

Our Mississippi



US Army Corps
of Engineers

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JASON LINDSEY

Innovations drive battle against invasive carp

Finding ways to limit the spread of invasive carp is taking a research village of a particularly creative sort.




IF YOU WERE A FISH swimming into Mississippi River Lock No. 19 in Keokuk, Iowa, you might think you'd drifted into the middle of a Mötley Crüe concert.

There is an Underwater Acoustic Deterrent System (aka a sound bar) with 16 underwater speakers about 100 feet downstream of the lock gates that play the sound reminiscent of the revving of a boat engine and other attributes. It is a sound that researchers describe as something like the first 3 seconds of the Mötley Crüe's "Kickstart My Heart."

And if you were an invasive carp, you'd probably hate it, freeze or flee—or so hope the researchers testing a carp deterrent system with specially engineered sounds that they believe the carp will avoid and most native fish be at least neutral toward.

The three-year research project is funded by the Great Lakes Restoration Initiative and the U.S. Geological Survey's Biological Threats Program. It is designed to help perfect a way to keep the carp now established in parts of the Mississippi and Illinois rivers into further extending their range and decimating more fisheries. This, and other innovative research originating at the U.S. Army Corps of Engineer Research and Development Center in Vicksburg, Miss., will culminate in a combination of deterrents such as sound and electric cables placed at the massive Brandon Road Lock and Dam near Joliet, Illinois. The lock is a key



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ABOVE, FROM LEFT: Crews from the USGS, U.S. Fish and Wildlife Service, and Minnesota and Wisconsin DNR use the USGS-developed Modified Unified Method on the Upper Mississippi River, combining netting and herding techniques to concentrate carp for removal. ERDC's Dr. Christa Woodley conducting her laboratory sound system testing.

convergence point of Lake Michigan and the Illinois River, already overrun by the voracious carp.

Imported in the late '60s and '70s to control algal blooms and spread by flooding, carp like the silver, bighead and grass have outcompeted native fish for their favored treat, the plankton, and have taken over the fish mass in many parts of the big river.

But they haven't yet gotten established in more pristine stretches of the Mississippi, adjacent river systems or the Great Lakes with its still vital commercial, sports fishing and recreational boating industries. Innovative engineers and researchers from the U.S. Army Corps of Engineers Mississippi Valley Division, the U.S. Army Engineer Research and Development Center's Environmental Laboratory (ERDC-EL), the U.S. Geological Survey Upper Midwest Environmental Sciences Center (USGS UMESC), state natural resource departments and other partner agencies are throwing everything they can at the fish – from sound to the latest in (fish) facial recognition software—to find the most effective way to keep these dreaded fish at bay.

“What we know is necessary is a range of tools in the management tool box,” says Randy Hines, outreach and partnership coordinator and wildlife biologist with the USGS Upper Midwest Environmental Sciences Center. “We need many options to be able to manage a widespread problem like these invasive carp in different waterways and watersheds.”

One of the most ambitious projects involved the engineering and now monitoring of the underwater acoustic deterrent. The Corps' environmental laboratory is leading the effort for lab and field testing, and its Rock Island district engineered the system. That was after agencies met for a year to develop the best system and monitoring protocol for this Lock 19 project designed to test a system that could potentially be beneficial at deterring invasive carp where they could spread into the Great Lakes.

With the help of a 350-ton crane, crews installed the Soundbar at working Lock No. 19 in February 2021, and it became operational in May. But ERDC's Dr. Christa Woodley was in the laboratory long before, developing engineered soundtracks based on sounds invasive carp have been known to react to and testing their effect on the fish.

Teams tagged 250 silver carp, 100 grass carp, 50 bighead carp and 100 native fish, said Dr. Marybeth Brey, the USGS Research Fish Biologist heading the testing. They're looking at how both the native and invasive species behave in and around the lock approach when the deterrent is and is not playing.

When the system is operational, the fish hear three signals, 30 second each, that start with a sound like a siren, then a recording of a 100 hp boat motor recorded underwater—the very sound that has caused them to famously jump. It finishes with a gritty guitar sweep with a frequency developed at the Corps laboratory that is intentionally similar to that of the Chinese River Dolphin. That rare dolphin is one of the invasive carps' few predators in their native ranges. What does this research team hope they'll see?

“You would have carp coming in, they'd hear it and turn around and go



another direction,” Brey said, “and native species would pass upstream at the same rates they do when the deterrent is not in place.”

Carp round-ups take the pressure off

Researchers from the USGS and Illinois Department of Natural Resources even traveled to China to see how Chinese fishermen there round up huge quantities of carp—in that country to feed a large appetite for a popular food source. Teams are now using the Chinese-developed Unified Method, here called the Modified Unified Method, to hold large-scale netting drives that group carp into a specific area where they can be rounded up and removed. Kentucky teams removed 240,000 pounds of invasive carp from one 300-acre lake with the method, and the Minnesota DNR 31 as a way to test the system's usefulness in places not yet overrun.

A type of facial recognition program—for fish—is also being tested at the Emiquon water control structure on the Illinois River, as part of a particularly innovative program looking at whether a fish Steeppass can be modified to recognize and sort native versus invasive fish—letting natives pass to their desired end point and shuttling non-natives to a spot at which they can be rounded up and removed.

Researchers operated the ladder three times so far this year—for 12 days total—moving 1,792 fish through a Steeppass fish ladder; however, not a single bighead carp moved through in the testing period. Researchers will continue to look for ways to encourage carp movement through for testing, including operating it when the water temperature is amenable to carp spawning, said Jim Lamer of the Illinois Natural History Survey.

And in another lab at the Corps Engineer Research and Development Center in Vicksburg, researchers are losing sleep over the issue—literally. Alan Katzenmeyer and his team are testing salinity tolerance to see how well invasive carp might do in the brackish waters of Gulf estuaries, particularly relevant when they're swamped with freshwater plumes in flood events. In one study, they're upping the salt levels each hour and monitoring the response to see if tolerance builds over time.

The worry, he says, is not that invasive carp will become established in ocean fisheries, but instead that they'll be carried on freshwater plumes over saltwater into other coastal river systems. Even a small amount of salt, one hypothesis goes, could potentially make the fish less susceptible to electric barriers being used to keep them from the Great Lakes.

“We're really concerned as these invasive species go through structures, they'll use freshwater plume to exploit new habitats. That's a concern we're trying to address by seeing what the salinity tolerance is. If we have another flood event, they could be pushed to the Apalachicola River or somewhere even further east. There's brackish water of a sort even near Chicago where road salt runoff gets into the Illinois River. Salt in some instances has been used to calm fish; could salt make them even stronger in resisting the electric barrier designed to keep them from the Great Lakes?

“It's absolutely amazing that one invasive fish can create so many headaches and such an impact,” he said. “We need to make sure we don't repeat the same mistake we once made as a country in letting invasive species in. Once they're here, the amount we're having to spend on control is astronomical, but the amount of damage they're doing is far greater.” —K.S.



Sharing the Mighty Mississippi *Safely*

Captain Gregory Smith knows what can go wrong between commercial tows and recreational boats. During a 47-year career as heavy tow captain for American Commercial Barge Line, he has seen close calls and heard stories, including the time one boat fishing in the navigation channel could not get its engine started.

"Ultimately, we were able to get slowed down to be able to dodge it. We were within feet," said Smith, a respected trainer of river pilots and author of a textbook on river navigation. "Thankfully, nobody was hurt. It could have been very bad."

Collisions between pleasure craft and commercial traffic are uncommon, but they highlight the worst-case scenario where these two classes of vessels coexist, something far more likely to occur on a beautiful summer boating day. The Mississippi's powerful currents also pose one of the greatest dangers to recreational boaters, able to push them against a barge or bank when they become disabled, says Paul Barnard, recreational boating safety program manager with the U.S. Coast Guard's Eighth District office in New Orleans. Commercial barges with angled front ends can exacerbate the situation.

"Lots of pleasure craft don't recognize the danger zone out in front of a tow," he said. "They really need to understand how dangerous it is to cut across in front of our tow. If their engine cuts out, we can't stop quickly." Large Mississippi River tows consist of as many as 56 barges, which can cover seven to nine acres of water and carry as much tonnage as an average ocean bulk carrier. Commercial vessels can require a full mile to complete a maneuver.

Communicate, communicate

Commercial vessels are constantly communicating on how they will pass one another on a bend. Recreational boaters should either avoid lingering in blind river bends or get a marine band VHF radio and learn proper radio protocol and etiquette. The two primary channels for use are channel 16 for distress calls and channel 13 for navigation calls and discussion.

"If you want to talk to a towing vessel, use channel 13," Smith said. "It's not for long conversations or chit chat. Keep it short, to the point, and business-like." He trains pilots and steersman to expect pleasure craft and be helpful, offering guidance to those who may not know the "rules of the road."

Still, recreational craft need to be aware of the navigational rules applicable on the Mississippi River. Vessels under 65 feet in length and sailboats are not allowed to impede the passage of commercial traffic where those larger vessels may require the entire navigable channel to operate safely, Barnard said. The Coast Guard's "U.S. Aids to Navigation System" booklet can help recreational boaters with navigation rules.

That guide shares way to avoid the hazards particularly unique to the Mississippi. Wing dams are one. They are rock walls that channel current to the middle of the river, helping to maintain an adequate navigation channel. They are not lighted and can be hard to see, so Barnard recommends a good GPS as an aid in pinpointing them.

Fog can be another unexpected challenge. The Mississippi River can hold fog when water temperatures are low, which can extend well into the recreational boating season, and boaters should stay off the river when conditions are foggy unless their boat is radar equipped.

Another unique feature of navigating the Mississippi is the locks and dams on its upper stretches, said Amanda Kruse, natural resource specialist with the US Army Corps of Engineers, St. Louis District. The Corps' "Safety in Locking Through" brochure lays out the procedures and tips for a safe passage.

Most importantly, boaters should comply with equipment requirements for their respective states, she said. All states require a personal flotation device to be on board when navigating the sometimes unforgiving Mighty Mississippi. Some 88% of people who drown are not wearing a life jacket.

"Wearing that life jacket is just like wearing a seat belt," Kruse said. "It should be second nature to put it on. It's there to protect us. No one intends to go out and have an accident." —D.D.

ABOVE: Paddlers exploring near commercial barges are a common site in the multi-use Mississippi River.



**K.J. Millhone, Minnetonka, Minn.,
Guinness record holder for
fastest paddle-powered trip
down the Mississippi (and twice)**

"As a young man I became enamored with the idea of having a world record. As somebody who canoed, I could see it was possible. In 1980 the record we had was 35 and a half days. I don't think anybody acknowledged we were doing it. Steve Eckelkamp, who was one of my partners, was a lifelong friend. Four years ago he had a catastrophic heart attack, and his nephew had the idea of getting the record back for his uncle. I mused that I might be able to do it. My daughter Casey said, 'If you're going to do it, I want to do it, too.' There aren't too many times a teenage daughter wants to spend time with her dad.

"The only way to get the record now is to paddle around the clock. The rules require everybody to say in the boat if it is moving forward. We figured our schedule would be that you paddled nine hours and got three hours to sleep in the boat. Hallucinations and delusions become part of the conversation because you are not able to sleep. We registered with the Coast Guard and they sent out bulletins telling people on the river where we would be. Our support boat had apps that told them where boats were and how to contact them. Our crew called to ask where they wanted us to go when we passed.

"South of Baton Rouge, most of the time when we passed an ocean-going ship it would blast its fog horn. You felt like a flea with the dog celebrating what you are trying to do! We were sharing the river with folks who make their livelihood on it. The vast majority were thoughtful, accomodating and encouraging. Everybody who is part of the river community imbraces you. I am honored to be a part of its history ... We did it!"

Millhone completed the trip with a team that included his daughter Casey, Bobby Johnson of Clearwater, Florida and Rod Price of Orlando. They completed the 2,352 mile trip in 17 days, 20 hours. A second team attempting to best their record failed due to boat damage. —R.S.

ABOVE, LEFT TO RIGHT: Team MMZero: Rod Price, KJ Millhone, Casey Millhone, Bobby Johnson.

Quick action saves historic military cemetery on bluff



Jared Minor had just taken over as project manager of an ongoing U.S. Army Corps of Engineers project to shore up a bluff along the Natchez National Cemetery. He'd already made a major design shift when he got an emergency call from the cemetery. Erosion had gotten worse.

"I went out there and I wasn't expecting to see a huge chunk like I did break off," he said. "The bluff loses about a foot a year of edge, and that's what we were tracking. We went on site, and it had lost several feet."

"We went on site on a Thursday. We had no plan. By Saturday mid-day it was completely done,"

He went back to the project design team at his Vicksburg District to expedite the schedule, then got another call about more erosion a week and a half later. When two days later, he got another call, he sought permission for emergency contracting efforts to keep the high hill overlooking the Mississippi River from caving in, and the district's colonel made it happen.

"We went on site on a Thursday. We had no plan. By Saturday mid-day it was completely done," he said. "We put a drone in the air to take a photo, and it looked like we had shrink-wrapped the whole area. The only time I've seen us move that quickly is in a flood event, and that's basically what emergency action is. We basically said, 'Everybody drop what you're doing now and go to Natchez and figure out how we can support them stabilizing the bluff.'"

We sent 20 people from our maintenance and project design teams, and I was there the whole time doing everything from calling everybody with updates to moving sandbags when needed. As a project manager, I can go all day thinking of ways to fix it, but if I don't have people to support me, I'm just enjoying the view—and that view was getting scary."

The Natchez National Cemetery was listed in the National Register of Historic Places in 1999, but it was constructed around 1863 north of Natchez near the river bluff. Some of the earliest internments were men who died in The Gardens, a Natchez military hospital for federal troops, and burial ceremonies still take place on the bluff for veterans as well as active duty personnel who die as well as eligible family members.

For Minor, who has extensive experience managing river levees, this project held sentimental importance. "It's one project my grandfather—a war vet from the Korean war—always cared about. He always asked, 'How's that cemetery project going?!'" —K.S.



SHARING THE MUCK

Corps scientists are looking to restore oyster habitat without blocking favored dining spots of an endangered fish.



ABOVE: Todd Slack displays some endangered Gulf sturgeon, a species of concern in a collaborative project to restore oyster beds like pictured above.

WHEN IT COMES TO A CHOICE between restoration of some of the prime oyster habitat near the mouth of the Mississippi River and protection of one of the nation's most unusual ancient species, you may end up at impasse.

Oysters are a big economic driver for those harvesting and serving them in restaurants. But federal laws protect the threatened Gulf sturgeon, a dinosaur lookalike that feeds on shrimp and other small, soft-bodied invertebrates in the muddy sands of the Gulf and its estuaries.

Now, scientists with the Army Corps of Engineers and University of Southern Mississippi are working on a plan to help both the oysters and those who rely on them and one of nine native sturgeon species listed as threatened or endangered.

"If we can come up with a successful recipe for creating productive oyster reefs, and Gulf sturgeon can have access to increased forage habitat, that's the win-win," said Todd Slack, a scientist and sturgeon expert with the U.S. Army Engineer Research and Development Center Environmental Laboratory.

"This is something that could be expanded throughout the entire Gulf of Mexico. Then there's an additional component of the potential positive impact on recreationally and commercially important species within the Mississippi Sound. Three big facets could really benefit from this work."

The issue and the recipe

Increased rainfall over the past several years has resulted in more serious flooding, inundating oyster beds with fresh water, particularly when the Corps has needed to more frequently operate its Bonnet Carré spillway and divert floodwaters from major cities by channeling it through Lake Pontchartrain. In the process, oysters within "the most productive habitat in the western portion of the Mississippi Sound" get an influx of fresh water that alters the salinity levels needed for them to thrive, Slack says.

"The idea was to come up with some experimental conditions to figure out if we could restore oyster beds. What recipe could we use to get the best production?"

The recipe involves developing a series of artificial reefs which will be placed on four experimental plots. Each will be located where there has been oyster production historically. Each will have "subplots" that allow for testing within the plot of reef material, the timing of disposing of the material and so on.

Slack serves on the sturgeon team of the multi-disciplinary project. While the creation of artificial reefs to boost oyster production is not new, looking at the impact on sturgeon is. The reefs create surfaces where free-floating oyster larvae can attach and grow. What is not well known is whether that will limit the sturgeons' access to food or actually be a benefit. One possibility, he says, is that it could create a halo effect of productive habitat near the beds.

"It may provide a greater forage base, but the flip side of that is that we've got all this soft bottom habitat that is considered critical foraging habitat for sturgeon. With construction of reefs, you are converting habitat from one use to another. We don't think that's going to be a major impact, but you are converting critical habitat.

"If we do come up with the ideal recipe, this is something that could be expanded throughout the whole Gulf of Mexico, Florida to Louisiana. If successful and can address benefits to another endangered species, it's a win-win." —K.S.



Restoring ancient megafauna

Cooperative efforts pull lake sturgeon from the brink of extinction

EVEN AFTER 150 MILLION YEARS, it was an epic moment for the lake sturgeon. In broad daylight, where the silty waters of the Mississippi River gently lap against the rocky edge of a parking lot, a cluster of now-endangered lake sturgeon were spawning just below Mel Price Dam 26 at Alton, Illinois.

Fishermen watched the frenzy as they cast lines in search of a dinner of river fish other than these ancient beauties from a popular fishing spot on the Missouri side of the river. One posted a video online, and that's what alerted wildlife biologists to the event they now hope to replicate elsewhere.

"Could the river's dams help the lake sturgeon to recover?" asked Ryan Swearingin, a U.S. Army Corps of Engineers wildlife biologist. He works from the Corps Rivers Project Office in West Alton, Mo., along the river just a rock-skip upstream of Lock and Dam 26 where the rare spawning incident occurred.

Lake sturgeon had previously been found spawning below dams in other areas. He wondered: Could the dam itself have the right water flows and conditions and thus the perfect recipe for sturgeon to spawn? He received a recent grant from The Nature Conservancy's Sustainable Rivers Program to study that possibility of using the dams to reproduce spawning conditions by modeling a way to re-create the flow and gate conditions.

Swearingin is cooperating with the water control and hydraulics divisions in the St. Louis Corps of Engineers District Office to create models of river conditions during the 2015 spawning. Teams take temperature and dissolved oxygen measurements daily at West Alton for historic comparisons.

Recovery

The recovery was no accident; instead, it's the result of long-time work by the Wisconsin Department of Natural Resources and USFWS which collect roe and milt for the restocking program, said Travis Moore, an MDC fisheries management biologist. Fertilized eggs raised to fry and fingerlings in the USFWS Genoa National Fish Hatchery in Wisconsin are stocked in the Upper Mississippi. Fish raised in the MDC Lost Valley Fish Hatchery in Warsaw, Missouri, are stocked into Missouri tributaries.

Fingerlings typically are released in September, when they are six to nine inches long. About 485,000 have been released since 1984. Each spring, conditions permitting, MDC biologists set lines below Lock and Dam 26 in the hope of catching, measuring and tagging lake sturgeon. Some are fitted with acoustic transmitters that ping receivers placed at numerous locations along the river.

Fish released on Missouri River tributaries have been detected below Rathbun Lake in Iowa and Gavins Point Dam in South Dakota, Moore said. A fish tagged on the Mississippi at Clarksville, Mo., went north to Keokuk, Iowa, then was caught six years later in the Arkansas River. A sturgeon tagged below Hannibal, Mo., also was tracked to Keokuk then two years later pinged on the Ohio River.

Lake sturgeon are bottom feeders that eat larval aquatic insects, crayfish, snails, small clams and small fish. They prefer clean sand, gravel and rocks. "When the females come close to shore to release eggs, males crowd around to release sperm. The eggs are sticky and need to attach to cobble. There needs to be a good flow over those rocks to keep the eggs oxygenated," Swearingin



ABOVE, FROM LEFT: Wildlife researchers hoist a lake sturgeon caught below Lock & Dam 26. Sarah Peper describes one of the acoustic recorders left along rivers then retrieved to download information identifying tagged fish that have passed by. A transmitter that will be surgically implanted into the belly of a fish..

And what a past

Lake sturgeon can live 80 to 100 years and grow to eight feet and 300 pounds. Their ancestors swam at the feet of wading dinosaurs and survived continental drift, asteroid strikes, ice ages and the fishing nets of Native Americans and European pioneers. Populations began to plunge in the 19th Century due to overharvest. Initially, commercial fisherman found little market for the oily fish and tossed them onto the river banks. As consumers acquired a taste for the flesh and caviar, overharvest nearly eliminated most lake sturgeon populations.

Lake sturgeon are listed as threatened in 19 of 20 states they inhabit. Missouri "residents" include shovelnose sturgeon, considered common, and pallid sturgeon, classified as federally endangered.

Sturgeon throughout the world are imperiled, said Sarah Peper, a Missouri Department of Conservation fisheries management biologist who tracks lake sturgeon populations. One reason they're threatened is that they live long but also take time to reach reproductive age.

In Missouri, Lake sturgeon were listed as endangered in 1974. The Missouri Department of Conservation (MDC) and U.S. Fish and Wildlife Service (USFWS) launched a restocking program 10 years later. But since lake sturgeon do not reach sexual maturity for 25 to 30 years, fish stocked in the 1980s only recently started reaching reproductive age.

said. "Lake sturgeon are a cold-water species, so they range north of here more than south," he said.

If reproducing spawning conditions can be determined, he said, "That could have management implications at locks and dams up and down the river, and we could potentially encourage spawning elsewhere."

An ancient survivor

Biologists measuring and tagging fish below the Mel Price Lock and Dam lift a sturgeon from the water at the end of a line they'd set for their research. The ancient creature has a flat, pointed snout and what seems to be foot after foot of armored body. The four barbels dangling from its head hold taste buds that help it find food to gather through the mouth hidden on the bottom of the body. Such features have enabled the sturgeon to survive for millennia.

Lake sturgeon appeared in the fossil record before North America became a continent and the Mississippi River formed. Ancestors survived the asteroid strike that ended the Cretaceous period and exterminated dinosaurs 65 million years ago. After the last Ice Age, lake sturgeon spread throughout fresh-water oceans left by melting glaciers. As those waters receded they settled into the continent's Great Lakes and great rivers.

"They are what we call a 'charismatic megafauna,' big and interesting," Peper said. "These fish have survived meteor strikes, continents colliding and pulling apart, glaciations many times, and a lot of impact from humans. They are definitely survivors and still need our help." But the evidence of spawning on the Mississippi gives hope, she said. "A project that started 40 years ago had come through, right here at Mel Price Dam!" —K.S.

MEET THE GENERAL



Maj. Gen. Diana M. Holland assumed command of the U.S Army Corps of Engineers Mississippi Valley Division (MVD) June 2020, when she additionally became the 41st president of the Mississippi River Commission (MRC). She is the first woman to assume command of MVD and hold the presidentially appointed (MRC) position. While she's new to the Mississippi River, she is no rookie to the leadership department. She served as the first woman commandant of cadets at West Point, led combat units in Iraq and Afghanistan and was the Corps' senior leader in Puerto Rico following Hurricanes Irma and Maria. In addition to numerous military accolades and honors, Atlanta Magazine named her a "woman making a mark." She accepts it all humbly, preferring to focus on others and their passions, but she does acknowledge this: "Military life is my passion. It's clearly my calling." Here, we learn a bit more.

Q: You are known for the way you encourage others to find their life passion. What led you to finding yours?

A: At a pretty young age, I told my dad I wanted to enlist in the Marine Corps. He was a marine, and my grandfather on my mother's side was a marine in World War II in the Pacific campaign. I'd seen their photos and their uniforms hanging in a closet. I was always aware of their service and what it meant to both of them.

I also think my dad made it his mission in life to provide his total support, so that I could do anything I chose. Very early on, he put a pull-up bar in the doorway of my bedroom and said, "If you're going to be in the military, you have to have upper body strength. I suggest that you start doing some pull-ups." He encouraged me to do well in school, and that opened many doors...I was convinced I could do anything I set my heart on, and he gave me the tools and constant encouragement and motivation to keep getting better."

How do you pay that encouragement forward?

I try not to miss an opportunity to help people find their passion or realize their potential or how to achieve the next level. But the higher up you get, the harder that gets. When I became commandant of cadets at West Point, I knew I wasn't going to be able to touch (figuratively speaking) all 4,400 of those future officers during their time. I then committed to an Instagram account, and I immediately realized the value of it from the feedback of my first few posts. That's carried on. (On social media) I stick to advocating, boosting, promoting, and thanking the people who work in our organization. It serves as a way to share the story about an organization that doesn't tell the human side very much, it's a way to document our history and it's a way to connect people to me and to each other. That helps them see they're part of something bigger than themselves.

Diversity, equity and inclusion has been a major initiative at the Mississippi Valley Division under your leadership. Talk about the importance of this effort.

As I look at it, there are two arguments for diversity, equity and inclusion. One is the moral imperative.

The Army, uniformed and civilian must represent the society it's sworn to support and defend. That's an obligation. It's important that our society sees itself in our Army, that our Army fights for them. If

they don't see that, you can have a growing chasm between society and the military. There's also a practical imperative. It's an all-volunteer Army, so we must be an attractive, viable option for all segments of our society. And I go back to us being a democracy and the importance of inclusiveness. There are armies in the world manned by a certain class, while excluding others and that's dangerous. Finally, there are also thousands of studies that show that the best, most creative, innovative, and effective teams are created by bringing diverse people together.

How are you working to bring this about in a practical way?

I challenge people that it's not enough to say "I'm not against diversity"; you must be for it and deliberate about how to achieve it. We need metrics to measure whether we're diverse and inclusive, from how we hire people and to how we promote them. We have to look at the things in our organization we do well in terms of diversity and retention, and the ones we fail to do. Without metrics we may not realize that we hold people back. So, it's a big campaign. It's not something we can do overnight, but we're on a good path forward.

You have a three year appointment to this post. What do you hope will be your legacy?

I consider myself more of a continuum of a very successful organization. Whatever I do personally will be in small ways. I hope every person I've touched will remember it as a positive experience, and that I'm a champion for them.

Are there any parallels between this civilian post and the active military?

My experience in Puerto Rico following Hurricane Maria, and I'm sure the same is true with flooding, is very similar to the military. It's fast moving, the safety of your people is paramount, you have to assume some risk, and you've got to execute quickly. You don't have the time to be too deliberate. In Puerto Rico, the crisis of life and death was ongoing for weeks. Entire villages couldn't get food or water. In fact, the entire power grid collapsed with very little progress for a long time, which meant the crisis persisted; refrigeration was unpredictable, so people couldn't store insulin, hospitals were barely able to keep power running. . I would say the experience was similar to my deployments in Afghanistan, and where every day brought

crisis. As a leader, I have to provide the resources for those who get the work done and set the tone and establish the right climate. If I appear to be in a crisis, running around frantic, people will feed off that and it will make it harder for them to provide a good, thoughtful response.

What has most surprised you about the Mississippi River and its watershed?

It was not until I arrived at MVD that I understood the economic benefits of the river as well as the threat it presents to those who depend upon it. It's a terrain feature I wish every American knew better. For the Corps' it is so important that we get it right, that our programs are the right ones for the river and that we continue to demonstrate that we are good stewards of the environment and faster navigation. I am impressed by the trust the people have in us to do our job. There are partnerships between communities and the Corps that have been in place for generations and that's not something you see in other parts of the Corps of Engineers. It is truly an honor to represent and serve in the Mississippi Valley Division.

What are the major challenges the watershed faces?

The evolving climate conditions and their impact on our mission is going to be increasingly challenging for everybody. It's not just an issue for the Corps, but it's certainly becoming a greater concern as we try to reduce risk from this river, protect people and their livelihoods and keep (the Mississippi) a viable navigation channel in an ever-evolving climate. Flooding is clearly going to be more frequent, and the impact on communities is going to be more serious. We are going to have to adapt to that, figure out how to get ahead of it. This is going to be everybody's challenge in the years and decades to come.

Another challenge we must address is that of aging infrastructure. Much of our infrastructure is more than 50 years old and will need continued investment in the years to come. Congress and the American people have been very generous to this point, but infrastructure requirements are outpacing funding. Hard decisions will have to be made as we seek to maintain our competitive edge in the global economy. —K.S.



The ‘Not At All Mad’ USACE Hatter

Twenty-three-year-old U.S. Army Corps of Engineers employee Alexander Harper wouldn’t call himself a “Mad Hatter” (an 1800s term used to describe the sometime odd behavior by hatmakers exposed to mercurous nitrate) but did admit to being “...just a little mad” when describing himself as a self-taught milliner.

As a high school intern, Harper came to know the engineering world of the Corps where the world of design and construction surrounded him. As such, it’s no surprise that the young entrepreneur—who worked three days a week at the Saint Louis District with nine other interns as part of the Clyde C. Miller Career Academy—that “a focused” Harper was assigned as the intern’s group leader.

“I really wasn’t interested in joining the Army at the time, but my school counselor made me take (the internship) and now it’s a career,” remarked the life-long Saint Louis native who is one of four children but is expecting a baby sister within weeks. He says now that he doesn’t hold the demand against his high school business administration counselor Judith Sams—“no,” said Harper, “not at all.”

He says he enjoys the steady and diverse work he receives as the new front-office Human Resource lead and, according to Sams, “Alex came back after only one week with the Corps and gave me a great big hug. He said that ‘he loved it,’” explained Sams who admitted that Harper had trepidations about joining the Army.

Sams went on to detail that the Corps ... “Was the very best internship choice we had. They were very good at showing the students what the real world of work looks like,” she said.

Harper turned the internship into a full-time job after graduating from University of Missouri-St. Louis with a degree in business administration and a minor in communications in 2020. However, for this ‘stay-at-home-minded’ graduate, some of his first experiences with USACE placed him way outside of his comfort zone.

Indeed, it was the tough-talking combat-experienced Major John Miller who ordered the young Saint Louisan off on official orders to the USACE Albuquerque District to learn the ropes of his new position from Jeannette Alderete who provided the training he needed to step into his new HR-focused role.

He said it was an important trip to help him focus his career but admitted that he had some anxiety about being away from his family. “That’s the furthest away I’ve ever been from home,” exclaimed Harper, who also simply hates to fly. Ultimately his New Mexico training became one of the most important challenges Harper recalls when asked about hurdles he’s faced in the Corps.

One of Harper’s newest tasks upon his return from the “Land of Enchantment,” beyond preparing awards and organizing all-hands training, has been to launch, market and then promote the newest MVS endeavor: preparing want ads to compete on LinkedIn, a social media giant that has overtaken Facebook recently as the U.S. Army Corps’ most active online platform.

And, aside from his day-to-day ‘at work’ service tasks, it was Harper’s mother Aflton, or more specifically his desire to provide her a classic Cloche Hat, but not having the funds to do so, that inspired him to make a solo entry into not just making a single hat but to eventually launch a line of homemade beauties that have become quite popular with friends and family.

Harper explained that he had trepidations at first and many of his calls to hat makers went nowhere as he sensed that “... nobody in the business wanted to give away their trade secrets.” But undaunted, Harper continued to learn and was eventually able to reach and discuss the tricks of the hat trade with new contacts in Texas and in Pennsylvania. He also racked up many hours on YouTube and other online resources learning the differences between gingham, Glen Plaid and a Gaucho — as any designer should.

Harper looks back and admits that he “messed up” his mom’s first attempted hat ... “but she loved the second one,” he noted with pride. But those early days are but a memory in this young man’s life. He’s stepping up his game and has become quite adept in showcasing his felted-wool spring lineup and interest has been skyrocketing in his neighborhood.

With USACE as his anchor, Harper has achieved a work-life balance where engineering fashionable headwear on his off-time melds quite well with the employee services he renders to engineers during the day. It’s a lifestyle that many inventors and craftsmen twice his age would envy and a claim that Harper’s counselor, Judith Sams, can take some credit in.

“Harper was one of my best students. He was punctual, respectful and dressed well,” she said. “But, most importantly he had an entrepreneur’s mindset and I knew the Corps of Engineers was the best fit for him.” —STORY BY ANDRE’ BILLEAUDEAUX,

CHIEF PUBLIC AFFAIRS OFFICER, SAINT LOUIS DISTRICT



ABOVE, FROM LEFT: U.S. Army Corps of Engineers employee Alexander Harper juggles his creative career as a human resources professional with the Corps St. Louis District and avocation as a hatmaker. Here, he poses with a few of his happy, stylish customers.

WILDLIFE FEATURE

The ‘Other’ Eagle of the Mississippi River Valley

Soaring eagles are a familiar sight along the Mississippi River. An adult bald eagle with its white head and tail is easy to spot as it catches a thermal or perches above a likely fishing spot. But a rarer eagle haunts the steep bluffs of the Upper Mississippi during cooler weather.

Golden eagles are uniformly dark brown as adults and can be distinguished from bald eagles by the golden-brown feathers that cover the back of their head and neck. But despite their lesser-celebrated status, golden eagles are one of the largest, fastest, and most nimble birds in North America, and they’ve recently been writing a comeback story of their own.

Golden eagles arrive in the Mississippi River Valley from Ontario and Manitoba, Canada, moving south after rearing their young and migrating around the western end of Lake Superior in October and November. The Hawk Ridge Bird Observatory in Duluth reported a record migration of 223 golden eagles in 2009. Some of these migrating golden eagles head for the hills of the driftless area in Minnesota, Wisconsin, and Iowa where they spend the winter and early spring in forested valleys.

Golden eagles are rarely seen directly on the river, preferring to hunt the forests and bluff-top openings, called goat prairies. Their most common prey here are squirrels, rabbits, and wild turkeys. That hunting style requires a constant scanning the entire landscape, paying attention everywhere, according to Scott Mehus, education director for the National Eagle Center in Wabasha, Minnesota.

That characteristic also made a golden eagle named Donald a visitor favorite among the resident eagle ambassadors at the center.

“Unlike his bald eagle companions, Donald would look at every single person that come in that room. He would look into you; he would look into your eyes. And so he would really make that connection with people,” Mehus said.

Spotting a golden eagle along the Upper Mississippi is still a special event. This year’s Golden Eagle Survey, a citizen science project of the National Eagle Center, found 126 golden eagles. In comparison, observers saw 1,433 bald eagles over the 47-county survey area. Mehus has coordinated this survey since 2004.

“We had a little over 20 Golden Eagles that first year with just 21 observers. The number of surveyors has grown ever since, which has been great. This year, we had almost 200 observers,” he said.

Mehus believes golden eagles have been present in the Upper Mississippi for quite a while and have just been overlooked. Many other eastern and southern states are now finding out they have resident golden eagles, thanks to the efforts of the Eastern Golden Eagle Working Group, a collaboration of scientists, educators, and resource professionals.

The working group recently estimated that 5,000 golden eagles overwinter in the eastern United States, based on fall migration data from many locations. Their current effort is creating a management plan that can help state wildlife managers protect the species during the winter.

“The golden eagles of the Mississippi River Valley rely on us for winter habitat, just as we rely on Central and South America to provide winter habitat for the songbirds we enjoy in Midwestern summers,” Mehus said.

Mehus hopes to expand the Golden Eagle Survey beyond the driftless area, a plan brought closer to reality after a year of Zoom presentations. This year, all National Eagle Center classroom presentations have been virtual, a good test for how to train golden eagle surveyors remotely. People interested in participating in the Golden Eagle Survey can send an email to golden@nationaleaglecenter.org to begin receiving updates when training sessions are available.—D.D.



**Scott Mehus, Education Director,
National Eagle Center,
Wabasha, Minnesota**

“My aunt and uncle lived in Rushford, Minnesota, and I remember as a kid driving across southern Minnesota on I-90 to visit them. And it was flat farm country and boring. But as soon as we started dropping down into the bluff country, it was like dropping into a magical place. It was a whole hidden world right here in Minnesota. And then you get down to the river, and it was just amazing. We watched the Delta Queen go through the lock and dam at Guttenberg. We saw signs for this place called the Upper Mississippi National Fish and Wildlife Refuge.

“In the late 1980s, seeing a Bald Eagle soaring against a beautiful blue sky in the Boundary Waters during a church youth group canoe trip (not a common sight at that time) sparked my interest in them. Then attending Vermilion College in Ely my professor took our class to Duluth, to Hawk Ridge to watch the migrating raptors, and that really spurred my interest in both bald and golden eagles. Seeing them be so energy efficient and being able to migrate such long distances with so little effort really amazed. Even at that stage I was also really intrigued at where the Golden Eagles that were migrating by Hawk Ridge were coming from, and why might they be migrating out of the areas that they had summered in.

“I feel very connected with eagles, and just like our connections with other humans with how we can feel more connections with some more people more than others, well the same is true of the eagles. Each bird has their own unique personality (birdonality) and it readily connects (or doesn’t) to others. I see people coming into to the National Eagle Center and having sometimes instant bonding with some birds versus others. It goes the same for the birds as well. I have worked with Angel the Bald Eagle (22 years of age) since 2006, and we have never hit it off. It has always been a challenge for me working with her, while others can come in and she will start working with them from day one!” —D.D.

Golden Eagle Fun Facts

Wingspan: 6 – 7 feet. Weight: 6.6 – 13 pounds

The golden eagle is the most common official national animal in the world. It is the emblem of Albania, Germany, Austria, Mexico, and Kazakhstan.

Golden eagles occur throughout North America and northern Eurasia and are patchily distributed in North Africa.

Immature golden eagles can be confused with immature bald eagles as both have predominantly dark brown plumage with some white. Young golden eagles have white concentrated at the base of the tail and the outer part of the wing. Young bald eagles have irregular patches of white across the body, especially under the wings.

Because they most commonly prey on mammals that don’t tend to ingest pesticides, golden eagles have escaped the harm sustained by fish-eating or bird-eating raptors from DDT and related chemicals.

The rough-legged hawk, the ferruginous hawk, and the golden eagle are the only American raptors to have legs feathered all the way to the toes.





THE MISSISSIPPI PANORAMA

As white settlers reached into the expanses of the Mississippi Valley early in the 19th Century, their footsteps were followed by artists attracted to the frontier from as far as Europe.

They were “as thrilled and excited by what they saw as any new traveler in a foreign land. They had neither the time nor the inclination to dream, but only to sketch and paint as accurately as they could every burgeoning town and village, every raft and keelboat, the endless banks and bluffs, the flora and fauna of the new inland waterway which had no equal in the world.”

So explained “Mississippi Panorama,” a book accompanying a 1950 St. Louis Art Museum exhibit. As staff began selecting exhibits, “it soon became apparent that the great waterways of the mid-continent had been a more fertile source of inspiration to the artist than is generally realized.”

Some of that content—and more—will be displayed in the main exhibition galleries of the St. Louis Art Museum from October 3, 2021, to January 9, 2022, in conjunction with the 200th anniversary of Missouri’s statehood.

“Art Along the Rivers: A Bicentennial Celebration” will explore artwork produced and collected over 1,000 years in the region surrounding St. Louis. “Although the region that has shaped the exhibition’s objects is small, it has played an outsize role in the history of North America due to the confluence

of powerful rivers and major trails and routes within its borders,” states the exhibit’s overview.

The first known depiction of St. Louis appeared on an 1817 bank note. Many artists specialized in “some particular aspect of that life that flourished there,” such as steamboats, Native Americans, landscapes or towns.

Ornithologist John James Audubon specialized in birds, of course, and painted a landscape of Natchez, Mississippi, in 1822. “Like all of them he was motivated by a driving inspiration as big in its own dimension as the territory he roamed,” the 1950 book explained.

That 351-piece exhibit also paid homage to ancient artists. “Once the exposed surfaces of the (river) bluffs bore weird Indian paintings such as the Piasa bird, near Alton, Illinois, which was a crude representation of a creature half bird, half serpent.”

The original bird, possibly painted around the 12th Century, had been weathered away but was represented in a drawing published in 1853.

“Art Along the Rivers” displays more than 150 objects reflecting the region’s diverse cultural history and arranges them thematically “to establish dialogues around the region’s geography, raw materials, and pressing social issues.” —R.S.



Water Safety Fun!



Cheers to the world's record holders

You've likely heard of the Guinness Book of World Records, but what you may not know is this: the idea started when the managing director of the Guinness Brewery was in an argument during a shooting party. He and his British hosts couldn't agree on which was the fastest game bird in Europe.

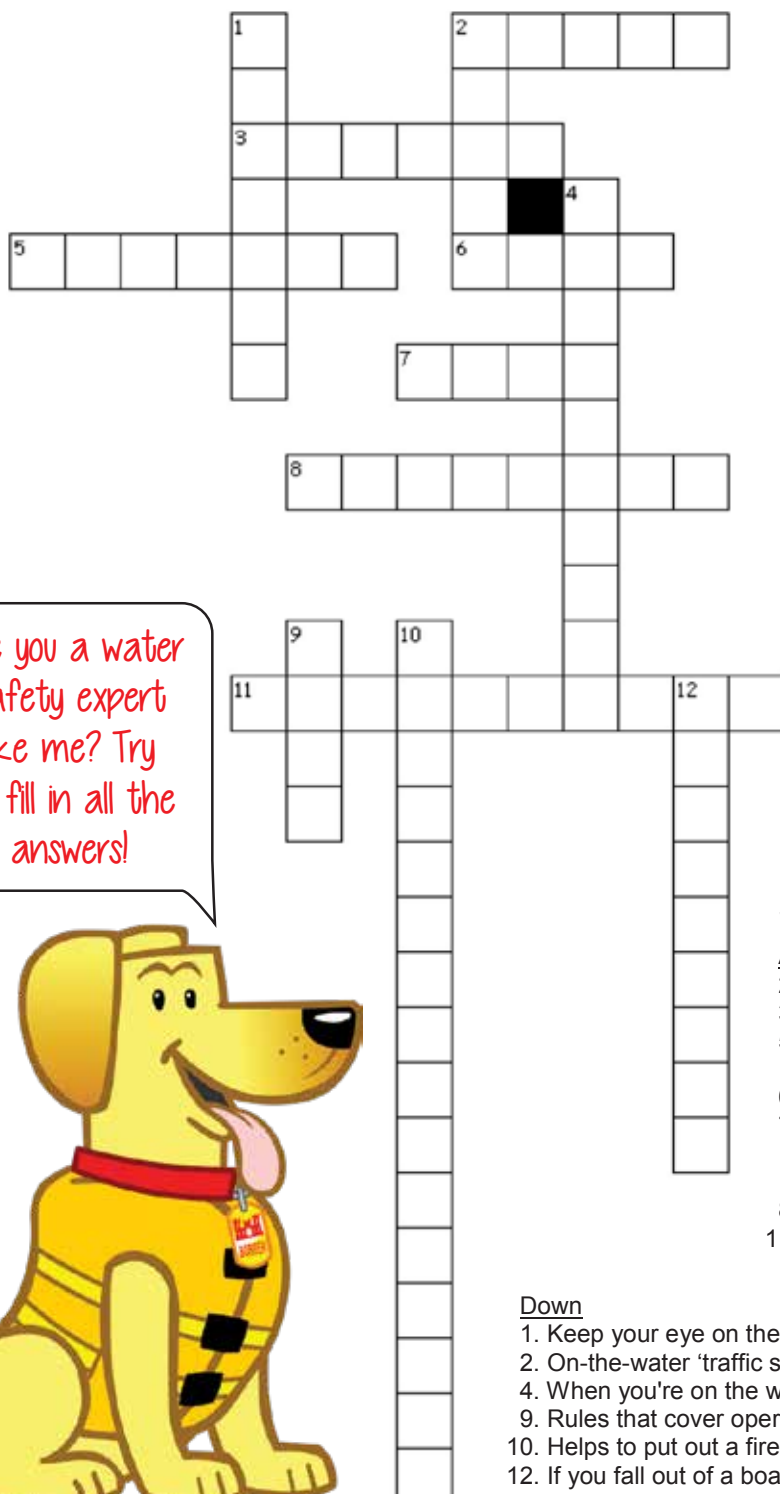
They never settled on the answer, but they did settle on creating a new book as a way to settle arguments at pubs! Today, there are more than 40,000 official "records." Among them are many set by kids—and young adults—some of them related to the Mississippi River, some related to such important matters as how many socks one can put on in 30 seconds.

KJ Millhone set his first record for "fastest time to row the length of the Mississippi River by a team" with a friend when he was 22. At 62, he this year broke his own record (and many others that followed his first attempt), and so did team member and 16-year-old daughter Casey Millhone. In doing so, the dad set the record for oldest person to have completed the 2,350-mile journey, while Casey set the record for the youngest!

Be inspired by other young people who have set records:

- 7 year old Montannah Kenney set a new record in 2018 for youngest person to summit Mount Kilimanjaro. She wanted to climb with her mom, Hollie, and did so in 6½ days to be closer to her father who had passed away five years earlier. At the top, she aimed a kiss toward heaven.
- Nilanshi Patel of India holds the record for the longest hair on a child or teen—5 feet, seven inches. Why? She had a traumatic haircut at age 6 and didn't want to go through that again!
- And no extra luck was needed for Katie Borka, who at age 11 broke the record for most four-leaf clovers collected in an hour. She found 166 "because she was good at spotting them."

Have a record breaking idea of your own? Apply here:
[guinnessworldrecords.com/contact/application-enquiry](https://www.guinnessworldrecords.com/contact/application-enquiry)



Are you a water safety expert like me? Try to fill in all the answers!



L Q C R P Q P B B V C N J J L
U A Q G V L Y E C D O A R R G
A I M R E H T O P Y H L S U P
O D A H Q I L B J S Q P I W S
C W D Q E A A W Y N G T P W N
D A C R N C N W O R D A W F F
Y L P Y A B C I U B C O C U O
I R A S N U S O V E R L O A D
P R U Q I I G Q D N M F B I X
D P I P L Z H T K H N T O I A
Y V M L F J E M S G E V A Q I
N X O A B D E H K A L H T E Z
C C M N W L K D W P O R I D P
H X E L E S A G I R U C N B R
V Y W N X I W E J B X J G J T

Boating Safety Word Search

Can you find these 18 words?

Boating	Capsize	Coast Guard	Collision
Drown	Float Plan	Hypothermia	Lanyard
Overload	Swamp	Wake	

Abbreviations: Blood Alcohol Concentration (BAC)
Boating Under the Influence (BUI) Heat
Escape Lessening Posture (HELP)
National Weather Service (NWS)
Personal Floatation Device (PFD)
Personal Watercraft (PWC)

Water Safety Criss-Cross Puzzle

Across

2. Always swim with a _____.
3. 'Brake' on a boat.
5. A major contributor to boating accidents and fatalities.
6. To keep you safe in the water, learn to _____.
7. Lakes can provide flood control, water supply and irrigation which causes the water levels to change. One should never _____ into these lakes.
8. Band-aids can be found in a _____ kit.
11. When operating a boat at night, you must turn on your _____ lights so others can see you.

Down

1. Keep your eye on the sky and watch for bad _____ when boating.
2. On-the-water 'traffic signs'.
4. When you're on the water you should always wear your _____.
9. Rules that cover operating a boat are called boating _____.
10. Helps to put out a fire.
12. If you fall out of a boat, that's called falling _____.



OUR MISSISSIPPI TRAVEL

In a stretch of the Natchez Trace National Scenic Trail, not far from Port Gibson, Mississippi, hikers' boots join a millennia-long caravan. Theirs are the latest in a line of thousands of tromping feet, boots that so deeply eroded the trail here that it lies a full 20 feet below the surrounding landscape. The high earthen walls shut out the noises of the outside world, and what daylight the earth doesn't block is largely kept at bay by towering oak trees. Nowhere on the Natchez Trace does this trail's history—and a hiker's place in it—feel more palpable.

History of the Natchez Trace

For thousands of years, the Chickasaw, Choctaw and Natchez forged and followed the Natchez Trace, a nearly 500-mile trail that connected settlements across the region to the continent's transportation highway: the Mississippi River.

In the late 1700s, European settlers followed the Trace to new homesteads throughout the Mississippi Valley. The region's boatmen, known as "Kaintucks," floated goods down the Ohio and Mississippi Rivers, sold their products in Natchez and New Orleans, and walked back home by way of the Trace. Slave traders followed the well-worn footpath, transporting enslaved people to and from the Delta. Meriwether Lewis wrapped up his famed expedition with a journey along the Trace, where he died in 1809. And American troops used the Trace as a military route during the War of 1812.

Steamboats would eventually render the Trace little more than a historical relic. But its former significance and natural beauty attracted the attention of the National Park Service in 1938. Eventually, the Park Service would construct the Natchez Trace Parkway through portions of Mississippi, Alabama and Tennessee, with historical pullouts and scenic overlooks. The Natchez Trace National Scenic Trail was added in 1983.

Trekking through a Diverse Landscape

The opportunity to explore this region of the Mississippi River Valley on foot, and to recreate in some small way the experiences of those early travelers, draws hundreds of day trippers to this Southern trail with their backpacks and hiking boots. Each year a handful of National Scenic Trail purists and long-distance hikers opt to trek the Trace's entire 444 miles, a challenging distance made all the more difficult thanks to the often hot, humid climate and the necessity of hiking the road's nearly non-existent shoulder.

Officially, the Natchez Trace National Scenic Trail consists of five distinct sections in Mississippi and Tennessee totaling 62 miles. The first of the trail's official segments is the Potkopen, or "little valley," an appropriate name for a stretch of the "sunken" Trace that's been eroded into something resembling a narrow gorge.

But the remains of the old Natchez Trace are seldom as obvious as they are in these sunken sections, where fine loess soil erodes easily. In fact, the Trace promises a diverse range of landscapes. Pre-historic Native American mounds rise over the landscape near Natchez and Tupelo. Sparkling waterfalls like Jackson and Fall Hollow gush over rocky promontories in



A "sunken" piece of the original trail.

other areas, while swaths of crimson clover, bluets and meadow buttercups brighten the entire Trace.

Parkway and trailside pullouts alert hikers, bicyclists and automobile drivers to historic sites scattered along the Natchez Trace. 18th-century inns like Mount Locust and the Gordon House, now historic sites, once housed and fed weary travelers. The remains of historic ferry crossings can be seen near Florence, Alabama, and Columbia, Tennessee.

Old Hardships, Modern Conveniences

If hiking the Natchez Trace seems bucolic, it is ... to a point. Hiking nearly 400 miles takes its toll physically, as it surely did for travelers in the 1800s. Swollen creek beds and flooded marshes occasionally swallow up the trail. At times the Trace grows thick with boot-sucking mud, and peaceful cypress swamps breed mosquitos and ticks. Warm, humid days morph quickly into damp, 35-degree nights in the spring, and surely twisted ankles, sprained knees and illness slow unfortunate travelers at times.

Modern hikers find respite with a hot meal, a warm bed and a proper shower at nearby hotels. But there were no Holiday Inns in 1810, nor ultralight tents, Gore-Tex boots or permethrin spray for repelling insects.

When contemporary travelers finally reach the northern terminus of the Natchez Trace on Nashville's outskirts, they follow decades of tradition with a celebratory meal at The Loveless Cafe. Famous for their scratch-made Southern food—fried chicken, homemade biscuits and jam, and house-smoked barbecue—the cafe promises a well-deserved treat and helps replace the thousands of calories burned over three weeks of hiking. It's perhaps not unlike the celebratory dinner enjoyed at trail's end, 200 years ago. —A.S.E.



I.D. Caption here



Loveless Cafe

For trip-planning information and history about the Natchez Trace, visit [NPS.gov/natr](https://www.nps.gov/natr)

THREE MORE MISSISSIPPI RIVER VALLEY HIKES

Itasca State Park, Minnesota

The Mississippi River begins its Gulf Coast journey in Itasca State Park, Minnesota's oldest. Some 50 miles of footpaths crisscross the park, ranging from short wheelchair-accessible trails and boardwalks to a paved bike path and more challenging routes through virgin pine forest. dnr.state.mn.us/state_parks

Mississippi Palisades State Park, Illinois

Follow the hiking trails of the Mississippi Palisades and you'll be tracing the footsteps of the Native Americans who cleared these paths nearly 1,000 years ago. 15 miles of trails pass Mississippi River overlooks and rocky outcroppings that give the park its name. illinois.gov/dnr/parks

Cat Island National Wildlife Refuge, Louisiana

The trails are short and easy, but the landscape spectacular at Cat Island, 30 miles north of Baton Rouge. The star of this park is the old-growth cypress and tupelo trees, some a century old, and visitors like herons and egrets. fws.gov/refuge/Cat_Island



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Oakwood Bottoms

Oakwood Bottoms is one of the largest contiguous tracts of bottomland hardwood forest along the Middle Mississippi River Corridor. It holds important habitat for migratory birds and other species, including the endangered Indiana bat, but levees built a century ago disrupted the area's natural hydrology cycles. Valuable wetland and hardwood ecosystems are shrinking. Even oaks are disappearing.

Under a habitat restoration and enhancement project of the Upper Mississippi River Restoration Program, a program this year marking its 35th year of restoration efforts, the U.S. Army Corps of Engineers soon will move dirt and install pumps to enable the U.S. Forest Service to better recreate natural conditions in the bottoms.

The project covers 4,700 acres of Oakwood Bottoms in the Shawnee National Forest near the Mississippi River in southern Illinois. When the land was farmed, the levees protected against flooding from Big Muddy River and channels were cut to drain wetlands. The Forest Service has managed the area since 1964.

Existing water control structures and pumps are aged and inadequate, said Brian Markert, the Corps' Upper Mississippi River Restoration Program project manager. The resulting "unnatural water fluctuations reduce the ability of the area to function optimally for the multiple habitat types."

Acorns and nuts are high in nutritional value for wildlife, but oaks and hickories in the bottoms are reaching the end of their life cycles. Replacing them are maple, ash and elm trees that tolerate wetter soils. Also being lost are the areas classified as "emerging wetlands" that provide important habitat and nutrition.

In projects expected to launch in 2022, the Corps will install multiple new well pumps to more efficiently place water on lands once subject to seasonal flooding, said Jasen Brown, the Corps' Upper Mississippi River Restoration Program engineering lead. A new pump station will enable the Forest Service to remove water more efficiently to restore dry conditions.

Degraded berms and drainage channels will be repaired and optimized. Hardwoods will be reforested in 94 acres and some maple, ash and elm stands will be cleared. —R.S.



**Upper Mississippi
River Restoration
BY THE NUMBERS**

56	Number of projects completed as of 2020
3	New projects expected to be completed in 2021
5,590	acres slated to be restored in 2021 through three new projects
9,810	acres slated to be restored in 2022
111,000	acres restored by end of 2022, over life of project.

Long-range Upper Mississippi resilience plan nears adoption

Changes in land use and climate-driven changes in precipitation were listed in a draft "Keys to the River" plan as key challenges impeding commercial navigation safety, degrading fish and wildlife habitat and affecting safety and economic stability of communities, agriculture and other industries.

The long-term plan for managing floods, drought and sedimentation is nearing adoption by the Upper Mississippi River Basin Association (UMRBA) and has been released for public comment. UMRBA was established by the governors of Illinois, Iowa, Minnesota, Missouri and Wisconsin to work with stakeholders and federal partners to advance multi-use management of the river.

"The complex nature of the river system and array of human uses requires thoughtful and inclusive dialogue among the diverse suite of stakeholder representatives throughout the region," the plan noted.

The greatest water volume in recorded history flowed in the Upper Mississippi in 2019, the plan explains. Sedimentation also is increasing, requiring additional dredging to maintain navigation channels and backwater ecosystems. The plan will suggest the need for new regulations on placement of dredged sediment and efforts to seek new uses and users for sediments.

Send story ideas to editor@ourmississippi.net

To subscribe to our e-edition, read past editions and find river-related education materials, visit <https://www.mvd.usace.army.mil/Media/Publications/Our-Mississippi/>

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