

2019 Winnebago System Sturgeon Spawning Assessment Summary Report

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Introduction and Methods:

The Winnebago System is home to one of the largest lake sturgeon populations in North America with an estimated adult population consisting of roughly 42,500 fish. Annual spawning migrations occur within four main rivers (Wolf, Embarrass, Little Wolf and upper Fox), but spawning has also been periodically observed in other smaller tributaries. There are more than 60 known spawning sites within the Winnebago System. Most sites are “man-made” with sturgeon spawning on large riprap (12-36”) placed on outside river bends to prevent bank erosion. The use of these spawning sites varies annually with site use ranging from a handful to hundreds or thousands of fish.

The annual sturgeon spawning run receives extensive interest from the media and general public, particularly at publicly accessible sites like the Sturgeon Trail (New London), Bamboo Bend (Shiocton), and Sturgeon Park below the Shawano Paper Mill Dam (Shawano). These sites provide a rare opportunity for the public to view large numbers of sturgeon spawning in shallow water. Peak spawning typically occurs when water temperatures are 52-58 degrees Fahrenheit. In



Lake sturgeon spawning commenced at the Sturgeon Trail on the Wolf River in New London on April 22, 2019.

most years, spawning occurs somewhere between April 10 and May 5. The average spawning run lasts 7 days, but duration is heavily impacted by weather. Cooler temperatures tend to result in longer spawning runs, while warm temperatures result in more condensed runs.

Each spring, WDNR crews capture spawning lake sturgeon and collect critical biological data that are used to assess the population and manage the winter spear harvest. The first spawning stock assessment was conducted in 1953, with annual assessments occurring from 1953-1964. Assessments were discontinued for roughly a decade as biologists at the time believed they had a good understanding of the driving forces affecting the sturgeon population and, therefore, allocated effort towards other fish species. Stock assessments resumed in 1975 and have occurred each spring since.



DNR fisheries staff use dip nets to capture a lake sturgeon during a past stock assessment conducted on the Winnebago System. (Bob Rashid photo)

tags placed on the dorsal fin) and passive integrated transponders (PIT; internal microchip tags). Monel tags were used to mark fish for much of the 1950s through 2004, while PIT tags have been used to mark fish since 1999. Fish were marked with both tag types from 1999-2004, but the use of Monel tags was discontinued midway through 2004 due to poor observed retention rates relative to PIT tags. Tag number is documented for each recaptured fish and PIT tags are inserted into all unmarked fish. All fish are then released back into the river. DNR fisheries staff work the duration of the spawning run and handle as many fish as possible. A normal spring typically consists of 1,000-2,000 fish being handled, with males comprising >80% of the catch. Males reach sexual maturity at younger ages (males = 14-20 years; females = 20-35 years) and have a shorter spawning periodicity relative to females (males spawn every 1-2 years, females spawn every 3-5 years). Therefore, males heavily outnumber females in a spawning run. Males are also targeted by dippers, to some degree, as the female is what holds a group of spawning fish together. If the female is removed or spooked, then sampling efficiency decreases.

Data collected during lake sturgeon stock assessments have provided managers with a better understanding of the factors that affect population trends. Most notably, mark data collected during spring stock assessments

Large dips nets are used to capture spawning lake sturgeon, typically with multiple dippers working together to corral fish (left photo inset). Electrofishing has also been used in recent years as a gear to capture pre-spawn lake sturgeon in the upper Fox River. All captured fish are measured to the nearest 0.1" total length (TL; measured to longest point of the caudal fin), and sex and spawning stage (green, ripe, or spent) is assigned based on extrusion of gametes (eggs or milt). Fish are then inspected for Monel (external metal



Top: Syringe used to insert PIT tags into adult lake sturgeon captured during stock assessments.

Bottom: DNR staff scan a lake sturgeon to see if the fish has been previously marked with a PIT tag.

provide the framework for estimating population abundance and exploitation (harvest) rates. Therefore, the spawning stock assessment has historically been, and continues to be, critical for effective management of the sturgeon population.

The primary objectives of the 2019 spawning stock assessment were to: 1) mark fish for estimates of abundance and exploitation, 2) monitor size structure of the adult population, 3) evaluate growth and mortality through collection of mark-recapture data, 4) evaluate movement, and 5) determine river and spawning site fidelity of adult lake sturgeon. In addition to these core objectives, there are several hatcheries that request gametes (eggs and sperm) to be collected from Wolf River strain lake sturgeon as part of their respective stocking and restoration program. The egg requests are met during the spawning stock assessment.

Results and Discussion

Record high water levels were the primary storyline from the 2019 lake sturgeon spawning run on the Winnebago System (Photo set 1). Lake sturgeon typically spawn in mid to late-April. Based on 106 years of data collected by the United States Geological Survey (USGS), median daily discharge on the Wolf River in New London are between 3,000-4,000 cubic feet per second (cfs) during this time period (Figure 1). However, discharge during the 2019 spawning run ranged from 7,000-11,000 cfs (Figure 1; Photo set 1). The high water had a significant impact on the 2019 stock assessment as we were unable to safely and efficiently tag fish at some of the usual locations. Many fish were also spawning further down the rock structure in deeper water and out of the reach of our sampling gear. Despite these challenges, WDNR crews were able to capture >1,000 fish and meet all egg requests for various sturgeon restoration programs.

Lake sturgeon spawning commenced on April 22, 2019 and lasted through April 29. A total of 1,184 lake sturgeon (964 males and 220 females) were captured during the spawning stock assessment (Table 1). Of the fish handled, 1,077 were captured from the Wolf River, 102 were captured from the Embarrass River, and 5 were captured from the upper Fox River. More fish likely would have been captured during pre-spawn electrofishing assessments on the Upper Fox had high water levels not prohibited sampling in the Princeton area. High water also prohibited sampling below the Manawa Dam on the Little Wolf River.

Fish were captured at 13 different spawning locations during the 2019 adult stock assessment. More than half of these locations (7) were located within the Wolf River, while fish were captured at 4 sites on the Embarrass River and 2 sites on the upper Fox River (Table 1). The Shawano Dam was the site where the most lake sturgeon were captured (485), followed by the Sturgeon Trail (231 fish), and Bamboo Bend (163 fish) (Table 1). These are the three largest spawning sites on the Winnebago System, so it's no surprise that the most fish were captured from these locations. These sites are also prioritized within our sampling schedule and we had crews working at each of these locations for multiple days.

Second and third spawning runs are common for lake sturgeon. These secondary runs are typically very short, usually just 1 day, and include a small number of females. Most females spawn during the primary run, but every year there are a few females that ovulate a bit later in the spring. Sampling crews have periodically captured fish during

these secondary runs, but catch has typically been low, relative to the primary run, and composed primarily of males. Secondary runs were observed in 2019, however, WDNR staff did not capture any fish during these runs.

The average length of female lake sturgeon captured during the 2019 spring stock assessment was 67.3" (range 53.6-82.8") while the average length of males was 59.2" (range 39.7-73.2"). Females 62-74" accounted for 74.1% of the female sample, while 71.6% of the males captured were 54-66" (Figure 2). Lake sturgeon that are 70 inches or longer are normally considered "trophy" size. Lake sturgeon exhibit sexual dimorphic growth with females reaching larger lengths than males meaning that most 70+" fish are females.

Roughly 35% of the adult female lake sturgeon captured during the 2019 stock assessment were larger than 70."

Most of the females captured during the 2019 stock assessment were assigned as sequence 1, meaning that fish was not previously tagged (Figure 3). Sequence 5 was the highest for any female captured during the assessment. Recaptured fish (sequences >1)



DNR fisheries staff with an 81.9" female lake sturgeon that was captured below the Shawano Paper Mill Dam during the 2019 stock assessment.



Dave Bartz (DNR Fisheries Biologist) with a lightly pigmented lake sturgeon that was captured during the 2019 stock assessment conducted on the Winnebago System.

could have been captured earlier that spring, but fish were likely captured during assessments conducted in prior years. Handling sequence data for male lake sturgeon was quite different from females. Sequence 1 fish were still commonly observed, but only represented 40.6% of the males sampled compared to 72.7% of females being sequence 1 capture events. There were multiple fish with handling sequences >10, but 91.9% of fish captured were assigned to sequence 1-4. The disparity in recapture rates between male and female lake sturgeon is attributable to the larger number of male lake sturgeon captured during stock assessments. Males reach sexual maturity at younger ages, have a shorter spawning periodicity, and are present on spawning grounds for a longer time period relative to females. These reasons all contribute to the greater number of males captured during spawning stock assessments, and the higher recapture rates of male lake sturgeon relative to females.

The Winnebago System lake sturgeon population serves as an important brood source for multiple lake sturgeon rehabilitation programs throughout the United States. Despite the challenges associated with sampling in record high water levels, WDNR staff were able to collect an adequate number of eggs to meet all stocking quotas. Gametes collected from the Wolf River were used to meet stocking goals for restoration efforts on Lake Michigan (streamside rearing facilities on the Milwaukee and Kewaunee Rivers) and the Tennessee River watershed (fish stocked into Georgia, Tennessee and Kentucky). Eggs were also collected and fertilized for the Genoa National Fish Hatchery, which is based out of La Crosse, Wisconsin.

I would be remiss if I did not mention the volunteer support that we received during the 2019 lake sturgeon stock assessment, particularly from the student subunit of the American Fisheries Society at the University of Wisconsin Stevens Point. Capturing and wrestling lake sturgeon is hard work. Over the past 8-9 years the WDNR has relied more and more on student volunteers to assist with this assessment. Typically, there will be 5-10 students assisting WDNR crews during each weekday of the spawning run and it's not



Students volunteers from the University of Wisconsin Stevens Point assist DNR crews during the 2019 lake sturgeon stock assessment on the Winnebago System.

uncommon to have >15 students available to help on weekend days. This dedicated student volunteer force allows WDNR staff to split into more sampling crews and maximize tagging efforts during what is typically a condensed spawning window. Sturgeon for Tomorrow generously supports the student subunit each year to offset travel costs of the students traveling to and from work locations. I've included some photos of students "getting their hands dirty" within this report. Thank you to everyone that volunteered during the 2019 stock assessment and I honestly can't thank you enough for your help.

Data collected during the spawning stock assessments are critical for proper management of the Winnebago System lake sturgeon population and spear fishery. Marking sturgeon of known sex during spring spawning stock assessments is required to derive abundance estimates that are used to establish safe harvest limits for

the winter spear fishery. We are fortunate that this assessment, along with all other sturgeon related management activities, is funded by revenue generated from the sale of sturgeon spearing licenses. Thank you to everyone that purchases a license and contributes to the Winnebago System lake sturgeon assessment program.

The sturgeon spawning run on the Winnebago System is truly a unique event. I strongly suggest making plans to check it out if you have never witnessed it. Predicting exactly when spawning will take place at various locations can be near impossible. Fish typically only spawn at a given site for 2-3 days and those dates change from year to year depending on weather conditions. Therefore, it's important to be flexible with travel plans and act quickly once hearing that the spawning run is underway. More information about the sturgeon spawning run on the Winnebago System is available through the following link.

<https://dnr.wi.gov/topic/fishing/sturgeon/sturgeonspawning.html>

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Scott Bunde (left) and Ryan Koenigs (right) with a 77.0" lake sturgeon captured from the Sturgeon Trail on the Wolf River during the 2019 stock assessment.

Table 1. Number of lake sturgeon (female, male, total) captured at spawning sites throughout the Winnebago System during the 2019 spawning stock assessment. Sampling conducted on 4/09/2019 and 4/20/2019 was done via electrofishing while all other sampling was conducted via dip netting.

Date	Waterbody	Location	# Females	# Males	Total #
04/09/2019	Fox River	Berlin	0	1	1
04/20/2019	Fox River	Berlin	1	2	3
04/20/2019	Fox River	Eureka	0	1	1
04/22/2019	Wolf River	Hwy X (Sturgeon Trail)	3	38	41
04/23/2019	Wolf River	Hwy X (Sturgeon Trail)	21	103	124
04/23/2019	Wolf River	Bamboo Bend	4	12	16
04/24/2019	Embarrass River	Pfeifer Park	0	14	14
04/24/2019	Wolf River	Bamboo Bend	13	66	79
04/24/2019	Wolf River	Hwy X (Sturgeon Trail)	7	59	66
04/24/2019	Wolf River	Town Garage	1	0	1
04/25/2019	Embarrass River	Cowyard Rips	2	17	19
04/25/2019	Embarrass River	Pfeifer Park	1	36	37
04/25/2019	Wolf River	Bamboo Bend	4	64	68
04/25/2019	Wolf River	Diemels	4	57	61
04/25/2019	Wolf River	Hwy 156	1	11	12
04/25/2019	Wolf River	Pines	1	8	9
04/26/2019	Embarrass River	Behnkes Bridge	2	13	15
04/26/2019	Embarrass River	Kruegers	1	16	17
04/26/2019	Wolf River	Diemels	12	78	90
04/26/2019	Wolf River	Hwy 156	2	22	24
04/27/2019	Wolf River	Hwy 156	0	1	1
04/27/2019	Wolf River	Shawano Dam	31	73	104
04/28/2019	Wolf River	Shawano Dam	99	242	341
04/29/2019	Wolf River	Shawano Dam	10	30	40
Total			220	964	1184

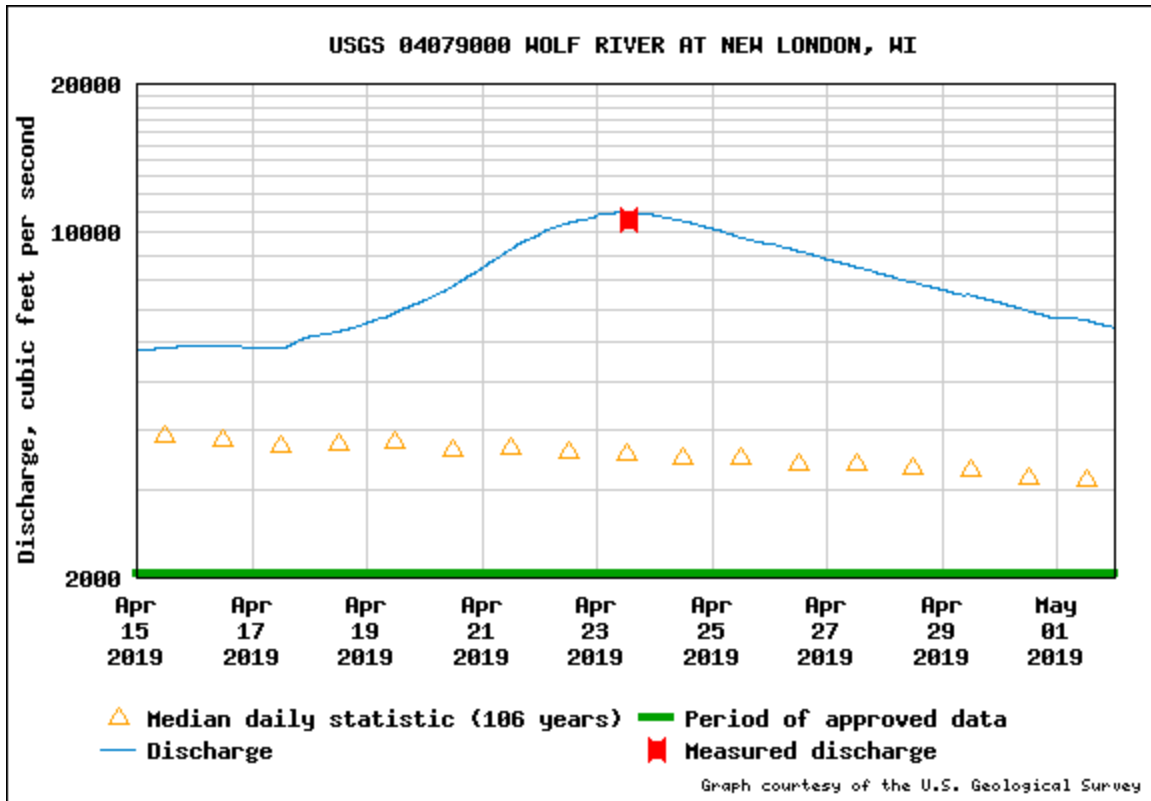


Figure 1. Hydrograph showing discharge within the Wolf River watershed during the 2019 lake sturgeon spawning run. Data courtesy of the United States Geologic Survey gauging station at New London.

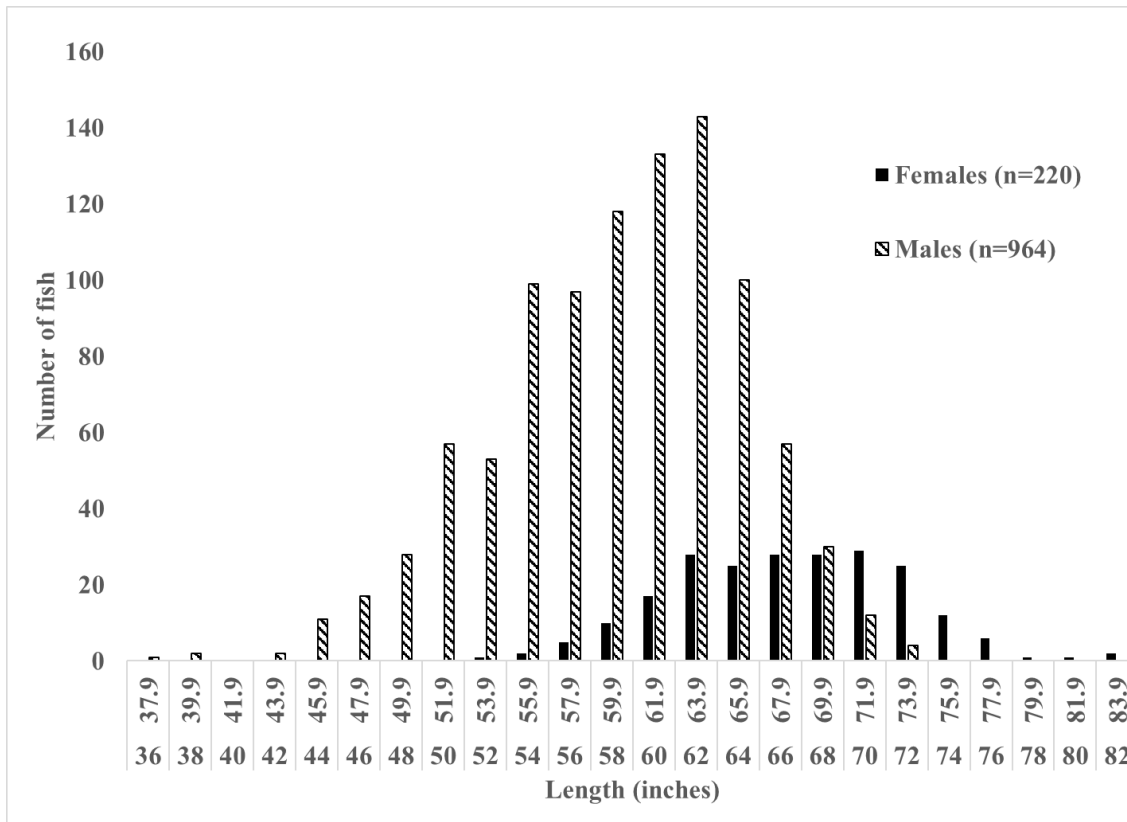


Figure 2. Size structure of adult female (solid bars) and male (hashed bars) lake sturgeon captured during the 2019 spawning stock assessment conducted on the Winnebago System.

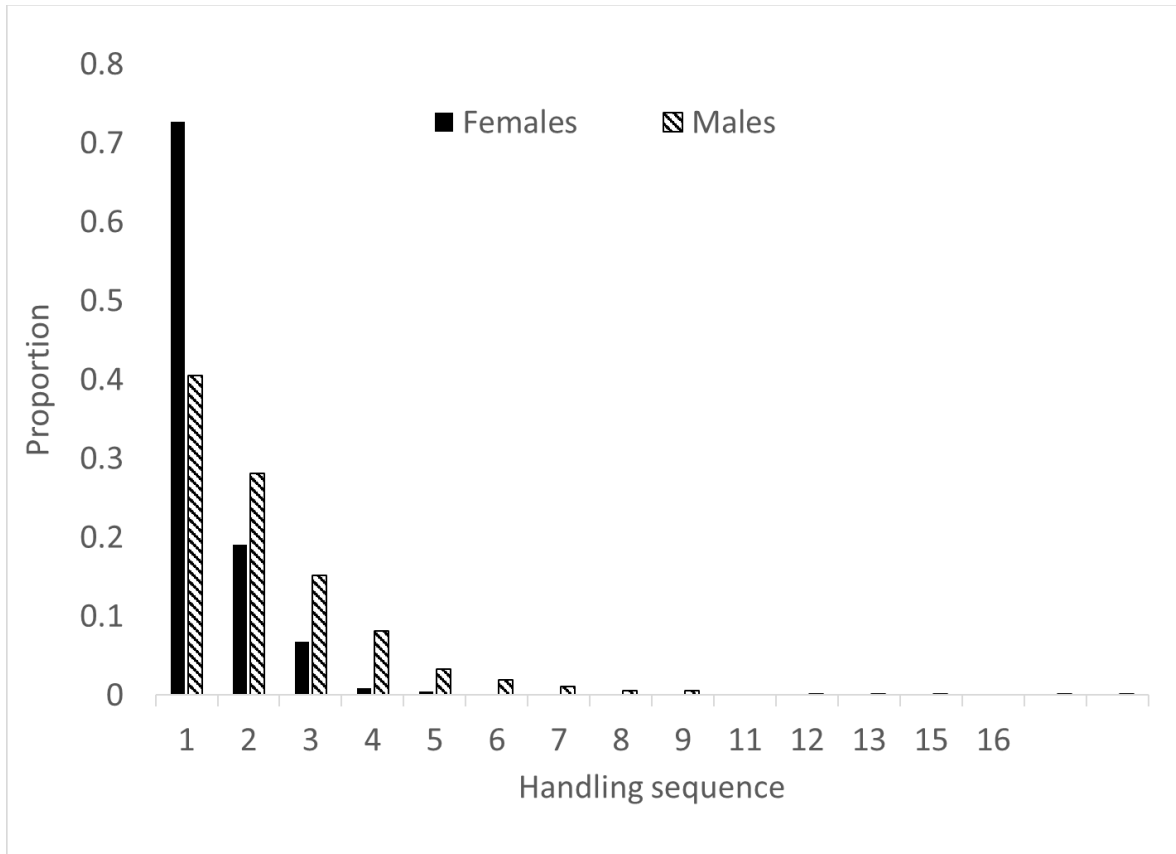


Figure 3. Histogram displaying the handling sequence of adult female (solid bars) and male (hashed bars) lake sturgeon captured during the 2019 spawning stock assessment conducted on the Winnebago System. Handling sequence refers to the number of times that individual fish has been captured by DNR staff during various assessments.



Photo set 1. High water levels experienced during the 2019 lake sturgeon spawning stock assessment. All photos were taken from the area around the Shawano Paper Mill Dam on the Wolf River.