

RENDEZVOUS ROOM

WEDNESDAY MORNING

ROOM: Rendezvous

TIME: Wednesday 8:00 AM

TITLE: Are Illinois most diverse and intact aquatic communities located in least-disturbed areas?

AUTHOR(S):

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ABSTRACT: Illinois biological stream ratings, first published in 1989, consisted of a five-tiered classification based largely on the type and condition of the fishery resource. In 2008 these ratings were updated to establish baselines against which change could be measured and understood. In addition to expanding taxonomic coverage beyond fish, these ratings incorporated both integrity and diversity measures into community assessment. Diversity was broadly defined as the variety of taxa within four aquatic groups. Integrity evaluated how closely the existing fauna matched historical or reference conditions. Streams segments with integrity and/or diversity ratings were identified as biologically significant if they had high ratings or scores based on data from at least two taxonomic groups. The purpose of this project was to determine if these streams were located in areas with low levels of anthropogenic disturbance. Stream ratings were compared to site- and watershed-scale disturbance ratings. Watersheds were rated for disturbance, as part of an Index of Biotic Integrity revision in 2000, based on seven watershed-scale disturbance measures and on five site-scale physical and chemical measures. The results of this project indicate that the majority of Illinois biologically diverse, intact, and significant streams are not in least-disturbed watersheds. Similarly, many least-disturbed sites do not have intact or diverse biota. Resource managers and environmental advocacy groups can use this information to guide management and restoration activities throughout Illinois.

KEYWORDS: stream, ratings, disturbance

ROOM: Rendezvous

TIME: Wednesday 8:20 AM

TITLE: Coolwater streams in Illinois: locating and characterizing these systems in a predominately warmwater state

AUTHOR(S):

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ABSTRACT: The majority of streams in Illinois have warm thermal regimes (> 22 degrees C mean daily July temp.) and as a consequence physical and biological characteristics of coolwater streams (< 22 degrees C) within the state are poorly understood. Locations of coolwater streams in Illinois were predicted using GIS models and distributions of coolwater fish (e.g. sculpin, dace, trout). The objectives of this study were to 1) validate our GIS models, 2) validate our coolwater fish species list, and 3) use on-the-ground assessments to characterize physical conditions within coolwater streams. We have measured summer temperatures at 160 streams that were predicted as coolwater or contained physical or biotic characteristics that indicated cool temperatures. Approximately 20 percent of those sampled sites were below the 22 degrees C threshold. Overall accuracy of our predictive temperature model is similar to models created by other researchers, however the model is best suited to estimating temperature regime at the warm and cold temperature margins rather than the transitional temperatures. Most candidate coolwater fish species were found to be eurythermal and few can be considered coolwater obligates, suggesting Illinois is on the periphery of their ranges or that their temperature preferences are not well understood. Comparisons of instream physical conditions between coolwater and warmwater streams indicate few differentiating characteristics between these thermal classes and few commonalities between sites within each class. Despite the lack of a single definitive indicator of cool conditions, this project suggests several indicators could collectively be used to identify additional coolwater streams in Illinois.

KEYWORDS: streams, coolwater, Illinois

ROOM: Rendezvous

TIME: Wednesday 8:40 AM

TITLE: A multimetric habitat index developed for wadeable streams in Illinois

AUTHOR(S):

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ABSTRACT: Current indices for characterizing stream habitat in Illinois apply a single set of scoring criteria statewide that do not account for regional or longitudinal differences in physical characteristics that may exist under "natural" (not directly modified by humans) conditions. Furthermore, existing indices are calibrated to biological responses of fish and macroinvertebrates than directly to physical conditions consistent with altered landscapes. The objective of this project was to develop a habitat index applicable to wadeable streams in Illinois that is rapid, sensitive to upstream and local disturbances, and accounts for natural variation throughout the state. Stream reaches were rated for anthropogenic land use disturbance using five landscape level factors: road density, riparian disturbance, developed land use (agricultural and urban), impounded water and strip-mined lands. Sample sites were selected to represent least-, moderate- and most-disturbed conditions. Local characteristics representing substrate, in-stream cover, channel morphology, riparian and stream bank condition, and pool and riffle quality were sampled at 474 stream sites covering the range of disturbance conditions statewide. Metrics for the index were chosen based on their responsiveness to disturbance. Six regional delineations and a classification based on stream size and gradient were assessed. This habitat index provides a useful tool for summarizing alteration in the physical character of stream segments associated with anthropogenic land use disturbance. Such information is frequently collected in conjunction with the sampling of fish, macroinvertebrates, and water quality and assists in providing an integrated picture of stream condition.

KEYWORDS: stream, landuse, habitat

ROOM: Rendezvous

TIME: Wednesday 9:00 AM

TITLE: Monitoring of fish communities and evaluation of habitat in prairie streams of Tallgrass Prairie National Preserve, Kansas

AUTHOR(S):

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ABSTRACT: Tallgrass Prairie National Preserve (TAPR) was established to protect and preserve the tallgrass prairie ecosystem. Changes in land use has altered habitat of prairie streams, impacting many native fish populations. As a result, the Topeka shiner (*Notropis topeka*), a federally endangered species found at TAPR, inhabits less than 10% of its historic range. TAPR provides some of the least impacted prairie stream habitat remaining in the Midwest, containing habitat critical for native fishes. In 2001, a long-term monitoring program was initiated at TAPR to determine the status and trends of fish assemblages, physical habitat, and water quality conditions. Control charts were used to assess trends and annual variation in species richness, diversity, index of biotic integrity, and abundance. Based on these charts, all four fish metrics were found to fall above the critical threshold established with three years of baseline data. To evaluate relationships between physical/chemical habitat variables and fish communities, Aikikes Information Criterion was used to select the best predictive model. Our findings show that size of sample sites (width, depth, length) were positively associated with species richness and diversity. However, abundance was negatively correlated with site dimensions, potentially due to greater efficiency in sampling smaller sites. Both water temperature and pH were found to be positively correlated with abundance. This long-term data gives park managers a better understanding of potential mechanisms driving these prairie fish communities, allowing for better management to sustain the integrity of these systems.

KEYWORDS: prairie, fish, monitoring

ROOM: Rendezvous

TIME: Wednesday 9:20 AM

TITLE: Using human threat indices to prioritize conservation areas for lotic fishes

AUTHOR(S):

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ABSTRACT: Conservation areas for lotic fishes can be prioritized by evaluating indices of biotic integrity, assessing relative degree of system impairment, and determining areas amenable to conservation practice implementation. Because fish sampling data are usually incomplete, assessing stream segments by relative degree of impairment and available conservation practices provides a means to uniformly assess ecological condition. The goal of this study is to provide tools that Natural Resource Conservation Service (NRCS) planners can use to prioritize private land conservation areas. Our objectives were to 1) develop a human threat index that identifies stream segments most impacted by agricultural activities within Missouri River basin, 2) develop a conservation index that accounts for currently implemented agricultural conservation practices, and 3) identify stream segments where NRCS conservation practice implementation is suitable. We developed a Standardized Agricultural Threat Index to identify stream segments most impacted by agricultural threats that are most amenable to remediation through implementation of agricultural conservation practices. A Standardized Agricultural Conservation Index was developed to assess the potential impacts of currently implemented NRCS conservation practices. NRCS conservation practices applied between 1999 and 2007 significantly reduced the number of stream segments with threat index scores between 50 and 100 (100 represents most threatened segments). Threat indices can identify streams impacted by anthropogenic activities and can be modified to identify specific threats that can potentially be mitigated by available conservation practices.

KEYWORDS: landscape, threats, fish

ROOM: Rendezvous

TIME: Wednesday 9:40 AM

TITLE: Influence of riparian forest and agricultural land use on stream community structure and function

AUTHOR(S):

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ABSTRACT: We examined nine headwater streams with a gradient of riparian forest and agricultural land use to determine the effect of riparian and watershed land use on stream communities. The nine sites were equally divided into three land use groups: 1) streams with high percent riparian forest and low watershed agriculture, 2) streams with high percent riparian forest and high watershed agriculture, and 3) streams with low percent riparian forest and high watershed agriculture. Sampling was conducted seasonally for two years. Macroinvertebrate and fish biotic metrics were used to determine differences related to land use, in-stream habitat, and water chemistry parameters. Differences in stream metabolism among sites were investigated as an assessment of land use effects on ecosystem function. Results suggest community structure is sensitive to agricultural influences at both the riparian zone and watershed scale. Macroinvertebrate and fish abundance and biomass were significantly higher in streams with low percent riparian forest compared to streams with high riparian forest. In addition, macroinvertebrate HBI and fish IBI scores improved with increasing percent riparian forest suggesting better stream water quality in the high riparian forest sites. While there were significant seasonal and annual differences, relationships among land use type were consistent over the course of this study. Overall, taxonomic composition and trophic structure were similar among streams in the two high riparian forest land use groups. Our results provide information on the influence of riparian vegetation on stream ecosystems and highlight the importance of restoring riparian areas in agricultural watersheds.

KEYWORDS: community, landuse, stream

ROOM: Rendezvous

TIME: Wednesday 10:20 AM

TITLE: Freshwater mussel habitat use in the Paw Paw River

AUTHOR(S):

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ABSTRACT: Freshwater mussels (Unionidae) are critical to aquatic ecosystem functioning and are imperiled. They are indicator species of biological integrity due to sensitivity to stressors and interconnectedness with the aquatic community. We conducted habitat and unionid surveys in the Paw Paw River in Southwestern Michigan to investigate habitat use of unionids in this system and provide management scenarios. Prior to this survey, little information was available on current unionid distribution and abundance in the Paw Paw River. This river is a tributary of Lake Michigan. It is a cold to warm water system and receives relatively high groundwater inputs for a southern Michigan river. Eleven species of unionid were found live, three of which are species of special concern (*Venusta concha ellipsiformis*, *Villosa iris*, and *Pleurobema sintoxia*). Three additional species were found as shells, one of which is a state threatened species (*Alasmidonta viridis*). Unionid densities were very low or were absent in small tributaries and increased with stream size. Densities exceeded 5 per square meter in the main stem of the Paw Paw River where habitat stability was apparent.

Understanding characteristics of unionid habitat suitability and distribution will help aid conservation of unionid assemblages.

KEYWORDS: mussels, habitat,

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TIME: Wednesday 10:40 AM

TITLE: Variations in some reproductive characteristics of red shiner *Cyprinella lutrensis* populations in the Lower Platte River, Nebraska, USA

AUTHOR(S):

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ABSTRACT: We investigated variations in reproductive characteristics including age and length at maturity gonad development spawning season, and fecundity of red shiner, *Cyprinella lutrensis*, collected weekly from Lower Platte River, Nebraska through spring of 2000 to fall of 2002. Length at 50% maturity 28.1 to 28.8 fork length (FL) for females and 31.0 to 32.9 mm FL for males, but were not significantly different among years. Most of males and females matured by year one. Spawning season estimated gonadosomatic Index occurred from the end of May to middle of August. It is likely that larger females completed to reproduce earlier than smaller ones. Fecundity and relative fecundity were 382 eggs per female and 328055 eggs per 1000 g female, respectively, but were not statistically significant among years. Several models were fitted to analyze which model describes best relationship of fecundity-length, fecundity-weight, and fecundity-age. While the relation of fecundity-length and fecundity-weight was described by power model, that of fecundity-age was performed by linear model. We may suggest that the red shiner from Lower Platte River matures rapidly, have high fecundity and long spawning period when comparing other cyprinids.

KEYWORDS: growth, redshiner, Platte River

ROOM: Rendezvous

TIME: Wednesday 11:00 AM

TITLE: The influence of light availability on the presence of *Didymosphenia geminata* in a montane stream

AUTHOR(S):

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ABSTRACT: *Didymosphenia geminata*, an aquatic nuisance and invasive species, has been established in Rapid Creek, South Dakota since 2002. Presence of the species in streams worldwide has been associated with factors such as nutrient availability, discharge, substrate composition, and light availability. This study examined the effects of light availability on the presence of *D. geminata* in Rapid Creek using girder bridges as shading cover. We calculated substrate composition and an index of mean *D. geminata* biovolume from rocks (n, 150) at each of four stream locations. Treatments (n, 3) were defined as areas upstream (within 10 m), downstream (within 10 m), or directly beneath each bridge (n, 4). We found no significant difference (Chi-square, X^2 , 0.56, P, 0.75) in substrate composition among locations. Mean *D. geminata* biovolume was not statistically different between the upstream (mean, 64.0) and downstream (mean, 72.7) treatments. However, the index of mean *D. geminata* biovolume beneath bridges (mean, 0.6) was significantly lower than that upstream and downstream (ANOVA, F (2, 11), 8.31, P, 0.009). This study shows that growth of *D. geminata* is restricted in areas with low light availability, implying that light is a limiting factor to the presence of *D. geminata*.

KEYWORDS: *Didymosphenia geminata*, light

ROOM: Rendezvous

TIME: Wednesday 11:20 AM

TITLE: Environmental influences on fish assemblages in Lake Huron tributaries

AUTHOR(S):

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ABSTRACT: Streams fish assemblages are affected by multiple environmental, chemical, physical and biotic factors. We sampled stream fish assemblages in eight tributaries of Lake Huron to determine assemblage composition, diversity, abiotic, and biotic factors that highly influence the assemblage. Sampling occurred in spring and late summer (during base flow). Within each stream, fish were sampled by electrofishing in four to seven 100 meter transects. Abiotic data including temperature, dissolved oxygen, specific conductance, turbidity, wetted width, depth, discharge, substrate composition, and bank slope were collected at each sampling event. Twenty three species were collected. Results suggest that distance from Lake Huron is a significant predictor of species richness and total fish numbers. Species richness and total numbers decreased with distance from Lake Huron. However, numbers of some species increased with distance. Spring sampling included large numbers of spawners including northern pike, white suckers, yellow perch, and largemouth bass. Great Lakes tributaries are important spring spawning grounds, supplemental aquatic habitat for lentic species, and nursery areas for larval and young-of-year individuals.

KEYWORDS: assemblage, tributary, abiotic

ROOM: Rendezvous

TIME: Wednesday 11:40 AM

TITLE: Effects of hydrology on substrate variation and subsequent fish assemblages for four years in the Wabash River

AUTHOR(S):

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ABSTRACT: Substrate composition of large rivers varies with local current velocity, high flow events, and the local river gradient, and strongly influences fish habitats. We evaluated effects of hydrology on substrate variation, and subsequent variation in fish assemblages for Wabash River sites from 2005-8. Substrate composition was quantified at 28 sites using a method modified from ORSANCO (Ohio River Valley Water Sanitation Commission). We analyzed hydrologic variation with the Indicators of Hydrologic Alteration (IHA) software and tested for hydrology effects on local substrate variation. Our fish collections were by boat electrofishing sites with lengths of 500-m. GIS software was used to examine temporal changes in substrate frequencies. We tested for effects of substrate variation on fish assemblages by categorizing abundances into functional groups.

KEYWORDS: hydrology, substrate, ecology