North Central Division American Fisheries Society

Esocid Technical Committee

Chair – Dave Woods (MDC; Dave.Woods@mdc.mo.gov)
Immediate Past Chair – Jonathan Meerbeek (IA DNR; jonathan.meerbeek@dnr.iowa.gov)
Chair-elect – Dave Kittaka (IN DNR; dkittaka@dnr.IN.gov)

2013 Summer Business Meeting Minutes

ETC/CTC/WTC Joint meeting at Stoney Creek Inn
Wausau, WI, July 23-25

The following notes highlight discussions from the ETC business meeting held 25 July, 2013 at the Stoney Creek Inn. ETC members in attendance at the business meeting were Keith Koupal, Jonathan Meerbeek, Justin Van De Hey, Jordan Weeks and Dave Woods.

Winter Meeting Minutes: No corrections were made to minutes from the December 2012 ETC business meeting. Those meeting minutes were provided to ETC members on 17 December 2012 and are posted on the ETC website.

Sales of the International Pike Symposium: There is a balance of $1,365.50 that we owe to the NCD for the $5,100.50 we borrowed to publish the book in 2008. There are still ten copies available for purchase @ $30/copy and have been advertised on the ETC website.

Past and Future Leadership: Dave Woods was elected ETC chair at the 2012 summer business meeting and assumed responsibilities at the 2012 winter business meeting in Wichita, KS. The ETC agreed that the Indiana representative should assume the future chair position at the 2014 winter business meeting, since the 2015 Midwest Fish and Wildlife Conference will be hosted in that state. Dave Woods contacted Dave Kittaka, the Indiana Department of Natural Resources ETC representative, and he agreed to assume chair of the committee in 2014.

Winter Meeting Announcement: The 2014 ETC Winter Business Meeting will be held at the 74th Midwest Fish and Wildlife Conference in Kansas City, MO (http://midwestfw.org/). The conference will be held January 26th-29th; however the specific ETC business meeting date is yet to be determined. Please let Dave Woods know if you plan on attending (Dave.Woods@mdc.mo.gov).

Themes/Location/Dates for 2013 Summer Meeting: Committee members of the ETC, WTC and CTC agreed that LaCrosse, WI will be a good venue to hold the WTC/ETC/CTC Joint Summer Meeting in 2014. The location of LaCrosse on the boarder of two states should allow for greater attendance at the meeting. Meeting theme was not discussed.

Budget: The ETC account (managed by NCD Treasurer Jason Goeckler) had a balance of $2,457.66. Since the winter meeting, the ETC account has increased by $6.28 (interest).

New Items:
The ETC discussed their possible role in the preparation of the 2016 Hugh C. Becker International Muskie Symposium in March 2016 in the Twin Cities area, which is sponsored by Muskies Inc. One role the ETC will likely fulfill is facilitation between the event organizers and possible speakers at the symposium. It will be important to communicate current research in a way that is relevant to the symposium audience. The ETC also discussed holding a possible fundraiser at this symposium.

Website Items:

This spring, the responsibility of website administration for technical committee sites was transferred from the NCD website administrator to the respective committee chairs. Hereafter, the ETC Chair will be responsible for updating the ETC website and posting new content. Useful instructional files were offered by Jason Fowler to facilitate this change in responsibility and will be available to all incoming committee chairs in the ETC files.

Chapter Representatives – Updates

- Dakotas: Steve Chipps
- Illinois: Steve Pallo
- Indiana: Dave Kittaka
- Iowa: Chair (2010-2012), Jonathan Meerbeek
- Kansas: Jeff Koch
- Michigan: Chair (2008-2009), Jim Diana
- Michigan: Kregg Smith
- Minnesota: Chair (2009-2010) Rod Pierce
- Missouri: Current Chair (2013) Dave Woods
- Nebraska: Keith Koupal
- Ohio: Curt Wagner
- Ontario: None (Steve Kerr retired in 2012)
- Wisconsin: Jordan Weeks

New Project Ideas:

None discussed.

State and Provincial Reports:

Dakotas (B. Blackwell)

North Dakota – No state report provided

South Dakota - No state report provided

Illinois (S. Pallo) – No State report provided.

Iowa (J. Meerbeek) –

Ten lakes and impoundments are currently being managed as muskellunge fisheries. 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. In 2013, 303 muskellunge were captured (165 recaptures) ranging from 25.6-50.9 inches in these lakes. Adult (≥ 30 inches) muskellunge population estimates for 2012 in the Spirit Lake/Okoboji Chain and Clear Lake were 0.13 and 0.11 fish/acre, respectively. Currently, only spring-stocked, minnow finished yearlings (SY) are used in Iowa's muskellunge culture program. All yearling muskellunge stocked into Iowa's natural lakes are tagged via PIT tags prior to stocking (since 2011). In 2011 and 2012, yearlings were tagged in the cheek. Some of these fish recruited to our gill nets this spring. Tag retention was 58% (22 of 38 tagged) at 2 years post-tagging. In 2013, all muskellunge were tagged in the dorsal musculature.

Tag Information regarding growth, survival and recruitment will help guide stocking rates to maintain desired population levels.

Emigration has been a concern in the past for the Spirit Lake/Okoboji system and Iowa's muskellunge reservoirs. Due to the infestation of silver and big head carp and pressure from local residents and business owners, an electric barrier has been constructed in the outlet to prevent additional Asian carp from entering the Spirit Lake/Okoboji system. The 1 million dollar project was completed this spring and has been active since 05/30/2013. The electric barrier most likely will prevent additional muskellunge emigration, but since the construction required that the electrical field is downstream of the existing dam (apron attached to existing dam), its effectiveness as a downstream migration barrier needs to be tested (see appended article published in Muskies inc.).

Figure 1. Electric fish barrier constructed at outlet of the Spirit Lake/Okoboji chain of lakes.

A physical fish barrier was constructed last summer at one of our small impoundments that emulated a barrier that was constructed to prevent muskellunge emigration in Lake Kinkaid, Illinois. This spring, the barrier had up to 11" of water flowing through after multiple rain events in the watershed. This was the first test of this structure. Crews made 4 trips over a 2 week period to check and clean the barrier. Some large woody debris accumulated on the structure, but overall, maintenance was minimal. The horizontal bars (10 ft) experienced some vibration, but everything remained tight. During one visit, staff observed at least 5 adult muskellunge in front of the barrier. There was no doubt that some of these fish would have been lost over the spillway without the barrier in place.

A laboratory study evaluating the effectiveness of light, bubbles, and sound as a deterrent for walleye emigration in reservoirs was completed. Results suggest that the barrier without lights deters walleye better than with light trials; however, there is a fair amount of variability in the minimum and maximum values for this treatment. Contact Jonathan Meerbeek (Jonathan.Meerbeek@dnr.iowa.gov) for a copy of the completed report.

A laboratory study evaluating the effectiveness of an electrical barrier for walleye has also begun. Preliminary findings suggest that the electric barrier is ~90% effective, whereas the sound bubble barrier was at best 50% effective.

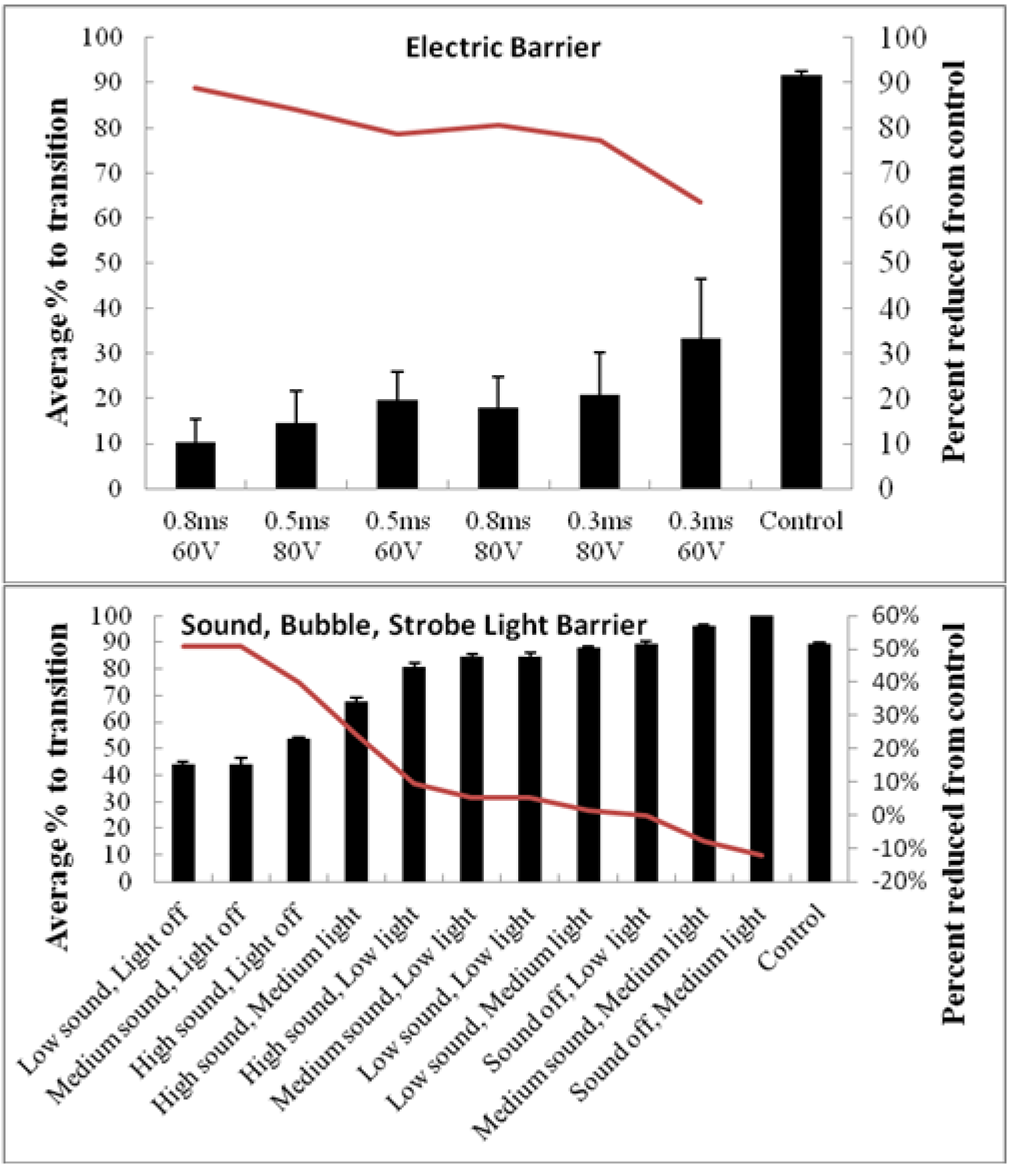


Figure 2. Electric and sound/bubble/strobe light barrier effectiveness evaluations conducted at Rathbun Fish Hatchery, Iowa for walleye.

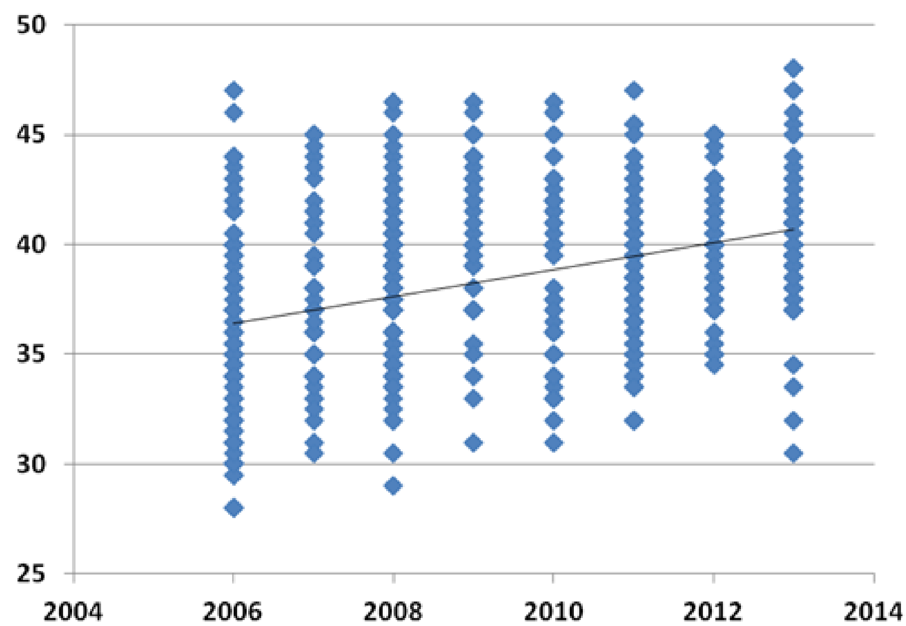
Mississippi River Northern Pike Study - This telemetry study was undertaken in order to identify and quantify the physical and chemical characteristics of habitat used by northern pike in the Upper Mississippi River. Twenty pike were radio transmittered within the Sny Magill Bottoms complex in Pool 10, in October 2011. Pike overwintered in off-channel backwater lakes with characteristics consistent with those identified as critical for Centrarchid overwintering (depth ≥ 1 m, no flow, $O2 > 4$ mg/l; Steuck 2010). As river levels rose in the spring and remained high through the early summer many pike moved into shallow flooded terrestrial areas. As water levels have dropped and water temperatures moved into the 80's, pike began to move to areas with cooler water such as areas with springs or into cold water tributaries. We will continue to track these fish for the next couple of years in order to determine seasonal movement patterns. An additional 40 northern pike will be transmittered in Pools 10 and 13 in October 2012. Information gained from this study can be used in the design and construction of future habitat rehabilitation and enhancement projects on the Upper Mississippi River. The 2012 annual research report on this project is appended below. For more information contact Kirk Hansen (Kirk.Hansen@dnr.iowa.gov)".

Indiana (Dave Kittaka) –

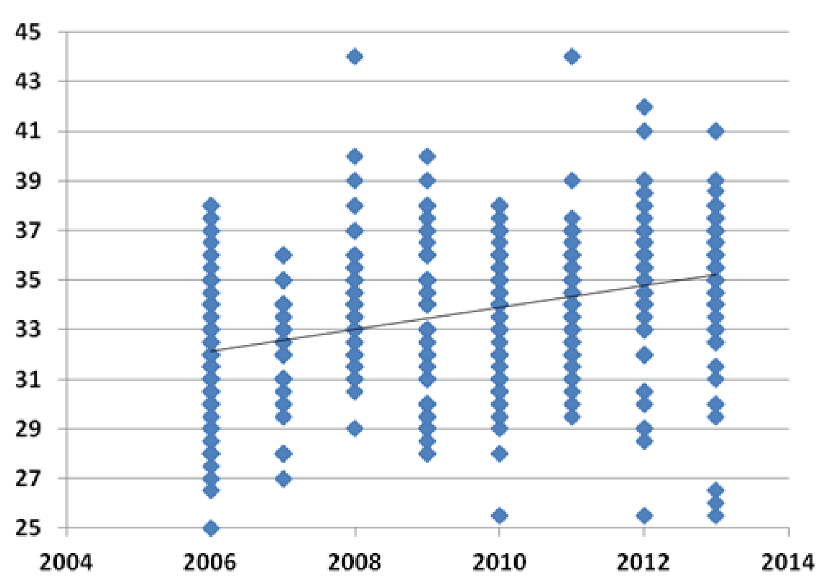
Jed Pearson
District 3 Fish Management Biologist
Indiana Department of Natural Resources

Webster Lake is a natural lake located in Kosciusko County and is the primary broodstock source for Indiana muskies. Since 2006, we've seen a gradual increase in the mean length of males and females, plus a reduction in the number of smaller muskies. In 2007, Webster Lake muskies were switched from a 90 day forage-finished fingerling to a 30 day forage. Because we don't catch muskies in our traps until they are about 4 years old, we won't know the full effect of the diet change for a couple more years. Meanwhile, other factors, such as changes in aquatic plant density, may play a role in this as well.

Female muskies



Male muskies



David Kittaka
District 5, Fish Management Biologist
Indiana Department of Natural Resources

Muskie surveys were conducted at Bass Lake and West Lake (Sullivan County) these lakes are reclaimed coal pits located in south-western Indiana. Muskie were collected at Bass Lake in 2008 using a Lake Michigan style trapnet. Indiana designed and purchased smaller versions of the Lake Michigan style trap net in 2012 for muskie sampling. Two nets were set at Bass Lake to determine if they were effective for catching muskie. In 4 lifts there were 14 muskies collected from 33.8 to 39.0 inches. No identifiable females were collected. Water temperature was 39F. Nets were set at West Lake the following week to evaluate the muskie population. West Lake has been stocked for 10 years. No muskies were collected in 5 net days. An angler creel and general fish surveys were conducted in 2008. No muskie catches were documented in the creel or general surveys. It will be recommended that this stocking be cancelled and the fish reallocated to another lake.

Tom Bacula
District 1, Fish Management Biologist
Indiana Department of Natural Resources

Bruce Lake is a natural lake located in Pulaski and Fulton Counties, and has been stocked since 2000. The survey was conducted from April 15 to 19, 2013. Water temperature ranged from 52.3 to 54.5 F. Effort consisted of 12 lifts over 5 days. Indiana style trap nets along with a small version of the Lake Michigan style trap net. No muskies were collected in the Indiana standard trap nets. A total of 90 muskies was caught (7 recaps from this year) from 26.5 to 48.0 in. Net catch rate ranged from 0 to 20 fish/net (small Lake Michigan style trap net average catch was 9.2/net). Overall CPUE 7.5 fish/net. Two thirds of the fish were males.

Tom Bacula Indiana DNR

Steve Donabauer
North Fish Research Biologist
Indiana Department of Natural Resources

A northern pike survey was conducted on Snow Lake (Steuben Co.) from April 1-9 using Indiana style trap nets, small Lake Michigan style trap nets (LMTN) and large Lake Michigan style trap nets. Twenty pike were collected that ranged from 19.2-35.8 inches and 1.5-12.3 pounds. Most (80%; N = 16) of the pike were collected in the large LMTN while several (15%; N = 3) were collected in small LMTN, and a single pike (5%) was collected in a Indiana style trap net. The number of female, male, and juvenile pike collected were 10 (50%), 8 (40%), and 2 (10%), respectively. Water temperatures ranged from 40.6-43.5 degrees in the main lake and from

44.9-47.0 degrees in the littoral area during the sampling period. Pectoral fin rays were collected for pike for subsequent age and growth analyses. Although the catch rate of pike in Snow Lake was low compared to surveys conducted on Clear and Hamilton Lakes in 2012, two “memorable” pike (> 34”) were collected in Snow Lake in 2013 compared to 0 and 5 “memorable” pike collected in Hamilton Lake and Clear lakes, respectively. Thus, this study provided evidence that Snow Lake has the necessary habitat available to produce pike of large size-classes and to support continued conservation efforts that use pike as an indicator species for the preservation and enhancement of coolwater habitat among Indiana’s glacial lakes. Lake Wawasee (Kosciusko Co.) will be surveyed for pike in 2014.


Mike Porto Indiana DNR

Kansas (J. Koch) –

The Kansas report is pretty short as the only lake in the state that maintained a pike population was renovated last year. The renovation was completed last fall, and this spring fingerlings from Nebraska were procured and restocked. Hopefully the stocking proves successful and the population reestablishes.

Michigan (K. Smith) –

<u>Muskellunge fishing regulations:</u> Over the past year, the Michigan DNR has made changes to muskellunge fishing regulations in an effort to improve fishing opportunities and to further protect the species. Starting April 1, 2013 the possession limit changed to allow anglers to keep only one muskellunge per season, instead of one per day. Anglers must also obtain a free harvest tag that must be attached to the muskellunge they intend to keep. As of July; 39,581 muskellunge harvest tags were issued to anglers. It is difficult to use this as a gauge of muskellunge anglers as many anglers may obtain a tag for incidental catch while fishing for other species. A follow up angler survey will be conducted to evaluate final harvest and angler participation for the 2013 fishing season. Some waters of the state are being added to a 50 and 46 inch minimum size limit during the 2014 fishing season.

Record muskellunge caught in Michigan waters: For the second time in three years, a new state record Great Lakes muskellunge has been caught in Antrim County, Michigan. The Michigan Department of Natural Resources confirmed the catch of a record-breaking 58 pound muskellunge on Oct. 13, 2012. The muskellunge was caught by Joseph Seeberger of Portage, Michigan while fishing on Lake Bellaire. The fish measured less than 59 inches and had a girth of 29 inches. The previous state record Great Lakes muskellunge was caught by Kyle Anderson of Rapid City, Michigan on Torch Lake. That muskellunge weighed 50.5 pounds and measured 56.13 inches. The state-record Great Lakes muskellunge caught by Joseph Seeberger of Portage, Mich., on Oct. 13, 2012, has now been listed as a world record by the International Committee of the Modern Day Muskellunge World Record Program (MDMWRP). MDMWRP is listing Seeberger's fish at 58 pounds, 58 inches long, and a girth of 29 inches.

Great Lakes Muskellunge Broodstock Operations: Michigan DNR Fisheries Division began its third year of gamete collections for the states Great Lakes Muskellunge program. This year all gamete collections were obtained from the Detroit River, whereas in previous years there was some effort expended in Lake St. Clair. This year a total of 12 females were spawned with 24 males with an estimated 758,938 eggs taken to the Wolf Lake State Fish Hatchery. Estimates of 490,701 fry were transferred to rearing tanks with an average hatch rate of 63% between twelve fish lots. Fall fingerlings will be stocked in the two state inland broodstock lakes, surplus fish will be stocked into public waters of the state and approximately 3,000 fingerlings will be traded with the state of Wisconsin.

Northern Pike Regulations: Beginning April 1, 2013 several new northern pike regulations took effect including modifications to the no minimum size limit with a possession of 5 fish daily with only one larger than 24 inches, and waters that are now regulated under a protected slot limit between 24 and 34 inches. Protected slot limits at Blind Sucker Flooding and Bodi Lake have been in place since spring of 2013. Anglers have had a difficult time understanding the regulation. Postcard surveys are in place at both waters and have been responded to well. Preliminary results show that anglers prefer numbers of fish over size of fish and potential for trophy fish. Also this postcard survey is evaluating the fishery before the regulation has really had any effect. It will be conducted again in the future to see if preferences, values, and size structure of harvest has changed. No MSL regulations for NOP on Nawakwa Lake have been well received. Most anglers are happy to see the regulation. It is in place to help improve growth rates of northern pike and walleye. In the 2000’s the regulation was in place and then removed when growth rates improved. No MSL regulations for NOP on Muskallonge Lake have been successful. The fishery today is better than it has been for some time. Angler reports of large northern pike and in good condition.

Eastern Lake Superior Management Unit muskellunge surveys: Muskellunge populations in ELSMU have fared well in recent years. Densities in the Tahquamenon River have been reported as being up. Angler’s report numbers of muskellunge are higher today than in previous years. A Status and Trends survey on Dollarville Flooding (an impoundment of the Tahquamenon) captured 23 muskellunge. Jaw tags were placed in all captured individuals. However, Kingston Lake which is a very popular muskellunge fishery has suffered from extremely low water levels and limited forage. Growth has slowed drastically in recent years possibly due to these factors resulting in cease of stocking. Plans are being made for future management actions such as woody structure being place in the lake and sucker transfers. Despite some of the troubles here it still remains a popular fishery with many larger fish being caught. Contact fisheries biologist Cory Kovacs at the Newberry DNR office for more information.

Ongoing Research

TITLE: DELINEATION OF NATURAL BOUNDARIES OF MUSKELLUNGE IN THE GREAT LAKES AND THE EFFECTS OF SUPPLEMENTATION ON GENETIC INTEGRITY OF REMNANT STOCKS

RATIONALE: The muskellunge (Esox masquinongy) is a native Great Lakes apex predatory fish that has experienced declines and extirpations in many areas resulting in numerous restoration efforts. Despite localized understanding of genetic diversity in some locations, a broader understanding of genetic differences among most major Great Lakes spawning aggregates is lacking. Historic and ongoing stocking of Great Lakes and non-Great Lakes strain muskellunge poses a threat to the genetic integrity of remnant populations. Broader understanding of the genetic diversity and structure of extant muskellunge stocks in the Great Lakes would benefit rehabilitation efforts by identifying genetic management groups. We hypothesize that genetic diversity will be hierarchically structured as a result of philopatry and habitat constraints that affect levels of movements among populations. Further, low population sizes likely increase rates of stochastic changes in allele frequency (genetic drift), predictably resulting in a highly structured genetic resource consistent with an isolation by distance model. We further hypothesize that admixture between native and stocked fish will be correlated to stocking intensity based on a higher probability of stocked fish surviving and reproducing with the resident fish with increased effort.

OBJECTIVES: Our objectives are to: (1) build on existing genetic data to determine if significant genetic structure exists among muskellunge spawning aggregates across the Great Lakes and their tributaries; (2) determine if significant admixture is present in Great Lakes muskellunge populations consistent with introgression between stocked and resident Great Lakes muskellunge; (3) determine if levels of admixture are correlated with numbers of stocking events; and (4) determine if the genetic structure of non-admixed Great Lakes muskellunge populations is consistent with a genetic stock model that can be described in terms of genetic stock identification and degree of stock isolation.

METHODS: We will build on a previously standardized muskellunge genetic database (14 microsatellite loci) and genetically characterize spawning populations of Great Lakes muskellunge. New genetic data will be collected from sites not previously included or underrepresented in analyses, and populations with incomplete genotype data. Sites will be sampled as necessary with a target of 50 samples per site. Combinations of traditional genetic diversity measures, clustering algorithms, and Bayesian analyses will be used to estimate the number and spatial distribution of genetically distinct groups, as well as for evidence of population admixture and interbreeding between various strains.

Contact fisheries biologist Patrick Hanchin at the Charlevoix Fisheries Research Station for more information on this genetics study.

Minnesota (R. Pierce) –

Expanding bag limits to allow more harvest of small northern pike was a topic revisited by public groups and the legislature this year. A creel survey is being conducted during summer 2013 on three lakes where the bag limit was expanded from 3 to 9 fish less than 22 inches. The creel is intended to determine to what extent people actually keep more small northern pike.

Dr. Anne Timm, (U.S. Forest Service) is completing a study on the influences of water level regulation on nursery habitat of northern pike in Rainy and Kabetogama lakes, border waters with Canada where water levels are regulated by an international joint commission.

Dr. Bruce Carlson (Univ. of Michigan) and Dallas Hudson (U.S.G.S.) are summarizing data on angling vulnerability of tagged northern pike in Shingobee Lake, a small north-central Minnesota lake where controlled angling has been monitored.

Results of a MNDNR study on thermal habitat used by northern pike will soon be available as a Fisheries Investigational Report at the MNDNR website (www.dnr.state.mn.us) and a shorter version will be published in Transactions of the American Fisheries Society.

Jerry Younk (MNDNR) continued a long-term pit tagging study of muskellunge at Elk Lake, Itasca State Park during spring 2013. In addition, new acoustic transmitters were implanted in muskellunge, northern pike, walleye, and cisco during spring 2013 as part of an acoustic telemetry study of habitat segregation among the species in Elk Lake. Lead investigator for the acoustic tagging study is Andy Carlson (MNDNR).

The Bemidji area fisheries crew initiated a tagging study of muskellunge in Lake Bemidji during spring 2013. Angler reporting of Floy tags (in cooperation with members of Muskies Inc.) will be used to obtain a population estimate.

Five years of genetic analyses coupled with pit tagging of muskellunge in Moose Lake was used to aid in removal of Shoepac strain muskellunge, and promote fish with genetic backgrounds native to the lake, or native fish mixed with a Wisconsin strain that had also been stocked at one time in Moose Lake. Shoepac strain fish have demonstrated poorer growth than other strains, and removal of Shoepac strain fish from Moose Lake was estimated to reduce Shoepac ancestry from 14% to 6%. This study also compared a variety of techniques for obtaining population estimates and found that marking fish during spring trapping, followed by spring electrofishing for recapture, required the least effort to get a reasonable population estimate. Lead investigator for the project was Steve Mero.

Missouri (D. Woods) –

Spring 2013 Sampling Results

Standardized fyke net surveys were conducted this spring at Pomme de Terre Lake, Hazel Creek Lake, Fellows Lake, and Henry Sever Lake. Conditions this year were completely opposite compared to last year. In 2012, we were complaining about water temperatures climbing to 70^{o}F by April 1st. This year water temperatures were struggling to make it out of the 40's by the end of April. Nevertheless, sampling went well and the results are below.

Pomme de Terre Lake – A total of 209 muskies were captured in 30 net-days, resulting in a catch rate of 7.0 fish per net-day. Of the muskie captured, 25% were 36 inches or longer and 3% were 40 inches or longer. The largest fish captured was a female that measured 43.5 inches long and weighed 21 pounds.
Hazel Creek Lake – A total of 32 muskies were captured in 4 net-days, resulting in a catch rate of 8.0 fish per net-day. Of the muskie captured, 41% were 36 inches or longer and 9% were 40 inches or longer. The largest fish captured was 41.5 inches long.
Fellows Lake – A total of 40 muskies were captured in 28 net-days, resulting in a catch rate of 1.4 fish per net-day. High water levels and variable spring temperatures were likely reasons for the low catch rates. Of the muskie captured 23% were 36 inches or longer and 5% were 40 inches or longer. The largest fish captured was 41.9 inches long.

Henry Sever Lake – A total of 35 muskies were captured in 8 net-days, resulting in a catch rate of 4.4 fish per net-day. Of the muskie captured, 53% were 36 inches or longer and 13% were 40 inches or longer. The largest fish captured was 43.0 inches long.

New Missouri Muskie Program Coordinator

The Muskellunge Program Coordinator is responsible for implementing objectives outlined in *Missouri's Muskie Management Plan*, coordinating muskie management strategies and communicating statewide muskie information to the public. The coordinator also oversees the Show-Me Muskie Project; including the writing of the Show-Me Muskie newsletter. The coordinator position rotates to one of the Fisheries Management Biologists responsible for managing muskie in one of the program lakes. Each coordinator serves a three year term. Craig Fuller's term (2011 – 2013) has come to an end. In his final newsletter, Craig said that the time he served as coordinator was "very fulfilling". Starting July 1, 2013, Dave Woods will serve the next term (2014 – 2016). Dave works out of the Southwest Regional office in Springfield and is responsible for managing Fellows Lake.

Show-Me-Muskie Project Summary

The Show-Me-Muskie Project is a volunteer reporting program in which the Missouri Department of Conservation invites conservation-minded muskie anglers to help evaluate Missouri's muskellunge management program. Volunteers include a wide cross-section of muskie anglers at all levels of skill and experience. Missouri's Muskellunge Plan sets muskie angler catch-rate objectives, which can be documented most efficiently by anglers themselves. In 2012, Missouri had 74 anglers submit information. Collectively, they made 377 trips and fished a total of 2,277 hours on four of the five program lakes. No daily trip record forms were submitted for Lake 35, Busch CA during 2012. There were 437 muskie encounters (5.2 hrs./encounter) and 162 caught (14.1 hrs/catch); of which 63 were 36 inches or longer (36.1 hrs./catch >36"), within the goal identified in the current muskie plan of 20 to 40 hours. The 2012 Show-Me-Newsletter provides a summary of all data collected last year and can be obtained by contacting Dave Woods, MDC.

Genetic Strain Evaluation

Over the years, muskies stocked in Missouri have come from several areas including Pennsylvania, Wisconsin, Michigan, Minnesota, North Dakota, and Iowa. Collectively, these "Northern" strain muskies living in their native cooler climates tend to have somewhat different life histories than those living in warmer climates. An evaluation was initiated in 2002 at Pomme de Terre (7,820 acres) and Fellows (820 acres) lakes to compare growth and survival of Northern versus Kentucky strain muskie; which may be better adapted to southern latitudes similar to Missouri.

From 2002 through 2006, marked muskie fingerlings (12 – 14 inches) were stocked into Pomme de Terre and Fellows lakes. Information for the strain evaluation was gathered from standardized spring-time fyke net surveys with Wisconsin style nets conducted on each lake annually from 2005 – 2012. A total of 121 marked Northern strain and 42 marked Kentucky strain muskies were collected from Pomme de Terre Lake. During the same period, a total of 18 marked Northern strain and 93 marked Kentucky strain muskies were collected from Fellows Lake.

Over the course of the study, only 1.4% and 0.6% of marked Northern and Kentucky strain fish, respectively, were recaptured in Pomme de Terre Lake. Similarly, only 1.8% and 5.3% of the marked Northern and Kentucky strain fish, respectively, were recaptured in Fellows Lake. Growth rates appeared quite variable for individuals of the same strain and sex. Relative weight analysis was performed on male muskies of both strains. Concurrent with standard practices of assessing relative weight for fishes collected during spawning periods, only male muskies were used for this analysis. Relative weight scores also appear quite variable for individuals of the same strain and lake.

Due to relatively low capture rates of marked fish and highly variable growth among same-aged individuals, it does not appear that the available data can provide an adequate analysis of differences in growth rates, time of recruitment to a certain size, relative weight, or survival, between the Northern and Kentucky strains in Missouri. This project did provide some useful information about general growth trends of muskellunge in Missouri. On average, it takes about six years for a muskie to reach 36” in Pomme de Terre Lake and about five years for a muskie to reach the same size in Fellows Lake. Expected growth rate differences between sexes were observed, with females reaching 36” in five years and males reaching that same length in about six to eight years in Pomme de Terre. In Fellows Lake, females can reach 36” in three and a half to four years while it takes males five to six years to reach that same length.

Growth data collected during this study also provide some insight into what anglers can expect from the muskie fisheries in Pomme de Terre and Fellows lakes. One of the main objectives of *Missouri’s Muskie Management Plan* is to maintain density and size structure of muskie populations that result in an average annual angler catch rate of one musky at least 36” in length per 20 to 40 hours of muskie fishing effort. Age and growth data suggest that growth rates in Pomme de Terre and Fellows lakes are adequate to provide the needed density and size structure of 36” fish to meet the angler catch rate objective. Many Missouri muskie anglers often argue that 36” is not a significant trophy length and urge managers to set new goals for muskie lengths, often in the 45” to 50” range. The data collected in this study suggest that muskie growth rates in Missouri may not be adequate enough to support those higher goals. Ultimately, while it is feasible for muskie in Missouri to reach these larger lengths, the density of those individuals would be much too low to set any attainable objectives by. Contact Dave Woods for more information about this study.

Nebraska (K. Koupal) –

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. The recently appointed director seems to have an interest in prioritizing northern pike in our systems so more pond space is being allocated to minnow production to feed esocids. 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. Two main items are on-going and have occurred since the last report.

Northern pike production is still inconsistent. There has been a decline in hatch percentage of broodstock spawned from our National Refuge lakes near Valentine Nebraska. Our hatchery staff has tried multiple combinations to try and isolate the specific problem and this past year they used a new buffer solution technique (10.1 pH) that was suggested by Wisconsin. The new buffer produced mean eye up of 64.5 and 69.3% with various broodstock sources as compared to 49.1 and 36.8% eye up with the more traditional 9.3 pH regular buffer. Using a 0.6% saline solution pre-mixed with regular buffer produced a mean eye up of 59.4%. Our staff employed 2 variable trials to get replication that would assist in determining if better eye-up and survivability results from the “hot buffer” as they refer to it (10.1 pH). Results have not been shared at this time.

<u>Lake Wanahoo Pike Study</u>

This study began in 2012 to measure angler exploitation of northern pike. However, the proposed regulations to allow limited harvest were not well received by the public and were taken out of consideration for our two year regulation cycle (2013-2014). This study has now shifted to explore northern pike growth and survival in the reservoir. Northern pike are being collected with trap nets in the spring and are floy tagged. The 2013 population estimate was 1,745 (3/acre), which was a 17% decrease from 2012. The mode of male northern pike increased from 540 mm in 2012 to 620 mm in 2013 and for females increased from 590 mm to 720. Tagging is scheduled to continue in 2014.

Ohio (C. Wagner) –

During the summer of 2013, Ohio Division of Wildlife personnel are installing automated PIT tag antennas/readers below four spillways at muskellunge program reservoirs in Ohio. This is part of the "set-up" phase of a 10-year project aimed at understanding reservoir emigration of muskellunge. Spillway designs range from a simple, uncontrollable "over-the-top" spillway to a dam having completely controllable, multiple outlet structures at various depths behind the dam. This summer's installation will include testing of detection ranges and velocities, as well as other ground-truthing exercises and adjustments. Beginning this September and each fall thereafter, all age-0 muskellunge fingerlings stocked into these four reservoirs will be tagged with both a PIT tag and a T-bar style anchor tag. Anglers will be encouraged to report their catches on the Ohio Muskie Angler Log (https://www2.ohiodnr.com/MuskieLog/welcome.aspx) to provide in-reservoir data to supplement that escapement PIT tag data. This project represents a partnership between the Ohio Division of Wildlife, organized muskellunge angler groups, and reservoir owners/controlling authorities. The planning of this project has benefited from numerous conversations with other researchers and managers across the NCD and within ETC, proving again the value of this group for information exchange. This project will be discussed in more detail as part of the upcoming Biology, Ecology, and Management of Muskellunge and Northern Pike symposium at the Little Rock AFS 2013 meeting.

Ontario (Seeking new representative) – No state report provided.

Washington (B. Bolding) – No State report provided.

Wisconsin (J. Weeks) – The team meeting notes below summarizes muskellunge work in Wisconsin.

Muskellunge Team Meeting Notes

Kemp NR Station, Lake Tomahawk

Wednesday, September 5, 2012

1. Attendance – Mike Donofrio (EAD), Steve Gilbert (NAD), Dan Isermann (UWSP), Martin Jennings (SS), John Aschenbrenner (WCC), Mark Luehring (GLIFWC), Dennis Scholl (NAD), Jonathan Pyatskowit (NAD), Tim Simonson (CO), Scot Stewart (SAD), Bruce Underwood (CO), Justin Van De Hey (UWSP), Jordan Weeks (WAD), Doug Welch (SAD), Aaron Cole* (NAD), Greg Matzke* (NAD), Mike Vogelsang (NAD), Dean Bortz. *=New member.

2. Reviewed Charge - http://dnr.wi.gov/fish/musky/muskymanteam.html

3. Musky Research Update – Martin Jennings provided an update on activities related to muskellunge research out of his office, including age and growth studies (including Spider Lake, Sawyer County), PIT tag retention, support of our broodstock management program, spawning/capture site fidelity and movements and

implications for population estimation and brood stock capture, volunteer PIT tag recovery program, and cisco monitoring program. Contact Martin for additional information.

4. Regulations – We reviewed the 2012 Conservation Congress Advisory Questions related to muskellunge management. First, the proposal to increase the minimum length limit from 28” to 40” on Spider Lake, Sawyer County (2,003 Yes – 381 No – originated as a resolution in 2011) is currently under review by the local fisheries biologist and they plan to assemble all the available data, including a survey planned for spring 2013 before acting on this proposal. We will have a chance to review this if a rule change proposal is developed. We also review 2 Congress advisory questions related to motor trolling: The first, essentially to allow trolling with live bait using an electric motor, “while position fishing” (2,161 Yes -1,236 No – originated as a resolution in 2011) was rejected in deference to the following proposal, which was to specifically allow motor trolling statewide (1,928 Yes - 1,576 No). This proposal was supported by the Musky Team. After considerable discussion regarding whether to propose 3-lines or 1-line, the consensus was to propose 3-lines statewide, and consider the statewide vote in applying the regulations uniformly across the state. We continue to recommend that this proposal be presented as a rule change by the department at the 2013 Spring Hearings. The format of the question should similar to the one presented by the Conservation Congress Warm Water Study Committee. In terms of citizen resolutions from the 2012 spring hearings, we supported to concept of increasing the musky size limit on Petenwell and Castle Rock from 45” to 50” because it fits within the framework we have established. Eventually, we would prefer to see the 45” waters changed to either 40” or 50”. We also discussed whether the entire Wisconsin River system (at least from the dam at Lake Du Bay downstream should be consistent. We will discuss this further if the local biologist submits a rule-change proposal for the next cycle. We are still on track to pursue the 54” minimum length limit on Green Bay/Lake Michigan for the 2013 hearings.

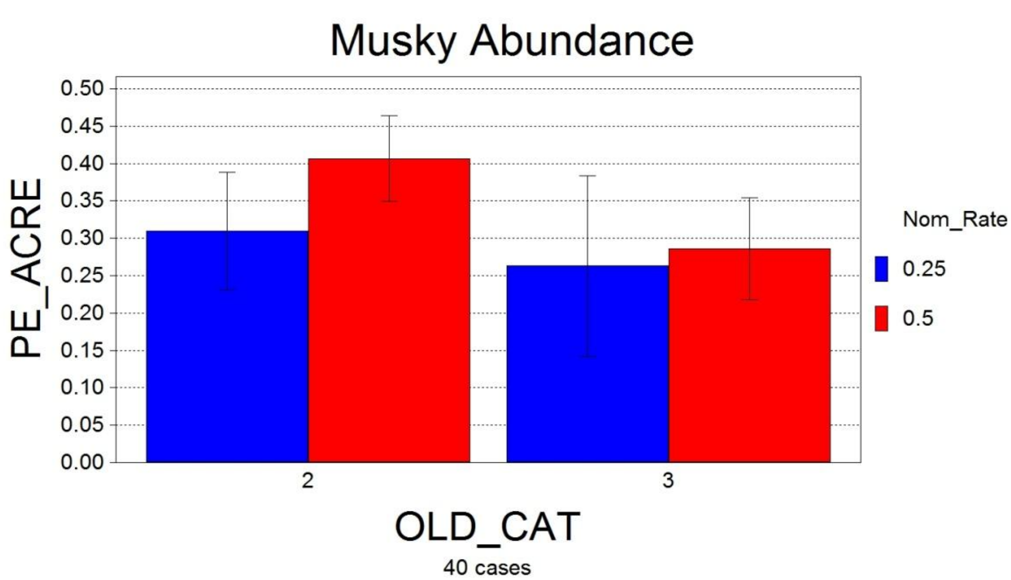
5. Propagation/Stocking – We reviewed the updated “cost to creel” estimates for large fingerling muskellunge. The revised method took several stocked waters with completed creel surveys, computed annual average ongoing costs to maintain the populations with stocking, and used creel surveys to estimate a “snapshot” of average annual catch and harvest. The propagation program is still working on developing the final cost estimates, so, while the method and catch/harvest data are completed, the final cost-to-creel estimate is not available. We also discussed current issues related to musky propagation, specifically related to the increasing forage costs/quality, and the implications for management. While we considered the option of stocking small fingerlings, including the development of hypotheses, for evaluation of this technique. However, Bruce felt that these would most likely be raised on dry forage. We felt that the larger issue of the use dry, pelleted forage for production fish needs to be addressed before we can begin to tackle the development of guidance for small fingerling stocking. We realize that cuts need to be made in the musky propagation program. The team did not feel comfortable with maintaining the same levels of production with a potentially lower quality product. Therefore, the Musky Team recommends that, until a thorough evaluation can be conducted of the long-term, in-lake survival of fish raised on dry, pelleted forage, that no such fish be used to fulfill regular production quotas. Rather, the musky team recommends that the total number of fish raised be reduced while maintaining the current live-forage rearing practices, in order to meet budget constraints. We will work with the biologists and work units to accomplish the anticipated reductions.

6. Aspects of the muskellunge brood stock management were discussed. Bruce Underwood provided a report on 2012 field spawning operations and current production levels. This past spring, GTH collected 1. 2 million musky eggs (24 quarts) from Lost Land/Teal Lakes. A total of 66 fish were spawned (27 females and 39 males) in 17- 1:1 pairings, 6- 1:2 pairings, and 4- 1:3 pairings. Of the 66 individuals spawned, 14 (21%) were tagged previously. Currently, GTH is on course to fill all 2012 musky quotas. However, because spring came 3 weeks earlier than normal, a 2-week delay in harvest was experienced due to a virus, and there are as many as 50% more large walleyes in our ponds than ever before, our total forage bill for the year is around $180,000 – almost $50,000 more than last year (which, up until this year, was the highest amount ever). Without a budget supplement, the facility will not be able to start the muskies it needs next spring to meet 2013’s quotas. Despite the virus, Sue Marcquenski has stated that the muskies we have this year are some of the healthiest, most robust muskies she has ever seen. GTH’s 2013 quotas show that nearly 10,000 muskies

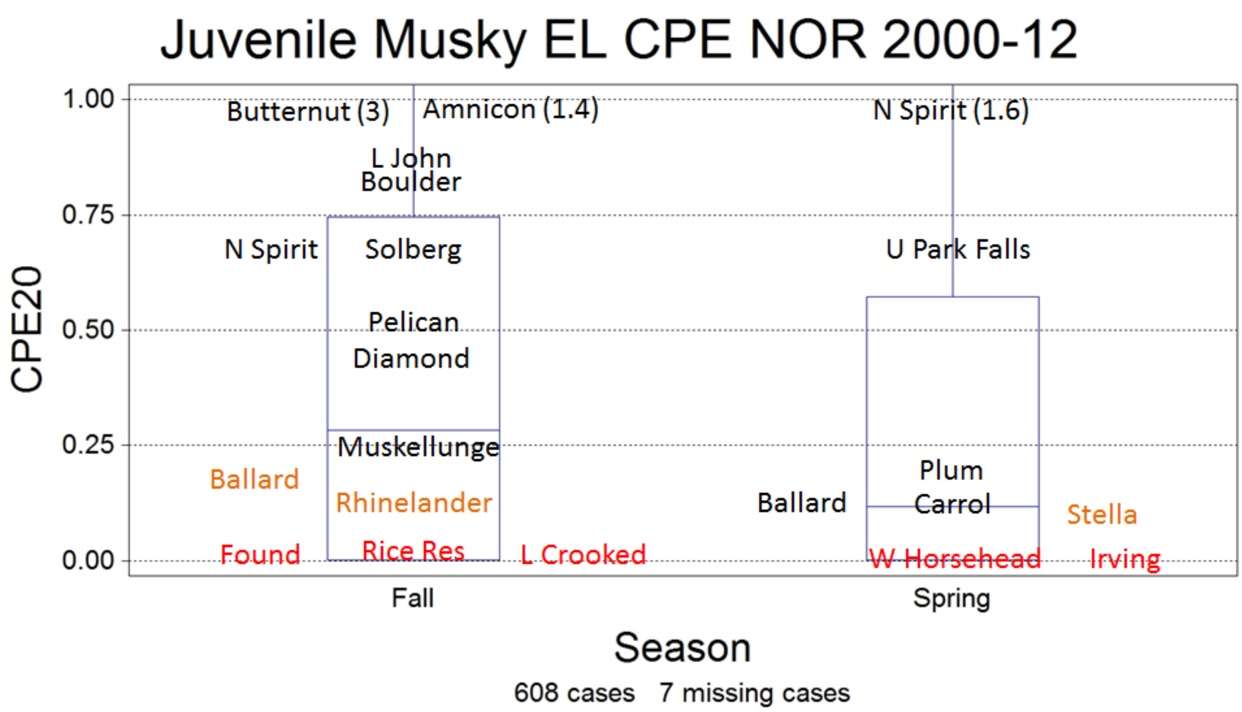
need to either be fin-clipped or PIT tagged, which means 3 ponds will need to be held well into September of 2013, in order for the water temperatures to cool sufficiently to allow this to be done, which means higher feeding costs. AOH collected 15+ quarts from Pelican Lake, Oneida County, March 20-April 16. A total of 32 fish were spawned with 10 pairings (5 – 3:1, 2 - 2:1, and 3 – 1:1). A total of 67 muskies were handled but not all were in spawning condition.

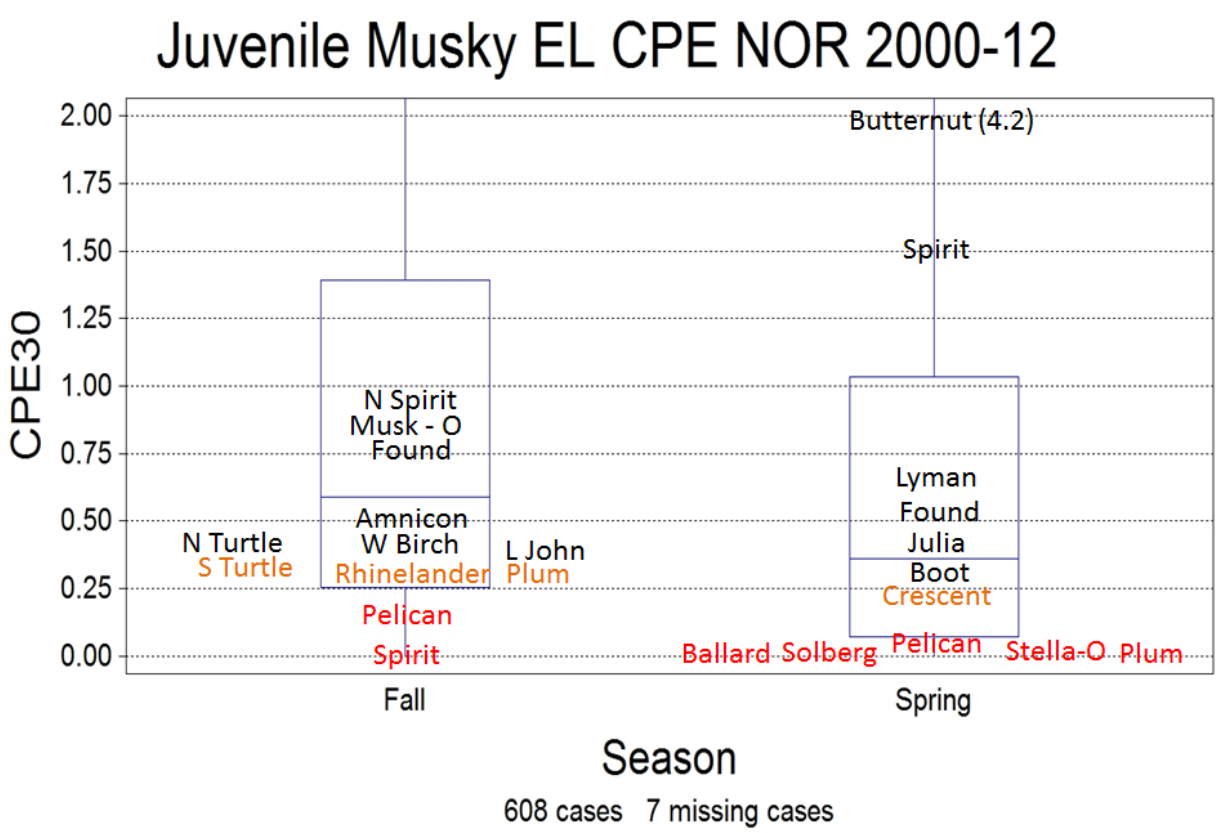
7. Justin Van De Hey provided an update of the ongoing evaluation of our brood stock management plan. UWSP has a graduate student (Zeb Woyak) working on a genetic-based evaluation of brood stock goals. He will be able to provide us with a detailed updated next summer, once he has gotten into his program of study. We discussed the continued practice of PIT tagging adults and stocked fingerlings in brood lakes. We concluded that we should continue to PIT tag all spawned adults, in order to determine repeated use of adults in brood lakes (which could potentially affect calculations of effective population size), and we also concluded that we should attempt to PIT tag all fingerlings stocked back into brood stock lakes. It is important to determine the relative contribution of natural versus stocked fish, especially in our brood lakes. Due to the expense, we will need to write a project for funding in the next biennium (or seek external funding).

8. We discussed the ongoing Stocking Evaluation, including what we know right now, and what we need to accomplish in 2013-14. We reviewed all the existing data for stocked lakes from the last 10+years. There are several patterns that will guide us in revising our stocking guidance over the next several months. First, we looked at abundance of muskies in category 2 and 3 lakes, stocked with large fingerlings at different rates (0.25/acre/year versus 0.5/acre/year). Generally, category 2 waters tended to have higher densities (presumably due to the joint contribution of natural and stocked fish). Also, the two stocking rates did not seem to strongly influence adult density in stocked (category 3) waters (see figure, below). A stocking rate of 0.25 fingerlings/acre/year typically results in acceptable adult densities in both types of musky waters. For waters where the goal may be a somewhat lower adult density, a lower stocking rate is recommended (e.g., A1 “trophy” waters). We will finalize these recommendations at our winter 2013 meeting.



We also looked at the randomly selected category 2 waters where stocking was terminated. Most have some information available, although very few have current population estimates (Trout, Plum, Crescent, N&S Turtle). We discussed other types of data that could be used to complete the evaluation. We have quite a bit of electrofishing data from these waters showing the catch of juvenile muskies. Is this sufficient to wrap up this project, or do we need population estimates? Given the status of Tier II funding, it is unlikely that we will have many more opportunities to conduct PEs on these lakes.





9. GL Spotted Musky – Mike Donofrio provided as update on development of our inland brood stock lakes. We anticipate again obtaining spotted muskellunge fingerlings spotted from the Michigan DNR this fall. We expect to obtain 3,000 fingerlings from 20 females. These fish were spawned from Lake St. Clair this past spring. The fish will be transported by us to the Wild Rose hatchery, where they plan to hold them overwinter for eventual stocking into the brood lakes in spring. Last year, catastrophic losses occurred at the hatchery and no fish were stocked.

10. We discussed standard sampling and assessment protocol for muskellunge fisheries. Based on the work of Martin Jennings, as well as the experience of our biologists, we recommend that, when conducting musky population estimates as part of a more comprehensive survey, that the marking be conducted in the year prior to the "comp survey" and the recapture period be included as part of the "comp survey". It is important to include a variety of sampling gears and periods to complete the recapture, and to put in as much effort as possible to increase the number of recaptured fish (which improves the estimate). Also, the marking period will provide a good indicator of whether the population is large enough to even complete an estimate of abundance. For example, if very fish are marked, it may not be cost effective to conduct the recapture. It is also very important to move the nets often during both the marking and recapture periods, given the high degree of site-fidelity that has been seen for muskellunge, included both targeted (based on past surveys and likely habitat) as well as random net locations. The protocol and handbook will be revised to reflect these recommendations. Also, we discussed and finalized standard criteria for assessment of trophy (Class A1) waters. These are expectations for our designated trophy waters, based on the normal ranges of data and best professional judgment. Lakes or rivers meeting these criteria (or with the potential to meet these criteria) should be designated trophy waters. Designated trophy waters not meeting these criteria should be evaluated for further management action(s).

Metric	Value
PSD42 (%)	$\geq$ 17
PSD38 (%)	$\geq$ 30
PE (number/acre)	$\leq$ 0.3
CPE (Number/net-night)	< 0.5
Length $_{\text{infinity}}$ (inches)	$\geq$ 48
Omega (inches/year)	8
Lake Size guideline (acres)	$\geq$ 1,000

We also discussed assessment criteria for determination of self-sustained waters. Below is a draft list of criteria for further discussion. There was a suggestion to add a PSD metric for the size-structure criteria. Simonson will evaluate this and provide the information for further input and a final recommendation.

Metric	Value	Normal range
Fall CPE $\leq$ 20" (number/mile)	$\geq$ 0.24/mile	0.0 – 0.53

Fall CPE < 30" (number/mile)	$\geq$ 0.67/mile	0.26 - 1.38
Spring CPE $\leq$ 20" (number/mile)	$\geq$ 0.13/mile	0.0 - 0.69
Spring CPE < 30" (number/mile)	$\geq$ 0.37/mile	0.00 - 1.65
Size-structure	"several sizes/ages"	- -
Adult PE (number/acre)	$\geq$ 0.14/acre	0.14-0.52

11. FYI - Musky symposium, Twin Cities, Spring 2016 – Muskies Inc.
12. Winter Meeting – May want to consider meeting at the fisheries statewide. If we do end up having a Statewide, it will be in February.

Appendix 1.

STUDY 7038

Evaluation of the status, distribution and habitats of Northern Pike in the Upper Mississippi River

OBJECTIVE

To develop, by 2016, recommendations for management of Northern Pike in the Upper Mississippi River.

JOB 2

Evaluations of methods used to sample Northern Pike.

OBJECTIVE

Determine sampling methods that efficiently collect Northern Pike and provide an unbiased estimate of relative abundance and size- and age structure for Northern Pike populations in the Upper Mississippi River.

JOB 3

Assess Upper Mississippi River Northern Pike populations.

OBJECTIVE

Determine growth, mortality, size- and age-structure, fecundity, recruitment, relative weight, and relative abundance of Northern Pike in Pool 10 and 13 of the Upper Mississippi River.

JOB 4

Evaluate seasonal movements and habitat selection of Northern Pike.

OBJECTIVE

Identify seasonal patterns of movement and habitat use by Northern Pike in Pool 10 and 13 of the Upper Mississippi River

JOB 5

Evaluation of the Northern Pike fishery in the Upper Mississippi River.

OBJECTIVE

Describe the Northern Pike fishery in Pool 11 and 13 of the Upper Mississippi River, and assess anglers' opinion about the Northern Pike populations.

ANNUAL REPORT
RESEARCH PROJECT SEGMENT

STATE:	Iowa	**TITLE:**	Evaluations of methods used to sample Northern Pike; and Assess upper Mississippi River Northern Pike populations
JOB:	2 & 3		

Upper Mississippi River (UMR) Northern Pike fisheries were sampled in summer 2012 and spring 2013. Thermal refuges (e.g., cold water tributary confluences, artesian wells and spring outlets) in Pools 10 and 13 were sampled from June 6 to July 15, 2012 to evaluate electrofishing as a sampling gear. Surface water temperatures were 25.6-28.9˚ C at cold water sites whereas other areas in these pools were as warm as 32˚ C at that time. In Pool 10, no Northern Pike were captured in 3.0 hours of eletrofishing. In Pool 13, 25 Northern Pike were captured in 1.2 hours (Mean CPUE = 26.3 fish/hour). Electrofishing catch rates were influenced by boat accessibility in cold water tributaries. Large woody debris prevented boat access in two of the Pool 10 cold water tributaries sites. Northern Pike were commonly observed avoiding the electric field resulting in low catch rates. This suggests that electrofishing may not be an effective method for sampling UMR Northern Pike.

Spring Northern Pike sampling began on April 1, 2012 in Pool 13, and April 8, 2012 in Pool 10 when water temperatures were 3.9 and 5.6˚ C, respectively. Standard framed fyke nets (0.9 m by 1.8 m) with 15 m (50 ft) long and 1.3 m (4.5 ft) high leads consisting of 19 mm (3/4 in) mesh were used to sample Northern Pike. Nets were set in morning and fished approximately 24 hours. When nets were lifted the following morning, Northern Pike were enumerated, sexed (male or female based on presence of gametes when pressure was applied near the vent or unknown if no gametes were visible), measured (nearest mm) and weighed (nearest g). Northern Pike over 300 mm were tagged with an individually numbered Floy tag (FD-94) inserted below the dorsal fin through proximal pterygiophores. Anal fin rays were collected from a subsample of Northern Pike (3 per cm length group) in Pool 10 and Pool 13 for age and growth estimation in each pool. Pelvic fin rays were clipped as a permanent secondary mark for estimating tag loss.

A total of 660 Northern Pike were captured between 2 and 11 April 2013 ranging from 401 to 925 mm TL with a male to female sex ratio of 1.1:1.0 (Table 1; Figure 1). In Pool 10, 209 Northern Pike were collected in 30 net nights (CPUE = 7.0 fish/24 hr set) and in Pool 13, 451 Northern Pike were collected in 32 net nights (CPUE = 14.1 fish/24 hr set). Of these, 189 and 334 were Floy tagged in Pool 10 and 13, respectively and 86 tagged fish were recaptured during this period.

Fecundity was measured from 56 gravid female Northern Pike collected during spring netting in Pool 13 in April 2013. Whole ovaries were removed, individually weighed, and egg counts from three subsamples (front, middle, and back) were enumerated. Total number of eggs per ovary was calculated by multiplying total ovary weight by the average number of eggs per subsample (# egg/g) with total fecundity being the sum of both ovaries. Gravid female Northern Pike ranged in size from 512-927 mm and 913-7,976 g and fecundity ranged from 21,829-182,062 eggs/fish (Mean = 63,402). The length-fecundity relationship was best described by (Figure 2):

$$Fecundity = 277.78(TL) - 120{,}437.$$

Gonadosomatic index (mean = 0.18) and eggs per kg of body weight (mean = 26,792 egg/kg) were unrelated to total length. On average the left ovary in most (i.e., 53 of 56) fish was 15% larger than the right. We postulate this may be due to the orientation of other organs within the body cavity.

Study Recommendations: Continue with this study as designed.

Table 1. Number of Northern Pike sampled, sexed, tagged and recaptured from Pools 10 and 13, Upper Mississippi River in 2013.

	Pool 10	Pool 13	Total
Males	81	228	309
Females	118	175	293
Unknown	0	0	0
Total	199	403	602
No. Tagged	189	334	523
Recaps	24	62	86

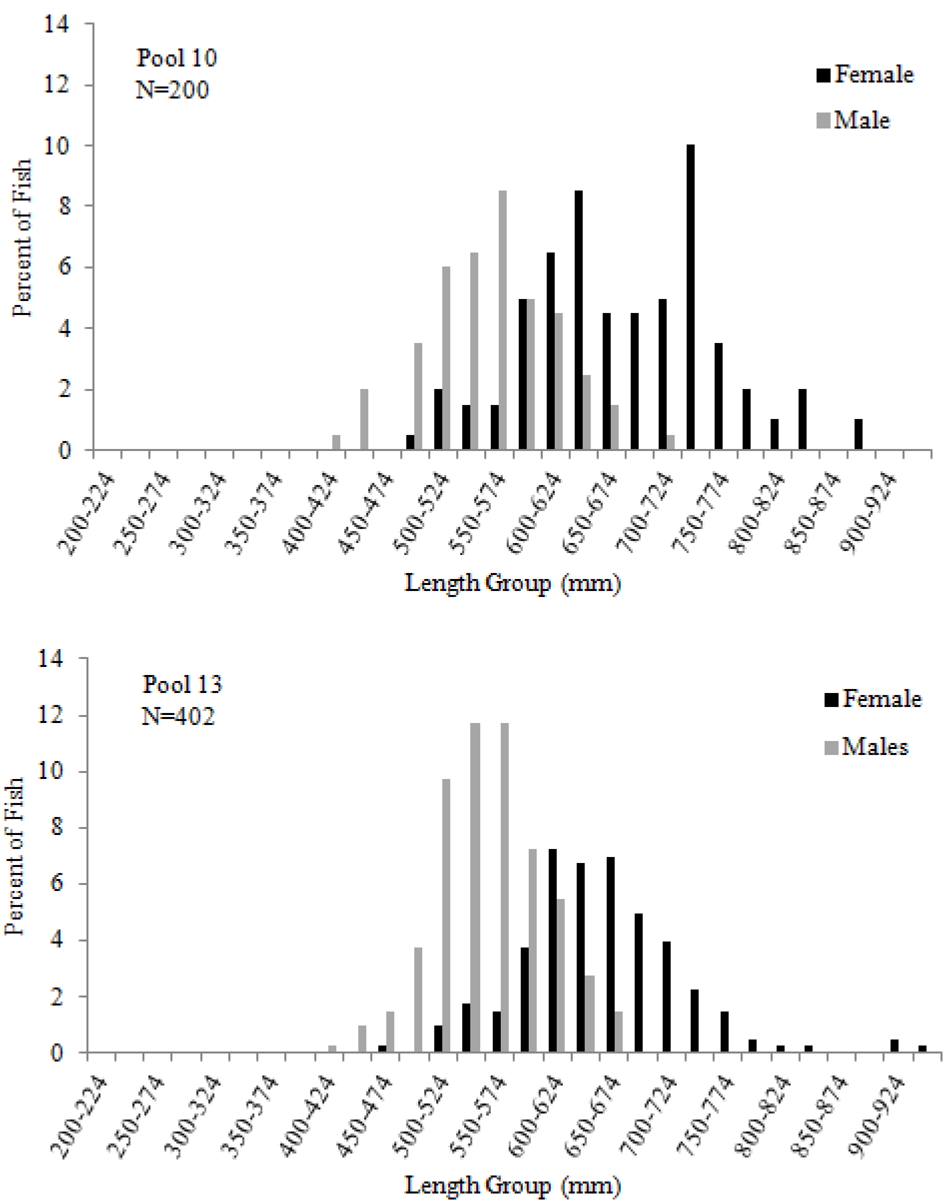


Figure 1. Length frequency histogram and sex of Northern Pike sampled from Pool 10 and 13, Upper Mississippi River in 2013.

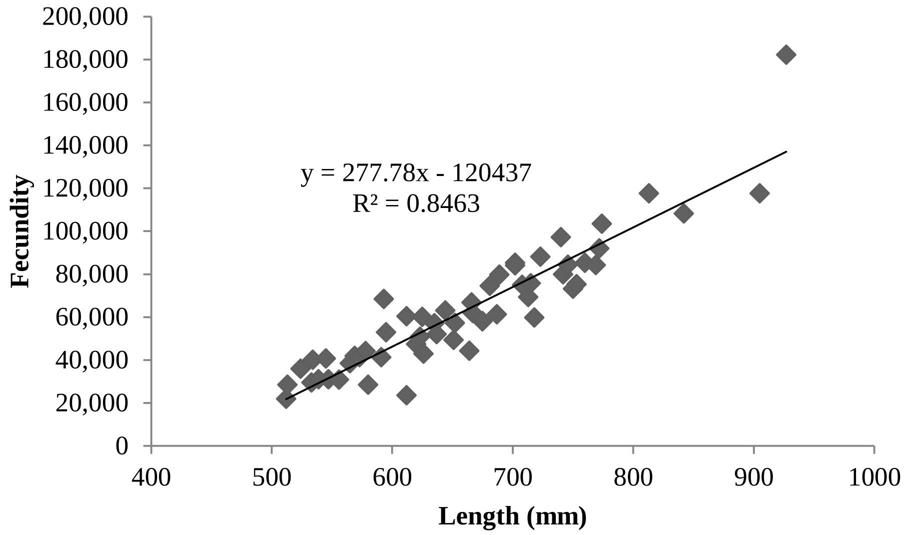


Figure 2. Length fecundity relationship for Northern Pike collected in Pool 13, UMR, April 2013.

ANNUAL REPORT
RESEARCH PROJECT SEGMENT

STATE:	Iowa	**TITLE:**	Evaluate seasonal movements and habitat selection of Northern Pike
JOB:	4		

In October 2011, Northern Pike were collected using a combination of standard fyke nets and electrofishing from Norwegian and Methodist Lakes of the Sny Magill Bottoms complex in Pool 10. Twenty Northern Pike were implanted with radio transmitters following the general methods used by Pitlo (1984) for walleye and sauger in the UMR. Individual transmitters weighed 25 grams, had 3,085 day life expectancy, and 12 hour per day duty cycle (Model # F1850 Advanced Telemetry Systems, Isanti, MN). Northern Pike were incapacitated prior to surgery using a pulsed DC backpack electrofishing unit. Mean length of transmittered Northern Pike was 716 mm (range 630-923 mm) and mean weight was 2,351 g (range 1,520-5,067 g). One radio tagged Northern Pike died before the first tracking event (6 days post tagging) for an observed short term tagging mortality rate of 5%. The transmitter was recovered and re-implanted into another Northern Pike in early November. Exploitation was 25% in the first year: two fish were harvested by ice anglers and three were harvested during open water.

In July 2012, 90% of recorded daily high temperatures in Eastern Iowa were higher than historical averages (National Weather Service, unpublished data). Surface water temperatures in backwater lakes of Pool 13 exceeded 32.2˚ C. More than 100 dead Northern Pike were observed in a Pool 13 backwater lake (Darren Witt, USFWS, personal communications). Widespread reports of Northern Pike mortality occurred throughout the UMR, including Pools 10 and 13, through July and August. During this period, three of 16 (19%) active radio tagged Northern Pike moved to cool water inputs: two sought thermal refuge in Sny Magill Creek, a trout stream that enters the Mississippi River in the Sny Magill backwater complex, and one moved to a cold water seep near Prairie du Chien, Wisconsin. Two of the three fish were subsequently harvested during this period. Northern Pike anglers in the UMR are known to concentrate their efforts on cold water inputs in the summer for high catch rates. Of the remaining thirteen radio tagged Northern Pike, four suspected heat related mortalities occurred. The percentage of Northern Pike that moved to cold water inputs during this time of thermal stress was much lower than expected. However, fish that did not seek out thermal refuges had a higher survival rate (69% vs. 33%) due to high angler harvest in cold water areas.

Eight recovered radio transmitters were re-implanted in Northern Pike in the Sny Magill complex in October 2012. Mean length of re-implanted Northern Pike was 673 mm (range 573-773 mm) and mean weight was 2,116 g (range 1,646-2,832 g). In September and October 2012, an additional forty Northern Pike were surgically implanted with radio transmitters into an alternate site in Pool 10 and two new sites in Pool 13. In Pool 10, ten fish were implanted in Bussey Lake north of Guttenberg, Iowa. Mean length of transmittered Northern Pike was 628 mm (range 593-890 mm) and mean weight was 2,168 g (range 1,242-5,992 g). In Pool 13, twenty Northern Pike were radio transmittered in Crooked Slough near Bellevue, Iowa and ten in lower Pool 13 in the Sabula Lake/Hubbell Slough complex near Sabula, Iowa. Mean length of transmittered Northern Pike in Pool 13 was 686 mm (range 586-873 mm) and mean weight was 2,078 g (range 1,276-4,448 g). No short term tagging mortality was observed in the Northern Pike in Pool 10. In Pool 13, four Northern Pike died post surgery. Overall short term tagging mortality rate was 8% in 2012 which is similar to the 5% observed in 2011.

In Pool 10, crews have logged 62 tracking events resulting in 520 individual locations since October 2011. Each fish was located an average of 18.6 times (range: 2 to 34). In Pool 13, crews have logged 25 tracking events resulting in 135 individual locations since October 2012. Each fish was located an average of 5.4 times (range: 1 to 9).

Northern Pike occupied 3 habitat strata, backwater lakes, side channels and the main channel border of the UMR. All Northern Pike in Pool 10 overwintered in habitat consistent with that observed for Centrarchid species (Steuck 2010). In Pool 13, many backwater lakes were dry during winter and eight Northern Pike (27%)

overwintered in side channel habitats. Mean depths and velocities differed during winter and open water periods by strata (Table 1).

Study Recommendations: Continue with this study as designed.

References:

Pitlo, J. Jr., 1984. Mississippi River Investigations. Project Number F-109-R-1, Federal Aid to Fish Restoration Annual Performance Report. Iowa Department of Natural Resources, Des Moines.

Steuck, M. J. 2010. An evaluation of winter habitats used by Bluegill, Black Crappie, and White Crappie in Pools 11-14 of the Upper Mississippi River. Iowa Department of Natural Resources, Federal Aid in Sport Fish Restoration, Project F-160-R, Study 7021 Completion Report, Des Moines, Iowa.

Table 1. Mean depth and current velocity measured at Northern Pike locations in backwater lake (BL), side channel (SC), and Main Channel Border (MB) habitat strata during open water and under ice conditions in Pools 10 and 13, Mississippi River, 2011-2013.

		Pool 10		Pool 13	
		Depth (m)	Velocity (ft/sec)	Depth (ft)	Velocity (ft/sec)
Open	BL	1.0	0.02	1.6	0.01
	SC	1.6	0.31	1.9	0.15
	MB	1.8	0.12	2.6	0.36
Ice	BL	1.0	0.00	1.1	0.00
	SC	NA	NA	2.4	0.27
	MB	0.9*	0.12*	NA	NA

* not mean, N = 1

ANNUAL REPORT
RESEARCH PROJECT SEGMENT

STATE:	Iowa	**TITLE:**	Evaluation of the Northern Pike fishery in the upper Mississippi River
JOB:	5		

Creel surveys were conducted in Pools 11 and 13 as part of Study 7017, Job 4 (Steuck et al. 2008) from 1993 - 2010. Northern Pike ranked 10^{th} in harvest over the past seven summers in Pool 13 (Table 1). Mean annual summer harvest of Northern Pike in Pool 13 was 122 fish with a harvest rate of 0.005 f/hr (Table 2). The creel survey conducted in pools 10 and 13 from 1993 through 2010 did not effectively creel sufficient numbers of Northern Pike anglers to describe this fishery. We suspect that Northern Pike anglers were not encountered in proportion to their use of these resources. After reviewing these data, we determined that it would be cost prohibitive to conduct a targeted creel survey for Northern Pike. Instead we opted to replace the creel survey aspect of Study 7038, Job 5 with an angler opinion survey conducted at multiple access areas along the Mississippi River.

The survey consisted of five questions. The first question was, “Do you catch Northern Pike while fishing the Mississippi?” If anglers responded “no” to this question the survey ended. If they responded “yes,” they were asked three additional questions: 1) From which Mississippi River pools do you catch Northern Pike; 2) Do you normally harvest Northern Pike; 3) Do you ever specifically target Northern Pike while fishing the Mississippi River? Anglers were also asked to rate their overall satisfaction with Northern Pike fishing on the Mississippi River on a scale of 1-5 with 1 = very dissatisfied, 2 = somewhat satisfied, 3 = neutral, 4 = somewhat satisfied, and 5 = very satisfied.

Angler opinion surveys were conducted from May-August 2012. For analysis, surveys were sorted by management districts: Guttenberg (Pools 9-11), Bellevue (Pools 12-15), and Fairport (Pools 16-19). A total of 207 interviews were conducted across the three management districts (Table 3). The percentage of anglers that catch Northern Pike by district decreased as you move downstream with 78%, 65%, and 26% of anglers reporting having caught Northern Pike in the Guttenberg, Bellevue and Fairport districts, respectively. The percentage of anglers that harvest pike (49%, 26%, and 2%) and specifically targeted pike (22%, 18%, and <1%) followed an identical downstream decrease (Table 3). This follows changes in river habitat and decrease in Northern Pike populations that is observed along the Mississippi River in Iowa. Of anglers that reported specifically targeting Northern Pike, 21% stated they don’t harvest them, indicating the presence of a trophy catch-and-release fishery.

Anglers reported catching Northern Pike from every pool of the Mississippi River (Figure 1). Anglers interviewed in the Guttenberg and Bellevue Management districts tended to be home bodies and did not report catching fish more than one pool outside the district. Anglers interviewed in the Fairport district (Pools 16-19) reported catching Northern Pike from every pool in Iowa with Pool 9, the farthest away, being the most common response.

Opinions of the fishery varied by management district with mean angler satisfaction ratings of 3.2, 3.6, and 2.6 for the Guttenberg, Bellevue, and Fairport districts, respectively. No angler in the Bellevue district rated the Northern Pike fishery lower than 3, while angler ratings at the other districts ranged over the entire spectrum of possible responses. Fairport had the lowest mean rating of 2.6, however if anglers that reported fishing upper pools (Pools 9-15) were removed, the mean rating dropped to 1.9. Anglers interviewed in the Fairport district that reported catching Northern Pike in upper pools gave a mean rating of 3.5, which is within the range given by anglers from the two upper districts.

Study Recommendations: The angler opinion survey conducted during this study segment was generally successful and yielded good results. Low sample sizes collected in the Guttenberg and Bellevue districts are of some concern and we recommend extending the survey through the summer of 2013 in order to collect more angler interviews. Therefore, Job 5 should be continued into Segment 18 and the budget should be adjusted accordingly.

References:

Steuck, M. J., C. Schnitzler and D. Weiss. 2008. Mississippi River Investigations; An evaluation of walleye and sauger populations and associated fisheries in Pools 11 and 13 of the Upper Mississippi River. Iowa Department of Natural Resources. Federal Aid in Sport Fish restoration, Project F-160-R, Annual Performance Report, Des Moines.

Table 1. Composition and number of sport fish harvested from Pool 13, May-October (Summer), Upper Mississippi River. Mean does not include October 2004 data.

	Year								
Species	2003	Oct-04	2005	2006	2007	2008	2009	2010	Mean
Freshwater drum	9,474	57	4,725	3,706	3.055	5,207	7,720	3,131	4,852
Bluegill	1,467	218	2,541	4,044	2,112	979	613	501	1,751
Channel catfish	4,643	172	2,158	2,962	1,661	2,801	4,727	1,325	2,897
Sauger	3,187	2,219	1,080	3,025	711	1,305	1,510	703	1,646
Crappie sp.	4,507	391	704	909	495	552	668	82	1,131
Walleye	1,559	194	426	1,160	499	835	1,244	590	902
White bass	647	829	3,068	1,319	1,740	743	992	261	1,253
Bullhead sp.	347	0	0	0	2	0	0	0	50
Largemouth bass	145	0	68	252	102	277	304	92	177
Yellow perch	7	13	22	26	18	10	21	9	16
Northern Pike	72	4	69	43	71	110	365	122	122
Carp	0	0	117	4	21	62	104	27	48
Flathead catfish	411	26	210	114	155	147	290	171	214
Smallmouth bass	20	2	0	4	20	55	51	18	24
Total	26,486	4,138	15,188	17,568	10,662	13,083	18,609	7,032	15,518

Table 2. Summary of angler catches and harvest of Northern Pike Pool 13, May-October (Summer), Upper Mississippi River. Mean does not include October 2004 data.

	Year								
	2003	Oct-04	2005	2006	2007	2008	2009	2010	Mean
No. caught	283	5	198	127	301	385	727	251	325
No. harvested	72	4	69	43	71	110	365	122	122
No. released	211	2	129	81	232	275	365	128	203
Catch rate (f/hr)	0.007	0.001	0.009	0.005	0.020	0.017	0.022	0.014	0.014
Harvest rate (f/hr)	0.002	0.001	0.003	0.002	0.005	0.005	0.011	0.007	0.005
Release rate (f/hr)	0.005	0.000	0.006	0.003	0.015	0.012	0.011	0.007	0.009

Table 3. Number of interviews and percentage of anglers that reported catching, harvesting, and targeting Northern Pike (NP) on the Mississippi River within the Iowa Department of Natural Resources Guttenberg, Bellevue, and Fairport Management districts during an angler use survey 2012.

	Guttenberg	Bellevue	Fairport
Number of interviews	37	34	136
Percent Catch NP	78.4	64.7	25.7
Percent Harvest NP	48.9	25.9	1.5
Percent Target NP	21.6	17.7	0.75

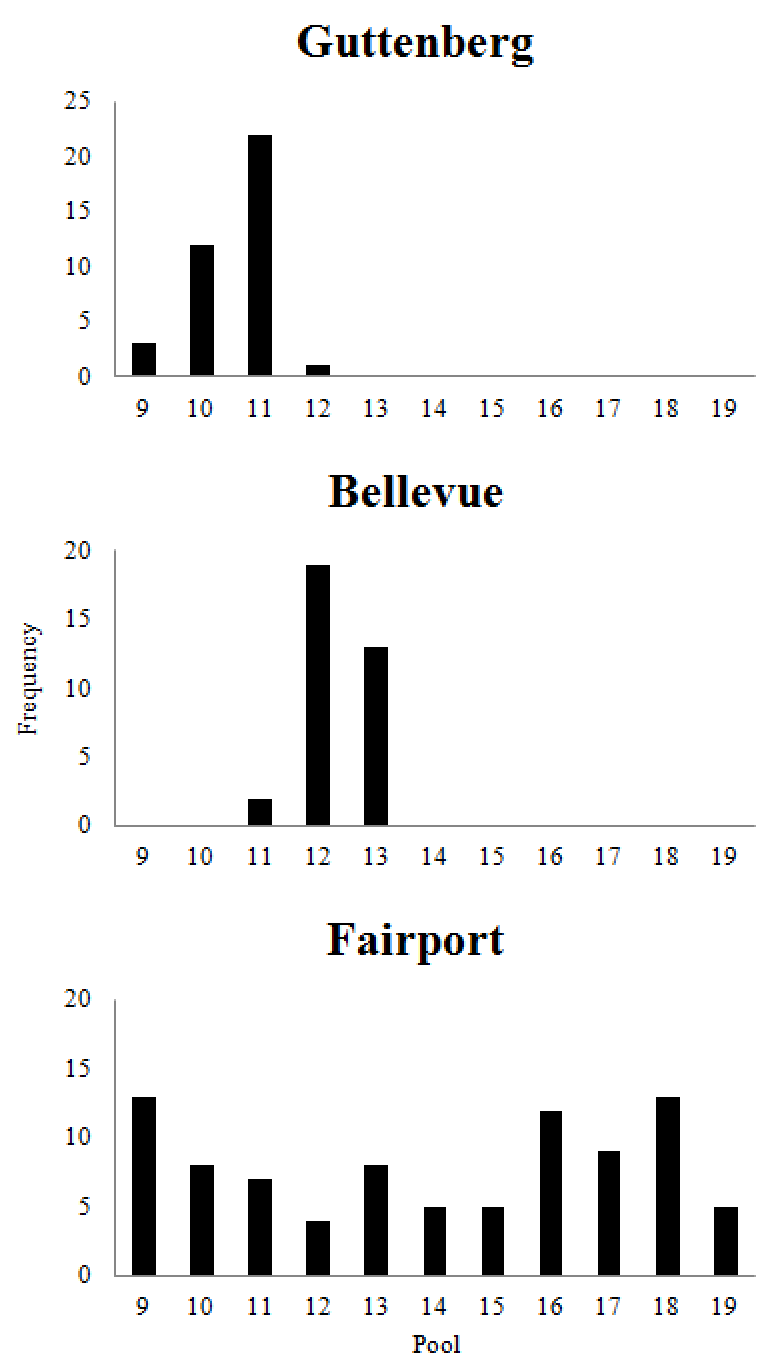


Figure 1. Pools that anglers reported catching Northern Pike on the Mississippi River from interviews conducted during an angler opinion survey within the Iowa DNR Guttenberg, Bellevue, and Fairport Fish Management districts in 2012.

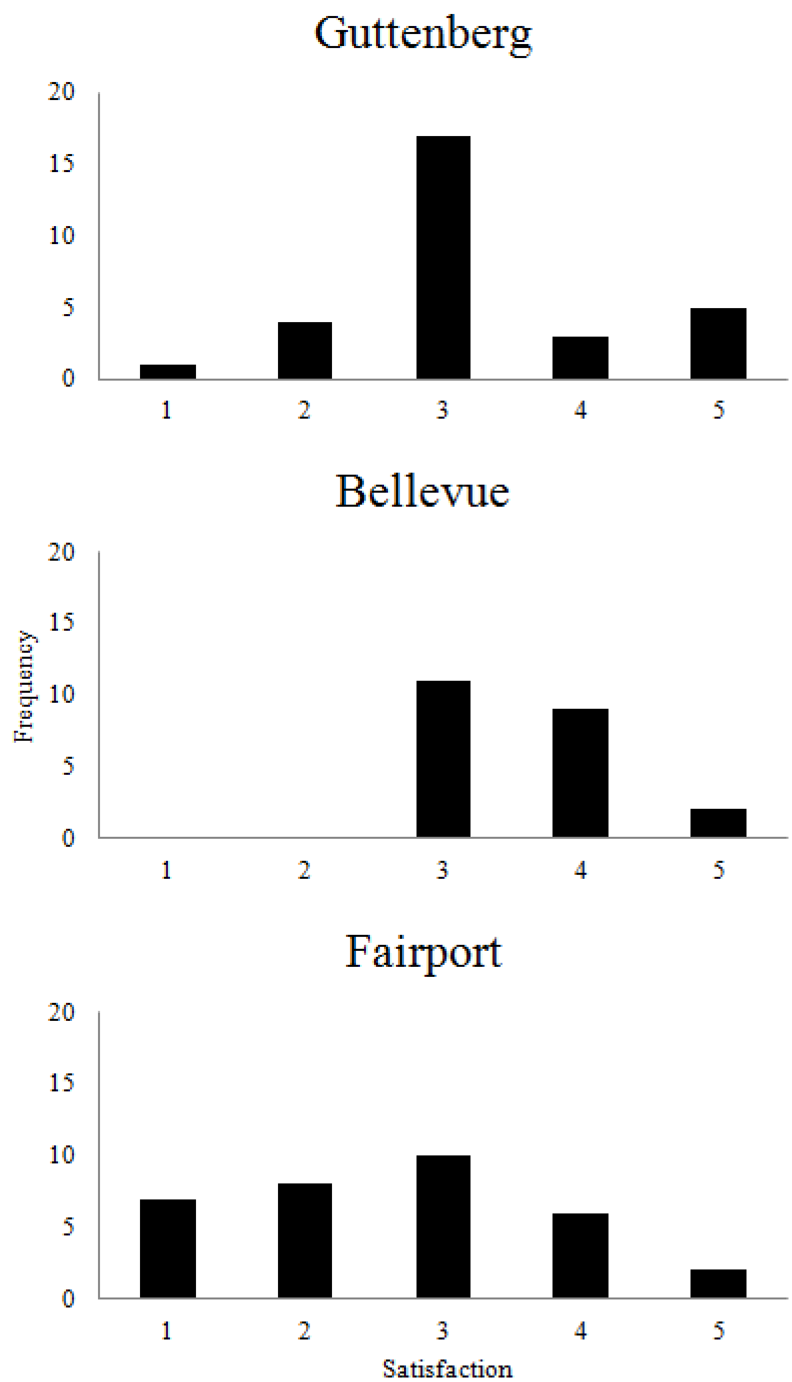


Figure 2. Angler satisfaction with the Northern Pike fishery in the Mississippi River from an angler opinion survey conducted within the Iowa DNR Guttenberg, Bellevue, and Fairport Fish Management Districts in 2012. 1 = Very dissatisfied, 2 = somewhat dissatisfied, 3 = neutral, 4 = somewhat satisfied, and 5 = very satisfied.

Appendix 2.

Iowa Great Lakes Electric Fish Barrier Project

by Leo Kofoot, Chapter 29 and Mike Hawkins, Iowa DNR

For the past twenty years or so, the Iowa DNR and musky anglers have been concerned about out-migration of muskies. Hundreds of individual fish have been observed and some caught by anglers in creeks and rivers below the dams of Iowa lakes and reservoirs. In one documented case the Iowa DNR estimated that between 300 and 400 muskies (approximately 50% of the adult population) left Spirit Lake in 2005 during a high water event. Such a significant loss could take years or even decades to recover from.

One particular muskie was P.I.T. tagged in Spirit Lake in 2006 as a 30-inch fish and later captured in the Missouri River below Gavins Point Dam, South Dakota in late 2010, a distance of 340 miles from its tagging site! It traveled over four dams on its journey.

In Iowa, the majority of the fish lost are underutilized in the vast river systems below these lakes, unlike northern lake flowages where fish move back and forth between lakes. Chapter 29 members have been working with DNR personnel for several years to find a solution, but financing was always an issue. Mechanical barriers were not feasible because of concerns over impeding the flow of water out of the lakes and impacting lake levels, a very sensitive issue. The Spirit Lake-Okoboji chain of lakes is a major tourist attraction with thousands of lakeside homes and a barrier that impacts water levels would not be acceptable.

Two birds with one stone? Some of our worst fears were realized in the summer of 2011. A major high water event in NW Iowa caused many rivers to reach record and near record levels, all the way downstream to the Missouri River. Although the timing of these floods probably spared significant muskie loss (most muskie loss has been documented in the spring), Asian carp had an open door to the Iowa Great Lakes and they stepped right in. Two were found in the summer of 2011 and 137 more were caught by commercial anglers in the spring of 2012. The jumping silver carp, in particular, caught the attention of the news media, local residents, and businesses. Efforts began immediately to find a way to stop the invasive carp, but the challenges of designing a barrier that didn't impede the flow of water still remained. An investigation by local agency professionals and stakeholders found the most feasible approach was an electric fish barrier. Electric barriers work by utilizing an electric field instead of a physical barrier to stop fish. Water can pass, but fish can't. Fish are very sensitive to electricity and although the strength of the electric field is enough to stop fish from traveling upstream it won't cause harm to them or humans.

How does it work? When Asian carp (or any fish) approach the barrier from the downstream side, they will start to encounter a graduated electric field that increases in intensity the further upstream the fish moves. The electric field will not harm fish; however it will impair their ability to swim while the flowing water pushes them back downstream.

The barrier has eight electrodes spaced about two feet apart that extend across the 160- foot width of the dam. These electrodes are steel bars that are recessed in the concrete and exposed to the water flowing across them. Each electrode is connected to a pulsator that supplies pulsed, DC electrical current creating an electric field in the water over the barrier. The system automatically adjusts to compensate for changes in water level and can even be programmed to start up or shut down as water levels rise or recede. A climate controlled control room located next to the dam holds all of the electrical equipment and has a back-up generator in case of a power outage.

That takes care of fish on the downstream side, but what about muskies? Electric fish barriers have traditionally been used and most effective in stopping the upstream movement of fish. Discouraging downstream migration can be more difficult because the direction of water flow works against the fish as it encounters the electrical field. A fish in the electric field that can't swim will be washed downstream. Due to barrier design and the sensitivity of muskies to electrical fields, as evidenced by their behavior around DNR electrofishing boats, biologists and engineers are optimistic the barrier will also work to keep fish in the lake. It is thought that fish will encounter the weak edges of the electric field and decide to turn around before going further.

The top surface of the completed electric fish barrier and dam. Despite the snow, the 8 recessed steel electrodes are visible running the length of the concrete dam. ***(Mike Hawkins photo).***

Partners and Cost? The barrier was not cheap. It required a unified effort and substantial fundraising to raise the $961,000 needed for design, engineering, and construction. This effort was truly a great show of support for the Iowa Great Lakes from many partners. Chapter 29 was able to contribute $8,000 towards the project from chapter funds, a grant from the Hugh Becker Foundation, and the Muskies Inc. Research Fund. Additional funds came from lakeside communities, county, Iowa DNR, lake protective associations, and the Minnesota DNR (the barrier will protect some southwest Minnesota lakes from Asian carp).

Smith-Root Inc. was contracted to do the design and engineering work. They have a long history of designing and developing fish barriers all over the world. A local contractor began construction on October 5, 2012 and completion was scheduled for February, 2013.

This muskie was P.I.T. tagged in Spirit Lake, IA in 2006 and captured in late 2010 in the Missouri River below Gavins Point Dam, SD, 340 miles from its tagging site!

The Iowa DNR plans to test barrier effectiveness at preventing muskie escapement by installing a PIT tag reader downstream of the barrier. Most muskies in the Iowa Great Lakes are already tagged and this should provide a good measure of success. The DNR will also have a remote camera at the barrier to monitor fish movement over the dam. Smith-Root Inc. has hinted that future barrier technology may be forth-coming to even better prevent downstream muskie movement. That technology, if applied, would be a future add-on to the barrier. Until the drought of 2012-13 ends and water starts to flow over the dam, the system cannot be tested for effectiveness. Stay tuned though, if this system proves to be effective at stopping downstream migration it will provide an alternative in places where physical barriers are not feasible.