



LANDSCAPE  
CONSERVATION  
COOPERATIVES



**EASTERN TALLGRASS PRAIRIE & BIG RIVERS  
LANDSCAPE CONSERVATION COOPERATIVE**

**2012**

*Advancing science for the future of conservation*





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Cover photo: Pelicans on Illinois River. Illinois Department of Natural Resources.



LANDSCAPE CONSERVATION  
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# From our steering committee co-chairs

We are dynamic, partner-driven and committed to delivering practical and pragmatic tools for conservation.

This year, the Eastern Tallgrass Prairie and Big Rivers LCC established an identity. We are dynamic, partner-driven and committed to delivering practical and pragmatic tools for conservation.

At our very first meeting in spring 2012, we put our heads together to identify common natural resource challenges we face on a day-to-day basis, and how we can work together to inform on-the-ground decisions made by land managers. It didn't take us long to acknowledge that our combined efforts could play a critical role in agriculture and natural resource management. With that focus in mind, we set forth on a mission to demand the highest return on our scientific investments, and build decision-support tools that can help the conservation community restore and manage the unique natural resources of the Midwest.

As we look back at our retreat at Dickson Mounds, Ill. in September 2012, we see a watershed event for our growing partnership. Inspired by 12,000 years of humanity living in partnership with the land, we laid the foundation for a strategic plan to guide our future. At the same time, we welcomed Dr. Gwen White in her new role as science coordinator for the LCC partnership.



Charlie Wooley, Deputy  
Regional Director  
U.S. Fish and Wildlife  
Service Midwest Region



Marc Miller, Director  
Illinois Department  
of Natural Resources

Within the agriculturally-dominated landscape of the Midwest, the LCC will provide a venue for partners to focus collective energy and put into motion conservation efforts that will benefit natural resources across the landscape.

We will strive to find a balance between two realities: one, that this LCC is centered on the corn belt and its farms must continue to help feed the world; and two, that these same agricultural lands must help sustain fish, wildlife and other natural resources that are treasured by Americans from all walks of life and places of origin

across the Midwest. Somewhere in that paradigm, we hope to do our best work.

We look forward to convening again in January 2013 to set forth on our mission to build healthy and functional landscapes for the natural resources and people of the Midwest.

Charlie Wooley  
Co-chair

Marc Miller  
Co-chair



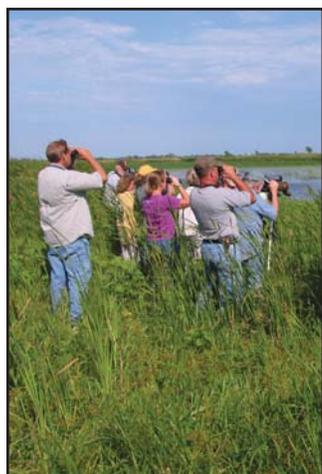
# Our Community



## Landscape Conservation Cooperatives Eastern Tallgrass Prairie and Big Rivers LCC

Landscape Conservation Cooperatives (LCCs) address large scale natural resource challenges that transcend political and jurisdictional boundaries and require a networked approach to conservation— holistic, collaborative, and grounded in science – to ensure the sustainability of America’s land, water, wildlife and cultural resources.

The Eastern Tallgrass Prairie and Big Rivers LCC is one of 22 partnerships across a national LCC network that share a common need for scientific information to support on-the-ground conservation management actions. This LCC is dedicated to addressing the conservation challenges of a heavily agricultural landscape that stretches across 11 states in the nation’s heartland eastern Kansas, Oklahoma and Nebraska eastward across Missouri, Illinois and Indiana to southwest Ohio and northward into segments of Iowa, South Dakota and Minnesota.



### LCC Network Vision

Landscape Conservation Cooperatives are the forum for the conservation community to define, design, and deliver landscapes that can sustain natural and cultural resources at levels desired by society.

### Our Vision

Functional tallgrass prairie and big rivers natural communities embedded in a healthy and productive agricultural and urban landscape—ecologically connected lands and waters, managed cooperatively for current and future generations.

### Our Mission

The Eastern Tallgrass Prairie and Big Rivers LCC coordinates among many partners to: 1) understand the consequences of landscape-scale change; 2) develop common landscape-level conservation objectives and strategies; and 3) produce pragmatic science that addresses current and future environmental stressors across the eastern tallgrass prairie and big river ecosystems from southwest Ohio across Indiana, Illinois and Missouri, westward to parts of eastern Kansas, Oklahoma and Nebraska and northward into segments of Iowa, South Dakota and Minnesota.



A landscape is a specific geographic area that includes the pattern and structure of the geography, the biological components, its physical environment, as well as the social and cultural setting.

# Our Geography



European settlers moving west across a young America discovered rich, rolling, fertile lands and ample farming opportunities in the area that would become America’s “cornbelt.” Millions of acres of forest and prairie were cleared, plowed and put into agricultural production. While the geography associated with the Eastern Tallgrass Prairie and Big Rivers LCC is predominantly agricultural and privately owned, the area also contains numerous state and federally-managed tracts of land including national wildlife refuges, state wildlife management areas, land trust parcels and nature preserves, which provide habitat for a wide variety of aquatic and terrestrial species of wildlife.



Eastern Tallgrass Prairie and Big Rivers LCC steering committee at Dickson Mounds near Lewiston, Illinois.

## Our People

We are leaders in the conservation community. We bridge physical sciences and human dimensions to utilize the knowledge and skills of biologists, economists, social scientists and communicators. We come from federal and state governments, not-for-profit and private organizations and pre-existing partnerships. We see beyond agency lines and authorities to identify what is in the best interest of our collective community, both within and outside of the LCC, to benefit fish, wildlife, habitat and people. Our steering committee membership represents more than two dozen agencies and organizations that cross jurisdictional boundaries in an enthusiastic and strategic collaboration. This steering committee is supported by LCC coordinator Glen Salmon, science coordinator Gwen White and communications coordinator Ashley Spratt. Our partnership includes representatives from each of the following agencies and organizations.



Illinois Department of Natural Resources.



LANDSCAPE CONSERVATION  
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**NECSC**  
Northeast Climate Science Center



**USGS**  
science for a changing world



The Nature Conservancy 



**US Army Corps of Engineers**



**ILLINOIS NATURAL HISTORY SURVEY**



Chicago Wilderness

**NATIONAL FISH HABITAT PARTNERSHIP**



**NRCS** Natural Resources Conservation Service

**DUCKS UNLIMITED**

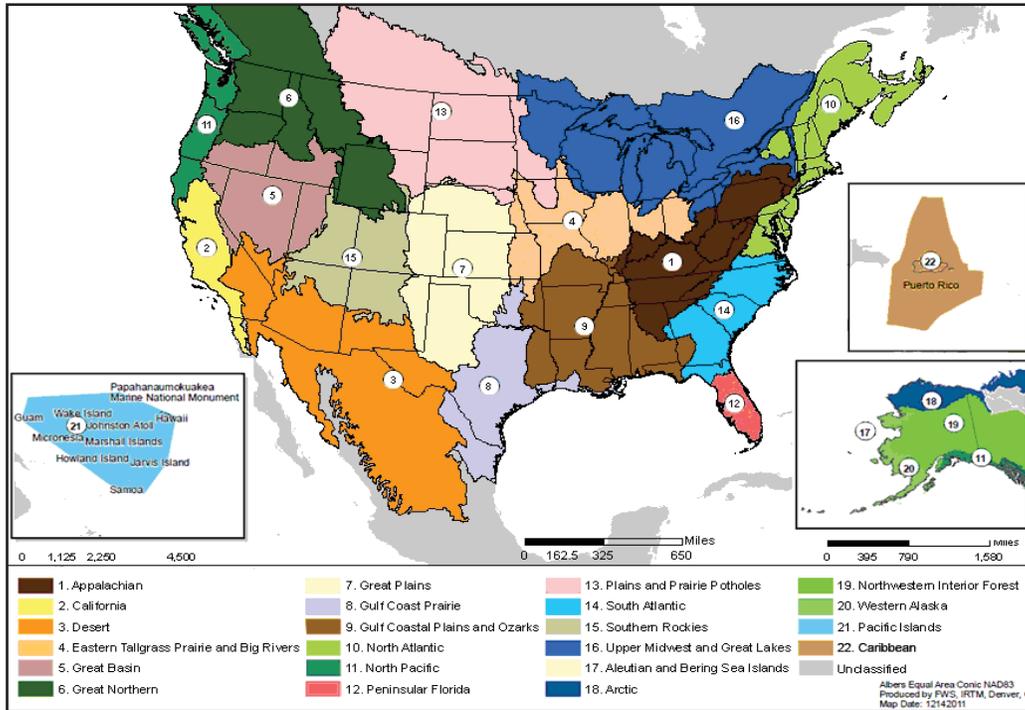


**NEBRASKA GAME PARKS**

**USDA**



# Our History



*With an initial budget of \$200,000, we began efforts to connect land managers with cutting-edge science that focuses on conserving tallgrass prairie and big river ecosystems through restoration, agroecology and urban river corridors.*



# 2009

In 2009, the U.S. Department of Interior demonstrated its commitment to serving the public's interest in our nation's treasured landscapes by issuing Secretarial Order 3289 titled: Addressing the Impacts of Climate Change on America's Water, Land, and Other Natural and Cultural Resources. Among the actions in that order, the Department of Interior committed to helping the conservation community develop a collaborative response to climate change.

# 2010

In 2010, Congress appropriated funds to support DOI's vision of establishing a national network of Landscape Conservation Cooperatives (LCCs). The Eastern Tallgrass Prairie and Big Rivers LCC was established in 2010, under the guidance and direction of the U.S. Fish and Wildlife Service's Midwest Region.

Glen Salmon was hired in July 2011 as full-time LCC coordinator. Dr. Gwen White joined the team in October 2012 as the full-time science coordinator with offices based in Bloomington, Indiana. U.S. Fish and Wildlife Service Deputy Regional Director Charlie Wooley and Illinois Department of Natural Resources Director Marc Miller agreed to serve as co-chairs of the steering committee.

# 2011



Glen Salmon  
LCC Coordinator



Gwen White  
Science Coordinator

# 2012

Illinois DNR Director Marc Miller hosted our first full steering committee in May 2012 with representatives from 19 conservation agencies and organizations. Steering committee members determined a plan of action for recruitment of additional members, adopted a governance document and selected preliminary focal areas. The steering committee gathered again in September 2012 at Dickson Mounds State Museum in Illinois to craft the key concepts necessary to develop into a draft strategic direction.

# Our Successes

## Building a strategic plan and identifying focal areas

In December 2012, LCC staff developed a draft strategic plan providing a foundation and structure to carry out the mission and vision of the LCC and its partners.

This strategic plan positions LCC members as leaders for regional conservation, identifies the natural resources challenges we are up against, and sets forth a vision, mission and guiding principles to encourage growth and maturity for the partnership.

The strategic plan also identifies habitats, focal areas and subregional differences capturing the cultural, social and ecological significance of natural resources across the landscape. These focal areas--and goals, objectives and strategies developed around them--were generated through discussion by steering committee members in September 2012 followed by further refinement in conference calls and informed by discussions with stakeholders.

As part of the strategic planning process, the steering committee put forth the first annual action plan for the LCC, outlining goals for steering committee structure, growth and interaction, development of a strategic communications plan to assist in LCC information dissemination, and preparation of an initial science needs assessment. This science needs assessment will: 1) set fundamental objectives and strategies for action within the focal areas of restoration, agroecology and urban rivers; 2) identify key uncertainties that limit conservation ability or management decision-making; and 3) direct solicitation of research proposals and related activities.



Kansas wind farms. Twyla White.



U.S. Fish and Wildlife Service.

***This strategic plan positions LCC members as leaders for regional conservation, identifies the natural resources challenges we are up against, and sets forth a vision, mission and guiding principles to encourage growth and maturity for the partnership.***



Pelicans. Illinois Department of Natural Resources..

***Focal Area 1:  
Restoration***

Develop and connect functional tallgrass prairie and big river ecosystems for biodiversity conservation, taking advantage of large-scale and small-scale opportunities.

***Focal Area 2:  
Agroecology***

Understand and use economics and incentives to influence best management practices that integrate functional natural communities with food, fiber and fuel production.

***Focal Area 3:  
Urban Rivers***

Promote rivers as a resource for green infrastructure and human connections that support functional natural communities in small towns, suburbs and large cities.

Vistas - Expansive restoration sites and big river systems that represent the iconic and historic landscapes of the region.

Gems - Scattered pockets of biodiversity that remain tucked among the working lands of a region largely dominated by agriculture and urbanization.



Chicago Area Waterway System Asian carp respos. Illinois Department of Natural Resources.

# Ongoing Research

The following scientific research projects have received support from the Eastern Tallgrass Prairie and Big Rivers LCC. These and other LCC-funded projects continue to transcend boundary lines to generate the most advanced and scientifically solid data to guide adaptive management of species and habitats across the landscape. The partnerships and data produced are critical to informing the protection and conservation of these unique and valuable natural resources.

## Mississippi River remote sensing

*\$62,750 funding in 2011  
Completed September 2012*

U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, U.S. Geological Survey, and many river partners along the Illinois and Mississippi rivers are partnering to collect infrared digital imagery during periods of peak vegetative growth to develop a cover map for the Mississippi River floodplain from Minneapolis, Minn. to the Ohio River confluence. This information is being used to identify changes within the basin over the past 10 years, strategically guide biological programs in support of natural resource conservation, and assist decision makers from federal, state, and non-governmental organizations in making science-based decisions within the Mississippi River basin. Images are currently being processed by U.S. Geological Survey.



Upper Mississippi National Fish and Wildlife Refuge. U.S. Fish and Wildlife Service.

## Aviation and remote sensing programs

*\$26,000 funding in 2011  
Completed September 2012*

The efficiency and effectiveness of aerial photography by the U.S. Fish and Wildlife Service's Midwest Aviation Program has been improved with upgraded components for the Applanix DSS 439 Camera System, including a 60 millimeter lens and gyro-stabilization mount. Both are installed and in use. The stabilization mount improves image resolution and minimizes asymmetrical pixels. The 60 millimeter lens also improves image resolution for higher quality aerial photographs. This advanced equipment results in more accurate bird counts and stereo interpretation of vegetation maps which will ultimately assist management decisions made in biological programs.



Prairie aerial. U.S. Fish and Wildlife Service.



Freshwater mussel. U.S. Fish and Wildlife Service.

**Refining freshwater mussel conservation techniques through the operation of a streamside rearing trailer**

*\$50,400 funding in 2011  
Completed September 2012*

As part of the Genoa National Fish Hatchery Native Freshwater Mussel Restoration Program, U.S. Fish and Wildlife Service researchers utilized advanced technology in mobile rearing to evaluate how different water sources support growth and survival of young freshwater mussels. A mobile aquatic rearing station, or MARS, was deployed along the banks of the Mississippi River in Wisconsin in the summer of 2012 to raise rare and endangered mussel species, including Higgins' eye pearlymussel, hickorynut, black sandshell and snuffbox. Information gathered will provide a knowledge base for the operation of the trailer moving forward, and ultimately will help optimize rearing techniques as stressors increase that threaten survival of early life stages in these ecologically-essential freshwater animals. [See feature story on page 20.](#)



Agriculture. U.S. Geological Survey.

**Assessing effects of agricultural best management practices on stream and river aquatic health**

*\$71,000 in U.S. Geological Survey Science Support funding in 2012  
Anticipated completion: 2014*

Sediment and nutrient runoff contributes to loss of agricultural productivity, degradation of local streams, and hypoxia in the Gulf of Mexico. The North Fork Maquoketa Basin has been identified as a major contributor of sediment and nutrients. Agricultural best management practices are now being implemented in the upper basin through the Mississippi River Basin Healthy Watersheds Initiative led by the U.S. Department of Agriculture-Natural Resource Conservation Service in conjunction with local watershed groups. Best management practices in target watersheds are designed to optimize use of nitrogen and phosphorus within fields and reduce downstream nutrient loading by trapping nutrient and sediment runoff, simultaneously improving wildlife habitat and maintaining agricultural productivity.



Stream corridor restoration, Fox River. Illinois Department of Natural Resources.

Monitoring sediment and nutrient loads at appropriate scales is challenging due to complex interactions between streamflow, chemical/sediment concentrations and living organisms in the ecosystem. In partnership with U.S Geological Survey, Iowa Department of Natural Resources and other conservation partners, the LCC is supporting continuous water quality monitoring using optical sensors and gages that measure nutrients and turbidity. These techniques are deployed to monitor across a broad range of relevant time scales and to collect the information needed for targeting conservation practices where they may be most effective.

**Environmental effects of agricultural practices**

*\$40,000 Northeast Climate Science Center funding in 2012  
Anticipated completion: 2013*

Researchers with U.S. Geological Survey Water Science Centers in Iowa, Kansas and Massachusetts are collaborating to conduct a comprehensive literature search of both published and ongoing research (2000-present) that sheds light on the interactions between climate change, agriculture and water quality across the combined geographies of the Eastern Tallgrass Prairie and Big Rivers LCC and neighboring Upper Midwest and Great Lakes LCC.

Project investigators compiled the information in a resource library by geographic location, providing an organized structure for future examination of all research related to interactions between climate change, agriculture and water quality in these two regions. Through cooperation with the Center for Integrated Data Analytics (CIDA), a searchable format geared toward the general end-user may be generated. [See feature story on page 18.](#)



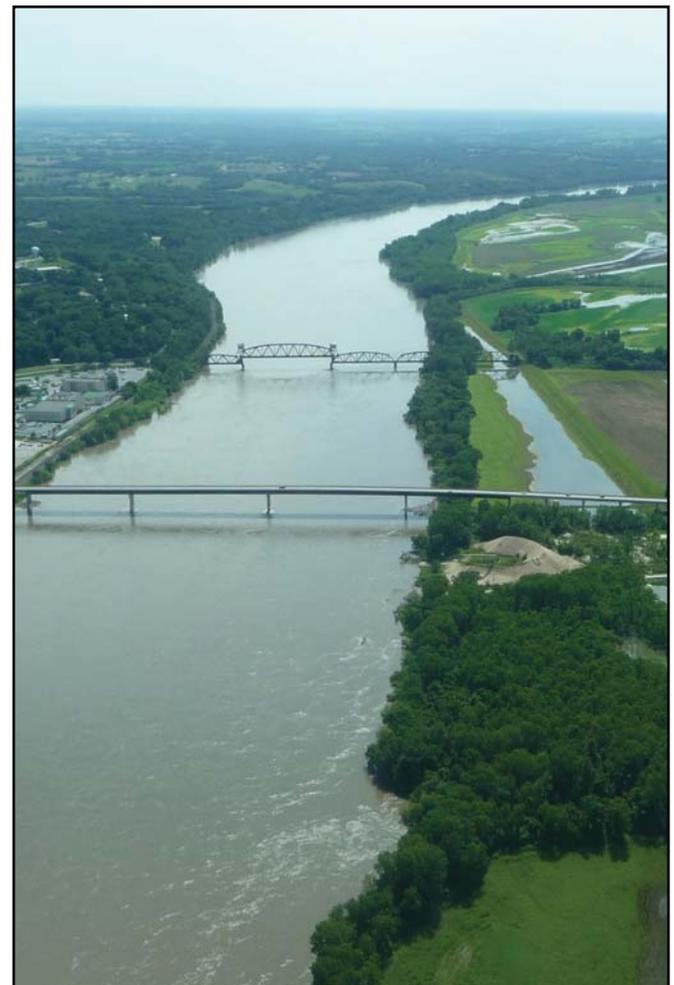
Prairie planter. Gwen White.

**A hydrogeomorphic approach to evaluating ecosystem restoration and habitat management for the lower Missouri River**

*\$50,000 funding in 2012  
Anticipated completion: 2014*

Hydrogeomorphic methodology is being applied along 670 miles of the Missouri River from Decatur, Nebraska to St. Louis, Missouri. Using this systematic and holistic method, engineers and ecologists will incorporate state-of-the-art scientific knowledge about ecological processes and key fish and wildlife species to identify critical natural hydrologic and vegetation/animal community dynamics. Conservation stakeholders and scientists convened in Omaha and Kansas City in 2012 and early 2013 to discuss the process, gather perspectives and determine information needs that may contribute to the evaluation.

Results of this research will guide land and water uses within the corridor aimed at maximizing ecological functionality while considering restoration potential, flood control, recreation, navigation and other interests. A range of local, state and federal agencies, nonprofit groups and private entities each make management decisions that affect numerous conservation properties and resources along this section of river. The project aims to work with these partners to provide a comprehensive ecological context for the region and to develop a basis for identifying common habitat objectives for their many related conservation actions. [See feature story on page 24.](#)



Lower Missouri River. U.S. Fish and Wildlife Service.



Private landowner. U.S. Fish and Wildlife Service.

### **Assessing landowner attitudes toward and motivations for participating in conservation programs beneficial to wildlife**

*\$50,000 funding in 2012*

*Anticipated completion date: 2014*

Researchers at the University of Minnesota seek to better understand the motivations of landowners, specifically farmers, that drive participation in programs that improve wildlife habitat and water quality in working agricultural landscapes. The LCC is working with U.S. Geological Survey to evaluate factors influencing landowners' enrollment in U.S. Department of Agriculture programs that improve water quality by reducing sedimentation and nutrient loading by utilizing best management practices that also support wildlife habitat and productive agriculture.

This first phase will complete the focus group research needed to launch a longer term evaluation that will provide insight into designing and developing programs, practices and messages that encourage broader participation in conservation programs and sustainable practices within the agricultural community. Initial focus groups will be held in spring/summer 2013 with final analysis expected in summer 2014. In subsequent years, contingent upon available funding, a closed-ended social survey targeting agricultural producers and other landowners in the LCC may be completed that will allow a more quantitative assessment of attitudes and motivations.



Eastern box turtle. Indiana Department of Natural Resources.

### **Evaluation of a restoration technique: Relocation of Eastern box turtles to reclaimed mineland at the Patoka River National Wildlife Refuge**

*\$50,000 funding in 2012*

*Anticipated Completion Date: May 2016*

Eastern box turtles are a long-lived species that can take up to 10 years to reach sexual maturity. Their life history and threats to their populations have led to a 50% decline in estimated population size over 13 years in Indiana with even more dramatic losses elsewhere. Translocation of turtles may counter losses due to habitat fragmentation by roads or other human disturbance. Researchers with the U.S. Fish and Wildlife Service, U.S. Geological Survey Upper Midwest Environmental Research Center, Indiana Department of Natural Resources and Purdue University are joining forces to pilot improved relocation methods for approximately 60 Eastern box turtles that were collected from an area where habitat has been disrupted during construction of a major interstate in Indiana. In March 2013, researchers will prepare temporary enclosures for the dislocated turtles on reclaimed mine land at Patoka River National Wildlife Refuge. After release, researchers will use radio-telemetry on both an existing resident remnant population and the newly translocated turtles to compare genetics, survival, movement, reproduction and habitat use for up to two years. Analysis will indicate whether translocation may be a useful tool in salvaging populations disrupted by land use or other threats. [See feature story on page 22.](#)

# Guiding research with Northeast Climate Science Center

Sediment and nutrient runoff from the Midwest has profound consequences over great distances for aquatic habitat and water quality both locally and downstream in the Gulf of Mexico, affecting shrimpers, water utilities and other related industries. Nine states account for 75 percent of the nitrates flowing into the Gulf with the largest contributors centered in the ETPBR LCC region.

Researchers from the U.S. Geological Survey Northeast Climate Science Center (NECSC) are examining impacts of climate change on agricultural practices, and consequently on water quality in streams, rivers, lakes and reservoirs.



U.S. Fish and Wildlife Service.

To address these challenges, researchers are investigating the relationship between best management practices, precipitation patterns, watershed hydrology and water quality. The team is currently examining available networks for compiling and utilizing data, models and forecasting tools that are already being developed by research agencies and organizations or being applied by the agricultural sector. Ultimately this partnership will generate applied scientific research to address information needs of the agricultural community and related sectors that will improve land use practices, maintain agricultural productivity and efficiency, and at the same time, reduce adverse effects of farming activities on water resources necessary for clean drinking water, fisheries and other aquatic resources.

To address these challenges, researchers are reviewing existing and current research activities on the relationship between changes in climate and changes in nutrient and sediment inputs into surface waters. They seek to identify current and recent investigations on best management practices in agriculture that will maintain resilience of agricultural landscapes with anticipated changes in climate. These investigations focus on the relationship between precipitation changes, watershed hydrology and water quality. The team is currently examining available networks for gathering data, models and forecasting tools that are already being developed by research agencies and organizations or being applied by the agricultural sector. Information on long-term trends in agricultural practices and production and possible relationships between changes in agricultural land use patterns and practices may be related to changes in water quality.

The expertise from the collaborative efforts of both the Northeast Climate Science Center and Eastern Tallgrass Prairie and Big Rivers LCC can also help the conservation community understand the effects of agricultural impacts and water quality on aquatic biological communities such as invertebrates, fishes, amphibians and aquatic plants. Ultimately this partnership will to facilitate communication between scientific research and the agricultural community and related sectors to improve farm practices, maintain agricultural productivity and efficiency, and reduce adverse effects of farming activities on water resources such as drinking water and recreational fisheries.

## USGS Northeast Climate Science Center *and* Eastern Tallgrass Prairie and Big Rivers Landscape Conservation Cooperative *collaborate to engage Midwest science community in climate change priorities.*

More than 40 scientists from across the Midwest conservation community gathered in May 2012 to establish science priorities as part of a five-year science plan under development by USGS' Northeast Climate Science Center. The session was led by Rachel Muir, interim director of the recently established Northeast Climate Science Center, and coordinated by the Illinois Natural History Survey, and the Eastern Tallgrass Prairie and Big Rivers Landscape Conservation Cooperative (LCC), a complimentary natural resources partnership dedicated to identifying and addressing landscape scale stressors on conservation, protection and restoration activities in our nation's "cornbelt".

The USGS Northeast Climate Science Center was established to generate research and science-based understanding that would better equip natural resources managers and decision makers to respond to impacts of climate change on natural resources. The Eastern Tallgrass Prairie and Big Rivers Landscape Conservation Cooperative takes a similar, but broader approach to identifying science needs in relation to large scale stressors across specific Midwest ecosystems. Both partnerships are focused on natural resources issues in the Midwestern United States, although the LCC focuses its energy on the heavily agricultural landscape that stretches from southwest Ohio westward across to eastern Kansas, Oklahoma and Nebraska, and segments of Iowa, South Dakota and Minnesota.

"The Eastern Tallgrass Prairie and Big Rivers Landscape Conservation Cooperative, used this opportunity to jumpstart the conversation about landscape level stressors to the natural resources of our agricultural communities, rivers and streams, grasslands, forests, and urban areas," said Glen Salmon, coordinator of the Eastern Tallgrass Prairie and Big Rivers Landscape Conservation Cooperative.

"Working alongside Illinois Natural History Survey and USGS Northeast Climate Science Center, we were able to create an open dialogue that will help not only identify science needs in relation to climate change, but also help the LCC identify its own priorities and concentrate the partnership's efforts in a strategic way."



Rachel Muir, interim director of the Northeast Climate Science Center in 2012. U.S. Fish and Wildlife Service.

***"The Eastern Tallgrass Prairie and Big Rivers Landscape Conservation Cooperative, used this opportunity to jumpstart the conversation about landscape level stressors to the natural resources of our agricultural communities, rivers and streams, grasslands, forests, and urban areas," said LCC coordinator Glen Salmon.***



Juvenile Higgins' eye pearlymussel growing within mobile rearing unit. Bright ring along each mussel's edge shows growth from this year. U.S. Fish and Wildlife Service.

## Advancing native freshwater mussel restoration

Freshwater mussels are considered key indicators of water quality and contribute to healthy aquatic ecosystems. However, steep population declines due to habitat degradation caused by sedimentation from agricultural and urban land use, invasive species and impacts of climate change, have presented conservation professionals with challenges to continued conservation of rare and endangered mussels.

The U.S. Fish and Wildlife Service's (Service) Genoa National Fish Hatchery, which safeguards and propagates freshwater mussels for reintroduction into native habitat, utilized advanced technology in mobile rearing to evaluate how different water sources support growth and survival of young freshwater mussels. The Eastern Tallgrass Prairie and Big Rivers Landscape Conservation Cooperative (LCC) dedicated funding to this project to help assess propagation techniques in light of broad-scale stressors to our aquatic resources.

"The tremendous network of big rivers, smaller tributaries, streams and headwater creeks form the very lifeblood across the geography of the regions this partnership covers. Freshwater mussels are an important component of Midwestern river systems and this project can increase our knowledge about possible reintroduction techniques," said Glen Salmon, LCC coordinator.

A mobile aquatic rearing station, or MARS, was deployed along the banks of the Mississippi River at the U.S. Army Corps of Engineers' Blackhawk Park near De Soto, Wisconsin, in the summer of 2012 to raise rare and endangered mussel species, including Higgins' eye pearlymussel, hickorynut, black sandshell and snuffbox. Freshwater mussels like these are known as ecological engineers for their unique ability to filter phytoplankton, bacteria and fungi from the water column and deposit nutrients into the sediment that feeds other aquatic life. Some mussel species lead complex lives, depending--in some cases exclusively--on particular species of fish whose gills serve as living incubators to carry the tiny newborn mussel larvae to new locations.

"This project is a great example of how our national fish hatcheries continue to integrate science into their work and remain an important component in the recovery of aquatic species," said Kurt Schilling, the Service's Midwest Region Hatchery Program Supervisor.

The mobile rearing unit was placed near the Mississippi River, and filtered large debris from river water while incubating the juvenile mussels. The project began in late July 2011 and was carried out through fall 2012.

Research from the 2012 field season indicated that river water was a better source for recirculating culture than either pond or well water. Trials showed that the rearing trailer is an ideal location for culture of yearling mussels. Most trials with yearling mussels resulted in 100 percent survival over the summer, and all individuals grew to a size suitable for stocking. Young of the year mussels were also recovered, but further research is necessary to determine optimal time of year and stocking density to optimize results.

Information gathered this year will provide a knowledge base for the operation of the trailer moving forward, and will help ultimately optimize rearing techniques in light of expanding stressors that threaten survival of early life stages of these unique and fascinating ecologically-essential freshwater animals.

*“This project is a great example of how our national fish hatcheries continue to integrate science into their work and remain an important component in the recovery of aquatic species,” said Kurt Schilling, the Service’s Midwest Region Hatchery Program Supervisor.*



The MARS unit was deployed in June 2012 along banks of Mississippi River to incubate and grow freshwater mussels using river water. The research will help inform propagation techniques for freshwater mussels, which are vitally important to clean and healthy aquatic ecosystems. U.S. Fish and Wildlife Service.

# Refining species translocation as a conservation tool



Eastern box turtle. Sarabeth Klueh, Indiana Department of Natural Resources.

Eastern box turtles are increasingly susceptible to local extirpation as adult survivorship declines across the species' range. Research has shown significant decreases in Eastern box turtle populations due to habitat destruction, degradation, and fragmentation, as well as commercial exploitation for the pet and food trades, and death from road kills. Translocation and reintroduction methods have been used in varying success.

Researchers with the U.S. Fish and Wildlife Service, U.S. Geological Survey-Upper Midwest Environmental Research Center, Indiana Department of Natural Resources and Purdue University are joining forces to implement a strategic relocation initiative for approximately 60 Eastern box turtles that were collected from an area that will become a major interstate in Indiana. The turtles were collected from 2010-2012 through the use of specially-trained turtle-sniffing

canines. The intent is to relocate the turtles to reclaimed mine land at Patoka National Wildlife Refuge. Before strip-mining, the 422-hectare habitat was dominated by upland hardwood trees and agriculture and likely supported a healthy population of Eastern box turtles. Currently, the area hosts a resident remnant population of Eastern box turtles.

"This translocation project could be very significant in terms of species conservation, reintroductions and land use, and provide data and information needed related to land resources of reclaimed mining habitat and potential reintroduction methods as a tool for species conservation," said Sarabeth Kuhn, non-game herpetologist with the Indiana Department of Natural Resources. Reclamation projects may provide suitable habitat to support species at risk including the Eastern box turtle.



Translocated turtle. Sarabeth Klueh, Indiana Department of Natural Resources.

In March 2013, researchers will construct enclosures on the reclaimed mine land to house approximately 60 turtles that were collected from 2010 - 2012 off of the right-of-way that will become I-69. The turtles have been housed in a semi-natural enclosure near the Patoka River National Wildlife Refuge since being collected.

After relocation, researchers will use radio-telemetry of a resident remnant population of Eastern box turtles to determine population and habitat use characteristics. Radio telemetry will also be used to monitor a small subset of turtles within the new enclosure to gather data on behavior, survival and reproduction of the translocated turtles during the captive phase of the new home-range adoptive process.

Monitoring efforts will take place from spring to fall of 2013 and 2014. The turtles within the enclosure will be released in spring 2015, allowing time for the turtles to acclimate to their new environment. Researchers will continue to monitor the survival, movements and habitat use of the released turtles from spring to fall of 2015 and 2016.

The results of this research will provide vital information as to the efficacy of translocating Eastern box turtles from areas experiencing large scale habitat destruction to reclaimed areas that now contain suitable habitat. This study will have great significance in identifying an efficient and effective strategy for salvaging Eastern box turtle populations applicable on a range-wide basis. Identification of effective translocation methods in response to the increasing loss of natural habitat is the only long term solution to ensure the Eastern box turtle remains off the list of Federally Threatened and Endangered species.

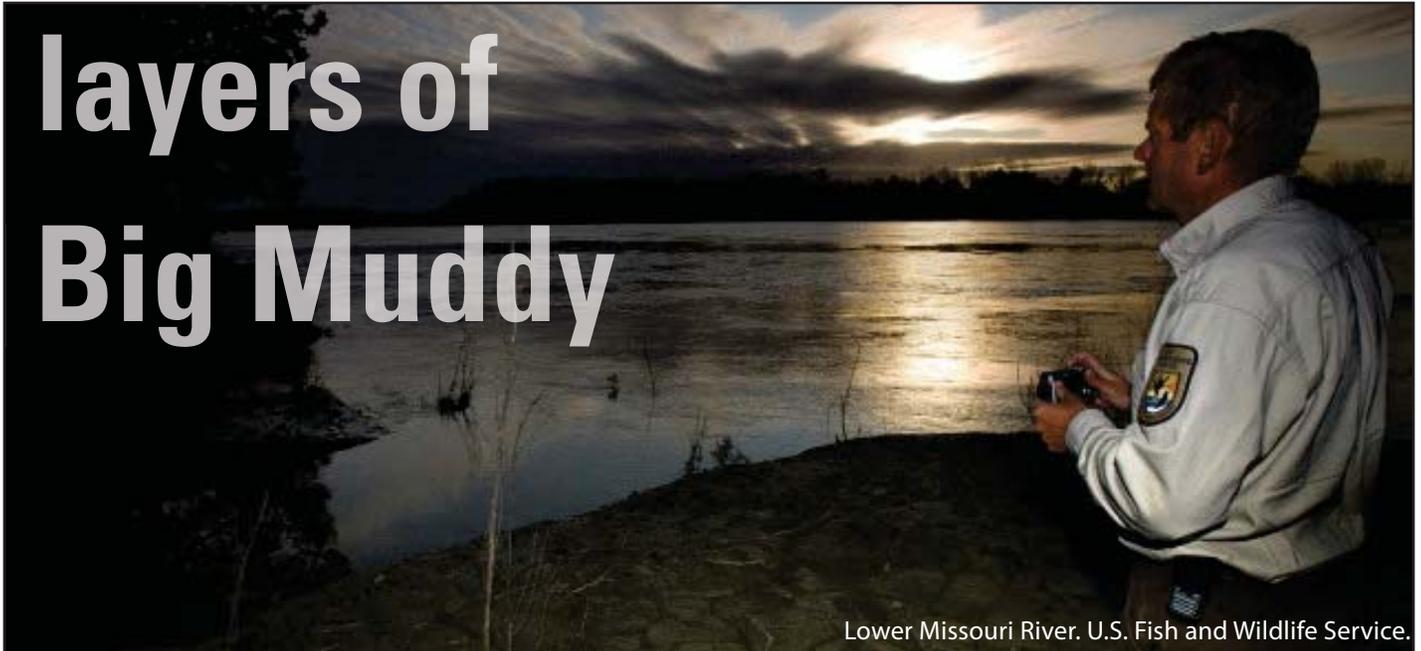


Turtle-sniffing canines. Sarabeth Klueh, Indiana Department of Natural Resources.

***“This translocation project could be very significant in terms of species conservation, reintroductions and land use, and provide data and information needed related to land resources of reclaimed mining habitat and potential reintroduction methods as a tool for species conservation,” said Sarabeth Kuhn, non-game herpetologist with the Indiana Department of Natural Resources.***

# Uncovering the hidden

# layers of Big Muddy



Lower Missouri River. U.S. Fish and Wildlife Service.

The lower Missouri River, the largest free-flowing river reach in the United States, encompasses nearly 1.5 million acres of bottomland habitat for fish, wildlife and plants, while providing commercial transportation and recreation opportunities for communities across our nation's heartland.

Two centuries ago, the lower Missouri River, nicknamed the Big Muddy, flowed through a series of braided channels creating a dynamic riverine and floodplain habitat that traversed across a mile-wide floodplain in some areas. But more than 200 years of urban development, flooding, agricultural expansion and human exploitation for navigational, recreational and commercial use have permanently altered the river's character.

Conservation forces across federal, state and non-governmental agencies and organizations are committed to uncovering layers of Big Muddy's past to set a course for future restoration and management of this regulated, yet untamed river system.

The method uses hydro-geomorphic characterization, or HGM, a landscape-scale analytical technique that has been

applied across major North American river systems including portions of the Colorado, Arkansas and Mississippi rivers, to help managers preserve existing and restore potential fish and wildlife habitat. Now, researchers aim to use the process to inform more effective conservation and management across 670 miles of the Missouri River from Decatur, Nebraska to St. Louis, Missouri, as part of the Lower Missouri River Hydro-geomorphic Restoration and Management Project.

Natural resource researcher and private consultant Dr. Mickey Heitmeyer is leading the effort to pull together quantitative data on the hydro-geomorphic attributes of the lower Missouri River prior to European settlement.

"We want to know how the Missouri River was formed, its shape, characteristics of the floodplain, and how that has changed over time," Heitmeyer said.

Today, the lower Missouri River is highly influenced by upstream reservoirs and flow regulation that dramatically affect the river's physical and ecological functions. These alterations pose significant challenges for

humans that live and make their livelihood from the river, as well as for the maintenance and protection of wildlife habitat.

Engineers and ecologists are working alongside Heitmeyer to analyze both historic and contemporary information about physical features of the lower Missouri River, ranging in scale from site-specific tracts on national wildlife refuges to large watersheds and floodplains.

"We are gathering the data in layers, piecing together the geology, soil structure, topography, and finally, the hydrology of the river. What was the nature of the river before it was altered, including its dynamics, and seasonal and long-term patterns?" Heitmeyer said. "Once we have that data, we map it, layer over layer, and compare it to current day conditions."

The U.S. Fish and Wildlife Service's (USFWS) Division of Biological Resources partnered with the Eastern Tallgrass Prairie and Big Rivers Landscape Conservation Cooperative (LCC) and Plains and Prairie Potholes LCC to co-fund the project. The Division of Biological Resources provides robust, defensible and transparent scientific information and

# *Understanding hydrogeomorphic history to restore, manage and protect the lower Missouri River*

assistance to the National Wildlife Refuge System, while LCCs are partnerships that seek to bridge the gap between science and natural resource management.

“This is a partnership that we are very proud of and we feel reflects the overlap of landscape scale conservation priorities between the National Wildlife Refuge System and the LCCs,” said Josh Eash, USFWS regional refuge hydrologist.

The research will not only benefit refuge managers, but will also provide valuable data that can be used by managers across a broad spectrum of publicly and privately owned lands throughout the floodplain.

“We want to ensure the Big Muddy remains home to vibrant and diverse fish and wildlife species, while continuing to benefit future generations of river communities,” said Rick Nelson, coordinator of the Plains and Prairie Potholes LCC. “By bridging the science behind the lower Missouri River landscape with all types of land managers, we can work toward more objective and scientifically sound conservation of this dynamic natural resource and the fish, wildlife and people it supports.”

Nelson and Eash agree that taking a landscape scale approach to conservation efforts and management decisions is crucial to addressing long-term natural resource challenges, from impacts of climate change to shifts in agricultural practices. Through this collaborative effort, land managers within the lower Missouri River floodplain can visualize the river in its pre-settlement state to help set conservation and management objectives for the future.



Overton overlook, Big Muddy National Fish and Wildlife Refuge. U.S. Fish and Wildlife Service.

“If we know the geology, the soils, elevations, and flooding patterns, then we can get a sense of what plant communities were historically there, what attributes caused them to be there, their distributions, and what physical features caused them to be sustained over time,” Heitmeyer said.

Refuge managers like Tom Bell of the Big Muddy National Fish and Wildlife Refuge in Missouri, are anxious to use results from the project to help inform restoration and acquisition actions for the refuge.

“This research will allow us to look at subsurface maps of ancient Missouri River features within the floodplain,” said Bell. “We will physically be able to see where surface topography will either promote or hinder wetland restoration, so we’ll be able to make better decisions on restoration activities and locations.”

Big Muddy National Fish and Wildlife Refuge, with units dotting portions of the Missouri River from St. Louis to Kansas City, was established following the flood of 1993 when private landowners sold more than 16,000 acres of floodplain for permanent protection to the federal government. The USFWS has approval through Congress to acquire up to 60,000 acres of floodplain and adjacent land on the Missouri River between St. Louis and Kansas City.

“We have the opportunity to get ahead in our strategic planning for restoration and acquisition of lands for the refuge, rather than learning by trial and error as we have done in the past,” said Bell. Heitmeyer said that managers at national wildlife refuges and wetland management districts will be able to zoom into specific tracts of land to

visualize historic hydrogeomorphic traits and overlay that visual with present-day conditions. “By visualizing the historic vegetation, natural resource managers can also determine, by default, the animal communities that were historically supported there,” he said.

Tom Cox, refuge manager at DeSoto National Wildlife Refuge, which straddles the Iowa-Nebraska border, said Missouri River refuges are home to a broad spectrum of floodplain-dependent fish and wildlife species.

“That’s why science-based decisions about land acquisition, and restoration and management is critical to how we do business in the future,” Cox said. Cox plans to use the results of the Hydro-geomorphic Restoration and Management Project to help plan restoration activities that benefit existing wildlife populations on the refuge, and have the potential to augment habitat for species in decline.

“When I came to DeSoto we were looking at serious declines in waterfowl numbers, a drop as much as 75 percent over historic long range numbers,” Cox said. “We have thousands of acres of hydric soils, so we are using wetland restoration as a key tool to bring back the ducks, and a host of other species from secretive marsh birds to shorebirds.”

Floodplains are also important spawning sites for numerous native big river game and non-game fish species, including the federally endangered pallid sturgeon. Natural and man-made channels also benefit resident and migratory shorebirds



Missouri River freshwater mussels. U.S. Fish and Wildlife Service.

and waterfowl, including the federally listed piping plover and interior least tern, which utilize sandbars for nesting, breeding and foraging.

Cox explains that shifts in agricultural practices over time on surrounding refuge lands have changed the diversity of wildlife on the refuge. “We know that we will never be able to restore the natural ecosystem as it existed in the past because of artificial manipulation of water levels, so we have to be more strategic and creative in our wetland restoration efforts,” he said. “The hydro-geomorphic study can open our eyes and give us a range of options for restoration activities.” Wetland restoration on the refuge has contributed to a four-fold climb in waterfowl populations over the past decade.

Refuges that adjoin stretches of the river are also common destinations for visitors from the Midwest and across the U.S. Birders, wildlife photographers, nature enthusiasts and hunters and anglers alike, frequent Missouri River refuges during spring and fall bird migrations and hunting and fishing seasons.

“Our management decisions on the refuge impact more than just wildlife. Our job is to help sustain fish and wildlife populations and protect habitat for declining species, but, we also recognize the economic and intrinsic value of these natural resources,”

Cox said. “Healthy habitats for fish, birds and other wildlife contribute to local economies by providing outdoor recreation activities enjoyed by many people.”

Boyer Chute National Wildlife Refuge in eastern Nebraska and Squaw Creek National Wildlife Refuge in northwest Missouri, also positioned along the lower Missouri River corridor, will also be able to use mapping tools developed by the Hydro-geomorphic Restoration and Management Project to inform acquisition and restoration activities in relation to contemporary flood control, reservoir regulations, policies, and other management considerations impacting refuge and surrounding lands.

The reality, as Heitmeyer, Bell and Cox attest to, is that returning river habitat to pre-settlement condition is simply not feasible under these current environmental conditions and stressors.

“So the final step in the process is evaluating management or restoration options in the current, real-world environment,” Heitmeyer said. “We have forests, ditches, levees, roads and other impediments to restoration that land managers must consider, in addition to the economic considerations of land-use.”



Environmental education. U.S. Fish and Wildlife Service.

Despite the dynamic changes experienced by the Big Muddy over the last two centuries, project partners are optimistic about the restoration and management potential of this landscape approach to data collection and research. By bridging the gap between science and natural resources management along the Big Muddy, land managers can more successfully protect, manage, conserve and restore portions of this biologically diverse, economically significant, and ever-changing river system.

“This is really where the rubber meets the road. We are forming a template for refuge managers to make decisions about restoration projects and species conservation efforts in light of historical and contemporary conditions,” Heitmeyer said. “By doing this from St. Louis to Omaha we are thinking about the entire

***“This is really where the rubber meets the road. We are forming a template for refuge managers to make decisions about restoration projects and species conservation efforts in light of historical and contemporary conditions,” Heitmeyer said.***

system and will get a sense of an entire stretch of river at a landscape scale. Our job is to put the refuge in the right context relative to the whole region.”

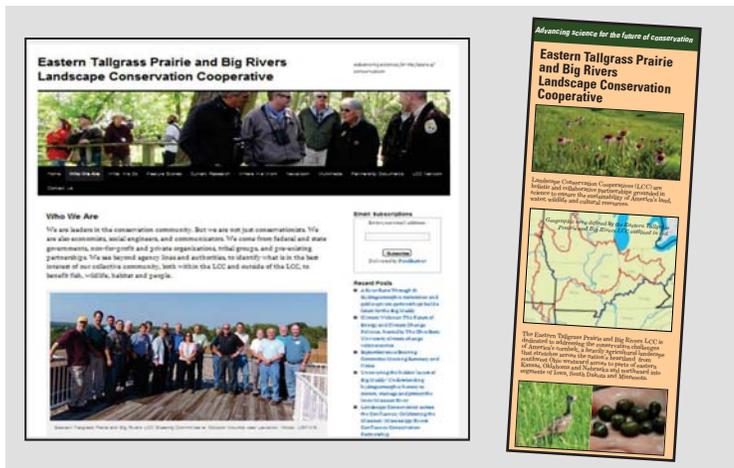
The lower Missouri River Hydro-geomorphic Restoration and Management Project received \$100,000 in funding from the Plains and Prairie Potholes LCC and Eastern Tallgrass Prairie and Big Rivers LCC, and, an additional \$150,000 from the USFWS Division of Biological Resources. The project is anticipated to take 2.5 years to complete.



During the extended flood of 2011, flood waters seeped into farmlands which were once historic channels of the Missouri River. Results of this hydrogeomorphic research will help land managers identify areas readily connected to the river that could provide critical shallow water habitat for a diverse range of aquatic animals from freshwater mussels to the federally endangered pallid sturgeon. U.S. Fish and Wildlife Service.

# Our Reach

Visit [www.TallgrassPrairieLCC.org](http://www.TallgrassPrairieLCC.org) to sign up for updates on LCC activities and announcements.



The Eastern Tallgrass Prairie and Big Rivers LCC is poised to provide science needs from the perspective of land, resource and conservation decision-making and provide support to partners to carry out pragmatic conservation actions. Communication is key to building the collaboration required for achieving LCC goals.



Steering committee members. U.S. Fish and Wildlife Service

In 2012, the Eastern Tallgrass Prairie and Big Rivers LCC welcomed the addition of a public affairs specialist to assist with strategic communications for the partnership. As a result, the LCC developed a comprehensive strategic communications plan, initiated communications requirements for research proposals funded by the LCC, and developed an external partnership Web site. Standardized templates for outreach products including banners, news releases, posters and fact sheets are available to promote the LCC. Effective communications will continue to be a high priority for the LCC and its partners, as the LCC builds its outreach capacity and strategizes ways to share research results with decision makers, land managers, policy-makers and other on-the-ground conservation interests.

# 2012 Engagements

LCC staff engaged in nearly 30 presentations and formal discussions over the past year with organized conservation agencies, organizations, groups and partnerships. These in-person engagements with members of internal and external conservation agencies and organizations expanded foundational knowledge about the LCC's goals and ongoing activities and provided a venue for two-way dialogue about natural resources priorities, challenges and opportunities. Below is an abbreviated sample of LCC staff engagements in 2012.

## January - August

The Nature Conservancy, Arlington, VA

Association of Fish and Wildlife Agencies, Washington, D.C.

Southern Indiana Conservation Cooperators, Muscatatuck National Wildlife Refuge, IN

North American Wildlife and Natural Resources meeting, Atlanta, GA

National LCC workshop, Denver, CO

U.S. Fish and Wildlife Service Fisheries Program, Minneapolis, MN

Gulf Coast Plains and Ozarks LCC steering committee meeting, Spanish Fort, AL

Northeast Climate Science Center listening session, Champaign, IL

LCC steering committee meeting, Springfield, IL

Midwest Association of Fish & Wildlife Agencies, Wichita, KS

## September - December

Chicago Wilderness executive council meeting, Chicago, IL

Midwest Regional Climate Center, Climate Services workshop, Champaign, IL

National LCC coordinators workshop, Lafayette, LA

Prairie Reconstruction workshop, Des Moines, IL

State Wildlife Action Plan Urban Coordination meeting, Chicago, IL

Midwest Fish & Wildlife Conference, LCC symposium, Wichita, KS

LCC Steering Committee retreat, Dickson Mounds, IL

U.S. Fish and Wildlife Service Surrogate Species workshops, IN, MO, MN

NOAA Midwestern Regional Climate Center, Bloomington, IN

Environmental Attorney continuing credit presentation, Chicago, IL

Indiana University, Bloomington, IN

Missouri Dept of Conservation, Jefferson City, MO

Illinois Dept of Natural Resources, Springfield, IL

Hydrogeomorphic project update meeting, Kansas City MO

State Wildlife Action Plan urban coordination meeting, Chicago, IL

U.S. Fish and Wildlife Service Partners for Fish and Wildlife Program, Bloomington, IN

U.S. Fish and Wildlife Service Ecological Services/ Environmental Contaminant, Minneapolis, MN

# Our Future

Over the next six months, the LCC plans to execute immediate actions to work with the conservation community to establish detailed work plans and guidance for future project support.

We kick off a new calendar year with a steering committee gathering in January 2013 in Dubuque, Iowa. Goals for this meeting are to continue refining a dynamic strategic plan and begin developing annual work plans for the three focal areas already agreed upon by the steering committee.

We will establish roles, responsibilities and invite representatives to participate in science core teams and topical advisory groups. A small science core team representing technical expertise in three key areas (restoration of prairies and river ecosystems; agroecology; and urban rivers) will identify and evaluate the science needs of on-the-ground managers, drawing from input by a wide range of stakeholders.

When the steering committee or science core team has identified a high-priority issue, action, or product, they may form a topical advisory group to conduct discussions and prepare recommendations for consideration. Topical advisory groups may carry out tasks as needed. These groups may be permanent or may disassemble when an issue is resolved or a product completed.

We will seek out ways to expand our reach by complementing successful Department of the Interior initiatives like America's Great Outdoors and by supporting ongoing work in conjunction with existing collaborations, such as the Migratory Bird Joint Ventures and National Fish Habitat Partnerships.



Eastern tallgrass prairie. U.S. Fish and Wildlife Service.

We will continue building our communications capacity by capitalizing on the communications expertise embedded within our own respective partner agencies and organizations.

We will stay engaged in the selection and implementation of surrogate species in partnership with the U.S. Fish and Wildlife Service. Our LCC is working alongside the U.S. Fish and Wildlife Service's Midwest Region, assisting in hosting workshops in Minnesota, Illinois and Indiana with Service staff and partners while continuing to develop a systematic process for surrogate species selection across the region.

The LCC will prepare an initial science needs assessment by leveraging the knowledge and process of existing groups where possible and fostering new associations to fill any gaps in collaboration. These activities may include:

1) Restoration - Building on participation in a Structured Decision Making workshop

for Prairie Reconstruction which identified the information gaps within the phases of prairie site selection, preparation, planting, and maintenance.

2) Agroecology - Generating conversations with the MAFWA Private Lands Committee, NRCS state technical committees, extension, producer organizations, and others to identify science needs in delivering wildlife conservation on-the-ground through Farm Bill and similar incentive programs.

3) Urban rivers - Facilitating collaboration and identification of science needs between state agencies that are updating their State Wildlife Action Plans and urban conservationists who are developing or considering green infrastructure plans in metropolitan areas throughout the LCC region, possibly working with Chicago as a pilot location for cross-jurisdictional planning and implementation.



[www.TallgrassPrairieLCC.org](http://www.TallgrassPrairieLCC.org)



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