

Our Mississippi

PARTNERING TO KEEP
AMERICA'S RIVER GREAT

FALL '15

The river gets a D+

First basin report card pinpoints areas of strength and concern.

SCHOOL'S IN SESSION, and the Mississippi River watershed is getting a passing grade—but barely so.

The river and its four sub-basins earned a grade of D+ on the first comprehensive measurement of the watershed's status as it relates to multiple factors. Those are: clean and abundant water, marine transportation, flood control and risk reduction, a strong economy, recreation and ecosystem health. The measurements are a result of a comprehensive, multi-year analysis that included participation from some 700 experts across the entire watershed—parts of 31 states and 41 percent of the continental United States.

"I have three little kids, and someone noted that we've all had grades we weren't proud of. If they brought home a D+ report card, there would be a problem. That's the first thing we should focus on because it's a clear message there are some real concerns," says Harald "Jordy" Jordahl, director of America's Watershed Initiative, a stakeholder coalition that spearheaded the evaluation.

But there's a brighter side to the

evaluation than the grades reflect, he and other participants say. The coalition has brought together experts from most of the country who represent every possible use of the river, and those people are already sharing potential solutions and focusing attention on major areas of concern. As people on the initiative team like to say, he notes: What gets measured gets addressed.

"We've never had this kind of a tool to bring people together to create this shared vision for the watershed," Jordahl said. "The report card is not where we stop. The goal is to form this water collaboration and identify how we take some of these next steps."

America's Watershed Initiative was convened following the 2010 America's Inner Coast Summit, launched with leadership from The Nature Conservancy and the U.S. Army Corps of Engineers. Members now represent regions across the watershed and a diversity of people and industries with a stake in the basin. For the report card development, the group also partnered with the University of Maryland's Center for Environmental Science, which employs experts who have developed similar report cards for other iconic ecosystems like the

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ABOVE: *This photo of the Mississippi River showcases the many purposes evaluated in a new river basin report card.*



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.



Help raise the grade.

- Protect, value and conserve water in rivers, streams and aquifers.
- Work collaboratively, realizing and appreciating the river's many valued uses.
- Get involved and take action where you live for the Mississippi River watershed. For a suggestion on a practical way to get involved, contact America's Watershed Initiative via americaswatershed.org.

Chesapeake Bay and the Great Barrier Reef. Those report cards have been used to catalyze improvements in ecosystem health and guide restoration efforts and relevant research.

This evaluation—some three years in the making—expanded the analysis beyond ecosystem needs and goals. The scope, participants say, is as massive as the river basin itself, a basin that includes not just the Mighty Mississippi but also the 250 rivers that flow into it, the drinking water it supplies to millions, the millions of tons of goods carried on the system and the roughly \$54 billion in agricultural products grown in the Mississippi River watershed.

Room for improvement

While no basin scored an overall A or B in any category, there were bright spots. The Lower Mississippi River basin earned a B in outdoor recreation, a grade based on factors like national park attendance and hunting and fishing licenses but also attributed to the growing number of river guides leading paddlers into newly restored backwaters increasingly populated with wildlife. Overall, find-

“Clearly our future health and growth in the United States depends on the clean and abundant waters that flow in the 250 heartland rivers within the basin.” —TERI GOODMAN, STEERING COMMITTEE MEMBER

ings on the ecosystem measure varied more dramatically than any other measure among the sub-basins: the Upper Mississippi, the Lower Mississippi, the Missouri, the Ohio/Tennessee and the Arkansas/Red.

Not surprisingly, since it eventually receives the accumulated nutrient runoff from agricultural and industrial areas of the river and tributaries, the Lower Mississippi scored on the lower side on water quality indicators like treatment violations; that was noted, too, as a major cause of low oxygen in the Gulf of Mexico at the river's mouth. The Ohio fared particularly poorly on water quality (D-), though that basin scored relatively high (B) in the area of wetland abundance and positive changes in wetland habitat (A).

The basin's overall water supply/depletion grade was relatively high (B-), key since the basin currently provides drinking water for millions as well as water for farms and ranches producing \$54 billion in food and goods each year, noted Teri Goodman, a steering committee member and assistant manager of the city of Dubuque, Iowa. “Clearly our future health and growth in the United States depends on the clean and abundant waters that flow in the 250 heartland rivers within the basin,” she said.

It will be critical, the analysis noted, to continue to assess how that supply may be stressed by demand from factors like climate change, likely to bring increasing demand from drier areas outside the basin.

Flood control and risk reduction emerged as a key area of concern, both due to aging levees and the increasing number of people moving into floodplains. The eastern areas of the watershed and Lower Mississippi received the lowest scores, though the report card noted that a huge investment in the flood control infrastructure on the Lower Mississippi did avoid major losses in the record flood of 2011. Damage prevented was not factored into the grade. But by far, the lowest scoring area was transportation, scoring poor (D) or very poor (F) in every basin due to universally aging locks and dams—nearly all beyond their design lives—and stagnant levels of maintenance funding.

The Lower Mississippi received a D on transportation, and the analysis noted that “a dangerous lack of funding for infrastructure maintenance means that multiple failures may be imminent ... which would result in severe economic, public safety and water security problems.” The water commerce network moves millions of tons of goods safely, reliably and efficiently but can't hold out forever without more investment, said project steering committee member Stephen Gambrell, director of the Mississippi River Commission. “The longer we wait to invest in raising the grade of America's Watershed, the more it will cost our children, our national security and the nation's future opportunities.”

In addition to problems, the report card pointed out potential, noted Dru Buntin, another steering committee member and executive director at the Upper Mississippi River Basin Association. Universally, basins are excited about the potential to increase recreational usage of their rivers as well as potential to better balance human impacts and ecosystem needs. Lessons learned are already being shared among basins, he said. “We're looking at what's working, what isn't working and how we can learn from each other.”

The “next steps” piece is now key and was addressed by a group of representatives from 20 states who came together in St. Louis Oct. 14 to look at the report card findings and how to address them. The need for new investments at all levels was one obvious key, along with more collaboration and long-term partnerships. The initiative is looking for feedback on the findings, Jordahl said, hoping the scientific measures will be a clearer than ever way to focus action. —K.S.

A full discussion of the grades for the six goals and technical documentation with data sources and calculations is available at AmericasWatershed.org/ReportCard.

WHO PARTICIPATED? 700+ Participants • 400+ Businesses and Organizations • 37 States + Canada and Korea
140+ Business Organizations • 145+ Federal Agencies • 180+ Organizations & Basin Groups
100+ State & Local Government Agencies • 85+ Academic Institutions

WHAT'S IN A GRADE?

In the case of the evaluation of the Mississippi River as a watershed, both opportunity and urgency, says **Stephen Gambrell**, an American Watershed Initiative steering committee member and director of the Mississippi River Commission.

Q: What does it mean to you that the watershed got a D+ grade overall, and how should the country react?

A: We should focus our efforts on raising the grade because it impacts our long-term economy. It impacts our gross domestic product in ways I think most of us as local citizens don't fully understand.

Q: How does measuring the critical issues facing the Mississippi River watershed make it easier to address them?

A: I don't think it necessarily makes it easier, and it may even make it harder. But it does give you insight, and that's what we want. We want to see the impacts and challenges and be able to address those as a system instead of as an individual element, issue or even sub-watershed. The individual watersheds will benefit, though. They can see how they fit in, and they will see what the others are doing to be more productive for the economy and the ecology. Because we are linking them together with a report card system, they can see things they may not have noticed before and think, "I can help or contribute" or "I can learn from that" and improve their part of the world.

Q: What stands out as an example of something one watershed has learned from another?

A: The whole idea of capturing water for irrigation and other uses versus taking water from a viable groundwater source (that could be used for drinking) is a solid lesson we can use throughout the watersheds. It's been done in many places around the world, including in Arkansas, where there are places using on-farm storage for excess water from streams for rice production so they will

not have to tap the vital aquifer used by multiple states. Arkansas is the number one rice producer in the United States, and that demands a lot of water. That they're finding a way to irrigate in a much more efficient manner than taking vital high quality groundwater is a practice that other people are going to benefit from in the future.

Q: Why has this not been done before?

A: Many people have thought it should be done, but when (and if) they come to the table, they can't stay there long enough because of the diverse interests involved. We have the same challenge—allowing people with categorical positions like an industry vs. a non-governmental organization vs. an agency to have a voice and express their position and then seriously consider it. Many times people are so engrained in their position that they can't tolerate even a change in a word, but in order to produce something like this, you must listen to that diverse interest and consider what they're saying instead of backing away.

Q: Why use letter grades?

A: Some people say, let's not put grades. That's too controversial. But you need for people to understand that these systems are of extreme value to them, whether they realize it or not, and the value to them is devastating in the future if they don't pay attention. Transportation is one that's a D-, and part of the reason is because 60 percent of the structures in the infrastructure portfolio are beyond their design lives. But at the same time you're moving the second-largest tonnage of cargo in the world. So what's your grade? That's part of the challenge. There's also the aspect of not

just what we can do in the future, but what should we do. Sixty percent of the exports moving on the river are related to agriculture. We're discussing trade agreements with just one country now that has more than 1 billion people, and what do you think the big need is? Food and water. When you have 1 billion people, you have a high demand for water, not just for drinking but for the agriculture to produce food. And we can transport it to them at a price they favor. But what if we use all our natural resources to produce food for the world and those resources are depleted?

Q: Many major issues the world faces into the next century seem to be somehow covered in this analysis, things like a potential global water shortage.

A: In big and small watersheds all over the globe, we're all struggling with the same base level issues of how to prepare our systems that mean so much for our economy and ecosystems for the future. If you have people who are hungry, and they can't afford a base level of food and water anymore, it doesn't matter where you are in the world, people become desperate. When they reach this stage, there is the danger of instability, and that impacts national security.

Q: What's next? How do you start addressing some of the critical issues raised?

A: We start getting even more data and information and challenges back from people along the rivers. We have a number of "next steps" in every measured category, but those have to be vetted with the people who come back to us with their reaction to the report card. Our request is that a broader audience—people who live along the rivers and receive from the source—come to the table and recognize the value of this God-given footprint of water and land that produces valued products for the nation and the globe. The short answer is, let's raise the grade. Instead of just challenging the grades, let's figure out ways to raise them. —K.S.

Mississippi River Report Card

SUMMARY	A B C D F					MISSISSIPPI RIVER	Grade
	Upper Mississippi	Ohio	Lower Mississippi	Arkansas Red	Missouri		
Recreation	57	24	64	48	54	53	C
Ecosystems	42	55	48	61	38	46	C
Economy	55	50	42	50	43	50	C
Transportation	42	37	17	12	N/A	21	D-
Flood control & risk reduction	38	44	26	43	49	38	D+
Water supply	57	59	29	28	34	47	C
Watershed-wide						25	D-
OVERALL	48	45	38	40	44	38	D+

See more detail about each basin's grades on pages 6 and 7.

At left is a summary of the scores given to each of the five sub-basins based on each measure evaluated. Letter grades are based on how high or low scores ranked on various criteria measured. To determine a water supply goal grade, for example, report card teams measured the safety of municipal water supplies based on past EPA violations as well as quantity of surface water during peak demand months. Recreation scores were based on measures of outdoor participation and sales of hunting and fishing licenses, while water quality assessed nutrient levels in watershed rivers and streams, evaluated the condition of animal communities, measured wetland area change and more. For a detailed look at what was measured and how, go to americaswatershed.org.

SUBMIT YOUR BEST RIVER PHOTOS



St. Louis-based Garry McMichael has photographed the Mississippi River from a creek above Lake Itasca to the mouth of the Mississippi at the Gulf of Mexico. For the past two years, he's visited the river shoreline weekly to capture the iconic Arch amid the weather, cloud formations and river action of that given day.

But a new idea struck while he was following a Facebook forum of Mississippi River photos—shots taken by tourists seeing the river for the first time, by a cook on a towboat, workers on barges. Thousands of people, he realized, are capturing the river, at as many locations, and each is from a unique perspective not easily replicated.

Now, McMichael is heading up the Mississippi River Photo Shootout. The photo contest/traveling art exhibit will collect a curated set of as many as 100 photographs designed to showcase various river uses/categories. Among those: wild-life, recreation, commerce and the iconic river itself—river-scapes and special places, every weather condition or season.

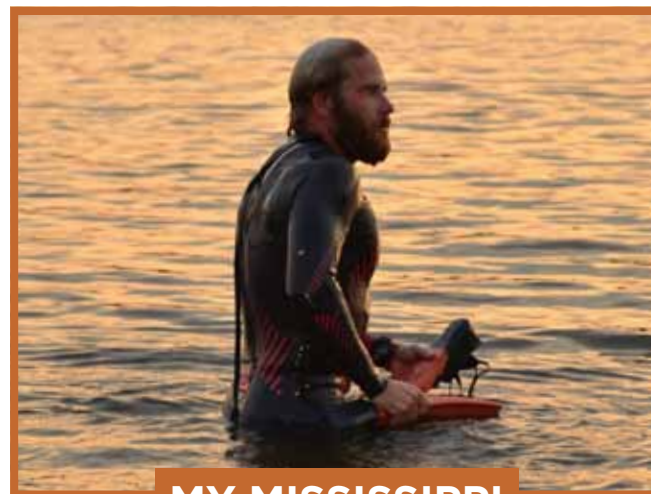
The entry deadline is Feb. 17, but the winning art will be showcased at Jacoby Arts Center in Alton, Ill., and at the Corps' National Great Rivers Museum in East Alton, Ill. Eventually, it will also travel to sites elsewhere along the river. Kimberly Rea, recreation manager at the Corps' Rivers Project Office, says it's a natural fit for the way the project showcases the importance of the arts, something the museum now showcases amid displays on river transportation, navigation, history and the natural world.

"The river has always been a catalyst for art, music and literature," she said. "The river is a muse. She inspires people and engages people."

Rea and McMichael say they hope would-be entrants will explore the river this fall and winter, capturing images and connecting with the river. They should also take a broad view of beauty, says Rea.

"One person might not see any visual interest in a towboat," she said. "But if it's photographed right, it can show the beauty in the river's more industrial and commercial components. It's also vastly different, depending on where you're located, but just because it's different doesn't mean it's more or less important. Every mile of the river is special and unique, and this contest allows us to showcase how special our river is." —K.S.

GUIDELINES: Entry fee is \$30 for two photographs, submitted electronically. Every image should be original and created after Jan. 1, 2013. Grand prize is \$500, but there will be prizes in every category and a people's choice award. Submit entries at mississippiriverphotoshootout.com, questions about the exhibition to garry@imaginagrapher.com.



MY MISSISSIPPI

Chris Ring, 28, California; transitioning from Navy

"I knew I wanted to be in the Navy at a young age. I served from 2005 to 2015. I was deployed to both Iraq and Afghanistan during that time. Now that I have transitioned out of the Navy, I wanted to do something to raise awareness in honor of all the fallen heroes and their families.

"I'm friends with the cofounders of Legacies Alive, a non-profit organization that brings awareness to those who have risked their lives for this country. They sponsor Legacy Challenges every year, and I volunteered for the challenge this year, which is to swim the Mississippi River in its entirety.

"Why the Mississippi? Well, the challenge is meant to be extremely mentally and physically challenging. The Mississippi River is the longest and most dangerous to swim, which will really draw people in to the cause. What's a better way to connect families and raise awareness for our fallen heroes other than swimming through the heart of America?

"I swim an average of 20-25 miles a day. I started in June and will be done by November, ending where the Mississippi River meets the Gulf of Mexico.

"This challenge has definitely brought me closer to the Mississippi River. I know it better. I've been around the river before, but swimming the entire thing really allows you to understand how the river changes over time, from different flows to different temperatures. It's interesting.

"Some days are harder than others, but I remind myself why I'm doing it: for all of the families and their sacrifices for this country." —T.B.

Celebrating the resiliency of **New Orleans**

"Despite rising sea levels and subsidence, engineering marvels and great levee systems will help the city live with water," New Orleans Mayor Mitch Landrieu announced as he hosted Katrina 10—a commemoration of not just what was lost in the tragic storm but what has come since.

"Instead of the Crescent City, we are now the 'Comeback City' after being to hell and back," Mayor Landrieu said. "We are also a great story of reinvention, creativity and strength. The reborn New Orleans will lead the way for the rest of the world as a beacon of resiliency."

Ceremonies mark the 10-year anniversary of Hurricane Katrina, showcase a city's bright future.

Senior leaders from the U.S. Army Corps of Engineers participated throughout the week in events that began on Aug. 24 and ended Aug. 29 with several somber wreath-laying ceremonies.

The world's focus seemed to be on the massive hurricane protection system the New Orleans District constructed during the past 10 years; the 10-year investment of \$14.5 billion is more money than has been spent in the entire 86-year history of the Mississippi River and Tributaries System. Corps experts were interviewed by more than 100 media organizations, including the New York Times, USA Today, ABC News, Weather Channel, NPR, Newsweek, Fox News, PBS, BBC and the *The Atlantic* magazine.

In a discussion moderated by The Atlantic, Ms. Karen Durham-Aguilera, Senior Executive Service (SES) Director, Homeland Security and Contingency Operations, said the new protection system is based on new modeling techniques that factor in climate change, sea rise and subsidence and "really is resilient to a storm such as Katrina or bigger."

Throughout the week, Corps representatives received positive feedback from elected leaders at all levels, as well as leaders from government and non-profits. The key resonating messages included the acknowledgement that there will never be "no risk," and that managing risk is a shared responsibility; the hurricane system around New Orleans is robust and resilient to a 500-year storm, and the hurricane system is recognized by others as "world class."

Additionally, the week featured visits by President Obama and former Presidents Bush and Clinton. President Obama visited the Lower Ninth Ward and discussed community resiliency beyond structural solutions, including more equitable social and economic systems. The path of rejuvenation, he and other speakers said, includes greater equity in job creation, better education and more storm-resistant housing.

Throughout it all resonated hope. As President Obama remarked: "If Katrina was initially an example of what happens when government fails, the recovery has been an example of what's possible when government works together—state and local and community—everybody working together as true partners." —B.A.

BE ON THE LOOKOUT: “teddy” bears are once again roaming the woodlands of the lower Mississippi region in healthy numbers.

The iconic Louisiana black bear, once so numerous a U.S. President came to the Mississippi River delta to hunt it, was threatened with extinction as forests were converted to farmlands. Thanks to public and private habitat restoration efforts, the bear population has recovered sufficiently to prompt the U.S. Fish and Wildlife Service to recommend removing it from the endangered species list.

This particular bear species was the inspiration for the famous stuffed toy,

That a renowned hunter such as Roosevelt had been unsuccessful, though, was highly unusual at the time. Then, the vast bottomland hardwood forests and thick canebrakes of the Mississippi delta were dense with bears, attracting many high-profile hunting parties.

“That’s the reason Roosevelt came here. The Mississippi delta was the place to come and hunt bears because they were so numerous,” said Kevin Nelms, president of the Bear Education and Restoration Group of Mississippi. “As near as we can tell, there was a bear behind every tree.”

The Louisiana black bear is a subspecies of American black bear distinguished by a longer, narrower and flatter skull. Its historic range is eastern Texas, Louisiana and southwestern Mississippi. The shy creature lives in dense forests, and any population census, past or present, is speculative, said Deborah Fuller, the endangered species coordinator for USFWS’s Louisiana office. In 1992, when the bear was listed as threatened, the population may have been under 100 and breeding pairs were restricted to the Mississippi alluvial valley in Louisiana; since then, the population has increased significantly throughout Louisiana and southwestern Mississippi.

“We don’t really have firm numbers,” Fuller said. “Right now we’re saying we have approximately 750 bears and possibly more.”

The recovery plan did not specify a goal for population; recovery was based on restoring enough habitat so additional breeding groups could form, with corridors enabling interactions between subpopulations. When listed, the bears were breeding only in the lower Mississippi valley of Louisiana; those bears have increased in population and additional breeding groups have formed in Louisiana and Mississippi. A 2014 study by the U.S. Geological Survey set the likelihood of the bear going extinct in the next 100 years at less than one percent.

During the past 25 years, the USFWS has worked with public and private partners to protect and restore more than 750,000 acres of critical habitat. Voluntary programs compensate private landowners who agree to provide conservation easements. Partners such as the U.S. Army Corps of Engineers also have purchased acreage outright.

“It’s really a story of habitat development that the bears responded to,” said Nelms.

Wildlife agencies are now educating humans to avoid conflicts with the increasing numbers of bears. The Louisiana Department of Wildlife and Fisheries, for example, has a bear-proof trash can program and a full-time education officer.

“That’s all she does, teach people to keep away from bears,” said Maria Davidson, a biologist with the department. “Humans to need to follow the suggestions from the resource managers to make sure trash cans are kept away from bears. If they don’t have anything to eat at your house, they’re not going to come to your house.” —S.F.

THE BEARS ARE BACK

Habitat restoration is key to the return of the Louisiana Black Bear



Hoping to catch a safe glimpse? Public access lands that provide the best opportunity include Bayou Teche National Wildlife Refuge; Richard K. Yancey Wildlife Management Area; Big Lake Wildlife Management Area; and Tensas River National Wildlife Refuge.

named after a cartoon that showed U.S. President Theodore Roosevelt refusing to shoot one. Roosevelt was on a hunting trip in Mississippi in 1902, and after three days without success, the party’s guide tracked an old black bear and tied it to a tree. The President refused to shoot the bear. Political cartoonist Clifford Berryman heard the story and drew a cartoon for The Washington Post. A toy-maker asked Roosevelt’s permission to name his stuffed bears “Teddy’s bears.” Suffice it to say, the toy caught on.

MY MISSISSIPPI Col. Richard Hansen, commander, Corps New Orleans District



“If the state of Louisiana is shaped like a boot, the New Orleans District is really the foot. We’re not one of the larger districts geographically, but we have a lot of responsibility, a lot going on. We have nearly 1,000 miles of Mississippi River and Tributaries levees, over 300 miles of hurricane levees, the largest dredging program in the Corps and one of the busiest regulatory programs. We are where the river and the coast of the U.S. meets the Gulf; there’s just a lot of activity, a lot of energy, a lot of opportunities and a lot of challenges.

“New Orleans/South Louisiana is one of the nation’s most important areas. Along the Mississippi River between Baton Rouge and the Gulf, we have four of the nation’s 15 busiest ports. Nearly 60 percent of the country’s grain is transported to the world by way of the Mississippi River. One of our missions is to ensure that the maritime industry has a safe and reliable navigation channel.

“We frequently use the term ‘battle tested’ to describe the men and women of New Orleans because of everything our folks have been through, particularly since Hurricane Katrina. This year’s 10th anniversary was both a great opportunity and a tremendous responsibility. We acknowledged the depth of the tragedy and destruction but also emphasized the Corps’ role in helping the city return and rebuild and become more resilient. Today, I think there is a lot of opportunity for the Corps to be part of the solution both here in Louisiana and nationally, especially with addressing concerns like subsidence and sea level rise. It’s fascinating to be part of history in that way.

“One of the challenges the district now faces and me as commander is completing the \$14.5 billion Hurricane Storm Damage Risk Reduction System program. We are working toward that goal. I use a lot of baseball analogies. I may not be the one who pitches the 9th inning and closes the game, but I see myself as the long reliever that pitched the 6th through the 8th.” —K.S.

Time for a funding revolution?

When you look at the percentage of its budget each of the world's countries spends on its infrastructure—the roads, bridges, hospitals and navigation locks—the United States ranks 143—in a tie with Greece. That's partly because the U.S. now spends the smallest percentage of its budget on this category as it has in more than 70 years, says retired general Duke DeLuca, a recent commander of the Corps' Mississippi Valley division and now a public speaker on a variety of military and policy issues.

That's just one situation with serious ramifications to the Mississippi River basin—and the nation—and one contributor to the low grades on a recent basin report card.

DeLuca is spreading the gospel of revolution around the country and at America's Watershed Initiative key summits. Applying the kind of military strategy to assess his own coun-

“This is going to create more water use demands and transportation demands.”

try's societal strengths and weaknesses in the same way he would have a foreign enemy's, he pinpointed four key societal revolutions and their current or potential impact on the Mississippi River basin and rest of the country.

The agricultural revolution is just one. Tools like precision irrigation, sensor-based harvesting and genetically modified crops have increased agriculture efficiency and output such that grain production grew 500 percent or more in 100 years than it had in the past 10,000. That has led to the need for a more reliable waterway transportation network and innovative thinking in irrigation—ways to water crops that don't deplete aquifers needed for drinking water.

Hydrocarbon and manufacturing revolutions similarly are adding demand to transportation system. That we're now the top oil and gas producer on the planet is a status unlikely to change, and it's increasing demand for supply and maritime transport options. What he calls “Industrial Revolution 4.0” is also underway, counter to traditional thinking. In 1950, the United States manufactured more than the rest of the world combined, but in 2014, it manufactured six times more than that. “This is going to create more water use demands and transportation demands on the watershed,” he said.

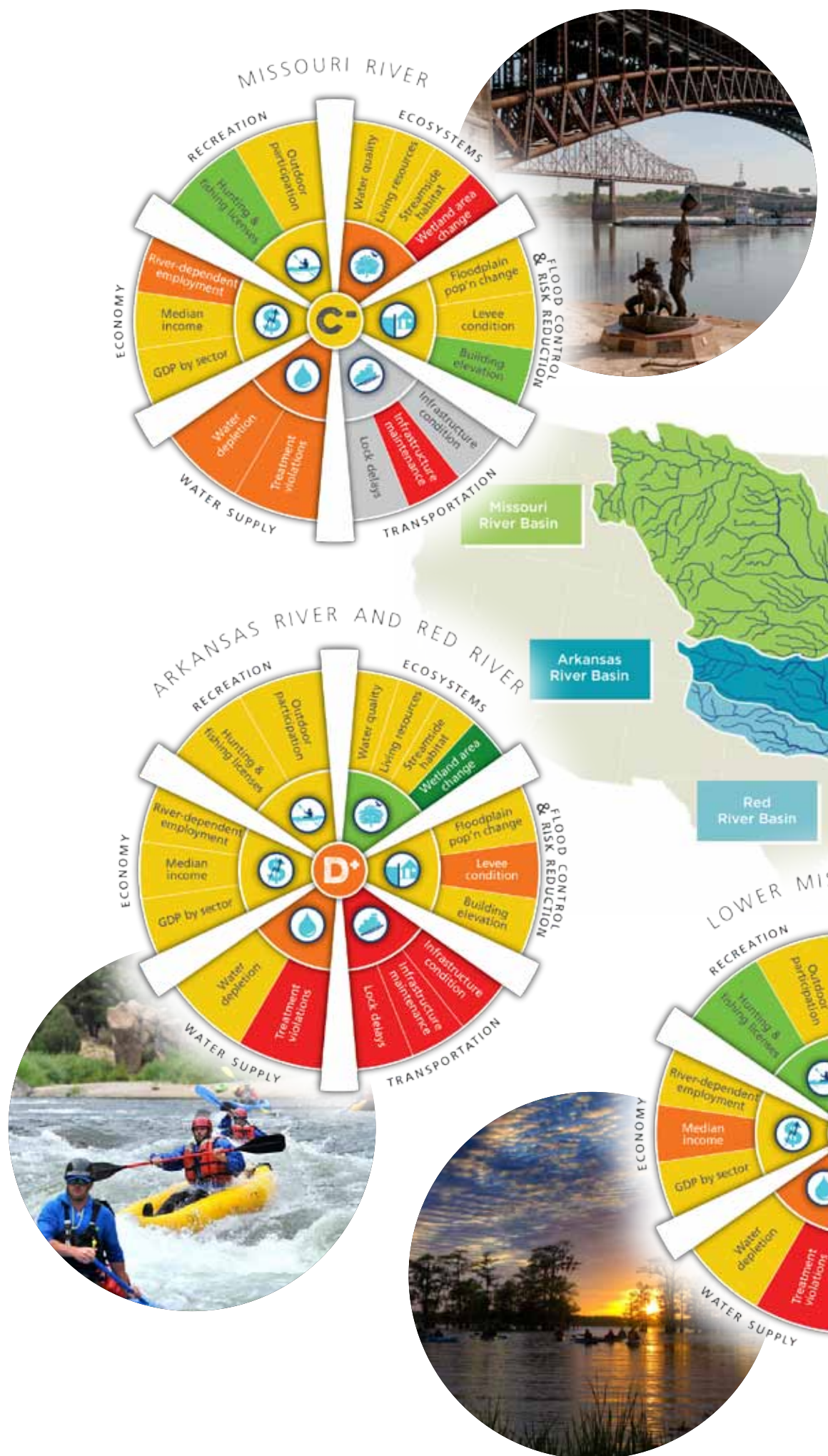
The final related revolution is the accelerating impact of climate change, based not on controversial and predictive models, but on measures of what has already occurred in the watershed.

“I have a number of charts that show elevated amounts of water in the Mississippi Valley each year and in fewer storm events,” he said. “Flood control and storm water systems were built for a certain peak flow, and they're no longer adequate to meet the flow. But there is no money yet being spent to adapt features to the new water reality.”

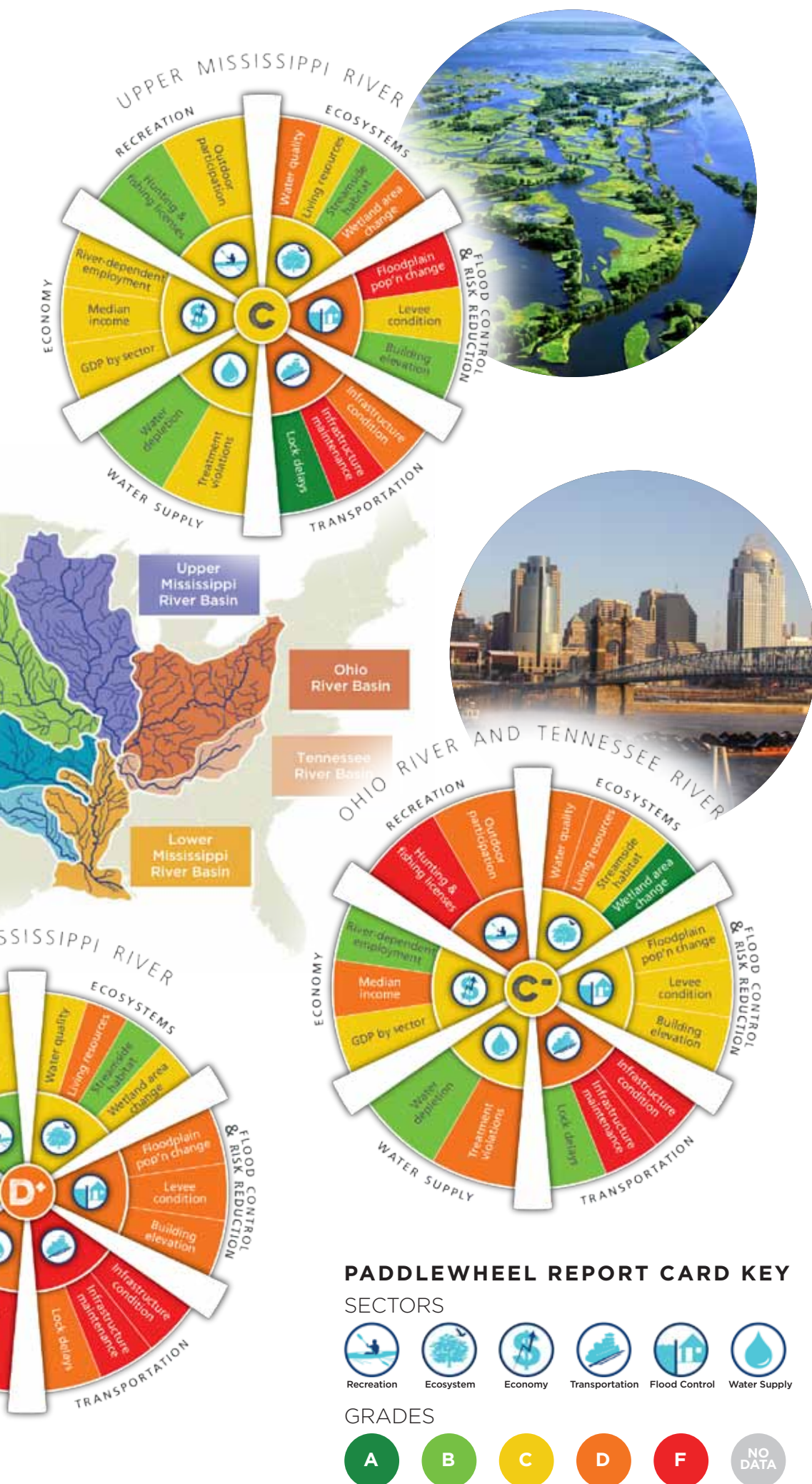
Like other international experts have been warning, DeLuca's analysis predicts a major world economic crisis likened to the Great Depression without a studied response to these revolutions. While tremendous federal investment is needed, far more would be spent cleaning up post disasters this spending could potentially prevent. The Mississippi River and Tributaries System is one example of efficient, effective spending, for the way it prevented any major damage or loss of life in a record 2011 flood. Affordable responses could be adapting construction standards in flood plains or coastal areas, merging water and wastewater utility systems to create efficiency, and moving from deep well to surface water irrigation.

“Infrastructure like the MR&T system pays you back 250 times over investment and pays you year after year,” he said. “We've lost track of that in our society ... We need better infrastructure and better education. The education part will especially help us all see, understand and act wisely in response to those ‘revolutions.’”

Grading the Missi



Mississippi River Basin



Measuring a river's worth

There's intuitive value in a clean river, in preserving its aquatic life and wildlife habitat, and in the resulting draw to people who want



to sit along its shores or float its current. But can you attach a monetary value to things like paddling trips and healthy wildlife species and clean water supply as well as traditional economic segments like agriculture and manufacturing?

A coalition of river organizations along the Lower Mississippi has shown the answer to be yes. Last year, the Lower Mississippi River Conservation Committee (or LMRCC, which is a coalition of 12 state natural resource conservation and environmental quality agencies) completed its comprehensive economic analysis of multiple river sectors. That analysis is fast becoming the comparative model for the river's other sub-basins—which is key to being able to talk about the river as a system, says Harald "Jordy" Jordahl, director of America's Waterway Initiative.

"The Mississippi is much mightier than we even realized."

"As we worked on the report card, we said we've got good information, but it's not comprehensive," he said. "One of the specific positive things that stood out was the Lower Mississippi River economic profile. It's good, and it provides an informative look at the economic impacts of the river. Because of this collaboration we've formed, the other basins are saying, 'We want this information and want to expand it so we can all start talking in a consistent way.'"

The U.S. Fish and Wildlife Service took the lead on conducting a comparable analysis of the Upper Mississippi, the results of which have been released in tentative form. Combining both study results showed the economic value of the Upper and Lower Mississippi to be \$405 billion—roughly double what was previously assumed—with a total of 1.3 million jobs directly generated from river-related activity, according to data released at the fall meeting of the Mississippi River Cities and Town's Initiative. The finding led Mayor Buol, mayor of Dubuque, Iowa, and co-chair of the coalition of river mayors, to quip: "The Mississippi is much mightier than we even realized."

The new analysis shows that the Upper River generates \$253.2 billion in revenue and 1.3 million jobs a year, while the lower river generates \$151.7 billion in revenue and supports 755,000 jobs. The top three economic drivers were manufacturing, tourism and agriculture, in that order.

That tourism came in second to manufacturing was heartening to Angie Rodgers, the LMRCC coordinator. That supports the belief that river environments are worth protecting and restoring and enhancing "not just inherently but as a way to bring robust local economies, recreation economies and fisheries."

Commercial harvest of natural resources—freshwater fish, seafood and alligator skins—generates \$559 million annually to just the economy of the Lower Mississippi. Participants in outdoor recreation, a separate category quantified—that includes activities like hunting, fishing, boating and bird-watching—generated \$1.3 billion to the economy. Energy production (\$7.8 billion) ranked high, as did commercial navigation with its whopping \$106.4 billion contribution. Water for drinking was critical too, generating \$385 million in revenue on the lower river and arising as a special concern of the mayoral group, which is launching a clean water initiative.

Agriculture, too, has a direct relationship to the river, not just in the economic value and use of water for irrigation

>>continued on page 12

Saving the River Mussels

To get there, they had to evade invasive zebra mussels (*Dreissena polymorpha*) and help an endangered native mussel species with its unusual method of reproduction—one requiring assistance from a fish.

Now, after 10 years of effort reintroducing the species into areas within its historic range and almost another 10 years of monitoring, the U.S. Army Corps of Engineers-led Mussel Coordination Team has evidence that they've brought back a reproducing population of the federally endangered Higgins eye mussel (*Lampsilis higginsii*) to the Upper Mississippi River drainage, much of which was once too polluted and altered from human disturbance to sustain this "canary in a coal mine" aquatic species. This year and since 2011, researchers have found signs that not only the Higgins eye mussels they have reintroduced into areas are surviving but are reproducing on their own..

And for the Corps' approximately \$8 million investment coupled with assistance from the team, the U.S. Fish and Wildlife Service (USFWS) has named the team "2014 Endangered Species Recovery Champions."

"This is such a new and emerging science, and this is the largest endangered

ters, herons and egrets. The bottom dwellers also contributed to water quality, filtering algae, bacteria and even pesticides and heavy metals from the water.

To help with the massive effort to bring them back, the Corps brought together representatives from the Missouri, Illinois, Iowa, Wisconsin and Minnesota departments of natural resources, the U.S. Fish and Wildlife Service, the U.S. Geological Survey, the National Park Service, and some academic experts and volunteers and then set out to reestablish the Higgins eye within its historic range by targeting 10 sites. The hope was that half of those would become long-term self-sustaining viable populations.

First, Kelner said, they tried physically cleaning attached zebra mussels off native mussels and relocating by hand-moving those mussels to new locations in upper pools in the Upper Mississippi River. The effort next evolved toward finding ways to grow new juvenile Higgins eye mussels through artificial propa-



FACTS ABOUT RIVER MUSSELS

- At one point, 60 factories were harvesting 21,000 tons of shells near Muscatine, Iowa (today, home to the Pearl Button Museum, muscatine-history.org).
- The U.S. Bureau of Fisheries tried to stop the steep mussel decline in 1914 by setting up a biological station to create cultured freshwater pearls.
- The late Princess Diana wore a ring made from a freshwater mussel's pearl sold to Queen Elizabeth by the Mississippi River Pearl Company in Alma, Wisc.
- Zebra mussels, which attach to hard surfaces like shells or rocks or barges, outcompete native mussels for food sources and oxygen and also interfere with reproduction and basic behavior. Indirectly, they degrade water quality and change habitat conditions.

ABOVE, FROM LEFT: *Higgins eye mussels ready for river placement. Biologists place inoculated mussels and cage in a river, one means of protecting them until they've grown large enough to resist predators. Dan Kelner (left) and Roger Gordon hold a tray of Higgins eye mussels just retrieved from cages. Zebra mussels, a number-one enemy, cover a native mussel.*

They and other mussels are essential, though, to the river ecosystem. Being the dominant benthic or lowest level organisms, mussel beds stabilize substrate, attract invertebrates and fishes and essentially serve as freshwater river coral reefs. As they disappeared, so did a prime food source for mink, muskrats, ot-

mussel reintroduction program in the world," said Dan Kelner, a Corps aquatic biologist from the St. Paul District and the Mussel Coordination Team leader. "The award was for the effort involved and the success we've had and our refinement of propagation methods. It's also a good example for others interested in reintroducing mussels in other parts of the country. They can transfer some of the techniques and learn from what we've accomplished."

The Corps formed the interagency team in 2000 in response to the U.S. Fish and Wildlife Service's determination that the Higgins eye is in threat of extirpation from the Corps' operation and maintenance of the Upper Mississippi River Nine-foot Navigation Project. In its biological opinion, the USFWS determined the project—by virtue of the way it allowed for commercial navigation and recreational boat traffic—would facilitate the proliferation and continued spread of zebra mussels throughout the Upper Mississippi River project area and result in the eventual elimination of the Higgins eye. That mussel, Kelner said, was already decimated by a perfect storm of aquatic threats, from the popularity of their pearly shells to the once-booming button and cultured pearl industries to municipal sewage, agricultural runoff, stream bank modifications, dam construction and channelization.

gation and place them into areas within the species' historic range outside of the zebra mussel threat. Crucial was Genoa Fish Hatchery, which for years had been working to propagate mussels. The hatchery had already been helping mussels to reproduce by injecting their glochidia (mussels in a larval stage) into the gills of fish, letting the fish help to extend the range.

Since Higgins eye prefer certain fish as hosts, the team after extracting glochidia from female Higgins eye, injected the glochidia into the gills of hatchery largemouth bass or walleye with a syringe, knowing that after several weeks that would transform into a juvenile mussel and drop off the fish. In the meantime, they used various methods to introduce those developing mussels—via those fish—into the targeted historic range sites.

In some locations, they released hatchery fish inoculated with glochidia into the wild by simply backing a hatchery truck to the river and dumping them in and allowing them to freely disperse. At some, they put the fish in wire mesh cages to hold them until the transformed juvenile mussels dropped off and settled to the bottom of the cage. They would then, after two to three years of growing them under protection to a size for better chance of survival in the wild, they were hand placed by divers out into the reintroduction sites. For a third method of reintroduction, they placed fish inoculated with glochidia into wire mesh cages with open bottoms to the river bed, allowing the transformed juvenile mussel to immediately drop straight to the river bed.

"It's all emerging science," Kelner noted. "And there was a lot of trial and error in refining the propagation techniques." But efforts appear to be paying off.

"Come 2006, we found our first Higgins eye in the Wapsipinicon River in Iowa," he said. "That was a big, big deal. Since Higgins eye were introduced via free-release fish inoculated with glochidia, individuals could have ended up over many miles of river. One guy described it as not even looking for a needle in a haystack but a needle in a hayfield." Since, they've found many, many more, both surviving and more recently reproducing on their own at most of the sites. One project goal is to educate the public on the importance of native mussels and adverse impacts from invasive species and other threats. There has been strong public and educational interest in the project ranging from volunteers assisting, to public outreach at schools and through print, internet, radio and television media outlets.

"Mussels are this unknown, mysterious organism," Kelner said. "If you have mussels in an area, you have good water quality. The shells are all different shapes and sizes, and there are over 30 species in the Mississippi River, historically as many as 50. When people start learning about this whole group of organisms that had long gone unnoticed, they get excited about it." —K.S.

Happy Birthday, NATCHEZ!

TURNING 300 calls for a special birthday celebration. That's especially true when you're the oldest city on the Mississippi River—some 60 years older than the country itself.

Natchez, Mississippi, will mark the occasion with an event a day for all 365 days of 2016 in a celebration themed "Where the river is wide and the history is deep."

"Everything we do practically in Natchez in some way focuses on the river," Mayor Butch Brown says, "and it has been that way since day one in 1716 when the French first came and settled what we call Fort Rosalie."

The year of parades, plantation home tours, pow wows, storytelling, 300-gun salutes and more will revolve around themes like civil rights, slavery and music—those and other themes critical to southern history and Natchez's culture. Some events, too, will be simply fun. Look for kayak and hot air balloon races, daily tales of culture and history, and even hints of the untamed past of Natchez Under the Hill will be part of the celebration.

Natchez is a great place to explore the changes in Mississippi River navigation over time and the resulting impact on river culture too. The invention of the first steamboat allowed cargo to move up the river, opening the door to more transportation networks. The invention of the steamboat allowed the transport of Gulf oysters and shrimp, cementing Natchez's continuing reputation as a culinary destination.

Celebrations will cover both the far and more recent past. One of the key moments in the city's history, Brown says, was when the U.S. Army Corps of Engineers stabilized the city's 200-foot vertical bluff and reclaimed 11 acres previously washed away by the river. Legacy projects, also a key focus of the tricentennial, will further the Corps' earlier work, Mayor Brown said, and will include construction of new affordable homes, an expansion of the Natchez Trail, revitalization of historic streets, diabetes prevention and reversal efforts and creation of an experiential school curriculum with a focus on the city's rich history.

"Natchez and the river are still going to be here when 2016 is over," he said. "We've got to provide for the future." —K.S.

View events at
natchezms300.com



PREPARING FOR THE BIG ONE



Federal, state and local agencies prepare for a potential earthquake along the New Madrid fault.

Slumbering in the early morning hours of Dec. 16, 1811, residents of the sparsely populated frontier town of New Madrid, Missouri, were violently awakened and thrown from their beds by one of the most powerful earthquakes in the history of the U.S. The ground buckled, rolled and shook, breaking trees like matchsticks and crumbling barns and homesteads. The monstrous quake toppled chimneys as far away as Cincinnati, Ohio.

New Madrid residents described the ground "rolling in waves," and Mississippi River flatboat crews watched in terror as the river rose and then flowed backwards. Then in early January and February of 1812, two more massive quakes struck, their 7.5 or greater magnitude making them three of the strongest in continental U.S. history. For perspective, they shook an area 10 times larger than that affected by the magnitude 7.8 San Francisco earthquake of 1906.

Loss of life was tempered, then, by the fact that few people lived in what was then rough, frontier settlements. A similar quake today would bring a far different story, with those settlements now huge population centers with infrastructure valued in the trillions.

Teams responsible for preventing loss of life in a potentially catastrophic quake are not taking any chances. The Corps of Engineers' Mississippi Valley Division (MVD) held a comprehensive earthquake planning exercise in Vicksburg in late July, gathering Corps representatives from multiple districts, divisions and headquarters as well as navigation industry representatives and several FEMA regions and representatives of the U.S. Department of Transportation, U.S. Environmental Protection Agency, U.S. Coast Guard and state and local governments as a way to cement which group would take which actions.

"Our immediate goal (in a natural disaster like this) is to quickly get into the impacted areas, save lives and begin the long and extremely complex recovery process," said MVD Commander, Maj. Gen. Mike Wehr. "These planning exercises will help us to be better prepared to respond faster and more effectively."

For the Corps, the key mission following a major earthquake is to move its vast engineering and technical support forces into the affected areas to assess and repair critical civil works infrastructure such as levees, floodwalls, pumping stations and navigation structures. The Corps will also execute missions in support of the Department of Homeland Security and FEMA under the National Response Framework, including providing emergency power and repairing damages to police stations, fire stations, hospitals and other municipal buildings, while also constructing emergency shelters. Experts will also manage the removal of dangerous debris from roads and repair public transportation infrastructure. An additional Corps mission is supporting the U.S. Coast Guard in the restoration of the region's navigable waterways and ports.

In the case of a New Madrid quake, thousands of responders from eight Corps divisions would immediately help provide emergency power, debris removal, structural repair and water removal.

Jared Garman, emergency management chief of the Corps' Mississippi Valley Division, summed up the Corps efforts when he said, "If the world is turned upside down by an earthquake, the Corps will be there to help turn it right side up again." —M.B.

ABOVE: A woodcut by A. Juengling depicts the New Madrid, Mo., earthquake of 1811.



OUR MISSISSIPPI KIDS

Join ‘every kid’ (and others) in a federal park

Maybe you’ve heard of Yellowstone, the Grand Canyon, the Redwoods and the nation’s other great national parks—and perhaps you’ve even visited one. But hundreds more federally operated parks offer a chance to explore the natural world much closer to home, most any time you want. And you can visit any of them for free if you’re a fourth grader, part of a fourth grader’s family or an educator with kids of that grade in tow.

President Obama launched the “Every Kid in a Park” program Sept. 1, offering the free passes to fourth graders and their families to 2,000 federally managed sites for a full year (through Aug. 31, 2016), including the many recreation sites managed by the U.S. Army Corps of Engineers. Most of those sites are located within 50 miles of a city or metropolitan area, making trail, lake and exploring fun an easy car or bus ride away.

Research has shown fourth grade to be a pivotal time in developing a recreational interest, and this project is designed to showcase what the outdoor world has to offer and inspire young people to both enjoy and protect the country’s natural and historic treasures.

Fourth-graders can visit the “Get Your Pass” section of the Every Kid in a Park website at everykidinapark.gov. All they need to do is complete a fun educational activity to obtain and print a personalized voucher for unlimited use at federal lands and waters for one year. Here are a few examples for anyone to try!

Find a map of all of the Corps’ recreation sites: CorpsLakes.us
National Park Service sites: nps.gov

THE MANY USES OF FEDERAL LANDS AND WATERS

People rely on federal lands and waters for many purposes. Unscramble the words to find out what nationally protected areas in the United States provide for animals and people. (SOLUTIONS AT BOTTOM OF PAGE)

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MY MISSISSIPPI

Dale Sanders, aka Grey Beard Adventurer, Bartlett, Tenn., 80, the oldest person to solo canoe the Mississippi source to sea



“A friend of mine used to hold the record—he did it at 65—but now I do, having started on May 15 and spending three months on the river.

“I’m very competitive. In 1959, I held my breath underwater for six minutes and three seconds, which was then a record. I’ve been the U.S. National Spearfishing Champion, too. Lately I was looking to add to my own Wall of Fame but I needed a great cause. I chose juvenile diabetes because of my grand niece, Anna, who was diagnosed at 4 and is now 11. We had an \$8 per mile goal—the trip is 2,350 miles—but we actually ended up raising \$12 a mile, and the money’s still coming in.

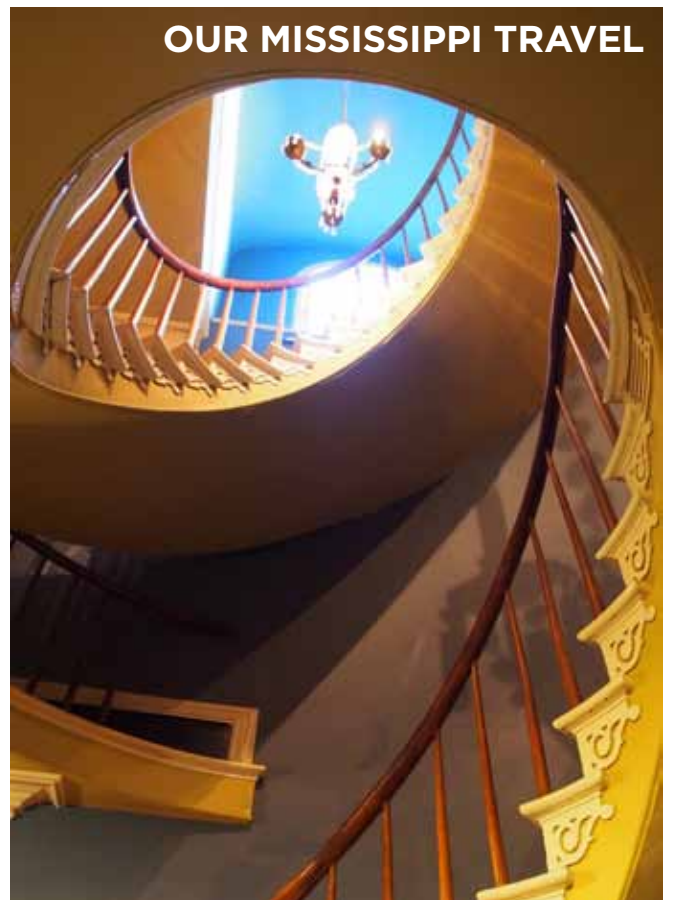
“I was kind of afraid to be alone on the river because the last time I paddled it alone a barge wave got me and filled my kayak. That’s the most frightened I’ve ever been on the Mississippi. But I got four people to accompany me. Two filmmakers were there on and off. A couple guys were keeping me company, but one dropped out early. He’s 52 but couldn’t handle my pace. The other guy’s doc pulled him off because of near heat stroke. Over three months, I was never frightened.

“I think my age helped me. I got a lot more attention. Because of the spot-tracker I carried, it was hard for me to camp at night without somebody showing up with fried chicken. And I played the age card a few times. Once, in a lock, the guy said we had to wait 45 minutes but I got him on the radio and said, “I’m 80 years old! I’m not sure I can stay in these waves for an hour,” and he opened the lock and let me in.

“I worked in parks and recreation management for 43 years, but when I retired in 2002 I never picked up a razor or went to a barber again. What age do I feel inside? My brain’s not as sharp as it used to be. Sometimes I forget things. But as far as enjoying the world, I feel younger than 50. To be honest, when I started at Lake Itasca, I thought maybe I wouldn’t last a week. I had a shoulder really giving me a hard time. But as I padded, each day it started hurting less and less. Exercise! I’m telling you, if you want to live a long and healthy life, get a hobby that requires exercise.” —S.A.

WORD SCRAMBLE SOLUTION: CLEAN AIR, HISTORY, SCENERY, WILDLIFE HABITAT, RECREATION, CLEAN WATER, JOBS, FOOD, CULTURE

History sleeps here ... and you can too



Acquaint yourself with a wisp of river history and culture by spending the night on or near the Mississippi. The type of setting and accommodation can vary as much as all the lessons ready for learning. Consider:

Houmas House Plantation, Darrow, La.

A genteel antebellum estate is nicknamed “Sugar Palace” because the annual sugar harvest exceeded 20 million pounds in the late 1800s. Guests tour the near-riverfront mansion and grounds, dine on classic Louisiana cuisine and settle into cottages resembling original plantation structures, complete with gracious rocking chairs. Ghost stories and a 38-acre garden have long intrigued “Hush, Hush, Sweet Charlotte” and other filmmakers. HOUMASHOUSE.COM

Delta Cotton Company Apartments, Clarksdale, Miss.

On the Mississippi Blues Trail, two blocks from the Delta Blues Museum and above Ground Zero Blues Club are eight homey apartments in a former warehouse for cotton grading. Each unit is uniquely furnished. Musicians perform downstairs four nights a week. DELTACOTTONCOMPANY.COM

Mississippi River State Park, Marianna, Ark.

Pack a tent and reserve a campsite at the newest Arkansas state park, which borders the Mississippi and is part of the 24,000-acre St. Francis National Forest. In the works: park extension to the confluence with St. Francis River, increasing opportunities for rich interludes with flora and fauna. ARKANSASSTATEPARKS.COM/MISSISSIPPIRIVER

River Inn of Harbor Town, Memphis. Facing the river on Mud Island near downtown is a 28-unit boutique hotel that harkens to an era of gas-lit lanterns, southern charm and Old World European hospitality. Expect a nip of port and chocolate truffles at turndown time, modern amenities and breakfast at Paulette’s, also open for dinner. RIVERINNMEMPHIS.COM

Eggers and Company General Store, Farrar, Mo. Kuchen, oatmeal sausage, spreadable cheese on fresh bread and other German specialties show up at breakfast for guests, who sleep upstairs

from the bit-of-everything store that opened in the mid 1900s, four miles from the river. Today the business, open by appointment, sells local art, wool batting, jams and other Missouri products. EGGERSANDCOMPANY.COM

Pere Marquette State Park, Grafton, Ill.

Inside an imposing Civilian Conservation Corps lodge made with massive timbers and local limestone, is a 50-foot-tall fireplace in the Great Room, guest rooms with modern amenities, a winery and restaurant. Outside are cabins with more rustic décor. Add winter eagle watching or all-year hiking near the confluence of the Mississippi and Illinois rivers. PMLODGE.NET

William M. Black, Dubuque, Iowa. The 1934 side-wheeler steamboat, built for U.S. Army Corps of Engineers river dredging, stays docked outside the National Mississippi River Museum. Groups of 15 to 55 can book crew quarters or stateroom overnights, April to October. Rates include educational programming in this hefty metal boat, a National Historic Landmark since 1992. RIVERMUSEUM.COM/OVERNIGHT

Blue Door Inn, Alma, Wis. Within the nationally recognized historic district of a little river town (population under 800) is lodging with modern amenities in preserved structures. Choose from an 1853 one-room house, 1857 stone building or 1875 hardware store situated between town bluffs and the water. BLUEDOORINNALMA.COM

Covington Inn, St. Paul, Minn. A 1946 tug-boat that pushed barges for 30 years sits docked at Harriet Island, across from downtown, and accommodates guests in four compact suites. Rates include a simple breakfast. Expect 360-degree river views from the rooftop lounge. One pier away is Minnesota Centennial Showboat, where college students perform seasonally. COVINGTONINN.COM —M.B.

ABOVE, FROM LEFT: *Houmas House Plantation and Gardens, depicted in three of the photos above, showcases the original grandeur of Mississippi River plantation homes, partly because it was spared destruction by the advancing Union Army when Irish owner John Burnside declared immunity as a subject of the British crown. Missouri’s Eggers and Co. just as authentically captures the region’s German roots.*



Since January, nearly 8,000 people have grabbed a pole and bait and dropped a line in the Mississippi—and that count is mostly first-timers who joined in new, free events sponsored by a network of parks, trails and refuges.

The Mississippi River Connections Collaborative enlisted host members and others, including the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, local state wildlife and conservation agencies, even Bass Pro and the National Eagle Center, to introduce the ancient sport in fun and creative ways.

The collaborative launched its “Year of” project with paddling and has since held years of cycling, geotourism and fishing along the river and within the natural areas run by the U.S. Army Corps of Engineers, 10 national parks, eight national scenic and historic trails, 32 national wildlife refuges and dozens of state parks. Plans are now underway for projects to celebrate the 2016 Year of Birding. With more than 325 species using the Mississippi River flyway as a migration route, chances are plenty will be scoped!

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Mississippi River Commission tours Tennessee, Cumberland Rivers

sion, took a special tour of the Chickamauga Lock in Chattanooga, Tenn., Aug. 8 to learn about a concrete aggregate problem and structural concerns and to receive an update on the stalled construction of a replacement lock. She stressed that being able to visit a project site in person like Chickamauga Lock is very beneficial because of the impact one lock can have on a series of locks on this river.

The five-story high, 241-foot towboat continued downstream, crossing through the Barkley Canal and "Land Between the Lakes" into the Cumberland River and to Clarksville, Tenn., where Rep. Mary Littleton emphasized the importance of transportation and keeping waterways open to move commerce. Citizens participated too, like Greg Batts, owner of Prizer Point Marina and Resort in Cadiz, Ky., who asked the commission to foster better communication with the recreation community. —L.R.

To help with its goal of developing a broad vision of water resource solutions across the entire Mississippi River watershed, the Mississippi River Commission this year toured the Tennessee and Cumberland Rivers on its summer inspection trip. Additionally, Dr. Norma Jean Mattei, a civil engineer and civilian member of the commis-

Measuring a River's Worth >>continued from page 7

purposes, but in its fragile tie. A record 2011 flood cost that segment \$660 million in lost revenue. Tourism, on the other hand, showed resilience to natural disasters like Hurricane Katrina and the BP oil spill, bouncing back stronger than before, the analysis showed. Not measured but noted in the study were the way wetlands and coastal marshes act as flood control and natural disaster barriers, how some 11 million acres of forested land helps with carbon filtering and also provides habitat for threatened and endangered species.

For the growing value of recreation and tourism, Rodgers credits pioneering guides like John Ruskey of the Quapaw Canoe Company. Ruskey estimates he's taken 10,000 people on trips in the lower river, and in doing so, he's opened many eyes to the tourism potential of a stretch often considered too dangerous for recreation. Ruskey has also showcased floodplain forests and river backwaters—which are special restoration targets for the group. People using and appreciating the river system can only help in promoting stewardship of the river system, Rodgers said.

"If you have a healthy river, that provides for increased recreational opportunities and more people interested in putting money into local economies to enjoy these recreation opportunities; therefore, there'll be even more demand for an even healthier river. It creates this nice little circle." —K.S.

Scan here with your smartphone to go to the *Our Mississippi* website. Here, you can subscribe to our e-edition, read past editions and find river-related education materials.



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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.