

# 15<sup>th</sup> Annual Emiquon Science Symposium

(presenting author in **bold**)

## Session 1

### **Spring 2021 update on Emiquon hydrology**

**K. Douglas Blodgett** and Sally McClure

The Nature Conservancy

In 2020, we used Emiquon's water control structure to create a more natural hydrology in the wetland by discharging water to the Illinois River during summer and to flood wetland vegetation in late fall, as well as for an initial assessment of a fish ladder. We initiated pumping for a drawdown 9 June. Discharge combined with evaporation, plant transpiration, and minimal precipitation, resulted in net reductions of 4.5 feet, 2817 acres (-63%), and 4.7 billion gallons (-76%) by 6 August. Then mostly through evapotranspiration and with limited precipitation, water continued to drop another 0.5 foot by 10 November. On 23 November, we opened the structure allowing river water into the preserve to flood moist soil vegetation produced during the summer drawdown. Unfortunately, the amount added to Emiquon was less than desired because the river was unseasonably low, and we got a late start. Even so, from 23 November through 17 December when things started icing up, we were able to bring in 0.5 billion gallons of river water, raising the water surface of the wetland 1.0 foot and reflooding roughly 587 previously dried acres, providing migratory waterfowl access to some moist soil plants produced during the drawdown. Finally, during fall we used one pump to create flows to the river via a fish ladder being evaluated as a tool for managing fish movements. Such may be valuable for providing desirable fish access into and out of Emiquon and other areas and for harvesting invasive fish, especially carps. For 2021, some pumping is anticipated in spring for additional fish ladder research and another drawdown is planned to begin in early July, with the potential for adding river water in the fall if needed and practical depending on a variety of wetland and river factors.

### **Predation risk at marsh bird nests as a result of water-level manipulations at Emiquon Preserve**

**Stephanie M. Schmidt**, Thomas J. Benson, Auriel M. V. Fournier, and Joshua M. Osborn  
Illinois Natural History Survey

Wetland-obligate marsh birds are a group of birds that are associated with complex vegetated habitat interspersed with open water that provides protection from predators and space to forage. Unfortunately, marsh bird populations are experiencing declines worldwide, and these are believed to be driven by wetland loss and degradation, something that is characteristic to the heavily altered landscape of Illinois. Illinois originally had an estimated 8.9 million acres of poorly drained hydric soil, however by the 1980s, 90% of this wetland acreage was lost due to drainage for agricultural expansion and urbanization. Proper management of the remaining wetland habitat is believed to be the solution for mitigating further marsh bird losses. Emiquon Preserve manages their wetland habitat through water-level drawdowns that mimic natural floodplain pulses. These drawdowns are beneficial for a variety of wetland species, but there are concerns they may be increasing predation risk at marsh bird nests because the drawdowns are

initiated after marsh birds have begun nesting. Knowledge on the effects of water-level manipulation for nesting marsh birds is limited, and we are particularly interested in learning more about the effects water drawdowns have on nest success and predator access to nests. In 2020, we searched suitable habitats (hemi-marsh, dense emergent) and located marsh bird nests (Least Bittern, Common Gallinule, American Coot, Black-crowned Night-Heron) (n=88) at varying water depths. We set up continuously recording cameras at a subset of nests (n=52) to record predators at the nests and we revisited the nests throughout the season to document their fate. We found that nests in shallow water and closer to the water's edge faced an increased risk of predation by mammals, and intense dewatering as prescribed by moist soil management may be exacerbating predation risk at marsh bird nests.

### **The return of Whooping Cranes to the Midwest**

**George Archibald**

International Crane Foundation

The tall grass prairies of northcentral USA and bordering areas in southern Canada, provided the major breeding habitat for Whooping Cranes before settlement by the pioneers. Unfortunately, the cranes were shot, most of the wetlands where cranes nested were drained, and the last breeding of the prairies was reported in Saskatchewan in 1922. Since 2001 the Canadian and US governments, state and provide organizations have joined forces to return Whooping Cranes to the Midwest through releases of captive-reared cranes in Wisconsin. Today there are about 80 cranes in the populations all of which nest in south-central Wisconsin and winter in scattered locations from Indiana to Florida. Reproduction in the wild, although improving annually, is still not sufficient to assure self-sustainability. Continued releases of captive-produced juvenile cranes must continue. Sandhill Cranes, although almost extirpated from the Midwest in the 1930, have made a remarkable recovery and now number in the tens of thousands. With patience and continued efforts, it is hoped the Whooping Cranes will also be successful.

### **Drawdown and the changing wetland vegetation community at Emiquon Preserve**

**Joshua M. Osborn**, Christopher S. Hine, Aaron P. Yetter, and Auriel M. Fournier

Illinois Natural History Survey

We monitored the response of wetland vegetation to restoration efforts at Emiquon Preserve during 2007–2020 relative to desired key ecological attributes identified by The Nature Conservancy (TNC). We mapped the wetland vegetation of Thompson and Flag lakes during fall of each year to document changes in wetland area, plant species composition, and vegetation assemblages. Spatial extent of wetland vegetation and other cover types grew rapidly during early years of restoration, and vegetation communities developed without supplemental planting or little hydrological manipulation. However, changes in vegetation communities observed in 2015-2016 suggested that the emergent marsh at Emiquon was in a state of decline. Consequently, TNC initiated a drawdown in 2016, and removed approximately 6 feet of water by July, 2018 to dry out the substrate and encourage regeneration of the marsh community. Since the drawdown, moist-soil vegetation has flourished, but emergent marsh communities have yet to return to a level seen during the initial restoration. We will present responses of the major vegetation communities (i.e., aquatic bed, persistent emergent, hemi-marsh, non-persistent emergent, and open water), soil characteristics, and invasive plant species to the initial

drawdown and water manipulations since, and relate our data to future management of Emiquon Preserve.

## **Session 2**

### **Asian carp reproduction and early life history in the Upper Mississippi River**

**James T. Lamer**

Illinois Natural History Survey

Bighead Carp and Silver Carp reproduction in the Mississippi River system has been evident since the 1990's and despite the wealth of research devoted to their life history, dynamics contributing to their early life history and spawning behavior are still not well understood. The complementary design and synthesis of independent agency research and monitoring provides a comprehensive insight into Asian carp production and early life history. The multi-agency collaborative assessment provides location of spawning activity (egg trawls, YOY otolith microchemistry, telemetry), frequency of spawns (egg trawls, larval light trapping, otolith microstructure, histological evidence, spawning patches and year class strength observed through contracted removal), and magnitude of individual spawns (larval light trapping, YOY sampling, year class strength). These collective efforts identified tributary contributions to production, identified up to 7-11 unique spawning events in 2016, contributed to identification of hydrological triggers correlated with spawning behavior, and identified factors contributing to YOY success. This research and collaboration demonstrates the value of multi-agency partnerships to address complex issues in invasion biology.

### **Evaluation of Asian carp use of a steppass fish ladder.**

**Kara Phelps, Kristopher Maxson, James Lamer, and Kevin Irons**

Illinois Natural History Survey

Asian carp continue to be a persistent threat to our Illinois waterways. Additional methods that aid in management, control, and removal are being explored. Asian carp are often attracted by water flow for upstream movements and spawning, a behavior we looked to evaluate to see if it can be exploited for their removal. We assessed both nonnative and native fish passage using Whoosh Innovations steppass fish ladder installed at The Nature Conservancy Emiquon Preserve's water control structure. The objectives of this study were to evaluate (1) if native and nonnative fish will use a steppass fish ladder, and (2) if they are using the ladder, what factors contribute to its use. During a five-day trial in September 2020, water was pumped from Emiquon to operate the steppass and attract fish. We measured a suite of biotic and abiotic variables before, during, and after steppass operation, including dissolved oxygen, temperature, conductivity, chlorophyll-a, turbidity, and daily zooplankton samples. We used Wi-Fi-controlled outdoor security cameras to record fish movement over the steppass and into a holding pool. At the end of the trial, we collected a total of 76 individual fish from seven species out of the holding pool. Gizzard shad were the dominant catch (n=61), and no bighead or silver carp were collected. Most of the fish collected were between 150mm and 450mm. Complications due to low water level during the trial likely had a large influence on size distribution and species composition. We are planning to run additional trials in Spring 2021 with lessons learned from 2020, including adjusting the elevation of the steppass off the river bottom and using an AI

scanner to better capture fish passage. With successful fish passage, this research could have important implications for Asian carp management and native fish passage.

### **Invasive carps in the Emiquon Preserve: a summary of the story so far**

**Levi Solomon**<sup>1</sup>, Amber Blackert<sup>1</sup>, Olivea Mendenhall<sup>2</sup>, and James Lamer<sup>1</sup>

<sup>1</sup>Illinois Natural History Survey

<sup>2</sup>Illinois Department of Natural Resources

Although the Emiquon Preserve is disconnected from the lower Illinois River, it experienced multiple connections prior to the completion of the water control structure in 2016. Of particular note, record flooding in 2013 and near record flooding in 2015 and 2016 overtopped levees and brought in river water, riverine fish species, and potentially invasive carps. Although it is widely known that common carp *Cyprinus carpio* survived removal efforts prior to restoration, it was unknown if bighead carp, *Hypophthalmichthys nobilis*, silver carp *H. molitrix*, or grass carp *Ctenopharyngodon idella* were present in Emiquon until 2016 when the first silver carp was documented. Since 2016, more silver carp have been observed and collected, prompting additional research questions into their status, paths of entry, and abundance within Emiquon. To address these questions, Illinois River Biological Station staff implemented additional netting in the fall of 2018. This effort led to the first documentation of bighead and grass carps as well as the collection of higher than expected numbers of all carp species. In the fall of 2019, additional gill netting and a mark-recapture study were implemented with the goal of estimating the population sizes of invasive carps within Emiquon. Results show silver, grass and common carps are larger than neighboring Illinois River carps, and the combined population of silver and bighead carps is estimated at  $156,060 \pm 88,506$  (95% confidence interval) individuals. Our objective here is to summarize our findings to date on invasive carps within the Emiquon Preserve.

### **Catch comparison of fishes and turtles in hoop nets using three bait types**

**Samuel J. Schaick**, Jesse A. Williams, Kristopher A. Maxson, Levi E Solomon, and James T. Lamer

Illinois Natural History Survey

Hoop nets are one of the most common passive gear types used in commercial fishing and are frequently used to sample and monitor riverine fish communities throughout the Mississippi River basin. Further, hoop nets can be baited with various attractants to target species of interest and increase catch rates. Since 1993, the Illinois Natural History Survey (INHS) has used small and large hoop nets baited with soybean cake as part of the Upper Mississippi River Restoration Program's Long-Term Resource Monitoring element (LTRM). These LTRM hoop nets are intended to sample the breadth of the benthic fish community. Starting in 2019, LTRM style hoop netting efforts were implemented with two specialized baits (clam and cottonseed) to specifically monitor for invasive Black Carp (*Mylopharyngodon piceus*). The use of hoop nets baited with soybean, clam, and cottonseed baits in the La Grange Reach of the Illinois River also allows for catch comparisons among the three baits. Using LTRM and Black Carp monitoring data, we compared catch per unit effort (CPUE) from 2019-2020 of fish species of interest to both fisheries managers and commercial and recreational anglers, including Channel Catfish (*Ictalurus punctatus*), Freshwater Drum (*Aplodinotus grunniens*), Smallmouth Buffalo (*Ictiobus*

*bubalus*), Black Crappie (*Pomoxis nigromaculatus*), White Crappie (*Pomoxis annularis*), and White Bass (*Morone chrysops*). We also examined turtle by-catch in our hoop nets with the three aforementioned baits. Based on our results, we believe fisheries managers can use different bait types in hoop nets if they wish to gain additional insight regarding specific species, while also potentially minimizing turtle by-catch.

## **Session 3**

### **Stress physiology of Redfin Shiners (*Lythrurus umbratilis*) varies among riparian areas with different land use practices**

**Alyssa Vignos** and Travis E. Wilcoxon  
Millikin University

Native habitats have been altered by human activity to create spaces for human use, such as urbanization and agriculture. These alterations often disrupt the natural landscape, resulting in habitat isolation, loss, and fragmentation. Creeks can be influenced by human development, and such development can impact many creek-dwelling species. Drastic changes in pH or dissolved oxygen can disrupt the creek biota, including alteration of fish assemblages and health. The purpose of this study was to determine if different riparian land alterations affect the water quality of various creeks and the physiology of creek-dwelling fish, using Redfin Shiners as a model species. Redfin Shiners were captured with a seining net at 12 different sites among 4 different creeks in Central Illinois. These sites could generally be classified as residential, agricultural, or riparian areas protected from development. We also recorded a suite of water chemistry data. We captured 271 Redfin Shiners among the sites, placing each into hormone-free spring water for 30 minutes, allowing them to exude cortisol and then measuring cortisol extracted from water samples. We found higher cortisol levels among fish in creeks with lower average dissolved oxygen over the 8-week study. Creek sites immediately downstream from agricultural areas had the lowest dissolved oxygen and shiners with the highest cortisol levels; whereas fish in the areas protected from development had the lowest cortisol levels. Our findings demonstrate that significant alteration of the stream habitat and associated changes in stream chemistry can impact glucocorticoid levels in native, pool-dwelling fish.

### **Simulated ammonium sulfate runoff elevates cortisol and reduces lysozyme activity in adult Western mosquitofish**

**Travis Wilcoxon** and Elyse Schnabel  
Millikin University

Fertilizers increase yield of crops but may have unintended negative effects on fish as a byproduct of runoff into bodies of freshwater. The objective of this study was to determine if environmentally relevant concentrations of an ammonium fertilizer impacts stress and innate immunity in Western mosquitofish (*Gambusia affinis*). The mosquitofish were exposed to different concentrations of ammonium sulfate fertilizer: 0 ppm, 40 ppm, and 80 ppm. To test the effects of ammonium sulfate on stress physiology, cortisol released into water by individual fish was collected after 1 week of exposure and again after 2 weeks of exposure and quantified with an enzyme immunoassay. Cortisol levels in the 0 ppm group were not significantly different over the course of the study, but we found a significant increase in cortisol levels in the fish exposed

to 40 ppm and 80 ppm. We found reduced survival in fish from the 40 ppm and 80 ppm of ammonium sulfate groups compared with the 0-ppm group. We also used blood samples to complete a lysozyme assay as a measure of innate immune defense. Higher concentrations of ammonium sulfate correlated with significantly lower lysozyme activity in the fish. Overall, our results suggest that relatively low amounts of ammonium sulfate runoff into bodies of water are likely to have negative sublethal and lethal effects on small fishes.

### **Drivers of fish growth and recruitment of Largemouth Bass, Bluegill, and Black Crappie at the Emiquon Preserve**

**Amber Blackert**, Levi Solomon, Elizabeth Meyer, Julia Thulander, Tih-Fen Ting, Jason DeBoer, TD VanMiddlesworth, Rich Pendleton, Mark Fritts, Andrea Fritts, and James Lamer  
Illinois Natural History Survey

The Emiquon Preserve is a restored backwater with variable connectivity to the Illinois River managed by a gated pumping structure. Trends in composition and structure of the Emiquon fish community has been evaluated through standardized monitoring since initial stocking in 2007. However, evaluation of fish vital rates and their response to specific management actions have not been investigated. Our objectives of our study will determine the influence of biotic and abiotic predictors (water elevation, water temperature, vegetation abundance, plankton abundance) on 1.) year class strength using catch curve residuals, 2.) yearly growth using otolith increment width and biochronology, and 3.) growth (individual yearly and cohort specific using length at age and size structure) from largemouth bass, bluegill, and black crappie. We will leverage previously collected sagittae otoliths from 2015 (n=269) and 2016 (n=120) and collect additional structures in 2020 and 2021 to achieve an otolith record dating back to Emiquon's initial stocking. Fishes will be collected in Spring using LTRM standardized electrofishing (60hz PDC), 10 fish per 10 mm size class for each species (min= 100 per species), and water elevation, water quality, and vegetation abundance will be collected as covariates. Sagittae otoliths will be sectioned, annuli identified and enumerated, and will use catch curves derived from age-length keys generated from standardized monitoring, to calculate catch curve residuals and evaluate year class strength. Additionally, incremental growth (response variable) will be measured and estimated using a linear mixed effects model accounting for variation in individual fish and age at capture to determine annual growth. Correlations for annual growth and year class strength will be tested with biotic and abiotic predictors such as water elevation, water temperature, vegetation abundance, plankton abundance. Determination of these relationships will help guide management actions to determine the effects of water level management on Emiquon sportfish communities.

### **Recovering the federally threatened *Boltonia decurrens***

**Michael Budd** and Amber Schorg  
U.S. Fish and Wildlife Service

The decurrent false aster (*Boltonia decurrens*) is listed as a federally threatened plant species with a range covering the Illinois River Valley and parts of the Illinois River/Mississippi River confluence. This plant historically depended on scouring spring floods that set back plant succession and promoted herbaceous vegetation. However, due to the protective levee system, large floodplain areas where the species historically flourished have been lost. Additionally,

invasive species as well as changes in flood frequencies and durations are also impacting the species. Within the past two years, the U.S. Fish & Wildlife Service, along with its partners and private landowners, have targeted areas where historical populations of *B. decurrens* existed and instituted a grinding and deep-discing regime. These actions are intended to mimic a scouring flood and should benefit *B. decurrens* as well as migratory birds and pollinators. Duck clubs on the Illinois River have been early adopters of this practice and have not had any concerns with a federally threatened plant species on their property, as they are benefitting from the simultaneous creation of more duck food. The summer of 2021 will be the first season to see if the management actions are working for *B. decurrens*.

## ***Science Snapshots***

### **Flathead Catfish artificial nest structure utilization within the Illinois Rock River system**

**Spencer J. Phillips**, James T. Lamer, Jason DeBoer, and Levi Soloman

Illinois Natural History Survey

Flathead Catfish (*Pylodictis olivaris*) are large-bodied piscivores that are growing in popularity among anglers in the Midwest. Flathead Catfish nest in cavities or protective crevices in the bank, woody debris, and riprap near the shore in June and July in the upper Midwest. In 2009, 14 train tanker cars derailed and spilled approximately 60,000 gallons of 95% ethanol into the Rock River system southeast of Rockford, IL. The ethanol degradation caused low oxygen levels that contributed to the hypoxia-induced kill of an estimated 75,000 fish, including many Flathead Catfish. Restoration efforts to reestablish the fish community downstream of the spill site included the placement of 20 artificial nesting structures at three locations between Dixon and Sterling/Rock Falls IL in 2015. Despite the installation of the artificial nesting structures, it is still unknown whether they promote their intended goal of increasing Flathead Catfish reproduction. Mature Flathead Catfish (n=225) were tagged with radio-transmitters in October 2020 to evaluate artificial nesting structure use. Intensive tracking efforts in the Dixon Reach and around the nesting structures will occur from Mid-May to Mid-August. Stationary receivers will also be deployed upstream and downstream of the study reach to understand potential fish movement out of the study reach. The usage of active remote sensing techniques such as side scanning sonar and real-time Panoptix scanning sonar will help to verify artificial nest structure use. Habitat use outside of the artificial nesting structures will also be examined to identify other nesting areas within the study reach.

### **An assessment of Mudpuppy (*Necturus maculosus*) population characteristics in Robert Allerton Park (Monticello, IL)**

**Marissa Jones**

University of Illinois-Springfield and Illinois Department of Natural Resources

Freshwater species across the globe are currently facing unparalleled declining population rates due to stressors such as urbanization, invasive species, point source pollutants, habitat destruction, and climate change. The conservation of the mudpuppy in its native range is of high concern, given that they are obligate hosts for the salamander mussel (*Simpsonaias ambigua*), the only mussel in North America to use a non-fish host. Despite the mudpuppy's wide distribution, information regarding the species, its populations and trends are lacking in most

areas. Thus, more extensive monitoring efforts are needed to better understand the species' population trends, conservation needs, and ecological relationships.

This research surveys known locations of the mudpuppy within the Sangamon River in Robert Allerton Park and Retreat Center in Monticello, IL in an effort to gather baseline data about the species' population size. In 2016 and 2017, an IDNR biologist performed presence and absence surveys for the mudpuppy within Allerton Park and confirmed the species is present within the river. The density estimates from this mark and recapture survey will support a future proposal for a State Wildlife Grant (SWG). The potential SWG will be used to fund statewide environmental DNA (eDNA) surveys for both the mudpuppy and the salamander mussel to better understand their population sizes and distributions across Illinois. The development and refinement of mudpuppy sampling protocols is an additional benefit of this regional sampling that will support the future SWG and overall conservation of the species

### **Waterfowl response to the 2020 drawdown at the Emiquon Preserve**

**Aaron Yetter**, Joshua M. Osborn, and Auriel M.V. Fournier  
Illinois Natural History Survey

The Illinois River valley (IRV) has historically been important to migrating, and more recently, wintering waterfowl. Prior to 2007, Chautauqua NWR was the most important migratory waterfowl refuge in the IRV; however, the restoration of floodplain wetlands at the Emiquon Preserve and Emiquon NWR changed the distribution of waterbirds. Emiquon/Spoon River Bottoms has taken over the top spot for migratory waterbirds and since 2007 has ranked 1.9 of 25 refuges in the IRV. The 2020 drought, management actions, and hunting pressure reduced duck abundance at Emiquon/Spoon River Bottoms during fall 2020. Waterfowl food resources were excellent during fall 2020, but the lack of water made those food resources unavailable to migratory waterfowl. To the contrary, spring migration habitat looks promising.

### **Motus: automated tracking of bird movements**

**Auriel Fournier**, Michael Ward, Michael Avara, Josh Osborn, Aaron Yetter, Chelsea Kross, Andy Gilbert, Matt Williams, Chad Cremer, and Stephanie Schmidt  
Illinois Natural History Survey

Summer 2020 we established 4 automated telemetry towers around the Emiquon Preserve and Chautauquau National Wildlife Refuge to explore the potential for future studies of the movements and habitat use of wetland birds. We've now tagged Wood Ducks and Least Bittern and I'll provide a brief update of what we've learned thus far.

### **Utilizing drones to identify invasive species**

**Thomas Rothfus**, Yanhui Guo, and Yun Zhao  
University of Illinois – Springfield

Unmanned Aerial Systems, more commonly referred to as drones, are a cost-effective alternative for acquiring observational data at high spatial and temporal resolutions. Increasingly they are finding use in biological and ecological research projects. One of the appeals of utilizing a drone in research is that it is capable of surveying a relatively large area in a short amount of time



while causing minimal disturbance to the plant and animal community. While this potential source of data is exciting, the large volume of data generated can be a challenge to process manually. AI-based image recognition techniques, such as computer vision and machine learning have the potential to automate the process, thus increasing efficiency and likely accuracy as well.

In the spring and summer of 2020, we began a pilot study utilizing a drone to capture images within the Emiquon Preserve, with the goal of identifying invasive Phragmites. Following the initial image collection, we have been training the AI model to recognize Phragmites with the end goal of being able to produce maps highlighting areas that removal should target. Early results are promising.

## **Session 4**

### **Using photography for pollinator surveys on nature preserves in west-central Illinois**

**Angella Moorehouse**

Illinois Nature Preserves Commission

From 2018-2020 pollinators and their plant associations were surveyed on protected prairie, wetland, and forest natural areas in west-central Illinois with the use of photographs. The goals of the survey were to establish baseline species lists of potential pollinators, find specialist pollinators associated with rare community types, obtain new ideas to guide management, and collect information to develop practical methods to evaluate natural area based on the pollinating insect community. Six sites were sampled annually with the goal of surveying site on a 5-year rotation. Each site was surveyed every 1-2 months (April - September), for 60-80 minutes per visit following pre-established meandering transects. Websites (BugGuide.net and I-Naturalist.org) were used to aid in identification of insects photographed. Potential pollinators and their flora associations were recorded to genus/species level when possible. Three years of surveys (18 sites) has identified about 673 potential pollinators on 209 species of plants. Species richness was similarly high (20-22%) for flies, bees, and beetles, followed by wasps (16%). Bees had the highest abundance followed by beetles, flies, and butterflies. The highest species richness and abundance were seen at preserves with prairie or open sunny grassland areas. Thus far sites which have experience high intensity management (frequent burns and brush clearing) have higher species richness and abundance. There was not a significant difference in sites receiving moderate to low intensity management and those which received no management. As external pressures from outside our preserves impact these isolated remnants the replication of these surveys every 5 years will be important to note changes in the communities of pollinators and the impacts of management.

### **Morton Village archaeological overview and research summary**

**Jodie O'Gorman**

Michigan State University

From 2008 to 2017 an inter-disciplinary, collaborative archaeological field program focused on increasing our knowledge about the post-migration ca. AD 1300 to 1400 Native American village located on the bluff top at the northern end of the Emiquon Nature Preserve. This paper summarizes the field findings and outlines the ongoing components of research in the natural and social sciences.

## **More bones than soil: animal remains from a large 14th-Century refuse pit at the Morton Village Site (11F2)**

**Terrance J. Martin.**

Illinois State Museum and Michigan State University

Excavations in 2012 by Michigan State University and the Illinois State Museum at Dickson Mounds at the Morton Village site, located on property owned by The Nature Conservancy, revealed a portion of Structure 25, six internal pit features, and artifacts and refuse from Oneota and Mississippian cultural groups. Feature 224 was distinctive among these pits in having a high density of domestic refuse such as broken ceramics (representing as many as 40 vessels) and more than 16,000 animal remains dispersed throughout four stratigraphic zones. Analysis of this faunal assemblage disclosed more than 30 vertebrate taxa (including fish, mammals, turtles, and birds) and two freshwater mussel species. This not only provides subsistence information for the mid-14th-century residents, but also impressions on natural habitats that were present near the site.

## **Surviving or thriving? Re-assessing social interaction and warfare related food insecurity at Morton Village**

**Autumn M. Painter<sup>1</sup>**, Jeffrey M. Painter<sup>1</sup>, Jodie O'Gorman<sup>1</sup>, and Terrance J. Martin<sup>1,2</sup>

<sup>1</sup>Michigan State University

<sup>2</sup>Illinois State Museum

Violent interaction between people of the Oneota and Mississippian traditions in the Central Illinois River Valley in the North American Midcontinent ca. 1300-1400 CE at Norris Farms #36 is a clear example of intermittent, low-scale warfare. One aspect of initial interpretations of the interaction, based on evidence for raiding of small work groups away from the village and initial zooarchaeology findings, identified resulting stress and subsistence insecurity within the Oneota population. While evidence of violence is clear, the faunal evidence for subsistence insecurity is based on a small sample of contexts from a restricted section of the adjoining habitation site, Morton Village, located adjacent to the Emiquon National Wildlife Refuge (NWR). Recent excavations focused on a broader sampling of the village document a more complex interaction. The expanded data support a complex and productive community of local Mississippian and migrant Oneota peoples engaged in a process of coalescence, further complicating the earlier representations. In this paper, we re-examine the evidence of violence-related food insecurity through an analysis of faunal remains from a random sample of contexts across the entire village. Our results show that Morton Village residents were readily exploiting the resources within Emiquon NWR and the surrounding area, and indicate that we must continue to refine our models and methods for detecting food insecurity in the past.