ILLINOIS CHAPTER AMERICAN FISHERIES SOCIETY

2015 ILLINOIS REPORT

TO THE

NORTH CENTRAL DIVISION AFS

RIVERS AND STREAMS TECHNICAL COMMITTEE

Respectfully submitted

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ECOLOGY

Ontogenetic shifts in prey selection and foraging behavior of young-of-year alligator gar (IL AFS Presentation)

Steven E. Butler, Illinois Natural History Survey

The alligator gar (Atractosteus spatula) is one of the largest freshwater fish in North America, but the early life history of this species is poorly documented, with little information available on food habits or ontogenetic diet shifts. We performed laboratory experiments to quantify prey selection and foraging behaviors of alligator gar through early ontogeny (16 - 80 mm TL). Larval alligator gar were simultaneously offered zooplankton, benthic invertebrates, and one of three densities of fish prey, and allowed to forage for 20 minutes, during which time foraging behaviors were observed and recorded. Larval alligator gar spent the majority of their time foraging at the surface of the water column, although the proportion of strikes in the middle and bottom of the water column increased with larger alligator gar sizes. The smallest size groups of alligator gar consumed zooplankton almost exclusively, but selection for zooplankton declined with increasing alligator gar size, whereas selection for fish prey increased. Benthic invertebrates were avoided by all size groups of alligator gar. Selection of fish increased, whereas selection of zooplankton declined at higher densities of fish prey. Increasing consumption of fish prey by larger alligator gar was associated with longer pursuit and strike distances, increased capture and handling efficiencies, and decreasing handling times. These observations indicate that alligator gar undergo several functional and behavioral changes during early ontogeny that facilitate a rapid transition to piscivory, but that prey consumption patterns are strongly affected by prey density.

Dorsal fin shape and biomechanics in Centrarchids (IL AFS Presentation)

Anabela Maia, Eastern Illinois University

The spiny portion of the dorsal fin reaches similar sizes to the soft dorsal fin portion in some Centrarchids and is thought to have a role both as predator deterrent and in locomotion. We sampled green, redear and bluegill sunfish from Eastern Illinois tributaries and analyzed dorsal fin morphometrics and fin function during steady swimming, hovering, routine maneuvers and fast starts. We also tested the response to hydrodynamic stimuli delivered to the dorsal fin. Geometric morphometrics separated the three species into two groups based on dorsal fin morphology but was not effective in distinguishing the green sunfish from the bluegill sunfish based on discriminant factor analysis. The main variables that separated these fishes were: size, relative position along the cranio-caudal axis and height of the spiny and soft dorsal fins. In terms of ontogenetic changes, the soft dorsal fin grows faster in height than the spiny dorsal fin. This suggests that the fins are under selective pressure, although they do not support a predatory function of the anterior portion of the dorsal fin. There were no significant differences in escape responses between green sunfish and bluegill sunfish of similar sizes, although the spiny dorsal fin was used during this behavior. Sunfish are able to detect hydrodynamic stimulus delivered to the fin and respond by temporarily collapsing and then re-erecting the spiny dorsal fin and with lateral movements of the soft dorsal fin. These results seem to indicate that the dorsal fin is capable of detecting flow and add to stability in different locomotor behaviors.

Age-O growth and timing of spawning and genetic population structure of juvenile channel and blue catfish in the Wabash River (IL AFS Presentation)

Alex Sotola, Eastern Illinois University

For sportfishes in large rivers little information is currently available regarding their early life history and genetic structure. This information is vital to continuing the sustainable exploitation of these fisheries. In Illinois, Channel and Blue catfish are some of the most important fisheries in large rivers. Therefore, understanding their age-0 growth, spawning, and genetic health is of utmost importance for managers. We sampled young of the year catfish during 2013 and 2014 using an electrified mini-Missouri trawl. Timing of spawning and growth were estimated from analysis of length frequency distributions. Based on our sampling, we found evidence that both species spawn as late as August in the Wabash River. During May and June 2013, samples were dominated by larger, age-1 channel catfish (77.29 mm). However, spawning events in late July shifted the catch towards smaller fish (21.16 mm). Blue catfish averaged 22.61 mm in July, but grew to 53.36 mm by September. This general trend was found in 2014 for both species, respectively. During summer 2014, we assessed the genetic structure of Channel and Blue catfish at two spatially distant sites on the Wabash River (Darwin: RM 192 and New Haven: RM 12). Based on these preliminary results, we found both species showed significantly different genetic structure between sites (Channel: FST - 0.039, P - 0.01 and Blue: FST - 0.065, P - 0.018). These data suggest Channel and Blue catfish show a protracted spawning season with reproductive isolation.

Recruitment of catfishes in the Ohio River using otolith microchemistry (IL AFS Presentation)

Devon Oliver, Southern Illinois University

U.S. commercial catch of Blue Flathead and Channel Catfish has increased from 2004 to 2010 (1472 to 2607 tonnes 129 to 156 tonnes 758 to 1643 tonnes) additionally there is an estimated 7.5 million recreational catfish anglers fishing a total of 104 million angling days with little indication of harvest biomass. However despite the potential for overfishing of catfish stocks in large rivers and strong interest among recreational anglers for more attention to management of catfishes in Mississippi River basin states limited data on catfish population demographics are available for many large rivers. This lack of data can result in grave oversight of inter and intra annual variations in recruitment and harvest. Harvest and recruitment fluctuations have been indicated as a cause of sampling variations between sites and years. Intra annual variation can also result from movement of catfishes between large Midwestern Rivers and their tributaries. The objectives of this study were to identify recruitment sources and base line emigration and immigration rates of catfishes in the Illinois section of the Ohio River. Sampling for catfishes was conducted during May-October 2012-2014 using electrofishing trot lines and hoop nets. Lapilli otoliths were analyzed for d18O and SrCa. Water samples from the Ohio River and tributaries were collected from 2010-2014 and were used to describe river and tributary-specific d18O and Sr:Ca signatures. Results of this study will be valuable for protecting important spawning and juvenile nursery habitats and assessing interactions among catfish stocks in the Ohio River and tributaries.

Recruitment sources of catfishes in the Middle Mississippi River (IL AFS Presentation)

Troy W. Laughlin, Southern Illinois University

Identifying habitats utilized by fishes for spawning foraging and refuge is vital for effective population management and conservation. Catfish are an important recreational species in the Mississippi River and are commercially harvested. However contributions of main channel and tributary habitats to catfish recruitment in large rivers such as the middle Mississippi River (between St. Louis MO and Cairo IL) are unknown. Stable isotope and trace elemental signatures in otoliths have been useful for determining environmental history of fishes in a variety of aquatic systems including the Mississippi River. The objectives of this study were to identify the principle natal environments for channel catfish Ictalurus punctatus and blue catfish I. furcatus in the middle Mississippi River (MMR) using otolith stable oxygen isotopic composition d18O and SrCa. Catfish were sampled during July-October 2013-2014 using electrofishing trawls and hoop nets and lapilli otoliths analyzed for d18O and SrCa. Water samples from the MMR and tributaries were collected seasonally from 2006-2014 to characterize site-specific signatures. Persistent differences in water d18O and SrCa among the MMR and tributaries including the upper Mississippi Illinois and Missouri rivers as well as smaller tributaries were evident enabling identification of natal environment for individual fish. Results indicated that the Missouri and Mississippi Rivers contributed substantial recruits to blue and channel catfish populations in the MMR whereas smaller tributaries showed minimal contributions. Year class investigations and efforts aimed at enhancing spawning and nursery habitats should be focused in the large rivers with less emphasis in smaller tributaries.

Habitat use and movement of channel catfish in the lower Wabash River using acoustic telemetry (IL AFS Presentation)

Hanna G. Kruckman, Eastern Illinois University

Channel catfish (Ictalurus punctatus) are one of the most sought after commercial and sport fish species in the Wabash River. Understanding seasonal habitat preference and movement behavior is essential to properly manage the species in a lotic system. The Wabash River provides an ideal study site to assess fish movements because it is free flowing and home to a well-established channel catfish population. During fall 2014, we tagged 15 channel catfish with acoustic transmitters near New Harmony, Indiana to monitor fish movement within a 10-mile reach of the lower Wabash River. To locate fish we conducted continuous seasonal 24-hour active tracking coupled with site tracking. At each location, habitat, substrate, and water quality parameters were recorded. Since September 2014, one tagged fish has been harvested, six of the remaining 14 fish have been located more than once during site tracking (17 locations), and a total of five different individuals have been monitored during fall and winter 24-hour tracking (101 locations). Although all located fish have only occupied a 2 km reach of the study site, fish have been found using various habitat types. All catfish have been found between 1 and 12 m in depth, with the majority of fish found on rip rap (47.46%) and sand bars (24.58%). Additionally, individuals have been found using log jams, tributary mouths, and the main channel. Once tracking has been conducted across all four seasons, diel movement data will help identify seasonal shifts in habitat requirements to supplement or improve current management strategies.

Linking energy expenditure to habitat use in Scaphirhynchus sturgeon (IL AFS Presentation)

Anthony P. Porreca, Southern Illinois University

Lotic ecosystems have highly variable energy landscapes. The federally endangered pallid sturgeon Scaphirhynchus albus and threatened shovelnose sturgeon S. platorynchus are two fluvial specialists that occupy heterogeneous flow fields within microhabitats of large rivers. Field and experimental studies suggest that both species select for sand substrates over gravel substrates, yet no information exists regarding the energetic costs of occupying such microhabitats. We used intermittent, flow-through respirometry to quantify energy expenditure (MO2: mg O2 kg-1 h-1) of age-0 pallid and shovelnose sturgeon within two experimental microhabitat types, sand and gravel, at low (range: 8.5-20.5 cm s-1) and high (range: 13.8-33.0 cm s-1) velocities. Micro-scale differences in velocity in the water column between the sand and gravel substrates were quantified using digital particle tracking velocimetry. Velocities near the substrate declined over the gravel compared to the sand bottom. Substrate altered energy expenditure, MO2 values for both species were higher over the sand substrate. The MO2 between sand and gravel was reduced more for pallid sturgeon than shovelnose sturgeon. Velocity did not affect MO2. Energy expenditure for age-0 pallid and shovelnose sturgeon changed in a similar fashion with respect to velocity and substrate type. The benefits of occupying sand may outweigh the increased cost of station holding. Sand occurs in depositional areas that may hold more food or contain fewer predators. Gravel may create undesirable turbulence that sturgeon would otherwise avoid. Differences in MO2 between species suggest that segregation may occur where pallid and shovelnose sturgeon overlap within microhabitats.

Population characteristics connectivity and recruitment sources of spotted bass in southern Illinois streams (IL AFS Presentation)

Nicholas J. Abell, Southern Illinois University

Spotted bass are a popular sport fish in the Midwest and southeastern United States. However, information on population characteristics, recruitment sources, and connectivity among spotted bass stocks in stream networks is limited. We are assessing age and size structure, growth and mortality rates and using fin ray microchemistry to determine environmental history of stream-dwelling spotted bass in southern Illinois. Fin rays are being used as a non-lethal alternative to otoliths for aging and chemical analysis due to the likelihood of relatively small population sizes of spotted bass in small steams. Spotted bass were collected from several streams in the Ohio and Mississippi River drainages during IDNR stream fisheries surveys and other independent sampling events in summer 2014 by electrofishing, seining, and angling. Fish were promptly released following measurement of total length and removal of the left leading pectoral fin ray. Fin rays were sectioned for aging and elemental (strontium:calcium and barium:calcium) analysis. Water samples were collected from fish sampling sites to identify streams that can be distinguished from one another and from the Ohio and Mississippi rivers using Sr:Ca and Ba:Ca This study will identify important natal environments, determine stock connectivity among streams and rivers and provide information on population vital rates to guide management of stream-dwelling spotted bass populations.

Black crappie population characteristics in the La Grange reach of the Illinois River with a comparison to Pool Thirteen of the Mississippi River (IL AFS Presentation)

Joshua D. Bruegge, Illinois Natural History Survey

Black crappies are a commonly sought after and widely distributed sportfish and are viewed as an indicator species in the Upper Mississippi River System (UMRS). Across their distribution, differences may exist among populations based on differing biotic and abiotic factors. To assess population statuses within the lower portion of the UMRS, we compared populations of black crappies captured from 1993-2013 in the La Grange reach of the Illinois River to Pool 13 of the Mississippi River. There are substantial differences in habitat between the two study areas. The La Grange reach contains many backwater areas that are shallow and devoid of vegetation, while Pool 13 is a mosaic of backwaters and side channels with abundant vegetation. In 2012 and 2013, over half of the fish (41 of 73 and 26 of 51, respectively) from the La Grange reach were >3 years old, with a large turnover in the population in 2014 (3 of 92 aged >3). In 2009, Pool 13 had 60 of 172 crappies aged >3. Relative abundance decreased after 2000 in the La Grange reach, yet remained consistent in Pool 13. However, cumulative length frequencies indicated a shift towards higher percentages of smaller fish being collected for both areas. This trend was most prominent in electrofishing surveys, but also in fyke net surveys in Pool 13. This study revealed declines in both relative abundance and the size structure of crappies in the La Grange reach and may be related to temporal changes in backwater habitats.

Temperature effects on the alarm pheromone response in Red Shiners (IL AFS Presentation)

Brooke J. Bryant, Western Illinois University

In nature, prey species obviously benefit by avoiding predators, and thus many predator avoidance strategies have evolved. Successful predator avoidance behaviors have high selection rates because avoiding predators is a life or death situation. To avoid predators, the prey can rely upon cues which allow them to detect the predators. In fish, three different types of predator cues are found that elicit predator avoidance responses: visual, auditory, and olfactory cues. This study focuses on fish alarm pheromones, an olfactory cue found in some fish species skin cells. Behavioral responses to the pheromone mislead the predator which helps the prey avoid being eaten. These substances induce a species-specific fright response in surrounding fish. This study has investigated the alarm pheromone response in the Red Shiner Cyprinella lutrensis and how it is affected by varying water temperatures. Such a response has previously been undocumented in this fish species. Responses elicited by the alarm pheromone include an increase in swimming velocity and a decrease in neighbor distance after exposure to the alarm pheromone.

Effects of body condition on fecundity of Largemouth Bass Micropterus salmoides in the Upper Illinois River Watershed (IL AFS Presentation)

Chelsea R. Gilliland, Illinois Natural History Survey

Understanding the fecundity, or the reproductive potential, of a species is essential for the management of fisheries in riverine systems. The fecundity of female fishes can be significantly

altered by physiological stress related to environmental disturbances. Accurate estimates of fecundity can help biologists determine the spawning biomass of commercially and recreationally-important fish species occupying highly-altered rivers. These data are especially significant for popular sport fish species, such as Largemouth Bass, Micropterus salmoides. Currently, there is a lack of fecundity data for fishes found throughout the Upper Mississippi River Watershed. This lack of information limits researchers abilities to generate realistic stock-recruitment models for future management. For my study, twenty-three Largemouth bass were collected from the Upper Illinois River. To calculate initial estimates of fecundity, we used the gravimetric method which involves manually counting weighed sub-samples of oocytes from the ovarian tissue and multiplying the result by the total ovarian mass. However, new methods tested on marine fishes may also be applicable to determine accurate estimates of fecundity. The fecundity values ranged from 32,012 to 320,586 with an average fecundity of 150,141.16 and a standard error of 6,178.14. Using simple linear regression, we compared age, total length, weight, condition factor, gonadosomatic index (GSI), and hepatosomatic index (HSI) for each female to the calculated fecundity. Total length, weight, and condition of female fish most significantly impacted fecundity indicating that larger, more robust fish are typically more fecund.

Pallid Sturgeon free embryo drift behavior from hatch to swim bladder inflation (IL AFS Presentation)

Patricia A. Herman, USFWS

Characterization of Pallid Sturgeon (Scaphirhynchus albus) free embryo drift patterns is needed to identify recruitment bottlenecks in the Missouri River. Previous laboratory investigations by Kynard et al. (2002, 2005, 2007) have described aspects of the drifting Pallid Sturgeon life stage. Our studies further those experiments through detailed observations on drift behavior from hatch through swim bladder inflation. Hatchery-propagated Pallid Sturgeon embryos were attached to rock, reared and hatched in an artificial stream. Conditions in the oval raceway consisted of a 38-cm wide stream channel and a 122-cm diameter pool with a velocity deflector (wing dike). The latter attribute was an attempt to mimic low-flow slack water conditions found in the Lower Missouri River. Stream velocities varied depending on location in the system and ranged from -9 cm s-1 to 33 cm s-1. Upon hatching, free embryos were swept into the current and were observed visually or with remote video cameras until they settled out of the flow at 11 days post hatch (dph). Depth, drift orientation (upstream or downstream) and location in the stream raceway were quantified at 3-hour intervals. Swimming stamina under various flow rates was also measured. To determine age at swim bladder inflation, histologies were performed on free embryos and larvae at 10 - 38 dph. Swim bladder inflation occurred at 11 dph. Initial results indicate Pallid Sturgeon occupied distinct areas of the raceway and specific behavioral changes occurred during development. These results are important for understanding survival and recruitment of wild Pallid Sturgeon in the Missouri and Mississippi rivers.

Factors affecting the growth of Largemouth Bass in the upper Illinois River (IL AFS Presentation)

Cassidy R. Miles, Illinois Natural History Survey

Knowing how climate affects aquatic ecosystems is important for conservation and management of fish populations. We can use annual growth increments from fish otoliths to understand effects of environmental factors on individual fish growth. We collected Largemouth Bass (LMB) Micropterus salmoides using pulsed-DC electrofishing in the Dresden Reach of the Upper Illinois River during Spring 2014, assigned ages to each fish, and back-calculated lengths-at-age from otolith growth increments. We modeled incremental growth as a function of age and several age-corrected environmental factors (e.g., river stage height, discharge, weather). Our environmental factors were auto-correlated, thus we only used a single environmental factor in each model, and used AICc to rank our models. Length increased with age and appeared to asymptote at age 6, whereas growth decreased with age. Age explained 77% of the variation in growth, however, each of the models containing age and an age-corrected environmental factor had a lower AICc than the age-only model. The two models containing maximum and minimum stage height had a combined AICc weight of 0.96. The parameter estimates for stage height were positive, indicating greater LMB growth occurred in years with greater stage height. We postulate greater stage height could allow for: (1) reconnection to seasonally isolated backwaters, which offer (a) greater access to energetically beneficial prey and (b) refugia from energetically expensive river flows, (2) increased availability of and access to flooded terrestrial habitat, and (3) inflow of floodplain nutrients into main-channel riverine habitats, which benefits LMB that remain in the main channels.

EXOTIC SPECIES

Round Goby expands range in Illinois Waterway

Last August (2014), a U.S. Fish and Wildlife Service (USFWS) research crew collected round gobies *(Neogobius melanostomus)* over 30 miles downstream of their documented range in the Illinois River. A bottom trawling survey found four gobies, one apiece from River Mile 75.5, RM 88.5 (near Beardstown), RM 106 and RM 111. Three of these locations were below the formerly documented edge of the species' range (RM 108.5).

Native to brackish waters of the Black and Caspian Seas, round gobies were introduced into the Great Lakes (originally Lake Superior) around 1990 via ballast water release from ocean-going freighters. They have since flourished in all five Great Lakes and many connected river systems. Ecological impacts of this intro-duction have been profound. Gobies outcompete native benthic fishes (such as mottled sculpin) for food and spawning sites while directly preying on the eggs and young of many fish species, both sport and non-game.

Ironically, one factor giving the goby a competitive advantage over native species is its unique ability to utilize another Eurasian import, the zebra mussel *(Dreissena polymorpha)* as a food source. Its appearance in middle reaches of the Illinois River supports recent findings regarding this species' adaptability. Although it prefers shallow, rocky lake habitats in its native range, the goby's presence here indicates it's willing to make an exception. *(Compiled from IDNR correspondence and US Geological Survey's NAS website)*

Asian carp control and monitoring continues

Efforts to harvest large numbers of Asian carp from their leading edge of expansion in the upper Illinois River continue through contracts with commercial fishermen. Despite the recent documented 23 positive hits for silver carp environmental DNA beyond the electric barriers installed in the Chicago Sanitary and Shipping Canal, intensive monitoring continues to find no live individuals in the area. Neighboring states continue their pleas for hydrological separation of the Mississippi River and Great Lakes basins, citing the protection of a $7 billion sport fishing industry supported by the Great Lakes fishery. Although there is reluctance to move forward with a plan to separate the basins, there are steps being taken to implement additional safeguards to species movement at the Brandon Road Lock and Dam on the Des Plaines River near Joliet.

Analysis of blue catfish gut contents: an assessment of feeding adaptation in response to Asian carp invasion in the Mississippi River basin (IL AFS Presentation)

Tad Locher, Western Illinois University

Blue catfish (Ictalurus furcatus) and other associated members of Ictaluridae have been studied extensively in their native environment, and their prey selection has been analyzed in main channel, side channel, and backwater habitat. However, their efficiency as a control for the expansion of non-native Asian carp species has not been evaluated. It is possible that the immense availability of Asian Carp (spp. Hypophthalmichthys) is offering greater energetic benefits than native prey such as Gizzard Shad (Dorosoma cepedianum). We examined the gut contents of Blue Catfish from pool 26 of the Mississippi River near Alton, IL. Tandem trammel nets were set in a backwater lake habitat during varying water conditions. Diets of the Blue Catfish caught were collected using gastric lavage and manual prompting. The gut contents were immediately placed on ice and then frozen upon return to the lab. The individual diets were picked through by hand, and there is strong evidence that Blue Catfish are actively feeding on adult Asian Carp. Genetic analysis was done on unidentifiable diet components, and results strengthen the lab findings. Based on our results, further research is needed in order to determine the frequency at which Asian Carp are selected by not only Blue Catfish, but also other native predators. The scientific verification of a species that has adapted its feeding behavior to accommodate an ever-increasing presence of Asian carp could be immensely important to future studies and management implications.

Juvenile Asian carp as forage for native predators in the LaGrange Reach of the Illinois River (IL AFS Presentation)

Cory Anderson, Western Illinois University

Increasing numbers of silver carp (Hypopthalmichthys molotrix) and bighead carp (Hypopthalmichthys nobilis) in the Illinois River has led to concerns about the impact their invasion has on native food web dynamics. Asian carp have high fecundities and rapid growth and in the absence of predator controls, they can quickly achieve high densities. A large Asian carp spawning event on the Illinois River was observed in the summer of 2014 providing us an opportunity to determine how native piscivorous fish (n-1527) respond to high juvenile Asian

carp densities. White bass (Morone chrysops), black crappie (Pomoxis nigromaculatus), white crappie (P. annularis), largemouth bass (Micropterus salmoides), and shortnose gar (Lepisosteus platostomus) were collected from the LaGrange Reach during a large Asian carp spawning event observed on the Illinois River (August 3 through October 31) using pulsed-DC boat electrofishing and 0.75 in. fyke nets. Fish were immediately anesthetized and put on ice following collection, and total length (mm) and weight (g) measured. Stomachs were dissected and preserved in 95% EtOH and the contents of each stomach were quantified visually, and separated into individual taxa. Wet weights of all individual taxa were recorded and dry weights obtained after drying at 110C for 48 hours. Diet analysis reveals that all 5 species fed heavily on juvenile Asian carp over a discrete juvenile size range. The duration of the sampling period also allowed us to determine the vulnerability to predation by native predators with changing densities of juveniles in the environment.

Watergun effective distance over time: a spatio-temporal evaluation of Asian carp density before-during-after firing (IL AFS Presentation)

Jose Rivera, Southern Illinois University

Invasive Bighead Carp (Hypoththalmichthys nobilis) and Silver Carp (H. molitrix) have demonstrated their ability to quickly dominate local fish populations with their rapid growth and reproductive rates. Having become entrenched in the Illinois River, they now account for over 60% of the total fish biomass. An increasing amount of evidence suggests that their high filter feeding capabilities are negatively impacting many native fish species in areas they have invaded. The potential undesirable ecological and economic effects caused by their invasion of the Great Lakes ecosystem have caused great concern, prompting state and federal agencies to evaluate new strategies to control Asian carp and understand how they can be integrated to maximize effectiveness.

In this collaborative study among the U.S. Geological Survey, Southern Illinois University and the Illinois Department of Natural Resources, mobile hydroacoustic surveys were used to evaluate a variety of control methods (i.e., feeding attractants, commercial harvest and water gun technology) with respect to their ability to affect the spatial distribution of Asian carp density and abundance. The effectiveness of water guns as a barrier to Asian carp movement between the Illinois River and a backwater lake near Morris, IL was examined using hydroacoustic data recorded at set time intervals before, during, and after use of the water guns. The distribution of fish relative to water gun operation, including fish swim behavior in response to water gun operation, will be discussed.

Changes in Asian carp demographics in Illinois River and its tributaries (IL AFS Presentation)

Clinton Morgeson, Eastern Illinois University

Invasive bighead (Hypophthalmichthys nobilis), and silver carps (H. molitrix) are among the most abundant fishes in the Illinois River system and pose an immediate threat of invasion to the Great Lakes. Asian carp have been heavily studied in mainstem rivers, e.g. the Illinois, Missouri, and Mississippi Rivers, however, little work has been conducted in tributaries of these rivers. We

studied Asian carp populations in the Illinois River and five of its tributaries during 2013-2014: Salt Creek and the Kankakee, Spoon, Sangamon, and Mackinaw Rivers. We compared the size and age structures, gonadal development, and sex ratios of Asian carp among these tributaries and the main channel. Asian carp were collected using pulsed-DC electrofishing and a conical cylindrical ichthyoplankton push net at downstream tributary sites. We removed cleithra from all adult Asian carp for age estimation. No Asian carp of any size form were collected in the Kankakee River. No larval Asian carp were sampled in 2013 but in 2014 we sampled a total of 2394 young of year Asian carp in the Spoon and Mackinaw Rivers ranging in size from 5 to 46 mm. In adult individuals, a significant increase in mean age (ANOVA $p < 0.0001$) and size (K-S $p < 0.001$) was found from 2013 to 2014 within the sampled tributaries. These data allow us to understand how Asian carp use these tributaries both as juveniles and adults. This work helps us ultimately determine the size of waterway necessary to sustain an entire Asian carp life cycle.

Competition among river planktivores: are native planktivores still fewer and skinnier in response to the silver carp invasion? (IL AFS Presentation)

Rich Pendleton, Illinois Natural History Survey

Planktivorous silver carp have successfully invaded much of the lower and middle Mississippi River System and its tributaries during the last 30 years. As a result, Irons et al. (2007) observed declines in the relative abundance and body condition of native planktivores (gizzard shad and bigmouth buffalo) in the La Grange Reach of the Illinois River and attributed the reduction to possible competition with silver carp and bighead carp. We present seven additional years of long-term fish community monitoring data to investigate whether silver carp are exerting consistent negative pressure on native planktivores since silver carp establishment within the La Grange Reach during 2000. The relative abundance and body condition of both gizzard shad and bigmouth buffalo were still significantly reduced when compared to pre-establishment years (1993-1999). Gizzard shad biomass and relative abundance were negatively related to silver carp biomass and relative abundance, however, only silver carp relative abundance significantly described gizzard shad biomass. Bigmouth buffalo biomass and relative abundance were statistically negatively related to both silver carp biomass and relative abundance, yet silver carp biomass was the better descriptor. In addition, average silver carp body condition was reduced (2008-2013) after very successful spawning during 2007 and 2008, possibly indicating intraspecific competition. Overall, silver carp appear to be negatively influencing bigmouth buffalo to a greater degree than gizzard shad, which may be a result of species-specific feeding and life-history traits.

Monitoring Asian carp in the upper Mississippi River (IL AFS Presentation)

Nicholas Bloomfield, USFWS

Asian carp have become established in the upper Mississippi River (UMR) above Lock and Dam 19. La Crosse FWCO has initiated a study to determine movement patterns, habitat use, population dynamics and recruitment sources. Movement was monitored using VEMCO VR2W receivers deployed from Pools 5A to 19, as well as manual tracking with a VEMCO VR100. Fish not used for tagging were euthanized and otoliths were removed for aging and microchemistry. YOY monitoring was conducted with mini-fyke nets, and a mamou trawl will be added in 2015.

Environmental DNA sampling in the upper reaches of the system will help determine location of the invasion front. This information will provide a better understanding of the movement, reproductive success, and population dynamics of Asian carp species throughout the UMR and potential management strategies. This study is ongoing and will continue into 2016.

Range of round goby expands toward the Mississippi River (IL AFS Presentation)

Jenna L. Merry, USFWS

The invasive round goby (Neogobius melanostomus) was first recorded in the Chicago Area Waterway System (CAWS) in 1993, about a decade after it is believed to have entered North American waters through ballast discharge of oceangoing cargo ships in the Great Lakes. Known for their ability to out-compete native benthic fishes for food and habitat, the round goby prefers rocky substrates in its native range and where it has become established in the Great Lakes. Beginning in 1995, the U.S. Fish and Wildlife Service coordinated an annual, multi-agency effort to monitor the movement of round goby in the CAWS and Illinois River, which form a direct connection between Lake Michigan and the Mississippi River. As part of this effort in 2014, our objective was to re-established the leading edge of round goby in the Illinois River and determine if their range was expanding despite the dominance of sand, silt and clay habitat in that system. Three round goby were captured downstream from their previously recorded extent (RM 108.5) - the most distant collection being 33 miles downstream (RM 75.5). We do not suggest that a robust population is present in the lower Illinois River, however the range extension indicates that the poor goby habitat in this reach does not serve as a barrier to the downstream movement of this species.

Using oxytetracycline marking of round goby Neogobius melanostomus otoliths to compare accuracy of back-calculation methods (IL AFS Presentation)

William L. Stacy, Illinois Natural History Survey

Understanding the factors influencing the invasion success of round goby (Neogobius melanostomus) is important to managing the dynamic food web of Lake Michigan. Growth is one aspect of fish biology commonly measured to identify ecological factors influencing the success of a species in a particular habitat. Growth is often measured using back-calculation in order to compare varying influences over the lifetime of a fish. This study compares the use of multiple otolith radii and back-calculation methods for round goby using artificial annuli created by immersion in an oxytetracycline (OTC) solution. Back-calculated length (BCL) was estimated using three otolith radii (rostrum, ventral, and post-rostrum) and two back-calculation methods (direct proportion, Fraser-Lee) and assessed for accuracy compared to the measured length at the time of OTC marking. In general, post-rostrum BCLs were the most accurate of the three radii and the Fraser-Lee method outperformed the direct proportion method. All but two BCLs (among all fish and radius x method combinations) underestimated length at marking. Growth rate was negatively correlated with the absolute value of percent error, indicating that faster growth leads to more accurate back-calculated lengths. Future work utilizing back-calculation to understand round goby growth should utilize a radius from the core to the post-rostrum point as well as the Fraser-Lee method with an appropriate biologic intercept in order to estimate the most accurate BCLs.

Do invasive Asian carp compete with native gizzard shad? (IL AFS Presentation)

Elizabeth P. Tristano, Southern Illinois University

Invasive species may alter primary productivity and nutrient content in native ecosystems, affecting condition of native species. For example, planktivorous bighead (Hypophthalmichthys nobilis) and silver carp (H. molitrix), collectively Asian carp, may alter freshwater trophic dynamics, reduce phytoplankton and zooplankton, and compete with native gizzard shad (Dorosoma cepedianum). To examine how Asian carp affect zooplankton, system primary productivity, and gizzard shad, we conducted a pond mesocosm experiment with gizzard shad in ponds with and without bighead and silver carp, as well as no-fish controls. Ponds were sampled weekly for zooplankton abundance, chlorophyll a concentration, and NH4, NO3, and PO4 concentrations for 16 weeks during spring-fall 2014. Overall mean total length and mass of gizzard shad after 16 weeks were higher than initial values, but mean final length and mass of gizzard shad was unrelated to Asian carp presence, suggesting that competition does not occur. Zooplankton density declined similarly across treatments, though midsummer zooplankton abundance was significantly lower in ponds with gizzard shad and Asian carp than in the presence of shad alone and in empty controls, which could be due to increased planktivory by Asian carp. Chlorophyll a, NH4, NO3, and PO4 concentrations did not differ by treatment over time. Asian carp may reduce zooplankton density, but they do not affect gizzard shad growth and condition, perhaps because gizzard shad can switch to detritus as food when zooplankton are not abundant.

FISH HEALTH

Demographics and parasite burdens of spotted bass in the Wabash River (IL AFS Presentation)

Evan C. Boone, Eastern Illinois University

Extensive studies have been done on Spotted Bass (Micropterus punctulatus) throughout their southern range, but little information is known regarding the population dynamics or the parasite burdens along their northern boundary in the Wabash River. Fish were collected from the lower 200 miles of the Wabash River using pulse DC electrofishing following the protocol of Long Term Electrofishing (LTEF). Forty-six individuals in 2013 and seventy-two individuals in 2014 were saved for age estimations and full-body necropsies. Relative abundance as measured by catch per unit effort (CPUE) was significantly higher in 2013 compared to 2014. For both years, the length distributions of Spotted Bass in the Wabash River were primarily composed of small fish below stock length. Fish (>150mm) from both years had a mean relative weight greater than 100 even though the majority of fish were infected with at least one species of helminth. The strigeoid trematode Posthodiplostomum minimum centrarchi, commonly known as white grub, was the most common helminth. During both 2013 and 2014, prevalence of white grub was approximately 50% in below stock bass and near 100% in stock, quality, and preferred size bass. Mean intensity of white grub in the visceral organs increased with fish age as well, with the highest numbers being found in the liver and near the brain stem. This study will provide

essential information on the population characteristics and health of Spotted Bass in the Wabash River, which will be valuable in the management of this population as a sustainable fishery.

Intersex condition in male Largemouth Bass from the Upper Illinois River Waterway (IL AFS Presentation)

Mark W. Fritts, Illinois Natural History Survey

Intersex condition, the presence of both male and female characteristics in individuals of a normally gonochoristic species, has been documented in many watersheds among a diverse variety of fishes. Previous researchers indicated that a suite of endocrine disrupting chemicals are strongly associated with the occurrence of intersex. Although natural rates of intersex condition in wild fishes vary substantially and the fundamental mechanisms for the development of intersex in individuals may be poorly understood, new studies in highly urbanized watersheds are important to our understanding of the management implications of this condition. Environmental reforms during the last 50 years have led to improved water quality in the Upper Illinois River Waterway (IRW) and the native fish community has responded favorably. However, emerging understandings of new threats like intersex condition pose new concerns. Our objective was to survey the severity of intersex in male Largemouth Bass in an area directly affected by surface runoff and wastewater effluents from the Chicago Metropolitan Area. Histological analysis indicated that testicular oocytes were present in 21 of 51 (41%) of Largemouth Bass. Oocyte numbers ranged from 1-25 among intersex individuals. Our study offers a modern analysis of the severity of intersex in a population of Largemouth Bass near a major metropolitan area, which represents an important contribution to the understanding of fish reproductive ecology, particularly in ecosystems with a history of environmental disturbance and recovery such as the IRW. Continued investigation of intersex condition may assist decision makers tasked with managing fisheries affected by reproductive impairment.

MANAGEMENT

Maximizing your research applicability: Research needs of the IDNR Division of Natural Heritage (IL AFS Presentation)

Bridget M. Henning, Illinois Natural History Survey

There is a well-known gap between policy and science, yet there is a need for sound science to inform agency decisions. The more informed the scientific community is about what agencies do and their research needs, the smaller that gap will become. We will review the various divisions and programs of Illinois Department of Natural Resources, focusing on the Division of Natural Heritage, and highlight their research needs. Current research informs much of what IDNR does, yet there are gaps in scientific knowledge, especially as it pertains to environmental review of impacts to endangered species. IDNR environmental reviewers are challenged to make recommendations about listed species with great uncertainty and incomplete scientific knowledge. Environmental reviewers express concern that the scientific community is unaware of the questions they have about species life history and specific technological impacts. We will

give examples of the types of questions environmental reviewers have on a day to day basis. There is an opportunity for scientists to improve the base of knowledge on which agency decisions are made. Developing richer connections between the scientific and regulatory/management community is needed to provide sound science to back up regulatory decisions and to provide researchers with research questions that will be immediately applicable.

What does genetic effective population size of Paddlefish populations tell us about conservation and management? (IL AFS Presentation)

Allison M. Asher, Southern Illinois University

The effective population size (Ne) indicates the rate at which genetic diversity declines and inbreeding increases due to genetic drift. Populations with small Ne lose their evolutionary fitness and are more prone to extinction. Ne can be reduced in stocked populations if the number of broodstock in a propagation program is small and the relative contribution of those few breeders to the stocked population is large. This is known as the Ryman-Laikre effect and can result in a reduced Ne even as the census size (Nc) is increased. Paddlefish (Polyodon spathula) populations have been greatly reduced in portions of their range and some of these populations are supplemented with hatchery reared paddlefish. We compared Ne of paddlefish from a large free flowing river (confluence of the Missouri and Osage Rivers, Missouri), two isolated Gulf Coast drainages (Pascagoula River, Mississippi and Bayou Nezpique, Louisiana), and an isolated stocked reservoir (Truman Reservoir, Osage River, Missouri). Ne of the open-river location was too large to be accurately measured using the method employed. The values of Ne within each isolated Gulf Coast drainage were smaller than that of the open river and varied between drainages, likely related to different Nc within each drainage. Truman reservoir had the lowest Ne, likely the result of the Ryman-Laikre effect. We recommend that future stockings in Truman Lake should employ broodstock collected in free-flowing portions of the Osage River.

Establishment of length-weight regressions for small Illinois fishes (IL AFS Presentation)

Jerrod L. Parker, Illinois Natural History Survey

Previous analyses have shown biomass can provide more accurate and biologically meaningful representations of fish responses to environmental alterations than abundance. In Illinois, fish are generally weighed to the nearest gram, weighed in groups (batch weight), or not weighed (small fish). When viewed at the assemblage level, these methods can significantly underestimate the contribution of small fish to overall catch statistics. To reduce this bias, we sought to create accurate length-weight regressions for fishes < 200mm. During 2014, we measured the weight of over 3,000 fishes (56 species from 12 families) from the Mississippi, Illinois, Kankakee, and Iroquois Rivers to the nearest decigram. Total lengths (mm) and weights were natural log transformed and simple linear regressions were constructed. Linear regressions trained using all species resulted in an r^2 of 0.90. To increase accuracy while limiting complexity, we constructed models for four distinct morphological groups ($0.98 < r^2 < 0.99$). This method allows weight estimation for uncommon fishes ($n < 50$), while still providing a high level of accuracy. Though these models will need further refinement and testing through additional data collection, we believe morphologically based linear regressions will provide the most succinct and accurate weight estimates based on fish length. These regressions will allow for novel use of

existing data, and may reduce reliance on potentially inaccurate and time intensive field recorded weights for small fishes.

Evaluation of flathead catfish populations in the Fox River (IL AFS Presentation)

Stephen M. Pescitelli, Illinois Department of Natural Resources

Flathead catfish have become more abundant in the Fox River over the past 20 years and are being increasingly targeted by local anglers. A study was initiated in 2009 to characterize basic population parameters and evaluate the need for harvest regulations. Mean pulsed-DC electrofishing catch rate for 2009 to 2013 was 10 fish/hour, lower than reports for other larger Midwestern rivers (28.2 to 41.6 fish/hour). Catch rate for hoop nets in the Fox River was one fish/net night compared to 0.03 to 0.33 fish/net night found in other studies. In the Fox River, hoop nets were not more effective for capturing larger-sized individuals compared to electrofishing. Overall, Fox River electrofishing catch rates were low for memorable-sized fish (>860 mm), averaging 0.4 fish/hour and only four trophy-sized (>1020 mm) fish were collected by all methods over the five year study period. Fish larger than 300 mm were marked using a Floy tags and adipose fin clips. Mean recapture rate was 12%, with tag loss averaging over 70%. Population estimates using three different methods ranged from 99-120 fish per river mile. Data from angler diaries in one study area indicated that anglers caught and (released) 25% of the population each year. Due to low electrofishing catch rates, especially for larger individuals, and potential vulnerability to harvest, a new regulation was established for the Fox River at a daily creel limit of three fish per day with only one fish 28 inches (700 mm) or larger.

Evaluating importance of targeted surveys for monitoring the status of rare fish species (IL AFS Presentation)

Brian Metzke, Illinois Natural History Survey

Standardized monitoring of fisheries (e.g., IDNR basin surveys, LTEF program) in Illinois has recorded 188 fish species during the past 15 years, however, state museum collections contain additional species not collected during standardized efforts. These additional species in museum collections generally are rare and of conservation concern that often are collected with targeted surveys. To evaluate the effectiveness of standardized sampling efforts at inventorying species, observed richness in each Illinois Ecological Drainage Unit (EDU) was compared between species recorded during standardized monitoring and those recorded in museum collections. On average, seven percent of species recorded within each EDU were not collected during standardized monitoring. Species in Greatest Need of Conservation (SGNC) and Threatened or Endangered (TE) species were disproportionately missed by standardized monitoring, with an average of 16 percent and 24 percent unrecorded, respectively. Furthermore, of those species unique to museum collections, an average of 56 percent were SGNC and 23 percent were TE species in each EDU. Targeted surveys can be used to locate and assess rare species missed during systematic monitoring. Case studies involving spring cavefish and Cache River backwater species are presented as examples of the value of conducting targeted surveys. Ultimately, tracking the status of rare species in Illinois requires prioritization, support and evaluation.

Alligator gar stockings denied

After three years of stocking alligator gar raised from fry produced by the Private John Allen National Fish Hatchery in Tupelo, Mississippi, the Illinois Department of Natural Resources Division of Fisheries denied additional stocking in 2014. Despite marked successes from the initial stockings that demonstrated tremendous growth rates and over-winter survival, the IDNR cited internal issues regarding the impacts of stocking a rare species and the potential consequences this may have on mandated sport fish management in the stocked waters.

Early milestones of the Alligator Gar Reintroduction Program include the successful stocking of 5,716 non-vulnerable alligator gar stocked at seven locations along the Illinois River corridor and the lower Kaskaskia River. To date, the largest individual collected by IDNR biologists was 49.2 inches and 27 pounds from Powerton Lake in 2013. This fish was stocked in 2011 as a two-year-old measuring 21.4 inches and three pounds. In 2014, two alligator gar estimated at about 60 inches long were "rolled", but not collected by biologists electrofishing Powerton Lake. 2013 also marked the first catch of alligator gar by a recreational angler in Illinois since 1966 when two were caught by hook-and-line from Rice Lake State Fish and Wildlife Area by a small group of fishermen targeting fish from the 2011 stocking. Both fish measured approximately 28 inches in length.

Although this reintroduction remains in jeopardy, southern Illinois will be the likely recipient of alligator gar migrating from the Ohio River tributaries of Kentucky, where the state has embraced the recovery of the species and continues an aggressive stocking program of 25,258 alligator gar stocked since 2009. Early evidence of this is an alligator gar collected on January 27th by a commercial fisherman from the Illinois waters of Angelo Slough near the confluence of the Mississippi and Ohio River.

Rung retires from DNR

After 28 years of service as a Streams Biologist in the northeast region of Illinois, Bob Rung has retired from the Illinois Department of Natural Resources Division of Fisheries. Bob labored with colleagues on the rivers and streams facing the many challenges that come with an expanding urban area of Chicago and its suburbs. He received notoriety from the local press for his efforts associated with the Northern Illinois Anglers Association's Kankakee River Fishing Derby, the collection of pre-spawn walleye for the LaSalle Fish Hatchery, and the thousands of water willow he had planted in the region's rivers through coordinated volunteer efforts. Bob Rung will be missed as an integral part of Illinois' fish management staff.

MUSSELS

Investigation of freshwater mussel glochidia presence on Asian carp and native fishes of the Illinois River (IL AFS Presentation)

Sarah A. Douglass, Illinois Natural History Survey

Densities of Asian carp in Illinois rivers are among the highest in the world and glochidia may inadvertently attach to these species. They have been reported to serve as fish hosts to freshwater mussels in their native territories. However no one has conducted research on the potential for Silver and Bighead Carp to host North American freshwater mussels or if they serve as reproductive sinks. In this preliminary investigation native fishes and non-native species (Silver Bighead and Common Carp) were collected from the Illinois River during summer of 2014. In addition Silver and Bighead Carp gills were collected from several major tributaries to the Illinois River. By collecting natives and non-natives we intend to document that glochidial release did occur and were available to attach to Asian carp. Preserved fins and tail and gills were observed. Gills were first treated with potassium hydroxide (KOH). An initial KOH test on multiple-sized gills suggested at least 20 minutes in 5% KOH to increase transparency of preserved gills. Although transparency became apparent in small gills in less time at 5% KOH the gill intactness and greater transparency still occurred at 20 min. Our primary objective is to evaluate the potential presence of glochidia on non-native fishes in the Illinois River system. If found this will be the first documented record (for Silver and Bighead Carp) in North America and would provide great incentive to pursue further studies to elucidate if Asian carp could serve as a successful host fish or as reproductive sinks-a possibility that could have a major impact on the future stocks of currently imperiled freshwater mussels.

When is a dam not a dam? - Stories of dam related projects at the INHS (IL AFS Presentation)

Jeremy S. Tiemann, Illinois Natural History Survey

Dams have been impounding rivers and aiding the progression of human society for more than 4000 years. Dams, however, are ecological disasters that cause severe disruptions to riverine ecosystems. Within the past year, we had the opportunity to work on two dam related projects. The first project pertained to two lowhead dams in the Vermilion River basin (Wabash River drainage) that are scheduled to be removed in 2015. We collected pre-removal baseline freshwater mollusk data by hand-picking at twelve sites centered around three lowhead dams. We found a diverse and abundant mollusk assemblage in reference areas but not in impounded reaches or in areas immediately downstream of the dams. The assemblage will be routinely monitored to document changes in richness and abundance after the dams are removed. Contrary to popular belief, these dams will not be the first to be removed from the Vermilion River basin. The Homer Park Dam on the Salt Fork near Homer was constructed in the 1830s but breached in the 1940s. We will touch on the current mollusk assemblage in relation to this former dam and compare it to the work of F.C. Baker from the early 1900s. Our most recent project was assisting with a fish and freshwater mollusk survey of the Xingu River (Amazon River drainage), Brazil, in November 2014 in anticipation of the completion of the Belo Monte Dam complex. The Xingu River, with its innumerable rapids and complex braids, flows for 1300 miles in the states of Mato Gross and Para. Over 500 species of fish have been documented from the Xingu, nearly 30 of which are endemics and could face extinction once the dams are operational. In our presentation, we will share these endeavors and discuss when dams are not dams.

Historical ecology and freshwater mussels: a window into the past (IL AFS Presentation)

Andrea K. Fritts, Illinois Natural History Survey

Freshwater mussels comprise a diverse fauna with multistage life histories. They are also highly imperiled animals that hold some surprising secrets about changes in the environment. The shells of freshwater mussels can provide a unique opportunity to conduct investigations of historical changes in aquatic ecosystems. Mussels deposit annual growth rings in their calcareous shells, much like tree growth rings, so that shells from archeological and museum collections can serve as records of long-term environmental change over the past 1000 years. We used sclerochronology techniques to evaluate changes in age-and-growth patterns in two mussel species collected from the Illinois River near Havana, IL from 1894-2013 as well as archeological shells from circa 1000 A.D. Von Bertalanffy analyses indicated that modern animals are growing at a 50% greater rate and reaching a maximum size that is 20 mm larger than their 1894 counterparts. We also used mussel shells to evaluate changes in legacy contaminants, specifically toxic metals, over the same time period. Divalent metals can be metabolically incorporated into the shell matrix of mollusks in a manner similar to calcium during periods of active growth. Archaeological shells served as a pre-industrial environmental baseline for metal concentrations prior to the arrival of European settlers. By constructing a historical biochronology response to environmental changes, we can better understand the dynamics of aquatic systems and the recovery rate after substantial perturbations and restoration efforts.

Genetic confirmation of putative Louisiana fatmucket in Illinois (IL AFS Presentation)

Alison P. Stodola, Illinois Natural History Survey

The range of the Louisiana fatmucket (Lampsilis hydiana) spans watersheds in Texas, northward to southern Arkansas, and eastward to western Mississippi. However, specimens with morphological similarities to the Louisiana fatmucket have been collected in watersheds in southern and south-central Illinois for several decades and were presumed to be strangely shaped fatmuckets (L. siliquoidea). To determine if both species co-occur in Illinois, specimens were collected from throughout the state and analyzed genetically using DNA sequences of the mitochondrial cox1 and nad1 genes. Phylogenetic analysis yielded two genetically distinct clades that support the recognition of two different species - L. siliquoidea and putative L. hydiana. The presence of L. hydiana in Illinois represents a substantial range expansion, so it is imperative that we obtain topotype material to determine if putative Illinois L. hydiana is indeed L. hydiana or another closely related species.

Assessment of a freshwater mussel community and short distrance translocation in northern Illinois (IL AFS Presentation)

Jeremy S. Tiemann, Illinois Natural History Survey

Freshwater mussels have undergone dramatic population declines due largely to habitat alteration. To mitigate the effects of anthropogenic habitat disturbance on mussels, short-distance translocations of individuals are commonly used. However, few studies can quantify the success

of translocations due to lack of sufficient post-translocation monitoring. Prior to the reconstruction of a bridge over the Kishwaukee River (Rock River - Mississippi River drainage) in northern Illinois, we evaluated the mussel community adjacent to the impacted reach and began to determine the efficacy of short distance translocations as a mitigation tool for threatened/endangered species. Using hand-picking surveys we found the mussel community at the site consisted of 15 species. The community was relatively diverse but was dominated by two species, Lampsilis cardium and Actinonaias ligamentina. We also recorded 17 Ligumia recta, a state threatened species. Using the two common species as a proxy for the co-occurring state-threatened species, we examined apparent survival rates following a short-distance translocation. We marked all individuals using passive integrated transponder (PIT) tags, and released them 200 m upstream of the construction site. We then monitored them monthly from May through October of 2013-2014. We used Cormack-Jolly-Seber models to estimate warm season apparent survival rates. Our data suggests apparent survival is lowest the first month after translocation, and stabilizes thereafter, indicating short distance translocation is a viable tool for species conservation but will not eliminate all mortality from anthropogenic habitat disturbance.

Lowhead dam impacts on mussel populations in the Vermilion River basin

Tiemann et al. - We sampled freshwater mussels at 12 sites centered around three lowhead dams in the Vermilion River basin (Wabash River drainage) to address their effects on the freshwater mussel fauna and to obtain baseline data prior to dam removal. Compared with reference sites, impounded areas and plunge zones had lower mussel abundance and extant species richness. We also examined literature accounts and museum collections to determine species distributions in the basin and compared those data to locations of the dams and location of the former Homer Park Dam, which was removed more than 50 years ago. Two species, Yellow Sandshell (Lampsilis teres) and the state-threatened Black Sandshell (Ligumia recta), are now found only downstream of the Danville Dam. Mapleleaf (Quadrula quadrula), which was found only downstream of the Homer Park Dam prior to 1950, has expanded its range upstream since the dam was removed. Data collected during this study contributes insights into the effects of lowhead dams on freshwater mussels, and will be used to compare to future post-dam removal collections.

Translocation of federally-listed mussel species

Tiemann et al. - Staff from the Illinois Natural History Survey participated in a joint project with the Illinois Department of Natural Resources and the U.S. Fish and Wildlife Service to collect two federally-endangered mussels species from the Allegheny River, Pennsylvania, and translocate them to the Vermilion River basin (Wabash River drainage), Vermilion County, Illinois. On 25 August 2014, 750 Northern Riffleshell (Epioblasma rangiana) and 808 Clubshell (Pleurobema clava) were collected at the U.S. Highway 62 bridge construction project in Allegheny River, Forest County, Pennsylvania. Animals were quarantined for four days at the INHS Aquatic Research Pond Facilities in Champaign-Urbana. While in quarantine, all individuals were affixed with a unique PIT tag and a plastic shellfish tag. After the quarantine period, the animals were divided and translocated to four sites in the Vermilion River basin, Vermilion County, Illinois, on 29-30 August 2014. Including the 2014 animals, a total of 2,099 Northern Riffleshell and 1,766 Clubshell have been translocated to eight sites in the Vermilion River basin since 2010. Detection rates have been highly variable by site, season, and species as

was reported in Tiemann (2014). Since the inception of the monitoring program, the detection rate per survey per site has varied from 3% to 100% with a project mean of 42% for the Northern Riffleshell and from 37% to 100% for the Clubshell with a project mean of 70%. Of the individuals encountered during the duration of the project, 58% of the Northern Riffleshell and 89% of the Clubshell have been alive.

Update on mussel species in greatest need of conservation

Douglass & Stodola - update on mussel species "in greatest need of conservation". Their technical report, published late last year, found that three species flagged for worry in previous surveys — monkeyface, purple wartyback and spike — had become even rarer. In addition, at least eight species considered to be in good shape were found instead to be rare or declining. But the news isn't all bad. With the increase in sampling, some species listed as state-threatened were actually found to be "more common than we thought," Douglass said. The black sandshell, slippershell and little spectacle case appear to be increasing and may no longer meet state requirements for listing as threatened, according to the report. And rock pocketbooks, which had been on the worry list, are in better shape, too.

OUTREACH

The Year of Fishing (IL AFS Presentation)

Cortney Solum, Two Rivers National Wildlife Refuge

Cortney will provide information about the Year of Fishing 2015, a series of family friendly events hosted by partner organizations along the Mississippi River, including local businesses, non-profit groups and government agencies. All ILAFS members are encouraged to participate or even host an event. Find events at www.mr-cc.org.

RESTORATION

Ecological evaluation of an urban stream restoration in West Chicago Illinois (IL AFS Presentation)

Austin T. Rundus, University of Illinois

Urbanization in the United States has created unique challenges to lotic systems, including increased runoff, higher pollution rates, and in-stream habitat degradation. Although stream restoration projects have become more common, ecological evaluations of those projects are rare. From 2005 - 2012 in-stream and riparian habitats of an 8-mile reach of the West Branch of the DuPage River were improved to restore ecological function and benefit stream fish communities. We conducted a two-year post-project evaluation of the West Branch, using as a reference the East Branch of the DuPage River, a degraded stream within the DuPage River watershed. The study objective was to examine the relative fish abundance, fish community composition, and species richness in relation to stream habitat, stream flow, and water quality

parameters. Fish communities were sampled using backpack electroshockers, and stream habitat, stream flow, water quality data were collected at 8 sites on each stream in the spring, summer and fall of each year. Preliminary results show a trend towards higher quality stream habitat but similar water quality in the restored West Branch when compared to the reference stream. We detected a trend towards higher fish species richness and abundance in the East Branch that may reflect a lag between physical restoration and positive fish community response. Abundance of young-of-the-year and juvenile Smallmouth Bass, however, was greater in the West Branch, indicating the potential that in-stream restoration had positive impacts on Smallmouth Bass recruitment by providing high quality juvenile rearing habitats.

Effects of dams on fish assemblages and habitat in the Vermilion River (IL AFS Presentation)

Shannon C. Smith, Eastern Illinois University

Artificial impoundments such as dams have the potential to change river habitat type and hydrologic regimes. Dams often create pooling effects immediately above the dam that shift riverine lotic habitats to lentic habitats. These changes can influence fish movement and dispersal, leading to changes in fish community assemblages over time. The Danville and Ellsworth Park dams located on the Vermilion River and the North Fork Vermilion River have been in place for nearly a century and are scheduled to be removed in 2015. To determine how these dams impact biotic communities and habitat quality, we have semiannually assessed fish assemblages and habitat characteristics in twelve sites (six per river) using DC electrofishing since 2012. Sites included two below each dam, two sites immediately above each dam in the artificial pool, and two sites upstream of the pool extent. Data verified fish assemblage differences between sites, below dam sites on both rivers had the highest diversity while pool sites had the lowest ($p<0.05$). IBI and habitat quality scores followed a similar pattern with the lowest scores in the pool sites. Habitat quality scores and substrate types at each site revealed that these dams have altered habitats immediately upstream of the dams. Our data also suggest that these different habitat types favor different groups of fishes, influencing the dispersal of pool and riffle specialists. Further monitoring of fish assemblages will continue after the removal of these dams in order to assess subsequent changes to the river system.

A science-friendly water control structure for The Nature Conservancys Emiquon Preserve (IL AFS Presentation)

Douglas Blodgett, The Nature Conservancy

In large-floodplain river ecosystems, hydrology is a key driver for a variety of important ecological processes including mediating the dynamic relationship between the river and its floodplain and shaping and sustaining the diversity of habitats and animal communities it supports. At The Nature Conservancys Emiquon Preserve along the Illinois River in Fulton County, a levee constructed nearly a century ago currently isolates approximately 5500 acres of former river floodplain from overland flow, severely altering natural floodplain hydrology and constraining or even eliminating many of those ecological processes essential for sustaining desired natural communities long term, including contributions to the Illinois River ecosystem. Working with partners, we have designed a water control structure for the levee between the

river and the preserve that will provide managed connectivity to restore a more normal floodplain hydrology and many associated natural processes. Additionally, the structure will provide drainage to protect private agricultural lands and other infrastructure such as roadways and the levee. It is designed not only to provide as much flexibility as practical in managing hydrology, but also to facilitate monitoring and research to 1) develop, test, refine and promote effectual floodplain management techniques for restoring and sustaining functional floodplains, 2) provide a better understanding of river-floodplain ecology, and 3) contribute to healthier large-floodplain river ecosystems for nature and people.

Ecomorphology of fish assemblages in an east central Illinois stream (IL AFS Presentation)

Carl A. Favata, Eastern Illinois University

Habitat degradation has negatively impacted Midwestern stream fish assemblages. Understanding the complex dynamics within these systems can help mitigate losses. Our objective was to assess and model fish communities within a Midwestern stream influenced by anthropogenic pressures. We examined fish communities at seven reaches within Kickapoo Creek in east-central Illinois. This creek is a region of decreased geomorphic stability and the site of multiple restoration projects. Fish communities were sampled in restored, reference, and impacted reaches using single-pass electrofishing sampling. We describe community metrics for each reach within the stream and use principal component analyses to explain the factors driving species composition among reaches. Restored reaches show higher average relative densities, index of biotic integrity scores, and species richness than reference and impacted reaches. Community assemblages within Kickapoo Creek are primarily influenced by factors relating to channel morphology including mean channel width and depth as well as flow regime. There is an apparent relationship between channel morphology and distribution of the six most abundant species. Reaches with higher mean depths and larger pool areas showed increased abundance of Longear, Lepomis megalotis, and Green Sunfishes, Lepomis cyanellus. Reaches characterized by shallower depths and faster flows show decreased abundance of sunfish and increased abundance of Bluntnose Minnow, Pimephales notatus, Steelcolor Shiner, Cyprinella whipplei, Sand Shiner, Notropis stramineus, and Central Stoneroller, Campostoma anomalum. The variability between assemblage structures can be explained by habitat and ecomorphology of fishes.

The Nature Conservancys Emiquon Preserve aquatic vegetation and fish community monitoring (IL AFS Presentation)

Todd D. VanMiddlesworth, Illinois Natural History Survey

The Nature Conservancys Emiquon Preserve consists of two historic floodplain lakes known as Thompson and Flag lakes. The Illinois Natural History Surveys Illinois River Biological Station has conducted aquatic vegetation and fish community monitoring to collect data and evaluate conservation goals for TNC known as Key Ecological Attributes. KEAs serve as restoration success criteria and as the driving management tool at the Emiquon Preserve. The restored floodplain sustains a diverse 11 species and abundant native submersed aquatic vegetation community that is otherwise difficult to find within the Illinois River Valley today. As the diversity and plant density increased since restoration, so has the species richness and biomass of native fishes. Native aquatic vegetation and fish species remained dominant in our collections

while non native species were present during 2014. Non native aquatic vegetation and fish species will continue to be monitored closely. The INHS IRBS will continue to monitor the aquatic vegetation and fish communities at TNCs Emiquon Preserve to evaluate KEAs and conduct additional research. The knowledge gained from the data collected will continually serve useful for floodplain restoration managers.

Hydrologic restoration plans stall at Emiquon

A controversial plan by The Nature Conservancy (TNC) to hydrologically re-connect restored wetlands with the Illinois River has stalemated an interagency plan to manage the Emiquon National Wildlife Refuge near Lewiston. Last November, TNC submitted a letter to the U.S. Army Corps of Engineers stating it would not sign a Project Partnership Agreement at the time. However, TNC's river conservation director, Doug Blodgett, said they were "not pulling out" of the Emiquon East Habitat Rehabilitation and Enhancement Project and was hopeful issues could be resolved with the Corps and other partners (IDNR, U.S. Fish and Wildlife Service and Natural Resource Conservation Service).

At the center of the controversy is TNC's plan to connect the 6,000 acre Emiquon East unit with the Illinois River. The Nature Conservancy owns the wetland, now separated from the river by a levee, and would like its hydrology dependent upon natural flood pulses by the river. Opponents of the project point to the likelihood of invasion by exotic species (notably Asian carp) and impacts of the river's con-siderable sediment loads on the wetland should it be reconnected. A petition opposed to the project drew more than 1,500 signatures, according to retired IDNR Fisheries chief Mike Conlin.

Another sticking point appears to be TNC's plan to construct ten islands within the parcel. NRCS holds a Wetland Reserve Program (WRP) conservation easement on much of the property and has withheld authorization for this activity. TNC's letter calls for more Federal cooperation on the project. Two weeks ago (2/19/15) at an Emiquon Symposium, The Nature Conservancy announced the Corps' project agreement was too onerous for them as it required TNC to assume perpetual operation and maintenance. In addition, TNC and NRCS could not concur on a Compatible Use Agreement regarding management of the WRP parcels.

In the absence of these private-Federal partnership agreements, TNC announced they would unilaterally pursue a water control structure with their own funding. It would be constructed under the guise of the local drainage district and ostensibly address flooding of adjacent farms. According to Blodgett, the design incorporates box culverts and stop logs with the ability to monitor potential organism transfer prior to moving water. It would also have two pumps for active drawdown within Emiquon when the Illinois River was above the level necessary for gravity drainage. However, any operation of this structure would still require NRCS to sign off on the plans (via Compatible Use Agreement) because of the WRP easement. *(Compiled from 11/27/14 Outdoor News, Ralph Loos, editor, with contribution from Rob Hilsabeck, IDNR Fisheries)*

Fox River dam removal plans move forward

The Illinois Dept. of Natural Resources has pledged $3.5 million towards removal of two dam structures on the Fox River as part of an intergovernmental agreement reached with The Kane County Forest Preserve District. Of this total, $2.4 million will be spent removing the Carpentersville Dam at Fox River Shores Forest Pre-serve and the remaining $1.1 million to take out the Causeway at Fabyan Forest Preserve in Geneva. IDNR monies will be utilized for engineering, dam removal and habitat restoration at the two sites.

Further downstream in North Aurora, a similar agreement was reached between IDNR, the Village of North Aurora and the Fox Valley Park District. Here, village officials have yet to approve the project and are studying the proposal which includes another $3 million from IDNR. The North Aurora dam is the next one below a dam previously removed in South Batavia. As with other recent dam removal projects in northeastern Illinois, stated goals are to improve water quality, aquatic habitat and recreational safety.

Such projects bode well for one of Illinois' most significant aquatic ecosystems. The Fox River supports a hugely popular sport fishery, great diversity and several state-listed fish species (river redhorse, greater redhorse, Iowa darter). According to IDNR fisheries biologists, dam removal completed on the Fox thus far has opened miles of free-flowing river habitat, much of it suitable for spawning of smallmouth bass, channel catfish and a host of other sport and non-game fishes. Greater redhorse were reported for the first time upstream of a recently completed project. *(Excerpted from multiple local news sources, January 2015).*

Fox River 519 Project

Army Corps of Engineers has a 519 project ongoing on the Fox River. They are developing a feasibility plan for removal of 11 dams. Some of these will drop off the list - Algonquin and St. Charles, most likely. They are moving forward very rapidly due to the wealth of information already available on the Fox River Dams. Costs are coming down, initial estimates are about 10-12 million for all the dams. Recent DNR contracts for the Carpentersville and North Aurora removals can be used as match.

In addition, there is a public private consortium known as the Fox River Study Group which is working with local communities to remove dams for water quality improvement (in lieu of a TMDL process). So far they have met with all the Fox River Dam communities together with DNR staff. It may be a perfect storm for dam removal on the Fox!

Des Plaines River dam removals

So far, there have been 5 dams removed on the Des Plaines River, including two removed in 2014 as part of the Statewide Dam Removal initiative. The five remaining dams are in design phase for removal under this program and all five could be gone by the end of 2015. Completion of these projects would create a dam-free Des Plaines River from the WI border to the Brandon Lock - about 90 miles!

On a related note - GLMRIS has proposed installing a permanent barrier at the Brandon Lock to control upstream movement of the Asian carp. This would also stop native species movement into the soon to be dam free Des Plaines River. This river was previously very degraded. In

1983 it had an average IBI of 15 on the mainstem. In 2013 the average improved to 30 IBI points. Improvements have been noted even is the most recent surveys and new species continue to show up, mostly likely using the Brandon Lock as a migration path. Recent arrivals include the rosyface shiner, silver redhorse, three buffalo spp, and river carpsucker. A total of 33 species have added to the list since 1983. The Asian carp barrier would stop native migrations and limit the return on the public investment in river restoration on the Des Plaines River.

Vermilion River dam removal plans move forward

Planning and permitting for the removal of Ellsworth Park Dam on the North Fork Vermilion River and Danville Dam on the Vermilion River continue, despite the freeze on state funds by the newly elected Governor Bruce Rauner administration. The State dedicated over $2.5 million to the removal of these two dams under the administration of former Gov. Pat Quinn. These dams have been the sites of multiple drownings, the most recent was a canoeist in July 2003. In addition to the liability issues faced by the City of Danville, the failing Danville Dam also threatens catastrophic bank failure that would lead to the collapse of a city street at the top of the north bank. Removal of these two dams will also restore connectivity between the lower 22 miles of the Vermilion River and over 1,290 square miles of drainage that lie upstream of Danville Dam. Benefits are expected for the river fauna that includes 96 fish species and 46 mussel species.

RIVER AND STREAM ASSESSMENT

Resilient sportfish and vulnerable invaders: insights from six decades of sampling on the Illinois River (IL AFS Presentation)

Daniel Gibson Reinemer, Illinois Natural History Survey

Once considered a dumping ground for waste from the Chicago area, the implementation of the Federal Clean Water Act has resulted in major improvements in Illinois River water quality. Subsequently fish communities have also undergone major improvements. In the upper reaches of Illinois River, fish communities that were historically dominated by common carp (Cyprinus carpio) and goldfish (Cassius auratus) transitioned to a more diverse assemblage of sportfish and other native species. Of special interest is the steady improvement in important sportfish, particularly bass and other centrarchids. This recovery of sportfish populations in the upper Illinois River occurred while common carp and goldfish populations were plummeting throughout the entire river. There have also been improvements in the lower reaches downstream of Starved Rock dam, though these were never as impaired as the river closer to Chicago. Critically, the changes in both sportfish and carp populations are most evident when considered across four or five decades, highlighting the value of long-term monitoring for assessing species most relevant for fisheries management.

Effects of DC electrofishing pulse frequency on collection of fish in the Wabash River (IL AFS Presentation)

Zachary A. Mitchell, Eastern Illinois University

Large Midwestern river fisheries are both commercially and recreationally important, however, sampling these systems is difficult due to their large spatial scale and a myriad of habitats. Several gear types have been used to sample fish populations in large rivers each with selectivity and inefficiencies issues. Demographic estimates rely on accurate information collected in the field using these gears. We sought to assess the differences in fish communities sampled with two pulse frequencies of DC electrofishing. We sampled ten 1.6-km sites using both low frequency (15 Hz) and high frequency (60 Hz) pulsed-DC electrofishing during the fall and winter of 2014. Sampling was conducted for 0.5 hrs at each pulse frequency at each site. As an estimate of relative density we calculated catch per unit of effort (CPUE) for each frequency. We sampled a total of 1152 individuals from 34 species during the fall and winter. The interaction between frequency and season were shown to have a significant effect on CPUE of total fish sampled ($P < 0.05$), however, season was the only factor affecting the relative density of catfishes between frequencies ($P < 0.001$). Catfish CPUE was significantly lower during the winter season for both frequencies when compared to the fall ($P < 0.05$). Our current findings suggest that 60 Hz should be used to sample fish communities during the fall because of higher catch rates resulting in a more representative sample of those species, whereas, low frequency seems to over select for flathead catfish and underestimate the relative densities of other commercially important species.

Variation in the community structure of fishes from main channel border habitat among reaches of the Mississippi and Illinois Rivers (IL AFS Presentation)

Ben J. Lubinski, Illinois Natural History Survey

We analyzed four years (2010 - 2013) of electrofishing data collected from the main channel border of the Mississippi and Illinois rivers by the Long-Term Illinois, Mississippi, Ohio and Wabash Rivers Fish Population Monitoring Program (LTEF) and long-term monitoring for the US Army Corps of Engineers Upper Mississippi River Restoration (UMRR). Community structure of fishes differed significantly between the two rivers and among the reaches. The Des Plaines Reach of the Illinois River and Pool 8 of the Mississippi River formed a distinct group, with less than 45% similarity to all other reaches within the two rivers. Pool 8 and the Des Plaines Reach were characterized by high abundances of centrarchid sport fishes such as Bluegill and Largemouth bass. Other important species separating groups include invasive species such as Common carp and Silver carp. Our analysis revealed a surprising amount of overlap between the two rivers, including within finer-scale groups among river reaches. We will continue to explore the role of environmental variables and fish species in the observed community structure patterns.

Comparison of fish community composition and structure among river reaches of the Upper Mississippi River: determining the effects of lock and dam 19 (IL AFS Presentation)

Rebekah L. Haun, Western Illinois University

Completed in 1913, Lock and Dam 19 (RM 364.2) separates navigation Pool 19 (74.5 km) from Pool 20 (35.2 km) and created the first artificial impoundment on the Upper Mississippi River (UMR). Lock and Dam 19 is unique among most other dams on the UMR in that it is a hydroelectric dam with a significant hydraulic head (10 m) that created the largest impoundment (pool) on the system (46 miles as opposed to a median of 26 miles for the other pools on the mainstem). This dam likely acts as a significant barrier to upstream migration for fish. In 2013 and 2014, standardized pulse-DC electrofishing was conducted in Pool 19 (n 87/yr) and Pool 20 (n 52/yr) to assess local and system scale variation in fish community composition and structure among reaches above and below Lock and Dam 19. Sampling was consistent with standardized protocols from the Long Term Resource Monitoring Program (LTRMP) allowing for comparisons among the reaches we sampled and those sampled by the LTRMP (i.e., Pools 4, 8, 13, 26, the LaGrange Reach of the Illinois River, and the open Mississippi River). Cluster analysis and non-metric multidimensional scaling of fish community composition and structure was used to assess differences among all reaches. Preliminary results suggest Lock and Dam 19 serves as a transition for fish community structure and composition in the Upper Mississippi River. Sixty-four fish species were collected in pool 19 (n 16,041) and 50 collected from pool 20 (n 9,596) in 2013.

Efficacy of automated sampling buoys used in the Great Rivers Observatory Network (IL AFS Presentation)

Lori S. Gittinger, Illinois Natural History Survey

In this poster we address the deployment and efficacy of automated sampling buoys used by the Great Rivers Observatory Network (GREON). From May 14 to October 24, 2013, the first GREON buoy was deployed in an impounded backwater of Pool 26 of the Upper Mississippi River for preliminary testing. This deployment included a major flood event during the month of May and June. The GREON buoy was deployed adjacent to an LTRM fixed WQ site, allowing us to assess the accuracy of data from the buoy compared to the traditional sampling methods used by the LTRM program. We were able to detect outliers and issues with both types of sampling methods and remove these observations from our analyses. Significant linear regressions were found between GREON and LTRM data for all parameters: temperature, conductivity, pH, DO, turbidity, chl-a, and nitrate. The continuous readings from the GREON buoy allowed us to see trends that would have been missed, especially during flooding when traditional sampling was not possible. In the fall of 2014, four sampling buoys were deployed in the same backwater area for a little over a month. Data from the four sampling units was very consistent. Although automated samplers likely will never entirely replace a traditional water quality sampling, we believe our results show that they can be a valuable compliment to standard water quality sampling.

Triumphs and tragedies of partnerships: Balancing competing objectives for the Upper Mississippi River Restoration - Environmental Management Program (IL AFS Presentation)

John H. Chick, Illinois Natural History Survey

The U.S. Congress recognized the Upper Mississippi River System (UMRS) as a nationally significant ecosystem and nationally significant commercial navigation system in the Water Resources Development Act of 1986. This act also created the Upper Mississippi River Restoration - Environmental Management Program (UMRR) to help managers maintain the integrity of the UMRS for multiple ecosystem services. The UMRR is implemented by the United States Army Corps of Engineers, in partnership with six federal agencies and the natural resource agencies of the five UMRS states. There are two main elements of the UMRR: 1) Habitat Restoration and Enhancement Projects to improve critical habitat of the UMRS, and 2) the long term resource monitoring and scientific research to improve our understanding the UMRS ecosystem. The UMRR has a substantial record of success in both restoration and scientific research. Nevertheless, managing the multiple and sometimes competing interests of this broad partnership unavoidably creates challenges. Additionally, the UMRS is also substantially affected by anthropogenic and other influences that operate at the regional and global levels and are frequently beyond the regulatory/management authority of the partnering agencies. These factors include sediment and nutrient loading, invasive species, and climate change, all of which can influence the effectiveness of UMRR habitat restoration projects. The UMRR partners need to find ways to work together, but outside of the UMRR program itself, to address these regional and global drivers that impact the Upper Mississippi River System and the success of UMRR at meeting its strategic goals.

The Great Fish Depression: Exploring three consecutive years of low catch of fishes from UMRR monitoring (IL AFS Presentation)

Eric J. Gittinger, Illinois Natural History Survey

For the 20 year period (1994 - 2013) of long-term monitoring in Pool 26 of the Mississippi River for the USACE Upper Mississippi River Restoration (UMRR), we observed very low catch of fishes for three consecutive years from 2009 to 2011. For these three years, the total number of fishes captured declined by 45-57 % relative to the 20 year average total catch. Conversely, total catch from 2006 to 2008, along with 2012 and 2013, ranked among our highest for the 20 year record, with 2008 being the greatest total catch across all years. Three other LTRMP field stations, Pool 13 and the Open River Reach on the Mississippi River and the La Grange Reach of the Illinois River, had similarly low catch for these years. Similar declines were not evident for Pools 4 and 8 on the Mississippi River. We explored the underlying dynamics of this pattern, identifying which species showed declines, whether catch trends were consistent across sampling gear, whether unusual environmental conditions were present that may have influenced the effectiveness of our gear or contributed to declines in fish populations. Recent changes in flood frequency, timing, and magnitude appear to be a likely factor to have influence the patterns of low catch observed. Flooding has the capacity to affect our data by influencing sampling effectiveness and by directly influencing fish populations.

The Conservation Reserve Program and its effect on fish diversity in the Kaskaskia Basin (IL AFS Presentation)

Levi A. Drake, Illinois Natural History Survey

The State of Illinois Conservation Reserve Enhancement Program (CREP) offers land owners in the Kaskaskia basin financial incentives to implement conservation practices on a voluntary basis. This study looks to use "neighborhood" species pools at varying spatial scales to investigate how CRP/CREP lands affect stream fish diversity. Fish samples were collected at 78 randomly selected sites throughout the basin from June through August, 2013 and 2014. A combination of this data and existing data from the Illinois Department of Natural Resources fisheries database were used for analysis of species pools in several aquatic regions about each site. Network Analyst in ArcMap was used to calculate a matrix of network waterway distances amongst sites and define aquatic regions in incremental distances of 5 waterway kilometers from study sites. Machine learning techniques (e.g., random forest classification) were used to create basin-wide models of individual species and overall species richness, which were used to improve the estimates of species pools. Linear regression was used to evaluate whether the proportion of CRP/CREP lands in a catchment affects species richness standardized by richness at larger spatial extents. This study provides insight into the role of CRP/CREP in restoring fish diversity and its effectiveness for aquatic conservation.

Changes in fish species distribution and stream quality over thirty years in the Des Plaines River (IL AFS Presentation)

Stephen Pescitelli, Illinois Department of Natural Resources

Since 1983, a total of five surveys have been conducted on the Des Plaines River allowing evaluation of changes in fish assemblages and stream quality over 30 years in a highly urbanized river system. In 1983, 28 fish species were collected at 15 stations compared to 50 fish species found at 17 stations in 2013. Thirty-three additional native species were found in four surveys after 1983, for an overall total of 61. Seven stations were common to all five surveys. Mean number of species captured at these seven stations in 1983 was 11, compared to a range of 15 to 18 fish species per station in subsequent surveys. No intolerant species were found in 1983 and tolerant species made up 73% of the collection. The percentage of tolerant species decreased in each of the following surveys and comprised only 18% of the total in 2013. Four intolerant species were captured in 2013. Mean IBI in 1983 was 15 compared to a mean of 30 in 2013. Improvements in water quality throughout the system account for increased species numbers and higher IBIs. Additional species found over the sampling period included: quillback, river carpsucker, spotted sucker, smallmouth buffalo, silver redhorse, freshwater drum, longnose gar, flathead catfish and rosyface shiner. The most likely source for many of these species is the Lower Des Plaines River, downstream of Brandon Lock. A recent proposal to establish a barrier for invasive species at the Brandon Lock may also affect movement of native fishes.

The Long-Term Fish Population Monitoring Program for the Wabash River (IL AFS Presentation)

Cassi Carpenter, Eastern Illinois University

The Wabash River is a very unique system because a large portion of it is free flowing therefore makes it a good representative of a more "natural" large river ecosystem. Furthermore it also provides an important sport and commercial fishery for both Indiana and Illinois. To effectively monitor and assess fish populations shoreline DC-electrofishing was completed during 2010-

2014 in accordance with The Long-Term Illinois Mississippi Ohio and Wabash Rivers Fish Population Monitoring Program (LTEF). Each fish sampled was measured to total length (mm) and weighed (g). A total of 100.5 hours of DC electrofishing has been completed during project. 41212 fish comprised of 95 species were collected within 402 sites along the Wabash River. Gizzard Shad Freshwater Drum River Carpsucker Emerald shiner and Mississippi Silvery Minnow were the most abundant species collected. Gizzard Shad catch rates dropped drastically after 2012. The drop in Gizzard Shad catch rates could be caused by the drought of 2012 cyclic nature of Shad populations or possible influence of Silver Carp on their life history. LTEF sampling will continue indefinitely and will monitor future fish population fluctuations.

Standardizing a multi-gear approach for sampling Ohio River catfishes (IL AFS Presentation)

Devon Oliver, Southern Illinois University

There is a lack of basic demographic information on catfishes in many U.S. Rivers resulting from inadequate data and sampling. Standardized sampling methods used to assess catfish populations are well developed for lentic systems they are not as well developed in lotic systems and development of standardized sampling methods is necessary to analyze population characteristics of catfishes in the Ohio River. While there are many gear types that can be used to sample the populations of catfish in riverine systems catchability does not remain constant throughout the age distribution within an individual gear type and a multi-gear approach may be essential to representatively sample catfish populations in the Ohio River. The objective of this study was to develop a standardized sampling protocol for catfishes in the Ohio River. Sampling for catfishes was conducted during May-October 2012-2014 using electrofishing trot lines and hoop nets. We found that trot line sampling using cut bait was ineffective at catching any portion of the flathead catfish population. However trot lining was among the most effective gears for sampling blue and channel catfish >300 mm total length (TL). DC electrofishing at 15 pps was most effective for sampling small (< 300 mm TL) blue and channel catfish whereas 60 pps was most effective for channel catfish 300-600 mm TL. Hoop nets and low-pulse DC electrofishing both collected broad size ranges of flathead catfish but mean length of flatheads collected in hoop nets was significantly larger than fish collected by electrofishing.