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Quantifying the Shoreline Angling Stakeholder Group in a Diverse Urban Fishery

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Fishing has been a vital apect of Wisconsin's rich cultural history dating back to the earliest indigenous communities. A deep fishing heritage continued to grow with the arrival of European settlers through the 19th and 20th centuries and continues today where it provides a means of recreation, a source of sustenance, and supports a multibillion-dollar industry. Specifically, Wisconsin's fisheries are comprised of diverse commercial, recreational, and tribal angling opportunities. This resource supports thousands of jobs and is a vital aspect to local, state, and national economies. Many large municipalities along the Great Lakes, such as Milwaukee, are built near estuaries and harbors which are highly modified aquatic habitats that provide shoreline angling opportunities. The combination of shoreline angling locations near urban areas attracts a community of shoreline anglers that represent diverse racial, socioeconomic, and educational backgrounds. However, lacking organizational representation in policymaking forums, these communities' angling preferences are often overlooked.

A quantitative survey of shoreline anglers was conducted to characterize various subgroups within the shoreline angling community, identify their preferences, motivations, and sources of information, and the preferred mechanisms to solicit input from these stakeholders. A companion policy analysis was also conducted to determine if and how the perspectives of shoreline anglers are incorporated into policy decisions. We hypothesized that due to the lack of organizational representation in policymaking fora, shoreline anglers' interests and perspectives are not adequately incorporated into fisheries policy decisions. Through this investigation, we found that 34.4% of shoreline angler respondents are non-white, 59.7% hold a high school diploma or less, and 44.8% fall below the median household income for Milwaukee County. From this study, we gained a better understanding of shoreline angling communities, their characteristics, perspectives and interests in fisheries management, and to recommend effective policy communication best practices that allow for more diverse, equitable, and inclusive policymaking processes. This study provides a case study and model for natural resource management agencies to better characterize and incorporate underrepresented stakeholder groups in policy decisions.

Poster Presentation, Student

Smallmouth Bass Diet Analysis in a Warmwater Central Wisconsin Stream Using the Aquatic Community Assemblage

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Kayla Reed and Blake Raymer

Smallmouth bass Micropterus dolomieu (SMB) are an important opportunistic top predator and highly sought after gamefish in a variety of warm and cool water systems. The number of suitable SMB streams is expected to increase as water temperatures rise with climate change; however, limited information exists regarding important SMB diet items in smaller streams. Our objectives were to determine if certain prey were more common in SMB diets, if prey differed based on SMB total length, and if SMB showed prey selectivity. In fall 2022 and 2023, we sampled the Pigeon River in central Wisconsin. We used backpack electrofishing to sample all fish species at two distinct sites, totaling 1,400 yards each year. All fish (n = 1,229) were identified and measured for total length. If SMB were >130 mm, a gastric lavage was conducted (n = 103). Macroinvertebrates were collected with kick nets to obtain a representative sample at each site based on available habitats. We calculated an Index of Relative Importance (IRI) and a reduced IRI (rIRI), along with making community comparisons. Results indicate that crayfish, fish (including remnants), and insects all occur with high frequency in SMB diets. However, based on the IRI and rIRI, SMB <200 mm feed heavily on aquatic insects, specifically ephemeropterans and trichopterans, while SMB >200 mm feed heavily on crayfish. When comparing macroinvertebrate diet items to the community assemblage, SMB selected for ephemeropterans, hemipterans, and trichopterans. When comparing piscivorous diet items to the community assemblage, a larger sample size appears necessary as all species found in diets were selected for (n = 11 individuals). Our results contribute to baseline data on SMB in small streams including important diet items and available prey, aiding in future management as small streams respond to climate change impacts.

Poster Presentation, Student

Evaluating Lake Sturgeon Population Dynamics in the Black River

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Zach Woiak, Eric Kramer

The Black River is a large tributary to the Mississippi River that is free flowing downstream from the dam in Black River Falls, Wisconsin to the mouth in Lake Onalaska. Rising Lake Sturgeon abundance in the lower Black River has caused WDNR to increase sampling efforts to better understand the population. Discovering unique migratory patterns and investigating the growth and genetic diversity across age classes is essential for fisheries management. The Black River Falls Fish Management Team began tagging Lake Sturgeon in 2014 using PIT and floy tags and have recently expanded to acoustic tags in 2022. Recaptures in subsequent surveys are allowing us to understand growth of juvenile and mature fish and ponder the longevity of this prehistoric long-lived species. Movement data supports a connection between the Black River and other Mississippi River tributaries. The Black River's rocky substrate and low baseflows often complicate sampling efforts when using traditional gear. Hook and line surveys have been found to be the most effective survey method for all age classes of fish throughout the open water season. Genetic material has been taken from all individuals since 2022 to determine sex. Pectoral fin rays from fish less than 34" were removed for age estimation. Our results suggest a growing population with multiple year classes present in the population. There currently is not an open season for Lake Sturgeon on the Black River. Further inquiry may result in expanded fishing or harvest opportunities.

Poster Presentation, Professional

Aquatic Invasive Species Early Detection and Monitoring Program - 2023 Season Overview

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The Great Lakes are under continual pressure from aquatic invasive species (AIS) threatening native communities. Invasive species are known to cause cascading impacts on ecosystems that can be detrimental to native biological communities, recreation, commerce, and infrastructure. Given the importance of the Great Lakes basin and its resources, it is imperative that new nonnative species introductions are detected early so management agencies can assess and respond accordingly. The Green Bay Fish and Wildlife Conservation Office (FWCO) AIS Program conducts annual early detection and monitoring surveys throughout the near-shore zones and tributaries of Lake Michigan in locations with high invasion potential. Monitoring efforts focus on detecting known and novel invasive species. Early detection efforts are allocated between environmental DNA water samples, traditional fisheries gear surveys, and macroinvertebrate colonization rock bags. This poster provides an overview of the Green Bay FWCO AIS Program's effort and catch for the 2023 season.

Poster Presentation, Professional

Comparing population control strategies for invasive bigheaded carp species (Hypophthalmichthys spp.) in the upper Mississippi River with MetaIPM models

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Invasive bigheaded carp (Bighead Carp [Hypophthalmichthys nobilis] and Silver Carp [Hypophthalmichthys molitrix]) were introduced to the Illinois River in 1973 by a commercial fish producer, and by 1975 they had made their way into the lower Mississippi River. By 1981, bigheaded carp were documented in the Upper Mississippi River Basin. Bigheaded carp not only outcompete native species in the Mississippi River, but they can also alter the environment around them further inhibiting the life histories of native species. Silver carp specifically are hazardous in the Mississippi because they jump out of the water and can hit boaters. The management goal for bigheaded carp is to limit their spread throughout the upper pools of the Mississippi River. Our work has employed the SEICarP (Spatially Explicit Invasive Carp Population) model to achieve this goal. The SEICarP model tests different management strategies, such as deterrents on the lock and dams, and commercial fishing removal in specified pools for controlling bigheaded carp populations. Results from our work showed that a combination of commercial removal efforts and deterrent efforts was most effective for decreasing bigheaded carp population in the Mississippi River.

Poster Presentation, Student

Use of Game Cameras and Drone Imagery to Document How Beaver Dams Affect Salmonid Navigation of a South Shore Lake Superior Tributary

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Non-native salmonids uphold important commercial and recreational fisheries in Lake Superior. Coho Salmon Oncorhynchus kisutch and Steelhead Trout Oncorhynchus mykiss navigation of tributaries is vital for accessing spawning habitat to sustain wild salmonid fisheries in Wisconsin waters of Lake Superior. Our goal was to determine if beaver dams impeded access to potential spawning habitat in south shore Lake Superior tributaries. We used drone technology to locate and obtain aerial images of beaver dams on the East Fork of the Flag River in Bayfield County. In September 2022, we located a series of beaver dams with the potential to block salmonid migration. We used game cameras through autumn and winter 2022-23 to see if we could observe salmonids attempting to jump over the beaver dams. In September 2023, we used backpack electrofishing surveys to document the presence or absence of young-of-year Coho Salmon and Steelhead Trout downstream and upstream of the beaver dams. The presence of YOY fish upstream of the beaver dams would be evidence that adult spawners navigated past the dams. Aerial imaging showed the dams to be breached during the spring snowmelt in March 2023, and images taken in September 2023 showed the dams had been rebuilt. Although there was a plunge pool below the lower beaver dam, our game cameras did not detect any salmonid spawners attempting to jump over the dam. However, we captured images of multiple wildlife species using the beaver dams throughout the winter. Surveys of YOY fish in 2023 showed Coho Salmon present downstream and absent upstream of the beaver dams, whereas Steelhead Trout were present both downstream and upstream of the dams. We concluded that the beaver dams appeared to block the 2022 autumn spawning run of Coho Salmon, but Steelhead Trout appeared to navigate past the breached dams during their spring 2023 spawning run.

Poster Presentation, Professional

Maximizing Detection Efficiency in Juvenile Lake Sturgeon: Insights from Tag Size and Antenna Length Variations

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Patrick Forsythe

Lake sturgeon restoration has been at the forefront for managers internationally across the Great Lakes region. Over the past decade, researchers have focused efforts on evaluating lake sturgeon physiology and behavior to develop or enhance passage at man-made barriers. Our research represents the next stage of a series of projects aimed at investigating the potential of passage technologies in promoting the recovery of lake sturgeon populations in the Great Lakes, with a specific focus on the Menominee River. In addressing our research objectives concerning the downstream movement of juvenile lake sturgeon, extensive PIT equipment testing became imperative to gauge its efficacy in the Menominee River setting. We conducted trials involving three PIT tags (Biomark Mini HPT8, Biomark HPT9, Biomark APT12) in conjunction with varying lengths of litz cord antenna (30, 40, 60 feet). Controlled releases of tagged juvenile lake sturgeon were executed, providing species-specific detection rates in a typical river environment for each tag and antenna combination. Moreover, we employed drones—floating devices suspending PIT tags at one of four different heights tested—to assess detection probabilities across a spectrum of river environments, encompassing both natural and artificially impacted settings. Preliminary data analysis has revealed patterns in the detection of juvenile lake sturgeon. Notably, higher detection rates were observed in configurations employing larger tag sizes coupled with shorter antenna lengths, exhibiting a trend where detection probabilities declined with increasing antenna length or diminishing tag size (e.g., APT12/30' > Mini HPT 8/60'). Furthermore, our findings indicate a correlation between environmental degradation—specifically, excessive ferrous material —and decreased detection rates. The insight from these findings underscore the influence of different factors on the efficacy of PIT detections in juvenile lake sturgeon.

Poster Presentation, Student

Point-of-Use Detection for Prevention and Control of Invasive Species

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Native biodiversity in aquatic systems helps maintain ecosystem services and integrity. Unfortunately, aquatic invasive species (AIS) invade and significantly alter ecosystems. Prevention of new invasive species often hinges on their early detection and quick removal. AIS can be especially difficult to detect without extensive sampling due to habitat complexity and low initial abundances. Point-of-use biomolecule detection methods provide a possible solution given their ability to generate near real-time identification of DNA or other biological materials. Currently, the most common method is loop mediated isothermal amplification (LAMP) which provides a user-friendly approach for environmental (e)DNA detection and has found applications in detecting invasive species such as zebra mussels (Dreissena polymorpha). Further development of point-of-use methods could lead to shorter diagnostic times and reduced equipment needs. A new generation of methods such as lateral flow strips and CRISPR-based detection have recently been applied in medical settings as point-of-care diagnostics, such as for COVID-19. These methods are beginning to transition into lab-based detection for invasive species, with field-based applications forthcoming. These tests require little machinery and can give a diagnostic result within 20 minutes. We will present preliminary results pertaining to our development of biomolecule detection for the invasive red swamp crayfish (Procambarus clarkii) approaches that will enable efficient screening of known introduction pathways, such as the pet trade. Red swamp crayfish are not established in Wisconsin, but propagule pressure could lead to a population emerging. Once completed, our developed approaches could be implemented to detect, and possibly prevent, biological invasions through rapid field-based monitoring in Wisconsin and the Midwest.

Poster Presentation, Student

Yearling Muskellunge Survival in Green Bay in Relation to Length at Stocking and Stocking Location

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Daniel Isermann, Daniel Dembkowski, Jason Breeggemann

Muskellunge (Esox masquinongy) support a world class fishery in Green Bay that remains reliant on stocking of both fingerling and yearling fish. Yearlings require more investment from a propagation standpoint but provide higher survival. However, size of yearlings at time of stocking can vary substantially among and within stocked cohorts and this variation could influence survival. Furthermore, yearling muskellunge are stocked at multiple locations in Green Bay and its tributaries, which could also influence stocking survival, as certain areas may offer more favorable habitat and resources than others. We used data from yearling muskellunge tagged with passive integrated transponders (PITs) before they were stocked to determine if length at stocking and stocking location were associated with the probability of eventual recovery or detection of these PIT-tagged fish (e.g., survival). A total of 4,950 yearling muskellunge with PITs were stocked into Green Bay and tributaries and 177 of these fish were recovered or detected in subsequent sampling efforts. Logistic regression indicated the probability of recovery was related to both length at stocking and stocking location. Additional research could help identify optimal stocking lengths and locations to maximize survival rates of stocked muskellunge in Green Bay. These analyses may need to consider potential increases in costs associated with producing relatively large yearling muskellunge.

Poster Presentation, Student

Chinook salmon have a greater negative physiological response to sea lamprey attacks than lake trout in Lake Michigan

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The United States and Canada have devoted substantial effort and funds to control sea lamprey Petromyzon marinus abundance and estimate their impacts on salmonid hosts that contribute to a fishery annually worth nearly $7 billion USD. Lake trout Salvelinus namaycush are considered the primary host for sea lamprey, however previous studies have found that Chinook salmon Oncorhynchus tshawytscha are also potential hosts. Since 2012, the US Fish and Wildlife Service's Great Lakes Fish Tagging and Recovery Lab has annually surveyed angler-caught salmon and trout at approximately 40 port cities around Lake Michigan and US waters of Lake Huron from April through September. We observed that Chinook salmon had a lower proportion of healed marks relative to fresh marks compared to lake trout in lakes Michigan and Huron from 2012 – 2018, which may indicate differences in post-attack survival among lamprey host species. To investigate this hypothesis, we evaluated the physiological response of host fish to lamprey attacks in Lake Michigan. We found that relative body condition (Kn) and the percent dry weight of muscle tissue (% DWM, a proxy for energy reserves) were lower in fish with wounds than in non-wounded fish for both host species. Both Kn and %DWM were more severely affected in wounded Chinook salmon than wounded lake trout relative to non-wounded control groups, consistent with the hypothesis that Chinook salmon may experience greater negative physiological consequences post-attack. Our findings also demonstrate that physiological effects of sea lamprey attacks persist long enough to be detected on host animals in the wild, complementing prior laboratory studies. Accounting for alternate hosts and varying levels of effects on host species could inform fisheries management and improve damage assessments of the sea lamprey control program.

Poster Presentation, Professional

Structured Decision-Making to Support the Management of Plains Topminnow (Fundulus sciadicus) in Nebraska

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Decision-making in conservation planning requires recognition of diverse ecological, social, and political perspectives and the economics of management strategies. Decision makers must select from diverse management actions with uncertain outcomes by weighing the projected biological response and implementation costs against associated doubt. Structured decision-making (SDM) and Bayesian decision networks (BDN) have increasingly been used as decision support tools that managers can use to inform best actions while embracing uncertainty. Through SDM, stakeholder expertise and beliefs are expressed for transparent to identify important ecological and population processes and possible management alternatives most likely to achieve the desires of agencies and stakeholders. Their beliefs and the best available science are incorporated into a BDN model to rank management actions to best allocate limited resources by informed decisions. The Nebraska Games and Parks Commission (NGPC) recognized SDM was needed for the Plains Topminnow (PTM, Fundulus sciadicus), a prioritized species for management lacking an organized management plan in Nebraska. PTM has seen ~70% decline in presence in Nebraska that has been attributed to changes in stream flow, habitat degradation, stream fragmentation, introduced fishes, and climate change. A stakeholder group of 10 total staff from the NGPC fisheries, wildlife, heritage, and planning and programming divisions have provided input through the SDM and BDN modeling processes intending to reverse declines and maintain PTM in Nebraska. A spatially tiered BDN was constructed with the fundamental objective of PTM persistence in a stream reach (i.e., 100-300 m), watershed (i.e., HUC10), and statewide. Through this approach, a standardized, non-regulatory management plan can be used to conserve PTM in Nebraska.

Poster Presentation, Student

Water Quality Mapping Across the Upper Manistee Watershed to Support Arctic Grayling Reintroduction

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Pieter deHart

Arctic Grayling (Thymallus arcticus), the only native salmonid of Michigan's Lower Peninsula, was extirpated from the state by the 1930s, following extensive habitat loss and overfishing, as well as competition and predation via introduced trout species. Today a renewed effort to restore these fish to their native waters focuses on using remote-site incubators (RSIs) to reduce the potential stress of predation and increase the likelihood of adults returning to natal streams. However, identifying the best locations for RSIs and for the fish requires a longitudinal habitat assessment along the waters of interest for reintroduction. My project focuses on using spatial data to identify habitat "hotspots" in the Upper Manistee watershed across different life stages using habitat suitability models, with metrics of interest including substrate type, large woody debris amount, water depth, water velocity, and potentially most important, water quality.

To assess water quality, I collected data on temperature, dissolved oxygen, turbidity, and pH in 1-sec intervals. I then calculated the groundwater contribution index (GWCI), which is a measure of how much of a cubic meter of water is derived from groundwater sources and can be key for maintaining cool to cold-water habitats as stream temperatures increase. I derived suitability ranges of these water quality metrics for T. arcticus through a literature review to create a composite score (0-15) for each location. Initial findings indicate a wide expanse of high-quality water (scores > 11) with some areas to avoid for reintroduction (scores < 10), including the lower section of the North Branch Manistee River and Goose Creek. At the HUC-12 scale, average differences in water quality were minimal (range=11.5-12.1). These findings broadly suggest that high quality water for T. arcticus is abundant in the Upper Manistee, but certain locations may prove stressful for the species and should be avoided as reintroduction locations.

Poster Presentation, Student

Evaluation of Passage Utilization by Juvenile Lake Sturgeon in the Menominee River using Acoustic Telemetry

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Lake sturgeon restoration in the Great Lakes has been a priority for regional managers, emphasizing the understanding of sturgeon physiology and behavior to aid passage at human-made barriers. Our research centers on the Menominee River, a critical tributary to Lake Michigan, where dam construction has disrupted sturgeon migration, blocking access to vital spawning and nursery sites.

Employing acoustic telemetry, we monitor the movement of juvenile sturgeon in relation to the Park Mill and Menominee Dams. In the spring of 2023, we collected larval sturgeon below the Grand Rapids Dam and raised them in a stream-side rearing facility along the Menominee River. After reaching a suitable size, we surgically implanted Innovasea V5 and V7 acoustic tags. Subsequently, releasing 44 tagged fish above the dams, we tracked their movements using 14 Innovasea VR2Ws and conducted weekly active tracking sessions.

Our initial observations reveal swift downstream movements post-release, with some individuals covering over 18 kilometers in just a few days, navigating both dams. Subsequent research will prioritize active acoustic tracking to ascertain specific habitat preferences. In tandem, passive acoustic tracking will assess movement patterns, especially around diverse passage options like spillways and turbines.

Furthermore, our study aims to explore less-explored elements such as the influence of abiotic factors like water level, discharge rates, and temperature on the behavior of juvenile sturgeon regarding passage options. Understanding these variables will be instrumental in tailoring effective strategies for the recovery and preservation of lake sturgeon populations in the Great Lakes.

Poster Presentation, Student

Eurasian Ruffe Monitoring in Northern Green Bay, Lake Michigan

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Dalton Hendricks, Sharon Rayford, Matthew Petasek, Cari-Ann Hayer, and Troy Zorn

Eurasian ruffe (Gymnocephalus cernuus) were first introduced into the Great Lakes in the mid-1980s and have become abundant throughout Lake Superior. Ruffe were first documented in Lake Michigan in 2004 and have established an isolated self-sustaining population in Little Bay de Noc, Michigan, located in northern Green Bay. Long-term sampling, led by Michigan DNR, within Little Bay de Noc began in 2004 and catch rates of ruffe exponentially increased starting in 2017. In 2022, the Green Bay Fish and Wildlife Service Conservation Office implemented a study to monitor ruffe within Little Bay de Noc to better understand the localized population demographics and spatial coverage. Experimental gill nets, fyke nets, and Windermere traps were used at known capture locations to determine the most effective sampling method to capture ruffe. Experimental gillnets were the only gear type to capture individuals and were selected to be the dominant gear type used in future years. In 2023, sampling was expanded to include southern Little Bay de Noc and the west shore of Green Bay near the Ford River mouth. No ruffe were collected outside of previously known locations. Future surveillance will include additional areas in northern Green Bay to more clearly document the population boundaries.

Poster Presentation, Professional

Evaluating Trends in Angler Effort, Catch, and Harvest in the Ceded Territory of Wisconsin, 1990-2023

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Gregory Sass, Stephanie Shaw

Knowledge of angler effort, catch and harvest rates, and relative abundance is important for fisheries management because sole use of fisheries dependent data may mask true population status. Using long-term fisheries dependent data (i.e. creel surveys) in addition to fisheries independent surveys can provide valuable insight into potential hyperstable relationships in recreational fisheries. We used Wisconsin Department of Natural Resources point-intercept creel survey data collected across the Ceded Territory of Wisconsin during 1990 - 2023 to test for long-term trends in species-specific angler effort, catch, and harvest for fish species commonly targeted by recreational anglers. We used Generalized Linear Models to test for changes in mean annual targeted effort (hrs/hectare) and mean annual species-specific catch and harvest rates. Targeted effort towards walleye declined, while catch and harvest rates remained stable over the study period. In general, effort and catch increased for centrarchid species, although harvest varied among species. Trends in targeted effort, catch rates, and harvest rates were variable among muskellunge, northern pike, and yellow perch. Testing for patterns in fisheries dependent data over a long temporal scale is an important first step for assessing angler behavioral responses to fish abundance change because fisheries are variable social-ecological systems.

Poster Presentation, Professional

Gizzard Shad Dorosoma cepedianum movement and overwinter survival in a Missouri River reservoir

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Gizzard Shad Dorosoma cepedianum in South Dakota are at the northern periphery of their native range and serve as an important prey species in the high-profile Walleye Sander vitreus and Smallmouth Bass Micropterus dolomieu fishery in Lake Sharpe, a mainstem Missouri River reservoir. At northern latitudes, Gizzard Shad frequently experience high overwinter mortality, and previous work has suggested Hipple Lake, a backwater embayment narrowly connected to Lake Sharpe, is an important overwinter location for Shad. To further evaluate the importance of this novel habitat on Gizzard Shad overwinter survival, along with gaining knowledge of Shad movement, 40 adult Gizzard Shad (20 in 2014 and 20 in 2015) were implanted with acoustic telemetry tags with a 2-year battery life. Tagged Gizzard Shad were at large in Lake Sharpe from 5 May 2014 through 11 April 2017. Overwinter survival was similar between Hipple Lake and the Main Lake of Lake Sharpe, with winter severity potentially affecting mortality. No clear patterns of desired locations were observed within the reservoir other than inhabiting Hipple Lake in the late fall to early spring months. Gizzard Shad moved considerable distances in the summer and fall months but did not move substantially during the winter and spring months. While Hipple Lake does not appear to considerably affect overwinter survival of Gizzard Shad, the warm-water habitat may still be important for reproduction and recruitment of the species.

Poster Presentation, Student

Buckthorn Control in the White River Fishery Area

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Cris Sand, Nate Thomas, Logan Cutler

Glossy buckthorn (Rhamnus frangula) is an invasive shrub that forms dense canopies and produces allelopathic chemicals, outcompeting many native plants. Buckthorn thickets restrict angler access to streams, act as poor-quality wildlife habitat, and alter native plant communities. The White River Fishery Area (WRFA; Bayfield County, WI) is a popular multi-use outdoor recreation area in which angler access was severely limited by buckthorn growth. The WRFA was established to protect the headwaters of the White River, especially the South Fork of the White River, which support high densities of brook trout (Salvelinus fontinalis) and brown trout (Salmo trutta). The Wisconsin DNR Brule fisheries crew and partners have worked to remove buckthorn from the riparian zone for nearly a decade. Efforts began with manual removal of mature trees followed by treating stumps with Garlon 4 to prevent stump sprouting. In following years, regeneration was controlled by foliar spraying Garlon 3, burning small plants, or hand pulling. Regeneration control was scheduled annually at first, then on a 3-year rotation. To provide long term regeneration control, tree planting and seeding with native vegetation has been an effective method to outcompete buckthorn regeneration. By keeping up with a rigorous treatment plan, we developed and implemented an effective protocol to control buckthorn in treatment areas to increase angler access to the resources on the property, protect in stream habitat improvement investments, promote in stream macrophyte growth, and increase biodiversity in the riparian zone. We plan to continue treatments in previous areas, connect the upstream and downstream treatment areas, and work with foresters and wildlife biologists to remove buckthorn from adjacent upland areas.

Poster Presentation, Professional

Using Random Forest Models to Identify Lake Characteristics that Explain Largemouth Bass (Micropterus salmoides) Growth Variation in WI Lakes

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Colin Dassow, Greg Sass

As Largemouth Bass increases in popularity among anglers in Wisconsin, managers will be required to allocate more time to managing Largemouth Bass fisheries and the research conducted here can provide information on lake characteristics that may explain variation in Largemouth Bass Growth. Largemouth Bass and lake characteristic data from the Wisconsin Department of Natural Resources were used to calculate mean relative weight of age five Largemouth Bass. Relative weight is a measure of the body condition of a fish, good, fat, or thin. A random forest model was fit on the lake characteristics hypothesized to impact fish growth. Based on mean squared error increase from the output of the random forest model, percent of macrophyte species tolerant to varying lake water quality and lake class were the two top variables that explained relative weight at age five. Percent of tolerant macrophyte species had a positive relationship with relative weights at age five meaning, as percent of tolerant macrophyte species increased, relative weights at age five also increased. There were multiple lake types that were included from the data, warm-clear lakes tended to have lower relative weights at age five, likely because of higher relative abundances, while riverine and warm-dark lakes had higher relative weights at age five. Managers can use these findings, the relationships between the two top variables and relative weights at age five, to more effectively manage for a catch rate or trophy fishery.

Poster Presentation, Professional

Angler Response to Brown Trout Fishing Regulations in Two Wisconsin Streams

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Jordan Weeks, Kirk Olson, Matt Mitro

Trout fishing is a socioeconomic staple of outdoor recreation. The Driftless Area of Wisconsin offers renowned stream fisheries for wild Brown Trout Salmo trutta, with exceptionally high densities often exceeding 2,000 trout per kilometer. Anglers have perceived a lack of larger trout in high density streams, and fish survey data have confirmed an overabundance of small trout. Since the 1980s there has been a shift in angler behavior from harvest-oriented fisheries towards catch-and-release fisheries. Fisheries managers would like to encourage more harvest of Brown Trout in some streams to reduce densities and improve growth. Here we present creel and mail survey data to evaluate angler response to changes in angling regulations on two high-density Brown Trout streams in Wisconsin, Timber Coulee Creek (TCC) and Bohemian Valley Creek (BVC). Prior to 2016, TCC was managed as catch-and-release with artificial lures only in the lower half of the stream. In the upper half of TCC and throughout BVC, daily harvest of up to five trout under 12 inches in length was allowed with no gear restriction. In 2016, TCC changed to catch-and-release only with no gear restriction throughout the entire stream, and BVC changed to a daily ten bag limit with no minimum size. We compared angler effort, catch, and harvest before (2008) and after (2016) regulation changes on TCC and between the two streams in 2016. In 2008, despite allowing harvest of trout on a portion of TCC, anglers generally treated TCC as a catch-and-release fishery with very few trout harvested. Although liberalized regulations on BVC attracted some harvest-oriented anglers in 2016, few harvested the daily limit of 10 trout. The catch-and-release fishery on TCC remained popular. Creel and preference survey results suggest a limited utility in regulation changes to elicit more harvest when the prevailing angler attitude tends towards catch-and-release.

Poster Presentation, Professional

Cisco presence/absence and relative abundance not related to Walleye recruitment in Northern Wisconsin lakes

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Walleye Sander vitreus is recreationally, economically, and culturally important in the Upper Midwest, specifically in Northern Wisconsin. Recently, Walleye recruitment and subsequent adult abundances have been declining in some Northern Wisconsin lakes. Declining Walleye recruitment could be related to a variety of factors, one of which is predator-prey interactions. Cisco Coregonus artedi is a dominant pelagic prey species native to many deep-water Walleye lakes in Northern Wisconsin. In our study, we examined relationships between Cisco relative abundance and age-0 and age-1 Walleye relative abundance as a proxy of recruitment. Objectives were to test whether: 1) Walleye recruitment differed between lakes with and without Cisco; and (2) Cisco relative abundance was related to Walleye recruitment in lakes containing Cisco. We used Cisco CPUE (catch per unit effort) and fall age-0 and age-1 Walleye CPUE data collected from Northern Wisconsin lakes during 2011-2014, 2023 to address our objectives. Cisco were collected using vertical gill nets of varying mesh sizes placed in the deepest part of the lakes following stratification (CPUE = Cisco/net night). Fall age-0 and age-1 Walleye relative abundances were estimated via nighttime electrofishing of shorelines when the water temperature ranged from 12.8-18.3°C (CPUE = no. fish/km of shoreline). Mean age-0 Walleye relative abundance was greater in lakes with Cisco, while mean age-1 Walleye relative abundance was higher in lakes without Cisco, although neither comparison was statistically significant. No significant relationships were observed between age-0 or age-1 Walleye relative abundances and Cisco CPUE. Our results suggest that the decline in Walleye recruitment is not related to Cisco and likely due to other factors such as climate change, lake size and shoreline development, and phenological variability, which should be considered for future studies.

Poster Presentation, Student