2012 WIAFS-MIAFS Meeting
Poster Presentations

Listed in alphabetical order by primary author's last name.

Name: Emily Bouckaert
Affiliation: Michigan Technological University & U.S. Geological survey
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Title: The detection of larval lake sturgeon near a coal clinker reef in the St. Clair River, Michigan
Co-Author: Nancy Auer, Edward Roseman, James Boase, Jenny Sutherland
Abstract: The aim of this study is to investigate larval lake sturgeon (Acipenser fulvescens) ecology near an aged coal clinker (boiler slag) reef in the North Channel of the St. Clair River. In this system, natural lake sturgeon spawning habitat has been degraded or eliminated as a result of channelization, dredging, and substrate removal. In spite of habitat degradation, lake sturgeon have been observed spawning on an artificial reef that was created by the deposition of coal clinkers from coal powered steamships. Larval sampling took place between June 13th and July 14th approximately three nights a week using six D-frame drift nets. Two of the drift nets were placed 0.18 km upstream of the coal cinder reef, two were placed directly below the reef, and two were placed 1.4 km downstream. On June 20th and 22nd four additional nets were placed further upstream in the Middle Channel of the St. Clair River. All drift nets were deployed from 20:00 to 06:00 hours and samples were retrieved every two hours. This sampling regime will be repeated at this site in 2012. All larvae were captured in temperatures ranging between 14.4-16.7°C. A total of 54 larvae were collected: 20 larvae upstream of the reef, 14 larvae directly below the reef, 17 larvae downstream of the reef, and 3 larvae in the Middle Channel. Interestingly, 43% of these larvae were collected upstream of the coal clinker reef, suggesting there may be spawning occurring in an additional unknown site.

Name: Tyler Buchinger
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Title: Investigations of lake trout pheromones; prospects on a possible restoration tool
Co-Author: Nicholas Johnson, Weiming Li
Abstract: Restoration of lake trout (Salvelinus namaycush) in the Great Lakes has been impeded by low natural reproduction. Successful reproduction of lake trout has been hypothesized to be hampered in part by an inability to locate and spawn on highly productive reefs. Closely related Arctic char (Salvelinus alpines) rely upon pheromones to facilitate both homing and spawning behaviors. The nocturnal nature of lake trout spawning indicates non-visual senses, such as chemoreception, may be used to locate mates and coordinate reproductive behavior. Previous studies indicate lake trout may locate suitable spawning reefs based upon the odor of previously hatched young, in particular bile acids. Since natural reproduction has not occurred on many reefs for decades, natural chemical cues may be missing. Over the next three years we will begin characterization of potential lake trout pheromones by: 1) determining if mature adults behaviorally respond to the odors of fry and juveniles, 2) determining if mature adults behaviorally respond to other mature adults, and 3) profiling the bile acids emanating from lake trout embryos, fry, juveniles, and adults. Eventually, if a pheromone is found, we hope to identify and synthesize the pheromone and evaluate its use in a management context. A pheromone-based lake trout restoration effort seems promising following methods recently used to identify, synthesize, and apply mating pheromones to increase catch of the invasive sea lamprey (Petromyzon marinus).

Name: Jesse Comben
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Title: Abundance and habitat use of juvenile lake sturgeon in two Lake Michigan tributaries
Co-Author: Carl R. Ruetz III, Kregg M. Smith, Elizabeth Binoniemi-Smith
Abstract: Knowledge of abundance and habitat use of juvenile lake sturgeon (Acipenser fulvescens) are critical for successful restoration of this threatened species. Our goal was to conduct an assessment of juvenile lake sturgeon in the Grand and Kalamazoo rivers, Michigan, which are tributaries to Lake Michigan. Juvenile lake sturgeon abundance was assessed in September-December 2009 and 2010 using gill nets and baited setlines in lower sections of each river and areas surrounding river mouths in Lake Michigan. We used side scan sonar and hydro-acoustics to map areas where juvenile lake sturgeon have been captured and used ponar dredge sampling to identify substrate composition. One juvenile lake sturgeon (age 1) was captured in the Grand River, and two (age 0 and 1) were captured in the Kalamazoo River. One lake sturgeon in each river was fitted with radio transmitters and tracked daily until signals were unattainable (1-5 days). Both juvenile lake sturgeon appeared to emigrate to Lake Michigan in October-November shortly after being tagged. Our research, in conjunction with previous surveys, suggests reproductive success is low and likely variable among years in both systems. Residency time of juvenile lake sturgeon in lower sections of these rivers is unclear, but our preliminary results suggest juveniles (≤ age 1) are using the lower rivers in these systems for nursery habitats before migrating to Lake Michigan in the late fall.

Name: Amanda Chambers
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Title: Status, distribution, and environmental factors limiting brook trout in Cheney Creek, Michigan
Co-Author: Ashley Moerke
Abstract: Brook trout (Salvelinus fontinalis) numbers have been declining throughout much of their native range, yet in Michigan's Upper Peninsula, few studies have examined factors that may be limiting their distribution and abundance. We examined environmental factors that may be limiting brook trout in Cheney Creek, a small tributary stream of the Tahquamenon River located in Chippewa County. The study site was divided into three separate sampling reaches based on differences in surficial geology, and fish communities were sampled in early and late summer 2011. Additionally, in late summer, habitat variables (e.g., substrate, temperature, instream cover) were collected. Of the reaches sampled, brook trout were only captured at the reach located furthest upstream. Brook trout catches were low and there was no significant seasonal variation in abundance and condition. Environmental factors typically limiting brook trout in other parts of the country may not be responsible for limiting Cheney Creek brook trout. Mean temperature values throughout Cheney Creek fell within the thermal preferences for brook trout. Also, mean depth and velocity readings throughout the creek were likely sufficient to support brook trout over winter. Although much of the streambed was comprised of fine sediments, ground water upwellings within the stream should still allow for successful spawning. Based on the results of this study, it is difficult to definitively conclude which environmental factor(s) are limiting brook trout in Cheney Creek. It is possible that food resources and fish community structure could be linked to their current abundance and distribution.

Name: Gary Czypinski
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Title: Chequamegon Bay Partnerships Assist in Early Detection Monitoring for Invasive Mollusks and Fish
Co-Author: Henry Quinlan & Ronald Nemec
Abstract: Aquatic invasive species (AIS) can pose significant threats to fish and wildlife and their habitats. The U.S. Fish and Wildlife Service Ashland Fish and Wildlife Conservation Office (Ashland FWCO) has focused its efforts on preventing introductions of new AIS, early detection monitoring followed by rapid response to detection of new invasives, monitoring of fish communities inhabited by established invasives, providing coordination and technical assistance to organizations that respond to invasive species problems, and developing comprehensive, integrated plans to prevent and/or delay the spread of potentially threatening AIS.
The Ashland FWCO recruited voluntary assistance from marinas and a local high school to assist with early detection of non-native mussels and partnered with state and county agencies to monitor for new fish introductions. Chequamegon Bay, is a 39,520 acre embayment in southwestern Lake Superior, that receives transient vessel traffic from throughout the Great Lakes and upper Midwest. Many vessels also visit the Duluth-Superior harbor, 112 km west of Chequamegon Bay, which has established populations of invasive mollusks and fish. Early detection monitoring consisting of vessel hull inspections and adult zebra mussel sampling is conducted by marina employees and high school teachers and students. In 2010, four marinas inspected a total of 443 vessel hulls, and zebra mussels were found on two vessels; high school students completed a total of 428 sampler nights, and no invasive mussels were found. In 2011, two additional marinas were recruited, a total of 623 vessel hulls were inspected, and no invasive mollusks were found; the high school completed 720 sampler nights and found one zebra mussel on one sampler. Since 2009, the USFWS has conducted early detection monitoring annually for new invasive fish. Trawling consists of 24 five-minute tows in sites considered to be high risk for introduction of invasive fish. This monitoring continues to collect previously detected invasive fish (4 species), and no new invasive fish have been detected.

Name: Shannon Davis Foust
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Title: Using an Otolith Growth Chronology as an Archive of Environmental Change
Abstract: Growth chronologies developed from stable anatomical structures should be considered a valuable tool by fisheries management programs. In the absence of empirical body measurements a growth chronology can address the problem of after-the-fact data acquisition, ultimately helping improve our understanding of ecosystem relationships. Traditional fisheries growth models (e.g., the von Bertalanffy growth function) generally obscure annual variations in growth patterns making it difficult to find environmental factors that govern growth rates. This study demonstrates the value of a growth chronology in identifying environmental variables, including temperature and food resources, which influence fish growth.

Incremental measurements on thin sectioned sagittal otoliths were used to develop a growth chronology for Lake Winnebago, Wisconsin, freshwater drum (Aplodinotus grunniens). Drum diet analysis 2006-2009 revealed an adult length-related ontogenetic diet shift. Small drum (180-362 mm total length) predominately consumed chironomid larvae and microcrustaceans, and large drum (> 400 mm total length) predominately consumed fish, crayfish, and mollusks. Large drum were frequently engorged with zebra mussels (Dreissena polymorpha), which were first reported in this waterbody in 1998. High frequency fluctuations in the drum growth chronology from 1948-2008 were positively correlated to summer temperatures (r=0.75), and a continued increase in growth rates of large drum (a low frequency fluctuation beginning in 2001), corresponded to the establishment of zebra mussels. The larger year effects of the drum growth chronology from pre- to post-zebra mussel establishment were corroborated by increased relative weights of large drum but not small drum.

Name: Kris Dey
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Title: Genetic Distribution of Lake Sturgeon in the St. Marys River
Co-Author: Nancy Kirkpatrick
Abstract: The St. Marys River harbors a Lake Sturgeon (Acipenser fulvescens) population estimated at 500 individuals. Recent tracking studies by Lake Superior State University's Aquatic Research Lab found that these fish have very restricted movement patterns to the northeast side of Sugar Island; suggesting they could be reproductively isolated from other Great Lakes populations. In this same reach of river, Yellow Perch (Perca fulvescens) and Walleye (Sander vitreus) exhibit patterns of genetic isolation. This study used seven microsatellite DNA markers to detect if the Sugar Island (North Channel) population of Lake Sturgeon are genetically isolated from surrounding populations. Samples were taken from three study areas; the North Channel of Sugar Island, Munuscong Bay (12 km south), and the French River (300 km to the east; Ontario, Canada). The individuals from the north branch of the French River were used as an out-group to identify to what degree the North Channel of Sugar Island and Munuscong Bay were related. STRUCTURE was used to identify the number of populations (k=3) and clustering patterns within the dataset. One individual in the French River sample set was moderately close in relation to the Munuscong Bay population, showing possible gene flow from a different Lake Huron population. The North Channel had little genetic diversity, was genetically distinct from the other two populations, and exhibited no evidence of intermixing with surrounding populations. The restricted movements and genetic isolation of this population make the North Channel one to be managed delicately in the future.

Name: Garrett Drach
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Title: Internal Anchor Tag Retention in Muskellunge
Abstract: Various marking techniques have been used to mark muskellunge (Esox masquinongy) in the wild. Internal Anchor Tags are an individual external tag that can be viewed by anglers. We installed Internal Anchor Tags in muskellunge with the objective to evaluate the retention rate. Internal Anchor Tags were installed in 305 muskellunge on the Wisconsin River. The one year retention rate of Internal Anchor Tags installed in muskellunge was estimated at 75%. Anglers reported catching 125 muskellunge with Internal Anchor Tags. Internal Anchor Tags can be used in muskellunge studies which are not highly sensitive to tag loss.

Name: Matthew Faust
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Title: Precision of cleithrum and sagittal otoliths used to estimate ages of northern pike
Co-Author: Samantha Bizeau, Jason Breeggemann and Brian Graeb
Abstract: Precise age estimates can be difficult to obtain for northern pike. The cleithrum, a bone in the pectoral girdle, is the structure thought to produce the most precise age estimates for northern pike. However, otoliths have been found to provide the most precise age estimates for many other fish species; yet, otoliths have never been evaluated for northern pike. Our objective was to determine if sagittal otoliths or cleithrum provide more precise age estimates for two northern pike populations. Sagittal otoliths and cleithrum were collected from 82 northern pike (size range 323-1005 mm) from Devils Lake, North Dakota and 56 northern pike (size range 254-610 mm) from Cable Lake, Wisconsin. Cleithrum were viewed in whole submerged under water in a black dish and ages were estimated by two independent readers. Sagittal otoliths were mounted in epoxy and thin-sectioned, and ages were estimated by the same two independent readers. Precision of age estimates was quantified using percent reader agreement and mean coefficients of variation, and bias between structures was compared using age-bias plots. We expect that percent reader agreement and mean coefficient of variation will be similar for both sagittal otoliths and cleithrum. We also expect that age-bias plots will show no bias between cleithrum and otoliths.

Name: Douglas Galvas
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Title: Biomanipulation of Yellow Perch by Introducing a Top Predatorin a North-Temperate Bog Lake
Co-Author: Dr. Geoffrey Steinhart
Abstract: Cranberry lake is a small private lake in Michigan's eastern Upper Peninsula that is bog-like with tannic, low pH water. Previously, Cranberry Lake contained only yellow perch (Perca flavescens) and central mudminnow(Umbra limi) as natural lake conditions prohibited less acid-tolerant species. Abundance of small yellow perch was very high, leading to intraspecific competition and potentially stunting, or stockpiling of young age classes. In an effort to reduce yellow perch abundance and to increase their mean size, northern pike (Esox lucius) were added to the lake beginning in 2008. Northern pike are a top predator that can survive in relatively acidic water; however, Cranberry Lake was also limed in 2010 to make the pH more suitable for all species. Fish assessments were conducted, including yellow perch population estimates and size-structure,each fall and spring. Recaptured northern pike allowed for bioenergetic simulations of consumption. As hypothesized, following the addition of northern pike and lime, yellow perch declined in abundance and increased in proportional stock density. Bioenergetic simulations estimated that the introduced northern pike consumed at least 34,500 yellow perch over the course of this study, which was supported by the decrease in yellow perch survival and population abundance.

Name: Steven Gambicki
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Title: Changes in sea lamprey (Petromyzon marinus) size and fecundity on the Great Lakes
Abstract: The study objectives were to compare sea lamprey lengths, weights, fecundity, and egg diameters with previous studies conducted on Lake Superior in 1960 (Manion 1972) and Lake Ontario in 2001 (O'Connor 2001). I hypothesize that due to the availability of larger prey in the Great Lakes, sea lamprey sizes, fecundity, and egg diameters may have increased compared to past studies. Sea lamprey were collected from four rivers, two on Lake Superior, and two on Lake Ontario. Three 0.5 g sub samples of eggs were taken from each gonad and counted. The mean eggs/g from each of the three sub-samples was used to estimate the total number of eggs in each gonad. Research can add to existing knowledge in designing and implementing various control methods. (Manion and Hanson 1980). This research may provide information on population growth rates, which could alter how often streams are treated, and what methods are used. I am still analyzing the data and will have a conclusion by the time o the meeting.

Name: Joseph Gerbyshak
Affiliation: US Fish and Wildlife Service
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Title: A Small Dam Removal on a Cold-Water Stream in Northeastern Michigan - A Partnership Success Story
Co-Author: Andrea Ania
Abstract: The U.S. Fish & Wildlife Service, Michigan Department of Natural Resources, and Huron Pines have been working with a private land owner to remove a small dam on Miller Creek, a cold-water tributary of the Thunder Bay River. Miller Creek Dam, located a few hundred feet upstream from the confluence of the Thunder Bay River, was constructed in 1945 to create a shallow 30 acre impoundment. As is the case with many dams, it was a barrier to fish passage, interrupted sediment flow, and warmed water temperatures. All of these factors lead to an altered aquatic species community in the stream and riparian zone upstream of the dam. The dam was partially breached and needed to either be repaired or removed. Due to the high cost of repair and maintenance, removal was the most cost effective and ecologically beneficial solution. The impoundment was gradually dewatered over the course of the 2011 field season. In order to document the response of the watershed to the dam removal, a time-lapse camera was installed on the impoundment to capture the impoundment dewatering, revegetation and channel formation processes. In November of 2011, the dam structure was removed and a box culvert sized to span the bankfull width of the stream was installed. This project restored connectivity of over 12 miles of cold-water and 25 acres of riparian habitat. It also restored cold-water habitat that historically supported native brook trout and opens up fish passage from Miller Creek to the Thunder Bay River.

Name: Margaret Harings
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Title: Bluegill Population Dynamics Following Implementation of Catch-and-Release Regulations
Co-Author: Derek H. Ogle
Abstract: Inch Lake is a 31-acre soft-water seepage lake in Bayfield County, Wisconsin. The fish community is dominated by bluegill (Lepomis macrochirus), bluntnose minnows (Pimephales notatus), and largemouth bass (Micropterus salmoides), though substantial numbers of adult black crappie (Pomoxis nigromaculatus) and annually variable numbers of young yellow perch (Perca flavescens) are present. Prior to 2006, fishing was allowed, but since then, catch-and-release regulations were enacted for all species. Our main objective was to assess the population of bluegills in the years immediately following the regulation change. Bluegills were sampled with fyke nets during Mays of 2007 to 2011. Total length and weight were recorded for all fish, and all fish >150 mm were individually tagged. The CPE of fish < 80 mm indicated relatively constant recruitment throughout the study period. However, the CPEs of 80-150 mm and >150 mm fish declined significantly in 2010 and 2011. With the exception of 2010, the RSD-P increased each year while the PSD remained constant. The mean length of bluegills >80 mm increased from 2007 to 2011, except in 2010. Growth of bluegills <200 mm exceeded, whereas growth of bluegills >200 mm was similar to the average growth of bluegills in other northern region lakes. Fish condition declined for all lengths of fish in 2008-09 and rebounded in 2010-11, though the rebound was greater for fish that were <200 mm. We will continue to monitor fish populations in Inch Lake to determine the long-term effects of catch-and-release regulations on an entire fish community.

Name: Melissa J Johnson
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Title: Effect of Gull Island Shoal Refuge on Spring Lake Trout Abundance, Lake Superior
Co-Author: Michael J. Hansen and Michael J. Seider
Abstract: Gull Island Shoal refuge was created in 1976 in response to the lake trout population collapse in the Apostle Islands, Lake Superior. The purpose of my study is to determine if abundance differs inside versus outside the refuge and before and after refuge implementation. Spring lake trout abundance was collected from 1959 to 2010 by the WDNR from large-mesh gill net surveys. Abundance was quantified using the net-saturation model of CPUE and geometric mean of all stations for each year, then comparisons inside versus outside the refuge and before versus after refuge implementation was done using ANOVA. Results show that spring lake trout CPUE was greater inside versus outside the refuge but did not differ significantly before and after refuge implementation in 1976. Abundance is expected to be greater inside versus outside a refuge due to lower fishing mortality but the before and after analysis is confounded by stocked versus native lake trout abundance over time which previous analysis shows native abundance increasing in the Apostle Island region since the mid-1970s. Future work will be to determine summer and autumn abundance and combine these results with the spring abundance.

Name: Craig J Kelling
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Title: Hatch Timing and Growth of Age-0 Largemouth Bass in Wisconsin
Co-Author: Daniel A Isermann
Abstract: Largemouth bass have protracted spawning periods that can last up to several weeks. As a result, growth, total length (TL), and recruitment of age-0 largemouth bass may be regulated by hatch timing, but these relationships have not been thoroughly examined for bass in northern lakes. Our objective was to determine if hatch date influences TL and growth rate of age-0 largemouth bass in Wisconsin lakes. Initial results suggest that largemouth bass hatching in Wisconsin lakes can occur over periods exceeding 40 days. Total length of age-0 bass was negatively related to hatch timing (i.e., earlier hatched fish attain greater TLs), but these relationships can be relatively weak. Hatch timing was also significant in explaining variation in daily growth rates, with late-hatched fish growing faster than those hatching relatively early in the year. Due to differences in length observed at the end of their first growing season, it is likely that early-hatched age-0 largemouth bass will experience higher survival than fish hatching later in the year. Furthermore, climatic conditions that promote early hatching of largemouth bass or result in extended growing seasons could increase bass recruitment in certain years, resulting in relatively high abundance of adult bass in the future.

Name: Brian Marshall
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Title: Effect of spawning salmon on the emergence of aquatic insects in a Michigan stream
Co-Author: Ashley Moerke
Abstract: In the native range of Pacific salmon, research has suggested that aquatic insects emerge prior to salmon runs in order to avoid the disturbance associated with spawning activity. However, it is unclear how emergence patterns may change in Great Lakes streams where salmon have been introduced for over 50 years. The objective of this study was to determine if aquatic insects of Great Lakes tributaries alter their life history in the presence of spawning Pacific salmon. Thomson Creek in Manistique, Michigan was selected as a study site due to a dam being removed in the summer of 2010, which allowed a comparison of aquatic insect emergence below the dam (received 50 years of spawning runs) and above the dam (received first run of salmon in 2010). Samples were collected pre-, during, and post-spawning in 2010 using sticky traps to catch emerging insects biweekly. Patterns in emergence timing below and above the old dam both slowed correlation with temperature. The upper reach insects being naive to spawning salmon have a larger correlation than the lower reach. Emerging insects in lower reach have a negative correlation with the spawning salmon abundance, however when insects with different life histories are separated out some of the multivoltining insects show a different trend than longer lifestyle insects. The determining if the aquatic insects have altered their life history to avoid disturbance, can alter the dynamics of the food web in both the riparian and aquatic zones leading to reevaluating the connections between the two zones.

Name: Matthew McLean
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Title: Linking Large scale Geomorphic Characteristics to Shallow-water Riverine Fish Assemblage Patterns
Co-Author: Tyler DeBruin
Abstract: In 2009 we conducted a study of shallow water fish assemblages in three reaches of the Lower Chippewa River in western Wisconsin. The reaches were distinguished by the stability and diversity of their channel form; features quantified from analyses of historic aerial photographs. For each reach, we mapped the distribution of backwater, island, sandbar and riffle habitats. Fish surveys then were conducted from each habitat type to characterize the link between fish diversity patterns and local habitat and reach scale conditions. In the summer of 2011 this habitat data was augmented, adding additional GPS data. The braided reach contained all habitat types, but the most distinctive feature was its many islands, which added greatly to the overall habitat abundance. By contrast, habitat was most scarce in the stable, simple reach. Of the over 50 species collected 30 were examined for feeding and locomotive traits, to explore the link between functional diversity of fish species and habitat type. The importance of this work lies principally in its effort to link large scale geomorphic characteristics (channel dynamics) to small scale fish distribution patterns, and to classify community assemblages via functional diversity of traits of fish assemblages in their respective habitats.

Name: Eric Miltz Miller
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Title: Visual observation of feeding strategies used by brook trout (Salvelinus fontinalis) and steelhead trout (Oncorhynchus mykiss)
Co-Author: Eric Miltz-Miller and Jill Leonard
Abstract: The primary objective for this project was to examine feeding niche overlap of native brook trout (Salvelinus fontinalis) and non-native steelhead (Oncorhynchus mykiss) in a second order upper-Michigan stream using snorkel surveys. Three sections of stream were chosen based on a predominance of steelhead, brook trout, or an equal representation of the two species. Within these stream sections four behaviors were observed: column feeding, surface feeding, benthic picking, and benthic searching. Eight daytime observations were made between Aug 1st 2011 and Oct 18th 2011 depending on weather and water conditions. Our observations suggest that the steelhead were more active than brook trout. On average, steelhead fed on 2.1 times per individual observed during the sample period, whereas brook trout fed 1.5 times per individual. Both species showed a preference towards column feeding, with brook trout column feeding during 80% of events observed and steelhead 71%. Surface feeding varied with steelhead feeding on the surface 13% of the time, and brook trout 2%. Benthic feeding was approximately equal between the two species; benthic picking was the more common at 14% of observations and benthic searching at 2%. We found that feeding behaviors did not vary depending on the presence or absence of a species. Our data did not suggest a shift in brook trout feeding behaviors due to the presence of steelhead; however, they do suggest that steelhead are more active feeders which may lead to competition for food when these two species are found together.

Name: Andrew J Repp
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Title: Comparing Time Effort and Distance Effort for Electrofishing Indices
Co-Author: Michael J. Hansen
Abstract: Electrofishing catch per unit effort (CPUE) is often used as an index of relative abundance. Effort is typically recorded in units of either time or distance, such as catch per mile (CPM) or catch per hour (CPH). Both time and distance effort have been significantly correlated with population density of several game species. The trends provided by each, however, have been compared only once with limited scope and scale. My objective was to determine if time effort and distance effort provide similar trends in electrofishing CPUE for largemouth bass, smallmouth bass, and walleye in northern Wisconsin lakes. Electrofishing surveys were used to estimate relative abundance of adult walleye, largemouth bass, and smallmouth bass in many lakes over several decades. Survey guidelines suggest one complete trip around the shoreline, with two people netting. Catch, time effort, and distance effort were recorded. Pearson correlations were calculated between CPH and CPM. If the relationship was strongly linear ($r>0.9$) a geometric mean functional regression was calculated. The relationship between CPH and CPM was strongly linear for all three species. Since time effort and distance effort provide similar trends in CPUE, either may be used. Time effort may be more precise, easier to replicate, and has no chance of unit conversion error. When using time effort, closely following established protocols is necessary to avoid introducing additional error.

Name: Jacob Riley
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Title: Does the physical environment of a stream favor certain life history attributes of fishes?
Co-Author: Dr. Ashley Moerke, Troy Zorn
Abstract: A stream's hydrological regime affects its physical and chemical properties, as well as alters the abundance and composition of aquatic biota. However, little is known about the relationships between a stream's hydrological regime and life history traits of aquatic biota. The objective of this study is to determine if the hydrological stability or variability of Michigan streams is associated with certain life history traits of fishes. Fish and hydrology data from 1486 sites were obtained from Michigan DNR fish surveys and were compared, using quantile regression, to the life history traits of age at maturity, longevity, number of spawning days, and resiliency. Quantile regression showed a lower abundance of quick maturing, short lived, and longer spawning fish when the low flow yield of the stream increased. Fish with low and high resiliency showed a decrease in abundance as low flow yield increased, while fish with a medium resiliency rating showed an increase in abundance as low flow yield increased. This study will help predict fish species distributions throughout Michigan, based on functional relationships with their environment. Changes in stream flow will continue in Michigan due to growing water demands, human modifications, and climate change, and being able to predict fish distributions will allow scientists to effectively manage and protect Michigan's stream fishes.

Name: Joshua Schloesser
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Title: Early Detection of Invasive Fishes in Lake Superior
Co-Author: Henry Quinlan
Abstract: Invasive species pose a serious threat to the ecological stability of the Great Lakes warranting continual monitoring for the arrival of new species. Three locations in Lake Superior were identified as "high risk": St. Louis River near Duluth, MN, Upper St. Marys River near Sault Ste. Marie, MI/ON, and Thunder Bay, ON harbor. Each location was sampled during August and September 2010 and 2011 by boat electrofishing, fyke nets, and bottom trawling. Sample locations were randomly selected according to depth strata. At the St. Louis River twenty sites were sampled with fyke nets and electrofishing each, and ten bottom trawls. The Upper St. Marys River and Thunder Bay were sampled with fifteen samples of each gear type because the optimal gear allocation to maximize the number of species detected was unknown. Rarefaction curves indicate that a total of 50 (current effort level), 60, and 45 (current effort level) samples at the St. Louis River, Upper St. Marys River, and Thunder Bay harbor, respectively, would detect 94% of the known species in the study area. A gear mixture of 40% fyke nets, 40% electrofishing, and 20% trawls would maximize the number of species detected at the St. Louis River and Thunder Bay. The Upper St. Marys River should be sampled with 40% fyke nets, 20% electrofishing, and 40% trawls. A third year of sampling will provide a more robust evaluation of the sampling design, plus invasive species monitoring should continue as the threat for new invasive fishes persists.

Name: Troy Zorn
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Title: Long-term assessment of Lake Michigan nearshore fish communities in Michigan's Upper Peninsula

Abstract: The waters of northern Green Bay support nearly one fourth of the sportfishing effort on the Michigan waters of Lake Michigan. Understanding and management of fish populations here is complicated by many natural and anthropogenic changes to aquatic environments and communities, but limited data have been collected to document fish assemblage and environmental changes over time. We initiated long-term gill net and trawl surveys of these waters to address this deficiency. Areas sampled include Big and Little bays de Noc, as well as the ports of Menominee, Cedar River, Manistique, and Naubinway. Survey data will complement ongoing creel census and walleye jaw-tagging efforts, and be used to address issues such as: 1) setting harvest regulations for coolwater fishes; 2) assessing natural reproduction of walleye stocks, the contribution of stocked fish, and future walleye stocking decisions; 3) assessing changes in yellow perch populations following cormorant control; 4) assessing abundance levels of invasive species (e.g., Eurasian ruffe, round goby) and native species potentially affected; 5) describing fish community changes in response to changing physical environment (e.g., water clarity, temperature). Our efforts will yield more accurate and precise population abundance indices, improved data for collaborative yellow perch management (via the Great Lakes Fishery Commission's Yellow Perch Task Group), and larger sample sizes for population modeling efforts. By extending gill-net and trawl sampling to southern and eastern ports, we can better document changes and manage fish communities in these previously unsampled areas of Lake Michigan.