NORTH CENTRAL DIVISION OF THE AMERICAN FISHERIES SOCIETY
Joint winter business meeting of the Centrarchid, Esocid, and Walleye Technical Committees
Minutes winter business meeting

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Esocid Technical Committee Chair: Keith Koupal Keith.Koupal@nebraska.gov
Centrarchid Technical Committee Chair: Dan Dembkowski, dan.dembkowski@uwsp.edu

2:30 pm, Sunday, January 28, 2018
Hilton: Wright Ballroom A
Milwaukee, WI

1. Call to order at 2:35 pm by Jeff Koch 19 people attending 2 attendees for CTC, 3 attendees for ETC, 14 for WTC

2. Agenda additions and approval. no additions.

3. Approve minutes from 2017 summer meeting
Motion by Jordan Weeks to approve, 2nd Dale Logsdon, Minutes approved

4. Approve minutes from 2017 winter meeting
Motion by Melissa Wuellner, Janice Kerns 2nd, Minutes approved

5. Financial reports Treasurer's Report:
A) provided by Hilary Meyer 2017 WTC

2017 WTC	Description	Expenses	Deposits	Balance
1-Jan				$12,940.41
10-Jan	Sander Award	$100.00		
16-Jun	Plaque	$25.00		
19-Jul	Summer Meeting Catering	$3,627.00		
31-Jul	Summer Meeting registration		$4,525.00	
1-Aug	Summer Meeting supplies	$252.17		
4-Aug	Summer Meeting registration		$120.00	
28-Aug	MNAFS donation		$255.00	
13-Nov	WTC past chair plaque	$25.00		
31-Dec		$4,029.17	$4,900.00	$13,811.24

Approval of financial report. Justin Van Dehey 1st, Melissa Wuellner 2nd, approved

6. **Sander Travel Award**-$200 Sander Travel Award presented to Jason Fischer by Jeff Koch, matched by $200 from the AFS Ohio Chapter, presented by Janice Kerns. Jason gave a brief report on his research.

Jeff Koch (left) presents Jason Fischer (right) with the Sander Travel Award, and a copy of the Walleye Management book published by AFS.

Janice Kerns (right) presents Jason Fischer (left) the Sander Travel Award matching funds from the Ohio Chapter of AFS.

7. Joint meeting of the CTC, ETC, and WTC. July 24-26, 2018 Lakeside Laboratory, Milford, Iowa.
Jonathan Meerbeek (IA DNR), is organizing the meeting.

Rebecca Krogman gave a short description of the lab. There are motel rooms on site about $60/night, as well as group dormitories.

Theme: Dale Logsdon requested suggestions for the summer meeting workshop. Dale suggested a percid workshop to bring in the percid people to the WTC now that they have been included by the NCD in the committee. Steve Gilbert suggested a perch/walleye interactions workshop. Dan Dembkowski suggested percid tagging; Greg Sass suggested a workshop on climate adaptation of walleye. Several people suggested a Broodfish management workshop.
Jeff Koch: We will have the excom get together and discuss a workshop and topics/themes for the summer 2018 meeting.

8. Breakout session of the 3 committees.

9. Old Business WTC
Invitation to percid-related presentations Monday and Tuesday in room 103D
Jeff Koch, said it was too late for an organized symposium for this NCD meeting on walleye, but having Steve Gilbert as an organizer of the meeting resulted in a walleye themed session during the meeting, with 21 oral presentations scheduled for 103 D, and 5 posters in Ballroom C and foyer, with one more oral presentation the last morning in 102C

Operations manual update, maintenance of website
Hilary Meyer mentioned Beth Beard of AFS is contacting all the AFS chapters about maintaining their websites. Rebecca Krogman said the AFS is trying a website template in word press. Hilary Meyer said the NCD the ultimate authority on website issues.

Changes to the Operations Manual: John Bruner suggested adding that the immediate past chair is in charge of supervising the updates to the WTC website. Dale Logsdon said that having the past chair in charge of the website would be beneficial in that this person has a familiarity with the WTC.

Changes to AFS publications, Dan Isermann
Dr. Melissa Wuellner and Dr. Dan Isermann attended the AFS editors' meeting and journal summit in Reno, Nevada. Dan, Mike Hanson, Mike Quist, *et al.* put together a list of issues with the NAJFM; complaints went to each Editor in chief of each journal; Time to publication was an issue; Associate editors should spread out some of the work, to cut delays in publishing. Editor in Chief special issues to be addressed (Melissa Wuellner)
Dan Isermann: themes and suggested scope of each AFS journal were put together for the editor. The transition to Wiley as the publisher from Taylor and Francis is slowing things down for changes made in policy. Dr. Dan Isermann said still receiving complaints about submissions being denied to NAJFM. Dan thinks they might publish more case studies in the NAJFM and Journal of Agriculture which are not focused on impact factor in their articles but more focused on the utility of articles to the readership. Dan suggested we wait and see if there is a change in policy as opposed to starting a new journal.

8. Jeff Koch received 7 State/Provincial reports. They will be posted to the WTC website and included in the meeting minutes.

10. New business

11. Installment of new chair (Dale Logsdon)

- Certificates of appreciation given to past chairs

Jeff Koch (left; past-chair) accepts a certificate of appreciation from Dale Logsdon (Chair).

12. 3:15 pm adjourned meeting

Moved by Jeff Koch 1st, John Bruner 2nd, approved.

State Reports

Illinois

Charlie Roswell, INHS Lake Michigan Biological Station
In 2017 we continued collecting data as part of ongoing research/ monitoring projects, including micromesh gill net surveys that collect yellow perch in nearshore Lake Michigan. On the fishery-dependent side of things, we generate estimates of harvest and directed effort for the yellow perch fishery in Illinois waters of Lake Michigan, and assess harvest composition by collecting and aging anal spines, as well as by photographing the urogenital papillae of harvested perch to generate estimates of harvest sex ratios.
Our monitoring suggests the 2015 year class is stronger than many recent year classes, is persisting (high CPUE in 12, 16, and 19 mm panels of micromesh gill nets and high catch & release rates in the recreational fishery in 2017), and should begin contributing to angler harvest in 2018.
We had an article published in NAJFM that describes a field-based approach using photographs to determine sex of yellow perch; a "training dataset" of >100 photographs is available as a supplement online:
Joshua D. Dub, Charles R. Roswell & Sergiusz Czesny (2017)
Utilizing External Features and a Consensus Field-Based Approach to Determine Sex of Lake Michigan Yellow Perch,
North American Journal of Fisheries Management, 37:5, 1107-1111,
DOI: 10.1080/02755947.2017.1342724

Cory Suski, University of Illinois
A PhD student that I co-advise with Jeff Stein (Michael Louison, cc'd above) is about to embark on a study with yellow perch. Briefly, the study asks questions related to the impact of air exposure during ice fishing impacts fish, and one of the species he'll be using in his study is yellow perch. Again, no data yet, but a perch study nonetheless.

Neil Rude, Southern Illinois University
Southern Illinois University Carbondale is investigating Sauger movement ecology in the lower five navigation pools of the Ohio River using otolith microchemistry as a tool to infer movement. Preliminary results indicate inter-river movement of Sauger during multiple life stages, and large tributaries may contribute recruits to populations in the Ohio River. SIU/IDNR is also collaborating with the Ohio River Fish Management Team on their annual late-fall standardized sauger sampling (electrofishing) at Ohio River dam tailwaters for population monitoring. Furthermore, SIU has used data collected from standardized sampling of the Ohio River along with data from the Kaskaskia River to model the potential effects of different length regulations. Results indicate Sauger stocks in both rivers exhibited fast growth rates and high annual mortality. Yield per recruit modeling indicated that the current 356-mm minimum size limit for Sauger in the Kaskaskia River is sufficient to prevent growth overfishing and likely explains the consistently larger size structure (greater proportion of fish ≥ 356-mm total length) compared to Ohio River fish. Modeling suggested that growth and

recruitment overfishing of Sauger are likely occurring in the Ohio River with the current no minimum length limit based on available exploitation estimates for Sauger in the lower Ohio River. Implementing a 356-mm minimum length limit for Sauger in the lower Ohio River is predicted to prevent growth and recruitment overfishing based on available exploitation rate estimates and would be consistent with the statewide minimum length limit for Sauger in Illinois and minimum length limits on two major tributaries. Based on this research, SIU/IDNR along with the Ohio River Fish Management Team initiated a tailwater tagging study Fall 2017 to determine exploitation and what size individuals are harvested by anglers, and potentially what causes high observed mortality rates (i.e., fishing or natural mortality).

South Dakota

Lake Poinsett Minimum Length Removed

The 15-inch minimum length limit for walleyes was removed on December 4, 2017. The regulation change was made to help correct the predator-prey imbalance at Lake Poinsett. Presently there are three strong year classes of walleyes (predators) and few individuals exceed 15 inches. It is hoped that anglers will reduce the overabundant walleyes allowing the predator-prey relationship to become more balanced. As the predator-prey balance improves, so should walleye growth rates and the average size of walleyes in the lake.

Walleye Broodstock Mortality

Blackwell, B. G., M. J. Ermer, T. M. Kaufman, T. S. Moos, S. J. Kennedy, and R. J. Braun. Submitted. Assessment of Short-Term Mortality of Wild Caught Female Walleye Broodstock. North American Journal of Fisheries Management.

Abstract. Collection of Walleye *Sander vitreus* eggs to meet stocking needs is an essential part of Walleye management for many state and provincial agencies. The stress of capture, holding and gamete stripping from wild broodstock can potentially lead to Walleye mortality. In waters <1,200 hectares, high levels of mortality could alter population size structure impacting angler success, future egg collections and survival of stocked Walleyes. We quantified short-term (i.e., 5 day) mortality of female Walleyes during artificial spawning operations during 2015 to 2017 in four eastern South Dakota natural lakes. A total of 75 female Walleyes were stripped of their eggs and 75 fish were included as control fish. No fish died in 2015, four (17.4%) fish that were stripped of eggs died in 2016 and one (4.0%) stripped of eggs died in 2017. No control fish expired during the 3 years. Bruising was apparent on ovaries of both stripped and control fish. Livers of fish that perished were cream colored, but we could not conclusively say that the cause of death was a result of damage to the liver. Overall short-term mortality was minimal. We believe that if fisheries personnel follow standard Walleye artificial spawning procedures the amount of mortality will be low and should not impact populations of mature female Walleyes.

Age-0 Walleye Overwinter Mortality

Grote, J. D., J. D., M. R. Wuellner, B. G. Blackwell, and D. O. Lucchesi. In press. Evaluation of Potential Overwinter Mortality of Age-0 Walleye and Appropriate Age-1 Sampling Gear. Journal of Fish and Wildlife Management.

Abstract. Potential recruitment of age-0 Walleye *Sander vitreus* to adults is often indexed by the relative abundance of age-0 individuals during their first summer or fall. However, relationships between age-0 and adult Walleye abundance are often weak or non-significant in many waters. Overwinter mortality during the first year of life has been hypothesized as an important limitation to Walleye recruitment in lakes, but limited evidence of such mortality exists, likely due to difficulties in sampling age-1 Walleye during spring. The objectives of this study were to: 1) compare results from nighttime electrofishing to index relative abundance of age-1 Walleyes with relative abundance indices of mini-fyke nets in four eastern South Dakota lakes; 2) determine whether size-selective mortality was occurring in those four lakes; and 3) if size-selective mortality was occurring in these lakes, determine whether that mortality was attributed to body condition. Four natural lakes in eastern South Dakota were sampled over 2 weeks after ice-off in 2013 and 2014. Precision of nighttime electrofishing [Coefficient of Variation (CV) = 216.6] was greater than that estimated for mini-fyke nets (CV = 338.5) across both years. No differences in length-frequency distributions of collected spring age-1 Walleye were detected between the two gears. Age-0 fall relative abundance indices from electrofishing were significantly greater ($P < 0.01$) than spring age-1 nighttime electrofishing indices of relative abundance at three of the four study lakes, indicating that overwinter mortality may occur at a substantial rate during the first year of life for Walleye in these systems. Quantile-quantile regression plots showed evidence of size-selective mortality in three of four lakes sampled. However, body condition of age-0 Walleye appeared to have little to no influence on overwinter mortality. Instead, we suggest that smaller-sized walleye may be more vulnerable to overwinter predation. Collectively, these results provide evidence of previously hypothesized overwinter mortality within the first year for Walleye and indicate possibilities for indexing potential adult recruitment of Walleye just after this critical period.

Yellow Perch Genetics

A. J. Rosburg. 2017. Growth potential and genetic diversity of yellow perch in South Dakota. M.S. Thesis. South Dakota State University. Brookings.

Abstract. Yellow Perch *Perca flavescens* represent a valued sport fish throughout their range and are an important prey species for piscivorous fishes. In South Dakota, two distinct population types of Yellow Perch have been characterized that differ in growth, survival, and recruitment patterns. Fast growth populations exhibit high growth rates, high mortality, low population density, and inconsistent recruitment. In contrast, slow growth populations are characterized by reduced growth rates, low mortality, high population density, and relatively consistent recruitment. The role of genetics in contributing to these population characteristics is currently unknown. To address these questions, I used high-throughput restriction-site associated DNA (RAD) sequencing to scan the Yellow Perch genome for genetic markers associated with population type. A combination of laboratory and field common garden experiments was used to compare relative growth and survival of age-0 Yellow Perch from the two population types.

Eighteen markers that significantly differed between population types were identified through RAD sequencing; however, low allele frequency differences indicated weak support for correlation to the growth differences between populations. The laboratory and common garden experiments showed no significant differences in specific growth rates between fast and slow growth Yellow Perch populations. The results of this study indicate that population attributes are influenced more by biotic and abiotic variables within individual lakes than heritable genetic differences between population types.

Success of stocking Walleye in select bays of a large Missouri River reservoir
[1]Mark Fincel, [1]Robert Hanten, [2]Dan Jost, [2]Jason Jungwirth, [1]Hilary Meyer, [1]Kyle Potter, and [1]MikeJo Smith. Poster presentation at Dakota Chapter of the American Fisheries Society annual meeting.

Abstract. We compared the performance of two differing sizes and stocking densities of Walleyes *Sander vitreus* to natural reproduction in Lake Oahe, South Dakota. Walleye fry were stocked in May 2017 in one bay of lower Lake Oahe. In June, small fingerlings were stocked in select bays of lower Lake Oahe; 3 bays received low abundance stockings (60,000 individuals) and 1 bay received a high abundance stocking (120,000 individuals). All stocked fish were marked using oxytetracycline (OTC). Fall age-0 electrofishing surveys were used to evaluate stocking success through the first summer. Moreover, non-stocked bays in lower and upper Lake Oahe were used as controls to assess natural reproduction in those respective areas. Low catch rates of fall age-0 Walleyes were observed in lower Oahe where no stockings occurred or where Walleye fry were stocked. Slightly higher abundances of fall age-0 Walleyes were observed in bays that received low stockings of small fingerlings. The abundance of fall age-0 Walleye in the site with high small fingerling stockings was comparable to those sites in upper Lake Oahe where high natural reproduction occurs. These results suggest that high density stockings of small fingerling Walleyes can produce fall age-0 abundances similar to those found from natural reproduction in upper Lake Oahe bays. We recommend continued use of high abundance stockings of small fingerlings to bolster Walleye production in select bays of lower Lake Oahe.

WAE research in Lake Sharpe:
In conjunction with SDSU, SDGFP initiated a research project investigating walleye population in Lake Sharpe, SD. In the spring of 2017, over 4,000 walleye were affixed with individually numbered monel jaw tags. The primary objectives of the study will be to estimate walleye abundance, mortality and exploitation as well as model impacts of various harvest regulations within each reservoir. Tagging will take place through 2021. Additionally, the project aims at revealing seasonal movement patterns and habitat use through an acoustic-telemetry component to start in the spring of 2018.

WAE introductions in the Black Hills:
Game, Fish and Parks (GFP) responded to the request from anglers to increase fishing opportunities within the Black Hills Fish Management Area. In particular, Aquatics staff in the Rapid City office had been receiving requests to stock walleye in area lakes. Through a state-wide survey of anglers and public meetings, Aquatics staff came to the

conclusion that there was indeed support from anglers to attempt to establish walleye fisheries in the Black Hills.

After considering all factors, Aquatics staff recommended that Sheridan Lake in Pennington County and Stockade Lake in Custer County were the most suitable lakes. In both cases, there were established prey species and the addition of walleye would have no impact on the current cold-water management strategies of either system. In early October, 14,000 and 9,500 advanced fingerling (~5 “) walleye where stocked into Sheridan and Stockade Lakes, respectively. In an effort to establish fisheries, both lakes will be stocked with walleye for a period of 5 years. Additionally, the lakes fish populations will be sampled yearly to evaluate the effectiveness of the stocking and the status of all fish populations and angler use and harvest surveys will be used to estimate angler satisfaction and harvest of walleye.

WAE research in western SD irrigation reservoirs:
In conjunction with SDSU, SDGFP will initiate a research project investigating walleye populations in the three large irrigation reservoirs in Western South Dakota: Angostura, Belle Fourche and Shadehill this spring. The primary objectives of the study will be to estimate walleye abundance, mortality and exploitation as well as model impacts of various harvest regulations within each reservoir. Additionally, the project aims to estimate the effects of temperature and depth on hooking mortality.

WAE stocking in Lake Lewis and Clark
Due to sustained low abundance, SDGFP will be cooperating with Nebraska game and parks to stock OTC marked walleye into Lewis and Clark Reservoir. Evaluations will be made in the fall to determine stock contribution, distribution through the reservoir and distribution downstream in the Missouri River.

State Report for North Dakota at the 2018 Winter Walleye Technical Committee Meeting.

The walleye population in Devils Lake is doing well. There are many age-classes of walleye in the lake and some of the fish can become quite old, as a 21 year old was sampled in 2013, and we sampled 3, 20 year old walleyes in 2016.
We conducted our Standard Adult Sampling on Devils Lake in July. The overall CPUE of walleye fell a bit to 20 walleye/net-night in our 125’ variegated gill nets. (24 last year) This year’s catch is just a bit below the long-term average of 20.5 walleye/net-night. Walleye size structure was well balanced. The northern pike and white bass catches were both above the long-term average, while the perch catch was below average. Due to lower walleye reproduction the past few years, we stocked walleye in Devils Lake again in 2017. We also completed a creel survey on Devils Lake in 2017. The survey covered the periods of May 15, to August 31, 2016, and also December 15, 2016 through March 31, 2017. During the summer period, there were 622,600 angler hours, and anglers harvested about 335,700 walleye, 48,500 pike, 9,200 white bass, 5,000 yellow perch, and 1,700 black crappie. During the winter period, there were nearly 343,700 angler hours,

and anglers harvested about 24,300 walleye, 11,500 pike, 350 white bass, 112,385 yellow perch, and 6,500 black crappie. Overall, about 463,500 walleye were likely harvested during both survey periods, which equates to about 3.1 walleye harvested per acre. Nonresidents continue to make up a significant proportion of anglers at Devils Lake, as nonresidents made up about 42 percent of open-water anglers and 49 percent of ice-anglers.

The North Dakota Game and Fish Department had worked with the US Fish and Wildlife Service and local angling groups to open up the Lake Alice National Wildlife Refuge to ice fishing. Ice fishing is now allowed on the roughly 15,000-acre lake that supports walleye, pike, perch and white bass. Anglers have definitely taken advantage of this new fishing opportunity over the past few winters. Our creel survey flights occurred over the Lake Alice/Lake Irvine complex over the winter of 2016-2017, and from that we estimated that the two lakes received about 61,000 hours of angler effort, which equates to roughly 3 angler hours/acre.

The Lake Alice and Lake Irvine complex can also produce very good walleye fishing in feeder streams during the springtime in years with high runoff. This type of fishing results in the department getting various requests to implement special regulations, such as a "one-over 20"" limit, to protect spawning walleye. The spring of 2017 brought significant runoff, so we conducted a creel survey at the feeder streams above Lake Alice. The survey ran from April 3rd-23rd. Results estimated that this area received about 17,400 angler hours, and that about 10,200 walleye were harvested. This does represent a significant harvest for a short period, but the 20,000+ acres that probably contributed walleye to these feeder streams means that anglers only harvested about 0.5 walleye per acre. The sex structure of the harvest was about 60% male walleye, and the size structure was composed of about 34% of the fish being over 20" long. If a one-over 20" regulation would have been in place, it may have saved about 11% of the fish from harvest, or about 1,100 fish. Interestingly, about 25% of the fish over 20" were males.

One of our other large lakes, Stump Lake is doing well too. We conducted our Standard Adult Sampling there in late June. The walleye population appears to be doing well, as our catch rate was 20 walleye per net, which is above the long-term average of about 16 walleye per net. The numbers of 10" to 20" walleye were down somewhat from last year, but they are still near their long-term averages. The yellow perch, northern pike, and white bass were all either above or near their long-term averages. We also conducted a creel survey at Stump Lake in conjunction with the Devils Lake creel survey. During the summer period, Stump Lake had about 52,000 angler hours, which is about 3.2 angler hours per acre. Anglers harvested an estimated 14,300 walleye, 8,400 white bass, 500 northern pike, and 300 yellow perch during the summer period. Anglers expended about 80,100 hours fishing during the winter period, which is about 5 angler hours per acre. During the winter period, anglers harvested about 36,200 yellow perch, 5,400 walleye, and 300 northern pike. Between the two survey periods, about 19,800 walleye were harvested, which equates to about 1.2 walleye per acre. Nonresidents made up 22 percent of the summer anglers and 19 percent of the winter anglers.

In the Northeast District of the state, some of our most impressive walleye waters continue to be new fisheries that were formerly duck-marsh type habitats. Some of these waters are also able to produce good numbers of walleye over 24" long.

Across the rest of the state, the good old days of walleye fishing, and fishing in general, continue to be right now. We are still relatively wet and the fish populations have responded very well to the abundance of water. Statewide, there are about 440 waterbodies that are being managed for fishing. This is a great increase from only about 175 managed fisheries in the early 1990's. Since 1997 we have added about 107 new walleye fisheries. State-wide there are currently about 150 waters that have fishable walleye populations and we seem to be able to add a few on to the total each year. Even since 2012, we have added 47 new walleye lakes, although not all of them are providing a fishery yet. About the only place where walleye are not doing so well is the Missouri River system below Lake Sakakawea. This is due to habitat degradation and poor forage production since the flood of 2011. Conditions are improving, but there are still some areas where the walleye populations are still in tough shape, such as in the Garrison Reach where growth and size structure are still poor.

Our department stocked walleye in 145 lakes in 2017, of which 133 lakes received fingerling walleye and 12 were stocked with fry. This year, both of the Federal hatcheries that our Department partners with produced record numbers of walleye fingerlings. Garrison Dam National Fish Hatchery produced 10.5 million fingerlings and Valley City National Fish Hatchery produced just over 3 million fingerlings. Our Department broke its record for walleye fingerlings stocked this year too. The 12.1 million fingerlings stocked by our department this year were generally about 30 days old and were around 1.25" long. We also gave 1.1 million walleye fingerlings to Wyoming. We did stock Devils Lake again in 2017 with about 1,440,000 fingerlings, which equates to about 9.1 fingerlings per acre.

Previous to 2015, zebra mussel veligers were sampled in small numbers periodically in the Red River near the confluence with the Otter Tail River near Wahpeton, ND. However, in 2015 there were large numbers of veligers sampled throughout the North Dakota portion of the Red River. There were also adult zebra mussels discovered for the first time that year as well. Department personnel looked for zebra mussels in the fall of 2015 and were able to document that adults were present in many different locations with suitable attachment substrate, so it is likely that adults were present along the entire North Dakota portion of the Red River. We wanted to visit the same areas over the past two falls to see if the adult population had changed, but higher water levels prevented thorough sampling. In response to the Zebra mussel situation on the Red River, the Department enacted additional ANS regulations in addition to the previous regulations. The new regulations included making sure all drain plugs, etc., are removed during transport, and on the Red River it is now illegal to leave the river with any water, which includes water in bait containers.

Minnesota update to NCD Walleye Technical Committee
January 28, 2018
By Dale Logsdon

Stocking and production:

An evaluation of the response to increased fingerling stocking in 254 lakes beginning in the mid-2000's under our "Accelerated Walleye Program" has been

completed. In general, the increased stocking failed to produce a detectable change in gill-net CPE in the majority of the lakes that were changed and subsequent lake by lake evaluation of recruitment, growth, forage, and predator abundance was used by the Area Managers to determine whether current stocking plans should be retained or changed to levels thought to better maximize sustainable recruitment given observed trends and conditions in the lakes. Following this review, elevated fingerling stocking density will be continued on 70 lakes (28%), continued until additional surveys are completed on 45 lakes (18%), stocking density or frequency will be increased on 10 lakes (4%), stocking density or frequency will be reduced on 85 lakes (33%), stocking will be converted to fry on 36 lakes (14%), and Walleye stocking will be discontinued on eight lakes (3%). The revised average total of FYA stocked into these 254 lakes will be 55,626 lbs/year; a net reduction of 24,852 lbs/year (31%) from the prior average total of 80,484 lbs/year in the 254 where fingerling stocking was increased.

2017 Stocking:

237,077,604 fry
24,380 small fingerlings
1,387,522 large fingerlings
36,425 adults

General:

Discussions are continuing about a possible decrease in state wide bag limit from six to four. Many important Walleye fisheries already have reduced bag limits and some of our more conservation-minded anglers are beginning to advocate for bringing the rest of the state in line with those lakes. We do not have evidence that it would create a widespread reduction in Walleye harvest but feel that it may reduce the seasonal peaks in some or our more popular lakes. The next step in the process will be a survey of all fishing license buyers to determine their acceptance of a reduced bag. We are also reviewing our suite of special regulations (toolbox) to determine which were most effective and under what circumstances they should be applied.

Large Lakes:

Mille Lacs – The no harvest restriction and temporary fishing ban the was in place during the open water season has been relaxed to allow harvest of 1 walleye between 20-22" or greater than 28". Further information about Mille Lacs management can be found at http://www.dnr.state.mn.us/millelacslake/index.html

Leech Lake – Zebra mussel veligers have recently be found in the lake.

Winnibigoshish and Kabetogama Lakes – Water clarity continues to increase making walleyes harder to catch

Midwest presentations:

Gretchen J.A. Hansen, Jordan S. Read, Luke A. Winslow Melissa Treml, Patrick J. Schmalz, Stephen R. Carpenter – Ecosystem Changes and Effects on Walleye Sustainable Harvest in Mille Lacs, Minnesota.

Anthony J. Kennedy, Gary C. Barnard, William P. Brown, Donald L. Pereira – Walleye Management in the Red Lakes, Minnesota: Collapse, Recovery, and Cooperative Management.

Heather Marjamaa, Andrew Hafs, Tony Kennedy – Assessing the Dispersal of Stocked Walleye Fry in a Northern Minnesota Chain of Lakes.

Phillip Oswald, Andrew Hafs, Tony Kennedy, Jake Graham – Assessment of Walleye Reproduction Success in the Tamarac River, MN.

Kirk Olson, Paul Piszczek, Joel Hoffman, Deserae Hendrickson, Terry Margenau – Population Dynamics, Sport and Commercial Harvest and Management of St. Louis River Walleye (1981-2015).

Jeffrey Reed, Bethany Bethke, Michael McInerny, David Staples – A Multi-scale Approach to Identifying and Addressing the Causes of Minnesota's Declining Yellow Perch Populations.

Steve Hauschildt, Andrew W. Hafs – Variability in Spatial Distribution of Larval Yellow Perch in a Northern Lake Ecosystem.

Current research and lab updates:

University of Minnesota – Dr. Paul Venturelli left the U of M for Ball State. U of M is in the process of finding a replacement with a target hiring date of fall 2018.

Bemidji State University – Heather Marjamaa, Phillip Oswald, and Steve Hauschildt are presenting talks (see above) on the walleye and yellow perch research being conducted in Dr. Andrew Hafs lab.

Minnesota State University – Dr. Shannon Fisher left MSU for Minnesota DNR (Populations and Regulations manager). No word as to a replacement fisheries professor.

Loren Miller (MNDNR) – Assessing parentage-based tagging using genetic markers to identify stocked walleyes. Finding high, but imperfect, agreement with OTC marking.

Tim Cross (MNDNR) – Influence of substrate characterization and water movement on spawning habitat. Much of this work was reported in a 2017 UWSP MS Thesis completed by Doug Zentner entitled "Modeling wind, water

movement, and physical habitat on Minnesota lakes and associated influences on Walleye spawning habitat". The findings stress the importance of nearshore water depth and substrates along with water movements tied to wind exposure. Ongoing research is being directed at quantifying wind-wave currents on Minnesota lakes.

Steve Shroyer (MNDNR) – Assessment of fall electrofishing data. Compiling data and developing analysis.

Dale Logsdon (MNDNR) – Impacts of walleye stocking in lakes with walleye egg-take operations. Finding lower than expected wild hatch rates, some density dependent growth effects on YOY walleyes, and a weak but somewhat Ricker-shaped recruitment response to total fry density.

Mike McInerny (MNDNR) – Finding some early data on when a given year's annulus appears on various aging structures from walleye. Based on fish examined from the Carlos State Park fish cleaning station, scale annuli from age 3 and 4 walleye appeared in mid-June, two to three weeks earlier than on otoliths from the same aged fish. Annuli on otoliths of age 3 and 4 appeared about 2-3 weeks before they appeared on otoliths from age 6-8 walleye. I did not take dorsal spines until early July, and annulus appearance times appear similar to those found on otoliths.

Andrew Carlson and Charles Anderson (MNDNR) – Gill-net selectivity and factors affecting catch rates.

Pete Jacobson, Gretchen Hansen, Bethany Bethke, and Tim Cross (MNDNR) – Hindcasting population abundances of Walleye, yellow perch, and other species to the pre-disturbance conditions of the late 1800s in Minnesota lakes. Climate and eutrophication have substantially changed habitat within these lakes and stressor-specific population responses have varied by ecoregion and species. Taxa-specific habitat niche models illustrated that Walleye and yellow perch populations have likely benefited from eutrophication in prairie ecoregion lakes, but climate changes have been detrimental to those species in forested ecoregion lakes.

Gretchen Hansen (MNDNR) – Statistical models to predict Walleye abundance based on spatial factors (e.g., lake size, depth, etc) and temporal factors (e.g., water temperature, abundance of other species, stocking). Also working with several MN DNR staff, plus researchers from Voyageurs National Park and the Natural Resources Research Institute at UMD to develop a proposal to examine the effects of zebra mussel and spiny water flea invasion on Walleye production in Minnesota's large lakes.

Jeff Reed (MNDNR) – Multi-year, multi-lake evaluation of small fingerling stocking recently published in North American Journal of Fisheries Management.

Iowa WTC Report, January 2018

Projects:

1) **We are in the process of updating Iowa's WAE Management Plan**

2) **Update of the 3rd edition, UMRCC Fisheries Compendium**

Contact: Scott Gritters, (563) 927-3276, scott.gritters@dnr.iowa.gov

The Compendium is a compilation of peer-reviewed and agency white papers on Upper Mississippi River fish life histories. Percid species include Yellow Perch, Sauger, and Walleye. Compendia were published in 1967, 1979, and 2004. The 4th edition will hopefully be published in 2018.

3) **Evaluation of Interior River Fingerling Walleye Stocking Strategies**

Contact: Greg Gelwicks, (563) 927-3276, gregory.gelwicks@dnr.iowa.gov

Walleye fingerling stocking has greatly increased Iowa's interior river walleye populations over the last 20 years. This has resulted in an increasingly popular fishery that has brought walleye fishing opportunities close to home for many Iowa anglers. The success of this program has also increased demand for two inch long, Mississippi River strain walleye fingerlings. Limited hatchery capacity has made it difficult to consistently produce enough fingerlings of the size and genetic strain requested for the program. Providing information needed to more efficiently utilize our limited hatchery production capacity and exploring the potential of alternative fish culture systems in meeting the demands of the river walleye program is the focus of this study.

Available pond culture space has been a limiting factor for producing Mississippi River strain fingerling walleye to stock in interior rivers. Recent research at the Rathbun Fish Culture Research Facility has shown promising results raising walleye fingerlings using an alternative method, intensive fry culture. Intensively reared walleye fry are stocked into recirculating tanks and trained on formulated feed from day 1 post-hatch, instead of stocking them into ponds where they feed on zooplankton (extensive culture). Evaluating the relative contribution of intensively reared fingerlings to interior river walleye fisheries will determine whether this production method could help further improve river walleye fisheries.

Study sites were selected on four Iowa rivers to evaluate the relative contribution of intensively reared walleye fingerlings to interior river Walleye populations. Extensively reared fingerlings were marked, hauled, and stocked alongside intensively reared fingerlings to serve as a control. Walleye fingerlings produced by this culture method are known to survive and contribute to river walleye fisheries if river conditions are favorable. Intensively cultured walleye fingerlings were marked with a circle freeze brand and extensively cultured fish were marked with a bar brand. Between 44,000 and 57,500 marked intensively and extensively cultured walleye fingerlings were stocked annually in the Wapsipinicon, Maquoketa, and Cedar rivers during June 2015-2017, and in the Shell Rock River in June 2016. Study sites were sampled in late-September and October each year to determine survival and growth of walleye fingerlings. Preliminary results indicate that intensively reared fingerlings contribute to interior river walleye populations at a lower rate than extensively reared fingerlings. Intensively reared fingerlings have accounted for 20% or less

of branded young-of-year fish sampled during fall at most sites during most years. River conditions were not conducive to survival of walleye fingerlings raised by either culture method in some rivers each year. We will continue to mark and stock walleye fingerlings raised by each culture method and monitor their survival and growth. The resulting information will guide production and stocking decisions for walleye fingerlings that will provide the greatest benefits for sustaining and improving walleye fisheries in Iowa rivers.

4) Rathbun Walleye Barrier

Contact: Mark Flammang, (641) 647-2406, mark.flammang@dnr.iowa.gov

This project remains in the planning stages but is to be co-funded funded by the USACE. Previous research tested sound, light, bubble barriers and electric barriers. The electric barrier was up to 90% efficient, whereas combinations of sound, light, and bubbles only reduced escapement by approximately 50% in a simulated reservoir. Weber et al. (2013) evaluated the impacts of increased flows on walleye emigration at Rathbun Lake, and found walleye escapement probability increased exponentially with daily discharge and doubled as discharge increased from 40 – 60 m^3/s. Couple that with the new Rathbun Lake Regulation Manual which will potentially increase flows by 300%, and we realize, in order to sustain this population, we must come up with a technological solution.

Weber, M.J., M. Flammang, and R. Schultz. 2013. Estimating and evaluating mechanisms related to Walleye escapement from Rathbun Lake, Iowa. North American Journal of Fisheries Management 33:642-651.

5) Walleye PIT tag retention

Contact: Mark Flammang, (641) 647-2406, mark.flammang@dnr.iowa.gov

Fisheries management requires understanding processes regulating populations, including recruitment, growth, mortality, emigration, and immigration. Tagging provides one of the best methods to address these questions and passive integrated transponder (PIT) tags represent one of the newest technologies. PIT tags generally have high retention rates and minimal effects on fish growth and survival. Multiple PIT tag sizes are available; however, little is known regarding the effects of tag size on fish tag retention, growth, or survival. Weber and Flammang (2017) evaluated the effects of three PIT tag sizes (12, 23, and 32 mm) and two implantation sites (dorsal muscle and body cavity) on tag retention, growth and survival of age-0 Walleye and Muskellunge. Fish (210 individuals per species per year) were randomly assigned to one of six treatments or a control during 2014 and 2015 and held for 112 d. Walleye survival was lower in 2014 (87%) versus 2015 (>99%) but did not vary among implantation sites or tag sizes whereas Muskellunge survival was 100% during both years. Tag retention was nearly 100% in Walleye over 112 d regardless of tagging site or tag size. Tag retention in Muskellunge was lower during 2014 (65%) compared to 2015 (93%) and lower in the body cavity (63%) compared to the dorsal muscle (87%), but similar among tag sizes. Walleye and Muskellunge grew little overwinter and growth was generally similar among implantation sites and tag sizes. Combined, our results indicate that PIT tags >12 mm can be

successfully used in Walleye and Muskellunge and will likely increase tag detection rates of these species, particularly in studies that use stationary PIT tag antennas.

Weber, M.J., M. Flammang. 2017. Effects of Passive Integrated Transponder Tag Size and Implantation Site on Age-0 Walleye and Muskellunge Tag Retention, Growth, and Survival. North American Journal of Fisheries Management 37:480-488.

6) Population dynamics of adult Walleyes in Iowa's large natural lakes

OBJECTIVE

By the year 2020, estimate the abundance, growth, mortality, harvest, and exploitation of adult Walleye in Spirit Lake, East and West Okoboji lakes, Clear Lake, and Storm Lake.

In 2007, a 17-22 inch protected slot limit (daily creel limit of 3 fish, with no more than one Walleye > 22 inches) was initiated on Spirit, East and West Okoboji, and Storm lakes. This slot was designed to increase densities of broodstock fish and to allow harvest of smaller slow-growing Walleye. A 14-inch Walleye minimum (daily creel limit of 3 fish, with no more than one Walleye > 22 inches) continued on Clear Lake. In FY2017, Walleye population dynamics and harvest data were collected to monitor the adult Walleye populations and evaluate effects of harvest regulations.

Walleye Population Dynamics

Adult Walleye were collected during spring with gillnets and all fish were held for spawning, measured, examined for previous marks, and then individually marked with an individually-numbered Visual Implant tag or Visual Elastomer tag from 1990 through 2014 and with a Passive Integrated Transponder tag from 2015-2017. The Jolly-Seber open population model was used to estimate Walleye abundance, catchability, survival, and recruitment from recaptured Walleye. Additionally, the first two dorsal spines were removed from Walleye collected from Spirit Lake and the Okoboji lakes as a secondary mark and a subsample of these structures were used for age estimation and growth analysis (622 in 2016). In most years, broodstock densities in these lakes were below management objectives (2.0 adult fish per acre); however, since the establishment of the protected slot limit, these objectives have been more consistently met in Spirit Lake (Figure 1). Walleye broodstock density objectives were met occasionally in Clear Lake and Storm Lake; whereas, in the Okoboji lakes, these objectives have never been met (Figure 1). In 2016, Walleye broodstock densities decreased in all lakes except Storm Lake (Figure 1). Recruitment, catchability, and annual survival varied considerably in all lakes from 1990 to 2016 (Table 1). On average, it took 4-5 years for Walleye to recruit into the broodstock population. A typical male in Spirit Lake and Okoboji lakes would reach a maximum length of nearly 22 inches, whereas, a typical female Walleye would exceed 27 inches (Table 2).

Walleye Harvest and Pressure Estimates

Open water fishing pressure (May to October; angler hours per acre) for Spirit Lake in 2016 (15.9 h/acer) was similar to that of 2015 (15.2 h/acre) and remained below average (Figure 2). Anglers harvested 3,103 Walleyes weighing 3,819 lbs. in 2016, which was the highest observed since 2012 (Figure 3). Anglers harvested 26.5% of Walleye measuring less than 14 inches during the 2016 fishing season; 16.5% of all fish released were

between 17 and 22 inches (Figure 4). An estimated 25.1% of walleyes caught over 22 inches were harvested. Walleye released over 22 inches made up 2.7% of the total number of released fish.

An expandable creel survey was conducted on Clear Lake from January through October, 2016. During the open water season, 36,035 anglers expended 108,373 hours fishing (Figure 2; 29.4 h/acre). Walleye harvest in 2015 (4,999) decreased substantially from the previous year (9,741). The mean total length of harvested Walleye during open water was 16.0 inches.

Table 1. Annual catchability (p), survival (S), abundance (N), and recruitment (B) of broodstock Walleyes (≥ 17 in TL) in Spirit Lake, Okoboji Lakes, Clear Lake, and Storm Lake.

	Spirit Lake				Okoboji Lakes				Clear Lake				Storm Lake			
Year	p	S	N	B	p	S	N	B	p	S	N	B	p	S	N	B
1990		91.2%				60.8%										
1991	0.15	45.4%	2,438	2,419	0.20	62.9%	2,519	799								
1992	0.22	77.2%	3,526	861	0.20	59.3%	2,384	614								
1993	0.11	84.8%	3,581	1,726	0.17	73.2%	2,028	1,684								
1994	0.18	49.5%	4,764	263	0.21	79.1%	3,168	1,224								
1995	0.19	61.1%	2,622	1,682	0.18	71.2%	3,729	2,227		50.4%				136.2%		
1996	0.20	96.6%	3,283	5,178	0.16	57.4%	4,880	147	0.12	48.4%	5,079	0	0.03	5.8%		-667
1997	0.12	47.4%	8,349	-102	0.15	53.3%	2,946	822	0.32	66.1%	2,041	203	0.18	59.7%	3,870	7,042
1998	0.17	76.5%	3,853	4,266	0.27	72.6%	2,393	1,598	0.31	65.3%	1,552	506	0.11	57.3%	9,352	9,555
1999	0.18	82.2%	7,214	-200	0.16	76.1%	3,334	1,988	0.34	53.1%	1,519	1,216	0.08	46.3%	14,913	8,408
2000	0.11	47.2%	5,728	1,939	0.12	61.9%	4,525	483	0.32	100.0%	2,023	6,894	0.06	21.8%	15,307	2,076
2001	0.10	62.1%	4,641	4,524	0.09	51.0%	3,285	4,580	0.17	60.0%	8,997	272	0.19	24.0%	5,381	2,654
2002	0.13	77.9%	7,406	269	0.07	55.7%	6,254	-1,843	0.26	47.0%	5,668	966	0.31		3,942	
2003	0.09	70.3%	6,036	-233	0.10	59.6%	1,641	758	0.17	75.9%	3,627	3,043				
2004	0.07	45.0%	4,013	295	0.13	48.9%	1,737	295	0.21	76.0%	5,797	5,044				
2005	0.18	45.1%	2,099	184	0.12	46.8%	1,145	467	0.10	99.4%	9,451	2,379		60.0%		
2006	0.13	58.6%	1,129	616	0.26	100.0%	1,003	770	0.07	81.8%	11,774	0	0.55	67.3%	3,603	1,638
2007	0.21	100.0%	1,278	10,386	0.12	51.8%	1,874	1,951	0.07	93.6%	5,576	1,184	0.28	63.8%	4,064	1,599
2008	0.10	53.6%	11,669	8,156	0.13	60.8%	2,922	913	0.14	72.4%	6,400	1,338	0.29	55.0%	4,191	3,450
2009	0.16	54.8%	14,412	4,109	0.10	70.0%	2,689	669	0.17	27.6%	5,973	0	0.30	68.8%	5,755	1,324
2010	0.18	36.1%	12,003	7,529	0.07	41.8%	2,551	2,188	0.08	39.9%	1,548	2,620	0.18	63.0%	5,282	3,661
2011	0.19	47.5%	11,857	5,771	0.20	68.2%	3,254	2,538	0.08	67.9%	3,237	0	0.20	16.4%	6,991	2,142
2012	0.12	38.9%	11,400	4,248	0.13	41.2%	4,757	1,332	0.08	19.6%	1,414	214				
2013	0.14	58.3%	8,684	5,839	0.26	63.0%	3,290	5,842	0.22	84.6%	491	1,502	0.10	39.6%	3,288	2,290
2014	0.14	49.2%	10,898	4,567	0.21	62.8%	7,914	853	0.27	87.8%	1,917	1,516	0.25	60.7%	3,591	3,501
2015	0.22	64.8%	9,926	1,497	0.22	58.4%	5,819	1,002	0.23	26.6%	3,200	499	0.45	100.0%	5,680	7,267
2016	0.17		7,924		0.21		4,401		0.29		1,348		0.18		14,077	

Table 2. Back calculated mean length (TL in inches) at each annulus for adult female and male Walleye from Spirit Lake and the Okoboji lakes, 2016.

	Year Class - Female Walleye											
Age	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
1	2.8		3.6	4.3	4.7	4.5	4.5	4.5	4.6	4.6	4.4	4.5
2	6.7		7.0	8.0	8.6	7.4	7.9	8.5	8.5	8.6	9.0	8.4
3	9.3		10.3	10.8	12.0	10.2	11.0	12.3	11.9	12.0	14.5	11.9
4	11.6		12.6	13.1	14.1	13.2	14.8	15.6	14.9	16.3	17.9	15.4
5	13.2		14.8	15.6	16.4	16.3	17.5	17.9	18.0	19.2	20.1	18.1
6	15.8		17.7	18.4	18.2	18.7	19.6	20.0	20.4	21.3		20.0
7	18.5		19.6	21.0	20.3	20.8	21.5	21.9	22.1			21.6
8	20.6		20.9	23.0	22.3	22.5	23.1	23.4				23.0
9	22.2		22.7	24.3	23.7	24.0	24.4					24.2
10	23.8		24.0	25.5	25.3	25.3						25.2
11	25.1		25.0	26.4	26.4							26.1
12	25.8		26.1	27.3								26.9
13	26.3		27.1									26.8
14	26.9											26.9
15	27.7											27.7
16												
n	2		3	12	5	19	71	77	75	64	39	

	Year Class - Male Walleye											
Age	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average
1		4.6	4.1	4.4	4.2	4.7	4.4	4.2	3.9	4.7	4.4	4.3
2		7.2	7.3	7.2	7.4	7.9	8.2	8.1	7.9	8.9	9.1	8.1
3		10.0	9.0	9.4	10.1	10.3	11.1	11.3	11.3	12.1	12.8	11.1
4		11.8	10.7	11.1	12.1	12.5	14.0	14.0	14.0	16.0	16.1	13.9
5		13.9	12.0	13.2	13.7	14.8	15.7	15.7	16.4	18.0	18.0	15.8
6		15.5	13.0	15.5	15.5	16.3	16.9	17.4	18.3	19.3		17.4
7		16.9	14.3	16.8	17.0	17.4	18.3	18.9	19.6			18.5
8		17.8	15.2	17.8	18.1	18.6	19.4	20.1				19.2
9		18.4	16.0	18.8	19.3	19.7	20.4					19.7
10		19.1	17.0	19.6	20.2	20.7						20.1
11		20.0	18.0	20.5	21.1							20.6
12		20.5	18.9	21.3								20.5
13		21.2	19.6									20.5
14		21.9										21.9
15												
16												
n		4	3	6	18	27	45	58	56	32	6	

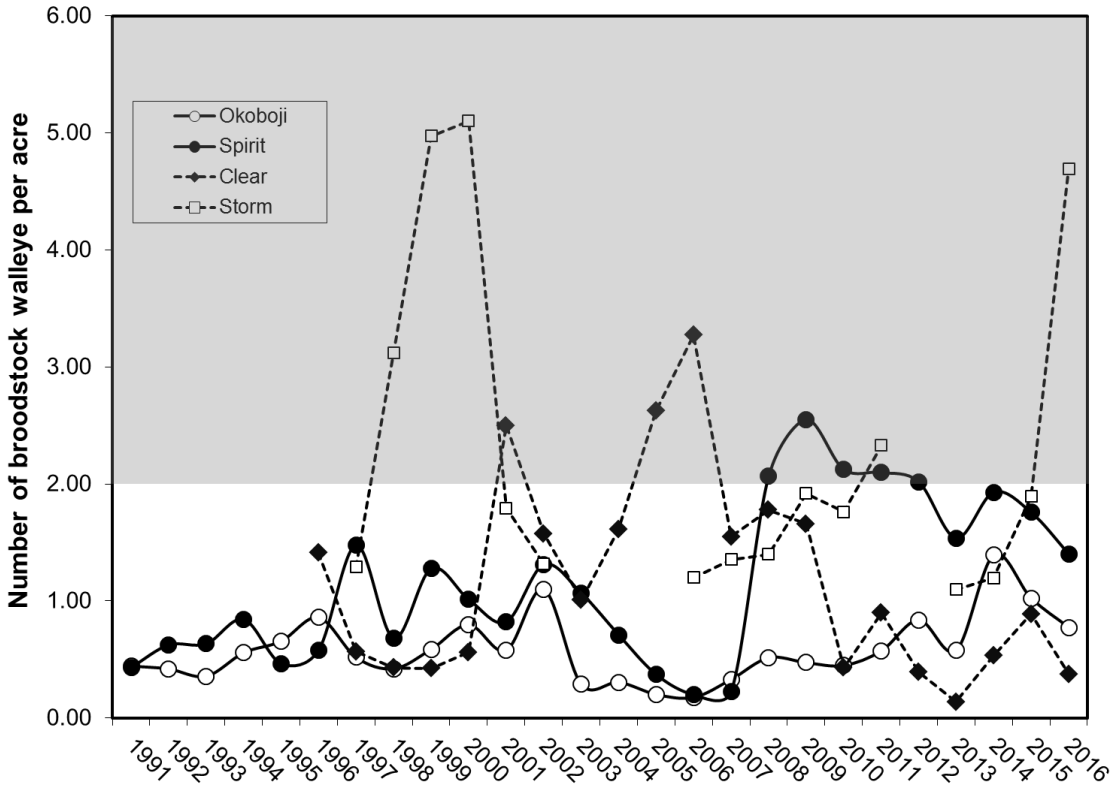

Figure 1. Number of broodstock Walleye (≥ 17 in TL) per acre in Spirit Lake, Okoboji lakes, Clear Lake, and Storm Lake (1991 – 2016) based on the Jolly-Seber open population model. A management objective of ≥ 2.0 Walleye per acre is represented in grey.

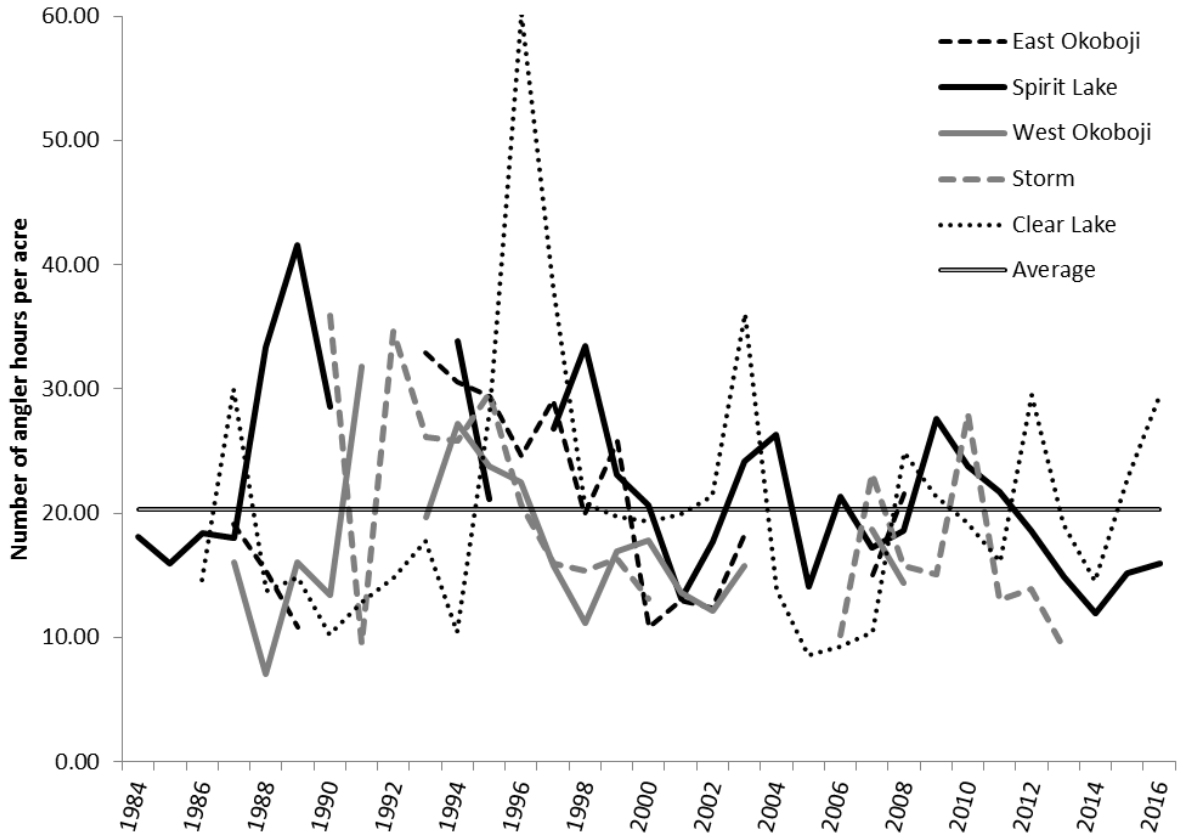

Figure 2. Estimated open water angling pressure (angler hours per acre) from creel surveys conducted on Spirit Lake, East and West Okoboji lakes, Storm Lake, and Clear Lake between 1984 and 2016.

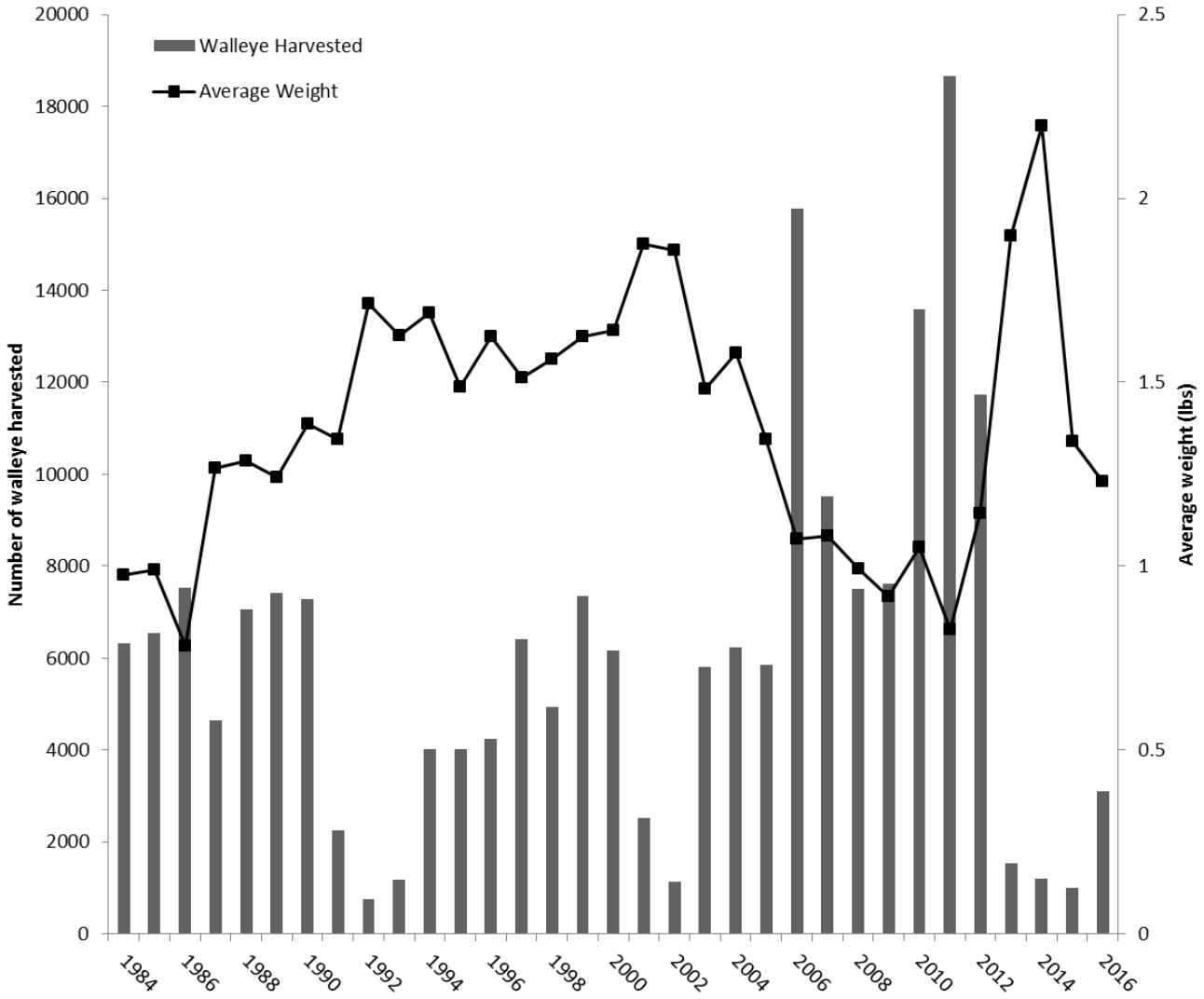

Figure 3. Walleye harvest and average weight of harvested Walleyes in Spirit Lake (1984-2016).

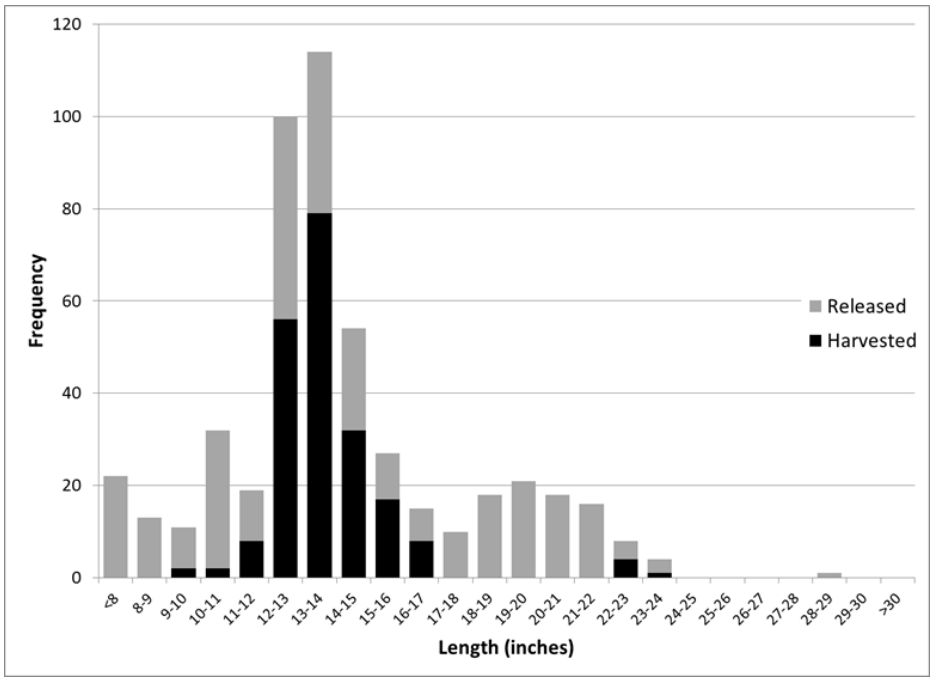

Figure 4. Length frequency histogram of harvested and released Walleyes caught on Spirit Lake during the 2016 fishing season.

Kansas update to NCD Walleye Technical Committee
January 28, 2018
By Jeff Koch

Kansas Walleye Initiative has entered its third year with continued evaluation of walleye regulations and new techniques for increasing culture production of fingerlings and advanced fingerlings. Meade and Milford hatcheries produced ~25,00 advanced fingerlings with a positive outlook for more next year. These larger fish are being stocked into reservoirs with invasive white perch issues to give walleye a better chance at recruitment. Otoliths from known hatchery fish and wild fish will be analyzed to determine feasibility of otolith microchemistry to identify stocked fish in Kansas reservoirs.

Cedar Bluff Reservoir, Trego Co., KS is an impoundment of the Smoky Hill River in western Kansas completed in 1951 and characterized by widely fluctuating water level. Walleye were first introduced in 1953 with harvest regulated by a 5 fish/day creel limit since initial introduction and an 18" minimum length limit (MLL) implemented in 1990. Since 2001 stocking consisted of two disparate stockings thus natural production and recruitment, coupled with a lag in angler harvest, fostered development of a population characterized by sufficient quality dynamics to support egg collection for Kansas hatchery production. Cedar Bluff has been an important egg source since 2006. Decreased trends in abundance of larger walleye were documented by standard sampling and spring egg collection efforts in recent years. Sex-specific population age structure was determined from otoliths collected during spring 2017 and growth was similar to that

documented in 2010 and 2011. Anectdotal evidence, supported by trends in annual state park visitation during March to May and angler preference documented by creel surveys indicated that walleye fishing pressure had increased. The most recent creel survey conducted in 2014 documented; high harvest from March to October at 5,620 walleye (1.86 walleye/ac.), nearly 100% of fish 18" and larger caught were harvested, and walleye was the most preferred sportfish by anglers. Taken together, good recent production and recruitment, no to minimal decrease in growth despite increased abundance, and high walleye specific angling pressure and harvest made it apparent that recruitment overfishing limited abundance of larger walleye. To allow recovery of size structure and optimize reproductive potential, a proposal to implement a 21" MLL on walleye harvest was made.

Milford Reservoir enacted a 21" MLL in 2017 and fall 2017 sampling results were encouraging as catch of 18"+ and 21"+ fish increased from previous years.

Genetic and sex determination samples were sent to Idaho Fish and Game geneticists for assistance in development of a sex marker for walleye. Western biologists are hopeful in creating YY walleye technologies, whereas Kansas is interested in creation of XX broodstock to produce all-female stockings.

Midwest presentations-

Dave Spalsbury-A proposal to implement a 21" minimum length limit on walleye harvest at Cedar Bluff Reservoir, Kansas.
Susan Steffen-Angler Opposition to n increase in the minimum length limit for walleye at Cedar Bluff Reservor, Kansas.

Two papers regarding triploid saugeye evaluation and saugeye aging structures will be in the first issue of 2018 NAJFM

Kansas walleye egg demand for 2018 - 114M eggs, looking into captive walleye broodstock

Wisconsin Report

1. **Wisconsin Walleye Initiative (WWI)**
   This program has been extended and funded in the state budget until July of 2020. This will make about 2 million dollars of general state funds available over the next two years to rear large (6"+) or purchase from private growers large (6"+) walleye fingerlings.

   The state walleye team is continuing to evaluate the success of fall fingerling walleye stocked as part of the WWI. The team's decision was to study the effect of various stocking densities, and measuring success by two main management goals, listed in order of priority:

   1. (Re)-establishing natural walleye reproduction
   2. Establish and maintain fishable walleye populations

In each year, all lakes receiving fall fingerling walleye will be assigned to one of four treatment groups: 5, 10, 15 or 20 fall fingerlings per acre. A subset of 72 "sentinel lakes" was randomly chosen to be monitored annually through the duration of the project. The adaptive management component is intended to commence after three stocking cycles, with elimination of stocking from waters with no return and hopefully identifying an optimum stocking rate (or optimums for specific classes of lakes).

2. Hatchery Walleye Production

Due to the funding of the WWI program a significant number of large walleye fingerlings ($\geq$ 6") were again produced in our state and private hatchery system in 2017. The state hatcheries also produced a significant number of small fingerling (1.2 to 2") walleye.

	State Small	State Large	Private Large	Total Large
2016	1,165,442	547,050	250,965	798,015
2017	1,878,920	689,022	182,949	871,971
2018	800,294	655,731	126,767	782,498 (proposed)

These numbers do not include fish purchased by private groups

3. Regulation Changes

Statewide Trolling Rule

Trolling with three lines is currently allowed in most counties statewide. However, seventeen of the state's 72 counties were covered by regulations that prohibit trolling or allow it only on select waters.

As of May 1, 2018, trolling rue is permanent and is now allowed in these counties with the following restrictions:

-
- Only one line can be trolled per angler with a limit of three lines per boat.
- You can cast and retrieve up to two additional lines per angler.

4. Staff Issues

There was a realignment of the state natural resources agency to line authority by program in 2016. As a result of this change fisheries was removed from the water program and placed in the new division of Fisheries, Wildlife and Parks.

Fisheries Biologist

Through two separate hiring events ten biologist positions were filled around the state in 2017. We are currently in the process of hiring one additional inland biologist and a two-year project biologist on Lake Superior.

Research Biologist

Our science services program hired a new fish research biologist who will be working out of the Escanaba Lake station in Vilas County.

Fisheries Technician
We filled twelve fisheries technician positions around the state. Two were in our hatchery program and the others in fish management.

Application information for all state seasonal and permanent positions can be found on the Wisconsin state employment site www.wisc-jobs.

5. **Walleye Research**

Wisconsin DNR Office of Applied Science (Research)

- 10 year evaluation of 50% annual exploitation on Sherman Lake, WI. Completed in 2016, 10 years of 50% annual exploitation on the walleye population in Sherman Lake resulted in less than desirable adult walleye densities, major improvements in walleye growth, declines in age at maturity, and no significant influence on walleye recruitment. This study is in preparation for publication with the Great Lakes Indian Fish and Wildlife Commission as collaborators.
- Walleye genetic pedigree analysis of the Sherman and Escanaba Lake, WI walleye populations. Beginning in 2016, WDNR fisheries research has collaborated with Dr. Wes Larson of the Wisconsin Cooperative Fishery Research Unit at UWSP to genetically link age-0 and age-1 walleye with individual parental walleyes. Preliminary results suggest that larger, older females may be disproportionately contributing to the survival of age-0 fish to their first fall.
- Does woody habitat addition increase walleye production? Beginning in 2015, a long-term study was initiated to test whether the addition of trees to a lake increases fish production, including the production of walleye. Pre-manipulation monitoring of the fish community and aquatic ecosystem has been completed and the first phase of tree drops is scheduled for spring 2018.
- Walleye comparative recruitment study. Beginning in summer 2017, a 3-5 year comparative walleye recruitment study was initiated with Great Lakes Indian Fish and Wildlife Commission biologists. The project aims to measure within-lake and watershed characteristics from a suite of lakes throughout northern Wisconsin with stable walleye recruitment and in those where natural recruitment has declined over time. The goal of this study is to test for differences between the lake types and to identify applied management actions that could be applied to improve walleye natural recruitment.
- Whole-lake centrarchid removal to improve walleye recruitment. In collaboration with the Wisconsin Cooperative Fisheries Research Unit at UWSP and the Center for Limnology, UW-Madison, a whole-lake centrarchid removal project was initiated in 2017. Because anecdotal evidence has suggested that abundant largemouth bass populations may negatively affect walleye populations, this whole-lake removal of centrarchids will test whether the removal of a substantial portion of the bass/panfish family improves walleye natural recruitment. Following a year of baseline monitoring of the fish and aquatic community, centrarchid removals will begin in spring 2018.
- Maternal effects better predict walleye recruitment in Escanaba Lake, WI. The long-term walleye dataset from Escanaba Lake (1946-2015) was used to test

whether maternal characteristics of the walleye populations better predicted walleye natural recruitment over time. Total egg production compared to female abundance and adult stock size (male and female) was found to be the best predictor of age-0 abundance to the first fall. Further, greater egg contribution by larger females was found to be positively correlated with recruit survival. This manuscript is provisionally accepted in the Canadian Journal of Fisheries and Aquatic Sciences.

- Eroding walleye productivity in northern Wisconsin lakes. This study used the long-term Ceded Territory of Wisconsin walleye data set to test for walleye production trends over time. Over the past 30 years, walleye production in northern Wisconsin lakes has declined coincident with declines in natural recruitment. This manuscript is provisionally accepted in the Canadian Journal of Fisheries and Aquatic Sciences.
- Long-term trends in walleye growth in northern Wisconsin lakes. This study used the long-term Ceded Territory of Wisconsin walleye data set to test for walleye growth trends over time. Overall, growth rates of juvenile walleye have increased significantly over time, whereas larger, older walleye growth rates have not changed. Increases in juvenile walleye growth rates were positively correlated with water temperature and largemouth bass relative abundance, and negatively correlated with adult walleye density. This manuscript was published in the Canadian Journal of Fisheries and Aquatic Sciences in 2017.

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University of Wisconsin Stevens Point Research

- Pre-treatment data collected for our collaborative evaluation of centrarchid removal on walleye recruitment in a northern Wisconsin lake. Removal will commence in 2018. See our poster for more details.
- Acoustic transmitters implanted into 193 walleyes within Green Bay during Sept-Nov 2017 as part of a joint assessment of walleye movements and spawning locations. Another 107 fish to be tagged next spring. More than 150 acoustic receivers deployed in and around Green Bay to monitor movements.
- Completed work assessing genetic stock structure, population dynamics, and movements of Green Bay walleyes based on Floy tag returns. Manuscript in review. Dan Dembkowski is presenting the movement portion of this work Tuesday at 11:00 AM.
- Assessment of walleye recruitment bottlenecks in northern Wisconsin lakes complete, please see Isermann's talk at 2:20 on Tuesday. Work confirms that something is going on at or before larval stage. Larvae often present but nothing in mid-summer gill nets or fall electrofishing.
- Completed an assessment regarding the effects of additional training on among reader precision associated with estimating walleye ages from spines and otoliths. Dan Dembkowski is giving a lightning talk about this on Wednesday.

- Starting study on Green Bay examining diets of walleye, lake whitefish, and yellow perch to determine if walleyes might affect abundance of the other two species. Sampling begins in May 2018.

- **Developing a high-throughput SNP panel for walleye in Wisconsin and Minnesota (PIs Larson and Sass)** *Background*— Walleye are one of the most highly sought after and harvested fish species in the upper Midwest. Genetic tools can be used to define management units for walleye, design more effective propagation programs for restoration, and conduct parentage analysis to understand walleye biology. However, the genetic tools currently developed for walleye (microsatellites) are time consuming to use and do not provide high accuracy for many applications. The goal of this research is to develop a high-resolution GTseq marker panel for walleye populations in Minnesota and Wisconsin. *Impact*—This project is an important collaboration between the Wisconsin and Minnesota DNRs that will help to improve walleye management across the Midwest. Specifically, data from this project will be used to refine genetic management units and inform propagation programs. Additionally, the adoption of the GTseq panel by these two states will help to demonstrate the utility of this emerging technology across the region.

- **Using parentage analysis to investigate the spawning and recruitment dynamics of walleye in a small Northern lake (PIs Larson and Sass)** *Background*— Supplementation and management strategies for walleye are based on a variety of assumptions about the spawning and recruitment dynamics of the species. However, many of these assumptions have never been directly tested because it is difficult to observe spawning *in situ*. Our goal is to use genetic parentage analysis to test these assumptions in a wild population. We analyzed a year of pilot data and are currently waiting for the GTseq panel in project above to be developed before proceeding. Once the panel is developed, we will work with the WDNR to hire a graduate student and complete the project. *Impact*—Results from this project will have significant implications for management of walleye as well as other recreationally and commercially important species. For example, we will be able to directly test whether larger females produce more offspring, an important assumption that is frequently incorporated into fisheries management. This project is innovative because pedigrees are rarely constructed for wild populations outside of a few model species, such as salmon.

State of Ohio report to the Walleye Technical Committee

Prepared by Matthew Faust, Fisheries Biologist II, Sandusky Fisheries Research Unit, Ohio Department of Natural Resources, Division of Wildlife.

Lake Erie Walleye Population Status

Ohio serves on the Great Lakes Fishery Commission's Lake Erie Committee via the Walleye Task Group (WTG). Data for 2017 are currently being analyzed, and so a summary of the 2016 population assessment and fishery statistics are provided. At total of 3.078 million Walleye were harvested across Lake Erie, which included 0.856 million fish harvested by the sport fishery and 1.960 million fish harvested by the Ontario commercial fishery. Sport effort totaled 2.350 million angler hours, and harvest per unit effort was 0.36 Walleye/angler hour. Age-2+ population estimates for Walleye in the

western and central basins was 30.625 million fish, although this is expected to increase substantially thanks to strong recruitment during 2014–2015.

The full WTG report, which contains detailed fishery and population statistics, can be found here: http://glfc.org/pubs/lake_committees/erie/WTG_docs/annual_reports/WTG_report_2017.pdf.

Additional updates regarding ongoing research of note on Lake Erie and Ohio's inland waters are provided below.

Lake Erie Walleye Spatial Ecology Study

The Great Lakes Acoustic Telemetry Observation System (GLATOS; https://glatos.glos.us/) continues to provide useful information on Ohio's Lake Erie walleye population. During 2017, an additional 186 walleye were tagged from Ohio's sport fishery and Ontario's commercial fishery, bringing the total number of fish tagged during 2011–2017 to more than 1,200. More than 100 acoustic receivers were deployed across Lake Erie to provide detection data that will provide further insight into walleye spawning ecology, movement among management jurisdictions (e.g., between US and Canadian waters of Lake Erie), and mortality rates.

Results have demonstrated extensive within-lake movement and very little between lake movement by walleye tagged in the western basin. For instance, approximately 5% of tagged walleye remained within the western basin after spawning, with 95% moving into the central and eastern basins, and less than 1% of tagged fish traveled into Lake Huron during 2014 and 2015 (Raby et al. in press: Does behavioral thermoregulation underlie seasonal movements in Lake Erie walleye? Canadian Journal of Fisheries and Aquatic Sciences).

Ohio Inland Report to the Walleye Technical Committee
Prepared by Joseph D. Conroy and Jeremy J. Pritt

Comparing Stocking Success of Fry vs. Fingerlings for Maintaining Ohio Reservoir Sander Fisheries

The Ohio Department of Natural Resources, Division of Wildlife (ODNR-DOW), annually stocks more than 8 million Sander spp. (Walleye Sander vitreus and saugeye S. vitreus females x S. canadensis males) fingerlings and 23 million Sander spp. fry to maintain high-quality sport fisheries in about 65 inland reservoirs. Fingerlings are stocked at about 250/ha whereas fry are stocked at about 2,500/ha. The general programmatic approach relies on fingerling stockings although previous research has shown fry stocking to result in successful year classes in a small number of reservoirs. We evaluated fry- compared to fingerling-stocking success (determined from standard age-0 Sander spp. fall electrofishing assessments) in 11 upground reservoirs during 2011–2014 and 7 tributary reservoirs and 2 canal reservoirs during 2013–2016. Standard

assessment measures determined during these periods, plus the data from non-project standard assessments resulted in a total of 143 reservoir-years of data used to assess whether fry stockings could support successful recruitment. Further, we measured zooplankton density at the time of fry stocking to determine whether prey resources shaped fry-stocking success. Finally, we compared fry point- versus scatter-stocking success and the contribution of natural reproduction to Walleye recruitment.

We found that fry and fingerling stockings resulted in comparable recruitment during this project. Age-0 Sander spp. relative abundances during this project differed from non-project years with no clear explanation. Zooplankton density did not predict fry stocking success. Stocking success from saugeye fry point- and scatter-stocking were similar. Natural reproduction generally contributed less than 50% of age-0 Walleye, and often much less.

Based on project findings, we recommended that the ODNR-DOW: (1) continue to stock fry in those reservoirs in which successful year classes have been demonstrated; (2) point stock all Sander spp. (both fry and fingerlings) as no benefit was observed in this project from scatter stocking fry and the literature shows no benefit of scatter stocking fingerlings; and (3) continue to stock Walleye to maintain important Walleye sport fisheries.

Evaluating Boat Electrofishing as an Index of Sander Recruitment in Ohio Reservoirs

Since 2004, the ODNR-DOW has conducted standard (1) fall boat electrofishing surveys to determine year-class strength of stocked age-0 Walleye and saugeye and (2) gill-net surveys to determine the abundance, size- and age-structure, and growth of adult Walleye and saugeye. We are currently working to establish a connection between those two surveys to evaluate the effectiveness of our year-class strength index. We are also working on incorporating selectivity information from multi-panel gill nets to refine our adult Sander population metrics.

Sauger Population Characteristics and Exploitation in the Ohio River

The ODNR-DOW conducts annual fall Sauger and Walleye boat electrofishing surveys at the tailwaters of Ohio River dams in cooperation with neighboring Ohio River states (collectively, the Ohio River Fisheries Management Team, ORFMT). Information collected in these surveys suggests that mortality of Sauger is very high and size structure is poor. In 2016, a tagging study was initiated at two tailwaters and expanded in 2017 to five additional tailwaters to quantify exploitation and determine the efficacy of a minimum length limit. Preliminary results show that exploitation is periodically high in some tailwaters. The ORFMT continues to analyze data from these efforts and plans to make regulation recommendations during summer 2018.

Genetic analysis of Ohio River Walleye

A genetic analysis of the Ohio River's walleye population was recently completed (Page et al. 2017: Spatial and temporal genetic analysis of walleyes in the Ohio River. Transactions of the American Fisheries Society 146: 1168 – 1185). That study's abstract is provided below:

Previous genetic analyses have shown that Walleyes Sander vitreus in the upper Ohio River comprise two distinct genetic strains: (1) fish of Great Lakes origin that were stocked into the Ohio River basin and (2) a remnant native strain (Highlands strain). Resource agencies are developing management strategies to conserve and restore the native strain within the upper reaches of the Ohio River. Hybridization between strains has impacted the genetic integrity of the native strain. To better understand the extent and effects of hybridization on the native strain, we used mitochondrial DNA and microsatellite markers to evaluate the spatial (river sections) and temporal (pre- and poststocking) genetic diversity of Ohio River Walleyes. Contemporary Lake Erie Walleyes and archival museum specimens collected from the Ohio River basin were used for comparison to contemporary Ohio River samples. Although there was evidence of hybridization between strains, most of the genetic diversity within the Ohio River was partitioned by basin of origin (Great Lakes versus the Ohio River), with greater similarity among river sections than between strains within the same section. Results also suggested that the native strain has diverged from historical populations. Furthermore, notable decreases in measures of genetic diversity and increased relatedness among native-strain Walleyes within two sections of the Ohio River may be related to stocking aimed at restoration of the Highlands strain. Our results suggest that although the Highlands strain persists within the Ohio River, it has diverged over time, and managers should consider the potential impacts of future management practices on the genetic diversity of this native strain.

2017 Walleye and Sauger Stocking Levels

Below are stocking levels for walleye and saugeye within Ohio's inland waters (no stocking occurs in Lake Erie). Ohio currently uses 3 hatchery facilities for stocking these fish and have protocols in place to guard against the spread of the VHS virus. Although VHS-attributed mortality was observed in the Maumee River (Lake Erie tributary used as source of gametes), it has not been found in any ODNR hatcheries or in stocked inland waters.

Species	Lifestage	Number Requested	Number Stocked
Saugeye	Fry	17,833,000	17,803,140
	Fingerlings	4,260,825	6,334,784
Walleye	Fry	10,336,000	20,343,345
	Fingerlings	1,990,100	4,200,584