This document is intended to provide an update regarding lake sturgeon activities within the Lake Huron basin. Please contact the agency leads listed for more information about a specific project.
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Frank Zomer  Bay Mills Indian Community
**Location:** Southern Lake Huron and Upper St. Clair River

**Project Title:** Lake Sturgeon Population Assessment in Southern Lake Huron

**Project Description:** Southern Lake Huron (Upper St. Clair River) contains one of the largest populations of lake sturgeon in the Great Lakes. In 1995, the Ministry of Natural Resources and Forestry began a mark-recapture study to gain a better understanding of lake sturgeon population demographics at this location. Tagging operations ceased in 2008. Overall, 1,657 lake sturgeon were marked and it is estimated that the lake sturgeon population is near 30,000 individuals. In 2012, the U.S. Fish and Wildlife Service along with the Ministry of Natural Resources and Forestry and Purdy Fisheries resurrected lake sturgeon tagging operations at this location. Lake sturgeon are tagged annually with the cooperation of Purdy Fisheries. Since 2012, 1,058 sturgeon have been tagged, with 126 tagged in 2019. The goal of this work is to obtain a more precise estimate of lake sturgeon abundance and monitor trends in abundance overtime.

**Project Duration:** Spring 2012 - Annually

**Contact Information:**
Justin Chiotti, USFWS, Alpena FWCO - Detroit River Substation, 248-891-0087, justin.chiotti@fws.gov
Chris Davis, MNRF, Upper Great Lakes Management Unit - Lake Huron, 519-371-8303, chris.davis@ontario.ca
**Location:** Southern Lake Huron and Upper St. Clair River

**Project Title:** Lake Sturgeon Gamete Collection in Southern Lake Huron

**Project Description:** Beginning in 2017, the U.S. Fish and Wildlife Service, Ontario Ministry of Natural Resources and Forestry, University of Windsor, and Purdy Fisheries began collecting lake sturgeon gametes in order to stock fall fingerling lake sturgeon in the Lake Erie and Huron basins.

The gametes collected will be used to restore the Maumee River, OH and Saginaw River, MI lake sturgeon populations. These lake sturgeon restoration programs are a bi-national effort between Federal, Provincial, State, and non-governmental agencies. The lake sturgeon gametes collected will be reared at either the U.S. Fish and Wildlife Service Genoa National Fish Hatchery or a streamside rearing facility operated along the Maumee River by the Toledo Zoological Society. The upper St. Clair River lake sturgeon population was chosen as the source for this reintroduction effort due the large size of the population, on-going monitoring efforts, and is likely similar genetically to what was historically found in the Saginaw and Maumee Rivers (GSU 1; Welsh et al. 2010). In the spring of 2019, gametes were collected from 8 female and 32 male lake sturgeon.

**Project Duration:** Spring 2017 - Annually

**Contact Information:**
Justin Chiotti, USFWS, Alpena FWCO - Detroit River Substation, 248-891-0087, justin_chiotti@fws.gov
Rich Drouin, Ontario Ministry of Natural Resources, 519-873-4611, richard.drouin@ontario.ca
Location: Saginaw River Watershed

Project Title: Lake Sturgeon Rehabilitation in the Saginaw River Watershed

Project Description: In the fall of 2017, the Michigan Department of Natural Resources began stocking fall fingerling lake sturgeon in the Saginaw River Watershed. Gametes were collected by USFWS in southern Lake Huron and Michigan State University (MSU) in the Black River with the goal of rearing 500 lake sturgeon fingerlings each at the Black River facility and Genoa National Fish Hatchery. If sufficient larval fish are collected in the Black River, these will replace the collected gametes. During each fall, between 2017 and 2043, a target of 1,000 lake sturgeon will be stocked in the Saginaw River system. A target of 125 fall fingerlings each from Black River and Genoa hatchery will be stocked into the Tittabawassee, Shiawassee, Cass, and Flint rivers. All fall fingerlings stocked will receive a PIT tag.

Objectives:

1. Through annual stocking, build a genetically diverse adult population of lake sturgeon that return to the Saginaw River system.
2. Determine if there are differences in survival and stream fidelity between Black Lake source sturgeon reared at a streamside facility (on Black River) and southern Lake Huron sturgeon reared at a “traditional” hatchery.
3. Build public support for lake sturgeon rehabilitation within the Saginaw River watershed.

Number of sturgeon stocked in the Saginaw River system annually.

<table>
<thead>
<tr>
<th>River</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cass River</td>
<td>-</td>
<td>475</td>
<td>255</td>
</tr>
<tr>
<td>Flint River</td>
<td>-</td>
<td>478</td>
<td>255</td>
</tr>
<tr>
<td>Shiawassee River</td>
<td>-</td>
<td>472</td>
<td>255</td>
</tr>
<tr>
<td>Tittabawassee River</td>
<td>393</td>
<td>479</td>
<td>255</td>
</tr>
</tbody>
</table>

Project Duration: Fall 2017 – Annually

Contact Information:
Jeffrey Jolley, MDNR, Fisheries Division, 989-686-2678, jolleyj1@michigan.gov
**Location:** Saginaw Bay

**Project Title:** Fish Community Status in Saginaw Bay, Lake Huron

**Project Description:** The Michigan Department of Natural Resources annually conducts gill net and trawl surveys in Saginaw Bay, Lake Huron to assess the status and trends of the fish community. The trawling survey began in 1971 and gill net survey began in 1989. With the implementation of the Lake Sturgeon stocking program into the Saginaw River system in 2018, this survey will serve as a means to gauge restoration success. The survey typically takes place in September with the 2019 survey being conducted from September 3 to September 17. In 2019, 24 bottom trawling tows and 16 gill net lifts were conducted within Saginaw Bay. No Lake Sturgeon were collected in 2019 in either gill nets or trawls.

Partial catch from a 2019 Saginaw Bay trawl tow.

**Project Duration:** 1971 – Present

**Contact Information:**
Andrew Briggs, Michigan Department of Natural Resources, Lake St. Clair Fisheries Research Station.
Phone: 586-465-4771 ex. 23, briggsa4@michigan.gov

Dave Fielder, Michigan Department of Natural Resources, Alpena Fisheries Research Station.
Phone: 989-356-3232 ex. 2572, fielderd@michigan.gov
**Location:** Canadian Waters of Lake Huron

**Project Title:** Lake Huron Fish Community Index

**Project Description:** Ontario's Ministry of Natural Resources and Forestry performs a number of fish community assessment projects throughout the Canadian waters of Lake Huron every year. While these projects may not target Lake Sturgeon specifically, the wide range and generally unselective nature of the gears used tends to lend themselves to the capture of many different fish species, including most life stages of Lake Sturgeon. Many different habitats are surveyed, from macrophyte-covered shallows to deep, barren offshore zones. Given the magnitude of the lake, effort is diffuse. However, Georgian Bay, the North Channel, and the Main Basin are typically sampled every year. The image on the right depicts the general locations that were sampled this year. Basic biological data was collected from any Lake Sturgeon encountered. If they were of sufficient length, a segment of pectoral fin ray was removed for ageing purposes and they were tagged internally using a Passive Integrated Transponder (PIT) tag and externally using a T-bar anchor tag. The only area where Lake Sturgeon were captured in 2019 was the Mississagi River. They were captured during spring electrofishing, summer gill netting, and fall gill netting projects at this location. There were no mortalities. A total of 15 sturgeon were tagged.

Table: Efforts applied, number of sturgeon captured, tagged, and their mean total length by area.

<table>
<thead>
<tr>
<th>Basin</th>
<th>Efforts</th>
<th>Captured</th>
<th>Tagged</th>
<th>Mean Total Length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Georgian Bay</td>
<td>620</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Main Basin</td>
<td>164</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>North Channel</td>
<td>580</td>
<td>27</td>
<td>15</td>
<td>836</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1364</td>
<td><strong>27</strong></td>
<td><strong>15</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Project Duration:** Spring 2019 – Fall 2019

**Contact Information:** Jeff Speers, MNRF, Upper Great Lakes Management Unit - Lake Huron, 519-371-0420, jeff.speers@ontario.ca
**Location(s):** Detroit-St. Clair River System; Lake Huron; Lake Erie

**Project Title:** Geographic organization and population structure of lake sturgeon in the Lake Huron-to-Lake Erie corridor as inferred from long-term, population-scale movement patterns.

**Project Description:** This study uses acoustic telemetry to describe the spatial structure of lake sturgeon populations that spawn in the St. Clair and Detroit rivers in order to provide managers with information on habitat use by different sturgeon populations as well as on population-scale movements and dispersal patterns at ecologically-relevant temporal scales. Since 2011, a total of 282 adult lake sturgeon have been captured in the Detroit and St. Clair rivers, implanted with high-power acoustic tags with a battery life of 10 years, and then released near the capture site. Strategically-located acoustic receivers in the Detroit-St. Clair river system, Lake Huron, and Lake Erie (map to the right), are allowing scientists to track sturgeon movements between feeding, overwintering, and spawning grounds over thousands of square miles. Study results will be used to test the hypothesis that a number of separate sturgeon populations occur in the Lake Huron-to-Lake Erie corridor rather than one large population.

Results to date have shown that lake sturgeon habitat use varies by release location. Lake sturgeon released into the Detroit River (black circles, left) tended to remain in the Detroit River or move up into Lake St. Clair, whereas lake sturgeon released into the lower St. Clair River (red circles) either remained in the St. Clair River or moved down into Lake St. Clair. Lake sturgeon released into the upper St. Clair river (blue circles) spread out to occupy Lake Huron, the St. Clair River, and Lake St. Clair. Significant mixing of release groups occurs in Lake St. Clair, whereas Lake Erie is rarely used by lake sturgeon, even those released into the Detroit River. The extent and timing of movements by different release groups suggest the potential for complex metapopulation dynamics, which could impact conservation strategies.

Year-round tracking of lake sturgeon movements also has confirmed the existence of migratory and river-resident life histories. The high incidence of river residency in Detroit-St. Clair river lake sturgeon was a surprise.

**Project Duration:** 2012 - 2022

**Contact Information:**
Darryl Hondorp, USGS - Great Lakes Science Center (Ann Arbor, MI), 734-214-7241, dhondorp@usgs.gov
Location: Moon and Musquash Rivers, Georgian Bay

Project Title: Evaluating the Effectiveness of Created Spawning Shoals

Project Description: In the spring of 2019, Fisheries and Oceans Canada began a project to evaluate the effectiveness of created spawning shoals for lake sturgeon spawning. These shoals were built to offset destroyed or degraded fish habitats and fish productivity losses below hydro dams, or to improve spawning habitat for lake sturgeon populations. The created shoals to be evaluated include three sites in the Ottawa River and two sites in Georgian Bay. In addition to the created shoals, unremediated habitats will be monitored at three locations in the Ottawa River, two locations in Lake Superior and two locations upstream of the created shoals in the Georgian Bay rivers. In Georgian Bay, the Moon and Musquash rivers had spawning shoals constructed in 2008 (Moon River) and in 2011 (Musquash River). Shoals in both Georgian Bay rivers were specifically created to facilitate walleye spawning after multiple years of low lake levels, which blocked or impinged passage upstream to natural spawning sites. Unconfirmed reports indicated that lake sturgeon had also begun to use these created shoals for spawning.

In the spring of 2019, during a record high lake water year, egg mats were set in both rivers on the created shoals and at one of the accessible natural spawning locations further upstream in the Musquash River. Lake sturgeon eggs and hatched larvae were collected on egg mats at the natural spawning site in the Musquash River; no lake sturgeon eggs were collected on the egg mats in the Moon River (created shoal site sets only). D-frame larval drift nets were set when water temperatures reached 14°C at two locations in each river; below the remediated shoals and at the natural spawning locations. Both eggs and larval lake sturgeon were collected in the drift nets below the natural spawning sites in both rivers. Drifting larvae were also collected in the nets at the rehabilitated site on the Moon River, however, we believe that these larvae originated at the natural spawning site above the created shoals. No lake sturgeon eggs or larvae were collected in the nets at the created shoals in the Musquash River. In 2020, the work will be repeated in the Moon and Musquash rivers, at both the created shoals and the natural spawning locations, using both egg mats and larval drift nets. One additional location, the lower Severn River, will be added in 2020 as anecdotal reports indicate that adult lake sturgeon have been seen in the river below the locks in the springtime, however, it is unknown if spawning occurs at this location.


Contact Information:
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Lisa O’Connor, Fisheries and Oceans Canada, 1-705-941-2671, lisa.oconnor@dfo-mpo.gc.ca
**Location:** Black Lake, MI

**Project Title:** Male Lake Sturgeon (Acipenser fulvescens) migratory behavior associated with intra-annual variability in sperm quality and reproductive success.

**Project Summary:** Males exhibit variable pre-spawning behavior, associated with migration to spawning areas, in responses to environmental variables, and associated with intra-sexual and inter-sexual interactions. Timing and duration of breeding area occupancy and access to mates, may not alone be predictive of male reproductive success because of effects of intra- and inter-sexual interactions on sperm depletion. For long-lived iteroparous species such as Lake Sturgeon (Acipenser fulvescens) that migrate to spawning areas, reproductive effort in a given year may affect inter-annual spawning interval and lifetime reproductive success. To characterize measures of intra-annual male reproductive behaviors and trade-offs (e.g., inter-annual spawning interval), radio frequency identification (RFID) antennas were placed at the mouth of the Upper Black River, MI and immediately below upstream spawning locations to quantify river residence time, upstream migration time, number of intra-annual spawning migrations, annual spawning duration, and inter-annual spawning interval. Sperm samples collected from 180 males in 2017 and 2018 were used to quantify sperm concentration (sperm / mL). Computer assisted sperm analysis (CASA) was used to quantify measures of sperm quality in 2018. Analyses of variables associated with sperm concentration using combined 2017-2018 samples indicated river residence time had a strong negative influence on sperm concentration. River residence time was also negatively associated with principal components quantifying composite measures of sperm quality. The number of intra-annual spawning migrations and upstream migration time also were negatively associated with sperm quality. Male river residence time and the number of female encounters were positively associated with male reproductive success. Male reproductive effort quantified as the number of migratory events and rate of upstream migration reduced sperm quality indicating sperms depletion is a reliable measure of sexual activity. Migratory behavior in the current year was associated with inter-annual spawning frequency, demonstrating trade-offs between benefits and costs associated with current reproductive effort that can future reproductive activity.

**Project Duration:** Spring 2017 – Present

**Contact Information:** Kim Scribner, Department of Fisheries and Wildlife, Michigan State University, 517-353-3288; scribne3@msu.edu or Edward Baker, Michigan Department of Natural Resources, 906-249-1611, ext 309; bakere1@michigan.gov; Doug Larson, Department of Fisheries and Wildlife, Michigan State University; 989-733-6176; larso147@msu.edu
Location: Black Lake, MI

Project Title: Migratory behavioral variability and evidence of a trade-off between intra-annual reproductive effort and subsequent reproductive migration timing in Male Lake Sturgeon (Acipenser fulvescens).

Project Summary: Variation in timing of spawning migrations for lake sturgeon (Acipenser fulvescens) and duration of occupancy of spawning areas are often attributed to environmental cues (e.g., temperature, discharge, day length) or biotic factors (e.g., operational sex ratios). Using PIT antenna arrays, spawning migration data was collected from lake sturgeon adults during the 2016 through 2019 spawning seasons in the Black River, MI. Data on body size was obtained for a subset of adults upon capture on the spawning grounds. An analysis of principal components indicated six axes of significant contribution. Based on Akaike’s Information Criterion, models that included principal component 1 and principal component 2 were the best predictor of daily number of migrating of lake sturgeon. Principal component 1 best correlated with the 48-hour lagged effects of increasing temperature, while principal component 2 best correlated with the 48-hour increase in temperature and decrease in discharge. Once in the spawning grounds, variability in spawning behaviors were evident. Preliminary piecewise regression analysis suggests an ecological “tipping-point” at which fish with longer spawning ground residence time are less likely to reproduce in the next spawning season. Results suggest that lagged effects including increasing temperature and declining discharge strongly impact spawning behavior. Additionally, preliminary results indicate a tradeoff for future spawning bouts when intra-season river residency time increases.

Project Duration: Spring 2016 – Present

Contact Information: Kim Scribner, Department of Fisheries and Wildlife, Michigan State University, 517-353-3288; scribne3@msu.edu or Edward Baker, Michigan Department of Natural Resources, 906-249-1611, ext 309; bakere1@michigan.gov; Doug Larson, Department of Fisheries and Wildlife, Michigan State University; 989-733-6176; larso147@msu.edu
**Location:** Black Lake and Upper Great Lakes

**Project Title:** Characterization of Olfactory Imprinting to Inform Restoration of Lake Sturgeon in the Great Lakes

**Project Description:** Olfactory imprinting has been suggested as the mechanism guiding natal stream homing in anadromous salmonid species. Migratory and genetic structuring of Lake Sturgeon populations suggests they also exhibit natal stream homing behaviors. The ability of Lake Sturgeon to return to natal or target streams is relevant to the restoration of Lake Sturgeon populations across the Great Lakes. Currently, fish are raised in stream-side rearing facilities to expose juvenile Lake Sturgeon to natal stream odors under the hypothesis that olfactory imprinting is occurring during development that will guide natal stream homing as adults. We are investigating the timing and key odorants involved in olfactory imprinting in juvenile Lake Sturgeon.

Two-choice maze experiments will be used to test for preference of natal stream water by juvenile Lake Sturgeon as a proxy for adult homing behaviors, to test whether a preference for natal stream water was developed during various stages of exposure during development. Individuals will also be sampled for total-body thyroid hormone quantification during development to identify the time of imprinting. Maze experiments will also be used to assess preference by Lake Sturgeon for nearby and distant rivers to assess the ability of fish to distinguish between natal and non-natal streams.

Amino acids have been suggested as the key odorant involved in olfactory imprinting in salmonids, but more evidence is needed to support the stability of amino acids and their role in olfactory imprinting. We will be assessing the stability of amino acids and their ability to act as the key odorant involved in imprinting for different Great Lakes tributaries. We will also be assessing the preference for amino acid profiles of streams in two-choice maze trials. Water samples will be collected from Lake Michigan and Lake Superior tributaries to characterize amino acid profiles for each stream yearly. Water samples will be collected from sites within the Black River system to identify seasonal and site variation in amino acids profiles.

**Project Duration:** Spring 2019 – Fall 2021

**Contact Information:** Kim Scribner, Department of Fisheries and Wildlife, Michigan State University, 517-353-3288; scribne3@msu.edu or Edward Baker, Michigan Department of Natural Resources, 906-249-1611, ext 309; bakere1@michigan.gov; Doug Larson, Department of Fisheries and Wildlife, Michigan State University; 989-733-6176; larso147@msu.edu
**Location:** Burt Lake Watershed, MI

**Project Title:** The Burt Lake Watershed Lake Sturgeon Restoration Project

**Project Description:** The Cheboygan River Watershed contains two of the largest inland lakes in Michigan, Burt Lake and Mullett Lake. Burt and Mullett Lakes are sister lakes separated by the Indian River. Although these lakes are incredibly large they were not able to withstand the 20th century’s pressures and the Lake Sturgeon populations collapsed.

Recent lake surveys by LTBB and the MDNR in 2011 and 2015 estimate that Burt Lake had a population less than 1,000 fish of all ages, where most were from MDNR stockings in the early 1980s. This is incredibly low for a 17,000 acre lake. Burt Lake’s sister lake, Mullett Lake a 16,000 acre lake, was less fortunate where estimates in 2011 showed fewer than 200 total fish and again the 1980’s stockings accounted for the majority of the remaining population.

In response to the low population and an abundance of spawning habitat, restoration efforts are currently focused on building the population up to self-sustaining levels, which will take at least two and a half decades. The LTBB Fisheries Enhancement Facility (Hatchery) has been working in cooperation with Michigan State University and the Michigan Department of Natural Resources; as well as the Burt Lake Preservation Association’s Sturgeon Club and Sturgeon for Tomorrow to restore the Lake Sturgeon population in Burt Lake.

In 2019, LTBB was able to release 1,108 Lake Sturgeon fingerlings into the Sturgeon River. Since 2013, the LTBB FEF has released 4,038 fingerling sturgeon into the Burt Lake system. Of the 4,038 fingerlings, 2,665 have been stocked in the Sturgeon River at or upstream of Wolverine () in hopes to improve their chances of imprinting and returning to the river when they mature.

**Project Duration:** July 2013 – Current

**Contact Information:**

Kris Dey, Little Traverse Bay Bands of Odawa Indians Natural Resource Department, 419-460-5747, KDey@LTBBODAWA-NSN.GOV
**Location:** Northern Michigan Schools

**Project Title:** The Nmé in the Classroom Program

**Project Description:** A major component to any successful restoration is public engagement and education. An educated community gives the sturgeon the best chance for success and to avoid the problems of the past (lack of care/concern for the species). It is for this reason; LTBB is reaching out to local schools to bring this culturally significant fish back to the local waterways and back into our hearts of our community members. We believe this multi-generational restoration should start with the next generation, and there is no time like the present.

The Nmé in the Classroom Program includes a curriculum developed by the LTBB Education Department, and invests in Place-Based-Learning for schools to learn not only about Lake Sturgeon, the Odawa culture, and natural resources; but also about the impacts of society’s actions or feelings toward a species.

By bringing sturgeon into the classroom, we quite literally brings the students closer to the natural world. In turn this project gives students the opportunity to grow and develop life long bonds with the world around them. Which LTBB believes is a staple of a strong community.

**Project Duration:**
July 2013 – Current

**Contact Information:**
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Hatchery Office: (231) 373-0576

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Figure 1: Tribal Councilmen Fred Harrington discussing the importance of the nmé
Location: Black Lake and Upper Great Lakes

Project title: Relative influences of microhabitat incubation conditions and genetic parentage effects on lake sturgeon (*Acipenser fulvescens*) offspring traits shift during early ontogeny

Project Description: Knowledge on factors influencing traits during critical early growth periods is essential for predicting changes in populations. Genetic effects and microhabitat stream conditions at female selected oviposition sites influence larval phenotypes. However, limited work has jointly examined contributions of both factors across sequential ontogenetic stages for wild larvae. Using a wild population of lake sturgeon (*Acipenser fulvescens*) from Black Lake, Michigan (USA), fertilized eggs were collected from stream substrate just prior to hatch at 1-meter intervals along seven transects sampled at an adult-selected spawning area. Microhabitat variables (depth, discharge, substrate size) were recorded at egg collection points. Body length, body area, and yolk-sac area were quantified for free-embryos (N=359) at the time of hatch. Post-emergence larval growth was measured weekly for four weeks after the onset of exogenous feeding. Parentage was assigned using genetic-based analysis. Inter-individual variation in phenotypic traits quantified at hatch were attributed to stream microhabitat variables. Mean depth had the largest influence. No additive genetic effects were detected at hatch. Post-emergence larval growth significantly varied within and among maternal groups with the greatest range in body size observed at 33 days post-hatch. Additive genetic variance and heritability increased with age. Results demonstrate that female-selected incubation habitats influenced traits at hatch for wild-produced fish, but effects do not persist to sequential ontogenetic stages. Alternatively, growth during the critical period (e.g., onset of exogenous feeding) is primarily driven by intrinsic (genetic) factors which must be considered when designing and implementing rehabilitation strategies for threatened riverine fishes.

Contact Information: Kim Scribner, Department of Fisheries and Wildlife, Michigan State University, 517-353-3288; scribne3@msu.edu or Edward Baker, Michigan Department of Natural Resources, 906-249-1611, ext 309; bakere1@michigan.gov; Doug Larson, Department of Fisheries and Wildlife, Michigan State University; 989-733-6176; larso147@msu.edu
**Location:** Black Lake and Upper Great Lakes

**Project Title:** Abiotic Conditions Alter Drifting Macroinvertebrate Communities During Larval Lake Sturgeon Dispersal

**Project Description:** In long-lived iteroparous fish, such as the threatened lake sturgeon (*Acipenser fulvescens*), high predation during larval stages represents a major bottleneck to population growth. Many of the same predators that feed on larval lake sturgeon also prey upon drifting macroinvertebrates as major portions of their diet. A multi-year study (2011-2018) was conducted to investigate patterns in aquatic insect drift associated with abiotic conditions in sturgeon spawning habitats of the Black River (Cheboygan, MI, USA). Drifting macroinvertebrates and fish were sampled using D-frame drift nets which were set up nightly during periods of larval lake sturgeon drift. We found several strong predictors of drifting macroinvertebrate abundance and biomass across year, including temperature, time, discharge, and lunar illumination. While some taxa were observed regardless of abiotic conditions, other taxa displayed preferential drifting activity under certain conditions. Variability in the drift of macroinvertebrate species composition and biomass has implications for predator-prey dynamics across trophic levels within the river system including co-distributed prey such as lake sturgeon larvae.

**Contact Information:** Kim Scribner, Department of Fisheries and Wildlife, Michigan State University, 517-353-3288; scribne3@msu.edu or Edward Baker, Michigan Department of Natural Resources, 906-249-1611, ext 309; bakere1@michigan.gov; Doug Larson, Department of Fisheries and Wildlife, Michigan State University; 989-733-6176; larso147@msu.edu
**Locations:** Black River, MI; St. Clair River, MI; Sturgeon River, MI; Peshtigo River, WI

**Project Title:** Assessing the risk of emerging and endemic fish pathogens to Great Lakes lake sturgeon (*Acipenser fulvescens*) populations

**Project Summary:** Only one sturgeon species (e.g., lake sturgeon, *Acipenser fulvescens*) is indigenous to the Great Lakes (GL), where it is the largest and longest-lived fish therein. Such unique life history traits, in conjunction with delayed maturation, sporadic spawning, and low natural recruitment have placed lake sturgeon (LST) at heightened risk for human induced mortality. In fact, GL-LST abundance is now estimated to be <1% of historical levels. To restore wild LST populations, substantial resources have been allocated to raise sturgeon in aquaculture facilities and hatcheries. Concurrent with the growth of US sturgeon farming, aquaculture has seen the emergence and apparent range expansion of multiple sturgeon-pathogenic microbes that can cause mortality in wild and captive sturgeon stocks. This expansion has brought some of these pathogens dangerously close to the GL basin and its indigenous and already threatened LST stocks. Regrettably, lack of funding has hampered the performance of monitoring and surveillance efforts to determine the presence of these pathogens in GL-LST populations. Of further concern are LST mortality events in MI streamside rearing facilities that have been linked to fish pathogens and about which little is currently known. Equally little has been explored about LST susceptibility to emerging and GL-endemic pathogens and the degree to which these pathogens have/will contribute to the tenuous status of GL-LST populations. In this context, this USFWS-GLFWRA funded (F19AP00229) study seeks to determine which microbial pathogens are present in multiple wild/cultured LST populations using novel molecular and microbiological methods and conclusively determine for the first time LST susceptibility to a range of pathogenic microbes under controlled laboratory experiments. Last, novel prevention and control strategies against the most virulent microbes will be investigated, thereby generating crucial tools to enhance GL-LST rehabilitation.

In 2019, blood and multiple tissue biopsies were non-lethally collected from >230 spawning LST from the St. Clair (St. Clair County, Lake Erie watershed), Peshtigo (Marinette County, Lake Michigan watershed), and Black (Presque Isle County, Huron watershed) rivers for virological, bacteriological, histopathological, molecular, and/or hematological analyses. Tissues were also collected and clinical examination performed on >500 juvenile LST reared in facilities on the Whitefish, Cedar, Black, and West Branch Ontonagon rivers for the same purpose. With sample analyses ongoing and year 2 sampling set to begin, this research project, to our knowledge, constitutes one of the most extensive GL-LST infectious disease studies to date. Additional future phases of the study include controlled laboratory studies to assess the virulence and pathogenesis of multiple emerging microbial fish pathogens to GL-LST, as well as *in vitro* disinfectant efficacy experiments that are a crucial first step for preventing/controlling infectious diseases in the hatchery environment.

**Project Duration:** 2019 – Present

**Contact Information:** Thomas P. Loch, Michigan State University (MSU), 517-884-2019, lochthom@msu.edu; Kim Scribner, MSU, 517-353-3288, scribne3@msu.edu; Esteban Soto, UC-Davis, 530-752-2440, sotomartinez@ucdavis.edu; Amber Johnston, MSU, 517-884-2017, john4057@msu.edu
**Location:** St. Marys River

**Project Title:** Population demographics of lake sturgeon in the St. Marys River

**Project Description:** Due to increased lake sturgeon catches in the recreational creel and during biological assessments in the St. Marys River, the St. Marys River Fisheries Task Group wanted to revisit the lake sturgeon population assessment work that was led by Lake Superior State University in the early 2000’s. The goal of this work is to determine lake sturgeon population status in the St. Marys River and help foster restoration plans in this system.

During the summer of 2019, a total of 89 setlines (50 hooks; 25 - 9/0 size and 25 - 1/0 size) were deployed between June 24th – July 23rd at water temperatures ranging from 10.0 – 19.8°C. Effort was distributed equally between areas of the North Channel and shipping channel down to Lake Nicolet. In addition to the setlines, three gee-style minnow traps were also deployed at each location to assess the small benthic fish community. All lake sturgeon captured received a PIT and external floy tag. No lake sturgeon were captured in the shipping lane or in Lake Nicolet. A total of 35 lake sturgeon were captured in the North Channel and these fish ranged between 672 - 1579 mm in total length. Five lake sturgeon were captured < 1000 mm. Three fish were recaptured from the 2000 – 2007 tagging events. By-catch on setlines included one burbot and two northern pike. Catch rates increased as the field season progressed and as a result this assessment will likely begin later in the summer of 2020. Future work will also likely include the implantation of acoustic transmitters in order to identify spawning locations and general movement patterns. A total of 266 minnow traps were deployed which captured 11 different fish species and three different crayfish species.

**Project Duration:** Summer 2019 – Annually

**Contact Information:**
Justin Chiotti, USFWS, Alpena FWCO - Detroit River Substation, 248-891-0087, justin_chiotti@fws.gov
Lisa O’Connor, Fisheries and Oceans Canada, lisa.oconnor@dfo-mpo.gc.ca
Kevin Kapuscinski, Lake Superior State University, kkapuscinski@lssu.edu
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Lexi Sumner, Anishinabek/Ontario Fisheries Resource Center, lsumner@aofrc.org
Russell Aikens, Sault Tribe, RAikens@saulttribe.net
Edward Baker, Michigan Department of Natural Resources, BakerE1@michigan.gov
Frank Zomer, Bay Mills Indian Community, fzomer@baymills.org
Edward Roseman, U.S. Geological Survey, eroseman@usgs.gov
Stephen Chong, Ontario Ministry of Natural Resources and Forestry, Stephen.chong@ontario.ca
Location: Garden River/St Marys River

Project Title: Spawning and Over-Wintering movements of Lake Sturgeon in the Garden and St. Marys Rivers

Project Description: In springs 2016-2019, 59 adult Lake Sturgeon captured in the mouth of the Garden River were implanted with V-16 acoustic telemetry transmitters. Their movements are being monitored by VR2AR and VR2W receivers deployed throughout the Garden River and St. Marys River. The objectives of this acoustic telemetry work are:

1) to track the spring spawning migration of Lake Sturgeon to two distinct spawning locations in the Garden River;
2) to monitor the over-wintering movement of these Lake Sturgeon throughout the St. Marys River system.

In spring 2019, 11 Lake Sturgeon were detected moving up the Garden River. All 11 fish were detected at the down-river spawning site, and 3 were detected at the uppermost spawning location. Preliminary results from winters 2017-18 and 2018-19 suggest that the Lake Sturgeon that spawn in the Garden River remain within the St. Marys River system throughout the year. Almost all tagged fish remained in the system over the winter, moving between the north channel of the St. Marys River and Lake George. Acoustic telemetry receivers will continue to be deployed until transmitter batteries run out (lifespan is approximately 7 years). This work is being completed in partnership with Garden River First Nation.

Project Duration: Tagging 2016 –2018; Acoustic telemetry 2016 – ongoing

Contact Information: Lexi Sumner, A/OFRC, Phone: 705-492-3658; lsumner@aofrc.org
Location: St. Mary’s River Rapids

Project Title: Investigation of Lake Sturgeon Spawning and Larval Drift in the St. Mary’s Rapids

Project Description:

The St. Mary’s River is the Great Lakes connecting channel connecting Lake Superior to Lake Huron and is the international border between Michigan, United States, and Ontario, Canada. The river flow is regulated through the navigational locks and a series of 16 compensating gates immediately upstream of the area known as the St. Mary’s Rapids. To survey fish use upstream and downstream of the Big Rapids/locks/compensating gates area, we used egg mats, D-frame, bongo, and Miller sampler nets to collect drifting larvae near the bottom and surface during day and night sampling. Viable lake sturgeon eggs were collected in the outfall from a hydro-electric power facility adjacent to the rapids in late June in both 2018 and 2019 and larvae were collected for several weeks during July. Eggs were reared in the laboratory until hatching for verification of identity. Even though lake sturgeon larvae have been documented in the Garden River, a Canadian tributary of the St. Mary’s River, this is the first contemporary documentation of successful lake sturgeon spawning and larval drift within the St. Mary’s River proper.

Project Duration: Spring 2018 – Fall 2020

Contact Information: Ed Roseman, U.S. Geological Survey Great Lakes Science Center, 734-214-7237; eroseman@usgs.gov
Lake Huron  
Table 1. Observations or general status of lake sturgeon populations in the Lake Huron Basin. Table includes water bodies that historically supported or recent evidence exists lake sturgeon may be present. Population status definitions are: **Extirpated** or **Extant**; **Re-I** (reintroduced) = fish stocked into a system with an extirpated population; **Supp** (supplementation) = fish stocked into a system with an extant population, or **Unk** = unknown. A “**Yes**” indicates regular observation or presumed annual occurrence. Occasional (**Occ**) observations are as noted. Successful reproduction was defined as recent capture of larval or juvenile sturgeon. Notes follow the table.

<table>
<thead>
<tr>
<th>Basin/Site Number</th>
<th>Site Name</th>
<th>Population Status</th>
<th>Size of Annual Spawning Run</th>
<th>Observations: Adults</th>
<th>Spawning</th>
<th>Larvae</th>
<th>Juveniles</th>
<th>Juvenile Index (year)</th>
<th>Repr. Success?</th>
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<tbody>
<tr>
<td>1</td>
<td>Carp River, MI</td>
<td>Extant</td>
<td>Unk</td>
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<td>Unk</td>
<td>Unk</td>
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<td>2</td>
<td>St. Marys River, MI ON</td>
<td>Extant</td>
<td>≈ 500¹</td>
<td>Yes</td>
<td>Yes²</td>
<td>Yes²</td>
<td>Yes</td>
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<td>Root River, ON</td>
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<td>Yes</td>
<td>Yes</td>
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<td>7b</td>
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<td>Blind River, ON</td>
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<td>9</td>
<td>Serpent River, ON</td>
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<td>Yes³</td>
<td>Yes³</td>
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<td>5.3 (2012)</td>
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<td>Occ</td>
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<td>Year</td>
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<td>Year</td>
<td>Occ</td>
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<td>24</td>
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<td>Occ</td>
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<td>28</td>
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<td>Burt/Mullett Lake (including lower Black River downstream Alverno Dam) MI</td>
<td>Supp</td>
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3. Lisa O’Connor, Fisheries and Oceans Canada, personal communication, 2020