of water, the coffee grounds and a crunched tin can. They would build a big bonfire, then they would scavenge for a limb that would make a good hockey stick. The crunched tin can was the puck, and ferocious games of shinny would take place. ... Being very short on toys, the children made do with what was there. Dishes were clamshells, the brown seeds of the sourdock were coffee, and grape leaves served many purposes in the little kids play.

Flooding

Nowadays when the river comes up, it is called a flood and everyone seems to panic. Back then they just called it high water, and it was a fact of life as common as the wind and sunshine. No one became terribly excited. They just moved everything that would get damaged to a higher place and lived with it. I remember one time visiting Aunt Laura and Uncle Emil Jacobsen during high water. I was a bit of a pain in the neck and thought it would be fun to wade through the water in their house. There couldn't have been more than an inch or two on the floor, but Aunt Laura scolded: “Don't run in the house. You'll make waves on the wallpaper!”

Weather forecasting

The residents of Beaver Island relied on Mother Nature to do the forecasting. ... Mares tails (long, sweeping cirrus clouds) or a mackerel sky (clouds that look like fish scales) told of rain coming. A brilliant red sunrise will soon give way to heavy clouds and falling weather. But the sunset that was brilliant red meant a wonderful day to follow. ... When the weather got there, the descriptions made you wonder. Rain could be gauged from a “leaf wetter” to a “frog strangler.”

People

Pat Hendricks (Paddy) had a special talent all his own. He knew how to make moonshine and was the Farm House Grocery Store's best customer when it came to buying sugar. ... Dr. Hullinger was always known as Doc. ... In 1955, he was still practicing medicine at age 94, the oldest practicing physician in the United States! ... He delivered 3,200 babies from the time he started in 1892 until he was 94. He claimed that by not using whiskey, beer, tea, coffee or tobacco, he was hale and hearty. To celebrate his 94th birthday, he played a few spirituals on his coronet for his friends. —K.S.

OUR MISSISSIPPI KIDS

Making connections in the river's **FOOD WEB**

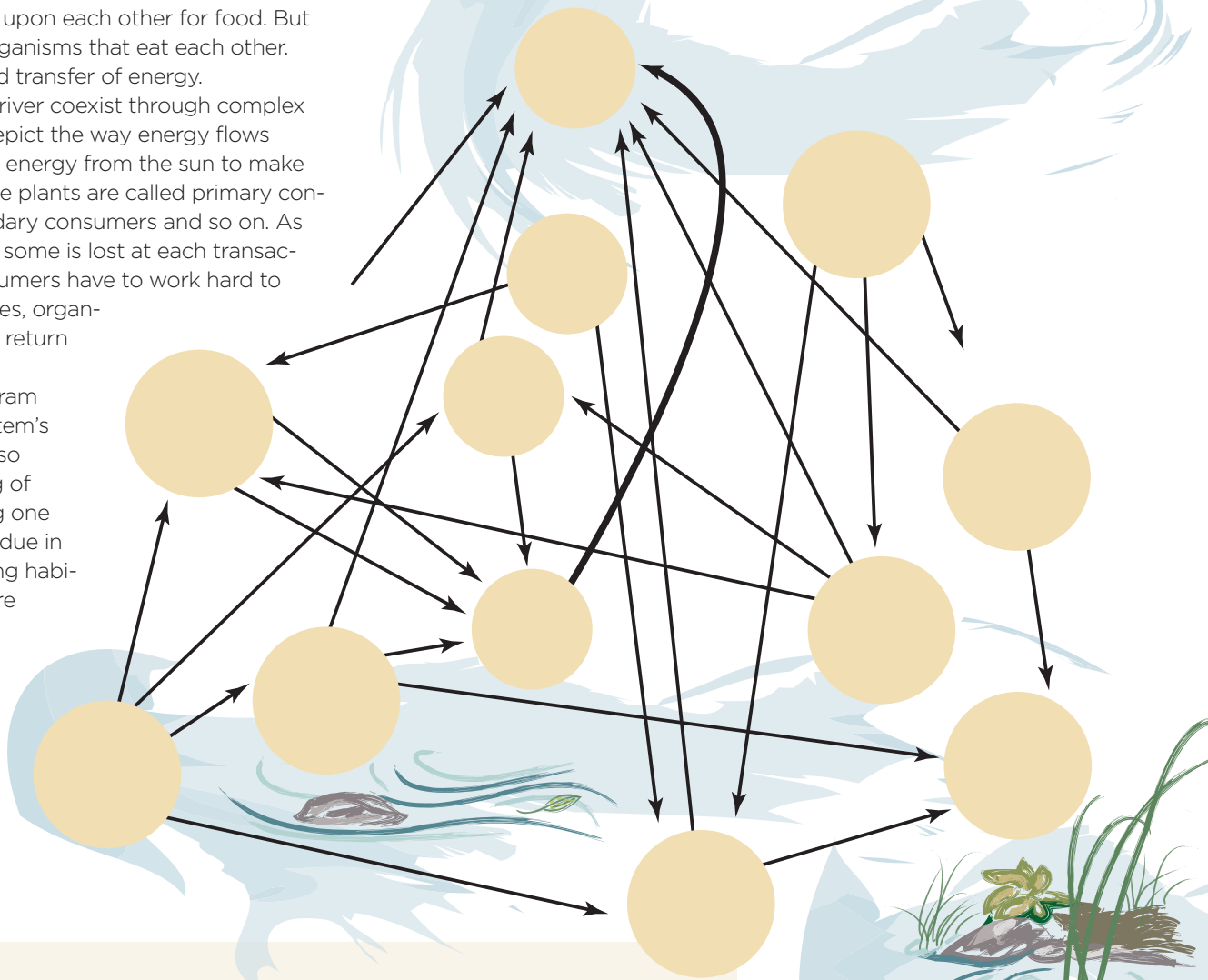
All living things need energy to live and depend upon each other for food. But food chains are more than just a collection of organisms that eat each other. They are also a conduit for the accumulation and transfer of energy.

The plants and animals within a wetland and river coexist through complex interactions. Creating a food web can visually depict the way energy flows through an ecosystem. Plants, or producers, use energy from the sun to make food via photosynthesis. The animals that eat the plants are called primary consumers. Those animals are then eaten by secondary consumers and so on. As energy is passed from one organism to another, some is lost at each transaction. Because of this, these higher levels of consumers have to work hard to get enough nutrients. When a plant or animal dies, organisms called decomposers break them down and return their nutrients to the soil or water.

The Upper Mississippi River Restoration Program makes needed improvements to restore the system's health and restore a healthy river food web. It also helps scientists develop a deeper understanding of a river and its watershed as a system. Improving one component has a ripple effect on all the others, due in part to the interaction of the food web. Improving habitat for plants, for example, means more fish. More fish provide additional food for birds, even humans, and so on.

Instructions

Read the chart below about which organisms consume which, then try to place the plants, amphibians and mammals in the correct spot on the food web at right.



PRODUCERS

- Plants
- Nut Trees

CONSUMERS

- Coyotes
- Insects
- Large Fish
- Bald Eagles
- Rodents
- Frogs
- Snakes
- River Otters
- Rabbits
- Small Birds
- Small Fish

What they consume

- River Otters, Rabbits, Rodents*
- Plants*
- Insects*
- Large Fish, Small Birds, Rodents, Small Fish*
- Plants, Nuts*
- Plants, Insects*
- Frogs, Rodents*
- Large Fish, Plants, Small Fish*
- Plants, Nuts*
- Nuts, Insects, Plants*
- Insects, Plants*

For more on the food web and the ways human actions have an impact, go to Lesson 2.1 (PAGE 75) in "Our Mississippi Educator's Guide," available at ourmississippi.org.

SOURCES: "OUR MISSISSIPPI EDUCATOR'S GUIDE" AND THE NATIONAL MISSISSIPPI RIVER MUSEUM AND AQUARIUM.

MY MISSISSIPPI

John Manier, 33, graduate student in aquatic studies at University of Wisconsin-La Crosse



"For 10 years I've worked for the U.S. Geological Survey, in its water quality lab, testing mostly for suspended solids and chlorophyll. Then I applied for funding [under the long-term resource monitoring element] to help me study phytoplankton of the Mississippi for my master's. Phytoplankton are microscopic plants that turn waterways green in the summer and form the base of the food chain. Our lab has thousands of samples that had never been studied due to lack of funding.

"It took me eight hours per sample, and I did 225. It's surprisingly interesting work because they take on beautiful shapes and colors. When most people think of the river they think about big things like fish and waterfowl, but when you look through a microscope it's a whole different world, which is just as important, if not more so, to the ecosystem. Some are toxic, like the blue-green algae that caused a bloom and fish kill on Lake Pepin in the 1980s. What factors can cause such a bloom. And Asian carp—why haven't they established here yet? They're filter feeders, eating phytoplankton, and it's possible we don't have the right kind for them. My research might help us answer questions like these.

"I feel like I'm working on something good. Every night when I leave the lab I feel I'm making a contribution to science, even if it's a really small one."

Return of the Big Birds

OUR MISSISSIPPI TRAVEL



Big Birds

The showy American White Pelican is rewriting Upper Mississippi River history and drawing plenty of glances upward toward impressive flocks of one of the world's largest birds.

There are as many as 6,000 pelicans in a 25-mile stretch of the river near Thomson, Ill. Of those, 2,000 to 2,500 are part of a nesting colony spread over six islands in the river's Navigation Pool 13, says Ed Britton, a wildlife refuge manager with the Upper Mississippi River National Wildlife and Fish Refuge. That's up from the 15 to 20 white pelicans that showed up in 1992, he said.

"There was no prior documented pelican nesting in Illinois until 2009," Britton said. "There was one record of pelican nesting in Iowa in the early 1900s, and it took 100 years for them to return to nesting in 2007."

But the fact they've settled in doesn't come as a complete surprise, he and others say, especially as habitat improvement efforts start to show fruit and lead to at least localized increases in fish populations. The Upper Mississippi pelican

population boom mirrors a similar rise in the population of similarly impressive birds like the eagle and tundra swan. The eagle population has steadily increased since around 1986. While that is primarily due to a cleanup of DDT in the environment, experts say, there may be a connection to the bettering of overall habitat, particularly fisheries that provide a key food source.

A direct correlation has been drawn between the extensive island building projects in Pool 8 of the Mississippi and a measurable increase in the populations of tundra swans and various other waterfowl, says Brian Stemper, a wildlife biologist with the U.S. Fish and Wildlife Service. As many as 30,000 swans have been spotted in the area at one time, he said.

"The projects take multiple years to be completed, but we have been seeing more wildlife and fish response. While many focus on fish and waterfowl as the two main categories, other categories like pelicans and eagles take advantage of the projects too, and turtles."

Fall aerial surveys around the Pool 8, Wisconsin Islands project showed that swans and diving ducks have responded en masse to the three-phase island construction project, Stemper said. "The islands have had good vegetative response for certain plant species like arrowheads, and the swans eat the tubers," he said. "The vegetation that canvasbacks focus on is wild celery. Having these islands help break up the wind fetch and helps that vegetation expand and grow further down the pool."

The comeback of the pelicans isn't tied directly to any restoration project, and the nesting colony is still limited to Pool 13, but Britton says it's almost surprising that it took pelicans so long to settle on the Upper Mississippi.

"The water quality is excellent, the fishery is excellent and there are plenty of areas for them to nest," he said. "They're looking for islands and structures to nest next to; most nest next to logs."

While fishermen sometimes shake their fists at the efficient eaters, they primarily feed on the small fish that humans reject as well as frogs and aquatic insects. They're a bird-watcher favorite for their impressive size and the unusual way they appear white in the sky when flying a particular direction and then black as they turn to show their black-edged wings. The Migratory Bird Treaty prohibits visitors from disturbing nesting grounds, but the birds are pretty efficient guards in their own right, Britton says.

"They spit up a half-digested fish soup when you approach the young, which is a great defense mechanism against human intrusion." —K.S.

CATCH THE SHOW



EAGLES are visible below most of the locks and dams on the Upper Mississippi River in winter and spring, particularly where water is open at that spot and frozen elsewhere and they can feed easily on gizzard shad, says Tim Yager, deputy manager of the Upper Mississippi River Wildlife and Fish Refuge. All year, eagles can be spotted easily in Pool 9, where 180 of the 300 nests so far identified on the entire refuge are located. Paddling the well-marked Reno Bottoms Canoe Trail is a great way to spot them, he said. Reno Bottoms is designated a research natural area due to its diverse floodplain forest habitat and, Yager says, is one of the best examples of what the river looked like prior to impoundment.

FIND IT: 15 miles North of Lansing, Iowa, on Highway 26. (MYLANSINGIOWA.COM/INDEX.PHP/CANOEING-AND-KAYAKING). Another great

spot for eagle spotting is anywhere within the Capoli Slough Habitat Rehabilitation Project, a 2,000-acre backwater across from Ferryville, Wis. And approximately five miles below Lansing, Iowa.

PELICANS The Brownsville Overlook is where to head, Yager says, to spot flocks of White Pelicans, along with eagles, ducks, tundra swans and geese. Dedicated in late 2009, the shaded overlook located about one mile south of Brownsville on U.S. Highway 26 provides a stunning panorama. He also recommends Petosi Point in Pool 11, not far from the famed National Brewery Museum and Petosi Brewing Company.

White Pelican Facts

- Adult birds are primarily white except for black-edged wings that are visible in flight.
- The white pelican has a long neck, a long, flattened orange bill with an expandable pouch and short orange legs with big webbed feet.
- They're colonial nesters, another way of saying they like communal living near great blue herons, great egrets and double-crested cormorants. But they also end up with plenty of elbow room since they nest on sand while other colonial breeders generally nest in trees.

- White pelicans are primarily fish eaters, they also eat frogs, salamanders and aquatic insects. Unlike their brown pelican cousins, they don't dive from the sky to fish. Instead, they generally swim in a group to herd fish and then scoop them up in their oversized pouches.

FACT SOURCE: ED BRITTON, U.S. FISH AND WILDLIFE SERVICE

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Job creation a fringe benefit of ecosystem restoration program

It's sometimes hard to quantify the economic value of ecosystem restoration programs, even when they boost fishing options, draw bird watchers and other eco-tourists and even result in cleaner drinking water. But one clear benefit comes in the jobs, says Marvin Hubbell, regional manager of the Upper Mississippi River Restoration Program.

The U.S. Army Corps of Engineers researches, designs and engineers restoration projects in cooperation with their state and federal partners. But the contracts for actual construction generally go to the private sector. In the 28 years since its inception, the Upper Mississippi River Restoration Program has constructed 55 projects, this year supporting roughly 566 private industry jobs, Hubbell said.

Private companies use specialized marine equipment to dredge channels and build islands and protective habitats according to the Army Corps' specifications. The exacting nature of the projects provides invaluable experience and training to the company's engineers and skilled workers.

Private companies also take the expertise learned on these innovative first-of-their-kind projects and spread the innovations to other river systems and other job sites.



"We learn a lot on the Upper Mississippi River restoration projects and we can apply it elsewhere," says Mark Binsfeld, marketing director of the family-owned J.F. Brennan Company, one company that has built islands and protective habitat for the Corps. "As we've gotten more involved in these projects, it's helped us to expand into other markets, such as environmental remediation for the EPA." Now, environmental remediation and restoration accounts for about 70 percent of the business of the company, which employs 330 people across the Midwest. —S.F.

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This newsletter is a quarterly update of ongoing efforts in the Mississippi River Watershed and does not necessarily reflect the views of the U.S. Army.