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**Presentation Type:** Poster

**Dates:** Only Wednesday

**Title:** Fish Consumption and Advisory Awareness among Older Wisconsin Fishermen

**Co-Author:** Henry A. Anderson, Candy Schrank,

**Abstract:** Objectives: The provision of fish consumption advice issued by the Wisconsin Departments of Health Services (DHS) and Natural Resources (DNR) has evolved over the past 40 years. In 2010, DHS received a US EPA Great Lakes Restoration Initiative (GLRI) grant to evaluate existing advisory approaches, identify gaps, and adapt current communication approaches. Methods: Previous research conducted by DHS found that older, male anglers eat more sport-fish and have higher body burdens of persistent contaminants found in fish than other groups. As part of the GLRI, Wisconsin aimed to engage this subpopulation and improve communication by using an internet-based survey to collect information about fishing habits, consumption, and advisory awareness. At the end of the survey, participants were provided with answers to advisory questions and links to relevant on-line information. From fall 2011 through spring 2012, 827 men completed this survey. Results: Nearly all were aware of the existence of consumption advisories. Although awareness was high, penetration of traditional outreach materials was low with fewer than 35% having seen any of the pamphlets featured in the survey. Knowledge of the advisories was significantly higher among residents of counties along Lakes Michigan and Superior and among more frequent sport-fish consumers. Men who were aware of these advisories were significantly more likely to have modified their consumption behavior. Conclusion: Wisconsin's experience suggests general awareness among older male anglers. The response to the online survey may also support the use of interactive web programs as one means to reach and inform this subpopulation.

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**Presentation Type:** Poster  
**Dates:** Both Wednesday and Thursday

**Title:** Status, Distribution, and Threats of Lake Superior Brook Trout  
**Co-Author:** Henry Quinlan

**Abstract:** Brook trout are the only stream dwelling trout native to the upper Midwest and populations have declined dramatically since early settlement; however, the extent, severity, and in some cases, the specific cause of the decline across this range is unknown. Current fishery data along with landscape scale GIS data is being used to model the status and distribution of brook trout at the catchment and subwatershed scales in an effort to complete a range-wide status and distribution map for the United States. Partner agencies have provided recent fisheries data collected throughout the U.S. portion of the Lake Superior basin, and USFWS Ashland FWCO collected additional data during the 2011 and 2012 field seasons. Catchments and subwatersheds with sufficient data have been classified according to brook trout status. Landscape scale metrics will be used to develop a classification tree model to predict brook trout status in areas where fishery data is insufficient. The end product, geo-referenced maps and data will assist biologists, land managers, and other interested parties evaluate and prioritize areas for protection, enhancement, or restoration of brook trout populations and habitat and provide a baseline for monitoring climate change effects on cold-water species.

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**Presentation Type:** Poster  
**Dates:** Both Wednesday and Thursday

**Title:** Concentrations of Mercury and Fatty Acids in Wisconsin Sport Fish: Implications for Consumption Advisories

**Co-Author:** Candy Schrank (WI DNR); Dr. Henry Anderson (WI Dept. of Health Services)

**Abstract:** As part of a continuing effort to provide the public with timely sport fish consumption advice, the Wisconsin Departments of Natural Resources (DNR) and Health Services (DHS) have analyzed fish tissues for a suite of contaminants, including mercury and polychlorinated biphenyls (PCBs), since the 1970s. DHS recently received a grant through the Great Lakes Restoration Initiative for improving fish consumption advisory programs. One aspect of this grant is to examine the concentration of beneficial long-chain polyunsaturated fatty acids ([EPA+DHA]) in commonly eaten fish species. Skin-on fillets were homogenized, subsampled, and analyzed according to Wisconsin's fish contaminant monitoring protocols. We currently have data for 91 samples, comprising 14 sport fish species from 11 waterbodies. Fish length and [EPA+DHA] were log<sub>10</sub> transformed to ensure normality. Overall, [EPA+DHA] was positively correlated with fish length ( $P < 0.01$ ), although the strength of the relationship varied by species. Additionally, some species that were sampled from multiple locations had significant differences in [EPA+DHA] between locations and were treated as separate groups. Using partition analysis (JMP 10), fish were separated into groups based upon [Hg] (see Rasmussen et al. 2007) and [EPA+DHA]. Samples partitioned into three groups: fish with [Hg]  $< 0.23 \mu\text{g/g}$ , fish with [Hg]  $> 0.23 \mu\text{g/g}$  and [EPA+DHA]  $> 1360 \text{ mg/kg}$ , and fish with [Hg]  $> 0.23 \mu\text{g/g}$  and lower [EPA+DHA]. Incorporating fatty acid data into our analysis of commonly-caught sport fish allowed us to more precisely classify species according to their nutritive value. Integration of these data into consumption advisories will give the public more accurate information on the species, frequency, and amount that should be consumed to optimize benefits and minimize risks.

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**Presentation Type:** Poster  
**Dates:** Both Wednesday and Thursday

**Title:** Status and Trends of Wisconsin Musky Tournaments  
**Co-Author:** Jon Hansen

**Abstract:** Muskellunge (*Esox masquinongy*) populations in Wisconsin declined in the early and mid-20th century due to harvest pressure and habitat degradation. In the later decades of the century a catch-and-release ethic developed among muskellunge anglers, which resulted in an improvement of the size and quality of fish in the state. As a result, muskellunge tournament angling has become popular in both the northern and southern parts of Wisconsin. Here we examine fishing tournament data at the statewide level and intensively utilizing two long running muskellunge tournaments to describe the current status of muskellunge tournaments and improvements in the muskellunge fishery. Between 2008-12 over 200 muskellunge tournaments have been held in Wisconsin, and many tournaments date back much farther. Preliminary analyses show the size of muskellunge caught in tournaments has increased. Utilizing long-term alternative datasets, such as tournament records, proves to be a useful way to characterize changes in fish populations over time.

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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 largemouth bass in northern lakes. Our objective was to determine if hatch timing 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 were often weak. Hatch timing also explained significant variation in daily growth rates, with late-hatched fish typically growing faster than those hatching 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, if overwinter survival is length-dependent. Climatic conditions that promote early hatching of largemouth bass or extend growing seasons could increase bass recruitment, resulting in relatively high abundance of adult bass in the future.

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**Title:** Application of Side-scan Sonar technology for benthic habitat analysis in Small Streams

**Co-Author:** Dr. Patrick Forsythe

**Abstract:** Substrate sampling is a common component of habitat analysis for lotic systems. Researchers routinely seek to quantify substrates using techniques that are cumbersome, time-consuming, or site-specific. Additionally, comparisons across studies may become increasingly difficult as methodologies refine and progress through time. In recent years, side-scan sonar use has been developed to facilitate greater area sampled and finer resolution of micro-habitat information for marine systems. However, few studies have tested whether this technology can strengthen the predictive power and conclusions of substrate assemblages at multiple spatial scales within and among small and relatively shallow river systems. We assessed 14.4km of the Sheboygan River's benthic profile using a combination of side-scan sonar and transect work. During a drought year, we scanned 69% of the profile with side-scan sonar while 31% was assessed using transect methodology. We overlapped side-scan sonar and transect techniques for two statistical comparisons using an ANOVA with intensive random sampling. Though accuracy for neither a comprehensive interpretation (65.8%) nor an image sampling transect simulation of sonar imaging (91.7%) were found to be greater than the transect method (95.8%), practice interpreting sonar imaging will undoubtedly alleviate disparities. A comparison of effort for each technique shows that the complete sonar method, including field time and lab interpretation time, produced data at a rate of 70.7 m/person-hours, while the transect method produced data at a rate of 22.2 m/person-hours. Numerous other benefits of side-scan sonar, such as identifying unique or uncommon benthic features (e.g. large woody debris), also exist. Side-scan sonar offers researchers unprecedented ability to conduct benthic habitat assessment in more area faster, cheaper, and in finer resolution, while producing data comparable with previous methods and accuracy.

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**Dates:** Both Wednesday and Thursday

**Title:** Replicating Otolith Ages for Largemouth Bass in Northern Lakes: A Comparison of Scales and Spines  
**Co-Author:** Daniel Isermann

**Abstract:** While there are several methods to estimate age of largemouth bass *Micropterus salmoides*, previous studies have generally demonstrated that otoliths provide the most accurate and precise estimates of age. However, largemouth bass are not routinely sacrificed during standardized sampling in most states and provinces and scales are typically used as a nonlethal means of estimating age. Many evaluations have suggested that scale-based age estimates for largemouth bass may be inaccurate and imprecise. Age estimation using fin spines offers an additional nonlethal alternative to otoliths, but spines have not been thoroughly evaluated for largemouth bass. The primary objective of our study was to determine if anal and dorsal fin spines are better than scales for replicating otolith-based ages of largemouth bass in northern Wisconsin lakes. Additionally, we compared relative precision of ages estimated from the four different structures. This is an ongoing study, but preliminary results indicate that dorsal spines are more precise than scales when compared to otoliths.

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**Presentation Type:** Poster  
**Dates:** Both Wednesday and Thursday

**Title:** Assessment of larval lake sturgeon (*Acipenser fulvescens*) production and drift periodicity on the Menominee River, Wisconsin  
**Co-Author:** Dr. Patrick Forsythe

**Abstract:** Lake sturgeon larvae were sampled below the North American Hydro dam on the Menominee River for the 2012 drift season. Ten drift nets were deployed in approximately the same position and evenly spaced along a 200 meter wide transect, 800 meters downstream from the Menominee Dam, two additional nets were deployed in an elevated position, 0.5 m above the river bottom. A total of 374 lake sturgeon larvae were captured, with two distinctive peaks in larval drift activity observed. A total of 201 lake sturgeon larvae were captured during the first peak of larval drift (5/14-5/18), and 173 lake sturgeon larvae were collected during the second peak (5/27-6/1). The peak of drift each night was consistently between 21:00 and 22:00 hours. Based on water temperature data, the spawning events that contributed to the peaks of larval production occurred on approximately 4/16 and 5/17, respectively. Most larval lake sturgeon larvae were captured in the middle of the stream and near the Wisconsin shore. Both elevated nets were productive, with one capturing the largest number of larvae during 2012, (n=49). There was a statistically significant correlation between average river velocity at each net and the number of lake sturgeon larvae captured, ( $p < 0.05$ ;  $R^2 = 0.424$ ).

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**Dates:** Both Wednesday and Thursday

**Title:** Population Demographics and Dynamics of Common Carp in Lake Koshkonong, Wisconsin

**Co-Author:** Connie Isermann, Kurt Welke, Laura Stremick-Thompson

**Abstract:** Common carp are important ecological drivers in many aquatic ecosystems, but the biological attributes of carp populations remain poorly understood. During January-March 2012, biological information and otoliths were obtained from 243 carp (total length range = 17-32 inches) removed from Lake Koshkonong, Wisconsin. Our goal was to describe the population characteristics of common carp within Lake Koshkonong with a specific focus on describing growth trajectories and recruitment patterns. Estimating age of common carp from sectioned otoliths has been difficult, but our initial results suggest that: 1) common carp collected from Lake Koshkonong were between 3 and 26 years of age; 2) at least some level of recruitment has occurred each year and 3) significant variation exists in the relationship between age and length. The final results of our analyses will be presented, including comparisons of population metrics between male and female common carp.

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**Title:** Size-Selective Exploitation of Bluegills in Lake Archibald, Wisconsin  
**Co-Author:** Cory Wienandt, Michael Donofrio, and Jeremy Zimmerman

**Abstract:** Fishing mortality is size-selective, but the specific nature of this selectivity is often poorly understood for many important recreational fisheries. Bluegills support important, harvest-oriented fisheries across much of their range and harvest within these fisheries is known to be size-selective, but this selectivity has not been well described. A better understanding of angler harvest selectivity would aid in making decisions regarding bluegill harvest regulations. We conducted a preliminary assessment to determine the extent of size-selective exploitation of bluegills occurring within a single Wisconsin lake. During early May 2011, the Wisconsin DNR used Floy® tags to mark 322 bluegills between 6 and 8.3 inches total length (TL) in Archibald Lake, Wisconsin. A creel survey was conducted on the lake and signs located at the boat ramp instructed anglers to contact the Peshtigo DNR office if they harvested a tagged bluegill. By the end of January 2012, 20 tagged bluegill had been reported by anglers or observed by creel clerks, 2 of which had been caught and released, resulting in 18 harvested fish. Size-selective harvest of bluegills was readily apparent. While the tagged sample of bluegills was dominated by fish between 6 and 7 inches TL (61%), most (12 of 18; 67%) bluegills harvested by anglers were  $\geq 7$  inches TL. Further research is needed to accurately determine how exploitation varies in relation to bluegill size and how this selectivity varies in relation to the size structure of bluegills available within a lake or region.

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**Title:** Use of side-scan sonar to assess substrate composition in the littoral zone of Wisconsin lakes.

**Co-Author:** Brian L. Sloss and Daniel A. Isermann, U.S. Geological Survey, Wisconsin Cooperative Fishery Research Unit, College of Natural Resources, University of Wisconsin-Stevens Point

**Abstract:** Evaluation of littoral-zone fish habitat has usually been accomplished using transect-based methods that can be labor intensive. Use of a relatively inexpensive (~\$2500) side scan sonar unit may offer a more efficient means of measuring this habitat. The objective of this study was to determine if side scan sonar can accurately and efficiently measure substrate composition in nearshore littoral zones of Wisconsin lakes compared to a traditional transect-based method. Five lakes in northern Wisconsin ranging from 194 to 656 hectares in size were evaluated. Habitat data for each lake was collected at 100 transects using visual classification; a single pass around each lake was used to capture sonar images. Percent substrate composition (e.g., 20% versus 50% cobble) estimates from the side scan sonar and traditional transect method will be compared at lake level. To assess efficiency, we will compare time required to complete each evaluation method. We hypothesize that substrate composition will be similar between methods on a lake-wide basis and the sonar will offer a more efficient and less costly method for describing substrate composition in the littoral zone.

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**Title:** Evaluating Future Need of the Gull Island Shoal Lake Trout Refuge in Lake Superior  
**Co-Author:** Michael Hansen

**Abstract:** Lake Superior is one of the largest lakes in the world and historically supported one of the largest and most diverse lake trout fisheries in the Laurentian Great Lakes. The Apostle Islands region is unique in Lake Superior, with a diversity of shoals that each supported unique spawning stocks of lake trout. Lake trout stocks collapsed throughout Lake Superior because of excessive fishery exploitation and sea lamprey predation, so stocking and fishery regulations were enacted to support stock restoration. A refuge was established around Gull Island Shoal to enable recovery of the lake trout stock that spawned on this historically important spawning shoal in the Apostle Islands region. Lake trout stocks in the Apostle Islands region of Lake Superior are nearing carrying capacity, so may be able to sustain commercial and recreational fisheries. The purpose of this project is to determine if future lake trout stocks depend on the Gull Island Shoal refuge to remain at sustainable levels. To achieve this we will be constructing an age-structured simulation model to assess the exclusion and inclusion of the refuge, as a harvest management tool, on sustainability. Results of our simulations will be used to guide state-tribal fishery management in determining the future status of the Gull Island Shoal lake trout refuge. We expect to find that the refuge is crucial for sustaining lake trout stocks in the Apostle Islands region.

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**Title:** Modelling the lake-wide sustainability of lake trout stocks in Lake Superior  
**Co-Author:** Dr. Michael Hansen

**Abstract:** Lake trout stocks collapsed in Lake Superior during the 1950s because of over-fishing and sea lamprey predation. Stocks were restored by regulating fisheries, controlling sea lampreys, and stocking hatchery-reared lake trout. At present, fisheries are regulated using fishing quotas in sub-areas of the lake that assume no net difference in emigration and immigration among areas. We developed a stochastic age-structured simulation model to test the efficacy of this assumption (emigration = immigration) in relation to stock sustainability within the management area that lies in Wisconsin waters of the lake. The model was parameterized using estimates of movement from tag-recapture studies, and estimates of age-specific abundance, natural mortality, sea lamprey induced mortality, and fishing mortality from catch-age modeling. Model uncertainty was based on parameter uncertainty and process error associated with estimates of movement, abundance, and mortality. We expect to find that emigration and immigration among stocks will alter sustainability of the sub-population of lake trout residing in Wisconsin waters of the lake. Our findings will be useful for managing the lake trout population in Lake Superior, which has generally been managed as a collection of independent populations, rather than as a meta-population.