

CONSERVATION RESULTS REPORT 2023

A Systems Approach to Managing Large Rivers

Rivers, of course, do not recognize human-created boundaries, such as state borders and property lines. However, for management purposes, large rivers like the Mississippi are often figuratively carved up, with responsibility for different sections assigned to various entities. While well-intentioned, this decentralized approach makes it difficult to coordinate efforts and ensure optimal results for an entire river, including its tributaries and floodplains. Some parts receive high-quality stewardship while others are left to decline.

"Large rivers are linear systems, ecologically and hydrologically," says Bryan Hopkins, Illinois and Upper Mississippi River director of freshwater conservation for The Nature Conservancy (TNC). "We need to follow their lead and adopt a systems approach to restoring them."

To achieve this holistic vision, TNC's Midwest team is collaborating with conservation partners to look at river sections in need of restoration and create frameworks for cross-coordination efforts.

A MASTER PLAN FOR POOL 19

Hopkins points to Pool 19 on the Upper Mississippi—along the southern Iowa/Illinois border—as an example of a deteriorated river section. Part of Pool 19 is privately owned and has not benefited from restoration work by government and nongovernment organizations. In addition, a lock and dam installed in 1910 caused the loss of beneficial river islands and floodplains.

TNC has invited partners—state and federal agencies, county officials, nongovernmental organizations and affected communities-to a series of planning workshops in 2024. Together, we will create a collaborative master plan for saving Pool 19. One likely strategy: restoring island complexes, which will decrease erosion caused by wind and help bring back plants and wildlife.

In addition to local Midwest efforts like Pool 19, TNC's Mississippi River Basin program has begun pursuing broader discussions about whole-river governance at the federal level.

A HISTORY OF COOPERATIVE MANAGEMENT

TNC's long history of collaborating with partners to manage rivers will help foster and inform teamwork at Pool 19 and elsewhere. For example, TNC's Emiquon Preserve provides a standard for managing connected wetland systems via a water control structure with the adjacent Illinois River. Emiguon's location has led to active cooperation between TNC and the U.S. Fish and Wildlife Service. "TNC's systems approach is providing templates for what can be done elsewhere on rivers," Hopkins says.

their lead and adopt a systems

lotus flower at TNC's Spunky Bottoms Preserve © Andrew Simpson; The Mackinaw River © Timothy T. Lindenbaum



"Large rivers"

systems ... We

need to follow

are linear

READ HOW

science guides TNC's work at nature.org/ conservationbydesign

RESTORING OUR CONNECTED WATERS



Science-Based Solutions for Agricultural Runoff

Adding constructed wetlands near farm fields can successfully capture and reduce the amount of excess nutrients in water that runs off croplands through subsurface drainage tiles—by nearly 50%. That was the conclusion of a study by TNC researchers and partners, which involved testing water samples from three farm-based wetlands over a 12-year period.

TNC and partners are experimenting with other strategies for reducing nutrient runoff as well. "One question we're studying is how the timing of fertilizer application effects nitrogen levels in runoff," says Maria Lemke, director of science, TNC in Illinois.

EVEN TINY WETLANDS HELP

For more than 20 years, TNC has partnered with farmers in the Mackinaw River watershed, in central Illinois, to improve water quality. When water drains off croplands, excess nutrients get into rivers and streams, which can infiltrate drinking water, damage wildlife habitats and exacerbate the Gulf of Mexico's "dead zone." Applied at scale across farms, constructed wetlands—which naturally filter out and convert pollutants in water—have the potential to dramatically improve water quality.

A key takeaway for farmers considering constructed wetlands: Even tiny wetlands have big impacts, reducing excess nitrate-nitrogen in subsurface runoff by 38% to 50%.

MULTIPLE SOLUTIONS AT ONCE

TNC is also testing nitrogen management, cover crops and other regenerative agriculture practices, both independently and alongside wetlands. In one experiment, scientists found that applying nitrogen fertilizer to corn fields in spring—versus fall, as is common—significantly reduced the amount of nitrate lost through subsurface drainage before spring crops were established. "By applying nitrogen when the corn can actually use it, we saw an immediate reduction in nitrate losses from the farm field we tested," Lemke says.

LEARN MORE ABOUT

TNC's agricultural research at nature.org/illinoisfood

Testing AI and Sonar for Invasive Carp Control

Nonnative carp species—silver, bighead, grass and common—are wreaking havoc on the Illinois and Mississippi River ecosystems by eating plankton and vegetation that native fish and mussels depend on. Large numbers of silver and bighead carp entered TNC's Emiquon Preserve as tiny larval fish during flooding nearly a decade ago.

Effective ways of managing these carp are urgently needed. At Emiquon and elsewhere, commercial anglers create commotion to scare fish into gill nets. However, this spook-and-catch approach is barely making a dent in the robust populations. "Carp are more sensitive to their environments than we give them credit for," says Randy Smith, Illinois River project director. "When there is even a small disturbance, most carp hide."

What's needed are larger-scale approaches that can deplete and contain carp populations. To this end, TNC is collaborating with partners to test two innovations at Emiquon.

SEPARATING FISH ON THE RIVER

In 2020, Emiquon staff began partnering with the Illinois Natural History Survey and Whooshh Innovations to test a portable fish ladder designed to attract and sort fish along waterways. Equipped with a fish version of facial recognition software and powered by artificial intelligence (AI), the ladder is designed to recognize and capture invasive carp in a container while allowing native fish to travel through the system.

Scientists have learned a number of lessons from piloting the fish ladder on the Illinois River directly adjacent to Emiquon. For instance, fish are attracted to Emiquon's water, which was pulled from the preserve's nutrient-rich wetlands. When Emiquon water was used with the fish ladder, carp swam up the ladder. But when less fertile river water was used, carp ignored the ladder.



FINDING HIDING SPOTS WITH SONAR

Last fall, the U.S. Geological Survey (USGS) launched semi-autonomous kayaks equipped with side-scanning sonar onto Emiquon's waters. The goals: identify approximate numbers of invasive carp and where they hide while testing the use of underwater sound to herd and capture carp.

Over the next two years, USGS will deploy the kayaks to collect carp data, which will be analyzed using AI. TNC hopes the information will guide a large-scale removal event where semi-truckloads of carp are flushed out and corralled. The project is led by USGS fish biologist Josey Ridgway, who began using recreation-grade sonar technology to survey fish about six years ago and recently added unmanned kayaks to the mix.

"If this works, it will be a really big deal for wetland managers," says Smith. "It would take many, many years to achieve the same level of fish removal using traditional methods."

TACKLING CLIMATE CHANGE



"Our goal is to support the development ofmore climate-resilient communities"

A Multi-Strategy Approach to Aiding Nature and People

Every fraction of a degree that we can lower global warming matters—to wildlife and ecosystems as well as to the people at risk of floods, droughts and other climate-related emergencies. In Illinois, we have been contributing to TNC's global climate goals by planting more trees, advocating for renewable energy and helping people affected by flooding, heat waves and other extreme weather events.

PLANTING TREES IN CHICAGO

A healthy tree canopy benefits people as well as birds and other wildlife. In addition to removing CO₂ from the atmosphere, trees can lower ground temperatures on hot days and absorb excess rain that causes flooding.

Recognizing this, we have been helping to address tree canopy disparities across Chicago. On the city's south and west sides, some neighborhoods have less than 10% canopy coverage. In comparison, trees abound in many neighborhoods on the north and east sides, with canopy coverage as high as 46% (2020 Chicago Tree Region Census).

TACKLING CLIMATE CHANGE

"Together with partners, we're planting, mulching and monitoring trees in areas that are more vulnerable to the effects of climate change," says TNC's Joel Zavala, director of community engagement. "Our goal is to support the development of more climate-resilient communities." Learn more about TNC's work in Chicago at nature.org/chicagoconservation.

PURSUING CLEAN ENERGY POLICIES AND OPPORTUNITIES

Since the passage of two landmark climate laws—Illinois' Climate and Equitable Jobs Act and the federal Inflation Reduction Act (IRA)—TNC has continued to collaborate with coalitions and partners to further engage on climate policies and funding opportunities to ensure a rapid deployment of renewable energy.

For example, in Illinois, we have been exploring ways to reduce carbon emissions from the transportation HELPING PEOPLE IMPACTED BY RIVER FLOODING sector, which is now the number one carbon-emitting sector in the state. TNC joined the Illinois Clean Jobs After record rainfall burst open a levee near Dogtooth Coalition's (ICJC) Neighbors for an Equitable Transition Bend peninsula, a farming community at the southern to Zero-Emissions (netzillinois.org). The campaign tip of Illinois, TNC stepped in to assist. In partnership focuses on influencing the State of Illinois to adopt two with the U.S. Department of Agriculture's Natural rules aimed at reducing pollution from diesel vehicles: Resources Conservation Service (NRCS), TNC helped The Advanced Clean Truck Rule would help jumpstart release \$14.5 million of federal funding to purchase a zero-emission vehicle market for trucks, buses and easements from interested landowners. In addition to delivery vans, and the Heavy-Duty Omnibus Rule would providing a funding match, TNC worked with NRCS to set standards to effectively reduce diesel pollution. determine criteria for selecting qualifying acres (for example, land with high sand deposits from floods).

TNC is also co-leading on opportunities stemming from the passage of the IRA. For instance, we aided At end of 2023, over 2,700 acres in Dogtooth Bend ICJC in providing recommendations on the state's were under conservation easements. The easement application for the Environmental Protection Agency's program has helped create momentum for change Climate Pollution Reduction Grants. Our suggestions in the region, which is part of the recent boundary included pursuing the build-out of bus rapid transit expansion of the U.S. Fish and Wildlife Service's on state-controlled roads, implementing community Middle Mississippi River National Wildlife Refuge. In car-share and bike/e-bike-share programs and using September, USFWS announced plans to acquire up to TNC tools, including Power of Place (nature.org/ 90,000 acres from interested landowners in southern powerofplace), to ensure that land-use decisions Illinois and eastern Missouri, including in Dogtooth Bend. for new renewable installations minimize impacts to sensitive natural and working lands.

ENCOURAGING INFORMED SITING OF RENEWABLE PROJECTS

To help energy planners and developers, as well as large businesses, take environmental and socioeconomic impacts into account when siting renewable projects,

TNC and our partners developed an interactive mapping tool called Site Renewables Right (SRR). The SRR map identifies sites in the central United States where wind and solar energy installations can be developed without harming important wildlife habitats and natural areas. Access the SRR maps and other renewable energy resources at **nature.org/ilclimate**.



The ultimate goal is to restore large swaths of floodplain forests and wildlife habitats. This will include planting 1.6 million trees donated by the Arbor Day Foundation. In coming years, visitors will be able to enjoy acres of forests and wetlands intermixed with white sandbars. Read more about TNC's work along the Mississippi at nature.org/mississippiflooding.

OPPOSITE PAGE LEFT TO RIGHT Wind and solar colocated on the same site © Adobe Stock/Jevanto Productions; a tree planting © Devan King; THIS PAGE: An animated version of a Site Renewables Right map © TNC

TNC in Illinois Is a Leader in Prescribed Fire

Indigenous peoples used fire in grasslands to encourage new plant growth and lure bison and other game for hunting. Borrowing from that tradition, TNC has been using "good fire" for more than 60 years to keep native habitats healthy.

"If we don't use fire, our prairies, wetlands and oak woodlands become choked with dense brush-exotic shrubs and small trees-that end up degrading native habitat for lack of sunlight," says TNC's Bill Kleiman, Illinois fire manager and project director at Nachusa Grasslands.

Recognizing prescribed fire's importance, TNC in Illinois has made it a priority to increase knowledge and use of this conservation tool.

EXPANDING OUR BURN CREWS

To ensure safety and effectiveness, TNC has adopted fire standards set by the National Wildfire Coordinating Group. To become licensed burn crew members or managers, our staff and volunteers must obtain the same strenuous training and certifications as federal wildland fire fighters.

"Burning more acres typically comes down to needing more people trained to do this work," Kleiman says. TNC is helping to meet this resource challenge by providing and encouraging training opportunities, including the following: Prescribed burns at TNC preserves and on partner lands provide burn crews with hands-on opportunities to practice fire skills.

"Burning more

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LEARN MORE

prescribed fire efforts at nature.org/ilfire

about TNC's

Currently, 18 Illinois staff serve on TNC burn crews, and six Illinois staff are now certified burn bosses. Volunteers also play a critical role. At Nachusa alone, 25 of the 47 fire crew members were volunteers in 2023.

GROWING THE KNOWLEDGE BASE

TNC is also advancing prescribed fire efforts through advocacy and research. Two TNC burn bosses—Kleiman and Rob Littiken, project director, Kankakee Sands-Illinois—serve as directors on the Illinois Prescribed Fire Council. One of the council's key projects is focused on mapping where all prescribed burns are performed in Illinois and assessing how many more acres need to be burned to improve ecosystems.

In addition, TNC scientists and partners are studying how to increase the effectiveness of prescribed fire. The ongoing research aims to uncover, for example, how adjusting the timing of fires can further improve habitat health.

PROTECTING LAND FOR NATURE **AND PEOPLE**

 TNC encourages our fire crews to sign up to fight wildfires during summer months. Besides aiding people and nature in danger, TNC crews get to perform vital fire skills when suppressing fires that are also needed for managing prescribed burns. • TNC offers an annual wildfire suppression training program in Belize, in partnership with TIDE Belize and Belize National Parks, for staff to gain needed skills and licenses.

How Bison Are Affecting Other Wildlife

Bison were reintroduced at TNC's Nachusa Grasslands Preserve in 2014. Today, about 100 adults and their calves live on 1,500 of the preserve's 4,000 acres.

How have these immense grazing animals affected other wildlife? Researchers, including TNC's Elizabeth Bach, ecosystem restoration scientist, assessed the bison's impact during their first five years at the preserve. The key takeaway: "Bison are influencing animal communities to a greater extent than plant communities," says Bach.

ANIMALS AND INSECTS

On the insect front, dung beetles—which follow the dung supply—have been thriving since the bison's arrival. In addition, groups of native bees and wasps are building their underground nests in bison wallows, which are indentations created when the mammals roll on the ground.

READ MORE ABOUT TNC's bison restoration efforts at **nature.org/buffalo** Another finding: On full moon nights, mice and other rodents have adjusted their foraging in areas with reduced vegetation cover due to bison grazing. The reason is likely to dodge predators. To avoid moonlight, they look for food earlier in the evening or later at night.

PLANTS

At Nachusa, researchers did not find any changes in the diversity of plants in the first five years after the bison arrived. The preserve has intentionally kept the number of bison to about 100 adults, which has helped ensure a light grazing rate. This may be why no changes were found in the plant community. Alternatively, it could be that Nachusa had already reached an upper threshold of plant diversity prior to the bison's introduction. Studies of Kansas prairies found increases in plant species within five years of introducing bison. But those prairies had less plant diversity before the bison moved in than Nachusa did.

Bach and her collaborators will continue studying the bison's impact. "We're dedicated to monitoring for the long term," she says.

Creating Tomorrow's Nature Advocates and Stewards

Today's young people are inheriting complex and mounting environmental challenges. At the same time, studies show that children are spending less time outside, and they are feeling increasingly anxious about climate change.

"Children need opportunities to explore nature and, as they become young adults, they need leadership experiences that help them understand how they can take an active role in solving the crises facing people and nature," says Jason Beverlin, deputy director of conservation programs. Together, TNC and local partners in Illinois have developed a suite of youth engagement programs that help connect young people to nature, their communities and each other.

MIGHTY ACORNS

Mighty Acorns is a program designed for children in grades 3–5. Program partners work closely with local schools and teachers, such as Lorenzo R. Smith Academy in Hopkins Park, to develop in-class curricula that are then

complemented by trips to local natural areas. Unlike "one-off" field trips, the program provides a learning cycle, bringing students back to the same natural areas throughout the year to learn about habitats, plants and wildlife as the seasons change. TNC contracts with the Field Museum to provide the indoor learning, and TNC leads guided outdoor learning experiences at Kankakee Sands-Illinois in Pembroke Township.



YOUTH ENVIRONMENTAL THINKERS (YET)

YET is a paid internship program led by Debra Williams, community engagement specialist at Indian Boundary Prairies, which engages young people ages 16 to 21 as interns and staff to address issues related to people and nature. Aspects of the experience include field work, content-related field trips, research and presentations.



"I really enjoyed the YET program's focus of connecting people to people and people to nature," says Antoine Stokes, YET program alumnus and alumni mentor. "That idea has been really instrumental in my growth as a civil and environmental engineer, and it provides me with a unique perspective that I like to bring wherever I go and in whatever I do."

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YES! PROGRAM

The Youth Environmental Stewards (YES!) program is a paid internship through which young adults gain hands-on stewardship experience, explore conservation career pathways and develop a network of connections with local conservation organizations. On-the-ground learning happens at natural areas across Pembroke Township, including at TNC's Kankakee Sands-Illinois. The program is a collaboration between the U.S. Fish and Wildlife Service, Community Development Corporation of Pembroke-Hopkins Park, Field Museum and TNC.

SCIENCE AND RESEARCH



Expanding the Knowledge Base

TNC in Illinois works with conservation partners on a variety of research and community science projects—from hand-pollinating orchid plants to protecting box turtles. Here's a sampling of our science work from 2023.

BOX TURTLE GUIDELINES FOR PRESCRIBED BURNS

Land managers of Illinois prairie grasslands now know the best times to conduct prescribed burns to avoid harming the ornate box turtles that live there. The turtles, new research shows, are almost guaranteed to be underground from Nov. 1 through April 1. If air temperature is less than 59 degrees F prior to Nov. 1, a fall fire may be safe in turtle habitats. If air temperature is less than 50 degrees F after April 1, a spring fire can still be safe for turtles.

SCIENCE AND RESEARCH

Researchers from the University of Illinois Urbana-Champaign led the study, which involved radio-tracking 47 ornate box turtles at TNC's Nachusa Grasslands and two other natural areas from 2019 to 2022. Elizabeth Bach, ecosystem restoration scientist at Nachusa, contributed to the research, which was published in late October in the Journal of Wildlife Management.

"We need prescribed fire for healthy habitats, and we need to protect box turtles," Bach says. "This paper gives Illinois managers some specific dates and parameters to make choices about how to prioritize prescribed fire in units where there may be box turtles."



GROWING OAKS THAT THRIVE IN CHANGING CLIMATE

Restoring oak-hickory woodlands is a top priority for TNC's Southern Illinois team. Our staff conduct prescribed fire and other stewardship activities to keep forest canopies open so sunlight can reach the forest floor and allow young oaks the chance to grow. "Without active land management, forests have been darkening up for decades, causing oak species to decline," says Caleb Grantham, stewardship coordinator.

In 2023, Grantham and Danielle Cafin, TNC burn crew member, helped with another oak-saving strategy: Planting 1,000 white oak seedlings at Dixon Spring Agricultural Center, a University of Illinois Extension (UIE) station in Pope County. Many of the seedlings were grown from seed sources in Florida, Texas and other warm states.



"The purpose is to identify seedling sources that perform well in this region with the goal of using better-performing trees to produce seed orchards to supply nurseries with acorns that produce better-performing seedlings," says Christopher Evans, UIE forester. "This is especially vital given the changing climate, as local genetics may no longer be best adapted to current conditions."

The U.S. Forest Service and other partners also assisted with the UIE planting, which is part of a white oak genetics study led by the University of Kentucky.

A THREATENED ORCHID GETS A BOOST

Summertime finds TNC staff and volunteers walking preserve prairies in search of the rare eastern prairie fringed orchid (*Platanthera leucophaea*), an ornate perennial with creamy white flowers. As participants in a U.S. Fish and Wildlife Service (USFWS) restoration effort, TNC crews assume the role of pollinators, using toothpicks to transfer tiny pollinia (filled with pollen grains) from one orchid to another. In autumn, the crew returns to detach seed pods that have formed and scatter the plants' tiny seeds across the prairie.

The USFWS project is underway at TNC's Nachusa Grasslands and Indian Boundary Prairies (IBP) Preserves, as well as the U.S. Forest Service's Midewin National Tallgrass Prairie, which TNC helps manage. Data on the orchids, such as plant height and number of seed pods, is collected and shared with USFWS. "We've seen good success with seed production at IBP from hand-pollination efforts," says TNC's Emilie Pfeiffer, biodiversity coordinator.

A related project by a Texas A&M doctoral candidate aims to identify what creatures pollinate eastern prairie fringed orchids. The plant's only known pollinator is the sphinx moth. Last summer, cameras were set up near the orchids at Nachusa and IBP to catch pollinators in action. An analysis of the footage is expected soon.

"TNC enlists community scientists who acquire a trained eye and delicate touch for this important endeavor." says Allison Cisneros, Midewin project manager. "Volunteers enjoy this unique and rewarding experience of helping these rare orchids."



GAINING INSIGHTS ON BATS IN URBAN HABITATS

Nestled near two highways in the populous Chicago suburb of Markham, TNC's IBP Preserve provides a living laboratory of urban wildlife. For instance, IBP is participating in a bat monitoring project sponsored by the Lincoln Park Zoo's Urban Wildlife Institute. "Bats face a lot of challenges in urban areas, and it's important to understand which bat species are here and how we can support them," says TNC's Emilie Pfeiffer, biodiversity coordinator.

Staff and volunteers walk prairie trails after sunset carrying a small acoustic device secured atop a pole. Ultrasonic bat calls—which cannot be heard by humans—are recorded, and a phone app suggests what species made the call. The Urban Wildlife Institute then uses sonogram software to confirm what bats were logged. Five bat species have been recorded at IBP: silver-haired, hoary, evening, Eastern red and big brown. In addition, the team is uncovering potential insights into urban bat behaviors that warrant additional exploration. For instance, the IBP bat monitoring crew found many echolocation calls in prairie areas close to highways where they thought loud traffic noise would keep the bats away.

The monitoring is also helping determine where vulnerable bat populations may be living so that TNC can ensure we don't endanger these bats during brush clearing and other stewardship work.

QUESTIONS

If you have a question about TNC's research, contact Maria Lemke at mlemke@tnc.org.

Meet the Team

TNC's success in Illinois is made possible by the leadership of our Board of Trustees, the commitment of every donor, the diverse talents of our staff, the hard work of volunteers and the collaborative spirit of partners.



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A bee on a flower at TNC's Nachusa Grasslands Preserve () Charles Larry