# Indiana ETC Update

Nick Haunert

## Learn to Fish for Muskie Workshop

The Indiana Department of Natural Resources (IDNR) held its first Learn to Fish for Muskie Workshop on October 12, 2019. A total of 21 participants attended the 3 hour classroom based workshop at Fort Harrison State Park. The Learn to Fish Muskie workshop was designed to teach beginners the skills needed to Muskie fish on their own. Participants were taught about Muskie biology, handling, fishing tackle, seasonal fishing techniques, and where they can fish for Muskie in Indiana.

## Muskellunge Egg Collection

In April of 2019, the IDNR collected over 350,000 eggs from Muskellunge in Lake Webster. A total of 23 females were stripped that ranged in size from 31.6 inches to 43.8 inches and a total of 43 males were used that ranged from 28.2 inches to 37.5 inches in length. East Fork State Fish Hatchery reported an 84% hatch rate resulting in an estimated total of 317,200 fry. All 12 Indiana Muskellunge Program lakes received their full requested stocking rates (15,394 fingerlings total).

## Targeted Muskellunge Surveys

Objective: Monitor the status of glacial lake Muskellunge (Esox masquinongy) populations by describing the population catch-rate and size structure for two Indiana glacial lakes surveyed in April of 2019.

Gear & Effort: The two lakes sampled in April of 2019 were Bruce Lake (Pulaski Co.) and Lake Tippecanoe (Kosciusko Co.). Eight overnight trap net (Small Lake Michigan style) lifts were deployed at each lake.

Results:

Bruce Lake - A total of 16 Muskellunge was collected that ranged in length from 23.6 to 47.5 inches. The Muskellunge sampled in this survey had an average length of 37.6 inches.

Lake Tippecanoe - A total of 3 Muskellunge was collected at that range in length from 36.5 to 46.0 inches.

## Targeted Northern Pike Surveys

Objective: Monitor the status of glacial lake Northern Pike (Esox lucius) populations by describing the population catch-rate and size structure for three Indiana glacial lakes surveyed in March of 2019.

Gear & Effort: The three lakes sampled in March of 2019 were Diamond (Noble Co.), Silver (Steuben Co.), and South Twin (LaGrange Co.) lakes. Eight overnight trap net (Small Lake Michigan style) lifts were deployed at each lake.

Catch-Rate & Size Structure:

Table 1. 2019 survey catches and average (interquartile range) Northern Pike catch per 8 overnight trap net (SLM style) lifts by size category at seventeen glacial lakes from 2012-2019.

<Stock Stock Quality Preferred Memorable Trophy Total

Diamond 0 0 8 1 0 0 9

Silver 1 0 2 2 1 0 6

South Twin 0 0 0 0 0 0 0

1st Quartile 0 0 5 2 0 0 9

Median 0 0 11 5 1 0 17

3rd Quartile 1 3 18 7 2 0 27

Figure 1. Proportional size distribution (PSD) of female and male Northern Pike collected during 2019 targeted surveys by size category.

**Iowa's 2019 Esocid Update**

***Prepared by Jonathan Meerbeek***

***Muskellunge Stocking, Tagging, and Population Dynamics*** (Contact: Jonathan Meerbeek jonathan.meerbeek@dnr.iowa.gov) - Thirteen lakes and impoundments are managed as Muskellunge fisheries in Iowa and populations are maintained via stocking spring-stocked, pellet-started minnow finished yearlings. In 2019, 2.225 yearling Muskellunge (mean TL = 12.4 in) were stocked in five natural lakes. In lakes where Muskellunge are used as broodstock, populations are monitored via annual spring gillnetting and population metrics are estimated using the Jolly-Seber model. Adult Muskellunge were sampled in the Iowa Great Lakes (N = 121; mean TL 35.4 in), Clear Lake (N = 140; mean TL 35.6) and Black Hawk Lake (N = 46; mean TL 32.6 in) and fish ranged from 24.0-49.5 inches in these lakes. Adult (≥ 30 inches) Muskellunge population estimates for 2019 in the Iowa Great Lakes and Clear Lake were 0.06 and 0.29 fish/acre, respectively. All yearling Muskellunge stocked into Iowa's natural lakes are tagged via PIT tags prior to stocking (since 2011). To date, 852 yearling Muskellunge have been recaptured and

initial analyses indicate that size (TL) at stocking is the single most important variable influencing survival. However, we have observed that survival rates vary considerably among lakes. More specifically, survival is much higher in general in lakes where large populations of top-level predators are absent (i.e., Clear Lake; Figure 1).

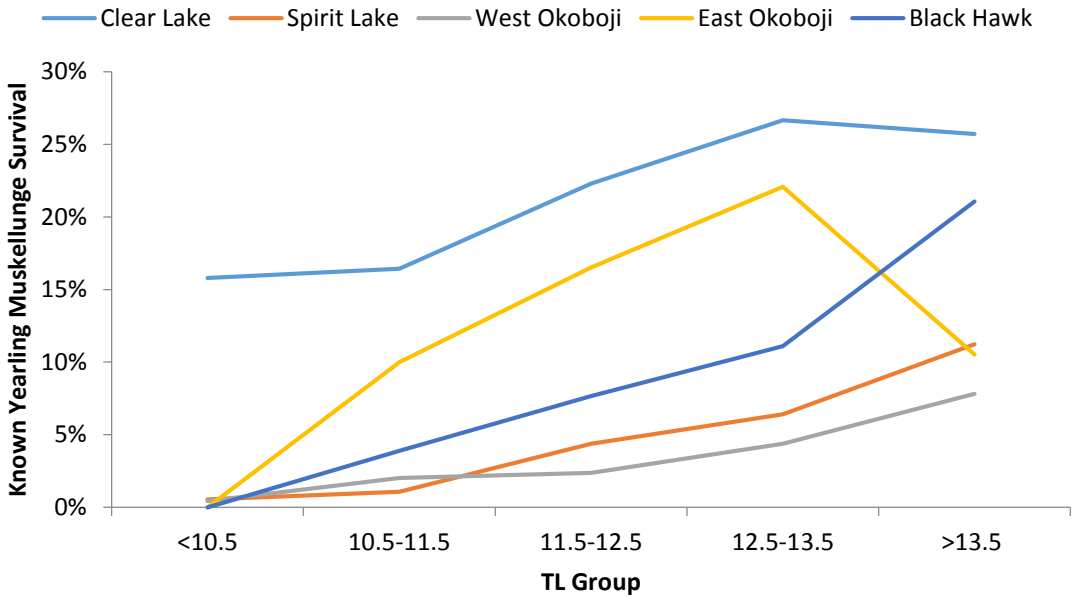



Figure 1. Known yearling Muskellunge survival by length group (0.5 in) in Clear, Spirit, East Okoboji, West Okoboji, and Black Hawk lakes.

***Yearling Muskellunge Survival Study*** (Principle Investigator: Jonathan Meerbeek jonathan.meerbeek@dnr.iowa.gov) – Year four of a stocked yearling Muskellunge telemetry project was completed in 2019. The first two years of the study found that the size of fish stocked was most important variable influencing yearling Muskellunge survival. Based off logistic regression models, a 13.0" Muskellunge had a 70% chance of survival to 100 day, whereas, a 14.0" Muskellunge had a 90% chance of survival. In 2018 and 2019, additional efforts were made to increase stocked yearling Muskellunge to TLs ≥13.0 inches. More specifically, fish were sorted by size in May and fish not exceeding the minimum length of 13.0 in (or 200 g) were reared for an additional 30-40 days. On average, yearling Muskellunge grew ~ 1.0 in and 40-60g during the grow-out period. Prior to stocking, 14-16 yearling Muskellunge were affixed with radio telemetry tags. Short-term (108-114 d) mortality was 23% (7 of 30). Based off length-based probability curves, if these same fish would have been stocked in May, their estimated survival rate was about 45%. Therefore, survival increased by an estimated 32% via growing out yearling Muskellunge for an additional 30-40 days. Findings from this study will guide Iowa's production and stocking techniques.

***Big Creek/Brushy Creek Muskellunge Emigration Study*** (Principle Investigators: Ben Dodd Ben.Dodd@dnr.iowa.gov, Ben Wallace Ben.Wallace@dnr.iowa.gov, Michael Weber mjw@iastate.edu), Robert Weber rweber@iastate.edu- Iowa State University, the U.S. Army Corps of Engineers and the Iowa DNR are collaborating on a Muskellunge emigration study at two central Iowa impoundments, Big Creek Lake (814 ac) and Brushy Creek Lake (690 ac). A horizontal bar barrier was installed at the Big

Creek spillway in 2012. Brushy Creek has no barrier but is similar in size, depth and watershed:lake ratio, and is serving as a reference lake for this study. PIT tag readers and antennas were installed on the spillways of both impoundments to quantify fish escapement and evaluate the efficacy of the barrier. Nighttime boat electrofishing and gill nets were used to collect adult Muskellunge in April 2016-2019. All stocked yearlings were implanted with HDX PIT tags. Since spring 2016, nine Muskellunge were known to go over the dam from Big Creek (barrier), all of which were tagged pre-stocking at Rathbun (2 were known to go over when the barrier was compromised). At Brushy Creek (no barrier), 146 Muskellunge were known to go over the dam, of which, 91 were tagged pre-stocking at Rathbun. The vast majority of escapement has been in April and May, although some occurred in March and June during flow events. In 2018 and 2019, 84 of the 252 Muskellunge that were part of the 2016 stocking at Brushy Creek went over the dam, meaning at least 33% of those age-1 fish survived two or more years post-stocking and escaped. The vast majority of these (60 of the 84) escaped in April and May 2019. Based off these observations, it appears that stocked juveniles remain in the lake until they near maturity. A barrier is planned to be installed on Brushy Creek this summer.

***Effectiveness of an electric barrier to reduce emigration of Walleye and Muskellunge in Iowa's natural lakes*** (Principle Investigator: Jonathan Meerbeek jonathan.meerbeek@dnr.iowa.gov) - Downstream movement of adult Muskellunge in an interconnected chain of lakes has been extensively documented in Iowa via the states broodstock collection program and extensive PIT tagging database. In some years, approximately 50% of the adult Muskellunge population has moved from Spirit Lake downstream to the Okoboji chain via a spillway that connects the two waterbodies. Since the spillway acts as a fish barrier to fish migration upstream during most of the year, Muskellunge populations in Spirit Lake have suffered and drastic population imbalances have been observed. A similar problem exists at the outlet structure of the interconnected system and Muskellunge loss to the river has commonly occurred. However, an electric fish barrier was installed in 2013 to prevent Asian Carp from entering the lake system and as a side-benefit, hopefully reduce Muskellunge loss. Since July 2017, the area directly below the outlet dam has been sampled via electrofishing to collect Muskellunge and determine if escapement has occurred post-barrier installation via PIT tag information. In 2019, 97 Muskellunge have been collected below the barrier during 19 electrofishing events. Collectively, 177 Muskellunge (25.0-47.0 in) have been collected below the electric fish barrier and returned to the lake. Many of these fish had moved into the river post-electric barrier installation. In summer 2019, a low-pulse (0.5 volts/in) electric fish electrode was installed directly above the electric fish barrier in attempt to prevent downstream movement of Muskellunge and Walleye. The effectiveness of the barrier will be evaluated in 2020.

**Northern Pike Propagation and Stocking** (Spirit Lake Hatchery Manager: Kim Hawkins kim.hawkins@dnr.iowa.gov; Fairport Hatchery Manager and Mississippi River Management Station: Andy Fowler andy.fowler@dnr.iowa.gov; - Northern Pike propagation is still an important component to manage these fish in lakes, rivers and impoundments across Iowa. In 2019, 1.1 million Northern Pike sac fry, 14,345 1-inch fingerlings, 68,489 3-inch fingerlings, and 327 10-inch fall fingerlings were produced from the Spirit Lake hatchery.

Northern pike adults were captured from the Mississippi River using fyke nets in March and stocked in hatchery ponds. On May 23 fingerlings were sampled and measured showing successful spawning had occurred in the pond. Unfortunately, the river levels eventually topped the dike of the pond and fish escaped.. Once flood waters had receded, all lower ponds were drained and a large number of advanced

fingerling northern were collected and used for stocking requests. The flooded ponds yielded 166 advanced fingerlings that were stocked on July 2 in Mississippi River backwaters.

# 2019 Kansas ETC update

Micah Waters

District Fisheries Biologist

Kansas Department of Wildlife, Parks, and Tourism

Kingman State Fishing Lake is located 7 miles west of the town of Kingman in South Central Kansas. It is a shallow impoundment that is about 30% covered with Emergent and Submerged vegetation. On the northern end of the lake, there is a spring which provides thermal refuge for fish. This thermal refuge allows for the survival of Northern Pike during the summer making it one of the only public lakes in Kansas that supports a population of Northern Pike. The lake was renovated in 2012 to remove White Perch Morone americana, Gizzard Shad Dorosoma cepedianum, and Common Carp Cyprinus carpio. The lake was restocked with Largemouth Bass Micropterus salmoides, Bluegill Lepomis macrochirus, Northern Pike Esox lucius, and Channel Catfish Ictalurus punctatus. There have been other species not stocked by the department but were found in sampling since the renovation including: Warmouth Lepomis gulosus, Green Sunfish Lepomis cyanellus, White Crappie Pomoxis annularis, Black Crappie Pomoxis nigromaculatus, Black Bullhead Ameiurus melas, Yellow Bullhead Ameiurus natalis, and Common Carp. Eurasian Water Milfoil Myriophyllum spicatum was also discovered in the fall of 2017 and was treated in 2018. Prior to the renovation, the population of Northern Pike was self-sustaining.

CPUE of Northern Pike at Kingman State Fishing Lake was low and variable in 2019 like 2018. No juvenile Northern Pike were sampled in 2019 (smallest fish – 676mm) suggesting that natural recruitment has not occurred yet. It was hoped that the restored water levels in 2018 may allow Northern Pike to spawn as they had prior to the renovation.

Possible reasons that juvenile Northern Pike have not been sampled include: density of mature fish is too low for successful spawn, lack of proper spawning habitat, or juvenile Northern Pike have not yet recruited to sampling gear. One factor limiting the water quality in the lake is turbidity likely caused by an abundance of Common Carp. Although the renovation was successful at removing Common Carp, they eventually found their way back into the lake from upstream impoundments. Since the re-establishment of carp in the lake secchi readings have gone from over 1m, to less than 5cm. Roughly 17% of Northern Pike sampled were over the minimum length limit of 30 inches making them susceptible to harvest. Mortality, low relative abundance, and lack of recruitment suggest that Kingman State Fishing Lake will need to be stocked with Northern Pike to maintain the fishery.

# Michigan Esocid Updates for ETC Winter Meeting 2020

## Great Lakes Muskellunge Production:

2019-Wolf Lake State Fish Hatchery stocked out just under 12,500 fall fingerlings. Average total length was 9.5 inches. Nine bodies of water were stocked statewide. Our two Great Lakes muskellunge broodstock lakes received yearlings in spring of 2019. Average size of yearlings was 12.3 inches. Hatchery is currently overwintering 2,500 fingerlings with a target to be harvested as yearlings in June 2020. Wolf Lake staff looking to use Common Carp pituitary injections on green females collected during egg take on the Detroit River. Looking for any feedback from those facilities or agencies who have experimented or are currently using this technique. Please contact Matt Hughes for anything you may have to share.

2020-Thompson State Fish Hatchery upgrades are slowly being completed. Many hurdles and road blocks for this project, but staff believe they will begin using rearing ponds for muskellunge in the spring of 2021. Fall fingerling muskellunge expected to be stocked out in fall of 2021. Expected production of fall fingerling muskellunge is up to 18,000.

## Regulations:

Mandatory registration for muskellunge harvest summary: In the 2018/19 fishing season (1st Sat in June-March 15), a total of 28 muskellunge were harvested statewide. For the 2019/20 fishing season, as of January 27, 2020, a total of 16 muskellunge have been harvested statewide. The ice season has been poor in Michigan this year with many weather systems moving through in between days of warmer weather.

## Special Projects

· Jan-Michael Hessenauer (MDNR-Research, Mt. Clemens)- is conducting a muskellunge telemetry study on the St. Clair and Detroit River system. This project represents a collaboration between the DNR (St. Clair Research Station and Lake Erie Management Unit, Ohio DNR, USGS and OMNRF. Jan will be presenting his project results, to date at the upcoming Esociformes Symposium at the 150th AFS meeting in Columbus, OH.

· Jennifer Johnson (MDNR-Management, Crystal Falls)- Preparing a project to investigate movement of muskellunge in the Paint River system. Techniques will pattern that of the WIDNR project by Max Wolter by using fishing guides to collect biological and social data to supplement that of traditional in stream sampling methods. This is proposed to be a 5-year study.

· The Southern Lake Huron Management Unit (Bay City crew) -Stock the Tittabawassee system of reservoirs with muskies. Concern by managers and the public that the Great Lakes strain fish are not surviving and taking hold. In the fall of 2019, the crew fin clipped 2,500 fish and stocked them in Sanford Lake. The intent of this project is to evaluate survival and movement of fish downstream through the dam(s). Staff is looking to operate a rearing pond with the capabilities to release fish directly into Secord Lake. Staff is also operating a northern pike marsh pond for

direct release as well. This will allow for a production of 1,000-8,000 fish to stock directly to the Tittabawassee River system and to other area lakes.

· The Southern Lake Michigan Management Unit (Plainwell crew)- Conducted muskie targeted surveys at Lake Ovid in 2019. Captured 18 northern muskie ranging from 35 to 46 inches. Pike surveys for 2019 were in Lake Lavine and Wabasis. Lake Lavine was an evaluation of the success of the no minimum size/possession limit in reducing pike densities. Crew captured 14 fish in one night of netting and determined it was not a success. Trout management abandoned on Lake Lavine going forward. Wabasis was mainly a Walleye survey, but was timed well for pike. We captured 313 pike in 24 net nights. Most were skinny and regulations may be changed pending age and growth data. It was year 2 of the veg management project in Eagle Lake (Kalamazoo County). GL Muskie were stocked there in 2018. Plans are to conduct a survey to determine survival and reproduction potential after fish become mature. An evaluation is planned for the broodstock lake (Thornapple Lake) in 2020. Removal of northern strain that are captured to facilitate GL survival.

Minnesota Esocid Update – ETC January 2020 Mike Habrat

Muskellunge Production

· Fingerling production was outstanding in 2019.

o The base stocking quota was 28,000 fingerlings.

o Ultimately, MNDNR stocked nearly 48,000 fingerlings into 44 lakes and two rivers.

· Hatcheries made the complete switch to a new feed (Otohime) for the rearing of transplants in 2019. Still too early to determine if this played a role in the surplus fingerling production, but improvements in mortality and growth in the hatchery were noticed.

Management

· Adult population estimates continue to be performed at an increasing rate. Numerous lakes have had or are planned to have a second estimate within the past ten years. Two-year studies have become the norm with the total catch in year 1 representing the marking period. In many situations multiple gears are used in each year. Casual examination of these estimates suggests Muskellunge densities range 0.08-0.25 fish/surface acre (mostly) regardless of lake size.

· The current Muskellunge Long Range Plan will expire this year. The process for creating a new plan has begun.

Research

· A graduate stable isotope project in relation to dietary patterns of introduced and native populations of Muskellunge in lakes with and without cisco began in 2019. The three-year project is a collaboration of DNR, Bemidji State University, and University of St. Thomas. Researchers sampled 165 Muskellunge across the 3 lakes where they were present, approximately 111 fish had some sort of diet item. Rare, but other interesting diet items included 2 muskrats and one large bird, which was believed to be a ring-billed gull.

· The Lake Vermilion (40,500 acres) Muskellunge population estimate began in 2019. The lake was broken into three basins utilizing three survey crews. This was the first year of a planned two years where the total catch from 2019 will represent the marking period. Over 700 unique adult Muskellunge were marked.

· An update to "Fish community responses to the introduction of Muskellunge in Minnesota lakes" (Knapp et al. 2012) is going through revisions

## Missouri 2019 ETC State Update

Mike Anderson

### 2019 Spring Fyke Netting

Standardized fyke net surveys were conducted at Pomme de Terre Lake and Hazel Creek Lake. Fellows Lake, Henry Sever Lake, and August A. Busch Lake 35 were not sampled for muskies in 2019.

Pomme de Terre Lake – Water temperature was 48°F and lake elevation was 843.5 msl (normal pool = 839.0) and rising, which are not optimal temperature or lake level sampling conditions. The ideal temperature for sampling is between 50°F and 55°F. The lake level was high enough to cover button bush shrubs. Two nets had to be relocated to alternate sites. The water visibility this year was about average with four feet of visibility. A total of 60 muskies (39 males and 21 females) were captured in 20 net-days, resulting in a catch rate of 3.0 fish per net-day. Of the muskies captured, 25 percent were 36 inches or longer and 2 percent were 40 inches or longer. The largest fish was a female that was 43.0 inches long and weighed 22 pounds, 14 ounces. The long-term average catch rate for muskies on Pomme is 5.2 fish per net day. This is the fourth year in a row that catch rates have been below the long-term average, indicating a lower relative abundance of muskie. Additionally, size distribution has changed and includes few fish over 40 inches. Nearly all muskie in the 2019 sample were between 30 and 40 inches.

Hazel Creek Lake – Water temperatures were consistent ranging from 47° to 48°F. A total of 73 muskies (57 males and 16 females) were captured in 12 net-days, resulting in a catch rate of 6.1 fish per net-day. Of the muskies captured, 25 percent were 36 inches or longer, and eight percent were 40 inches or larger, including one fish that measured 45.5 inches.

2019 Muskie Stocking

In Missouri, the four muskie program lakes less than 1,000 surface acres are stocked annually with one muskie fingerling (≥ 12 inches) per acre. Pomme de Terre Lake is annually stocked with 0.60 muskie fingerlings per acre. In 2019, staff at Lost Valley Hatchery experienced some mortality during the muskie harvest that prompted them to send samples to the USFWS Fish Health Center in La Crosse, Wisconsin. After nearly two months, the virology samples tested positive for Golden Shiner Virus. The USFWS Fish Health Center, Missouri State Veterinarian, Missouri Department of Conservation (MDC) Aquatic Animal Health Specialist, and MDC Fisheries Division Management Team all agreed the remaining muskie fingerlings could be stocked with no risk to wild fish populations. All lakes were stocked with the requested number of muskie fingerlings except for Hazel Creek Lake in which 67 percent of the lake's allotment were stocked at Pomme de Terre Lake and Fellows lake to make up for stocking shortages in 2018. Although surplus muskie fingerlings were not available, the approval was given to stock Henry Sever Lake with 0.5 fish per acre since it had not been stocked in two years.

Lake Surface Acres Number of Muskies Requested Number of Muskies Stocked

Pomme de Terre 7,820 4,700 4,953

Fellows 820 820 823

Hazel Creek 530 530 177

Henry Sever* 158 0 81

Busch CA Lake 35 62 62 62

Total Stocked 6,096

*Provides supplementary angling opportunities at Henry Sever Lake by only stocking surplus muskie fingerlings when available (up to one per acre annually).

Nebraska Esocid Technical Committee Report 2019

For State of Nebraska

Prepared by Keith Koupal

The following report is being submitted to the Esocid Technical Committee meeting in January 2020 at the Midwest Fish and Wildlife Conference. Nebraska has limited use of esocids within our systems. We are managing to stock both muskie and northern pike in the requested systems at 2-3 year intervals. Space to culture esocids to a desirable size and the expense involved with raising them to this size are limiting factors for increased production and stocking. Many waters seem unable to successfully recruit these species. Thus, a statewide 40 inch minimum is in effect

for muskie and many stocked waters have a 30" minimum on northern pike. Starting this year a 50" minimum length regulation has been implemented on Merritt Reservoir.

With an interest in creating a potential muskellunge destination fisheries and the observed fast growth rate and potential from the Sandhills region of Nebraska, a muskellunge project has been proposed. This project would focus on getting accurate age-growth analysis of Muskellunge from both Merritt Reservoir and Cottonwood Steverson. Use of PIT tags in newly stocked individuals would allow for improved age and growth information over time, as well as determination of natural recruitment. This project is still in a proposal stage but ideally would start collecting data from existing populations in 2020.

A northern pike tagging project was started at Lake Wanahoo in March 2012 with the goal of getting a population estimate, and to monitor population dynamics such as length frequency, dynamics, and growth. Northern pike are collected with trap nets in the spring and floy tagged. Population estimates indicate an increasing population from 2015-2019. Two models are used to estimate the population abundance, and indicate the population is between 2,743 and 3,273 individuals in the reservoir. This project is scheduled to continue into the future and is expanding to another reservoir (Flanagan Reservoir) where northern pike were recently stocked in a similar fashion to Lake Wanahoo.

A final esocid note is that tiger muskellunge are proposed to be stocked in two waters. Historically we have been producing tiger muskellunge for other states, but there has been renewed interest in use of this hybrid in Nebraska. The interest for trophy fish potential, reduced fertility, and their role within predator control of undesirable or stunted fish populations has spurred this interest.

## Ohio Muskellunge Program: ETC Report - January 23, 2020

**Curtis Wagner and Kevin Page, ODNR-Division of Wildlife**

***Reservoir Escapement and Angler Use of Stocked Muskellunge in Ohio – Project Update***

Within four reservoirs, all advanced fingerling muskellunge stocked from 2013 – 2018 (6 cohorts; 51,965 fish tagged) were implanted with passive integrated transponder (PIT) tags. PIT tags are a reliable marker for monitoring muskellunge over long time periods. Emigration of PIT tagged muskellunge is being monitored using PIT tag antennas extended across the width of the spillways connected to shore-based, continuous-scanning readers (Biomark systems) stationed below reservoir dams. Data are expected to provide a detailed picture of muskellunge emigration and other population dynamics.

Monitoring of tagged muskellunge within reservoirs is being conducted through reporting of tagged fish by anglers. Anglers will report tagged fish via the Ohio Muskie Angler Log (https://apps.ohiodnr.gov/muskielog/welcome.aspx). Hand-held PIT tag readers have been supplied to the most productive anglers chosen based on previous catch reports reported in the Muskie Angler Log and additional readers are available at marinas and distributed during club outings. ODNR fisheries crews are also sampling study reservoirs and recording capture and tag information as part of fisheries independent surveys.

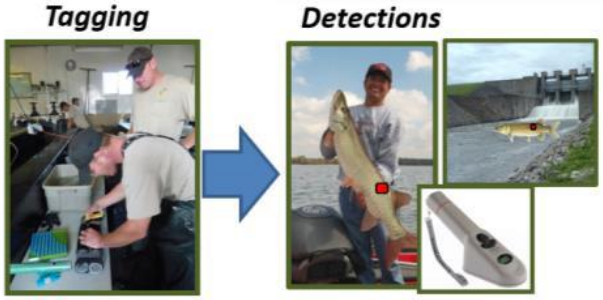
In agreement with prior literature, we are generally seeing emigration from muskellunge age-3+. Below are some slides from a recent project update.

**Slide 1**. Detections by reservoir and categorized as emigrated (reservoir emigration via spillway) or in-reservoir. Note the variation among reservoirs in escapement; Alum Creek is a large reservoir with

multiple gate types including tainter gates and Clear Fork is a fixed spill-over dam, whereas Leesville and Salt Fork are low water exchange reservoirs with deeper, off-shore sluice gates. 2

# Tagging/detections

- 6 years of tagging
- 51,965 fish tagged
- 1,439 detections
  (1,198 unique fish)




| Location | Total | Emigrated | In-reservoir |
|---|---|---|---|
| Alum Creek | 575 | 305 | 270 |
| Leesville | 462 | 0 | 462 |
| Clear Fork | 216 | 174 | 42 |
| Salt Fork | 186 | 16 | 170 |

**Slide 2**. Early MARK estimates of emigration by location and life stage. Estimated probability of juvenile reservoir emigration via spillway is low across systems whereas probability varies among systems and years for adults.

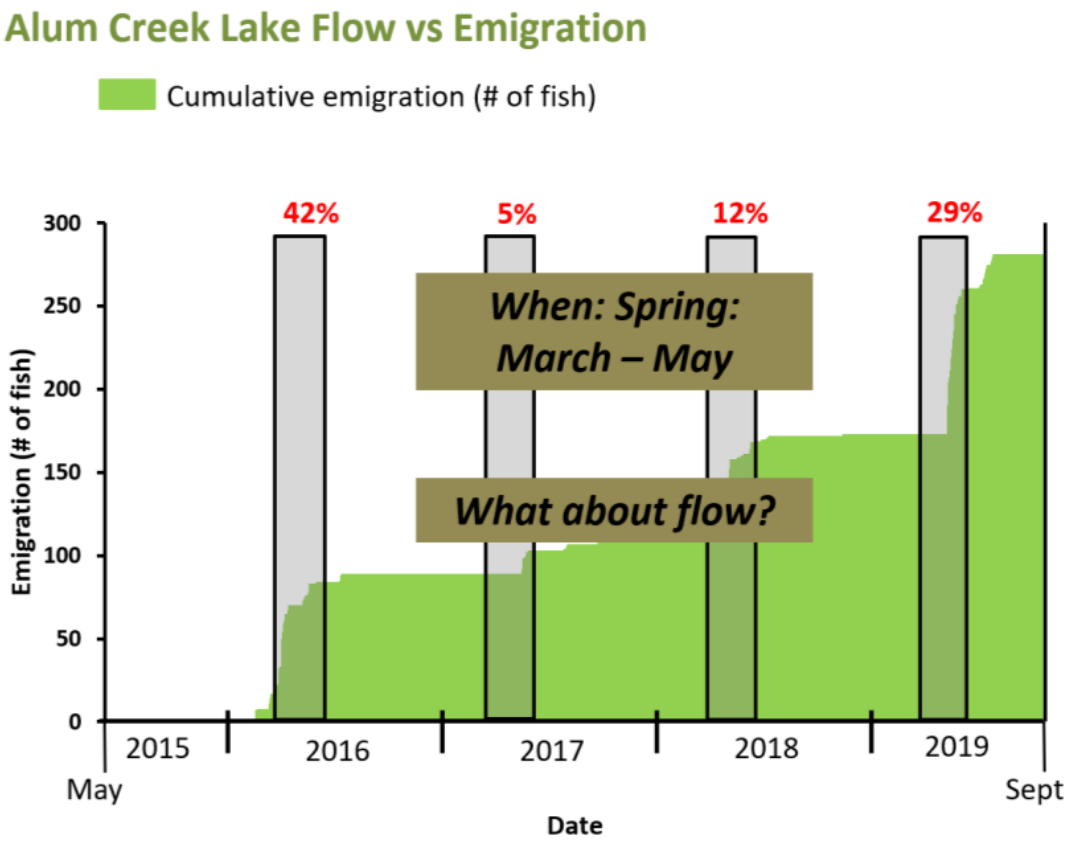
# Model results

| | | Juvenile emigration | Adult annual emigration |
|---|---|---|---|
| Leesville and Salt Fork |  | 0.0% | <1.0% |
| Alum Creek |  | 1.5% | 5–42% |
| Clear Fork |  | 2.0% | 8–92% |

*Where: Surface discharge*

*Magnitude: variable, but potentially high; adult fish*

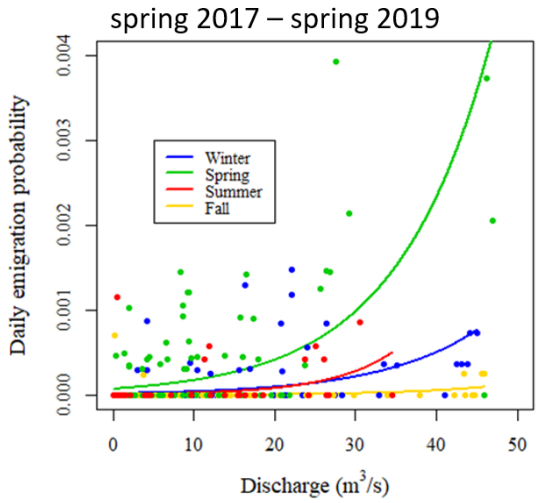
**Slide 3**. Variation across years of estimated annual emigration probability and cumulative number of unique muskellunge escaped from Alum Creek reservoir, Ohio. 3



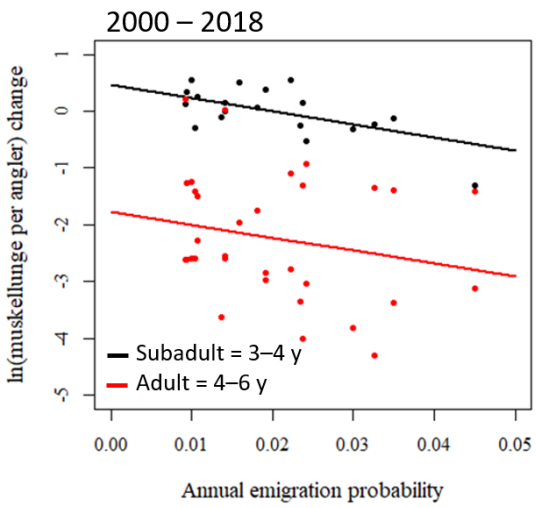
**Slide 4**. In conjunction with in-house ODNR work, a DJ project was tasked to the Ohio State University to do some shorter-time scale but deeper digs into data patterns. Daily emigration probability varies across seasons with spring exhibiting much high emigration probabilities at higher discharge values (left panel). Further, data within Ohio's Muskie Angler Log was coupled with emigration data with some preliminary indications of fishery success (catch rates) negatively influenced by higher annual emigration probabilities. Unpublished data currently but wanted to show some trends to the ETC group.

## OSU Alum Creek Lake emigration study

*Shane, K. D. 2018. Habitat use and emigration patterns of two top predators stocked in a flood-control impoundment. OSU Masters thesis. Project FADR77.*




***Emigration influenced by flow rates***



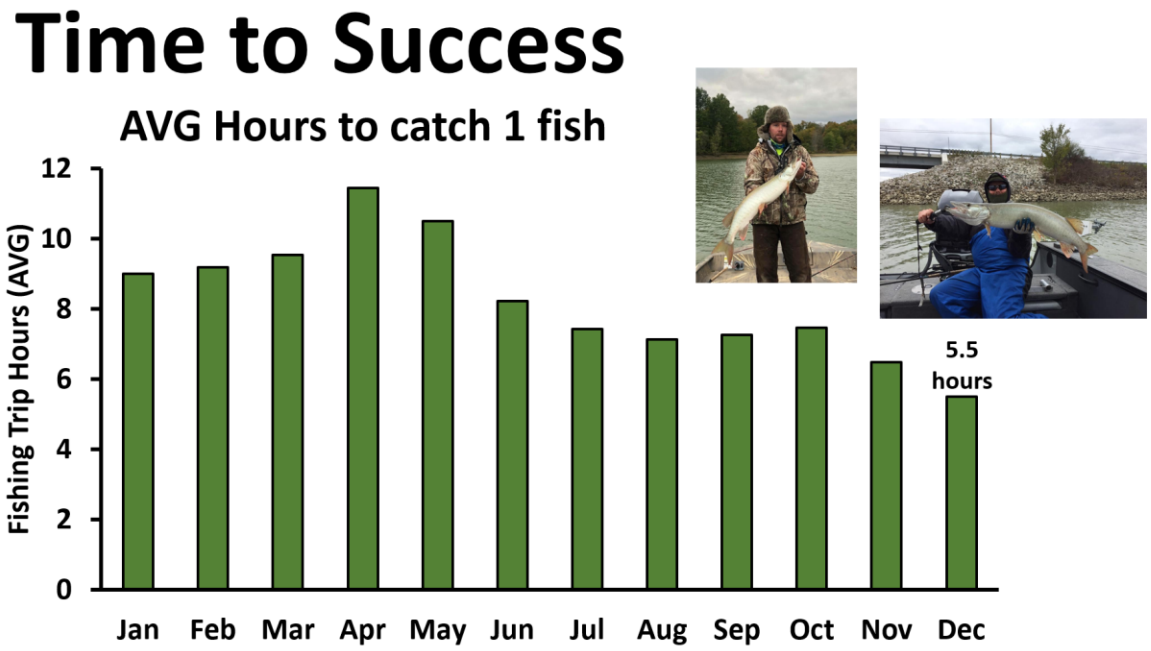

***Angler catch reports related to emigration***

***Ohio Muskie Angler Log Update – Explorations of angling patterns***

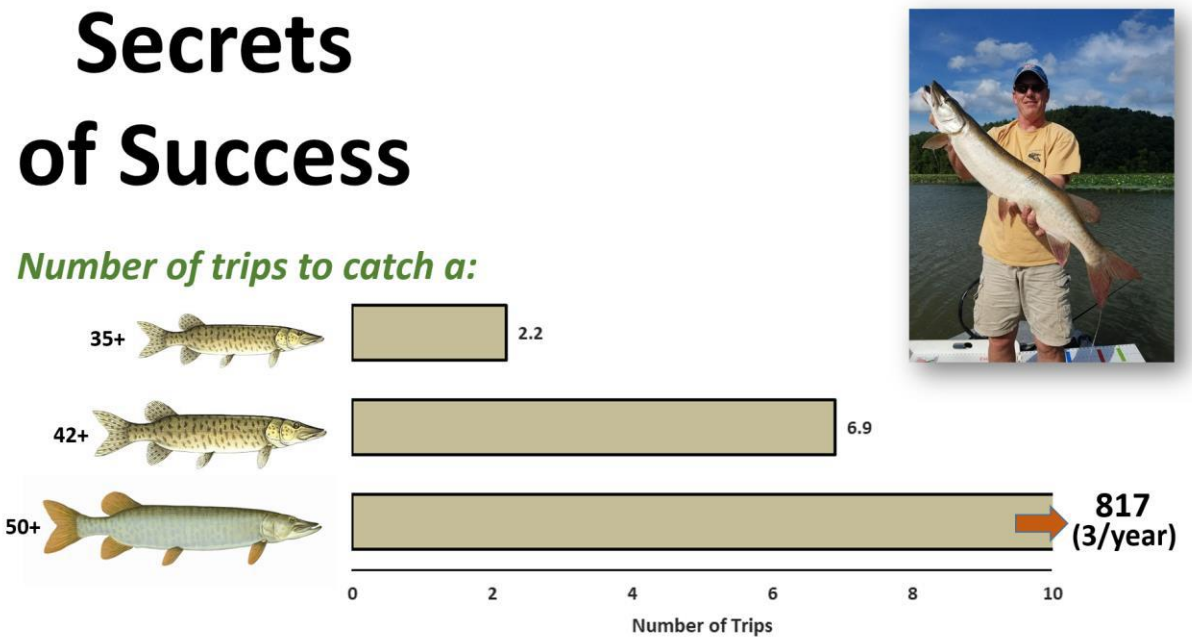
The online Ohio Muskie Angler Log (MAL) (https://apps.ohiodnr.gov/muskielog/welcome.aspx) was launched online in 2008. Anglers register by setting up a username and password, much like any other user-based internet tool. Consequently, the Ohio Division of Wildlife gets basic user information for a unique angler that can be used in fisheries analyses while the muskie angler has the ability to tailor their online experience and keep their catch and trip diary online. The MAL is a collaborative effort between the Ohio Division of Wildlife and the organized muskellunge clubs throughout Ohio.

Much of what we have presented to the ETC in the form of annual reports focused on agency management use of the MAL in terms of tracking size structure and catch rates (abundance surrogate) across systems and years. This year we will share some interesting peeks into the diary – catch details side of the MAL for a little fun. 4

**Slide 5**. Fishing trip length until catching a muskie by month.

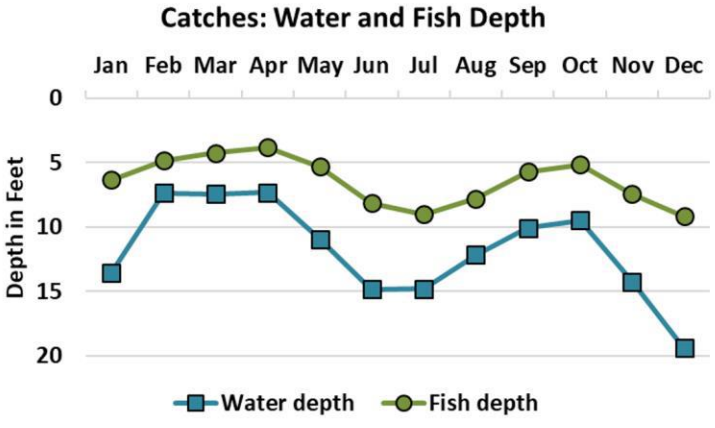



**Slide 6**. Number of trips per unique angler to catch a 35+", 42+", and 50+" muskellunge in Ohio reservoirs



**Slide 7**. Breakdown of presentation and structure options and the five top descriptor words in the lure type field by MAL muskellunge anglers.


**Slide 8**. Mean water depth and fish depth of reported muskellunge catches within the MAL by month. 6




***Other Ohio Muskellunge Updates***

We have discontinued stocking of East Fork reservoir in southwestern Ohio due to low angler use and low angler reporting within the Ohio Muskie Angler Log, coupled with low abundance estimates from Ohio Division of Wildlife index netting. An alternative muskellunge program reservoir, C.J. Brown, was selected based on geographic distribution, presence of gizzard shad, and water retention in the reservoir. Production will remain static around 20,000 fall advanced fingerlings distributed among the 9 program reservoirs.

Dakota Chapter Esocid Update

Provided by Brian Blackwell

January 2020

South Dakota

Muskie Movement and Habitat Use

South Dakota Department of Game, Fish and Parks and the University of Nebraska at Kearney launched a muskie movement and habitat use project in 2019 at Lynn Lake and West 81 Lake. Twenty adults (10 of each sex) were implanted with acoustic transmitters in both lakes in April 2019. Any other adults captured were implanted with PIT tags if they already didn't have one. Active tracking began on a weekly basis through the first week of November. Passive receivers were deployed in May and retrieved in October to download data. Mapping of habitat using side-scan sonar is ongoing. The transmitters will last 48 months, and data will be used to determine home ranges, movement rates, and habitat use.

In addition to adults, juveniles (248mm-305mm) were stocked into both lakes in October 2019. Prior to stocking, 20 individuals for each lake were implanted with acoustic transmitters. The expected battery life of the transmitter is 5 months. The juveniles were actively tracked weekly until ice-on (late-November), and passive receivers will record individuals until the end of transmitter life. Data from this part of the study will be used to assess dispersal rates from the stocking locations, habitat use, home ranges and movement rates. The project is expected to finish by June 2021.

High Water Returns to Eastern South Dakota

Above normal precipitation in eastern South Dakota in the last year has resulted in rising water levels inundating terrestrial vegetation on most lakes and water moving across the landscape. Age-0 northern pike were observed in several waters during the 2019 fall and expectations are that pike numbers will increase throughout eastern South Dakota in the next few years.

# North Dakota

## Trophy Northern Pike

The North Dakota Game and Fish Department initiated a trophy (> 1 meter in length) northern pike tagging study in 2017 to assess how anglers are utilizing these fish on two Missouri River Reservoirs (Lake Sakakawea and Lake Oahe). To date, we have tagged 468 trophy pike with uniquely numbered metal jaw tags. Additional fish will be tagged in 2020 and 2021.

Anglers reported catching and releasing 9.3% of the fish and catching and harvesting 6.8% of the fish within one year of being tagged that were tagged in 2017 and 2018. Preliminarily, it does not appear that angler harvest is negatively impacting Missouri River System trophy pike fisheries in North Dakota.

## Devils Lake Northern Pike Ages

A study of Devils Lake northern pike age and growth information is being conducted through a cooperative effort between the North Dakota Game and Fish Department and Valley City State University undergraduate student Ethan Rasset

# WVDNR Esocid State Report 2020

Submitted by Jeff Hansbarger and Nate Taylor

## Spawning Aid Study

Hatchery issues and ongoing large-scale improvements to WV Division of Natural Resources (WVDNR) warmwater hatchery systems have impacted WV hatchery production of muskellunge over the last few years. However, the installation of a new water supply pump and repaired reservoir allowed the state's primary musky hatchery to operate at an improved capacity for 2019. WVDNR has historically relied on the use of dried carp pituitary gland as a spawning aid to synchronize and improve ovulation and spermiation in hatchery spawned musky. Unfortunately, the sole supplier approved by US Fish and Wildlife Service's Investigational New Animal Drug (INAD) program is no longer in operation. The WVDNR conducted a preliminary investigation into the use of two new spawning aids in 2019: synthetic salmon gonadotropin-releasing hormone analogue (OvaRH) and luteinizing hormone analogue (LHRHa). Due to hatchery limitations relating to availability of pond space, two females and four males were injected to evaluate each of these new drugs.

LHRHa is a peptide that is similar naturally occurring hormone secreted by the pituitary gland that stimulations ovulation in females and gonadal production in males. Two intramuscular injections of LHRHa were conducted, a priming dose (30µg/kg) and a resolving dose (70µg/kg) were administered 48 hours apart. Ovulation did not occur in either of the two females injected, and sperm was not tested for viability due to unsuccessful egg production and predetermined

parings. One female perished following injection, and eggs were similar in appearance to the those removed from the deceased female injected with OvaRH.

OvaRH is a synthetic spawning aid that has been proven effective in inducing ovulation and spermiation in salmonids, ictalurids, and carp. It has also been estimated to be 17 times as effective as LHRH in these fish. Intramuscular injections of OvaRH were conducted at maximum approved dosage (50µg/kg of body weight). One of the two females injected released 19oz of eggs, unhealthy in appearance, less than 24 hours post-injection. Approximately 50% of these eggs were considered dead within the first 24 hours. No eggs survived to hatch. The other female did not release any eggs and perished within the holding pond 5 days post-injection. Upon inspection, eggs had a neon-green hue to them. Injected males produced an average of 1oz (.05–1.5oz) of viable sperm per fish, and production appeared to be directly related to total length (584–851 mm). One male perished within 7 days of injection.

Given the small sample size of this study, more research is necessary to determine if either drug could be utilized as spawning aids in musky production. Anecdotally, neither drug appeared to be as successful in egg maturation or sperm production as injectable carp pituitary gland at the dosages administered in this pilot study.

Delayed Mortality Research Project

The WVDNR is also involved in a cooperative research project with the Virginia Department of Game and Inland Fisheries (VDGIF), Coastal Carolina University (CCU), and West Virginia University (WVU) to investigate delayed mortality in caught and released muskellunge. The WVDNR working with Dr. Kyle Hartman of WVU will concentrate on Stonewall Jackson reservoir and a pond component, while VDGIF and Dr. Derek Crane of CCU will investigate this issue in the James River muskellunge population. Fish will

be evaluated for short and long-term survival after angling events to determine if delayed mortality associated with summer angling has an impact on overall population numbers. The pond component will allow for more closely controlled temperature levels for angling events and will allow definitive proof of the fate of angled fish due to them being contained in a pond setting. This project was originally ‘spawned’ by discussions at the Little Rock AFS annual meeting 2013 Esocid Symposium. Similar studies have restricted striped bass (coolwater fish) angling in SC during July and August. Angling impacts were found to be great enough at a population level to restrict angling during the hottest times of the year due to reduced survival from angling encounters.

Muskellunge will be implanted with transmitters during early spring (2020, 2021) for the reservoir and river component. Posters and outreach efforts will alert anglers to contact the WVDNR and the VDGIF when they catch and release a tagged Stonewall Jackson or James River muskellunge. Angler ‘gatherings’ will also be directed to target tagged muskellunge during summer conditions. Graduate students from WVU and CCU will then track released tagged fish for short and long-term survival using telemetry gear. The pond component will consist of refurbishing two ponds at Palestine Fish Hatchery in Elizabeth, WV. Adult muskellunge will be collected from local waters, stocked into the ponds and angled during high temperature levels

encountered during two summer seasons. Supplemental funds are also being donated/collected and can be deposited into a WVU account, which will help offset the overall cost of the project. To date we have graciously received donations from organizations including Muskies Inc, Hugh C. Becker Foundation, and individual Muskies Inc. chapters. The January issue of Muskie magazine featured an article on the research project which has implications for muskellunge management across their native and introduced range.

## ETC Summary-Wisconsin by Jordan Weeks (WIDNR)

### Stocking

WI will review stocking guidance/quotas. All existing quotas were deleted and each biologists were asked to justify all quotas from here out. In addition, each quota will be subject to a prioritization which is in development.

Great Lakes Stock Brood Lakes Sampling schedule is as follows: Big Elkhart-2020, Archibald-2020, and Anderson 2021.

### Mail Survey

Wisconsin has performed a Muskellunge Mail Survey on a 10-year rotation with three surveys completed in the past. Most of the questions are standard, to allow us to look at temporal trends through time. The last rotation completed in 2010 was done online. The initial send out was by mail with a pin to complete the survey online and was a random draw of nonresident and resident anglers. In addition, we reached out to Musky Club Alliances and allowed everyone a single entry per member into the survey. There is interest in adding a Great Lakes section to see how that has influenced musky fishing the past 10 years. Some questions will be dropped as laws have changed (trolling). Questions regarding angling in high water temperature and how social media has influenced fishing should be added. Last budget was approximately 8K.

### Research

1-UW-Stevens Point and WIDNR continue to evaluate Pellet vs. Minnow Study. We continue to survey select lakes, particularly in the north to bolster the dataset.

2-We are developing a list of lakes that fit WIDNR criteria for a 50-inch minimum size limit. We continue to discuss how connected waters should be classified.

3-Hot water hooking mortality (Weeks/Dembkowski). We are interested in pursuing this project using telemetry. However, obtaining necessary funds has (and probably will be) a hurdle. At this point, we don't think it is wise to resubmit to the Becker Foundation because we probably will not be able to scrounge up additional funds needed from individual muskie clubs or the Musky Clubs Alliance. We already had to return $ to the Becker Foundation for this project once and I don't want to risk having to do it again, potentially losing them as a source of funding in the

future. We have only moderate interest from muskie clubs to this point. Derek Crane is beginning a similar project in WV with some of these aspects now.

4-Green Bay Acoustic study (Isermann, Dembkowski, Sheffer). 60+ adult musky are tagged now…last six were tagged this past spring with WIDNR. Randomly selected sites for eggs presence/absence. Trying to tease out habitat variables. Is there imprinting going on with stocked fish returning to streams for spawning? Second graduate student started this spring and is overlapping with Robert Sheffer who has graduated.

5-Wausau Area Angler PIT Tag Program summary. A proportion of stocked fish are tagged each year, all fish handled in the field by DNR staff have been tagged. Two anglers have tagged 81 additional Musky since 2012. In total 3,900 Musky tagged in the Wisconsin River from Merrill down to Castle Rock Lake. 305 recapture events (251 anglers; 130 survey). Tim will get the anglers on a scientific collector's permit. Moving forward they will look at movement through the system (only downstream movement possible).

6-Chair Elect Addie Dutton has scorn Wisconsin for employment in her home state of Michigan. I can't remember where she is working, but does it really matter? Best of luck Addie!