

# MONDAY POSTER SESSION

## FISH AND AQUATIC ECOLOGY

ROOM:

TIME: Monday

TITLE: Forecasting and mapping recruitment of coarse woody structure from riparian areas to littoral zones of north temperate lakes in Wisconsin

AUTHOR(S):

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ABSTRACT: Current riparian land-use practices have been linked to a decrease in the recruitment of coarse woody structure (CWS) into lakes resulting in reduced habitat for fish and wildlife. The objective of this research is to compare predicted levels of CWS recruitment among lakes that have varying levels of shoreline development to elucidate how land-use affects the sustainable recruitment of woody habitat to lakes across northern Wisconsin. Riparian area land-use is being delineated using high resolution and color infrared aerial photography in order to forecast recruitment rates of CWS into littoral zones of lakes over a 150 year time span, beginning at present. This study forecasts effects of several land uses, including unaltered natural riparian areas, total forest removal, and several types of intermediately modified riparian conditions. A forest succession model (JABOWA) predicts growth and survival rates of trees in riparian areas and linked to a recruitment model developed by Scribner (2006) that predicts coarse woody structure recruitment rates to lakes. GIS mapping of distinct patterns of land use and resulting varying levels of recruitment of natural sustainable woody habitat will be integral in assessing how the riparian landscapes and littoral zones are affected. It is anticipated that land managers, lake associations, and other stakeholders will be able to employ these models as a tool to index how human disruption has affected CWS recruitment and in turn affected fish and wildlife habitat.

KEYWORDS: riparian, GIS, littoral

ROOM:

TIME: Monday

TITLE: Otter Lake restoration project

AUTHOR(S):

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ABSTRACT: The vision of the Otter Lake initiative is to provide a "one-stop shop" for landowners interested in protecting natural resources and reducing soil erosion but unfamiliar with the myriad of state and federal programs available to help defray the cost. The concept will improve the IDNR's relationship with federal conservation programs making it easier for landowners to sign up and make use of these programs. We are trying to change our role to make the legwork (for landowners) as easy as possible. Many federal programs require matching funds and the IDNR can help supply some of the needed match to get a federal project started. Otter Lake will bring together a variety of agencies and programs to protect rare and declining habitats and species, while addressing water quality concerns for the lake. Recent work has included field surveys, estimations of sediment and nutrient loadings, targeted landowner outreach and project implementation, landowner workshops, and grant applications focused on specific land treatments.

KEYWORDS: restoration, partnership, Illinois

ROOM:

TIME: Monday

TITLE: Evaluation of estrogenic compounds in the West Fork White River

AUTHOR(S):

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ABSTRACT: Environmental Estrogenic Compounds (EC) are known to cause physiological and behavioral changes in fish. Point sources of ECs include wastewater treatment plants (WWTP), combined sewer overflows (CSOs), and some agricultural operations. The West Fork White River is impacted by all three potential point sources of ECs as it travels through Delaware County. The objective of this study was to evaluate the presence of ECs in White River using morphological measurements of the bluntnose minnow *Pimephales notatus*. Fish were sampled using a tote-barge electrofishing unit at two sites located above and below town as well as three sites located below the most active CSOs within Muncie city limits. After collection fish were evaluated for sex, total length, weight, widest head width (HW), interocular distance (ID), gonadosomatic index (GSI), gonad weight (GW), egg count (EC), tubercle count (TC), and tubercle score (TS). A total of 377 fish were collected between May 19 and May 29, 2009. Males exhibited a lower TC, lower TS, smaller GW, lower GSI, longer ID, and longer HW at sites upstream of Muncie while females exhibited higher GSI, higher GW, longer ID, and longer HW upstream of Muncie. Males also showed a slight decrease in TS, TC, and GSI below town. The physiological differences found in our study agree with similar studies evaluating the effects of ECs on other fish species. Our data indicate White River is receiving ECs upstream of Muncie and there is some evidence to suggest Muncie is contributing to the environmental ECs in White River. To gain a more accurate evaluation of environmental ECs in White River wild caught male fish should be evaluated for vitellogenin expression.

KEYWORDS: estrogen, contaminants, pimephales

ROOM:

TIME: Monday

TITLE: The common snapping turtle as a sentinel of agricultural effects on lotic ecosystems

AUTHOR(S):

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ABSTRACT: The anthropogenic control of lotic systems, in addition to the use of pollutants has created both direct and indirect effects on the aquatic systems of the world. Namely, the modification of rivers and streams along with the use of pesticides has caused a global decline in the number of reptiles. Goals of this study are to determine: (1) the relative abundance of Testudines, (2) movement patterns of snapping turtles, and (3) the amount and distribution in the water, as well as the levels and age dependence in snapping turtles of atrazine and glyphosate. This study was carried out in the Embarras River in Coles County Illinois. Hoop nets and modified minnow traps were deployed at each location for four days using frozen fish as bait. All turtles captured were identified to the species level and their quantity was recorded. In addition, snapping turtles were individually marked and location was recorded using a GPS. Six different species were found to inhabit the river. Abundance in descending order was the eastern painted (*Chrysemys picta*), red-eared slider (*Trachemys scripta*), eastern spiny soft-shell (*Apalone spinifera*), the common map (*Graptemys geographica*), and the common musk (*Sternotherus odoratus*). The snapping turtle was the third most abundant Testudine found in the river in both trapping seasons. Recapture data revealed that snapping turtles in the river channel were caught at greater distances than slough snapping turtles. Mean aquatic atrazine concentration increased significantly as you moved upstream.

KEYWORDS: atrazine, activity, movement

ROOM:

TIME: Monday

TITLE: Spatial and seasonal changes in the zooplankton community of the St. Marys River

AUTHOR(S):

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ABSTRACT: Zooplankton communities of the Great Lakes have received significant attention in light of recent food web changes. No attempts have been made, however, to characterize the zooplankton community of the St. Marys River, the sole connecting channel between Lake Superior and Lake Huron. The purpose of this study was to describe seasonal and annual changes and illustrate the spatial variability of the St. Marys River zooplankton community. Sampling occurred at LSSU's Aquatic Research Lab from 1997 to 2007 and at 9 coastal wetlands in 2005. Results suggest zooplankton density is related to seasonal temperature fluctuations. Annually, decreased densities of daphnids and increases in other cladoceran taxa as well as increased relative densities of small cyclopid copepods were observed. Coastal wetlands showed greater species diversity and total density than the river channel. Furthermore, both seasonal and spatial surveys yielded quite different community structure than those noted in past studies of the St. Marys River. These differences may be explained by increased vertebrate predation or the presence of the predatory, invasive zooplankton, *Bythotrephes cederstroemi*. However, the St. Marys River zooplankton community appears to mimic the Lake Superior community, where *Bythotrephes* are present in low densities and changes are more likely the result of vertebrate predation.

KEYWORDS: zooplankton, river, wetlands

ROOM:

TIME: Monday

TITLE: Metabolism as an indicator of river ecosystem health: a case study on the Little Susitna River, Alaska

AUTHOR(S):

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ABSTRACT: When assessing river ecosystem health, many researchers note that structural metrics (physical and biotic characteristics) can misdiagnose river condition and the inclusion of functional metrics (energy flow and nutrient cycling) provide a more robust assessment. Ecosystem metabolism is often favored because it quantifies important functional attributes including autochthonous energy production and total energy consumption. Ecosystem metabolism was used to monitor river health in the Little Susitna River, south-central Alaska, where a popular sport fishery leads to extensive boat and foot traffic during the summer salmon runs resulting in poor bank stability and elevated turbidity. Ambient dissolved oxygen concentration was continuously monitored at upstream "reference" and downstream "impact" sites during the summer of 2008. Gross primary productivity (mean) was higher at reference vs. impacted sites (0.43 vs. 0.19 g O<sub>2</sub> m<sup>-2</sup> day<sup>-1</sup>). Ecosystem respiration was relatively constant across sites (0.33 g O<sub>2</sub> m<sup>-2</sup> day<sup>-1</sup>) and net ecosystem metabolism revealed autotrophic conditions (P:R, 1.42) upstream and heterotrophic conditions (P:R, 0.58) downstream. Decreases in productivity at impact sites were best explained (R<sup>2</sup>, 0.53) by increases in turbidity suggesting recreational activity is altering natural metabolic processes of the system. Less autotrophic energy production may trigger a trophic cascade leading to decreased salmon production in the lower reaches of the Little Susitna. Utilizing a functional approach to assess river health was successful and further exploration of these metrics would improve our understanding of ecosystem processes.

KEYWORDS: metabolism, productivity, salmon

ROOM:

TIME: Monday

TITLE: Evaluating the impact of effluent discharge on benthic algal assemblages in the Sangamon River

AUTHOR(S):

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ABSTRACT: Anthropogenic inputs into aquatic systems continue to degrade of surface water quality. Treated effluent discharges and nutrient rich runoff from agricultural areas result in increased availability of nutrients in lotic systems. Resulting elevation in concentrations of plant nutrients from these point and nonpoint sources may result in marked increase of benthic algae in affected streams. Senescence of these algal blooms can result in an accumulation of excess biomass in aquatic systems which in turn may increase biochemical oxygen demand and ultimately lead to oxygen stress in vertebrate organisms. By assessing the influence of treated discharge from the main treatment plant of the Sanitary District of Decatur (SDD), and comparing it with algal assemblages upstream of the SDD discharge, we intend to assess whether effluent from advanced wastewater treatment plants significantly impair stream quality in the Sangamon River in central Illinois. Our assays involve use of artificial streams (continuous flow troughs) that will be randomly assigned varying concentrations of effluent and river water obtained upstream of the point discharge to create varied concentrations of effluent (0, 33, 66, 100%). Artificial streams are inoculated with benthic diatoms from natural substrates in order to determine the effects of effluent on benthic diatom assemblages, photopigments, and biomass accumulation. We observed species specific responses due to enrichment of phosphate and inorganic nitrogen present in treated effluent. We conclude that SDD discharge may shift the Sangamon River from a stream system that relies on allochthonous input of algae to one that relies on autochthonous instream primary productivity.

KEYWORDS: effluent, diatom, nitrification

ROOM:

TIME: Monday

TITLE: Temporal and spatial gradation of physiochemical characteristics of Decatur Reservoir Basin

AUTHOR(S):

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ABSTRACT: Deteriorated water quality has long been an issue for lakes and reservoirs that are located in the predominantly agricultural areas of the mid-west. Lake Decatur is an excellent example of a relatively shallow reservoir with an area of approximately 10 square kilometers. Created in 1922 by a dam impoundment, it is utilized for public water supply and recreation. Although there are major metropolitan areas within the basin, agriculture comprises more than 80% of the current land use. Our objective is to determine whether anthropogenic activities are causing this reservoir to act as a sink or a source of nutrients and sediments to a lotic system below the discharge. We have delineated 8 sub watersheds in the Sangamon River basin and are determining land-use and land cover associated with each tributary. Stream discharge is being determined along with suspended sediment and nutrient concentrations in order to determine loading to the reservoir. Land use and land cover, anthropogenic activities and meteorological patterns appear to be correlated with nutrient and sediment loads. We consider it likely that Lake Decatur is acting as a source of elevated nutrient concentrations in the Sangamon River downstream of the dam.

KEYWORDS: reservoirs, deteriorated, nutrients

ROOM:

TIME: Monday

TITLE: Impacts of land-applied wastes from concentrated animal feeding operations on fish communities

AUTHOR(S):

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ABSTRACT: Midwest agricultural fields typically have subsurface tile-drain networks that facilitate transport of excess water from fields to a ditch network system. As a result, sediments, nutrients, pesticides, and hormones are also delivered to ditches receiving tile drainage from fields fertilized with manure and associated lagoon effluent from concentrated animal feeding operations. We hypothesize that such ditches are characterized by altered fish community structures compared to largely intact headwater streams. Three sites, Marshall Ditch (CAFO influenced), Box Ditch (crop influenced), and Ghost Creek (reference), were sampled using electrofishing on three distinct transects at six-week intervals during May-October in 2008 and 2009. The species of each fish was identified and length was measured prior to release. Species richness was found to be statistically different among the sites for the duration of the study. Marshall Ditch and Box Ditch were both found to be significantly different than Ghost Creek. Ghost Creek was also notable due to the presence of species considered to be intolerant of degraded environmental conditions that were not observed in either Marshall or Box Ditches. Reproductive condition of creek chubs (*Semotilus atromaculatus*), a species common to all three sites, was also assessed. The reproductive condition of creek chubs was lower in fish sampled from the agricultural ditches compared to those from the reference stream in 2008. The relative abundance of creek chub was also found to be significantly different among the sites. Our results suggest that agricultural ditches do have altered stream communities, and that these characteristics are much more variable over time compared to the reference site.

KEYWORDS: CAFO, diversity, ditches

ROOM:

TIME: Monday

TITLE: Diel variation in substrate preference of cyprinidae fishes

AUTHOR(S):

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ABSTRACT: Diel substrate preference variation will be observed in five species of cyprinidae, central stoneroller (*Campostoma anomalum*), spotfin shiner (*Cyprinella spiloptera*), sand shiner (*Notropis stramineus*), bluntnose minnow (*Pimephales notatus*), and redbfin shiner (*Lythrurus umbratilis*). Artificial stream setups containing varying substrate types (silt, sand, cobble, and gravel) will be used to test if habitat preferences of cyprinid fishes shift between day and nighttime behavior. Tanks will be arranged with two substrate types whereby fishes will be observed twice daily (am / pm) and substrate preference recorded.

KEYWORDS: diel, substrate, cyprinidae

ROOM:

TIME: Monday

TITLE: Microhabitat selection among five congeneric darter species

AUTHOR(S):

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ABSTRACT: Five *Etheostoma* darter species including the greenside darter (*Etheostoma blennioides*), rainbow darter (*E. caeruleum*), fantail darter (*E. flabellare*), johnny darter (*E. nigrum*), and orangethroat darter (*E. spectabile*) were collected from seven streams and rivers in two Indiana counties to determine patterns of microhabitat use. Depth, flow, and substrate size characteristics segregated one or more species. Greenside and rainbow darters showed similar microhabitat use and were most commonly found among intermediate substrate sizes (cobble-boulder) and locations with higher velocities and greater depths. Fantail and orangethroat darters associated with intermediate to large substrate sizes (cobble-bedrock) in shallower average depths and lower velocities. Fantail darters were only observed in Franklin County. In contrast, johnny darters were found only in Delaware County among small substrate sizes (silt-sand) in above average depths and average velocities. Substrate size was most important in creating segregation among the five species based on Principal Components Analyses. Patterns of microhabitat use may be influenced by competition, morphology and other life history traits, and may explain the existence of congeneric species in ecosystems having heterogeneous habitats.

KEYWORDS: microhabitat, darters, Indiana

ROOM:

TIME: Monday

TITLE: Ecosystem-scale evaluation of sound bubble barrier technologies to prevent range expansions of Asian carps

AUTHOR(S):

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ABSTRACT: Bighead (*Hypophthalmichthys nobilis*) and silver (*Hypophthalmichthys molitrix*) carps have invaded the Mississippi River Basin and have successfully established in the La Grange reach of the Illinois River. The invasion of Asian carps in the Illinois River has negatively influenced native fish populations and pose an imminent threat to invading Lake Michigan through the Chicago Sanitary and Shipping Canal. Sound Projector Array Bio-Acoustic Fish Fence (ie. sound-bubble-strobe light barriers) technologies may have the ability to slow or eliminate Asian carp range expansions. In 2005, sound-bubble barrier technologies were shown to be 95% effective at deterring adult bighead carp passage in hatchery raceways. In order to use this technology for Asian carps management, barrier effectiveness trials must be conducted at an ecosystem-scale. We tested the effectiveness of sound-bubble-strobe light barriers at repelling Asian carps passage in the fall of 2009 within Quiver Creek, a tributary to the Illinois River. Because Asian carps are sensitive to high sound frequencies, in the range of 750-1500 Hz, we chose to use sound frequencies between 500-2000 Hz. Asian carps and native fishes will be removed from upstream of the barrier. The upstream portion of Quiver Creek above the barrier is pooled by a lowhead dam preventing fishes from moving further upstream. All captured fishes will be measured for length, weight, and will receive a floy tag prior to being released downstream of the barrier. Barrier effectiveness will be determined by upstream recaptures and behavioral responses of tethered Asian carps.

KEYWORDS: Asian, carps

ROOM:

TIME: Monday

TITLE: Asian carps in the mid-continent great rivers

AUTHOR(S):

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ABSTRACT: Great river research has been ongoing by multiple federal, state, and multi-state organizations in the Upper Mississippi, Missouri, and Ohio rivers. Concurrently, expansion of Asian carps in the central US presents a huge challenge to resource managers. Together, these programs shed light upon our understanding of the various effects of non-native species. Invasive bighead *Hypophthalmichthys nobilis* and silver carp *H. molitrix* catches showed increasing populations in all of these rivers, with exponential increases in some reaches. Data from the Illinois River has documented reduced body condition in native planktivores (gizzard shad *Dorosoma cepedianum* and bigmouth buffalo *Ictiobus cyprinellus*) since the Asian carps invasion. A recent population estimate for silver carp highlights the concern regarding these fish, with an estimated 4,100 sub- and adult fish per river mile in La Grange Reach, Illinois River. Data throughout the rivers confirms a strong correlation among spawning success and hydrology. Further analysis of relative catch rates will allow for temporal and spatial comparisons. Wide ranging monitoring efforts and comparisons across geographical and/or political boundaries are essential for inter-jurisdictional fisheries management.

KEYWORDS: carp, rivers, nonnative

ROOM:

TIME: Monday

TITLE: Habitat fragmentation and the effect on populations of darters

AUTHOR(S):

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ABSTRACT: This study examines stream fragmentation within Polecat Creek located in Coles County, Illinois. Sensitive habitat specialists such as the rainbow darter (*Etheostoma caeruleum*) and the greenside darter (*Etheostoma blennioides*) may have become isolated from other populations in distinct patches of appropriate habitat (riffles). This isolation may lead to a decrease in genetic variability within a population, as well as a decrease in gene flow and an increase in genetic differentiation among populations. This mark-recapture project estimates population size, and uses the movement data to determine dispersal rates as measures of current isolation patterns. Based on preliminary movement data, recapture results suggest isolation between populations due to little or no movement from marking site to site of recapture. Maximum distance moved is 60m with 29 of 31 rainbow darters recaptured at their marking site and 2 of 31 captured at the adjacent upstream site <60m away. All greenside darter recaptures (9 of 9) were in the original marking site. Both species of darters in this stream appear to exhibit a great deal of current philopatry. The next step is to determine if the current ecological conditions have been at an equilibrium long enough to have caused a genetic signature among the isolated demes.

KEYWORDS: movement, darters, genetics

ROOM:

TIME: Monday

TITLE: Comparative fish assemblages of the Lake Decatur watershed

AUTHOR(S):

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ABSTRACT: Diminished water quality and availability, closure of fisheries, extirpation of species, groundwater depletion, and more frequent and intense flooding are increasingly distinguished as consequences of current river management associated with impoundments. The Sangamon River Basin is a 14,000 km<sup>2</sup> watershed covering all or portions of eighteen counties in east central Illinois. Although there are major metropolitan areas within the basin, agriculture comprises more than 80% of current land use. More than 3540 km of streams within the basin course through glacial and alluvial deposits creating typically low gradient streams with sand and gravel substrates, but they have been impacted for most of the past century, receiving inputs from both point and non-point sources. I found differences between fish assemblages and fish-based indices of biotic integrity in eight tributaries to the Sangamon River above of Lake Decatur and those in the river mainstem downstream of the reservoir. These changes in fish assemblages likely are the result of altered physical habitat and chemical water quality.

KEYWORDS: Sangamon, impoundment, stream

ROOM:

TIME: Monday

TITLE: Detectability distributions of stream mussels and the variation among species

AUTHOR(S):

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**ABSTRACT:** Understanding of the detectability distributions of species is critical for choosing appropriate mark-recapture models to estimate population size, and the information on variation in detectability among species helps sampling design and data interpretation. In the present study, we used a dataset derived from a seven-year mussel sampling study in the upper Embarras River, Champaign County, Illinois, to address both objectives. The studied stream segment was 168m in length and averaged 8m to 11m in width. The reach was divided at 1m intervals and thoroughly searched in low-flow summer months each year between 2003 and 2009. All individuals were marked and their capture histories carefully compiled. Deaths and new individuals were also recorded. Seventeen species were found with Wabash Pigtoe (*Fusconaia flava*), Pistolgrip (*Tritogonia verrucosa*), and Fatmucket (*Lampsilis siliquoidea*) being dominant species. Seven species were abundant enough to allow precise estimations of the mean detectability of individuals, which ranged from 0.49 in Fatmucket (*Lampsilis siliquoidea*) to 0.74 in Plain Pocketbook (*Lampsilis cardium*). Estimates of the mean detectability were positively associated with the average body lengths of species and negatively with silt-muck substrates. The shapes of detectability distributions differed among species, with the three dominant species being adequately fitted with uniform or normal-distribution models. These findings imply that the abundances of small species and those species that prefer muddy riverbeds are more likely to be underestimated in a survey, and different mark-recapture models would be needed for estimating the abundances of different species in stream mussel studies.

**KEYWORDS:** mussels, recapture, Illinois

ROOM:

TIME: Monday

TITLE: Morphological variation of *Elimia livescens* populations of Indiana

AUTHOR(S):

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ABSTRACT: *Elimia livescens* gastropods were collected throughout Indiana. The objective of this study was to quantify morphological variation within and among gastropod populations and test for environmental effects. We used the TPS morphometric software by James F. Rohlf, to digitize landmarks, construct outlines, and conduct multivariate analyses. The environmental variables we examined include watershed area, lake vs. stream, and several water quality parameters. Local environmental variables provided an explanation for morphological differences in *E. livescens* populations.

KEYWORDS: *E. livescens*, morphology, morphometrics

ROOM:

TIME: Monday

TITLE: Effects of dam dewatering on downstream water quality mussels and fish

AUTHOR(S):

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ABSTRACT: Dam inspections at US Army Corps of Engineers reservoirs occur once every five years. In order to complete inspections a reservoir may need to be drawn down followed by a period of no water releases from the dam. While these steps are necessary for inspections and completion of maintenance and repairs, downstream impacts are also considered. In August, 2009, the dam at Long Branch Lake was due for inspection. In order to drawdown the lake two feet prior to inspections, a water release from the emergency gate located near the bottom of the lake was needed. Once the lake drawdown was complete, water releases would then cease during dam inspections. From a water quality/aquatic biota standpoint, this resulted in several areas of concern. Deepwater releases would draw anoxic water from the hypolimnion creating the potential for low DO problems downstream. Once releases were ceased for inspections, downstream DO problems could be further exacerbated. And finally, fish and mussels would be stranded in the stilling basin as it was dewatered. In order to reduce negative impacts during the Long Branch inspections, several actions were taken. The no-flow period was minimized, water quality parameters (DO, turbidity, temperature, pH, and conductivity) were continuously monitored downstream and used to adjust flows if needed, and staff from the Missouri Department of Conservation moved fish and mussels from the stilling basin as it was dewatered. Effects of the changing water releases on water quality and fish and mussels are presented.

KEYWORDS: dam, water, monitoring

ROOM:

TIME: Monday

TITLE: Freshwater mussel distribution in Michigan Upper Peninsula watersheds in relation to in-stream habitat

AUTHOR(S):

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ABSTRACT: Information on the status, distribution and habitat preferences of freshwater mussels (*Unionidae*) in the Upper Peninsula of Michigan is minimal. The objectives of this study were to determine the distribution of freshwater mussels in Paint (Iron Co.) and Sturgeon River (Dickinson Co.) watersheds of the Upper Peninsula of Michigan and identify relationships between mussel populations and in-stream habitat parameters that may explain the difference in species richness between the two watersheds. Over 90 sites in the Paint River and Sturgeon River watersheds were surveyed for freshwater mussels using glass bottomed buckets and a transect method. Mussels found were identified, measured, and placed back into the substrate. Regression analyses were performed to determine possible relationships between freshwater mussel populations (presence/absence, density, and species richness) and instream habitat parameters (e.g., current velocity, sediment size, shear stress). Of the surveyed sites, 33% in the Paint River watershed and 61% in the Sturgeon River watershed had mussels present. A total of 11 species were identified throughout the study, with the number of species at each site ranging from 0 - 10. One species identified is state threatened and another is a species of special concern. The findings from this study will be useful for regional freshwater mussel population management and future habitat restoration.

KEYWORDS: mussels, streams, *Unionidae*

ROOM:

TIME: Monday

TITLE: Ecology and habitat use of paddlefish in the unimpounded Middle Mississippi River

AUTHOR(S):

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ABSTRACT: How paddlefish (*Polyodon spathula*) early-life history dynamics affect recruitment is relatively unknown. We quantified factors affecting age-0 paddlefish abundance, hatch time, growth, and survival in the Middle Mississippi River during 2000-2008. We trawled several habitats, collecting 2,074 age-0 paddlefish from 10-170 mm total length. Paddlefish hatch timing varied across years (30-60 days), generally commencing in mid April and ending in June when a threshold water temperature was reached and river stage variability increased. Correspondingly, an analysis of covariance revealed a strong interaction between year and habitat for CPUE in the small (10-50 mm) and medium (51-100 mm) size classes indicating habitat preferences were likely influenced by year. However no relationships between these variables in the large size class (>100 mm) existed. Age-0 paddlefish growth rates differed among years (i.e., 1.87-3.31 mm/day) and were positively related to water temperature. Mortality rates varied by year (range -0.26 to -0.57) and were positively correlated with the number of days water temperature was >28 degrees C during April 15 through July 15. Water temperature and river stage variability may regulate early-life dynamics of paddlefish. The highest catch rates of young paddlefish were on the main channel and side channel sides of islands, suggesting these habitats are important to paddlefish. Within these habitats, paddlefish frequently occupied moderate velocities (i.e. 0.4 to 0.6 m/s), moderate depths (i.e. 3 to 5 m), and sand substrate.

KEYWORDS: paddlefish, Mississippi,

ROOM:

TIME: Monday

TITLE: Fish passage at St. Johns Bayou

AUTHOR(S):

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ABSTRACT: Many riverine fish species rely upon seasonally predictable flood pulses, which provide access to floodplain areas that support reproduction, rearing, and foraging. However, the connectivity to these areas has been drastically reduced in the Mississippi River. While there are still a couple of areas with direct connection to the river, most basins are separated from the river by levees for flood control measures. The St. Johns Bayou basin extends from Commerce and Benton, Missouri to New Madrid, Missouri encompassing 450 square miles. It is separated from the river by levees that form a sump that is drained by a gravity outlet when the Mississippi River is lower than the Bayou. The goal of the St. Johns Bayou water control structure is to protect the area behind the levee from high Mississippi River stages, however whether these riverine fish species are able to pass through the water control structure and retain access to these key spawning and rearing habitats is unknown. In order to evaluate fish passage through the existing water control structures, fish were captured and floy tagged on the Mississippi side of the structure. After events in which the gates were open and water from the river was allowed to enter the Bayou, fish were sampled on both sides of the water control structure to determine the potential of passage through the structure. In addition to our sampling, angler tag returns have provided additional information about fish passage.

KEYWORDS: fish, passage, bayou

ROOM:

TIME: Monday

TITLE: Impact of mean annual discharge on early life history survival of *Scaphirhynchus* sturgeon in Lower Missouri River

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ABSTRACT: The natural flow regime has been disrupted on lower Missouri River (LMOR) since six dams were constructed along the middle one-third of its length between 1930 and 1963, and was followed by a decline in many obligate fluvial species. Our objectives were to 1) show how variation in mean annual discharge affected catch-per-unit-effort (CPUE) of young *Scaphirhynchus* sturgeon in LMOR and 2) model annual survival as a function of mean annual discharge. Catch data were from a stern towed otter trawl between 2003 and 2008. The trawl mesh size was selective against sturgeon ca. <60 mm FL, but was the only trawl gear with a record of data greater than three years. Our model predicted young sturgeon survival was highest in years with intermediate mean annual discharge. The low flow recruitment hypothesis (LFRH) explained the importance of reduced flow and backwater habitats on native river fish reproduction in Australia. Similarly, we hypothesize sustained higher annual flows and a loss of historical low flow periods has limited *Scaphirhynchus* sturgeon recruitment. Navigation flows during summer on LMOR would preempt the critical low flow period for recruitment predicted by LFRH. Restoring periods of stable low flow may aid recovery of important river species like *Scaphirhynchus* sturgeons. Our gear bias resulted in unrealistically high estimates of survival. However, because we minimized variation in catchability among years by using a single gear, the pattern produced by our model is likely real while the absolute values produced are likely inflated. Future work should focus on improving catchability of <60 mm FL sturgeon to improve estimates of survival in the wild.

KEYWORDS: sturgeon, survival, discharge

ROOM:

TIME: Monday

TITLE: Relations between walleye spawning habitat and recruitment in northeastern Wisconsin lakes

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ABSTRACT: The addition of rock spawning habitat to increase walleye recruitment has been an accepted management tool in north temperate lakes for decades. However, assessments of spawning habitat projects in northern Wisconsin have showed that few were successful at increasing recruitment. This suggests poor reef design, poor lake choice, or the existence of recruitment-limiting factors unrelated to spawning habitat such as stock size, prey availability, and spring temperatures. Thus far, no studies have been conducted to determine the exact quality or quantity of spawning habitat necessary to support natural reproduction and walleye recruitment. This study seeks to determine how much spawning habitat is needed to support healthy walleye production. The objectives of this study are to 1) develop a standardized method to quantify walleye spawning habitat in north temperate lakes and 2) determine the relation between spawning habitat and recruitment. Twenty-one study lakes with varying amounts of walleye spawning habitat and recruitment were chosen in northeastern Wisconsin. To develop a standardized sampling method, walleye spawning habitat was measured using three different methods: 1) littoral zone habitat was measured along 250 random transects, 2) visible gravel/cobble segments were measured at the shoreline-water interface, and 3) the length of actual spawning habitat, defined as > 50% gravel and/or cobble substrate with low embeddedness, was measured along shoreline areas. A standardized method to quantify spawning habitat along with an understanding of the relation between habitat and recruitment will aid in determining whether spawning habitat is a limiting factor in walleye lakes exhibiting poor recruitment.

KEYWORDS: walleye, habitat, spawning

ROOM:

TIME: Monday

TITLE: Movement of walleyes in three Michigan Lakes with Great Lakes connectivity

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ABSTRACT: Fisheries managers occasionally need to identify the extent of migration in fish populations in order to delineate stock boundaries, calculate harvest limits, and assess potential genetic implications. In large populations that have the potential to move large distances, tag return data may be preferable to telemetry data, which is often limited by geographic area and sample size. As part of a study to estimate population sizes, we tagged legal-size (> 15 in) walleyes *Sander vitreus* in Muskegon Lake and Lake Charlevoix, which are connected to Lake Michigan, and the Portage-Torch lake system, which is connected to Lake Superior, in order to assess the extent of Great Lakes movement. Based on tag returns, significant movement to the Great Lakes was documented in Muskegon Lake and the Portage-Torch lake system, both of which contained native populations. Lake Charlevoix, which contained an introduced population, had much less movement to the Great Lakes, though analysis was hindered by the inability to adjust tag returns for angler effort in the various recapture locations. In this poster presentation we will report the temporal and spatial distribution of tag returns, and we will discuss how walleye movement varied by size and sex. Implications on gene flow, stocking strategies, and stock assessment will be addressed.

KEYWORDS: walleye, movement, tagging

ROOM:

TIME: Monday

TITLE: Yellow perch gonadal development and spawning in the Indiana portion of Lake Michigan

AUTHOR(S):

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ABSTRACT: In 2009, mature yellow perch were collected from the Indiana waters of Lake Michigan to determine whether: 1. location of spawning, 2. time of spawning, 3. maturation differences between males and females, and whether abiotic and biotic factors influenced time of sexual maturation. Three zones were sampled during this study, East Chicago (west), Burns Harbor (central), and Michigan City (east) each zone included 12 individual sites. Fish were sampled using gill nets set at various depths depending on fish abundance. Spawning was sampled by using both diving and an underwater camera. Arrival and time of spawning appeared to be different between males and females. Our sampling also indicated that egg deposition in Indiana waters during 2009 was minimal to nonexistent. Yellow perch relative abundance increased after a majority of the fish were spent suggesting fish were spawning elsewhere, then migrating to Indiana waters. Increasing yellow perch spawning activity in Indiana waters may only be accomplished if changes in the management of habitat occur, such as artificial reef creation and protection of likely spawning habitat.

KEYWORDS: yellow perch, spawning, Lake Michigan

ROOM:

TIME: Monday

TITLE: Growth of young-of-year yellow perch in the Indiana waters of Lake Michigan

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ABSTRACT: We collected YOY yellow perch at two near-shore sample sites in the Indiana waters of Lake Michigan to determine growth rates. Age-0 fish captured in September 2007 and 2008 and July-September 2009 were used to determine relative mean lengths throughout the first year of life. In addition, sampling in 2009 focused on determining the timing of offshore migration to pelagic water, and the return to near shore water. We caught no fish moving offshore but captured YOY yellow perch returning to the near-shore waters in late July. Published work suggests that year class strength is fixed in the first year of life. Identifying growth rates for YOY yellow perch provides a better understanding of their early life history and gives the earliest indications of year class strength, necessary for implementing sound management alternatives for this portion of Lake Michigan.

KEYWORDS: yellow perch, growth, Lake Michigan

ROOM:

TIME: Monday

TITLE: Simulating food web interactions among nuisance common carp, invading zebra mussels, and the native biological community in a shallow eutrophic lake

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ABSTRACT: Invasive species have the potential to alter the transfer of energy through aquatic food webs, potentially limiting resources available for game fishes. Future resource availability for game fishes is uncertain in cases of recent invasion and interactions with non-native nuisance species. Considerable uncertainties exist for invasions occurring in shallow eutrophic lakes where available lake habitat may facilitate or limit population growth of invasive species. Clear Lake, a shallow eutrophic lake in north central Iowa with an existing nuisance population of common carp (*Cyprinus carpio*) was recently invaded by zebra mussels (*Dreissena polymorpha*), which may adversely affect trophic flows in this popular and economically important sport fishery. We collected data on the aquatic community over the latent and exponential population growth phase of the zebra mussel population, and in this study we will couple original field data with existing data from similar systems to parameterize a trophic interaction model for Clear Lake. The resulting model will represent the baseline food web interactions between native and non-native species in Clear Lake. Scenarios evaluating changing zebra mussels and common carp populations over time on trophic flows to native fishes will be evaluated to aid the development of management strategies to maintain the fishery of Clear Lake.

KEYWORDS: zebra mussels, invasive, food web

ROOM:

TIME: Monday

TITLE: Monitoring Devils Hole pupfish larvae: improving survey design at multiple scales

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ABSTRACT: Devils Hole pupfish *Cyprinodon diabolis* is one of the most endangered vertebrates in North America. The entire population occurs in Devils Hole, a ~20m<sup>2</sup> underwater limestone cavern in southwestern Nevada. Since the early 2000s, the threat of extinction has loomed over the Devils Hole pupfish population due to observed declines in adult abundance. In 2005, larval surveys were initiated to better understand patterns in larval abundance and factors influencing recruitment. There are multiple levels in the current sampling design structure: surveys (2 samples per month), events (3 samples per survey), and plots (9 samples per event). The goal of this study was to determine how changing the sample size at each level (survey, event, and plot) affects the ability of scientists to detect a defined change in abundance at some level of statistical power. Using a linear mixed model, variance components were estimated for all three sampling levels (i.e., survey, event, and plot). Next, sample sizes across all levels were allowed to vary, as to represent different combinations of surveys, events, and plots. Variance of the mean was recalculated and used to calculate statistical power. Increasing sample size at the level of survey had the greatest influence on statistical power, followed by plot and event. However, since surveys are more difficult to implement, the optimal sampling design results from increasing the number of plots per event. Higher statistical power will improve the ability to detect trends in pupfish recruitment.

KEYWORDS: survey, monitoring, pupfish