12th Annual Emiquon Science Symposium

9th May 2018
Illinois State Museum at Dickson Mounds, Lewistown, IL

Abstracts for Oral Presentations
(abstracts are in the order according to the schedule)

9:05 am -- Restoring Mississippi River basin health with floodplains
Bryan Piazza, Joseph Baustian, James F. Bergan, and Karen Gautreaux
The Nature Conservancy

Floodplains in the Mississippi River Basin (MRB) have been converted to agricultural, urban, and industrial uses at an unprecedented rate; and the wetlands that remain are often hydrologically altered and fail to provide the same level of ecosystem services they once did. These facts have led to an increased effort to protect and restore floodplains that require partnerships between scientists, practitioners, and policy makers, often from across a geographical region.

The Atchafalaya River Basin (ARB) in Louisiana provides a compelling example. At about 405,000 ha, it contains the largest tract of bottomland forest left in the MRB. Its habitats support high biodiversity and critical natural processes, like nutrient sequestration and carbon storage. It also provides ecosystem services – flood control, nutrient sequestration, carbon storage, navigation, oil and gas resources, forest, fish and wildlife resources – that have been used extensively by humans. As a result, anthropogenic modifications have created largescale changes in the ARB, altering hydrology and reducing the ability of the ARB to provide its full suite of services. These facts have spurred a movement for conservation and restoration of the ARB, focused on science-based solutions and progressive watershed management strategies.

This talk describes the Atchafalaya River Basin Initiative (ARBI), The Nature Conservancy's multi-disciplinary effort to protect and restore the ARB through successful scientific, conservation, and policy partnerships. First, we report on our initial restoration project that will improve water quality and habitat across 5,500 acres by summarizing extensive scientific monitoring and research results. Next, we report on the partnership and stakeholder efforts that are necessary to succeed in this floodplain restoration. Finally, we link the ARBI to larger efforts to reduce nutrient loading in the MRB that contributes to annual hypoxia in the Gulf of Mexico.

10:05 am -- Why the Illinois River attracts world attention
Richard Sparks
Illinois Natural History Survey
The Nature Conservancy

The Illinois River belongs to a world class of large floodplain-rivers where seasonal floods inundate floodplains long enough for plants and animals to take advantage of expanded aquatic habitats. To understand why this relatively small river, in terms of flow, is in this world class, it is necessary to understand the geological history of the river.

The very wide valley of the Illinois River was carved by enormous ancient rivers. The ancient Teays River drained much of the eastern United States. The ancient Mississippi joined the larger Teays in central Illinois. Subsequent glaciations filled most of the Teays Valley with alluvium, but left the valley exposed south of Hennepin, Illinois. The slope of both the Illinois River and its floodplain is very flat because of the deposits, so it takes a major seasonal flood, weeks to slowly fill and then drain from the large floodplain, in contrast to rivers with steeper slopes and narrow floodplains.

What initially attracted Stephen Forbes, the first Director of the Illinois Natural History Survey, to start a comprehensive study of the Illinois River in 1894, was the extraordinary fish yield, which exceeded that of the Mississippi River and other large rivers bordering Illinois. He hypothesized that seasonal flooding played a role and thought the studies would make foundational contributions to the new science of ecology. The Survey scientists documented the relationships among organisms (food webs) and with the physical environment (flooding) before the river was affected by pollution and leveeing and drainage of the floodplain. The conservation movement of the 1920s and the environmental movement of the 1970s instigated recovery efforts before the river was irretrievably altered. Having a well-documented historical reference condition and a recovery that started before too much was lost makes the Illinois River a benchmark for evaluating river restoration worldwide.

10:25 am – Large-scale floodplain restoration in the Illinois River Valley: Specialness of the Hydrobiologia special issue

Mike Lemke
University of Illinois-Springfield

Eleven peer-reviewed, scientific articles emerged as a special issue published by the international journal of aquatic science, Hydrobiologia, in December 2017. The articles in this publication documented many aspects of the ecosystem transition in the early phases of restoration at Emiquon. In addition to a description of relationships in river floodplain organisms, river-system ecology, effects of flooding, and the importance of river connection, the special issue was capped at its ends with an overview and a prelude of things to come. Each article represents a significant accomplishment in that pieces of a world-class restoration project became better understood and documented. However, an emergent property of the collection is that the special issue, as a whole, has greater influence than the sum of its parts. Documentation of restoration ecology conditions at Emiquon is now timeless, existing for readers everywhere and for all time. Findings influenced, and influence, management decisions locally, and because of the nature of the restoration project and river ecosystem topics, are likely to be considered in the international arena. Summary of the results jacketed in the special issue will be presented along with assessment of current and near-future impacts.

10:55 am -- Initial assessment of fish movements between the Emiquon Preserve and Illinois River through a managed connection

Sally McClure and Douglas Blodgett
The Nature Conservancy

In naturally functioning large-floodplain river ecosystems, dynamic connections between rivers and their floodplains can mediate movements of fish and other aquatic organisms attempting to access important habitats for spawning, feeding, wintering and other such life requisites. In 2016, we began developing methodologies to evaluate fish movements between The Nature Conservancy's 6700-acre Emiquon Preserve and the adjacent Illinois River through the recently installed water control structure. We evaluated three different types of nets to sample fish emigrating from Emiquon into the Illinois River and immigrating from the river into the preserve. In 2016 and 2017 combined, we collected a total of 124,637 fish representing 19 species and one hybrid in 61 samples as water gravity-flowed from Emiquon into the river. One 30-minute collection of fish emigrating with the flow from Emiquon produced an estimated 55,085 fish. Sampling fish attempting to immigrate into Emiquon against the flow was more difficult and yielded notably lower numbers of individuals but similar numbers of species. Continued refinement of our methodologies should contribute to more reliable data in the future and a better understanding of fish movements between a river and its floodplain.

11:15 am -- Efficacy of an acoustic deterrent for bigheaded carps at the Emiquon Preserve water control structure

James Wamboldt, Kelsie A. Murchy, and Marybeth K. Brey
US Geological Survey

Expansion of bigheaded carps Hypophthalmichthys spp. throughout North American waterways has prompted the need to develop and evaluate alternative deterrent strategies aimed at reducing the spread of these invasive species. The avoidance response of bigheaded carps to playback of an outboard boat motor has led researches to investigate acoustic deterrents as a means to dissuade fish at key locations. Prior research has focused on manipulating bigheaded carps' movement in laboratory tanks and ponds, where consistent negative phonotaxis to an acoustic stimulus has been demonstrated. However, there is still a need to investigate the efficacy of the outboard boat motor acoustic fish deterrent system on a larger scale and in a riverine environment. During the summers of 2016 and 2017, a speaker array was installed in the water control structure (WCS) connecting the Emiquon Preserve and main channel of the Illinois River. The placement of speakers at this location served as a unique opportunity to assess the acoustic propagation and efficacy of a 100 hp boat motor sound under dynamic field conditions. Results from this study, future expansion of the acoustic deterrent project, and the potential implications to management of bigheaded carps will be presented.

11:35 am -- Evaluation of carbon dioxide as a fish deterrent at a water management structure

Aaron Cupp[1], Justin Smerud[1], John Tix[1], Kim Fredricks[1], Chad Vishy[1], Carolyn Koebel[1], Ryan Jackson[1], and Doug Blodgett[2]
[1] US Geological Survey, Upper Midwest Environmental Sciences Center
[2] The Nature Conservancy

Carbon dioxide (CO2) is being investigated as a new fisheries chemical to deter or block the movements of Asian carps (*Hypophthalmichthys spp*.) and other invasive fishes. Infusing CO2 into water at pinch-points of rivers (e.g., navigational locks) creates a localized unfavorable environment for aquatic organisms and could deter unwanted movements of invasive fishes without impeding navigation or gate operation. Results from several published laboratory and pond studies demonstrate that Asian carps consistently avoid areas with elevated CO2 and move to other freshwater locations. We conducted a short field evaluation in 2016 to determine if CO2 injected into water could reduce fish occupancy near the water management structure (WMS) at the Emiquon Preserve. Carbon dioxide was injected into WMS culverts during routine discharge conditions to quantify the effects on relative fish abundance, water quality, and air quality (operator safety). Results from this first field study with CO2 will be discussed with specific focus on how these data informed subsequent large-scale field studies.

11:55 pm -- Fish community composition at the Emiquon Preserve water management structure

Olivea M. Mendenhall[1], Andrya L. Whitten[1], and Andrew Casper[2]
[1] Illinois Natural History Survey
[2] John G. Shedd Aquarium

Water management structures (WMS) are commonly used to regulate water levels in restored backwaters of large rivers. The costs and benefits of these structures to the surrounding ecosystem can vary depending on their design and location. Understanding how native and nonnative fish assemblages change in response to WMS operations is essential to restoration activities. The Emiquon Preserve in Lewiston, IL is a 6700-acre restored floodplain lake that uses a WMS to control water levels. In 2017, we evaluated fish community composition and environmental conditions on both sides (i.e., Emiquon and the Illinois River) of the WMS when it was non-operational and operational (i.e., flowing into the Illinois River). Fish community and water quality sampling followed the Upper Mississippi River Restoration Program – Long Term Resource Monitoring protocols. In total, we captured 886 fish comprising 14 species in Emiquon and 1431 fish comprising 25 species in the Illinois River. The NMDS analysis indicated that the fish community composition differed when the WMS was operational versus non-operational. Results from the SIMPER analysis showed that increased catches of white bass, gizzard shad, threadfin shad, and skipjack herring are driving the differences in the Illinois River when the WMS is operational. In Emiquon, increased catches of bluegill when the WMS is operational, largemouth bass when the WMS is non-operational, and variability in gizzard shad catches contribute to the differences in the fish community. Changes in environmental conditions are likely causing the shift in the fish community composition. When the WCS is operational, the flow of water from Emiquon into the Illinois River changes the surrounding fish habitat by

providing a microhabitat of increased flow and highly productive water that likely contains increased food resources.

1:15 pm -- Exposing the complexity of changes in the land at Emiquon

Alan D. Harn[1], Sally McClure[2], and Edwin Hajic[3]
[1] Dickson Mounds Museum
[2] The Nature Conservancy
[3] Pathfinder, CRM LLC

The Nature Conservancy's establishment of the Emiquon Preserve in 2000 set the stage for a new era of scientific investigation at the Illinois-Spoon River confluence. Numerous archaeological investigations conducted on the property between 1930 and 2000 had provided significant information about many aspects of its human history, and to a lesser extent the biotic regime upon which humans depended. However, these investigations provided only indirect evidence about the environment in which these organisms operated and how its periodic natural modification sometimes dramatically transformed the face of the valley and impacted many of the life forms living there. This paper briefly summarizes recent investigations of the landscape employing widespread geomorphological coring, multiple deep subsurface excavations of the bottomland and valley margin sediments, and additional related archaeological fieldwork that provide new insights into landform assemblages, climatic modification, and a fluctuating paleo-biotic resource presence for use in interpreting changes in the Emiquon environment through time.

1:35 pm -- Blood lead levels in raptors and their avian prey base in Central Illinois

Travis E. Wilcoxen[1], Shelby L. Chesko[1], Jane Seitz[2], and Jacques T. Nuzzo[2]
[1]Milikin University
[2]Illinois Raptor Center

Studies of raptors across the United States have revealed lead exposure linked to human activities. Lead has negative neurological and hematological impacts on birds. Although several steps have been taken toward solving this issue, including the ban of the use of lead shot in waterfowl hunting, ingestion of lead from the food raptors consume is potentially a much greater conservation issue than previously indicated. We collected blood samples from raptors admitted to the Illinois Raptor Center in Decatur, Illinois for rehabilitation from March 2014 to March 2018. Most birds were admitted from the area within a 100-mile radius of Decatur. We determined lead content with an ESA LeadCare II lead analyzer and assessed the degree to which elevated blood lead levels appear with a frequency among species that differs from random. After finding that non-scavenging species, such as Cooper’s Hawks, frequently showed high levels of lead, we also tested blood samples from common prey species in the area for lead. Lead in the blood above baseline levels does appear among species at a rate that differs from random, with scavengers representing the highest proportion of high lead individuals. Further, we found evidence that lead is prevalent in the living prey base of many of these species, particularly in urban pigeons. Overall, our work provides better understanding of the sources of lead in multiple species of raptors, including these non-scavenger species.

1:55 pm -- The use of fatty acid profiles to evaluate potential effects of bigheaded carps on multiple trophic levels in waterbodies of the Midwest

Andrea Fritts[1], Brent Knights[1], William Richardson[1], Lynn Bartsch[1], Michelle Bartsch[1], Jon Vallazza[1], Rebecca Kreiling[1], Sean Bailey[1], Toben Lafrancois[2], and Byron Karns[3].
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[3] National Park Service, St. Croix National Scenic Riverway

Literature indicates that the establishment of bigheaded carp has led to a reduction in condition of native planktivores and may detrimentally affect other trophic levels by altering the base of aquatic food webs. We used fatty acids to evaluate potential effects of bigheaded carp on taxa from multiple trophic levels in the Upper Mississippi, Illinois, and St. Croix rivers. Seston fatty acid concentrations were highest in the Illinois River lotic sites and connected backwaters and were positively associated with omega-3 highly unsaturated fatty acids, indicating that these locations had abundant, high-quality basal food resources despite hosting the greatest bigheaded carp densities. Fatty acid profiles of threeridge freshwater mussels tracked the fatty acid values in the seston and were not influenced by bigheaded carp abundances. Hydropsychid caddisflies and bluegill and did not differ significantly in total fatty acids or percent lipid among spatial locations, indicating that omnivorous species may be relatively unaffected by bigheaded carp. Gizzard shad, however, exhibited the lowest fatty acid concentrations in the locations with the highest relative bigheaded carp densities, and multivariate models identified bigheaded carp densities as the predictive factor that explained the greatest amount of variability. Zooplankton abundance has been greatly reduced after bigheaded carp establishment in the Illinois River, which may explain the disconnect between the gizzard shad fatty acids and the plentiful, high-quality phytoplankton in that river. Our data provide additional evidence that bigheaded carp are negatively affecting native planktivores such as gizzard shad.

2:15 pm -- Unintended consequences of invasive species management: Asian carp barriers may also constrain long-term dynamics of the native fish assemblage

Matthew Altenritter[1] and Andrew Casper[2]
[1] Illinois Natural History Survey
[2] John G. Shedd Aquarium

Preventing the spread of aquatic invasive species is often much more cost- and ecologically effective than trying to control them post-invasion. However, popular control methods such as the use of barriers can have their own ecological impacts. For instance, barriers proposed at Brandon Road Lock and Dam (BRLD) meant to keep silver and bighead carps from entering the Great Lakes would also prevent movement by native fishes. Indeed, surveys and assessments suggest upriver movement has allowed native fish to re-establish in recently improved reaches of the Illinois and Des Plaines Rivers. Our research aims to characterize the consequences of barriers that are anticipated to eliminate a migratory corridor for native fishes. By integrating available information into a conceptual model, we identify potential consequences of hydrologic separation affecting primarily fishes and mussels. We hypothesize that the loss of supplementary immigration of native fishes through BRLD will slow the rehabilitation of upriver fish communities and potentially limit freshwater mussel rehabilitation. We anticipate that our

conceptual model will eventually guide both future research priorities and mitigation efforts aimed at minimizing any negative outcomes of a hydrologic separation on aquatic resources upriver of BRLD.

2:45 pm -- Waterbird abundance in relation to floodplain connectivity and wetland habitat restoration in the Illinois River Valley

Aaron Yetter, Heath Hagy, Chris Hine, and Joe Lancaster
Illinois Natural History Survey

Floodplains of large river systems in the Midwest are often disconnected or partially disconnected from flood waters for the benefit of agriculture, urban development, and natural resource management. Many of these rivers are drastically altered from their natural hydrology to allow for commercial navigation, recreation, and managed flows. In these altered systems, tradeoffs in ecosystem services exist between connected and disconnected floodplains. We will present data from the Illinois River of central Illinois that illustrates the tradeoffs in biotic communities, especially waterbirds, using floodplain wetlands that are hydrologically connected, partially connected, and isolated behind levees. Wetland birds, fishes, and vegetation all respond differently to floodplain connectivity and management objectives should be considered carefully prior to restoring hydrologic connections in floodplains of highly altered river systems.

3:05 pm -- Breeding ecology of waterbirds in a restored floodplain of the Illinois River

Cheyenne Beach[1], Heath Hagy[2], Ben O'Nea3[2], Mike Wood[1], Devin Jen[1], Kayanna Wolter[1], Tyler Beckerman[1], and Daniel Wu[1]
[1] Illinois Natural History Survey, Forbes Biological Station
[2] US Fish and Wildlife Service
[3] Franklin College

Wetland loss in the United States has resulted in population declines in many waterbird species. The Nature Conservancy's (TNC) Emiquon Preserve is the largest wetland restoration project in the Illinois River Valley and has provided critical nesting habitat for species of conservation concern including the American bittern, least bittern, black-crowned night-heron, and common gallinule. Waterbirds have been identified as valuable indicators of wetland quality but are relatively understudied. During June and July (2013–2017), we conducted weekly nest searches at Emiquon Preserve to evaluate waterbird nesting characteristics, nest density, and nest success in two distinct wetland vegetation communities: hemi-marsh and persistent emergent vegetation. We located and monitored a total of 308 nests of 11 species. While annual nest abundance and nest density fluctuated, mean nest survival in hemi-marsh (51%) and persistent emergent (49%) vegetation communities were similar. Overall, daily nest survival was 97%, and nest density was 1.2 nests per hectare, contributing an estimated 423 waterbird nests per year. Waterbird nest monitoring has contributed to TNC's growing dataset of key ecological attributes used to evaluate ecosystem health and guide management of the preserve. Installation of a water-control structure in 2016 has increased TNC's ability to influence availability of waterbird nesting habitat and adaptively manage the preserve.

3:25 pm -- Spring diving duck response to forage quality emphasizes a need for large-scale conservation

Joseph D. Lancaster[1], Heath M. Hagy[2], Joshua M. Osborn[3], Aaron P. Yetter[1], Christopher S. Hine[1], Randolph V. Smith[4], Jeffrey M. Levengood[5], and Joshua D. Stafford[6]
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[6] US Geological Survey, South Dakota Cooperative Fish and Wildlife Research Unit

Habitat loss and degradation are perhaps the greatest threats to migratory birds. Science-based conservation planning has become an increasingly valuable tool to distribute limited resources toward migratory bird habitat protection and restoration. A central tenant in conservation planning is that populations recognize and utterly respond according to habitat quality or restoration. This foundation is untested for spring migrating diving ducks and is required before conservation planning can be capitalized for waterfowl in the Midwest. We evaluated the response of two waterfowl species of conservation concern that serve as sentinels for aquatic ecosystems in the upper Midwest to environmental habitat quality, during springs 2012–2015. Specifically, we assessed the functional and numerical response of lesser scaup (*Aythya affinis*) and canvasback (*A. valisneria*) to forage abundance, a common target of conservation planning for waterfowl. In addition, we collected individuals and evaluated their recent lipid dynamics in relation to forage quality at collection sites. We generally observed low food densities and negative energy balances of diving ducks suggesting that food may be limited during spring migration. A lack of evidence for patch and area selection indicated that diving ducks may be unable to differentiate foraging patch quality based on energetic value. Employing these statistics in an individual based model, we simulated diving duck foraging on the Emiquon Preserve, a restored floodplain of the Illinois River with simulated variation in the amount and distribution of forage to examine their impact on lipid dynamics. Results indicated that efforts to increase large-scale energetic availability, rather than at specific sites, had a greater impact on lipid dynamics of lesser scaup. We recommend conservation planners examine key assumptions regarding food availability and use predictive models to simulate response of target species to habitat restoration and enhancement prior to project initiation.

3:45 pm -- Marsh bird use of wetlands managed for waterfowl in Illinois

Therin Bradshaw[1], Heath M. Hagy[2], Christopher N. Jacques[1], Joseph D. Lancaster[3], and Abigail G. Blake-Bradshaw[3]
[1] Western Illinois University
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Wetland management in the Midwest is often used to increase energetic carrying capacity for primarily dabbling ducks. Other conservation initiatives encourage multi-species management, but often waterfowl are a primary focal group. It is widely assumed that waterfowl management activities benefit other birds, but few studies have quantified those benefits. A key assumption of several conservation planning documents is that waterbird habitat and population objectives can

be accomplished by fulfilling waterfowl habitat objectives. However, few researchers have examined the relationship between wetlands managed for waterfowl and the provision of habitat for other migratory birds. In fact, the IDNR Wetlands Campaign identifies the "contribution of moist-soil management to wildlife objectives" as an important information gap which requires additional research.

Overall, marsh birds are an understudied guild of wetland-associated species that can be valuable indicators of wetland health. As wetlands have declined in Illinois, likely so have marsh birds due to habitat loss. Wetlands managed for other species have the potential to provide benefits to marsh birds.

For this project, we determined marsh bird use across a wide range of wetland types (e.g., emergent, non-vegetated), hydrologic regimes (e.g., seasonal, semi-permanent), management practices (e.g., active, passive, unmanaged), and past disturbance regimes in Illinois during late spring and early summer of 2015, 2016 and now 2017. Our objectives are to 1) compare marsh bird use of wetland impoundments managed for waterfowl across a continuum of management intensities and strategies to predict how these actions can increase use by both groups, 2) compare marsh bird use of restored and natural wetlands, and 3) determine characteristics of wetlands and the surrounding landscape that influence marsh bird use of restored wetlands. Additionally, we surveyed marsh birds using the standard protocols on wetlands concurrently surveyed within the Illinois Critical Trends Assessment Program (CTAP) for comparison of methodologies.

Poster Presentations

(Abstracts are ordered by poster number)

1 - Patterns in Trematode Parasitism in the Illinois River Watershed

John Marino[1], Camille Steenrod[2], and Jacob Jones[1]
[1] Bradley University
[2] University of Maryland

Parasitism can strongly affect animal populations and communities in aquatic ecosystems. However, relatively little is known about the distributions and drivers of parasites in many systems, including the Illinois River watershed. For our project, we assessed the distributions of one group of parasites, trematodes, in two species of snail first intermediate hosts (*Planorbella trivolvis* and *Physa gyrina*) in the watershed. We hypothesized that parasite communities in the snail hosts would depend on proximity to the river and land use, due to potential impacts of these factors on vertebrate definitive hosts (typically waterfowl), which mostly aggregate closer to the river and in less disturbed areas. To test this hypothesis, we collected 25 individuals of one or both snail species (depending on presence) from 35 wetlands within the watershed using dipnets, including four sites at Emiquon. We also recorded water quality measurements and habitat characteristics at each site. We then screened the snails for infection in the laboratory, identified the parasites, and analyzed spatial patterns in trematode infection. We found diverse trematode communities in both snail host species with broad but variable distributions among wetlands in the portion of the watershed, including important pathogens of wildlife (e.g., *Ribeiroia ondatrae*, which causes limb deformities in amphibians, its second intermediate host). We also tended to find higher numbers of infected snails and greater diversity in more natural habitats, closer to

river, in line with our hypothesis. Our results offer increased understanding of the role of parasites in the watershed and potential environmental drivers underlying their distributions.

2 - True metabolizable energy of submersed aquatic vegetation for ducks

Margaret Gross[1,2], Christopher Jacques[2], Heath Hagy[3], Sarah McClain[2], Joseph Lancaster[1], Sean Jenkins[2], Brian Davis[4], John Simpson[5], and Aaron Yetter[1]
[1] Illinois Natural History Survey, Forbes Biological Station
[2] Western Illinois University
[3] US Fish and Wildlife Service
[4] Mississippi State University
[5] Winous Point Marsh Conservancy

Wetland vegetation communities provide critical foraging habitat for waterfowl and are disappearing at an alarming rate throughout the Midwest. The loss of wetlands and the submersed aquatic vegetation (SAV) they contain is well documented. However, there is a lack of information about the implications of these losses on energetic carrying capacity for waterfowl. Managers can estimate the energetic carrying capacity for a wetland by determining the energetic value (true metabolizable energy; TME) of foods available to ducks. Although energetic carrying capacity models are sensitive to TMEs, very few TMEs are available for SAV. Most available TME values are from plant seeds and have only been estimated from mallards and blue-winged teal, neither of which primarily consume aquatic vegetation. We estimated TME values of eight common species of SAV for mallards (*Anas platyrhynchos*), gadwall (*Mareca strepera*), and ring-necked ducks (*Aythya collaris*) in order to parameterize energetic carrying capacity models. We used established TME methods which consisted of fasting, feeding ducks a known amount of vegetation, and subsequently collecting their excreta. Excreta was dried, ground, pressed into pellets, and combusted in a Parr 6050 compensated jacket calorimeter to determine gross energy. We then calculated TME from gross energy of raw vegetation and excreta. Preliminary results for mallards indicate that TME was greatest for Canadian waterweed (*Elodea canadensis*; 1.69 ± 0.33 kcal/g) and southern naiad (*Najas guadalupensis*; 1.40 ± 0.43 kcal/g) and lowest for Eurasian watermilfoil (*Myriophyllum spicatum*; – 0.53 ± 0.51 kcal/g), which required more energy to process than was assimilated. The TME values for these SAV species will allow wetland managers to more accurately evaluate wetland management practices and refine energetic carrying capacity estimates. Moreover, these values contribute a better understanding of the value of emergent marshes containing SAV for ducks, which potentially could provide as much energy as moist-soil wetlands.

3 - Impacts of *Lonicera maackii* removal on growth of spring ephemerals at Eureka Lake Park

Luke Brodahl and Cecilia Hennessy
Eureka College

Amur honeysuckle is an invasive species in disturbed, temperate, Illinois forests. This invasive species outcompetes many native flora found throughout Illinois, including spring ephemerals. This has led to funding for research and conservation efforts to remove honeysuckle from forested and prairie areas.

One example of an area invaded with honeysuckle is the Eureka Lake Park in Eureka,

Illinois. This ecosystem is full of amur honeysuckle, which is preventing growth of many native species of plants. This poster describes the beginnings to a long-term, environmental research study on the effects of removing an invasive species and the regrowth of native spring ephemerals in the area.

The experiment included setting up eight 10x10 meter plots, identifying, measuring biomass of, and removing honeysuckle, and applying herbicide where necessary. I proceeded to survey the forest to determine trees and understory plants living in the area. Future plans for the project include: measuring the amount of sunlight reaching the forest floor with a densitometer and using a one-way ANOVA test to compare spring ephemeral growth.

4 - Zooplankton as an Indicator of Recovery Following Asian Carp Harvest During the Unified Method

Elizabeth E. Dix[1], Amber E. Blackert[1], Ashley L. Stanley[1], Kristopher A. Maxson[1], Alison M. Anderson[1,2], and Andrew F. Casper[3]
[1] Illinois Natural History Survey, Illinois River Biological Station
[2] US Army Corps of Engineers, St. Louis District
[3] John G. Shedd Aquarium

Silver (*Hypophthalmichthys molitrix*) and Bighead carp (*H. nobilis*) populations have been increasing in the Illinois River since the 2000s, causing negative impacts for the aquatic ecosystem, including zooplankton. Because zooplankton form the base of the food web, any impact on them will also be felt at higher trophic levels. In 2015, a study showed that zooplankton densities increased where commercial harvest reduced Asian carp and could therefore be used as an indicator of whether suppression was ecologically effective. In 2016, a more intense form of harvest, the Unified Method, was implemented. This multi-agency effort contracted commercial fishermen to coordinate a large-scale harvest at a pair of Hanson Material Services Sand and Gravel Pits near Morris, Illinois. The west pit is a lentic ecosystem separated from the east pit through a culvert, and the east pit is in turn fully connected to the Illinois River. The Unified Method was implemented in the west pit while no harvest occurred in the east pit. During the 2016 Unified Method, 96,277 pounds of Asian carp were removed. We sampled zooplankton once before harvest and two times after harvest at 15 sites per sampling event for each pit. The effect of harvest was significant only for rotifers and copepods, while the influence of month sampled was significant for all taxa. These results show that while monthly (seasonal) succession is important, it also shows that the plankton with shorter reproduction cycles (rotifers) may respond more quickly to harvest than plankton with longer reproductive cycles (cladocerans).

5 - Plant species management in Sanders Hall Rain Garden

Elle LeClaire and Kathryn Everett
Eureka College

Prior to European settlement, wetlands were common to the Illinois landscape. Today most native wetlands have been drained for agricultural purposes. Reintroducing wetland habitats through the creation of “rain gardens” serves as a small step in reclaiming lost ecosystem services from the native Illinois landscape. In 2014, a joint effort by faculty, staff, and students was launched to establish a rain garden on the Eureka College Campus. Our project examines the

importance of wetlands to a functioning ecosystem, documents how and why the Sanders Hall rain garden was established, and both analyzes what plant species are present within the garden and plans for its future management. Major species of concern include cattails (*Typha spp*), ragweed (*Ambrosia artemisiifolia*), and various trees. We compiled this information into a management guide to serve as a resource for future stewards. Understanding these data is vital to maintaining biodiversity within the rain garden, especially in its early years of establishment.

6 - Conservation practice effectiveness and application for water quality improvements in agricultural subwatersheds of the Mackinaw River, Illinois

Krista Kirkham[1], AM Lemke[1], AR Maybanks[1], AL Marino[1], M Day[2], DA Kovacic[3]. MP Wallace[3], KL Bohnhoff[4], JR Kraft[5], AT Noto[6], WL Perry[7], and RM Twait[8]

[1] The Nature Conservancy
[2] California Polytechnic State University, San Luis Obsipo, CA
[3] University of Illinois, Champaign, IL
[4] Macon County Natural Resources Conservation Service
[5] McClean County Soil and Water Conservation District
[6] Conservation Strategies Consulting, LLC
[7] Illinois State University, Normal, IL
[8] City of Bloomington Water Department

The Nature Conservancy and partners have been working in the Mackinaw River watershed in central Illinois for over 15 years to determine how well best management practices perform to improve water quality in a row crop dominated landscape. Results from a 7-year paired watershed study (10,000-acre scale) demonstrated that traditional conservation practices are not enough to improve water quality in these highly tile-drained agricultural watersheds, and has led to subsequent research testing efficiencies and effectiveness of constructed wetlands to intercept tile water and reduce nutrient exports. Ten years of wetland research at the farm scale (~250 acres) has demonstrated wetland to watershed ratios of 3% to 9% can remove an average of 13% to 47% of nitrate nitrogen and 45% to 94% of orthophosphorus loadings, respectively. In 2010, The Nature Conservancy and partners received a USDA-NRCS Conservation Innovation grant to demonstrate the effectiveness and cost-benefits of using constructed wetlands and nitrogen management to reduce nitrate loads to local drinking water that supplies the City of Bloomington, Illinois. Data from GIS, LiDAR topography, soils maps, and aerial infrared photography were used to identify tile drainage networks that helps to guide strategic placement of conservation practices in the watershed. Seven tile-treatment wetlands were constructed during the project and are currently monitored to quantify effectiveness for nitrate and dissolved phosphorus reductions. Collectively, these projects can serve as proof of concept studies with wide applicability beyond the McLean County, IL area for sustainable conservation and agricultural production.

7- Evaluating the Effects of Herbivory on Aquatic Vegetation in a Midwestern Reservior

Jacob Sherell
University of Illinois-Springfield

Macrophytes (aquatic plants) are an important component of freshwater ecosystems. They provide food and habitat for a variety of aquatic and terrestrial organisms, reduce erosion and resuspension of sediments, facilitate biogeochemical processes, and add to the aesthetic and recreational value of lakes. In recent years, several lakes and reservoirs in central Illinois saw a dramatic decline in macrophyte diversity and abundance. While the direct cause of the decline is unknown, herbivory may play a critical role in the suppression of regrowth and recruitment. In this study, an aquatic vegetation restoration effort in Sangchris Lake in Christian County, IL was used to determine the effect of herbivory on growth and survival on four transplanted macrophyte species (water stargrass, white water lily, spatterdock, and American pondweed). These species were planted in three distinct areas of the lake with or without protective exclosures that prevent grazing by herbivores. Growth and survival were compared between these two treatments and between different planting locations using two-way ANOVA. Results show that herbivores did have a significant effect on growth and survival for all species at all locations. Analysis also showed significant differences in growth and survival for two species (water stargrass and American pondweed) based on locations, indicating planting site also contributed to growth and survival. My results suggest lake restoration managers should consider protecting plants from herbivores until populations are well established. Lake managers at Sangchris Lake can also use site-specific data for adaptive management in the current restoration project, focusing additional reintroductions at the best sites.

8 - Dietary Choices of Franklin's Ground Squirrels (*Poliocitellus franklinii*) in Central Illinois

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Franklin's ground squirrels (*Poliocitellus franklinii*) are a species in decline, existing in prairie or savanna-like habitat in Illinois. This species has been identified as the most carnivorous ground squirrel among ground squirrel species, due to observed preferences for bird eggs, nestlings, and insects. As part of a larger mark-recapture project, the carcasses of Franklin's ground squirrels that were found road-killed or that died incidentally were collected. Of these carcasses, 12 intact stomachs were removed and stored in 95% ethanol at room temperature. Stomach content analysis was performed by identifying items of 5% (by weight) of the stomach contents, and by calculating the percent volume of the types of items in the sample. Stomach contents were also surveyed for large or unusual items after the 5% was removed for intensive analysis. Preliminary results indicate that stomach contents are highly variable between individuals, with one stomach containing almost entirely beetle (*Coleoptera spp*.) parts but other stomachs containing only plant matter, and some in between. No indication of non-insect animal predation has yet been detected. We intend for our results to supplement knowledge of natural history of Franklin's ground squirrels, and to help us to understand their diet choices in increasingly anthropogenic habitats.

9 - Nutrient loads delivered to the Illinois River from The Nature Conservancy's Emiquon Preserve

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The Nature Conservancy

Agricultural lands are major suppliers of unnaturally elevated loads of nitrogen (N) and phosphorus (P) delivered to midwestern rivers and streams that ultimately contribute to algal blooms and hypoxia in the Gulf of Mexico's dead zone. Naturally functioning floodplain wetlands have been suggested as one means to help reduce such nutrient loads. Restoration at The Nature Conservancy's Emiquon Preserve provided an opportunity to compare nutrient fluxes to the Illinois River under two contrasting land management practices: conventional rowcrop agriculture and restored natural floodplain wetland.

We estimated loads of N and P delivered to the Illinois River from Emiquon from 2003-2006 while the majority of the basin was in conventional agricultural production and from 2007-2017 as restoration and management of natural floodplain habitats was ongoing. While this study shows the potential to reduce nutrient delivery to the river by restoring natural floodplain communities on agricultural lands, allowing river water with elevated nutrient levels into floodplains for processing would likely be even more impactful.