Canada
Alberta

Alberta Walleye Sauger Update for WTC (Winter 2017)

Submitted by Michael Sullivan, Stephen Spencer

In Alberta, we are managing walleye and sauger populations following a protocol described as "Alberta's Fish Sustainability Index". In brief, the abundance of fish in a population is estimated using standard sampling catch rates (i.e., index nets in lakes, electrofishing in rivers). The populations (usually 5 populations, but sometime fewer) with the highest catch rates in Alberta are considered as "high density". All other populations are scaled to those reference populations, with thresholds of 70%, 50%, and 20% of reference. These thresholds correspond to management categories of low risk, moderate risk, high risk, and very high risk. Angling regulations, as well as habitat protection regulations are assigned based on the risk category. A full description of the protocol is on Alberta's website (http://aep.alberta.ca/fish-wildlife/fisheries-management/fish-sustainability-index/default.aspx).

For sauger management in Alberta, an in-term index is just being developed. The attached document describes a regulation change for the North Saskatchewan River sauger population, using the in-term thresholds and references. This change is for the angling regulation to become catch-and-release, from its current regulation of 3 saugers /day. The simple rationale is that the North Saskatchewan River (NSR) catch rate was 0.35 saugers/2km electrofished. This compares to a NSR walleye CUE of 5 to 14 walleyes/2km, and a Red Deer River (sauger reference popn) catch rates of 2.5 to 3 sauger/2km.

A science review (as attached) is required for all angling regulation changes in Alberta.

Scientific Review of a Fisheries Management Objective (FMO) - Sauger FMO change for the North Saskatchewan River, Alberta.

Proposed Regulation

Catch and release (from Harvest, 3 Saugers any size). This would be from the Bighorn Dam on the North Saskatchewan River (NSR) to the Alberta-Saskatchewan border (HUC 6s of 110102, 110201, 110301, 110302, 110401, 110403)

Rationale & Objective

We completed in the summer of 2016, an extensive and intensive survey using the Medium-Large River Sampling Protocol with 85 sites sampled in three distinct reaches from the NSR, Drayton Valley to the AB/SK border. Only 12 Saugers were captured with another 18 observed for a total of 30 fish. Not enough fish were captured for an age or length analysis. This information

indicated that Sauger catches were 10x to 100x lower than Walleyes in the NSR (Figure 1). Furthermore, the NSR Sauger catch rate was significantly lower than the Red Deer River population sampled in 2011 (Figure 2).

Our Fisheries Management Objective is to recover the NSR Sauger population to a FMO of Harvest-Standard.

Status of Fish Population

i) Current status of fish population

Indicators (Current Data):

1) Very low catch rates compared to Walleyes in the NSR (Figure 1); and Saugers in the Red Deer River (Figure 2).
2) Although Sauger are a highly migratory species, catches were lower in the reach with the highest human population numbers suggesting that angling may be a source of mortality.

ii) Desired status of fish population

Indicators (Objectives and Desired Values):

The majority of the evidence for a population decline comes from comparisons to the Red Deer data set (1991, 2004, 2011). As the Red Deer River was sampled in 1 km sites, I combined the Red Deer River data from adjacent 1 km sample sites to create a 2 km 'site' for comparison to the NSR data (and the current sampling protocol). Both the NSR and Red Deer River are fished with the same Sauger regulation of 3 fish, no size limit, so I assumed that the population is not at carrying capacity due to some level of harvest mortality or habitat loss.

As an interim Sauger F.S.I., I used the 5 sites with the highest catch rates from the 2011 Red Deer River dataset to create a population status objective and to classify Sauger populations. The top five sites from the 2011 Red Deer River data averaged 11 Saugers/2km site. I then used the Fisheries Sustainability Index to provide context, objectives and desired values.

Saugers/2km	Risk to Sustainability
>11	Very Low
7-11	Low
5-7	Moderate
2.5-5	High
<2.5	Very High

The NSR 2016 catch rate of 0.35 Saugers/2km site would classify the risk to the population sustainability as **Very High**. My objective would be to have catch rates of 5-11 Saugers/2km.

1) Fisheries management objective – Harvest Standard
2) Regulation change objectives –Reduce harvest through a catch and release regulation.

Status of Fishery

i) Current status of fishery

Indicators (Current Data):

1) Fishing effort – relatively high fishing pressure in the city (Patterson 1997). Likely considerably lower further from high human population areas (Watkins 2015).
2) Harvest – likely very low due to low Sauger numbers but this harvest appears sufficient to keep Saugers in a collapsed/risk of extirpation status. Additional, anecdotal evidence from Fish and Wildlife Officers indicate that harvest of Saugers does occur
3) Catch (including estimated mortality) – unknown

ii) Desired Status of Fishery

Indicators (Objectives and Desired Values):

1) Harvest Standard

Achieving the Desired States (Goal)

1) The current of 3 fish no size limit, *Harvest Standard* regulation, does little to protect the remaining Saugers as it is unlikely to restrict total harvest. Moving to catch and release will provide more protection and may have the added benefit of reducing angling targeted effort towards a species at very high risk. Illegal and release mortality will still affect Saugers.

Discussion of Ancillary Consequences of Regulation

Potential effects of this regulation on other systems, such as:

Effects on other species in the waterbody: measureable effects are not anticipated. Less incidental walleye harvest possibly due to misidentification.

Effects on other fisheries (e.g., effect of a sport regulation on commercial fisheries): there are Fishing Guides that will mostly not be affected as they state that they do not harvest fish. There has been little recorded participation by Indigenous peoples fishing in the NSR so it is assumed that

there will not be large effects. Recovering this population will provide more fishing opportunities in this popular fishery

Effects on nearby fisheries (e.g., will anglers move from or to nearby lakes): Unknown. There are other species in the NSR that will continue to attract anglers.

Scientific Review of Proposed Regulation

This is a very reasonable, well-supported argument. The catch rates are extremely low in the NSR, compared to the Red Deer River. Even without a solid comparison of habitat selection or catch rate-population density regressions, the NSR catch rates are so low that it is unreasonable to assume that the population is at anything other than very low density. Catch-and-release regulations are fully justified in this situation.

Head, Fisheries Allocation and Use
Comments on scientific review:

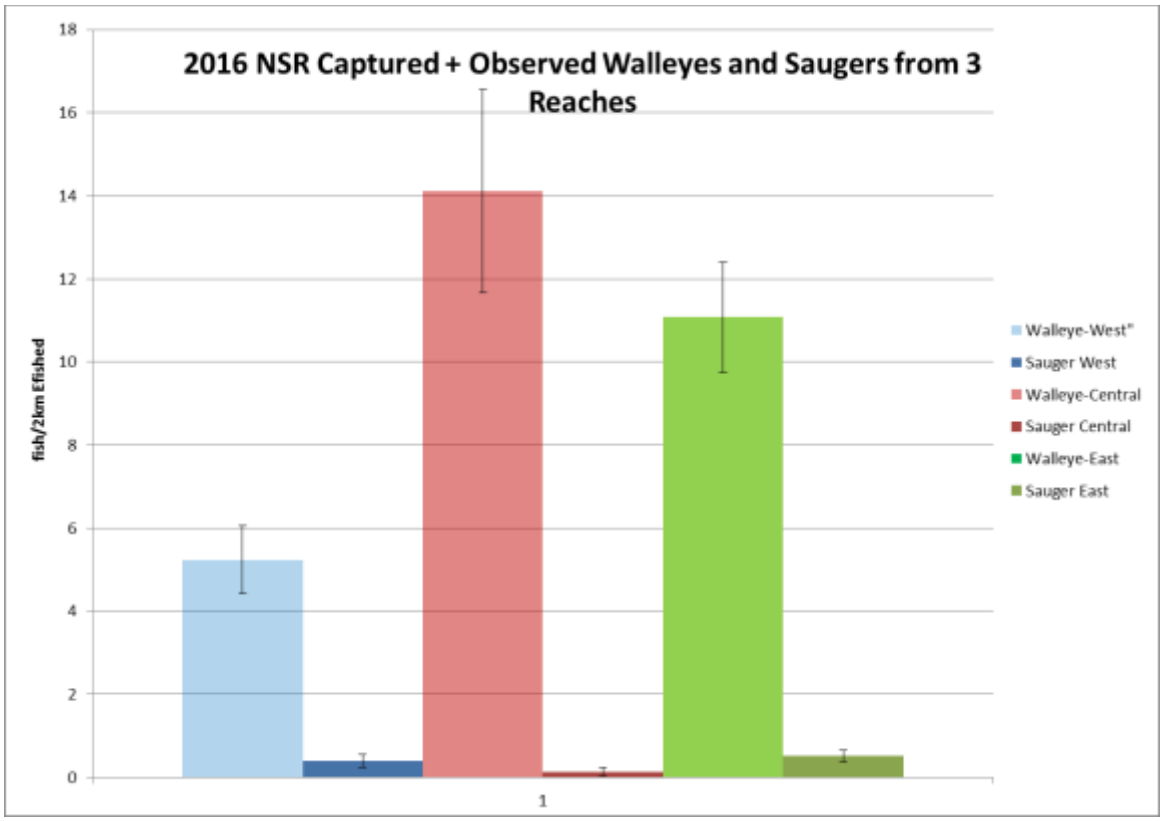

Figure 1. A comparison of the catch rates of Saugers and Walleyes caught in three reaches of the NSR. Error bars are the standard error of the mean.

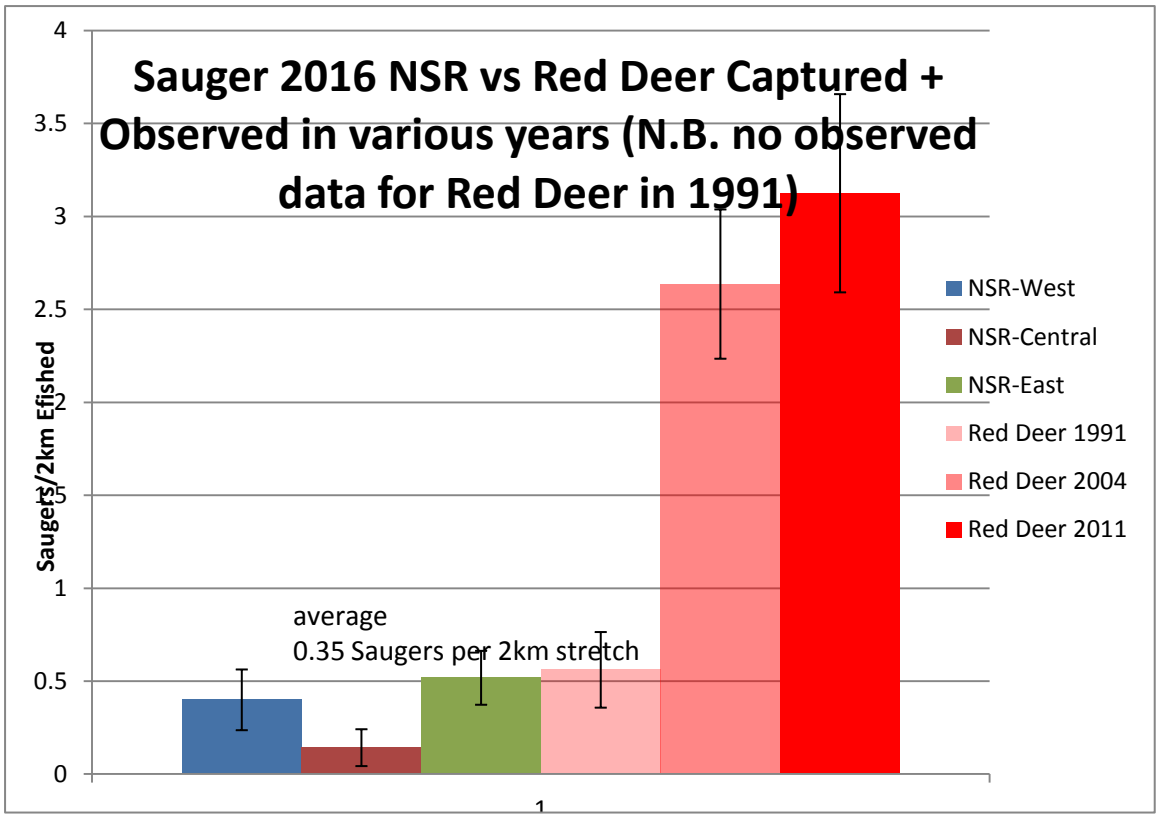

Figure 2. A comparison of the catch rates of Saugers caught in three reaches of the NSR and in three different years from the Red Deer River. Error bars are the standard error of the mean.

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Ontario

Ontario doesn't have the capacity for annual updates to their synthesis of data for state of the resource reporting; typically the best we can expect is a five year rotation. The state of the resource report that I sent you last year (which I've reattached) is the most up to date information (2015) we have available.

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Québec:

Martin Arvisais, Daniel Nadeau, Michel Legault, Henri Fournier, Francis Bouchard, and Yves Paradis wrote the most recent walleye management plan for Québec (2011-2016). Here is a link to the webpage where you can access a pdf of the management plan (in French).
https://www.mffp.gouv.qc.ca/english/wildlife/hunting-fishing-trapping/walleye-management-plan.jsp
I suggest you contact these biologists at the government to know more on the subject.

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Arkansas

2016 Arkansas Game and Fish Commission Walleye Management Report
Prepared for Walleye Technical Committee
Report submitted by Matt Schroeder, Fisheries Management Biologist, Arkansas Game and Fish Commission.

Walleye

Walleye in Arkansas are managed with a state wide creel limit of six fish per day. However, there are several lakes and rivers that are more intensively managed through reduced creel limits, minimum length limits, and slot limits (Table 1).

Table 1. Exceptions to the state wide Walleye Regulations.

Water Body	Length Limit	Creel Limit
Beaver Lake	18-in MLL	4
Bull Shoals Lake	18-in MLL	4
Greers Ferry Lake	20–28-in Protective Slot	6 (1 over 28-in)
Lake Norfork	18-in MLL	4
Table Rock Lake	18-in MLL	4
Kings River	18-in MLL	4
White River	18-in MLL	4

2016 Walleye production in Arkansas occurred on Charley Craig and Andrew Hulsey hatcheries (Table 2). Walleye were stocked in seven lakes and one river in Arkansas in 2016 (Table 3). Additionally Walleye fry were stocked in Lake Norfork's nursery pond, where they were grown to advanced fingerling size and released. Production and stocking numbers in 2016 were below average due to the stocking moratorium on Greers Ferry Lake. Greers Ferry Lake has been historically stocked biennially through the Greers Ferry Lake nursery pond. During these years, approximately 1,000,000 fry are stocked in the nursery pond, resulting in an estimated 200,000 advanced fingerlings being stocked into Greers Ferry Lake.

Table 2. Results of the 2016 Walleye Spawning Projects in Arkansas.

Hatchery	# of Females Spawned	# of Eggs Produced	# of eggs per female	# of Fry Produced	% Survival
Craig	48	3,620,000*	75,416	1,386,000	38%
Hulsey	42	2,968,365	70,675	1,265,000	43%
Total		2,968,365		2,651,000	

*722,300 were eyed eggs shipped to the Hulsey Hatchery.

Table 3. 2016 Walleye Stockings in Arkansas.

Date	Source	Destination	Size	# Stocked
4/11/2016	Craig	Norfork NP	Fry	386,000
5/24/2016	Craig	Lake Avalon	Fingerling	10,000
5/24/2016	Craig	Lake Norwood	Fingerling	5,000
5/24/2016	Craig	Windsor Lake	Fingerling	10,000
5/26/2016	Craig	Lake Fork Smith	Fingerling	2,800
5/28/2016	Craig	Table Rock Lake	Fingerling	60,000
6/1/2016	Craig	Beaver Lake	Fingerling	75,240
6/1/2016	Craig	Bull Shoals Lake	Fingerling	110,118

5/31/2016	Norfork NP	Lake Norfork	Fingerling	57,750*
5/9/2016	Hulsey	Lake Hamilton	Fingerling	25,110
5/9/2016	Hulsey	Lake DeGray	Fingerling	46,345
5/9/2016	Hulsey	Lake Catherine	Fingerling	21,545
5/9/2016	Hulsey	Lake Greeson	Fingerling	31,310
5/17/2016	Hulsey	Ouachita River	Fingerling	25,625
Total				**809,093**

*Estimated abundance

In 2016, Walleye were sampled in March with boat electrofishing in Greers Ferry, Bull Shoals, and Norfork lakes (Table 4). These samples are conducted in the main spawning tributaries of Greers Ferry Lake and adjacent to the dams of Bull Shoals and Norfork lakes. These spring electrofishing samples typically only sample the mature males and females in the population. Non-reproducing individuals are underrepresented in these samples.

Table 4. Arkansas Spring Walleye Electrofishing Results.

Lake	CPUE (fish/hour)	Mean Length (mm)	Size Range (mm)
Bull Shoals	121.5	508	396 - 624
Greers Ferry	107.9	425	233 - 643
Norfork	136.4*	461	341 - 558

*Highest in last 14 years.

Beginning in 2016, experimental monofilament gill nets were used to evaluate the Walleye populations in Greers Ferry and Norfork lakes (Table 5). A total of 48 and 38 net nights were ran on Greers Ferry and Norfork lakes, respectively. Catch rates were lower than expected. This gear will continue to be used on various Walleye lakes around the state.

Table 5. Arkansas Fall/Winter Experimental Monofilament Gill Netting Results.

Lake	CPUE (fish/net night)	Mean Length	Size Range
Greers Ferry	0.4	419	240 - 560
Norfork	2.8	410	200 - 575

An age and growth study was began on the Greers Ferry Walleye population in 2015 (Figure 1). Additional data of larger individuals is needed to assess the current protective slot limit. Age and growth studies will be conducted on Beaver, Bull Shoals, Greers Ferry, Norfork, and Ouachita lakes in the coming years. Additionally telemetry studies are being designed for Greers Ferry and Greeson lakes.

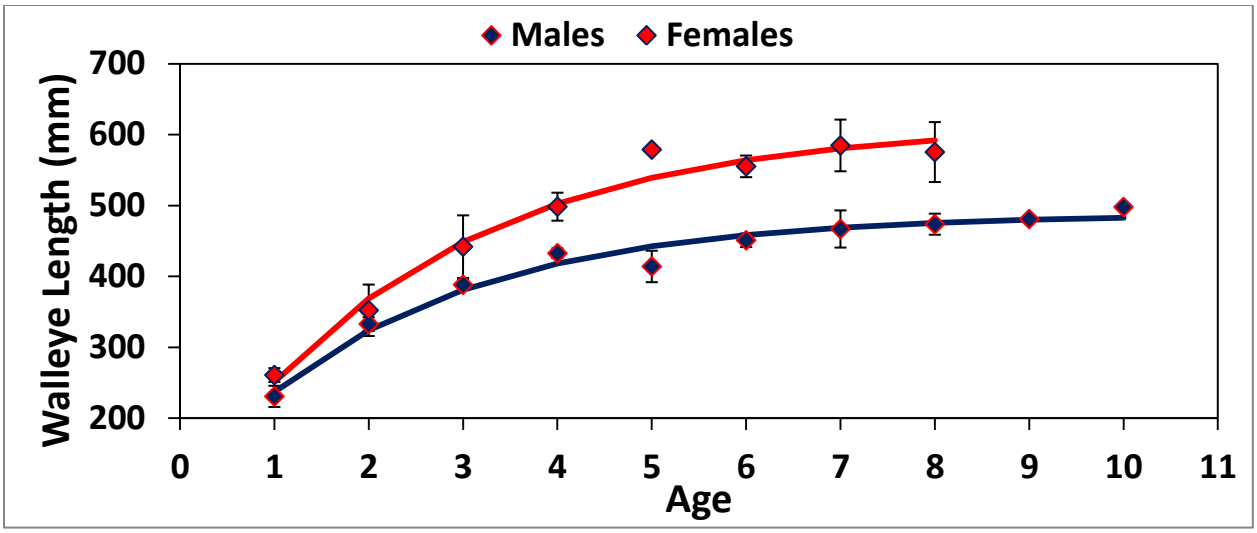

Figure 1. Walleye Mean Length at Age, Greers Ferry Lake, Arkansas.

Sauger

Sauger in Arkansas are managed by a state wide creel of six fish per day. Currently, a demand for Sauger hatchery production in Arkansas has not been identified. The main Sauger fishery in Arkansas is in the Arkansas River. No sampling occurred in 2016. However, a stock assessment of Sauger will begin in February 2017, in three pools of the Arkansas River.

Saugeye

Saugeye (Walleye x Sauger) are managed by a state wide creel limit of six fish per day. Saugeye have historically been used as a management tool for thinning out stunted crappie populations, while providing an additional fishery. This hybrid species has traditionally been stocked in several Arkansas lakes that do not have Walleye or Sauger populations in their drainage basins. However, the effectiveness of this management strategy has come under some scrutiny and stockings have been reduced drastically. An evaluation of this management strategy is currently ongoing on Lake Frierson (Table 6). Saugeye stocked in 2016 were not spawned in an Arkansas hatchery, rather they were acquired from the state of Colorado.

Table 6. 2016 Saugeye Stocking in Arkansas.

Date	Source	Destination	Size	# Stocked
4/11/2016	Donham	Lake Frierson	Fingerling	110,174
5/17/2016	Donham	Lake Pickthorne	Fingerling	25,978
Total				**136,152**

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Idaho Walleye Summary

Walleye were first introduced in Idaho waters in the mid 1970's with the intent of providing new and diverse fishing opportunities. Three Walleye fisheries were established by the Idaho Department of Fish and Game (IDFG) in isolated reservoirs in southern and southeastern Idaho. Due to the potential impacts of Walleye on native fishes and or other existing fisheries, these locations were carefully selected for their isolation with the intent of confining Walleye to only desired waters. IDFG Commission policy since the 1980s specifically limits intentional walleye releases to closed systems. However, illegal or unintentional (e.g., downstream drift from illegal introductions in adjoining states) introduction of Walleye has occurred in at least five other waters throughout the state.

Walleye are classified as a game fish in Idaho, but are actively managed to provide a fishery in only three waters. A daily harvest limit of six fish with no size restriction is used to manage two of the three intentional Walleye fisheries. Recently, a six fish daily limit (only one over 20 inches) was enacted on the third fishery. This regulation change was requested by anglers to improve abundance of large Walleye. Idaho does not support Walleye where unauthorized introductions have occurred. As such, all other waters where Walleye may occur are managed with no harvest limit and no size restriction. In addition, Idaho does not authorize catch-and-release Walleye tournaments on waters where unauthorized introductions have occurred. Angler exploitation of Walleye in existing fisheries is generally thought to be low. Annual exploitation, where estimated, was 10% or lower.

Densities of walleye in our three managed Walleye fisheries are considered moderate to high. Fall Walleye index netting (FWIN) surveys showed average catch rates as high as 37 Walleye per net. Idaho has no statewide standard for monitoring Walleye, but the FWIN protocol (established in Ontario Canada) has been used to survey two of the three managed Walleye waters, as well as two waters where unintentional or illegal introduction of Walleye has occurred. Densities in unintended Walleye waters have been low thus far and range from "occasionally found" to FWIN catch rates of two fish per net.

To date, Idaho has not attempted active management to reduce or eliminate undesired Walleye populations. Challenges associated with suppressing Walleye populations have prevented efforts from being initiated. These challenges include: feasibility on large,

complex, and connected water bodies; avoiding unintended impacts to diverse multispecies fish communities (some with sensitive native fish); and financial limitations. Since Idaho's 2015 Walleye summary, new information and investigations were limited. However, notable updates include:

- An investigation of Walleye diet was initiated on Lake Pend Oreille. Lake Pend Oreille, located in northern Idaho, has a relatively new and unintentional Walleye population. Diet investigations are intended to provide basic information on the potential impact of Walleye on other species present in the lake (e.g., kokanee, native salmonids).

- FWIN survey results from Salmon Falls Creek Reservoir, located in southern Idaho, suggested Walleye abundance in that water has declined in recent years. Salmon Falls Creek Reservoir has an actively managed Walleye population with a six fish daily limit (only one over 20 inches). Managers speculate poor recruitment related to below average reservoir storage and recharge has contributed to the Walleye decline. Hatchery stocking has been used periodically to supplement natural Walleye recruitment in the reservoir. Hatchery Walleye were stocked in 2016 in an effort to increase abundance.

- Fishery researchers and managers are working to develop sterile triploid Walleye for Oneida Reservoir, another managed Walleye population located in southeastern Idaho. Sterile walleye are desired to reduce the potential spread of Walleye both illegally and unintentionally to other waters.

Illinois:

Illinois report for 2017 winter meeting of WTC
Compiled by Jason DeBoer INHS and Mike Garthaus IDNR

LaSalle Hatchery – Frank Jakubicek, IDNR

Fish have been getting larger in the Fox Chain O' Lakes since gizzard shad established themselves in 2007. We no longer set fyke nets to collect broodfish. Catch rates were exceeding 65 fish per net and the amount of work we had to do to sort through walleye, muskie and by-catch was overwhelming so we switched to DC electrofishing for broodfish around 2012 and have done so since. Historically, our hatch rate (egg to fry) was consistent at 60% to 64% but last year it was down a little (48%). This could be due to the size of the females we're sending down compared to previous years, a portion of the eggs collected from very large fish are not of the same quality as 20" - 24" females.

We still hit our goal of 14,000,000 eggs.

LaSalle Hatchery Broodfish Collection Report-2016

Tournaments

Sauger	MWC/IWT (3/17-3/19)	IRWC (4/3)	Total
Number ♀ spawned	97	51	148
Number of eggs	11,260,000	3,040,000	14,300,000
Egg volume	294,000/L	294,000/L	
Number eggs/fish	116,082	59,607	96,621
Number of fry	7,967,000	2,733,000	10,700,000
Hatch rate (%)	70.8	89.9	74.8

The fry were stocked as follows: 1,800,000 – 3 LaSalle Hatchery Ponds, 8,900,000 – Illinois River.

Kankakee River Walleye
Number of ♀ spawned: 31
Total number of eggs: 4,200,000
Egg volume: 120,000/L (135,483 eggs/fish)
Total number of fry: 2,008,000
(1,008,000 fry split between ponds 12 and 13. The remaining 1,000,000 fry were stocked in the Kankakee River).
Hatch rate: 47.8%

Fox Chain O' Lake Walleye
Number of ♀ spawned: 91
Total number of eggs: 14,500,000
Egg volume was 115,000/L (159,340 eggs/fish)
Total number of fry: 7,000,000
(2,300,000 fry stocked in 5 hatchery ponds, 450,000 fry sent to Jake Wolf, 650,000 fry sent to Fin N Feather Rearing Pond and 3,600,000 fry stocked in FCOL)
Hatch rate: 48.3%

Walleye x Sauger Hybrids
Number of ♀ spawned: 12
Total number of eggs: 1,400,000
Total number of fry: 760,000
(760,000 fry stocked in 2 hatchery ponds)
Hatch rate: 54.3%

2016 Stocking Reports – Mike Garthaus, IDNR

5.3 million walleye, mostly into Fox Chain O' Lakes and Kankakee River
9.4 million sauger, mostly into Illinois River
233 thousand saugeye, into small lakes

Lake Michigan Yellow Perch – Charlie Roswell, INHS

In 2016 we continued collecting data as part of ongoing research/ monitoring projects, including gill net and bottom trawl surveys that collect yellow perch, and assessment of yellow perch habitat through side-scan sonar mapping. 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.

Notable recent findings include very low yellow perch harvest (numbers) in recent years, but a strong 2015 year class that seems to be persisting (at least through fall of 2016). Young perch (as small as ~70 mm) are utilizing round goby as a prey source.

Other updates:

- Josh Dub, who had been our station's "Yellow Perch Biologist", has moved on. Scot Peterson and I are the remaining biologists at LMBS, and will be working together on perch-related aspects of our research.

- Some of our longer-term projects (e.g., bottom trawl and adult gill net surveys; side scan sonar mapping) will not be conducted in 2017 (which may be a temporary change for some projects). Micromesh sampling of juvenile yellow perch will continue.

Wabash River – Eric Hine, Eastern Illinois University

I am conducting an assessment of demographics of the Sauger population in the lower Wabash River. In order to collect Sauger, we used pulsed DC electrofishing at 7 sites during the spring and winter. Since Sauger are most active at night, all electrofishing occurred after dusk. All collected Sauger are measured to total length (mm) and weighed (g) in the field. The fish are then taken back to our lab for aging (using sagittal otoliths) and sexing. This data will be used to determine various demographic aspects of the Sauger population.

Proposed IDNR/INHS research – Jason DeBoer, INHS

Walleye and sauger are important sportfish in northern Illinois, particularly for the large rivers of the region including the Rock, Fox, Kankakee, Des Plaines, and Illinois rivers. Much of the recent walleye and sauger fishery in these rivers is hatchery derived. Prior to the initiation of the stocking program on the Kankakee River, catch rates were in the 1-3/hour range increasing to an average of 30/hour in spring sampling since stocking began. Anglers have also reported increased catch rates since the program began, though no creel studies have been conducted to date. Post-stocking catch rates are lower for the Fox River, generally between 5-10/hour, though the upper Fox River appears to get walleye "overflow" from the Chain-O-Lakes stocking program, with catch rates in selected areas exceeding 20/hour. Prior to stocking, sauger did not occur in the 'upper' Des Plaines River (upstream of Brandon Road Dam), at least in recent history. However, as part of the Illinois River system, sauger were endemic to the upper Des Plaines prior to

dams and historic water quality limitations. At prime habitat locations, catch rates are as high as 40 per hour (averaging 10-15) and anglers report good catch rates as well. However, despite the success of stocking, the CPUE of walleye in the Kankakee and Fox rivers still differs. Habitat limitations and water quality concerns are obvious drivers, but the dynamics of these fisheries are also potentially affected by factors like seasonal movement and habitat use, river-specific differences in age structure and growth rates, as well as river-specific angler-exploitation rates.

With the importance of these fisheries to angling in this region, and uncertainty about the different constraints in these rivers, we believe there is a need is for an assessment of importance of the potential constraints, with special attention to how they may differ among river basins.

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Indiana:

I have solicited information from Indiana biologists and the only research that has been conducted over the past year is some work I am presenting at the Midwest. See attached abstract.

Examining exploitation of Walleye in a Midwestern reservoir using a tag return study

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Walleye *Sander vitreus* are one of the most sought after sport fish in Indiana. To meet this demand Walleye have been stocked in Monroe Reservoir since 1982 at an average rate of 36 fingerlings/acre. Previous research on yield-per-recruit models has provided insight into effects of various exploitation rates at multiple minimum length limits; however, exploitation for Monroe Reservoir Walleye is unknown. As such, a mark recapture study was conducted from 2015 to 2016. Walleye were tagged in early spring. Tag loss was estimated by double tagging every other Walleye. Non-reporting rate was estimated with an angler creel survey in 2015. Exploitation was estimated using the Ricker method at multiple levels of reporting rates. A total of 157 Walleye were marked

with Floy tags in the spring of 2015 and angler reports were accepted through the summer of 2016. Overall, fifteen tags were reported with forty percent of the reported tags being from Walleye caught in the Monroe Reservoir tailwaters. Exploitation rate was estimated at 0.15, 0.22, and 0.44 at a reporting rate of 75%, 50%, and 25%. Maximum yield estimated from the yield-per-recruit models is achieved at an exploitation rate of 0.65 and minimum length limit of 457 mm. The probability of yield reaching 80% of the maximum yield under the current minimum length limit of 356 mm at exploitation rates of 0.15, 0.22, and 0.44 is 0.1%, 74.7%, and 100%. Our results suggest that yield will only increase if exploitation was increased and no change is expected with an increase in the minimum length limit.

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Iowa:

Iowa WTC Report, January 2017

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 2017.

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 three 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. Nearly 44,000 marked intensively and extensively cultured walleye fingerlings were stocked in the Wapsipinicon, Maquoketa, and Cedar rivers during June 2015. Study sites were sampled in late-September to determine survival and growth of walleye fingerlings. This process will be repeated for several years. 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) Evaluation of Walleye Stocking Strategies in Iowa Reservoirs

Contact: Rebecca Krogman, (641) 774-2958, rebecca.krogman@dnr.iowa.gov

Past research at Rathbun Lake showed that stocking both fingerlings and fry produces more consistent year-classes of adult walleye, meeting our fishery management goals better than stocking only fry. Study results have been inconsistent in identifying which size of fingerling or stocking location is best. Fingerling walleye cost more to produce than fry and limited availability may cause small or irregular fingerling stocking allocations in some reservoirs. Better ways to share the stocking of advanced (>6 inches) fingerlings, 2-inch fingerlings, and fry are being studied to maximize the number of reservoirs that meet our walleye management goals.

This research project began in 2011 at Big Creek Lake, when 3,000 walleye fry/acre and five 8-inch fingerlings/acre were stocked into the reservoir by the Iowa DNR. The fingerlings received a unique brand (like a tattoo) on their side each year to identify which year-class they were from. Their survival from year to year was tracked by electrofishing each fall and identifying the age and origin (fry versus fingerling) of each fish. In addition to this aggressive stocking approach, a physical fish barrier was installed on the Big Creek Lake spillway in 2012, which likely helped us achieve our Walleye density goal of 3 adult Walleye/acre. The result? Major success in bringing the Walleye population up to almost 6 adult Walleye/acre! At this time, stocking has been reduced to

allow the existing Walleye to grow, and we learned that fry stocking was actually 17 times more cost effective on a per-dollar basis than stocking advanced fingerlings. However, advanced fingerling Walleye have much higher survival rates and compose a large part of the Big Creek Lake population, so it is important to stock them when and where fry do not survive.

Big Creek Lake's walleye stocking success and popularity led to the expansion of this study to six other reservoirs in 2014: Lake Manawa, Lake Macbride, Lake Icaria, Little River Lake, Pleasant Creek Lake, and Twelve Mile Lake. These waters will be stocked for several years with fry and fingerlings to better determine when each stocking size should be used. The study is also working to identify an effective sampling method for gauging fry stocking success prior to fingerling stocking; waters where fry did not "take" could then be prioritized in fingerling stocking allocations.

Reducing Escapement

Maintaining strong walleye populations in reservoirs is a challenge because of fish escaping downstream often through the spillway during spring flooding. After passing over the dam, escaped walleyes cannot move back up into the reservoir. This has been observed at Big Creek Lake and Rathbun Lake, when tagged fish stocked into the reservoir were caught by anglers in the river below, and likely occurs at many reservoirs across Iowa. Escapement reduces the effectiveness of stocking and drains a reservoir's walleye population over time.

The Iowa DNR is investigating a variety of methods to monitor and prevent future escapement. For example, fish tagged with Passive Integrated Transponders (or "PIT tags") can be tracked when they pass by or through a tag reader, which may be installed on a dam spillway. The Iowa DNR is working with the Army Corps of Engineers and Iowa State University to evaluate the effectiveness of a physical barrier installed at Big Creek Lake in 2012 and an electric barrier at Rathbun Lake to be installed in the near future. An effective barrier that reduces escapement will help the Iowa DNR strengthen current walleye populations and improve the effectiveness of stocking.

5) Rathbun Walleye Barrier

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

This project is still in the fairly early stages but is hopefully going to be co-funded by the USACE. Previous research tested sound, light, bubble barriers and electric barriers. The electric barrier was up to 90%efficient and as a result, that is how we are moving forward. 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.

6) Retention of small-format, rigid visible implant alphanumeric tags in adult Walleye (*in Review*)

Contact: Jonathan R. Meerbeek, (712) 336-1840, jonathan.meerbeek@dnr.iowa.gov

The effects of total length (TL), sex, days post-tagging, side of tag insertion, and tag insertion depth on retention of the small-format, rigid visible implant alphanumeric (VIA) tags injected underneath the lower mandible of adult Walleye *Sander vitreus* was evaluated from 2012 to 2016. Walleye (n = 2,455) collected via gill nets from natural lakes in Iowa were measured, sexed, and injected with two identical VIA tags; each side (left and right) of the lower mandible received one tag. Tag insertion depth for each tag was determined via the taggers ability to interpret the three-digit alphanumeric code (i.e., scored as shallow if code was readable, and deep if unreadable). Walleye were released back into the lake and recaptured using gill nets and by anglers. Of 366 Walleye recaptured up to four years post-tagging, 241 had retained both tags; the remaining fish had retained either the left (n = 42) or right (n = 83) tag. Overall, tag retention adjusted for fish that lost both tags (n = 14) was 79.9% (607 of 760). The retention of VIA tags was not influenced by sex, TL at time of marking, or number of days post-tagging at recapture, but was significantly related to tag insertion depth and side of insertion, as highest retention rates were achieved with deeply inserted VIA tags on the right side of lower mandible. Based off insertion depth alone, 94% (224 of 239) of deeply inserted tags were retained up to four years post-tagging. The additional time required to remove and reinsert VIA tags from Walleye was approximately two h for every 100 fish recaptures. Visible implant alphanumeric tags inserted deeply into tissue of Walleye could be used in studies that can tolerate low readability and/or increased processing time.

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

Contact: Jonathan R. Meerbeek, (712) 336-1840, jonathan.meerbeek@dnr.iowa.gov

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 FY2016, 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, examined for previous marks, and then individually marked with a

individually-numbered Visual Implant tag or Visual Elastomer Tag from 1990 through 2014 and with a Passive Integrated Transponder tag starting in 2015. The Jolly-Seber open population model was used to estimate Walleye abundance, catchability, survival, and recruitment from recaptured Walleye. Additionally, total length was taken and the first two dorsal spines were removed from a subsample of Walleye for age estimation and growth analysis (441 in 2015). In most years, broodstock densities in these lakes were substantially below management objectives (2.0 adult fish per acre); however, in recent years these objectives have often been more consistently met in Spirit Lake. In 2015, broodstock densities in all lakes were below the management objective, but all lakes were either similar to the 2014 estimate or increased in population density. Recruitment, catchability, and annual survival varied considerably in all lakes from 1990 to 2015. 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 23 inches, whereas, a typical female Walleye would exceed 27 inches.

Walleye Harvest and Pressure Estimates
Open water fishing pressure (May to October; angler hours per acre) for Spirit Lake increased from 11.9 h/acre in 2014 to 15.2 h/acre in 2015 but still remained below average. Anglers harvested 1,006 Walleyes weighing 1,347 lbs which marks the 2nd lowest harvest in the last 58 years. Anglers targeting Walleye caught 1.1 fish per trip in 2015 compared to 2.6 fish and 1.9 fish per trip in 2013 and 2014. Anglers harvested 31 Walleye measuring less than 14 inches during the 2015 fishing season or 3.1% of the total harvest. Anglers released 809 Walleye, 22% of which were within the protected slot limit. In 2015, 30% of walleyes caught over 22 inches were harvested and Walleye released over 22 inches made up 2% of the total number of released fish.

An expandable creel survey was conducted on Clear Lake from January through October, 2015. During the open water season, 29,032 anglers expended 84,273 hours fishing (22.9 h/acre). Walleye harvest in 2015 (9,741) increased substantially from the previous year (3,591). The mean total length of harvested Walleye during open water was 16.3 inches.

8) Diquat and columaris disease new animal drug research and status

Contact: J Alan Johnson, (641) 647-2406, alan.johnson@dnr.iowa.gov

Use of Diquat dibromide (REWARD® Herbicide; Syngenta) to control mortality of fish due to *Flavobacterium sp.* infections was first reported by Bullock et al. (1990) and has been available for investigational purposes under the U. S. Fish and Wildlife Service (FWS) Investigation New Animal Drug (INAD) exemption since the early 2000's. Because Diquat does not have an active sponsor, there has been limited research toward a U. S. Food and Drug Administration approval.. Recently, the FWS Aquatic Animal Drug Approval Partnership (AADAP) Program developed a drug research plan for Diquat including trying to find a sponsor t to lead the approval effort for this drug. In 2016, researchers with the Iowa Department of Natural Resources and AADAP conducted a trial at Rathbun Fish Culture Research Facility to contribute to the Diquat drug approval.

Walleye fingerlings (116 mm, 12.1 g) held in a 1457 L raceway displayed skin lesions consistent with infection of *F. columnare* bacteria. Low fish mortality indicated the disease was in the initial stage of infection. Fish were transferred into eight test tanks (93.9 L; 85 fish/tank) and tanks were randomly designated as treated or control (N=4). Treated tanks received 18 mg/L Diquat dibromide for two hour static bath treatment on three consecutive days whereas control tanks received a static bath sham water treatment for the same duration and frequency. Fish mortality was documented for 14 d posttreatment, and at the end of the study, mean percent cumulative mortality in treated tanks (6.6%) was significantly different (P=0.0376) than that in control tanks (38.8%).

9) Factors affecting mercury concentration in Iowa fishes

Contact: Darcy Cashatt, (712) 250-4610, darcy.cashatt@dnr.iowa.gov

Sampling for this cooperative project between the Iowa DNR and Iowa State University concluded early in 2016. In Iowa lakes and the Upper Mississippi River (UMR) mercury concentrations are generally low, and nearly 40% of the 1,937 fish sampled had concentrations below detection (0.05 mg/Kg). Only 9.4% had concentrations over the one-meal-per-week advisory level of 0.3 mg/Kg. Mean concentration was highest, in muskellunge, northern pike, freshwater drum (UMR), smallmouth bass (UMR), flathead catfish (UMR), largemouth bass, and walleye and lowest in bluegill, black and white crappie, yellow perch, yellow bass, channel catfish, hybrid-striped bass, white bass, and sauger. Fish mercury concentrations in Iowa rivers were also generally low (mean = 0.17 mg/kg, N = 764), with 2.5% < 0.05 mg/Kg and 10.5% ≥ 0. 3 mg/Kg. Mercury concentrations were highest in walleye, smallmouth bass, flathead catfish, northern pike and lowest in channel catfish. Fish mercury concentrations in most fish species regardless of sampling location were positively related to length and age.

Walleye sampled from the lakes and the UMR had a slightly different distribution of mercury concentrations by fish length than those from interior rivers (Figure 1). Of the fish sampled from lakes and the UMR 22% had mercury concentrations below 0.05 mg/Kg, and 14% had concentrations at or above 0.3 mg/Kg. Only one of the interior river walleye collected had mercury concentration below 0.05, and 30% were at or above 0.3 mg/Kg. The samples of yellow perch and sauger show that mercury concentration for these species is low (Figure 2).

The models determining which biotic and abiotic factors that are most influential in predicting fish mercury concentration will be useful to guide the mercury portion of the Iowa fish contaminant monitoring program, and are still under development. One commonality found in early models is that measures of lake or river watershed area as agricultural and developed land are negatively related to fish mercury concentrations. It is also likely that a species-specific-length-based consumption advisory will be developed with the results of this study. The completion report will be written this year.

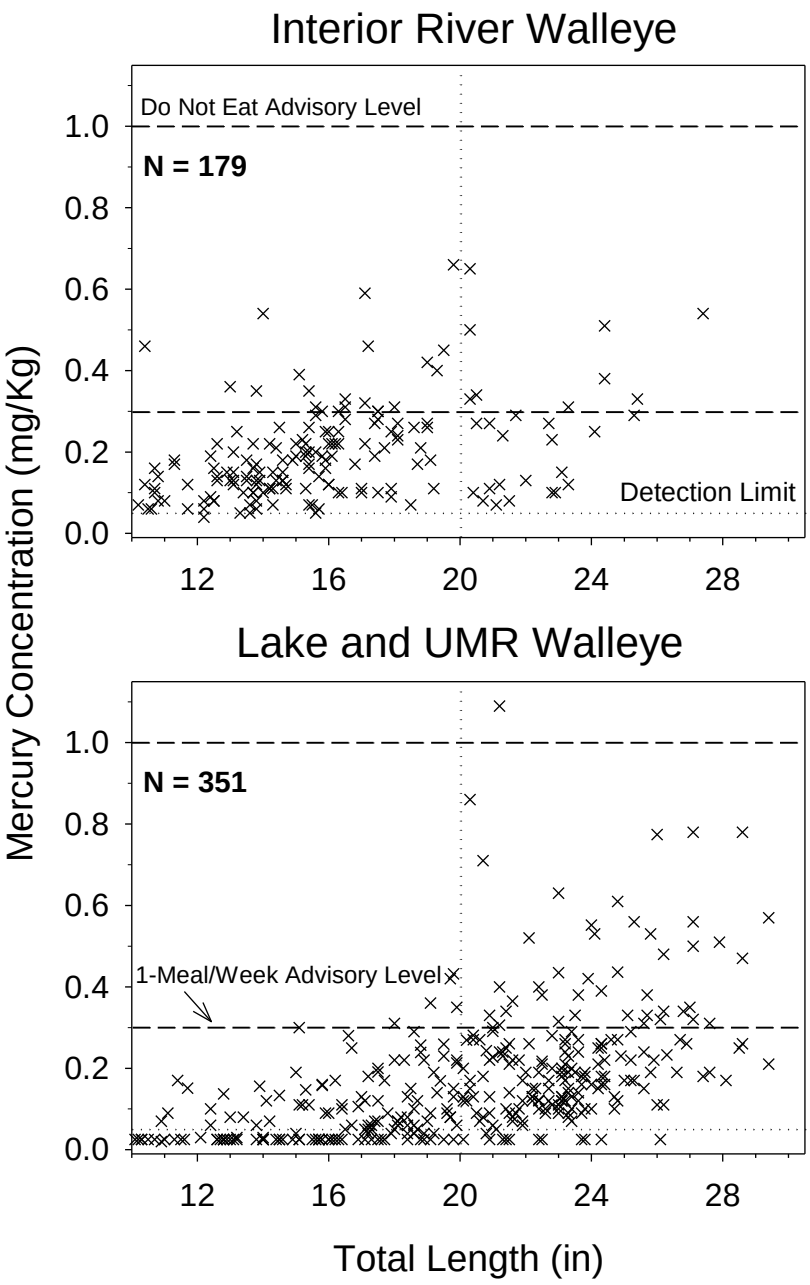

Figure 1. Mercury concentration (mg/Kg) of 530 Walleye sampled from 14 Iowa lakes, the Upper Mississippi River pool 13 (UMR) and 7 Iowa interior rivers. Samples were taken by a variety of sampling methods from 2013 through 2016. Tissue samples were analyzed by the State Hygienic Lab, Ankeny, Iowa using inductively coupled plasma - mass spectrometry. Those samples that were below the detection limit (< 0.05) were graphed as 0.025 mg/Kg.

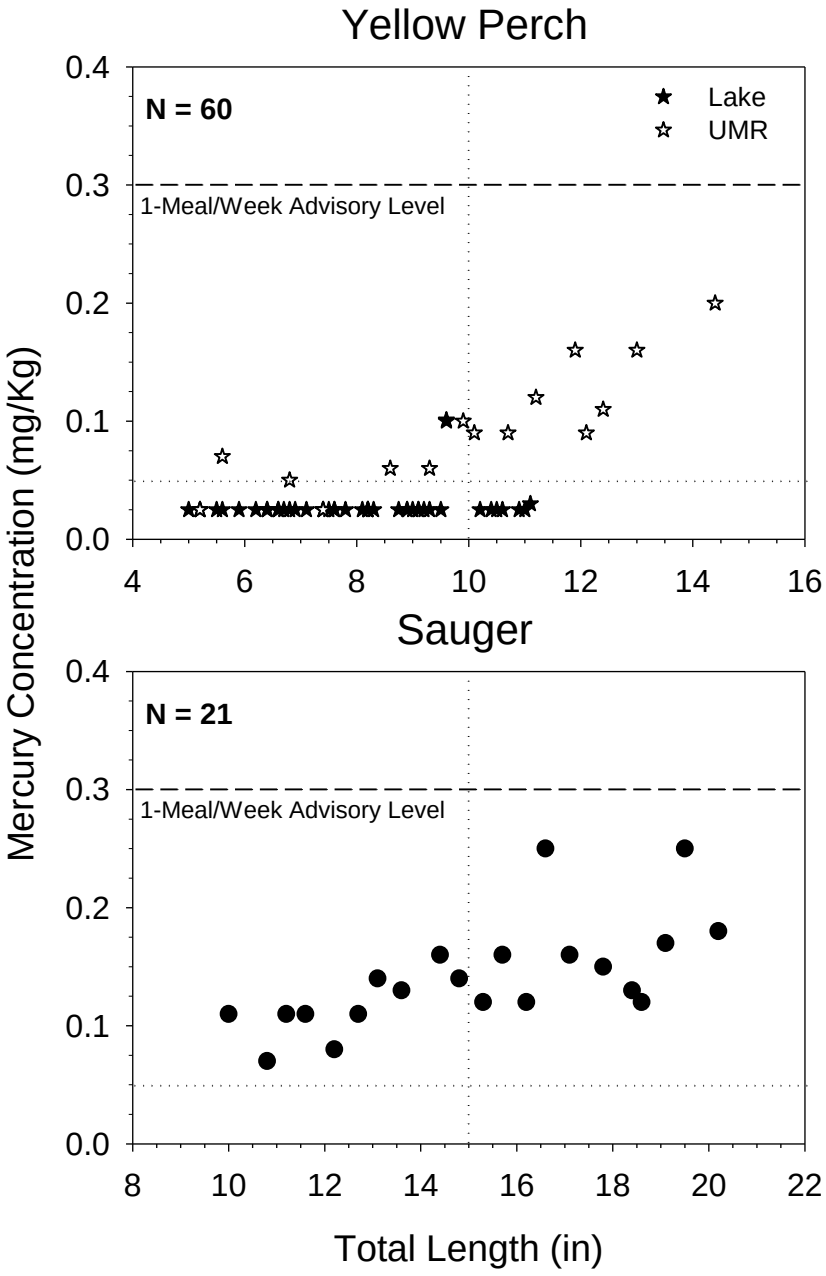

Figure 2. Mercury concentration (mg/Kg) of 60 Yellow Perch sampled from 6 Iowa lakes, the Upper Mississippi River pool 13 (UMR) and 21 Sauger from the UMR pool 10. Samples were taken by a variety of sampling methods from 2013 through 2016. Tissue samples were analyzed by the State Hygienic Lab, Ankeny, Iowa using inductively coupled plasma mass - spectrometry. Those samples that were below the detection limit (< 0.05) were graphed as 0.025 mg/Kg.

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Kansas:

2016 Kansas WTC report
Jeff Koch

The percid egg demand in Kansas has slightly increased in recent years. In 2016, 98M walleye eggs, 16M saugeye eggs, and 3M sauger eggs were collected from brood reservoirs, including eggs obtained in trades from Colorado and Nebraska.

Milford Reservoir was the site of the 2015 NTC tournament sponsored by Cabelas. A total of 185 teams participated and the winning three-day bag was 10 fish weighing 43 lb. Public pressure from local anglers and agency personnel led to an evaluation of the tournament including an exploitation study conducted in 2015. We estimated exploitation of walleye at Milford Reservoir in 2015 by tagging 433 walleye with reward tags and monitoring their returns for one year. Estimates of annual exploitation varied from 22% to 49%, depending on angler nonreporting rate. An objective of this study was to determine effect of a large walleye tournament on exploitation of walleye. Exploitation of walleye by tournament anglers was low and immediate mortality associated with tournament weigh in procedures was also low. In general, most harvest of tagged walleye came from recreational anglers who resided in Northeast Kansas near Milford Reservoir. Approximately 85% of tagged fish reported by anglers were caught in April through June. Linear regression indicated a negative relationship between proportion of tagged fish caught per length group and increasing size. Male and female walleye were caught by anglers in approximately similar proportions to those in which they were tagged.

Kansas is experimenting with protocols to produce fingerlings and advanced fingerling walleye in tank culture. The pilot project was met with some success. Stocking large fingerlings may be attempted in reservoirs with high densities of nuisance white perch where getting walleye recruitment is difficult.

Kansas implemented more restrictive regulations in attempt to provide high-quality walleye fisheries and reduce the likelihood of overfishing, as Mike Quist's work suggested.

Kansas continues to stock saugeye in small impoundments and reservoirs with marginal walleye habitat. Triploid saugeye have been produced the last several years, and an evaluation is being conducted to assess growth and survival of triploids and diploids. After three years of stocking and evaluation, diploid saugeye had about three times higher survival than triploids. Additionally, diploid individuals were generally larger than triploids.

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Michigan:

Michigan Report for 2017 Winter WTC Meeting
Seth J. Herbst, Ph.D.

1) Research continues to be implemented to address questions related to Walleye spawning in the St. Clair (SCR) and Detroit Rivers (DR). As part of this work USGS has conducted spawning surveys using egg mats, see Roseman (at end of this report) for map with sampling locations. Sampling has been intensive for the past six years in the SCR, and almost 13 years in the DR. Larval collections made with paired bongo nets, 500 micron. Examined depth-integrated sampling compared to surface only and those results are in the graphs below – generally more robust results with depth integrated. Any questions can be directed to Ed Roseman (eroseman@usgs.gov).

2) Research scientists and managers continue to collaborate on acoustic telemetry projects in the Great Lakes to address life history and management questions related to spatial ecology. These projects are utilizing the Great Lakes Acoustic Telemetry Observation System (GLATOS) receiver network and provide valuable insight into the spatial ecology of walleye populations in Lake Huron and Lake Erie. Primary questions being approached are characterizing the scope and scale of adult migrations in the Great Lakes, estimating the degree of spawning site fidelity, characterizing thermal preferences of walleye in lakes Huron and Erie, and estimating survival of walleye tagged in the Tittabawassee River. Telemetry data for the Tittabawassee River spawning stock in Lake Huron suggest more than half of tagged walleye moved out of Saginaw Bay after spawning and migrated to northern and southern Lake Huron and returned to the Tittabawassee River to spawn. Annual spawning site fidelity of walleye to the Tittabawassee River was 95% and apparent survival (survival confounded by emigration) ranged 45—73% annually. Other results from telemetry suggest less than 5% of walleye tagged in the Tittabawassee River moved from Lake Huron into the Huron-Erie corridor and only one individual was briefly (less than 1 week) detected in western Lake Erie before returning to Lake Huron. Results of bioenergetics modelling were consistent with higher growth rates in Lake Erie walleye than Lake Huron and indicated that food availability instead of water temperature experienced by walleye drive growth rates in lakes Huron and Erie. Any questions related to this work can be directed to Todd Hayden (thayden@usgs.gov).

3) The Michigan DNR is collaborating with University of WI-Stevens Point, WI-DNR, and Michigan State University to initiate a Walleye telemetry study in Green Bay. The project team plans to start tagging walleyes in 2018. The primary goal of this study will

be to determine if the current conceptual model regarding Green Bay walleye movements and stock contributions to recreational fisheries is valid. This model currently assumes: 1) walleyes spawning in a few locations support the recreational fishery; 2) movements of these fish are relatively limited; 3) regional fisheries (north vs. south) are largely supported by local stocks, and 4) few walleyes enter Lake Michigan. In general, the team hypothesizes movement of walleyes between regions (north vs. south or into Lake Michigan) and mixing of northern and southern stocks will be more prevalent than currently assumed. The team also hypothesizes the fishery contributions from spawning locations where no assessment occurs will be higher than currently assumed. Their specific working hypotheses are: 1) the walleye population in southern Green Bay is largely comprised (≥ 80%) of fish spawning in the Fox, Oconto, Peshtigo, and Menominee rivers, but fish spawning in other locations, including northern Green Bay are important components (10-20%) during summer and fall; 2) the walleye population in northern Green Bay is largely comprised (≥ 80%) of fish spawning in Little Bay de Noc and the Whitefish River, but walleyes spawning in other locations, including southern Green Bay are important components (10-20%) during summer and fall; 3) stock contributions in each zone (north vs. south) vary among seasons, with the greatest differences observed during summer; 4) ≥ 10% of walleyes in Green Bay enter Lake Michigan at some point and 5) walleyes spawning within a region or a specific tributary are not discrete stocks, with ≥ 10% of fish straying among nearby locations on an annual basis. Any questions related to this work can be directed to Troy Zorn (ZornT@michigan.gov).

4) As part of Governor Snyder's 2017 Budget the MDNR Fisheries-Division has received funding to perform upgrades at the Thompson Hatchery geared toward increasing walleye and muskellunge production. The upgrades include a new coolwater incubation facility and 4- ½ acre and 4- one acre ponds at the old hatchery location. When complete we expect the 8 new lined ponds to produce approximately 250,000 additional walleye fingerlings for stocking statewide. Construction may be completed in time for 2019 spring fingerling production. Any questions related to this work can be directed to Ed Eisch (EischE@michigan.gov).

5) Stocking update: During 2016 there were three walleye brood stock sources used. The sources included fish from the Muskegon River, St. Marys River, and Bay de Noc. Overall, this fall approximately 55,000 fall fingerlings at an average size of 6.4 inches (TL) were stocked into the public waters of Michigan. See summer 2016 report for spring fingerling and fry (sac and swim-up combined) stocking numbers.

****Insight requested from the group**: The Michigan DNR is looking to move away from using large quantities of copper sulfate during the spring fingerling harvest. The MDNR is requesting suggestions of alternatives that don't include chemical use to effective harvest walleye ponds. Please provide suggestions to Seth Herbst (Herbsts1@michigan.gov).

Summary of walleye spawning and larval research in the St. Clair and Detroit Rivers.

From Roseman and DeBruyne, USGS Ann Arbor

Spawning surveys done using egg mats, see map below for locations. Sampling has been intensive for the past six years in the SCR, and almost 13 years in the DR. Larval collections made with paired bongo nets, 500 micron. Examined depth-integrated sampling compared to surface only and those results are in the graphs below – generally more robust results with depth integrated

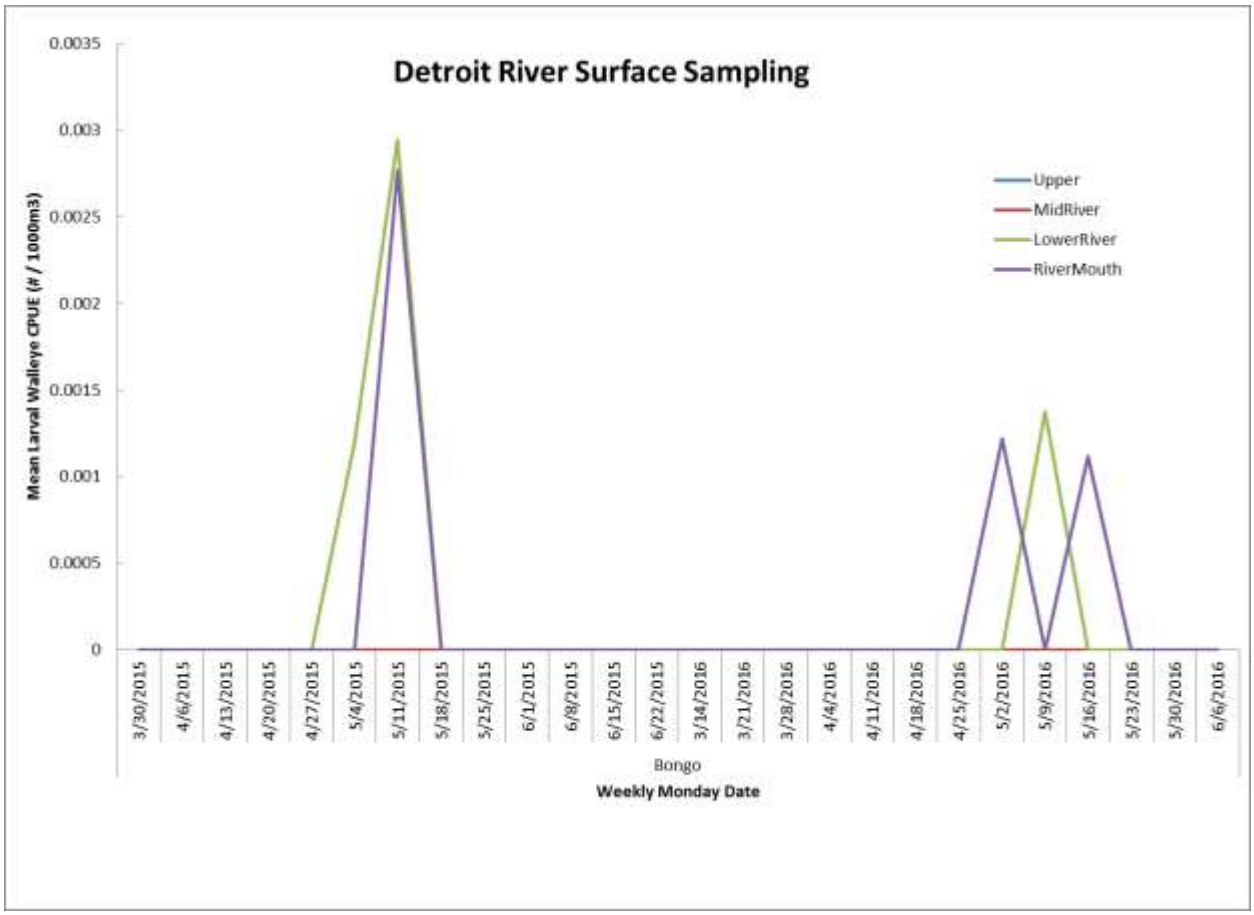
Some recent walleye pubs:

DuFour, M.R., C.J. May, E.F. Roseman, C.M. Mayer, S.A. Ludsin, C.S. Vandergoot, J.J. Pritt, M.E. Fraker, J.J. Davis, J.T. Tyson, J.G. Miner, and E.A. Marschall. 2016. Portfolio theory as a management tool to guide conservation and restoration of multi-stock fish populations. Ecosphere, 6(12): 1-21. DOI: 10.1890/ES15-00237.1.

Fischer, J., D. Bennion, E.F. Roseman, and B.A. Manny. 2015. Validation of a spatial model used to locate fish spawning reef construction sites in the St. Clair-Detroit River System. Journal of Great Lakes Research 41(4): 178–1184. doi:10.1016/j.jglr.2015.09.019.

Fraker, M.E. , E.J. Anderson, C.J. May, K.-Y. Chen, J.J. Davis, K.M. DeVanna, M.R. DuFour, E.A. Marschall, C.M. Mayer, J.G. Miner, K.L. Pangle, J.J. Pritt, E.F. Roseman, J.T. Tyson, Y. Zhao, and S.A. Ludsin. 2015. Stock-specific advection of larval walleye (Sander vitreus) in western Lake Erie: Implications for larval growth, mixing, and stock discrimination. Journal of Great Lakes Research 41(3): 830-845.

Pritt, J., E.F. Roseman, J.E. Ross, and R.L. DeBruyne. 2015. Using larval fish community structure to guide long-term monitoring of fish spawning activity. North American Journal of Fisheries Management 35 (2), 241-252.


Detroit River Surface Sampling
Mean Larval Walleye CPUE (# / 1000m3)
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Upper
MidRiver
LowerRiver
RiverMouth
3/30/2015
4/6/2015
4/13/2015
4/20/2015
4/27/2015
5/4/2015
5/11/2015
5/18/2015
5/25/2015
6/1/2015
6/8/2015
6/15/2015
6/22/2015
3/14/2016
3/21/2016
3/28/2016
4/4/2016
4/11/2016
4/18/2016
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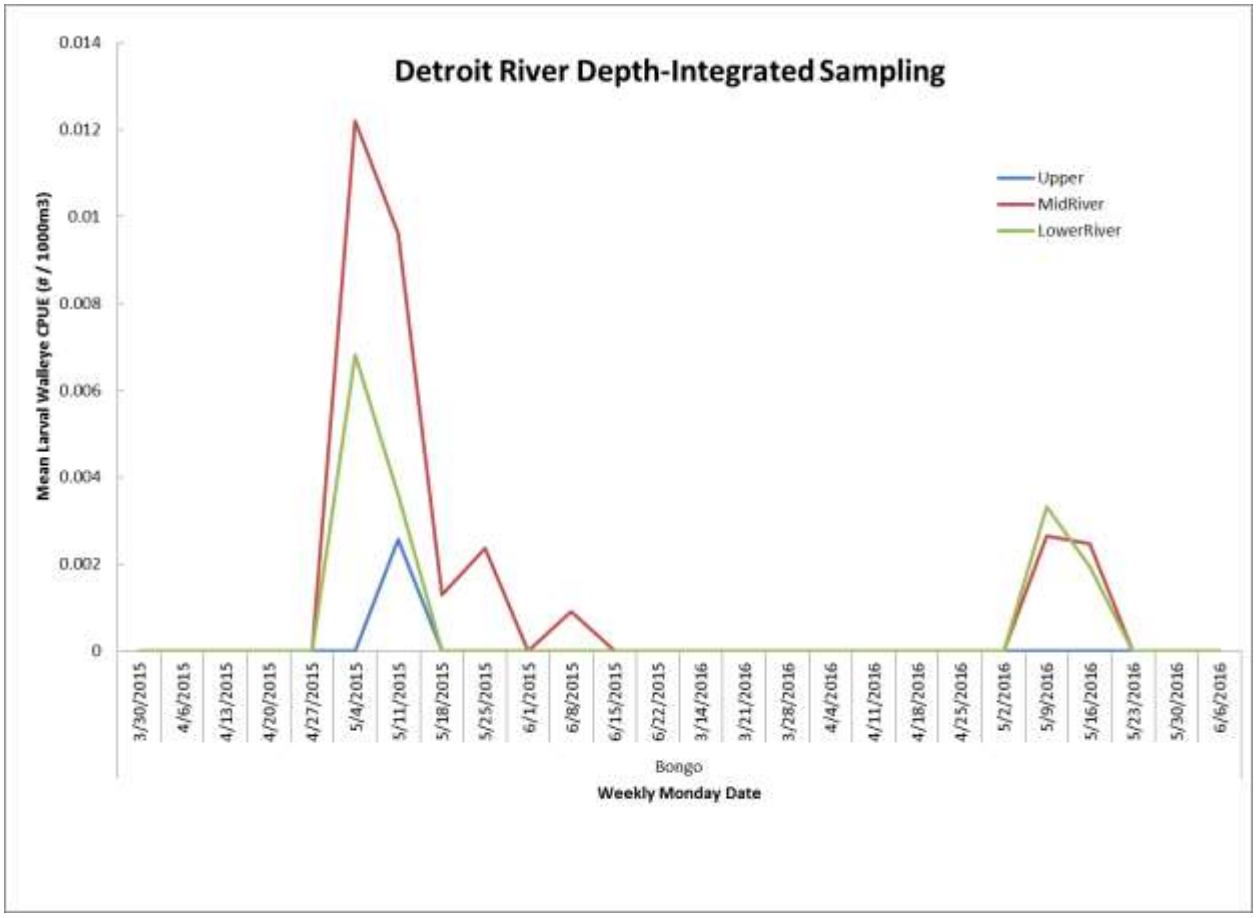
5/23/2016
5/30/2016
6/6/2016
Bongo
Weekly Monday Date


Detroit River Depth-Integrated Sampling
Mean Larval Walleye CPUE (# / 1000m3)
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
Upper
MidRiver
LowerRiver
3/30/2015
4/6/2015
4/13/2015
4/20/2015
4/27/2015
5/4/2015
5/11/2015
5/18/2015
5/25/2015
6/1/2015
6/8/2015
6/15/2015
6/22/2015
3/14/2016
3/21/2016
3/28/2016
4/4/2016
4/11/2016
4/18/2016
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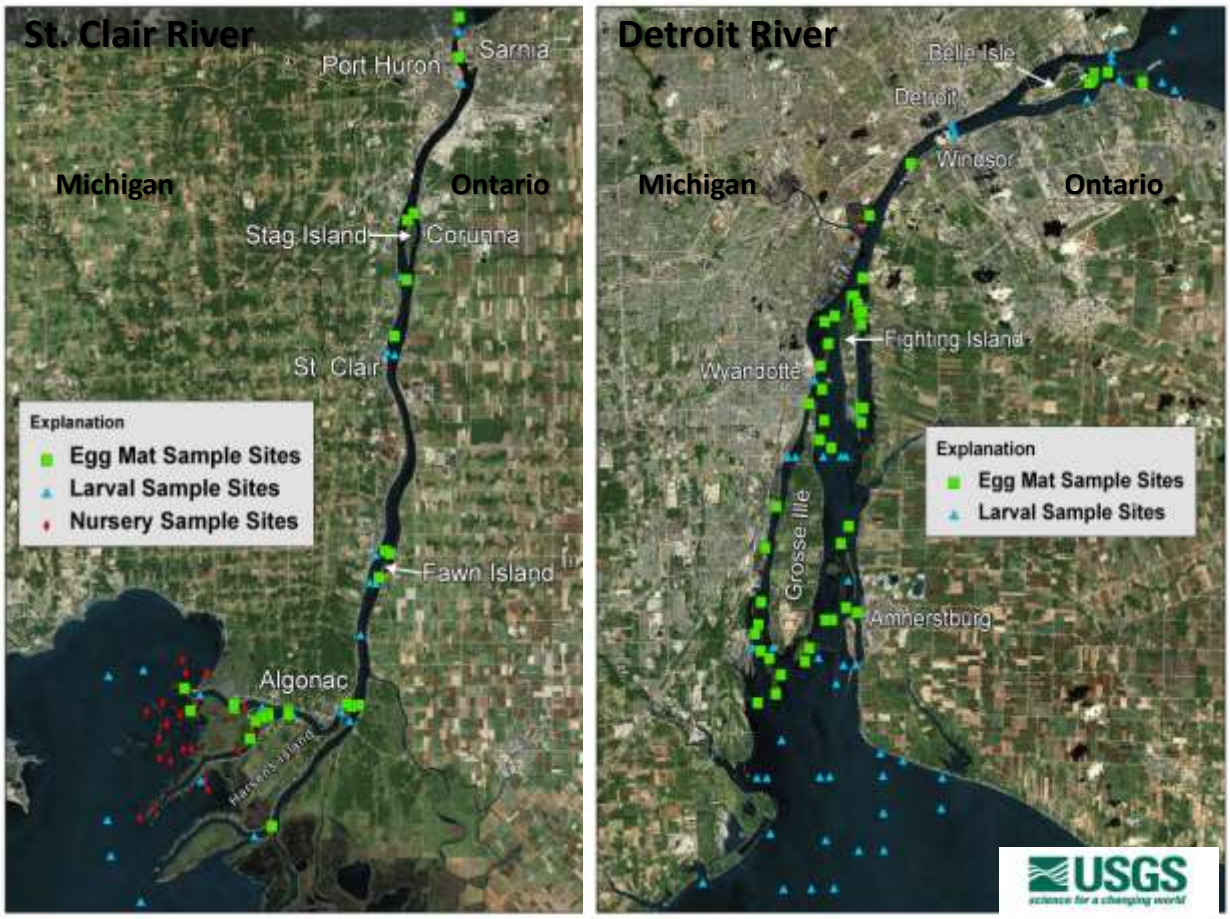
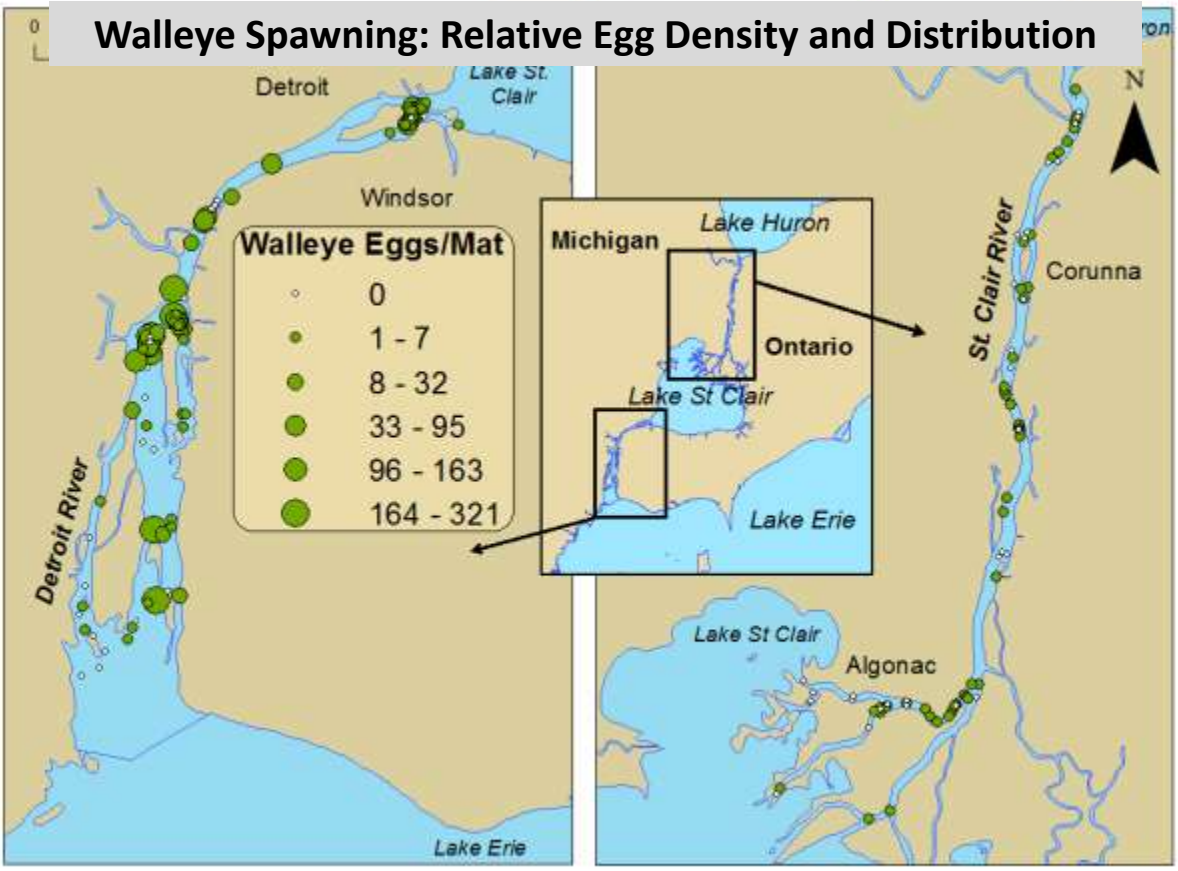
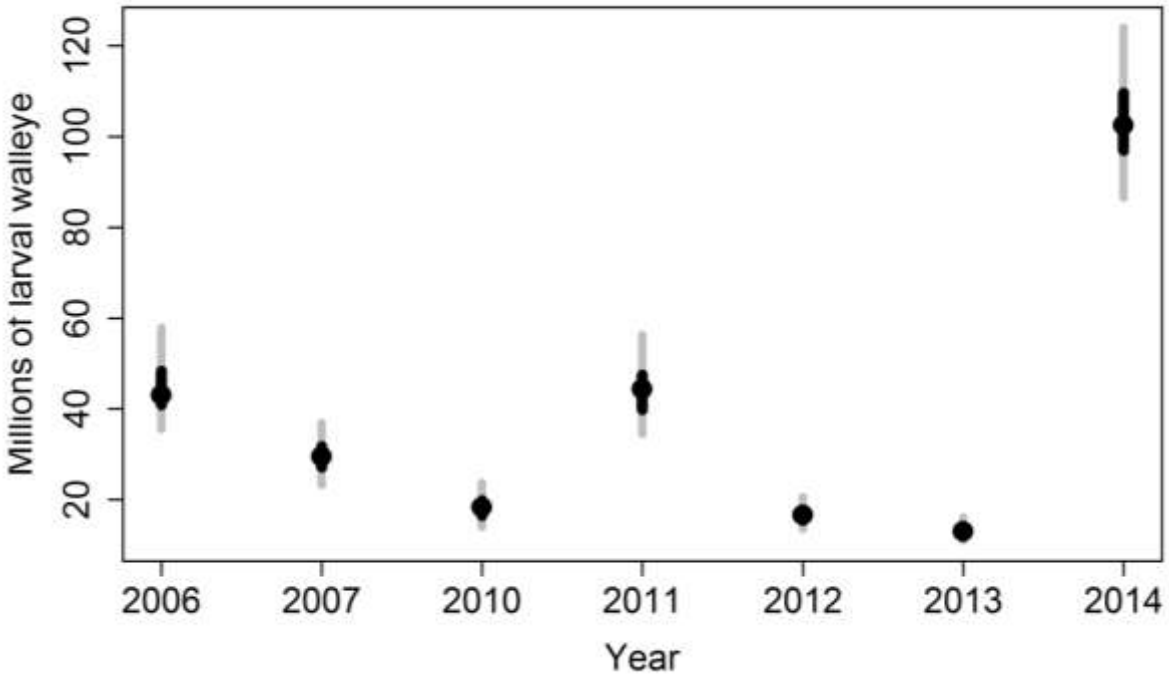
Weekly Monday Date



Sample site locations for past 6 years. Only DR will be sampled in 2017.



Relative collections of walleye eggs in SCR and DR. Much higher egg catches in the DR.



Results of Bayesian export model to estimate larval walleye production from DR. We are finalizing a manuscript for publication on this. Variable across years, we also have it broken down by channel for the lower river. Larval walleye production exported from the DR was estimated by Mark Dufour at U Toledo using Bayesian approach. Showed variability across years, but substantial contributions to the western Lake Erie population.

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Minnesota:

Minnesota Walleye update to AFS NCD WTC winter meeting

Feb 5, 2017
By Dale Logsdon

Stocking and production:

Limited ice and snow cover in recent years has reduced our ability to produce fingerlings. Minnesota relies heavily on natural wetlands (non-drainable ponds) to grow-out fingerlings but the lack of winterkill in recent year has allowed the fingerlings that evade harvest to survive over winter and cannibalize large

numbers of the next year-class of fry stocked into the ponds. As many of the "carry-over" fish are trapped out and stocked into fishing lakes as possible but either winterkill (unpredictable) or rotenone treatments (expensive) are needed to bring fingerling production back to previous levels.

2016 egg take:
4,772 quarts = 562,154,761 eggs
2016 stocking:
246,484,762 Fry
207,031 small fingerlings
1,628,019 large fingerlings
101,037 yearlings
71,640 adults

General:

We are continuing to evaluate stocking from a statewide perspective in an attempt maximize return to the angler while seeking potential efficiencies in our operations. To help managers make more informed and consistent stocking decisions, we have developed a set of standardized worksheet functions (WAEStock) to relate abundance, forage, and growth data to specific stocking events. We are also in the process of updating the guidelines in our Walleye stocking manual.

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. We are also reviewing our suite of special regulations (toolbox) to determine which were most effective and under what circumstances they should be applied.

Minnesota will be hosting the summer NCD WTC meeting July 18-20 on the shore of Mille Lacs at McQuoid's Inn, Isle MN. We plan to provide several case histories about the Walleye fishery on Mille Lacs and will try to arrange for participation, by either party boat or personal fishing boat, in the ongoing Walleye hooking mortality study there.

Large Lakes:

Mille Lacs - The no harvest restriction and night fishing ban in place or the 2016 open water season was relaxed during the 2016-2017 ice fishing season to allow harvest of one Walleye that must be either between 19" and 20" or larger than 26".

Lake Vermilion – The 18" to 26" protected slot limit was relaxed to a 20" to 26" protected slot beginning in the 2017 open water season.

Current research and recent publications:

Paul Venturelli (UofM) – A paper that uses Lester's biphasic growth model to predict age- and length-at-maturity solely from longitudinal length-at-age data is *in press* in Ecological Applications. A paper on water level effects on Walleye spawning habitat availability in Namakan Reservoir is also under review in Lake and Reservoir Management.

Tyler Ahrenstorff (MNDNR) - Bioenergetics of predator species in Mille Lacs

Tim Cross (MNDNR) –Influence of substrate characterization and water movement on spawning habitat

Dale Logsdon (MNDNR) - Impacts of Walleye stocking in lakes with Walleye egg-take operations.

Melissa Treml (MNDNR) - Population modeling on Mille Lacs

Steve Shroyer (MNDNR) - Assessment of fall electrofishing data

David Staples (MNDNR) - Mixed-effects year-class strength models

Loren Miller (MNDNR) - Persistence of a genetically distinct Walleye strain from the lower Mississippi River and tributaries (below Twin Cities), which accounts for most of the natural reproduction in multiple stocked southern Minnesota lakes. Also supporting development of very high-resolution genomic markers for Walleye with Wes Larson, USGS Co-op Unit, UW-Steven's Point

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

Tom Jones (MNDNR) - Hooking mortality in Mille Lacs

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. Also into the third year of a long-term tagging study of Walleye (and Northern Pike) in Elk Lake as part of the Section's Sentinel Lakes Program.

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Missouri

There is nothing major to report since the summer 2016 walleye/sauger report.

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Nebraska

State of Nebraska WTC Update, 2017

NGPC biologist Jordan Katt reported on an ongoing effort to elevate the long-term, sex-specific impacts of an experiential protected slot regulation on an important walleye broodstock lake. To estimate sex-specific survival, broodstock were tagged with VIA tags begging in 2015. Dorsal spines were also collected on a sub-sample of male and female broodstock in 2015 and 2016 to determine the age structure of the adult population. Growth curves show males are reaching the harvest slot (15") shortly after Age 3 and staying in the harvest slot (20") until Age 9. Females reach the harvest slot just before Age 3 and exit the slot around Age 5.
Brett Miller (MS student – UNK) in collaboration with NGPC is currently creating a standardized sampling protocol for age-0 white bass and age-0 walleye comparing three gear types across three months over two years on Harlan County Reservoir, Nebraska. Brett collected over 1,000 age-0 Walleye and over 6,000 age-0 White Bass over the two years of this project and is now analyzing data and writing his thesis.

Matthew Perrion (UNK) in collaboration with NGPC recently completed his MS degree which focused on early life-history characteristics of White Bass and Walleye within

Lake McConaughy, Nebraska. A total of 91% (81/89) and 89% (76/85) of collected Walleye were stocked in 2015 and 2016, respectively. Conversely, 92% (92/100) of White Bass were naturally produced within Lake McConaughy in 2015. Seasonally, Diptera spp. constituted a large proportion of juvenile White Bass and Walleye diets in the spring but decreased as the season progressed as White Bass and Walleye shifted to piscivory.

BJ Schall (UNK) completed his MS work on Lake McConaughy assessing dynamics and distribution of several species, including Walleye. Walleye had moderately fast growth and lived up to age 18, allowing for the production of trophy-sized individuals. Relative abundance of Walleye tended to be highest on the lower end of the reservoir, catch rates were lowest in the spring, and size structure was smallest in the fall.

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New York

State and Provincial Reports on Walleye/Sauger Fisheries – New York

Sauger Management
Sauger recovery continued in the Allegheny River watershed in 2016. Pond-raised sauger fingerlings were stocked in the Allegheny Reservoir in 2014 and 2015, but a generous contribution of 350,000 fry from the Kentucky Department of Fish and Wildlife allowed additional stocking throughout the upper Allegheny River watershed in 2016. Stocking consisted of 250,000 large fry (~3/8 inch) that were tank-raised for about 20 days on brine shrimp at NY's Chautauqua Hatchery, which were stocked in 5 river locations in late April and early May. Also, in late June, 3,250 pond-raised sauger fingerlings (1.5 inches) were stocked in the northern end of the Allegheny Reservoir. Follow-up surveys were limited due to drought conditions, especially in the upper watershed river sites. Fall daytime boat electrofishing in the reservoir resulted in a total catch of 26 sauger, including 9 YOY, in 2.6 hours of effort. All three year classes of stocked fish were collected and their lengths ranged from 7.3 inches to 17.5 inches. This stocking program will continue through 2018 and monitoring for spawning aggregations of sauger in the river will begin in the spring of 2017.

For more information on Sauger management in New York go to:
http://www.dec.ny.gov/outdoor/92788.html

Spatial Ecology and Migration of Adult Walleye in the Eastern Basin of Lake Erie
A study was initiated in the spring of 2015 to track walleye movements in Lake Erie. Walleye are known to move long distances in the lake and understanding how these

movements relate to fishing effort and harvest is essential to properly manage this complex, valuable, multi-jurisdictional fishery. Acoustic receivers have been deployed in the eastern basin of Lake Erie by New York State DEC to monitor the timing, magnitude, demographics, and spatial extent of migrating walleye tagged on western basin spawning areas by Ohio DNR. Additionally, acoustic transmitters have been surgically implanted into Walleyes from two eastern basin spawning aggregations (n = 106) to estimate spawning site fidelity, movement patterns of individual eastern basin spawning stocks, and exploitation rate. The relative contribution of eastern basin Walleyes to the mixed-origin fisheries in the eastern basin is being assessed by implanting acoustic tags in Walleye captured in the eastern basin mixed-fishery (n = 71). Acoustic receiver lines have been deployed in the open water of the eastern basin and on known spawning areas to monitor movement and spawning site fidelity. Existing acoustic receivers in the western and central basins allow detection of the westward movement of walleye tagged as part of this study.

Preliminary results from the first year of tracking include:

- A total of 39 tags have been returned by anglers and commercial fishermen.
- Exploitation was approximately 20% from each eastern basin stock tagged, compared to a previous estimate of 10% based on jaw tag returns.
- Approximately 10% of tagged western basin walleye migrated to the eastern basin.
- Individual western basin walleye stocks appeared in the east basin at the same proportions at which they were tagged, indicating that no western spawning stock had a higher propensity to migrate east.
- Walleye cannot be successfully tagged from depths greater than 10 meters due to barotrauma.

This study will run through 2019. For additional details on the study go to:
2015 Project Summary: http://www.dec.ny.gov/docs/fish_marine_pdf/2015lerpt.pdf
Project Website: http://data.glos.us/glatos/projects/32
Investigator Email: jason.robinson@dec.ny.gov

2015 Oneida Lake Walleye Population Update

Oneida Lake, at 50,000 acres, is the largest lake entirely within the borders of New York State and it supports the State's most popular walleye fishery. Researchers at the Cornell University Biological Field Station have been studying the lake's fish populations, with a focus on walleye, since 1956. It is the longest running warmwater fishery assessment in New York State. The walleye population is managed via annually stocking 150 million fry, special fishing regulations, cormorant hazing, and intensive monitoring of the population and fishery.

All stages of the walleye population are annually assessed: as larvae with Miller high-speed samplers; as juveniles in the spring, summer and fall with bottom trawls; and as juveniles, sub-adults and adults with gill nets in the summer, supported with mark-recapture for adult fish (age-4 and older) at regular intervals (currently every 3 years, last

conducted 2013). The fishery is assessed through annual access site creel surveys and full boat-roving creel surveys every 5 years.

The estimated adult (age 4 and older) walleye population abundance was 425,000 in 2015, which was a slight decrease from the 2014 estimate of 442,000, but well above the 2013 estimate of 360,000. The adult population abundance is influenced by relatively large 2010 year class recruiting into the fishery, making up about 30% of the population. Over the full course of the 58 year data series the adult walleye population has experienced a significant decrease, but has shown a significant increase since 2000 (Figure 1).

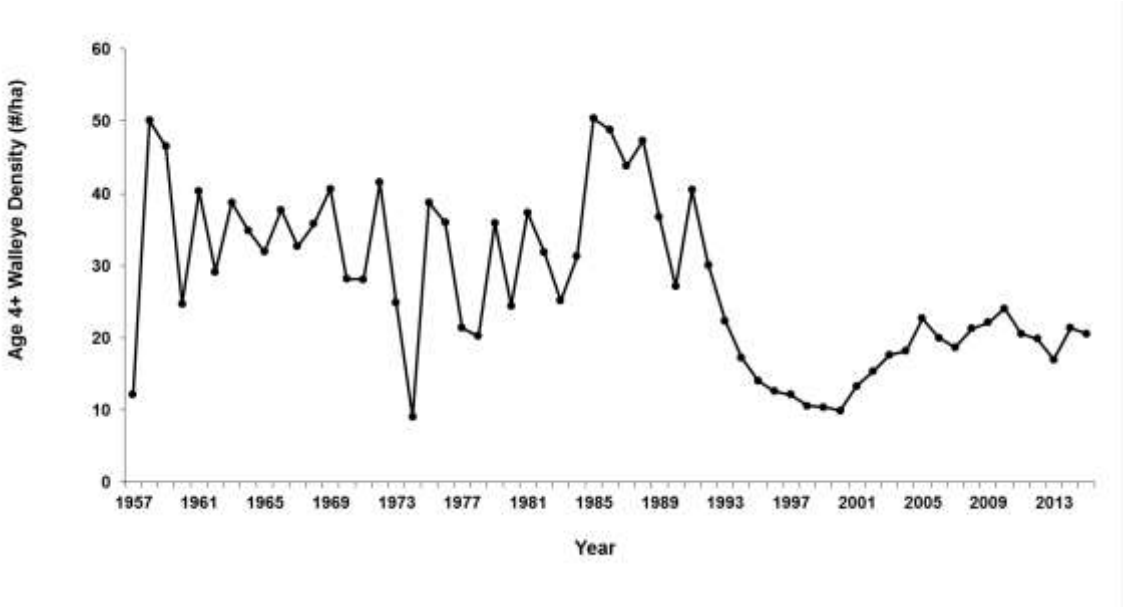

Figure 1. Density of adult walleye in Oneida Lake, New York, 1957-2015.

In 2015, an access site creel survey was conducted during June and July, which provides an accurate estimate of complete open water season walleye catch and harvest rates. Estimated fishing effort in 2015 was 232,928 boat hours, which continued a trend of increasing effort since 2002, with 2015 being the highest yet recorded. About 54% of anglers sought walleye specifically, while 30% sought only bass. The estimated walleye catch rate for June and July was 0.23/hour (a catch rate exceeding 0.25/hour is characteristic of an excellent fishery). The overall harvest rate was 0.13/hour. The estimated total harvest was 57,230 walleye, which was slightly less than the estimated total harvest of 60,192 in 2014 and 58,947 in 2013.

Round gobies were first confirmed in Oneida Lake in 2013, and by 2015 were the most abundant species in summer trawl surveys. If round goby follow the pattern observed in other systems, we would expect to see an expanding population over the next few years. Continued sampling should allow us to detect any responses in terms of fish diets, growth and angler catch rates.

For more detailed information on the Oneida Lake walleye population and other components of the monitoring program go to: http://www.dec.ny.gov/outdoor/41423.html

Swinging Bridge Reservoir Creel Survey

Swinging Bridge Reservoir is an 886 acre impoundment of the Mongaup River located in Sullivan County, in southeastern NY. It was first experimentally stocked with walleye in 1993, with successful wild recruitment first documented in 2000. A recreational fishery for walleye developed which attracted anglers from central New York and Pennsylvania. The walleye fishery had reportedly declined since 2005 when the reservoir suffered a partial dam failure and subsequent partial dewatering. A May – October 2014 open water season and February – March 2015 ice season creel survey was conducted with the objective of documenting the current condition of the fishery. The estimated total open water fishing pressure was 25,593 hours, including 15,508 hours from boats and 10,085 hours from the shore. The total estimated ice fishing effort was 896 hours. Walleye were targeted by 25% of the boat anglers, with 22% targeting black bass. Common carp were targeted by 32% of shore anglers. The open water catch consisted of 5,150 smallmouth bass, 4,726 black crappie, 683 walleye, 364 common carp, and 167 white perch, while the ice fishing catch was made up of 252 black crappie, 54 yellow perch, and 21 walleye. Open water targeted catch rates were 0.09/hour for walleye and 1.03/hour for black bass. Recommendations from this survey include the reestablishment of a walleye fingerling stocking program to enhance walleye population abundance, and further investigation of the white perch population through directed fisheries surveys.

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Ohio

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 2016 are currently being analyzed, and so a summary of the 2015 population assessment and fishery statistics are provided. A total of 2.713 million Walleye were harvested across Lake Erie, which included 1.325 million fish harvested by the sport fishery and 1.388 million fish harvested by the Ontario commercial fishery. Sport effort totaled 2.876 million angler hours, and harvest per unit effort was 0.43 Walleye/angler hour. Age-2+ population estimates for Walleye in the

western and central basins was 25.604 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://www.glfc.org/lakecom/lec/WTG_docs/annual_reports/WTG_report_2016.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; http://data.glos.us/glatos) continues to provide useful information on Lake Erie's walleye population. During 2016, an additional 158 walleye were tagged within Ohio's open-water reef complex and the Detroit River, bringing the total number of fish tagged during 2011–2016 to more than 1,000. 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 shown that males spend significantly more time on spawning grounds (either in tributaries or on open-water reefs) than do females, which is echoed in creel harvest estimates each spring where males typically make up 80% of the harvest. After spawning in the western basin, most tagged walleye (>90%) migrated into Lake Erie's central and eastern basins during 2014–2015. Fish moving into the eastern basin are of particular importance because this area is outside of the quota management zone, and exploitation of these walleye is not currently accounted for during the stock assessment and quota setting process.

Sauger Reintroduction Feasibility Study

The Ohio Department of Natural Resources is exploring the feasibility of reintroducing sauger to Lake Erie. Sauger were once part of the native fish community and supported important commercial and recreational fisheries in Lake Erie, but were extirpated during the last century due to a combination of overexploitation, habitat loss, and poor water quality. Reintroduction efforts previously occurred during the 1970s, when both fry and fingerlings were stocked in Sandusky Bay, but were unsuccessful.

A genetics study to determine a suitable source population for possible reintroduction has been completed. Archived samples of native sauger from Lake Erie were compared with contemporary sauger samples collected from across the species native range (i.e, Missouri, Ohio, and Ottawa rivers, Lake of the Woods, and Lake Winnebago). Results suggested that Lake Erie sauger are most closely related to Ohio River sauger.

Inland Walleye Stocking Evaluation

Three lakes located in northeastern Ohio were stocked with fry and fingerling walleye marked with OTC during 2012–2015 to estimate contributions to age-0 catches during fall electrofishing surveys. All three lakes have varying levels of natural reproduction, but not at a level to support these fisheries without stocking. Brief results

are presented below, with details results provided as a separate attachment. (see Walleye OTC Results from Three Ohio Lakes.pdf)

Mosquito Lake (7,241 acres) has historically been stocked with walleye fry (1/4") each spring. However, both fry and fingerling (1"+) walleye have been stocked at this lake since 2012 due to low fall (night-time) electrofishing catch rates (i.e., first year survival index) for walleye young-of-year for a few years prior to 2012. Overall, fingerling stockings have made a substantial contribution for three of the four years evaluated.

Berlin Lake (3,321 acres) has typically been stocked with walleye fry. This lake historically provided a higher percentage of walleye from natural reproduction compared with Mosquito Lake and Lake Milton (which is immediately downstream of Berlin Lake). Fry made a substantial contribution to young-of-year numbers in all years studied (2012-2015); natural reproduction also provided a substantial contribution in all years except for 2013.

Lake Milton (1,671 acres) has typically been stocked with walleye fingerlings, which made up a substantial portion of the young-of-year sampled from 2012 to 2015; natural reproduction only made a substantial contribution to young-of-year catches in 2012.

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Oregon

2016 Oregon Walleye Report to the WTC

prepared by Gary Galovich
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ODFW has not provided a report to the WTC in recent years, so some background on walleye and their management in Oregon may be helpful.

Walleye are not native to Oregon and their distribution is limited. They are found primarily in the mainstem Columbia River from the lower reaches upstream to the Oregon-Washington border above McNary Dam, a distance of approximately 300 river miles co-managed as a border water with the State of Washington. The river along much of this length is more a series of large reservoirs beginning with Lake Wallula on the upstream end above McNary Dam, then downstream to Lake Umatilla above John Day Dam, Lake Celilo behind The Dalles Dam, and then the final impoundment above Bonneville Dam. Below Bonneville Dam the river is free-flowing but tidally influenced

for the remaining 145 miles. Walleye are also found in the lower 26 miles of the Willamette River below Willamette Falls and through the City of Portland to where it joins Columbia River. Walleye are occasionally found in the Willamette River above the falls, but only infrequently. An isolated population that has drawn the attention of some anglers has recently appeared further up in the Willamette River Basin at Lookout Point Reservoir, but it's very likely the result of an illegal introduction and it's not yet known if it will persist.

Active management for walleye in these waters is constrained by concerns for native fish including federally listed stocks of salmon and steelhead towards which Oregon and Washington along with the federal government, the Columbia River tribes, and a variety of other river and fish management interests and entities have dedicated significant resources for conservation and recovery. As a result, in 2016 the states of Oregon and Washington jointly removed all size and bag restrictions for walleye in the Columbia River. This regulatory change, however, is expected to have little effect on the walleye population or on the angling behavior of most walleye anglers.

In the lower Willamette River, the size and bag limits for walleye remain in place with a focus on protecting the larger fish to provide a quality fishery while encouraging harvest on the more abundant smaller walleye that have also been shown to be more predaceous on juvenile salmonids.

Despite this limited distribution and the competing management priorities, Oregon continues to provide an outstanding angling opportunity for walleye. The Columbia River fishery has for many years been well known and revered for its record-size fish. The current Washington State record of 20.32 pounds was caught February 28, 2014, in the Columbia River above McNary Dam, an area of open water that carries into Oregon. Oregon's current state record fish of just under 20 pounds was also caught in the Columbia River, but further downstream near John Day Dam and many expect the river to produce still larger fish. Lake Umatilla - or what is often referred to as the John Day pool - is a popular location for walleye tournaments, though higher catch rates are often measured downstream in The Dalles and Bonneville pools. Two-day events held in 2016 in the John Day pool saw average fish weights of over 3 pounds and were won with collective team weights of more than 70 pounds with the "big fish" caught approaching or exceeding 13 pounds.

Though not often a tournament destination, the lower Willamette River fishery is growing in popularity. During the past several years anglers have reported increasingly consistent catches and of larger fish, particularly in the Multnomah Channel area near Sauvie Island.

Because Oregon's walleye fisheries are almost exclusively found on two of the state's largest and more difficult to effectively sample rivers, ODFW efforts to directly monitor them are limited. Much of the walleye data is collected incidental to other sampling efforts that target northern pikeminnow, smallmouth bass, or other species. In

addition, ODFW tracks angler and tournament angler catch, and warmwater and walleye-specific angling groups regularly post or provide catch information.

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Pennsylvania:

2016 Update – Pennsylvania Walleye

Inland Walleye populations within Pennsylvania are receiving greater assessment attention, especially where stocking is taking place as guided by a recently prepared "Plan for Management of Pennsylvania's Inland Walleye Fisheries" (2011). The initial focus of the plan is to insure that cultured Walleye are contributing to angler catch by measuring contributions of cultured and marked Walleye to assessment catch and/or assessing change in assessment catch rate following experimental cessation of stocking in rivers and large warmwater streams. To insure cost effective use of cultured fish, in those waters where stocking is contributing to the assessment catch; assessment catch rates must meet minimum catch rate benchmarks for Walleye stocking to continue. In reservoirs and lakes where Walleye fingerling stocking is taking place and where Walleye assessment catch rates are low, not meeting plan benchmarks, waters have been removed from the Walleye stocking program. In some reservoirs, to more concisely measure contribution of stocked Walleye life-stages to assessment catch rate, marked fish stocking is taking place. In those reservoirs, follow-up assessments are ongoing. With respect to experimental stocking cessation, beginning in 2008, Walleye stocking cessation occurred on most all Pennsylvania river sections previously stocked with fry and/or fingerling. Walleye assessment catch rate measurement continued following cessation and in many cases mimics pre-cessation sampling catch rate. On many river sections changes in assessment catch rate benchmarks were met, with Walleye population maintenance relying solely upon natural recruitment. On several river sections, changes in assessment catch rates did not meet plan benchmarks whereas, during stocking periods, had met benchmarks. Changes in catch rate on these river sections were sufficient to cause fishery managers to request resumption of Walleye stocking. Thus stocking in a small number of river and stream reaches has resumed. In those rivers and streams only marked life-stages are permitted to be stocked. Follow-up assessments including marking efficacy assessment, mark detection techniques, and other stocking and assessment measures are being refined with all work on-going in both reservoirs and rivers/streams. A summary of river Walleye stocking cessation sampling results through 2014 are available in: a Walleye Plan Update 2014; future updates are planned as meaningful assessment measures are assembled. Quantitative updates are not available for 2016.

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South Dakota

South Dakota WTC update
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Statewide/ North Eastern SD regulation changes

Walleye 15-inch minimum length limit

Staff meetings have occurred in the last year to discuss the future of the 15-inch minimum length limit for walleyes in eastern South Dakota waters. Because the 15-inch minimum currently appears to be of little benefit there will likely be a push to remove the regulation in 2 years when regulation changes will next be proposed by the South Dakota Department of Game, Fish and Parks Commission. Plans are to educate anglers about the successes, failures, or indifferences of the 15-inch minimum length limit in eastern South Dakota over the next 2 years.

In 2016, the 15-inch minimum length limit for walleye was removed from Bitter Lake and Cattail-Kettle Lake. The Bitter Lake regulation was removed because of slowed walleye growth and an abundance of small walleyes. Walleye numbers are extremely low in Cattail-Kettle Lake and the minimum length limit was having little impact because few walleyes were being caught. The walleye 15-inch minimum length limit at Campbell Slough was removed in 2017 because the lake has poor angler access.

High-grading

High-grading is now allowed on South Dakota/Minnesota border waters for all fish species, except walleyes. Anglers fishing South Dakota/Minnesota border waters that are licensed in South Dakota are now allowed to high-grade all species but walleyes. This change makes the high grading rule for South Dakota anglers the same on both border and inland waters.

Spearing

The South Dakota spearing season for game fish will now begin on May 1 and remain open until March 31; hours are now a half hour before sunrise to sunset. Several eastern South Dakota waters will now be open to spearing of all game fish species, including walleyes. Eastern South Dakota lakes where all game fish can now be speared include: Waubay and Bitter lakes in Day County; Swan and Dry Lake #2 in Clark County; and Albert, Henry, Thompson, and Whitewood lakes in Kingsbury County. These are the only waters where all game species can be speared in eastern South Dakota lakes. In South Dakota, spearing includes the use of spears, spear guns, bow and arrows and crossbows; spearing may occur from above water (e.g., dark house spearing) or underwater (e.g., scuba diving).

Fish cleaning and possession on the ice

The number of anglers that spend the night or several nights on the ice in hard-sided wheeled ice shacks has increased. A problem anglers that spend extended periods on the ice have encountered is how to possess more than a single day's limit while on the ice. Also many anglers have wanted to clean their fish before leaving the lake or some have wanted to cook fish while on the ice; both of these activities have been illegal in South Dakota.

Anglers can now have a possession limit of fish while on the ice. Although anglers will be able to have a possession limit on the ice, they must still comply with daily limits. In South Dakota, the possession limit is twice the statewide daily limit. Thus, for an angler to possess eight walleyes while on the ice they will need to have fished for a minimum of 2 days on most lakes since the statewide daily limit is four walleyes.

Cleaning and possessing cleaned fish while on the ice also became legal on January 1, except for those species on lakes where species specific regulations are in effect. For example, anglers fishing Bitter Lake will be able to clean all fish species that they catch because there are no lake specific regulations in place at Bitter Lake. However, anglers fishing at Lake Poinsett will not be allowed to have cleaned walleyes while on the ice as there currently is a 15-inch walleye minimum length limit in effect at lake Poinsett; all other fish species can be cleaned while on the ice at Lake Poinsett since there are no other lake specific regulations. The one walleye over 20 inches regulation is a statewide regulation and not a lake-specific regulation.

The transportation rule that cleaned fish must be readily countable still applies to fish cleaned on the ice. Anglers need to package cleaned fish so that they are easy to count, this will make compliance checks with Conservation Officers easier for both officers and anglers. Anglers that are freezing cleaned fish will need to package them individually; two fillets equal one fish.

South Eastern South Dakota

Adult yellow perch and juvenile walleyes netted from lakes prone to winterkill provided some additional fishing opportunity for a few lakes near Sioux Falls. These lakes have high angler use and require regular stockings to maintain their fisheries. Juvenile walleyes (1-3 fish/lb.) were stocked at 2-13 fish/acre into three lakes in 2015 and five lakes in 2016. Yellow perch (1.5-4.0 fish/lb.) were stocked into Scott Lake (60 fish/acre) in 2015 and four lakes (10-27 fish/acre) in 2016. A total of 10,373 walleyes and 28,588 yellow perch were stocked over the 2-year period.

A "mini creel survey" of boat and shore anglers was conducted at Scott Lake (103 acres) in November and December of 2015 to evaluate the fishery created by the fall yellow perch stocking. Fishing pressure was estimated at 5,300 hours (50 hours/acre) and anglers made about 1,725 fishing trips during the 2-month period. The economic benefit from this stocking was estimated at $43,000 based upon an expenditure of $25 per angler trip. Cost of the stocked yellow perch was about $6,000.

Scott Lake and Lake Alvin, both stocked with juvenile walleyes, are being surveyed in 2016 as part of a South Dakota State University economics study. Study estimates of angler use, catch, harvest, return of stocked fish, satisfaction, and expenditures as well as the economic impact and value of these fisheries will help us to better evaluate these adult fish stockings.

South Central South Dakota

SDGF&P collaborated with Nebraska Game and Parks to stock Lake Lewis and Clark, the southernmost Missouri River reservoir. Approximately14 million walleye fry were stocked by NG&P and 1.4 million walleye fingerlings were stocked by SDGF&P. All stocked walleye were OTC marked for later stock evaluations. Fall 2016 age-0 walleye surveys in Lake Lewis and Clark sampled 294 age-0 walleyes. Of those, 53% were stocked as fingerlings, 39% were naturally produced and 7% were stocked as fry. Marked age-0 walleye were also sampled below Gavins Point Dam suggesting entrainment occurred. Of the 60 age-0 walleye sampled below Gavins Point Dam (hence – below Lake Lewis and Clark), 47% were stocked in Lake Lewis and Clark as fingerlings, 33% were naturally produced, and 18% were stocked in Lake Lewis and Clark as fry.

Texas:

Texas Walleye Report

The walleye population in our primary walleye fishery, Meredith Reservoir, was extirpated during golden alga, *Prymnesium parvum*, blooms. The blooms were precipitated by high chloride levels due to extreme drought conditions. The reservoir had lost over 60 feet of elevation since 2000. The reservoir has regained about 30 feet of water level and the chloride concentration has declined to where we have not had a golden alga bloom in the past two winters. Since conditions had improved, walleye were stocked last spring and are scheduled to be stocked again this spring in an attempt to re-establish the population. Stocking will depend on whether golden alga blooms are detected this winter.

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Utah:

Management of Walleye in Utah

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Distribution

Currently, Walleye are present in 8 lentic systems statewide: Deer Creek, Yuba, Starvation, Big Sandwash, Willard Bay and Echo reservoirs, Utah Lake, and Lake Powell. Of these waters, only Deer Creek, Starvation, and Willard Bay reservoirs, and Lake Powell are actively managed as Walleye fisheries. Walleye at Yuba, Big Sandwash, and Echo reservoirs are viewed as unwanted or unmanageable populations and control or eradication (e.g., piscicide application) measures are being sought to address these populations. Because Utah Lake is home to the June Sucker, a recovery species, the Walleye population at Utah Lake is unwanted. However, the presence of June Sucker in this system, and the size of the system, limits the effectiveness of Walleye control measures that might be employed and makes chemical treatment impossible.
In addition to lentic populations, Utah maintains lotic populations of Walleye in both the Upper and Lower Colorado River drainages. These populations are believed to have been established by upstream or downstream escapement of fertile Walleye from existing lentic systems in these drainages. The impacts of these lotic populations of Walleye and other species of predators continue to hamper efforts to recover Colorado River Pikeminnow, Bonytail, Humpback Chub, and Razorback Sucker.

Management planning

Management planning is seen as critical to preventing the future illegal transport and stocking of impactful species like Walleye. However, Utah's angling public continues to express a desire for diversity in their fisheries and an increased interest in fishing for coolwater and warmwater species like Walleye. The Utah Division of Wildlife Resources (UDWR) is therefore pursuing management of impactful, yet desired, fish species using a multifaceted approach. First, illegal introductions are no longer greeted with a shift to management of the newly established population; a response that historically rewarded and even promoted illegal introductions. Regulations for catch and harvest of illegally introduced populations are now designed to undermine the motivations of interested anglers. For example, at a water where an illegal Yellow Perch introduction has occurred, UDWR pursues implementation of a regulation that does not allow harvest of fish prized by anglers for their edibility. The UDWR is also starting a program to produce sterile Walleye; inducing triploidy using techniques established by Idaho fisheries professionals. These sterile Walleye will be used to meet angler demand by creating low impact Walleye fisheries (i.e., develop populations that minimize the risk of predation on native fishes in the event of escapement and minimize the risk of new populations being established as a result of "bucket biology"). By addressing the needs of anglers proactively with less impactful analogs of the desired fishing opportunities, the UDWR believes that it can forestall illegal transport activities. Additionally, at Big Sand Wash and Rifle Gap reservoirs, UDWR is partnering with Colorado Department of Wildlife and Utah State University to investigate the efficacy of swamping fertile Walleye populations using Walleye with triploidy induction rates of 95% or greater to address unwanted Walleye populations in systems where chemical eradication might be infeasible or undesirable. The UDWR is also pursuing outlet screening to prevent escapement from its reservoirs.

Treatment

Previously, Walleye were illegally introduced to Red Fleet Reservoir. As a result Utah Division of Wildlife chemically treated Red Fleet Reservoir in 2015. Prior to the treatment of Red Fleet, a management team was established to discuss what the Red Fleet Reservoir fishery should look like post treatment. The team, made up of angling interests and regional stakeholders, concluded that a Walleye fishery was still desired if it could be established in a manner that was sustainable (i.e., in a manner that did not result in an apex predator outstripping its newly established forage resources) and not impactful to downstream native species. The team decided that a 100% sterile Walleye population, combined with outlet screening, would address the needs of all stakeholders; including members of the FWS responsible for oversight of the Upper Colorado Recovery Program. After treatment, forage species were introduced in a stepwise fashion along with 100% sterile Walleye fry produced from Willard Bay Reservoir fish.

Culture

During spring 2017, UDWR plans to continue its efforts to produce 100% sterile Walleye by collecting and spawning fish from Willard Bay Reservoir and using pressure chambers to induce triploidy. In addition to meeting needs for sterile fish at Utah waters, Utah plans to share sterile fry with adjacent western states (e.g., Colorado); assisting them with their efforts to reduce the impacts of Walleye.

Research

As mentioned previously, efforts to perfect the induction of triploidy to produce 100% sterile Walleye are underway in Utah. Additionally, UDWR and other partners have committed to funding a 5-year study at Utah State University to assess whether stocking sterile Walleye in waters where established fertile Walleye populations persist will minimize the reproductive success of these fertile Walleye populations. The UDWR is also partnering with the Upper Colorado River Recovery Program to begin tracking Walleye escapement from Lake Powell into the Colorado River.

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West Virginia:

West Virginia State 2016 Walleye Report to the WTC

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The West Virginia Division of Natural Resources - Wildlife Resources Section (DNR-WRS) manages walleye (*Sander vitreus*) in several rivers, small impoundments, and reservoirs. The walleye fishery in West Virginia is maintained by stocking efforts or

natural reproduction. Historically, DNR-WRS focused on stocking of Great Lake strain of walleye as the primary management strategy and liberal angling regulations were in place. Genetic analysis identified a strain of walleye, the Eastern Highlands walleye, native to the Ohio River basin that is thought to be adapted to riverine conditions (White 2013; Zipfel 2006; Palmer 1999). Interest by DNR-WRS and the angling public concerning native walleye populations and the management of this river dwelling fish began in the early 2000's. DNR-WRS staff began a series of investigations focusing on providing information to aid in managing walleye. As a result of these investigations, watershed based regulations were adopted in 2016 to help improve West Virginia walleye fisheries. Currently, effort is being placed on the collection of broodstock, propagation, stocking, and distribution of the Eastern Highlands walleye in West Virginia.

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Wyoming:

Wyoming Update to the Walleye Technical Committee
North Central Division, American Fisheries Society
Midwest Fish and Wildlife Conference
Lincoln, NE
February 5th-8th, 2017

Compiled by Paul Gerrity and Gordon Edwards
Wyoming Game and Fish Department

Current Fishing Regulations

See the 2016 Wyoming report for a detailed description of pertinent Walleye and Sauger regulations in the state.

The only major change since last year was a new regulation effective January 1, 2017 at the Miracle Mile reach of the North Platte River (which is upstream of Pathfinder Reservoir) allowing harvest of 12 Walleye per day/in possession – up from 6.

Walleye

Tournaments

See the 2016 Wyoming report for a detailed description of the Walleye tournament scene and related rules, regulations, and research. Growing interest by tournament organizers in "card" or "chip" tournaments has been notable during recent years in Wyoming. These tournaments allow anglers to "weigh-in" fish using photos taken with a unique item placed in the picture to verify authenticity. Due to the "immediate" release of walleye, these tournaments are approved any time of year. Tournament anglers give up the traditional or progressive live release format advantages (accurate weights, showing off their fish) but can fish longer, catch more fish, and do not have to transport fish to a central or roving weigh-in location.

Fisheries Biologist Gordon Edwards in Casper continued surface water temperature monitoring in Wyoming during 2016 and expanded the effort to all major Walleye tournament reservoirs. These include Keyhole, Boysen, Pathfinder, and Glendo. Data review is in progress and will inform potential changes to rules and regulations.

In addition, Fisheries Biologist Andrew Nikirk in Sheridan accompanied tournament organizers to observe and document procedures at many major tournaments across the state. His recommendations will further help review tournament rules and regulations. In addition, his presence was positive and helped improve relationships with the Walleye tournament community in the state.

Casper Region

Seminoe, Pathfinder, & Alcova reservoirs

See the 2016 Wyoming report for detailed management activities on these waters. No notable Walleye population changes occurred since last year.

A proposal to increase the daily/possession limit of Walleye from 6 to 12 at Pathfinder Reservoir generated significant negative feedback from well-organized Walleye anglers, and was not moved forward for the reservoir. However, the regulation was approved for the Miracle Mile reach of the North Platte River upstream of the reservoir. Trout anglers and casual anglers served by the trout fishery did not generate nearly the level of input on the proposal as Walleye anglers, even though creel survey data shows they collectively dominate the constituency here 2:1. The management balancing act continues between trout and Walleye fisheries at all these reservoirs on the upper North Platte River in central Wyoming.

The Casper Fish Management Crew worked with the Culture Section, and Speas Fish Hatchery in particular, to modify stocking requests for the upper North Platte reservoirs in fall 2016. Fewer, but larger catchable Rainbow Trout were stocked. The target size was 10 inches. Hopefully these larger fish will better outpace the Walleye populations and trout fishing will improve.

A comprehensive creel census at Pathfinder Reservoir and programmed survey at the Miracle Mile will occur from January through August 2017 to update previous reports from 1996 and 2009, respectively.

Glendo Reservoir

The abundance of Walleye at Glendo Reservoir rebounded substantially in 2016 (1.73 fish/h) compared to the five-year low in 2015 (0.74 fish/hour), but was still far from the most recent peak in 2011 (2.70 fish/hour). The number of small, age-2 and age-3 fish appeared to improve in 2016. The wild Walleye population at Glendo is not supplemented with stocking and appears to be rebuilding from several years of weak natural recruitment. Declines in Walleye abundance are somewhat cyclic at Glendo but have been short-lived. A single strong age-class can arise from optimum late spring reservoir elevation and ample forage abundance to carry the fishery for several years.

One factor that likely diminished Glendo's Walleye population was the near nearly complete die-off of Gizzard Shad over the winter of 2014-2015. Gizzard Shad overwinter at Glendo in high enough numbers during about nine out of ten winters to allow adequate repopulation and forage production the following spring. During 2015 and 2016, Wyoming Game and Fish collaborated with Nebraska Game and Parks to import adult Gizzard Shad from Nebraska to reestablish this population as well as at Keyhole Reservoir in northeast Wyoming. Juvenile shad appeared very abundant by late summer at both reservoirs during both years. The reliance on this key forage species for high fishing quality in Wyoming waters underpins the importance of good relationships with our neighboring states. Thank you North Platte boys!

Andrew Nikirk, Wyoming Game and Fish Department, holds a "keeper" gizzard shad while Caleb Huber and Jared Lorensen, Nebraska Game and Parks, pilot the ship at Lake Maloney, NE in 2015. Gordon Edwards manned the camera.

Laramie Region

Grayrocks Reservoir, when full, is 4,250 surface acres. It is a Wyoming Game and Fish Department Public Access Area. The reservoir is owned and operated by Basin Electric Power Coop, Laramie River Station and provides cooling water for the power plant. Water rights for the power plant are very junior. The reservoir only receives water in

good snowpack years after other water user's water rights have been fulfilled. Water levels were stable in the 1980s and 1990s and a popular cool water fishery thrived. The long drought that began in 2000 severely impacted the fishery and few anglers used the reservoir. Refilling started in 2009 and the fishery began to recover. Grayrocks Reservoir is once again a popular Walleye, Black Crappie and Smallmouth Bass fishery. Use of the reservoir has increased dramatically since water levels improved. The reservoir is managed as a Put and Grow Walleye fishery with 400,000 Walleye fingerlings stocked

On June 13, 2015 an angler road block was conducted where fisheries biologists obtained creel information and game wardens checked compliance with AIS, boating and fishing regulations. Spot creel interviews were obtained from 132 anglers. A disturbing result was that three citations were issued for transporting live game fish in boat live wells. The catch rate for all anglers and species was 1.20 fish per hour and a $PAS_{0.5} = 63$. Boat anglers caught mostly Walleye with a CPUE of 1.20 fish per hour. Eighty one percent of the anglers were targeting Walleye.

Standard annual sampling was conducted in September 2015. Walleye sinking gillnet CPUE has increased annually since reservoir water levels started to improve in 2006 and are now at their highest levels in the last 16 years (3.80 CPUE). The mean length of Walleye captured by sinking gillnets met the objective of ≥ 15 inches. The percentage of fish reaching RSD-Q (40) in 2015 was less than in 2014 sampling and falls short of the objective of RSD-Q = 60. The shortfall of RSD-Q fish may be related to the failure to stock fingerling Walleye in 2013.

Lander Region

Boysen Reservoir is located in central Wyoming and is known as one of Wyoming's top Walleye fisheries. It claims the current state record at 17.42 pounds, which was caught in 1991. The state creel/possession limit of 6 Walleyes applies to Boysen. It receives low to moderate fishing pressure, and annual mortalities ranged from 18% to 22% since 2009. The fishery is maintained by erratic natural recruitment; however, strong year-classes occur often enough to provide a good fishery. Fisheries managers are also reluctant to stock Walleyes to reduce the threat of hybridization with a genetically-pure Sauger population. Temporal differences in spawning likely prevents hybridization between the two species, as Walleyes spawn in mid-to late-April and Saugers spawn in late-May to early-June. The near-future of Walleye fishing at Boysen Reservoir is bright, as strong 2011, 2014, and 2015 year-classes currently exist in the reservoir.

Ocean Lake is located approximately 20 miles west of Boysen Reservoir, and provides a good local walleye fishery. It receives low fishing pressure because of its remote location and proximity to Boysen Reservoir, which is a superior Walleye fishery. The state creel/possession limit of 6 Walleyes applies to Ocean Lake. Ocean Lake's water supply comes from irrigation return-flow drains, which dump high loads of silt into the lake. The fishery is maintained through annual stocking because a large amount of silt covers the lake bottom inhibits Walleye natural reproduction. The near-future of Walleye

fishing at Ocean Lake is bright. Netting in 2016 produced a high Walleye catch rate, with most of the catch composed of age-1 and -2 fish.

Cody Region

In 2016 the Cody Fisheries Management Crew, Wyoming Game and Fish Department, began an investigation with Daniel Kaus, and his graduate adviser, Christopher Guy, at Montana State University to determine the feasibility of the suppressing illegally introduced walleye in Buffalo Bill Reservoir thereby reducing predation on the popular rainbow and cutthroat trout fishery. Several gear types, including gillnets, trapnets, night electrofishing, and angler exploitation, were deployed to determine gear efficacy and will be used as components of an instantaneous fishing mortality rate. Mark-recapture population estimates were conducted for different segments of the walleye population to determine the abundance of walleye in the reservoir. Over 500 walleye were released with reward tags to determine angler exploitation of the walleye population. Future work will entail the development of age-structured population models used to simulate Walleye population dynamics under various suppression scenarios with the potential cost per effort of each gear type.

Sauger

Wind River drainage

Annual electrofishing population estimates are used to monitor Saugers within lotic portions of the drainage, and annual gill netting is used to monitor Saugers within Boysen Reservoir. Population estimates showed a 73% decline in age-1 and older Saugers from 2002 to 2011, and gill net catch rate declined by 96% from 2001 to 2011. Sauger harvest is low throughout the drainage. Recent annual mortality estimates ranged from 10% to 15%. The decline in the Sauger population was caused by a lack of natural recruitment. Low-water years throughout the early 2000s combined with irrigation-caused dewatering dried up known nursery areas within the Wind River and Boysen Reservoir throughout the decade-long period. Low-water levels may have also increased water temperatures to levels unsuitable for natural reproduction.

Annual supplemental stocking operations commenced in 2013 and concluded in 2016. The operations included collecting wild adults, spawning them streamside, hatching the eggs and raising fish in a hatchery system, and stocking fingerlings and advance-fingerlings back into Wind River drainage waters. From 2013 to 2016 approximately 719,000 fingerling or advance-fingerling Saugers were stocked throughout the drainage.

Sauger numbers have recently increased, particularly within the lotic portion of the drainage. Estimated number of Saugers within the river system in 2016 was 95% of 2002 numbers, but Boysen Reservoir catch rate was only 30% of the mean 1993 - 2002 catch rate. Good water years in 2011 and 2014 - 2016 provided good spawning conditions and abundant nursery habitat and resulted in strong year-classes. The 2014 - 2016 year-classes were also supplemented by stocked fish. Evaluation of the contribution of stocked fish to the 2013 – 2016 year classes is ongoing.

Fisheries Technician Jake Werner with a large sauger captured during 2016 electrofishing on the Little Wind River.

North Platte River Drainage

The outlook looks good for a trial stocking of Sauger in the River between the town of Glenrock and Glendo Reservoir in 2017. Sauger were extirpated from the North Platte River near Casper during the latter half of the 20th century. Interest has grown in reestablishing them to this reach of river to provide sport fishing opportunities where little currently exists. The Wyoming Game and Fish Department's Culture Section is working with Nebraska Game and Parks to acquire Sauger fry from the lower North Platte River system. Rearing space previously allocated to the Wind/Bighorn supplement program is now available at the Garrison National Fish Hatchery in North Dakota.