20th Annual Emiquon Science Symposium

Session 1: 9:05 AM

Illinois River Program Updates: Emiquon and Merwin Preserve at Spunky Bottoms

Randy Smith
The Nature Conservancy

TNC staff and partners were busy in 2025 with a variety of events, scientific research, and management actions. We'll review key activities from 2025, provide an update on construction of a new water control structure at Spunky Bottoms and discuss plans for 2026 at both preserves, such as water level management, monitoring and science, stewardship, and other activities.

Status of Fisheries and Aquatic Vegetation Communities at the Emiquon Preserve in 2025

Toby Holda and Jim Lamer
Illinois River Biological Station

The Illinois River Biological Station (IRBS) has monitoring the fish and aquatic vegetation communities at The Nature Conservancy's Emiquon Preserve since 2007. Fisheries monitoring has been monthly from April-October and has followed the U.S. Geological Survey's Upper Mississippi River Restoration program's Long Term Resource Monitoring (LTRM) methods for backwaters. Aquatic vegetation monitoring has occurred at least during the peak growing season and followed two methods over the years: an LTRM rake method, and a box sampling method. Recent years have seen declines in water clarity and vegetation coverage, as well as condition and catch of some piscivores. In the last two years, aquatic vegetation densities have begun to recover, but are still low compared to high-abundance years. Fish communities are also showing undesirable shifts in piscivores in the past few years, however sunfish diversity has increased. There is also evidence of increasing populations of very large fish species such as alligator gar and flathead catfish. Current questions center on causes and ecological impacts of aquatic vegetation abundance, water column turbidity, abundance of invasive fishes, and increasing abundances of some native fishes.

Distributions of Trematode Parasites in Central Illinois and Implications for Frog Populations

John A. Marino, Jr., Grace Crull, Natalie Lopez, Jessica Guyton, Kiernan Robinson, Alayna Rosales, and Pam Taylor
Bradley University

Wildlife populations encounter a diverse suite of parasites in their habitats, and environmental changes are influencing host-parasite interactions. As parasite infection can significantly affect host fitness, such shifts in host-parasite interactions may have important consequences for wildlife population dynamics and community structure. However, parasites of many wildlife and

influences of key environmental factors are understudied. Our research focuses on the community of trematode parasites in aquatic snails and larval frogs (tadpoles) in Central Illinois. To gain a better understanding of parasite communities in this region, we have performed a field survey in local wetlands since 2017. We have also performed experiments to evaluate effects of environmental factors, such as rising atmospheric concentrations of carbon dioxide, on amphibian-trematode interactions. Field survey results reveal a diverse community of trematodes, including important pathogens of amphibians, such as *Echinostoma revolutum*, which infects frog kidneys and reduces kidney function, and *Ribeiroia ondatrae*, which can cause limb deformities in developing frogs. Prevalence of trematode infection in both snails and amphibians varied among wetlands and was associated with variation in land use and water chemistry (dissolved oxygen and nitrate concentrations). Experiments have revealed that shifts in environmental conditions may be influencing host-parasite interactions in these wetlands. For example, we found that elevated carbon dioxide concentrations can reduce tadpole growth, survival, and immune function, and current work is exploring consequences of rising carbon dioxide for trematode infection levels in tadpoles. Our findings enhance our understanding of an understudied component of wetland ecosystems and have important conservation implications in light of ongoing concerns regarding amphibian populations and environmental change.

Session 2: 10:15 AM

Emiquon Visitor Insights and Management Implications

Courtney L Schultz[1], Jason Beverlin[2], & Maria Lemke[2]
[1]Health & Technology Partners
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From 2023–2025, Emiquon has participated in a multi-year visitor use evaluation to develop a systematic, data-driven approach to understanding and managing recreation. Using onsite surveys administered across peak and non-peak seasons and an online non-visitor survey, the project examined who visits Emiquon, why they visit, and how visitor experiences relate to awareness of and support for conservation and restoration efforts. Key findings indicate that visitors are primarily motivated by nature-based experiences and place-based qualities of Emiquon, report high levels of satisfaction and perceived personal benefits, and demonstrate strong baseline support for conservation goals while also revealing opportunities to strengthen interpretation, communication, and pathways for deeper engagement.

In 2026, Emiquon will begin implementing management and engagement strategies informed by these findings. Planned actions include refining visitor communication and interpretive messaging, aligning infrastructure and access decisions with visitor use patterns, and developing targeted engagement approaches for distinct user groups. Together, these strategies are intended to enhance visitor experiences while more intentionally connecting recreation to conservation outcomes, supporting both stewardship and long-term restoration goals at Emiquon.

Building on the success of this project, TNC is expanding the visitor use survey framework to multiple additional sites across the Midwest Division. This expansion will allow for comparative analysis of visitor characteristics and experiences across sites, support consistent and outcomes-

focused visitor management practices, and provide TNC with a scalable tool for balancing public access, visitor experience, and conservation objectives throughout North America.

Mounds and Meaning: Earthworks, landscape and connection

Logan Pappenfort
Illinois State Museum-Dickson Mounds

Since time immemorial, Native peoples have lived in reciprocity with the landscape of Emiquon. Among the most visible markers of their enduring presence are the earthworks colloquially known as mounds—or, as the Inohka (Illinois Confederacy) called them, *pihkwaahkia*. These structures serve as an ever-present reminder of a deep, ancestral connection to the land.

This presentation explores the diverse types of earthworks found in the valley, their construction methods, and their multifaceted uses. Told from an Indigenous perspective, the session addresses the large-scale devastation of these monuments and argues for their preservation through a lens of respect and gratitude. Additionally, we will examine contemporary Tribal interpretations of these sites and the ongoing efforts to document and protect these vital cultural resources.

Envisioning Emiquon as a Traditional Cultural Landscape

Brooke M. Morgan
Illinois State Museum

Emiquon and the surrounding environs have been significant to Native American life for at least twelve millennia, as evidenced through numerous camp sites, villages, and burial grounds located throughout this portion of the Central Illinois River Valley. These include three archaeological localities listed on the National Register of Historic Places. Beyond the physical remnants of Indigenous occupation, Emiquon itself is a sacred place that is laden with meaning by people with deep connections to and reciprocity with the land. This paper proposes that Emiquon qualifies as a traditional cultural landscape, which is a large-scale locality of historical and ongoing significance to Indigenous people. It offers suggestions on how conceptualizing Emiquon as a traditional cultural landscape may enhance ecological restoration efforts and open new pathways for partnerships and education.

Session 3: 11:25AM

Motus: Using Radio Telemetry to Advance Our Knowledge of Animal Movements in the Midwest

Mike Avara and Mike Ward
University of Illinois at Urbana-Champaign

While radio telemetry is a tool ecologists have used to study wildlife movement for the past few decades, the development of a collaborative network of antennas and projects across the western hemisphere (Motus) is advancing the data we can collect on the movements of migratory species. This talk will provide an overview of Motus, its current use and presence in Illinois, and

examples of some of the data that has been collected to address scientific questions related to movement ecology.

Co-producing King Rail Science—Working together across geographies and projects

Auriel M.V. Fournier, Jess Novobilsky, Anne Puchalsky, Jason McCallie, Karen Rowe, and Caleb P. Roberts
Forbes Biological Station

King Rails are a state listed marsh birds in most states, other than gulf coast states, within the Mississippi Flyway. King Rail populations are experiencing multiple decade long declines, especially in the Midwest and Great Lakes where all individuals are migratory. King Rails have a split migration strategy where some individuals migrate, and some are fully resident along the Gulf Coast. Our work has been a close collaboration between the Arkansas Game and Fish Commission, the USGS Arkansas Cooperative Fish and Wildlife Research Unit and Forbes Biological Station to understand the migration status and nesting ecology of King Rails in southeastern Arkansas at a site where they are thriving, with the goal of applying what we learn to expand the abundance and distribution of King Rails across the Mississippi Alluvial Valley. This poster will focus on how we have taken the co-production model we used within Arkansas and used it to build larger collaborations across the flyway including starting new work in the Midwest.

Return of the Osprey: Progress from the Illinois Hacking and Recovery Effort

Tih-Fen Ting
School of Integrated Sciences, Sustainability and Public Health, University of Illinois Springfield

Ospreys (*Pandion haliaetus*) were listed as endangered in Illinois in 1977 and reclassified as threatened in 2020. Following national population increases associated with the ban on organochlorine pesticides and the expansion of hacking programs, Illinois initiated its own hacking effort in 2013. From 2013-2025, 142 chicks sourced from three populations—primarily the Chesapeake Bay and the South Coast Osprey Project (Westport River, MA)—were hacked at two central Illinois sites. Ten hacked individuals have been confirmed returning to the hacking region to breed or attempt to breed, with additional returns documented in Kentucky and Indiana. During the same period, statewide confirmed breeding pairs increased from 16 (2013) to 134 (2025). More than 58% of 2025 pairs occurred in Cook County and adjacent collar counties, where over 65% of nests were located on cell towers or utility poles; tower use (38 nests) exceeded nest platform use (19 nests). These patterns underscore both the specie's recovery trajectory and the potential for emerging human-wildlife conflict potential in densely populated regions. Continued hacking in rural central Illinois remains critical for establishing self-sustaining populations statewide. Concurrent statewide nest surveys, initiated systematically in 2025, are documenting fledgling production to assess reproductive performance across the state. These data will be incorporated into a Population Viability Analysis (PVA) to evaluate long term persistence and inform future decisions regarding potential delisting of ospreys in Illinois.

Poster Session 3: 11:45AM

Using Autonomous Recording Units (ARUs) to Detect Waterfowl Harvest Opportunity

Therin Bradshaw
Forbes Biological Station

Autonomous Recording Units (ARUs) have historically been used to collect audio recordings of wildlife activity and often quantified using audio detection software to identify specific audio signatures or features that indicate the presence or absence of wildlife species. For this project, we are using ARUs to record audio from wetlands known to have autumn waterfowl hunting, while using audio detection software to identify shotgun blasts. These data are then used to indicate the number of shotgun clusters (volleys) detected at each ARU for each day. This offers the possibility to passively measure the number of shotgun volleys, an indicator of harvest opportunity, where a shotgun volley event represents an event when a hunter overlaps with waterfowl and fires a shot. By measuring harvest opportunity in this way, we are able to expand our collection method across the larger landscape and potentially start answering questions of what management practices and wetland site characteristics increase the opportunity for waterfowl harvest.

Therkildsen Field Station's Programs at the Emiquon Preserve

Christa Christensen
Therkildsen Field Station at Emiquon

The UIS-Therkildsen Field Station at Emiquon provides researchers and students of all ages with the opportunity to study, explore, and learn from this unique floodplain restoration project. We believe in connecting participants with their environment through active, experiential learning. Since 2024, TFSE has enhanced its field trip opportunities for high school students and adult life-long learners, expanded its public programming offerings, expanded its reach into the surrounding rural communities with outreach programs, and developed and implemented a new Artist in Residence program. In just a short time, TFSE has seen a dramatic increase in its public engagement levels.

Nesting Ecology of Secretive Marshbirds at Emiquon Preserve

Andrew Gilbert, Joshua M. Osborn, Christopher S. Hine, and Auriel M.V. Fournier
Illinois Natural History Survey

We monitored the nesting ecology of secretive marshbirds at Emiquon Preserve during May through August of 2013–2025. We randomly selected 965 locations over the 13-year period within distinct vegetation communities (e.g., persistent emergent and hemi-marsh) likely to be used for nesting and searched a 25-meter buffer around each point for nests. All nests located within search areas and others located incidentally were monitored weekly until terminated (i.e., hatched, destroyed, abandoned). We calculated nest success using the Mayfield estimate of daily nest survival, and nest densities (nests/ha) for each vegetation community sampled. We found

725 active waterbird nests comprised mostly of least bitterns (n = 213), common gallinule (n = 204), black-crowned night herons (n = 141), American coots (n = 59), and black-necked stilts (n = 52). Annual nest survival estimates across all species, years and vegetation communities averaged 38.0%. Nest survival was highest for green heron ($\bar{x}$ = 60.8%), black-crowned night herons ($\bar{x}$ = 55.3%), least bitterns ($\bar{x}$ = 51.3%), and pied-billed grebes ($\bar{x}$ = 43.1%). Annual waterbird nest densities averaged 1.7 nests/ha across all species and vegetation communities.

Building better wetlands: Nitrogen reduction and phosphorus sequestration of constructed wetlands receiving tile drained waters from agricultural systems in the Midwestern U.S.

Krista Kirkham[1], David Kovacic[2], Michael Wallace[2], Jill Kostel[3], Jacob Berkowitz[4], Christine Van Zomeren[4], and Maria Lemke[1]
[1]The Nature Conservancy
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[3]The Wetlands Initiative
[4]USACE Engineer Research and Development Center

Wetlands provide valuable ecosystem services and many economic benefits to communities. Unfortunately, much of the original wetland habitat in the United States has been lost. In Illinois, over 90% of original wetland acreage has been converted for urbanization and agriculture. Approximately 39% of Illinois' agricultural acres are tile-drained, emphasizing the importance of edge-of-field practices to help reduce nutrient contributions to downstream watersheds. The Nature Conservancy, University of Illinois, and the Franklin Family have partnered since 2005 on the 101-hectacre Franklin Research and Demonstration Farm (FRDF) in Lexington, IL. This farm showcases various agricultural conservation practices, including sequential constructed wetlands that represent 3%, 6%, and 9% of farm drainage areas. Twelve years of water quality analysis demonstrate that the wetlands removed an average of 15%-57% of nitrate-nitrogen and 32%-95% of dissolved phosphorus loadings from tile drainage waters. Since the phosphorus (P) cycle lacks an atmospheric removal pathway, the capacity of wetlands to sequester P often decreases over time as the availability of soil sorption sites declines. US Army Corp of Engineers soil scientists evaluated the P sorption capacity of the FRDF treatment wetlands and found that the wetlands sequestered P, with water soluble P displaying significant decreases in sequential treatment cells (61.0 – 81.7% reduction). Soil P sorption capacity increased in the direction of treatment water flow as anticipated but varied significantly between treatment wetlands with soils ranging from P sinks to potential P sources. The Nature Conservancy and collaborators have also partnered with several other central Illinois landowners to install constructed wetlands for cropland drainage treatment utilizing USA Farm Bill programs. Our goals were to support landowner outreach while improving wetland engineering, operation and maintenance, and water quality monitoring. Our collective aim is to support conservation professionals and landowners that install constructed wetlands to ensure wetland functionality and longevity.

Investigating the impacts of land use on aquatic biodiversity within an agricultural watershed using environmental DNA

Jenna Benson, Gwen Church, Katelin Meek, and Kara Andres
Illinois State University

Biodiversity within riverine systems is crucial for the ecosystem's health and function, yet many of these ecosystems are being disturbed through increased human impacts, threatening the biodiversity within. While the general patterns of decreased biodiversity within riverine systems are well documented, little is known about how biodiversity across multiple taxonomic groups responds to land uses in the surrounding watershed. The Mackinaw River watershed is home to a vast majority of biodiversity in central Illinois. While many nature preserves are contained within this watershed, there is also significant disturbance from copious corn and soybean farms in the surrounding watershed. Environmental DNA (eDNA) can be used to efficiently measure the biodiversity and taxonomic composition of multiple species groups through sampling traces of DNA shed by organisms into the surrounding environment. In this study, we used eDNA metabarcoding to assess alpha and beta diversity across taxonomic groups at sites spanning a gradient of agricultural land use along the Mackinaw River watershed in central Illinois. To assess land use, we created a GIS map with 5-km buffers around each eDNA sampling site and applied a land use raster map to determine agricultural impact. We assessed biodiversity using eDNA metabarcoding with 12S and 18S primers to target fishes and eukaryotes, respectively. Our results revealed that alpha diversity of fishes was significantly higher in slightly and moderately disturbed sites, while eukaryotes were the most diverse in highly disturbed sites. Beta diversity among sites was high for both species groups. These findings demonstrate how land use in the surrounding watershed can impact the biodiversity of aquatic organisms across different taxonomic groups, providing important insights into potential conservation strategies to sustain the biodiversity of freshwater systems.

Biodiversity Monitoring in Restored Wetlands Using Environmental DNA (eDNA)

Gwendolyn Church and Kara Andres
Illinois State University

The Illinois River floodplain is home to multiple managed and restored wetlands of ecological importance, including the Merwin Preserve at Spunky Bottoms and the Emiquon Preserve. Monitoring efforts in the restored Emiquon wetland have been carried out over multiple decades while active restoration via a water control structure at Spunky Bottoms will commence this coming spring. Over the course of one year, we will collect environment DNA (eDNA) samples in both wetlands and use eDNA metabarcoding to gain an understanding of how the aquatic biodiversity of these watersheds' changes over time and space. eDNA metabarcoding is non-invasive, cost-effective, and efficient in sampling habitats that may be difficult to sample with traditional methods, allowing us to simultaneously detect species diverstiy and composition across multiple species groups including fishes and macroinvertebrates. eDNA samples will be taken at Spunky Bottoms before and after the completion of the water control structure to determine how the species' composition changes with active management efforts. This will provide data on the success of the restoration as well as whether native or invasive aquatic species are utilizing the wetland. Samples will also be collected at Emiquon preserve, which will

allow for a comparison of the aquatic communities of Illinois River floodplain wetlands across different levels of management. This study will allow for a better understanding of how biodiversity responds to the restoration of degraded floodplain wetlands. eDNA metabarcoding has also been underutilized in floodplain wetlands and this study will provide further data on the effectiveness of eDNA sampling in Midwestern wetlands.

Using Call Surveys to Characterize Frog Communities in Banner Marsh

Helen Ratchford, David Estrada, and John Marino
Bradley University

Amphibians are known to be key indicators for freshwater ecosystem health due to their sensitivity to environmental stressors such as pollution, temperature fluctuations, and sedimentation. They also play important ecological roles by regulating trophic dynamics and nutrient cycling across aquatic and terrestrial systems. Banner Marsh State Fish and Wildlife Area in central Illinois was previously used for agriculture and surface coal mining, making it a valuable site for evaluating amphibian responses to wetland restoration. To characterize the frog community within Banner Marsh, six call surveys were conducted during spring 2025 from March to May at two sites. Data for weather conditions were also collected on each date. Results revealed distinct temporal and spatial patterns in frog call activity at the sites. Overall call intensity was low in early March, increased through April, and peaked in late April, before declining in May, and calling activity differed between sites. *Pseudacris triseriata* (Western Chorus Frog) and *Acris crepitans* (Northern Cricket Frog) were detected early in spring, *Hyla versicolor* (Gray Treefrog) showed high activity towards the middle, and *Rana pipiens* (Northern Leopard Frog) emerged as the more dominant caller in mid-April. These patterns align with known temperate amphibian phenological patterns. Based on these patterns, habitat characteristics at our sites provide suitable conditions for breeding. This study establishes a baseline for long-term frog community monitoring at Banner Marsh and nearby areas and helps show the value of amphibian acoustic monitoring in assessing restoration success. Further research should also take into account water quality and vegetation surveys to better understand why the frog communities differ between the sites.

Drone-Based Assessment of Muskrat Density and Recolonization Potential at Emiquon

Chun (Jessica) Cheng, Noelle Grabowski, and Guillaume Bastille-Rousseau
Southern Illinois University – Carbondale

Muskrats (*Ondatra zibethicus*) are medium-sized semiaquatic rodents native to North America and widely distributed across the continent. Historically, muskrats were the most harvested wild furbearer in North America during the 20th century and remain economically important to trappers. However, several indicators suggest widespread declines in Midwestern muskrat populations, likely driven by wetland degradation, habitat loss, and broader landscape change. These declines have prompted regulated trapping in Illinois since 2011, while continued agricultural expansion has further limited suitable habitat. Declining muskrat populations increase the need for effective assessment methods of the species. Muskrat abundance is most often estimated through hut counts obtained via ground and manned aerial surveys in wetland habitats. Unmanned aircraft systems (UAS), or drones, are an emerging tool for wildlife research

and management that may serve as more efficient and less expensive alternative to traditional survey methods. This project will evaluate the use of drones as an application for assessing muskrat abundance based on hut counts throughout the state of Illinois. Given its history of muskrat activity, The Emiquon Preserve will serve as a key site for testing the effectiveness of this drone-based survey method. Increased agricultural activity in the Midwestern United States has resulted in the loss of nearly 98% of natural wetlands, severely limiting suitable semiaquatic habitat for muskrats. Consequently, muskrat recolonization now depends largely on restored floodplain systems. The Emiquon Preserve restoration, initiated in 2007, included extensive monitoring of aquatic vegetation and fish communities to reestablish habitat for native wetland fauna. Although restoration trajectories in floodplain wetlands can be non-linear, early post-restoration conditions often provide critical windows for species establishment. This multi-year project aims to assess muskrat recolonization potential at Emiquon by trapping, tracking, and monitoring survival, which brings insights into how restored prairie floodplains can support semiaquatic mammals and guide adaptive wetland management.