Wisconsin Chapter of the American Fisheries Society

Oral Presentation Abstracts

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Rock Garden / Comfort Suites, Green Bay, WI

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Presentation Type: Presentation
Dates: Only Wednesday

Title: Angler preferences for bluegill, largemouth bass, and walleye fisheries in Wisconsin
Co-Author: Dan Isermann and David Fulton

Abstract: Understanding anglers' preferences is central to effectively managing our fish populations. In the past, Wisconsin DNR Fisheries has conducted various species-specific angler preference surveys. These surveys have been focused on one species and do not incorporate the tradeoffs inherent in managing multiple interacting species, both in terms of within and between species abundance and size structure. We administered a survey of anglers to identify and quantify three general components of angler preferences associated with bluegills, largemouth bass, and walleye: 1) interest in harvest including numbers and sizes, 2) tradeoffs of within species fishery types (e.g. high bluegill catch rates with poor size structure vs. low bluegill catch rates with good size structure), and 3) tradeoffs of between species fishery types (e.g. high catch rates of largemouth bass vs. high catch rates of walleye). The results offer highly valuable insights into what angler's desire across the lake rich landscape of Wisconsin. Quantifying these preferences and tradeoffs will help managers provide an optimal diversity of opportunities as well as apportion resources appropriately, particularly relevant as lakes experience broad scale habitat changes.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: An evaluation of 14-18 inch protected slot length limit for walleye (Sander vitreus) in Lake Wissota, Chippewa County, WI.
Co-Author: None

Abstract: Lake Wissota is a 6300 acre flowage on the Chippewa River near Chippewa Falls, WI and is a popular angling destination for walleye. The lakes walleye population is sustained by natural reproduction and no stocking occurs. Historically, the poor size structure of the walleye fishery has been a concern from the angling community. In an effort to improve the size structure of the walleye fishery as well as better meet angler expectations; angling regulations for walleye were changed several times since 1990 with the most recent being the creation of a 14-18 inch no harvest slot in 1997 and the elimination of a year round angling season in 1998. Three fish surveys were available in 1996, 2006 and 2012 to evaluate the effectiveness of these regulation changes. Abundance of walleye has been variable over the study period. Walleye year class strength has likely been the largest driver in overall walleye abundance in the fishery. However, size structure indices show improvements in the quality of the walleye fishery. More specifically; proportional stock density values (PSD) increased from 15 to 29; relative stock density (RSD 20) increased from 10 to 22 and the mean length of female walleye improved from 17.1 inches to 18.6 inches over the study period.

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Presentation Type: Presentation
Dates: Only Wednesday

Title: Predicting walleye recruitment success
Co-Author: Joseph Hennessy

Abstract: Understanding factors controlling walleye recruitment is a long standing goal in fisheries management. We used a random forest model to predict the probability of successful walleye natural reproduction, defined as fall young of year walleye catch rates of greater than 10 fish per mile. A total of 3,222 surveys conducted throughout Wisconsin from 1989-2012 were used to calibrate the model. Recruitment success was predicted with 79% accuracy based on lake area, latitude, longitude, maximum depth, and conductivity. Model predictions were not improved by the addition of largemouth bass catch rates, secchi depth, watershed land cover, or other widely available lake-specific variables. Recruitment success was highest in large lakes in the north central part of WI with moderate conductivity and depths. Predicted probability of successful recruitment was calculated for candidate lakes for large fingerling stocking in order to evaluate the potential for these lakes to support natural reproduction, as used as a tool to prioritize stocking in lakes for which the stated stocking goal was restoration.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Evaluation of Biological Performance Indicators for Monitoring Exploitation of Walleye Populations in Northern Wisconsin
Co-Author: Nancy Nate and Gretchen Hansen

Abstract: We determined if variation in biological performance indicators (i.e., ω, mean total length (TL) at age 3, mean age at 50 cm TL, age classes present, age class diversity [H], catch-per-effort [CPE] of age-0 walleyes, coefficient of variation [CV] in age-0 CPE, targeting angler catch rate, and the mean TL of the 10 smallest mature females) observed for walleye populations in northern Wisconsin could be explained by exploitation rates while also considering adult density, lake surface area, recruitment category (naturally-reproducing or stocked), latitude, and longitude as additional explanatory variables. We also determined if BPIs could be used to identify walleye populations that have experienced relatively high exploitation rates (i.e., rates ≥ upper quartile values) in reference to recruitment category. Exploitation was of little importance in explaining observed variation in BPIs and BPIs were not effective in identifying walleye populations with relatively high mean exploitation rates. Biological performance indicators may be effective for assessing changes in exploitation within individual populations, but appear ineffective at a broad spatial scale because relatively high or low BPI values observed for some populations may be the result of factors other than exploitation. Additionally, exploitation rates for walleye populations in northern Wisconsin were generally low (median values ≤ 0.12) and may not be sufficient to elicit measurable changes in BPIs. Lastly, population and fishery data are collected at relatively infrequent intervals from most walleye populations in northern Wisconsin (sampling interval usually ≥ 3 years); this temporal scale may not be sufficient to describe relationships between BPIs and exploitation. Ongoing analyses will attempt to determine the behavior of BPIs in relation to exploitation using data for walleye populations where relatively frequent estimation of exploitation rates has occurred.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Exploring Optical Habitat for Walleye as a Determinant of Fish Community Dominance and Stability in Northwestern Wisconsin Lakes
Co-Author: David Neuswanger

Abstract: Fish habitat is most often considered in limnological terms with important components being spawning substrate, refuge, depth, temperature, and dissolved oxygen. However, previous research has shown that suitable optical habitat within the water column can be an important determinant of walleye production given their specialized low-light foraging strategy. Optical conditions in lakes are influenced by water color and turbidity, and are ultimately restricted by bathymetry. Optical conditions that are favorable to walleye have been described, and models to quantify optical habitat in lakes have been developed. To date, little attention has been given to optical habitat for walleye in Wisconsin lakes, although this factor may provide insight into recent shifts in fish community dominance from walleye to largemouth bass. In this study we adapted quantitative optical habitat models for use in northwestern Wisconsin lakes. We provide case studies of lakes that have undergone changes in water clarity and subsequently in the amount of suitable walleye optical habitat. We also tested whether optical habitat differed between lakes that have undergone recent declines in walleye abundance and lakes where walleye populations have increased or remained stable. Initial results suggest that two very different types of lake provide optical habitats that favor walleye population stability – deep, clear lakes and shallow lakes with low water clarity. Shallow lakes that are either clear or experience fluctuations in water clarity seem to be more susceptible to shifts in fish community dominance from walleye to largemouth bass. If confirmed, these findings may have implications for habitat management, angling regulations, and stocking strategies.

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Title: Abundance and Growth Responses of Walleye (Sander vitreus) to 35% Annual Exploitation on Big Crooked Lake, Wisconsin, 1998-2008
Co-Author: Steven P. Newman

Abstract: Understanding how fish populations respond to various levels of exploitation is critical to sustainable fisheries management. Since 1985, walleye (Sander vitreus) in the Ceded Territory of Wisconsin (CTWI) have been exploited by tribal spearing and recreational angling fisheries. From 1990-present, an annual adult walleye exploitation rate of 35% has been used as the maximum total allowable catch in the mixed fishery. To better inform CTWI management policies, a whole-lake 35% annual adult exploitation study (1993-1997 = pre-exploitation, 1998-2008 = 35% exploitation) was conducted on Big Crooked Lake, Wisconsin to test for responses of the walleye population in adult, male, female, age 0, and age 1 densities, and in several growth metrics. Adult walleye densities declined significantly over time and between time periods. Walleye densities declined from about 6 to 3 adults/acre over the course of the study and were about 2/acre during 2001-2008. Male densities declined significantly over time, while female densities did not change. Male:female sex ratios were < 1.1 during four years. No change was observed in age 0 or age 1 density over time or between time periods. Juvenile walleye growth rates and the mean length of several age classes increased significantly over time, while asymptotic length decreased, suggesting a density-dependent growth response to 35% annual exploitation. Our findings suggest that a sustained 35% annual exploitation rate on the Big Crooked Lake walleye population led to undesirable adult walleye densities (< 3.0/acre). Male:female sex ratios also approached those that have foreshadowed walleye population collapse in other CTWI lakes. Reduced exploitation rates may be needed to maintain desirable walleye densities and improve trophy growth potential.

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Presentation Type: Presentation
Dates: Only Wednesday

Title: Fish Passage Monitoring Techniques and Successes in Ozaukee County
Co-Author: N/A

Abstract: (early Wednesday presentation if at all possible. Thanks Justine) Fish passage restoration is widely considered an effective and economical solution to the deleterious effects of aquatic habitat fragmentation. Multiple organizations, particularly within the Great Lakes region, are implementing aquatic connectivity projects funded by a variety of sources. To date, the Ozaukee County Planning and Parks Department has been awarded $8.4 million in federal, state, local, and private grant funding for fish passage and habitat restoration activities on a County-wide scale, removing 233 fish passage impediments on 31 project streams and reconnecting 129 stream miles and 7,976 acres of wetland habitat. The County has utilized various targeted monitoring techniques to document successful fish passage at impediment remediation sites, including mark-recapture, larval fish trapping, angler reports, visual surveys, live online underwater video, and a region-wide communal tagging and marking protocol. County staff and project partners have documented successful fish passage and the restoration of natural reproduction at several project sites, directly confirming the immediate and tangible benefits of fish passage restoration projects across the landscape. This presentation will detail the County's successful fish passage monitoring techniques and results to inform regional stakeholders on methods that may be applicable to future similar projects in Wisconsin and across the Great Lakes region.

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Presentation Type: Presentation
Dates: Only Wednesday

Title: Vertical distribution of larval lake sturgeon (Acipenser fulvescens) on the Menominee and Oconto Rivers, Wisconsin
Co-Author: Dr. Patrick Forsythe

Abstract: Current populations of lake sturgeon (Acipenser fulvescens) are affected by many anthropogenic issues such as dams, pollution, development, and overharvest. Management and recovery efforts hinge on the comprehension of basic biological data to calculate recruitment. However, little information is available regarding differences is spawning time, egg development, and larval ecology between river systems that have remnant populations. The objective of this study was to document the horizontal and vertical distribution of drifting lake sturgeon on the Menominee and Oconto Rivers, Wisconsin, during the 2013 field season. Transects of standard D-frame drift nets were deployed below the known spawning sites in both the Menominee River (n = 1,222 with 12-14 nets, evenly spaced along a 200 meter wide transect, 800 meters downstream from the Hattie Street Dam), and the Oconto River (n = 135 with 6 nets evenly spaced along a 60 meter wide transect, 1250 meters downstream from Stiles Dam). Additionally, two to four vertical distribution nets (handcrafted) were also deployed along each transect, which consisted of up to seven stackable drift nets each, (76 cm across the base; 20 cm high; knotless 1.6 mm mesh nylon bag 240 cm long with a detachable collection cup). The vertical distribution nets captured 1,011 lake sturgeon on the Menominee River, and 250 on the Oconto River. The data was then correlated with ADCP (Acoustic Doppler Current Profiler) data, producing a new model to accurately predict recruitment for each system. Larvae length was found to be significantly larger, both higher in the water column, and as the night progressed. This could lead to major management implications for lake sturgeon population estimates and health, as well as a better understanding of lake sturgeon early life history patterns on a system by system basis.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Lake Sturgeon Reintroduction and Movement in the Upper Wolf River
Co-Author: Don Reiter, Ron Bruch, Dave Grignon

Abstract: The Winnebago System, Wisconsin, is home to the largest population of lake sturgeon Acipenser fulvescens in the world. Lake sturgeon have ample spawning habitat on the Wolf River, but construction of two dams has since eliminated the fish's access to their ancestral spawning grounds at Keshena Falls within the Menominee Indian Reservation. Given the cultural importance of sturgeon to the Menominee Tribe, the Wisconsin Department of Natural Resources and the Menominee Tribe are cooperatively working on a 10-year joint project to restore spawning lake sturgeon to Keshena Falls, while also re-establishing a river resident population upstream of the dams. To meet these objectives, 100 lake sturgeon per year are captured from the Wolf River below the dams, and transferred upstream of the dams to the Menominee Reservation. All transferred fish are surgically implanted with 10-year acoustic tags to determine spawning location and monitor downstream movement of sturgeon through the dams. The early stages of the project have yielded promising results, and for the first time in over 100 years, sturgeon spawned at Keshena Falls as a result of this project. Through cooperative efforts, this project has also strengthened the relationships between the Menominee Tribe and the sturgeon spearing community around the Winnebago System.

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Dates: Both Wednesday and Thursday

Title: Northern Pike (Esox lucius) habitat selection and success in restored wetlands on the west shore of Green Bay
Co-Author: Dr. Patrick Forsythe

Abstract: Aquatic habitat restoration activities are used increasingly to provide spawning and nursery habitat as other habitat is degraded or destroyed. However, restorations are often completed without considering biological and ecological information. Brown County, The Nature Conservancy (TNC), WI DNR, U.S. Fish and Wildlife Service (USFWS), and the Oneida tribe have collaborated to replace or enhance marginal and degraded wetlands on Green Bay's west shore. UW-Madison and Shedd Aquarium are assisting with research. These wetlands are intended as spawning and nursery habitat for Northern pike (Esox lucius). Northern pike are one focal species used to study how restoration projects can become tools to increase populations of important native fish. Successful year classes of young-of-year (YOY) pike are critical for population recruitment, and good-quality spawning habitat is required to produce large year classes. However, the restorations were done with little knowledge of the factors needed for a successful restoration. The objective of this study is to take advantage of variation between restorations to reveal those important factors. The study will quantify pike habitat selection and success in the adult, egg, and YOY stages within three restored wetlands on Green Bay's west shore. Preferred spawning and nursery areas, and areas where each stage is most successful, will be used to create a "hot spot" map of preferred conditions. This will reveal important factors a successful restoration needs and guide future restorations. Finally, this study may serve as a "living laboratory" for focus on under-studied aspects of fish biology and ecology, specifically reproductive ecology and early life history.

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Title: Backwater Connectivity Relationships to Minnesota River Fish Communities-Implications for Management
Co-Author: Shannon Fisher and Douglas Dieterman

Abstract: Backwater habitats are valuable nursery areas and can provide year-round fish refuge; however, connectivity can impact backwater fish production. Backwater habitats have been altered or lost on many river systems. Therefore, our objective was to assess fish communities in three Minnesota River backwater lakes with differing connection types. Sampling was conducted before (P1), during (P2), and after (P3 and P4) a 2012 connection event. Anderson Backwater Lake (ABL) experienced a flow-through connection, St. Peter Backwater Lake (SPBL) had a back-flow connection, and Harris Backwater Lake (HBL) connected by small canals. To assess young-of-year (YOY) fish communities, light traps and sled nets were deployed in each backwater and adjacent main channel areas during each period. Backwaters were also sampled with trap nets each period. There were 2,872 YOY fishes captured (88.9% from backwater lakes) and trap net catch totaled 7,387 fishes. Light trap YOY fish catch significantly differed among backwater lakes in P3 ($P < 0.001$), ranging from 64.5/LT (SE = 15.0) in HBL to 0.2/LT (SE=0.1) in SPBL. Similarly, P3 sled net densities in HBL [34.27/m3 (SE = 21.29)] and ABL [20.08/m3 (SE = 3.02)] were significantly greater than SPBL [0.20/m3 (SE = 0.14; $P < 0.001$)]. The HBL and ABL demonstrated more capacity as nursery habitats for YOY fishes; whereas, the lack of YOY fish in SPBL may indicate lower nursery suitability, lack of access, or other factors resulting in lower fish production. These results may advance understanding about river-backwater connection types and lead to improved backwater habitat restorations.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Genetic Diversity and Differentiation of Walleye in Green Bay
Co-Author: Brian L. Sloss, Daniel Isermann

Abstract: Green Bay supports one of the most prominent recreational fisheries for walleyes (Sander vitreus) in North America. Management is complicated because walleyes spawn in many locations within Green Bay and its tributaries, but it is not known if fish using these locations represent distinct genetic units and to what extent each putative stock contributes to the fishery. Identifying stock structure of Green Bay walleyes has been defined as a priority research need by the Lake Michigan Fisheries Team of the Wisconsin DNR and also represents an important research priority for the Michigan DNR, because both agencies jointly manage these stocks. However, widespread stocking and habitat disruption may have resulted in a loss of naturally occurring genetic differences and structure among putative walleye spawning stocks within Green Bay. Our objective was to determine if genetic differences exist among age-0 and age-1 walleye sampled from specific locations within Green Bay. Ten microsatellite loci were used to characterize genetic diversity of 247 age-0 and age-1 walleye collected in 2013 from 7 locations in Green Bay. Genetic diversity was high compared to inland walleye (values in parentheses) with 11.9 average alleles per locus (9.5 inland) and expected heterozygosity of 0.778 (0.759 inland). Bayesian admixture and principal coordinate analyses identified two genetic groups: a northern group (Big and Little Bay de Noc) and a southern group (numerous sites). Differences among the two groups (FST = 0.22) was consistent with previously observed divergences among inland walleye populations. Therefore, significant genetic differences exist between northern and southern Green Bay age-0 and age-1 walleye. These findings are consistent with expectations based on isolation by distance and suggest genetic stocks of walleye may exist in Green Bay and genetic stock identification would be of value to fisheries management efforts.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Stock Characteristics of Lake Whitefish in Lake Michigan
Co-Author: Daniel Isermann, Brian Sloss, and Justin VanDeHey

Abstract: Lake whitefish (Coregonus clupeaformis) support important recreational, commercial, and tribal fisheries in the Great Lakes, including Lake Michigan. Genetic analyses indicate at least six distinct lake whitefish stocks exist in Lake Michigan, resulting in a mixed-stock fishery. Biological characteristics could vary among stocks, resulting in stock-specific responses to exploitation that are not fully accounted for under current management practices. The objective of our study was to determine if stocks differ in terms of growth, maturation, age structure, condition, and fecundity. Initial results indicate that some biological differences exist among stocks; continued analysis will determine if these differences are meaningful from a management standpoint.

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Dates: Only Wednesday

Title: Status of yellow perch population in Wisconsin waters of Lake Michigan
Co-Author: David Schindelholz and Bradley Eggold

Abstract: The objective of this presentation is to provide an update on the status of the Lake Michigan yellow perch population and discuss management options. Yellow perch are an important component of the Lake Michigan fishery. Due to extremely weak recruitment, the population of yellow perch declined dramatically in the early 1990s, and remains low today. Except modest year-classes in 1998 and 2005, most of the year-classes have been very weak. In order to protect adult perch and facilitate a recovery, Wisconsin along with Illinois, Indiana and Michigan implemented stringent harvest regulations which included lake-wide closure of commercial harvest in 1996. However, no substantial recovery of the population is evident. The sport harvest in Wisconsin reached all-time low in 2012 with only 9,115 estimated yellow perch harvested. In spite of the multi-dimensional research effort, no cause and effect relationship has been established. Various assessment data from WDNR indicated low number of young-of-the-year, very low catch-per-effort of adults, skewed sex ratio, and extremely low number of males in the catch. The altered habitat and productivity of the nearshore waters of Lake Michigan due to the colonization of invasive mussels may be driving a structural change in the fish community, leaving very few management alternatives!

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Dates: Both Wednesday and Thursday

Title: Effects of climate change on the reproductive phenology of two Great Lakes fishes
Co-Author: Andrew L. Rypel, Thomas E. Burzynski, Jared T. Myers, Tammie J. Paoli, Peter B. McIntyre

Abstract: We evaluated trends in the date of the midpoint of reproduction and associated water temperatures for two populations of yellow perch (Perca flavescens, a spring spawner) and two populations of lake trout (Salvelinus namaycush, a fall spawner) in the Great Lakes. For yellow perch in Lake Michigan, spawning tended to occur earlier in the spring. Near Milwaukee the date of the reproductive midpoint advanced 6.6 days per decade from 1990-2012 whereas in Green Bay the advance was 2.3 days per decade from 1980-2012. Field-measured water temperature at the midpoint remained stable with a mean of 10.8oC for both populations. The date on which satellite-estimated surface water temperature first exceeded 10oC advanced to earlier in the spring at both locations from 1995-2012 with the strongest trend in Green Bay. For lake trout, fewer changes were evident. In Lake Michigan near Milwaukee there was a marginal trend towards later spawning in the fall, and the midpoint retreated 2.8 days per decade from 1983-2012. However in Lake Superior in the Apostle Islands there was no trend in the midpoint from 1990-2012. Water temperature at the midpoint remained stable with a mean of 9.9oC in Lake Superior, but no data were available for Lake Michigan. The date at which surface water temperature first dropped below 10oC in the fall showed no trend for either location from 1994-2012. These results suggest that yellow perch have shifted the timing of their reproduction as spring warming has advanced in order to spawn at a constant water temperature and that lake trout have displayed limited shifts in the timing of their reproduction in response to a lack of clear trends in fall cooling.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Gill lice as a proximate cause of brook trout loss under changing climatic conditions
Co-Author: Sue Marcquenski, Kari Soltau, and Paul Kanehl

Abstract: Ongoing and future changes in climate are expected to impact stream temperatures and ultimately native Brook Trout presence in Wisconsin streams. While climate change may be the ultimate cause of Brook Trout population declines or local extinctions, proximate causes may involve factors other than intolerance to high temperatures. Here we present data to support the hypothesis that species interactions between Brook Trout, Brown Trout, and gill lice in the context of changing environmental conditions can lead to declines in Brook Trout recruitment and possibly extirpation. The gill lice species infecting Wisconsin Brook Trout is Salmincola edwardsii. S. edwardsii do not infect Brown Trout. Gill lice were recently documented in Ash Creek, Wisconsin in 2010 and became epizootic in 2012. Conditions in 2012 conducive to an epizootic included unseasonably warm stream temperatures in March, drought conditions through summer, and a sympatric Brown Trout population effecting locally-high densities of Brook Trout. Infection prevalence increased from 42% in April 2012 to 95% in October; 94% of age 0 Brook Trout in October were also infected. Infection intensity ranged up to 11 gill lice per age-0 trout and up to 70 per trout age 1 and older. Brook Trout (but not Brown Trout) recruitment in Ash Creek was significantly less than expected based on long-term stock-recruitment data. Given the high infection prevalence and intensity among age-0 Brook Trout and their poor condition going into winter, we expected to see a decline in the Brook Trout population in 2013, which was evident in our spring survey. We present additional data from other sympatric trout populations in Wisconsin streams in which Brook Trout have declined or become extirpated, which supports the hypothesis that species interactions among trout and parasitic gill lice under stressful environmental and ultimately climatic conditions can be a proximate cause of native Brook Trout loss.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Long Term Patterns of White Sucker Reproductive Phenology Associated with Climate Change in Northern Wisconsin Lakes
Co-Author: Jeffrey Kampa

Abstract: In the past 57 years, changes in Wisconsin's climate have raised concerns about how the climate may impact the ecology and management of coolwater fishes in lakes. Particularly with a warming climate, changes in water temperatures could cause shifts in the reproductive phenology of coolwater fishes with unknown consequences to recruitment. To better understand how coolwater fish phenology has responded to climate change, we investigated long-term trends in annual spawning times for white sucker Catostomus commersonii in 12 lakes in Northwestern Wisconsin from 1979-2011. We hypothesized that increased springtime air temperatures would lead to earlier spawning times over the last thirty years. Annual peak spawning time of white sucker was defined as the date of maximum hatchery egg take within a 5 day minimum collection period. We also defined potential annual spawning times as the initial date of surface water temperature reaching 12.3^{o}C (i.e., peak white sucker spawning temperature) and ice-out date using hind-casted temperatures. Pearson's product moment coefficients were calculated to evaluate correlations among datasets and simple linear relationships were used to describe temporal trends in the timing of spawning. Few lakes exhibited significant temporal trends.

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Dates: Only Wednesday

Title: The relative effects of water chemistry on the biodiversity, abundance and early life history of fishes across tributaries of lower Green Bay, a prospective study
Co-Author: Dr. Patrick Forsythe

Abstract: Watersheds vary substantially in the types and amount of nutrients as well as the rate at which those nutrients enter aquatic ecosystems. Although all three variables can affect water quality, perhaps the rate of nutrient enrichment plays the largest role in aquatic ecosystem health as measured by fish biodiversity, growth and survival, or rates of reproduction. Some watersheds also have rivers and/or streams that empty directly into larger water bodies (e.g. lakes, estuaries). The resulting discharge plumes are characterized by physical processes (e.g. hydrodynamic convergence) that concentrate nutrients, promote high rates of primary production, and contain large stocks of zooplankton. Furthermore, recent literature suggests that river plumes play a significant role in recruitment variation observed in local fishes through the physical retention of larvae or the superior feeding conditions that these unique habitats provide. The southern portion of Green Bay serves as the confluence point for tributaries that transport nutrients through watersheds that differ substantially in both size and dominate landscape features. However, the annual variation in nutrient input and the dynamics of the river plumes associated with these tributaries are relatively unknown. We know little about the fish community residing in lower bay tributaries/near-shore areas and whether physical characteristics are predictive of ecological features including fish biodiversity, and larval abundance, retention, and recruitment. The goal of this presentation is to provide a prospective outline of a study designed to address a portion of this uncertainty.

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Presentation Type: Presentation
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Title: Use and validation of side-scan sonar to assess substrate composition in the littoral zone of Wisconsin lakes.
Co-Author: Brian L. Sloss, U.S. Geological Survey, Wisconsin Cooperative Fishery Research Unit, College of Natural Resources, University of Wisconsin-Stevens Point, and

Abstract: Evaluation of littoral zone fish habitat is usually accomplished using cost and time-expensive transect-based methods. Inexpensive (~$3,000), commercially available side-scan sonar units have been increasingly employed to map benthic and littoral zone habitat in stream studies and may offer a more efficient means of assessing littoral-zone fish habitat in lakes (e.g., walleye spawning habitat). The objective of this study was to determine if side-scan sonar can accurately and efficiently classify substrate composition in nearshore littoral zones of Wisconsin lakes compared to a traditional transect-based method. Sixteen lakes in northern Wisconsin (47 to 1,564 hectares) were evaluated. Side-scan sonar substrate composition estimation was validated using a series of sonar image screen captures along locations of confirmed substrates. Proportional littoral zone substrate composition was estimated for both methods at 100 equally-spaced locations on each lake. Accuracy of proportional substrate (e.g., 20% versus 50% cobble) estimates between the side-scan sonar and transect-based method were compared at the lake level using paired t-tests. Efficiency was measured as the proportional time (hours) required to complete each method. Overall classification accuracy of validation screen captures was 93%. Paired t-test results showed similar substrate composition estimates between both methods (p-values > 0.05) for all 16 lakes; however, on average, side-scan sonar estimates were completed with 60% less effort (5.6 hours vs. 14.9 hours). These results suggest side-scan sonar provides a practical, accurate, and efficient alternative to assess littoral zone habitat on a lake-wide basis, where high resolution, site-specific microhabitat is not needed.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Evaluation of Dorsal Spines and Scales as Nonlethal Alternatives to Otoliths for Estimating Bluegill Ages
Co-Author: Dan Isermann

Abstract: Otoliths are considered the most accurate structure for obtaining estimates of fish age for a variety of species, but bluegill Lepomis macrochirus ages are often estimated using scales because removal of otoliths requires fish sacrifice. While scales offer a nonlethal method for age estimation, scale-based age estimates are often inaccurate and imprecise. Dorsal spines may offer another nonlethal alternative to otoliths for estimating the age of bluegills, but they have not been evaluated for bluegills and a previous study indicated that dorsal spines provided consistently lower ages than otoliths for black crappies (Pomoxis nigromaculatus). Our objectives were to determine if: 1) ages estimated from dorsal spines, scales, and otoliths were similar for bluegills collected from several Wisconsin lakes; 2) estimates of growth and mortality for individual bluegill populations vary when using different structures to estimate age and 3) age-correction matrices for dorsal spines and scales can be used to provide growth and mortality metrics that are similar to metrics estimated from otoliths. On average, ages estimated from dorsal spines and scales were lower than ages estimated from sectioned otoliths and age estimates from dorsal spines where less precise than those from otoliths, while scales had similar precision to otoliths. The extent to which dorsal spine and scale ages differed from otolith ages was not consistent among lakes and individual readers, making development of a universal age-correction matrix difficult.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Monitoring Asian Carp in the Upper Mississippi River
Co-Author: N/A

Abstract: Lock and Dam 19 currently serves as a bottleneck (i.e., presumed passable only through the lock chamber) for fish passage, which has slowed movement of Asian carp in the UMR. Our objective was to determine movement of bighead and silver carp in the Upper Mississippi River (UMR) by using acoustic telemetry. Movement was monitored using 14 Vemco VR2W receivers deployed in Pools 16 - 20 from September to December, 2013. Vemco V16 coded transmitters were surgically implanted in 10 bighead and 17 silver carp (712 mm - 1170 mm) on Pools 17, 19, and 20. Nearly 3,000 fish detections and 14 (52%) fish were detected post-tagging with passive and active tracking in 2013. No movement upstream was detected in any pool for any fish. However, fish (22%) were observed moving downstream in September and November from Pool 17 to 18. Similar to an acoustic telemetry study on the Illinois River, Asian carp were observed moving downstream in the fall, which may slow the invasion. This study is ongoing and will continue into 2015.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Method for Estimating Pre-dam Distribution of Centrarchid Over-wintering Habitat on the Mississippi River

Co-Author: Kirk Hansen, Fisheries Research Biologist, Iowa DNR, 24143 Hwy 52, Bellevue, IA 52031

Abstract: Bluegill, largemouth bass and other centrarchids are important species within the Upper Mississippi River's historic and present fish assemblage. While the assemblage of species is similar over time, the distribution of critical habitat for many species has been altered due operation of locks and dams for commercial navigation. The objective of our study was to determine if existing data can be used to identify pre-lock and dam (prior to 1939) centrarchid over-wintering locations on the upper Mississippi River to develop an historic reference condition. Historic and contemporary bathymetry, soundings, air photo and land/water coverages for navigation Pools 8 and 13 were used to identify potential over-wintering locations based on water depth > 1m and no indication of flow/velocity. Results indicate potential pre-dam centrarchid over-wintering habitat can be identified using existing historic and contemporary data. Our methods estimated a minimum of 37 pre-dam centrarchid over-wintering sites in Pool 8, and a minimum of 23 sites in Pool 13. The pre-dam sites were relatively evenly distributed, averaging approximately 1 site per river mile (range 0 – 7 sites per river mile) in the pools we investigated. Distribution of existing centrarchid over-wintering habitat is clumped, concentrated primarily in the upper portions of pools, corresponding to areas least impacted by impoundment. Many existing over-wintering sites are a result of recent human actions for habitat restoration or dredging for development (7 of 23 existing sites in Pool 8, and 6 of 15 in Pool 13). When potential pre-dam sites are compared to known existing over-wintering sites that are not the result of human management actions, we observed similar losses in number of sites in Pools 8 and 13 (57% and 61%, respectively).

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Preliminary Implementation of Aquatic Invasive Species Early Detection and Monitoring Program in Lake Michigan

Co-Author: Timothy Strakosh & Marian Shaffer

Abstract: Aquatic Invasive Species (AIS) pose one of the greatest threats to Great Lakes biodiversity and ecosystem stability. Management and control of AIS can be difficult and expensive, with yearly costs in the Great Lakes Region exceeding $200 million. The early detection of new invaders can reduce potential impacts and increase the likelihood of control efforts. The U. S. Fish & Wildlife Service, in collaboration with partners from the United States and Canada, is developing a new monitoring program for early detection and reporting of invasive species basin wide. The monitoring program will employ both traditional and non-traditional (e.g., environmental DNA) sampling methods to detect new AIS. In collaboration with state partners, preliminary traditional gear sampling for fishes was initiated during the 2013 field season to help refine sampling plans and techniques. Lower Green Bay (WI), Milwaukee Harbor (WI), and Burns Harbor (IN) were selected for sampling based on multiple invasion pathways and in cooperation with state partners. Multiple gear types were used to increase probability of detection of rare fishes (i.e., new invasive species). Boat electrofishing, minnow traps, fyke nets, and mini-fyke nets were deployed in the fall of 2013. All fishes caught were measured (total length) and enumerated. Species richness for all gear types per location was 22 (Green Bay), 17 (Milwaukee), and 20 (Burns Harbor). Cumulative species richness among the three sites was 35. No new AIS were detected. The most common non-native species were gizzard shad (Dorsoma cepedianum), round goby (Neogobius melanostomus), and white perch (Morone americana). AIS monitoring will expand in 2014 with the inclusion of additional sampling sites, increased sampling effort and additional gear types.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Wake boats as a novel source of AIS transfer: Potential for spread, possible solutions
Co-Author: Titus Seilheimer, Todd Verboomen, and Phil Moy

Abstract: Recreational boating is a vector for the secondary spread of aquatic invasive species (AIS). The Stop Aquatic Hitchhikers! guidance of "Clean Drain Dry" has been instrumental in reducing the invasion risk of this vector. However, a relatively new segment of the recreational boating market, wake boats, has developed for which the "Clean Drain Dry" guidance may not be effective. This segment includes watercraft that have onboard ballast systems that allow users to engage in water sports that require large wakes. These wake boats can carry hundreds of gallons of water, which is mostly drained before transporting the watercraft, however residual ballast may remain in the ballast containers. In order to quantify the AIS transport risk associated with these watercraft, we worked with a local marina to sample watercraft with ballast systems. We investigated 25 wake boats and sampled 13 ballast systems. The volume of the residue ballast was measured and then the residual ballast was filtered through a 64 micron plankton net. The mean residual ballast in each watercraft was 31.69 ± 28.79 L. The residual ballast contents are still being analyzed, but initial observations confirm that there is plankton in the residual ballast, some of which was alive for at least seven days prior to being collected. Future work for this project will involve explaining and reducing the variability in residual ballast volume in these types of watercraft through a set of best management practices.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Realized Genetic Consequences of Implementing Conservation Genetics Practices in a Muskellunge Propagation Program
Co-Author: B.L. Sloss, J.A. VanDeHey, M.J. Jennings

Abstract: In 2005, the Wisconsin Department of Natural Resources' muskellunge Esox masquinongy propagation program underwent a series of revisions aimed at conserving genetic diversity. Changes were made primarily to ensure natural muskellunge diversity was represented in brood fish and crossing and rearing strategies were refined to minimize changes in genetic diversity throughout the propagation process. To evaluate these revisions, we determined if new crossing and rearing protocols resulted in improved genetic integrity between brood fish and offspring. Samples of 2012 and 2013 production from Governor Tommy Thompson (GTH) and Art Oehmcke (AOH) State fish hatcheries were genetically analyzed at 14 standardized microsatellite loci. Genetic integrity was inferred by testing for allele frequency differences between successive life stages. In 2012, allele frequencies at GTH were similar between brood stock and fry (G-test $p = 0.99$), and brood stock and fingerlings (G-test $p > 0.05$) (for all ponds pooled, and individual ponds). Conversely, allele frequencies at AOH differed (G-test $p = 0.02$) between broodstock and fingerlings. However, in 2012, ≥ 95% of all alleles observed in the broodstock, including 34 of 35 rare alleles, were detected in the pooled fingerlings at both hatcheries. If similar results are observed in 2013, improvements in the program's representation of native diversity throughout the rearing process will be evident. Nevertheless, some differences were still observed between subsequent life stages; results that require further efforts to address. Some of these efforts could include a stronger adherence to suggested spawning ratios and improvements in mixing progeny post-hatching.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Comparison of size and short-term survival of age-0 muskellunge reared using two different methods
Co-Author: Justin A. VanDeHey (UWSP), Brian Sloss (USGS, WI Cooperative Fishery Research Unit), Tim D. Simonson (WDNR), and Richard A. Klett (WDNR).

Abstract: Muskellunge (Esox masquinongy) are commonly reared on natural prey in hatcheries. This method is expensive and introduces biosecurity risks. Some states rear muskellunge on pelleted diets; however, studies on pellet versus minnow-reared muskellunge have raised concerns regarding comparative size and subsequent post-stocking survival. Nevertheless, continued biosecurity and fiscal concerns have led the Wisconsin Department of Natural Resources to investigate the use of pellet-rearing with minnow finishing as an alternative approach in muskellunge propagation. Our objectives were to determine if differences in total length, weight, and short-term survival existed between muskellunge reared solely on natural prey (minnow only; MO) and pellet-reared muskellunge with a short minnow finish (50 days; minnow finished; MF). Large fingerling muskellunge (N ≈ 6,000/treatment) were reared, marked, and stocked into 23 lakes throughout Wisconsin. On average, MO fish (306.12 mm and 166.62 g) were larger than MF fish (272.27 mm and 107.33 g) ($tTL = -16.73$, $df = 198$, $p < 0.001$; $tWeight = -17.53$, $df = 198$, $p < 0.001$). Short-term proportional survival was estimated using post-stocking, night-time shoreline electrofishing in which 59% of total captured muskellunge were MO fish (41% MF). Of the total 5,552 MO stocked fish 7.2% were captured (n=398) and of the total 5,328 MF stocked fish 5.2% were captured (n=278). Individual lakes exhibited a larger proportion of MO fish (average=10% of total stocked MO) captured than MF fish (average 7.3% of total stocked MF). Differences between MO and MF fish will be examined and discussed in relation to their likely influence on long-term survival and recruitment of stocked muskellunge. These data are the first preliminary results of a long term (5 years) study of survivorship among these differentially.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Early detection of non-native fishes using fish larvae while restoring native species to Green Bay
Co-Author: Anthony Rieth, Timothy Strakosh

Abstract: Management and restoration efforts have drastically improved the health and productivity of the Great Lakes. However, anthropogenic activities continue to put the ecosystem at risk for invasive species introductions and loss of biodiversity. Aquatic invasive species (AIS) compete with native species for food and habitat, disrupt the food web, impact water quality, and cost millions of dollars in prevention and control. The U.S. Fish & Wildlife Service recently implemented an AIS early detection monitoring program using traditional and non-traditional gear types. As part of the 2014 AIS program, larval fish surveys will be conducted in Green Bay, Lake Michigan. Ichthyoplankton will be collected at nighttime during the spring and summer months via deployment of light traps and bongo net tows. Samples will be analyzed in collaboration with the U.S. Environmental Protection Agency in Cincinnati, Ohio and will be identified using molecular taxonomy. In addition, the survey will target several historical hotspots for native lake herring (Coregonus artedii), or cisco, which may have been extirpated from Green Bay in the 1950's. Historically, lake herring was the most productive fishery in Green Bay but collapsed due to over-fishing, pollution, invasive species introductions, and low dissolved oxygen levels. Ichthyoplankton surveys will hopefully serve as an effective tool in not only detecting new AIS, but also locating potential remnant populations of native fishes.

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Presentation Type: Presentation
Dates: Both Wednesday and Thursday

Title: Predicted effects of angler harvest on largemouth bass abundance in Wisconsin lakes
Co-Author: Daniel Isermann

Abstract: Abundance of largemouth bass Micropterus salmoides has increased in many northern lakes and this trend is likely to continue based on projected changes in climate. The potential for largemouth bass interactions with other game fish such as walleyes Sander vitreus and density-dependent effects on bass growth and size structure are causes for concern among anglers and biologists. In an attempt to reduce largemouth bass abundance, the minimum length limit for bass has been removed from some northern Wisconsin lakes, but low rates of exploitation may prevent significant reductions in abundance. Our objectives are to use age-structured models to determine if angler harvest can be used to reduce largemouth bass abundance and recruitment potential in northern Wisconsin lakes and if length-based harvest regulations can be modified to facilitate these reductions. Initial simulations indicate that high levels of fishing mortality decrease abundance and recruitment potential. Relatively liberal harvest regulations (i.e., no minimum length limit) are more likely to aid in these reductions, although there were greater differences in size structure among the regulations as fishing mortality levels increased.