

# Winnebago System Sturgeon Spawning Assessments 2010-2016

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## Introduction

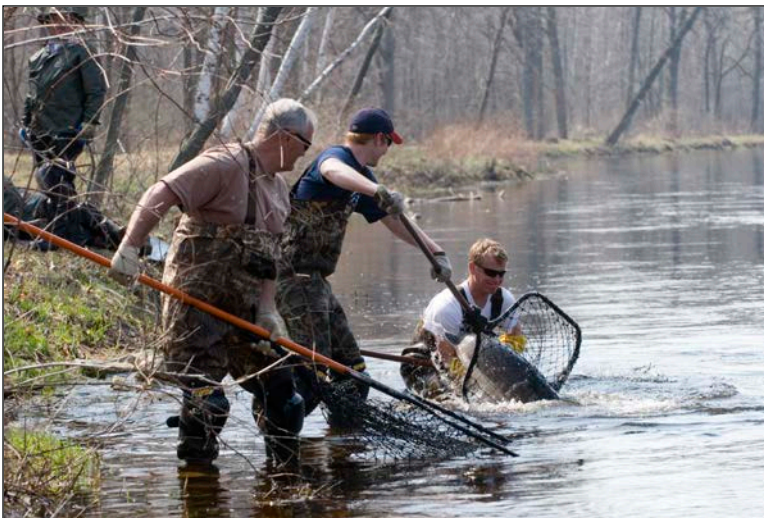
The Lake Winnebago System is home to one of the nation's largest lake sturgeon populations (~42,500 adults), while also providing the largest recreational fishery for the species. Further, the lake sturgeon population on the system is one of the most well studied fish populations in the Midwest. A litany of research projects have been conducted to evaluate movement, diet, life history, and genetics of the lake sturgeon population, but the two core assessment periods are during the annual winter spear fishery and the spring spawning migration.

The first spawning stock assessments took place in 1953 with annual assessments occurring from 1953-1964. There was a break in assessments from 1965-1974, until annual spawning assessments began in 1975 and have been occurring each year since. Monel (external metal) tags were used to mark fish with unique identification numbers for much of the 1950s through 2002, but internal PIT (passive integrated transponders) have been used to mark fish since 1999. Fish were marked with both tag types from 1999-2002, but tagging with Monel tags ceased midway through the 2012 spawning stock assessment due to poor observed retention rates of Monel tags relative to PIT tags.

Primary assessment objectives are to: 1) mark fish for estimates of abundance and exploitation (harvest rates), 2) monitor size structure, 3) evaluate growth and mortality, 4) evaluate movement, and 5) determine river and spawning site fidelity of adult lake sturgeon. This report focuses in on data collected during recent spawning stock assessments spanning 2010-2016.

## Methods

Lake sturgeon spawn on rocky shorelines of multiple tributaries to the Winnebago System; most notably the Wolf, upper Fox, Embarrass, and Little Wolf Rivers. Spawning lake sturgeon were captured by dippers from shore using large dip nets, typically 2-3 dippers worked together to corral fish (photo insert). All captured fish



were measured to the nearest 0.1" (total length, TL, measured to longest point of the caudal fin). Sex and spawning stage (green, ripe, and spent) was determined for all fish based on extrusion of gametes and each fish was inspected for internal and external tags. PIT tags were injected into all unmarked fish. All fish were released at the capture location.

**Results and Discussion**

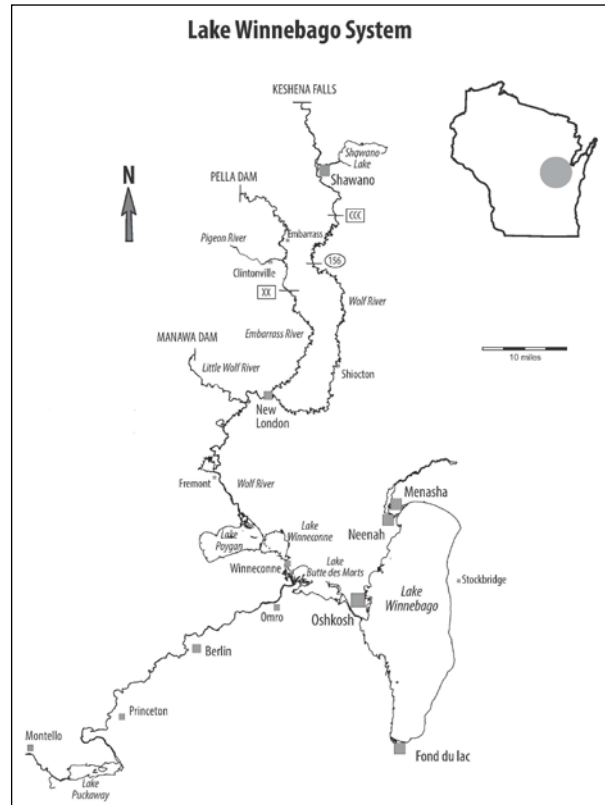
Duration of sturgeon spawning runs has been variable during the study period, ranging from 4-21 days (average 11.6 days; Table 1). These data span from the first date that spawning activity is observed until the primary run is complete. However, there have been years where temperatures cool substantially causing delays during the spawning period. Each year we captured and tagged fish on the majority of the days that sturgeon were actively spawning and averaged 8.6 days of tagging per year (range 4-14 days).”

A total of 10,536 lake sturgeon were captured during spring spawning assessments conducted between 2010-2016 (range: 1,012-1,964 fish/year; mean 1505.1 fish/year; Table 1). Of the fish sampled, 15.5% were females and 84.7% were males. The skewed sex ratio is attributable to a few main factors. First, lake sturgeon spawn in pods where one female will be spawning with multiple males. The pod will disperse if the female leaves the shoreline, so our dippers target males first as to not spook the female. Second, males will spawn with multiple females during a spawning run and are vulnerable to capture during the duration of spawning activity at a given site. In comparison, a single female will spawn over an 8-12 hour period and thus is only vulnerable to capture during a relatively narrow time window. Lastly, there are more adult males than adult females in a given spawning run because the males reach maturity at a younger age and have a shorter spawning periodicity relative to females (males spawn every 1-2 years compared to 3-5 years for females). For example, we currently estimate that there are 24,000 adult males and 19,000 adult females in the population. When taking into account spawning periodicity, there are likely around 16,000 adult males spawning in a given spring compared to only 4,750 females.

<b>Year</b>	<b>Duration of Run</b>	<b>Days Tagging</b>	<b>Female</b>	<b>Male</b>	<b>Total</b>
2010	10	7	223	1070	1293
2011	20	14	202	1448	1650
2012	21	11	237	1524	1761
2013	4	4	208	804	1012
2014	16	14	261	1721	1964
2015	6	6	311	1203	1514
2016	4	4	193	1149	1342
<b>Total</b>			<b>1635</b>	<b>8919</b>	<b>10536</b>
Min	4	4	193	804	1012
Max	21	14	311	1721	1964
Mean	11.6	8.6	233.6	1274.1	1505.1
Median	10	7	223	1203	1514

Table 1. Displays the duration of the spawning run, number of days that lake sturgeon were handled, number of female and male lake sturgeon handled and the total number of lake sturgeon handled during spawning stock assessments conducted on the Winnebago System from 2010-2016.

Fish were collected from 20 different locations across the Wolf (13), Embarrass (3), Upper Fox (2) Little Wolf (1), and Pigeon (1) Rivers. The Wolf, Embarrass, Upper Fox, and Little Wolf Rivers all receive annual spawning activity, but 2015 was the only year where adult fish have been observed spawning on the Pigeon River. Although fish were collected across 5 tributaries, the overwhelming majority of the fish were captured from the Wolf River (97.2%), with the Embarrass (2.2%), Upper Fox (0.3%), Little Wolf (0.2%), and Pigeon (0.1%) Rivers each making small contributions. There were three sites on the Wolf River (Bamboo Bend in Shiocton, the Sturgeon Trail in New London, and Shawano Dam in Shawano) where fish spawned every year and 72.6% of the fish were handled collectively at these three sites (12.3% at Sturgeon Trail, 8.3% at Bamboo Bend and 51.9% at the Shawano Dam). These data are skewed a bit in that all three sites are publicly accessible and our crew has prioritized tagging fish at each location in the past.



Observed size structures were very similar across years, which is to be expected given the longevity and slow growth rates of lake sturgeon (Figure 1). The timeframe of 7 years simply isn't long enough to observe trends in a fish species that can live in excess of 100 years. Mean length of male lake sturgeon was 56.7" across years (range: 29.2-74.7"), while mean length for females was 65.1" (range: 45.9-87.5"). The length bins with the largest contribution were 54.0-55.9" for males (41.0% collectively) and 62-67.9" for females (45.5% collectively). Each year's assessment contained a strong contribution of fish >70" (average 15.8%; range 13.1-19.2%). This should be of particular interest to sturgeon spearers as typically a 70+" fish is 100 pounds or larger.

We are routinely asked what percentage of fish already have been marked with PIT tags. As I stated earlier, PIT tags have been used to mark fish since 1999 and have much greater retention than Monel tags. Thus intuitively it would make sense for recapture rates to have increased over the last 7 years. This has been the case with male lake sturgeon but not females (Figure 2). Recapture rates during the study period ranged from 17.8-27.9% for females (average 22.9%) and 36.4-49.0% for males (average 42.5%). The higher male recapture rate is explained by the fact that the overwhelming majority of fish tagged have been male.

Data collected from fish handled during the spawning assessments are critical to managing the Winnebago System lake sturgeon population and spear fishery. Without marking fish in the spring we would not be able to estimate abundance, and in turn set

safe harvest limits. We are fortunate that this assessment, along with all other sturgeon related assessment and research, is funded by sturgeon spearing license dollars. So thank you to everyone that purchases a license and contributes to our assessment program.

We will again be handling fish during the spawning run in 2017. If you have never witnessed the spawning run on the tributaries to the Winnebago System, then I strongly suggest you make arrangements to do so in the near future. The spawning run on the Winnebago System is truly a unique experience that you cannot observe anywhere else in the world. There are other areas where you can see lake sturgeon spawn, but not nearly to the magnitude that you can witness on the Winnebago System. There are a number of sites that are publicly accessible and receive annual spawning activity. Those sites are the Sturgeon Trail in New London, Bamboo Bend in Shiocton, and below the Shawano Dam in Shawano. Each site is highlighted in the map insert. Oshkosh fisheries staff does maintain a Gov Delivery list where interested folks can receive updates about fisheries management activities on the Winnebago System. Daily updates during the sturgeon spawning run are sent to this list, making this the best avenue for staying informed about sturgeon spawning activity. Email Ryan Koenigs ([Ryan.koenigs@wisconsin.gov](mailto:Ryan.koenigs@wisconsin.gov)) to be added to the list.

I hope you found the report interesting and informational. Feel free to contact me by email or phone (920-303-5450) if you have any questions related to fisheries management on the Winnebago System. Hopefully 2017 will be a safe and successful fishing season for you and your loved ones!

*Ryan Koenigs*

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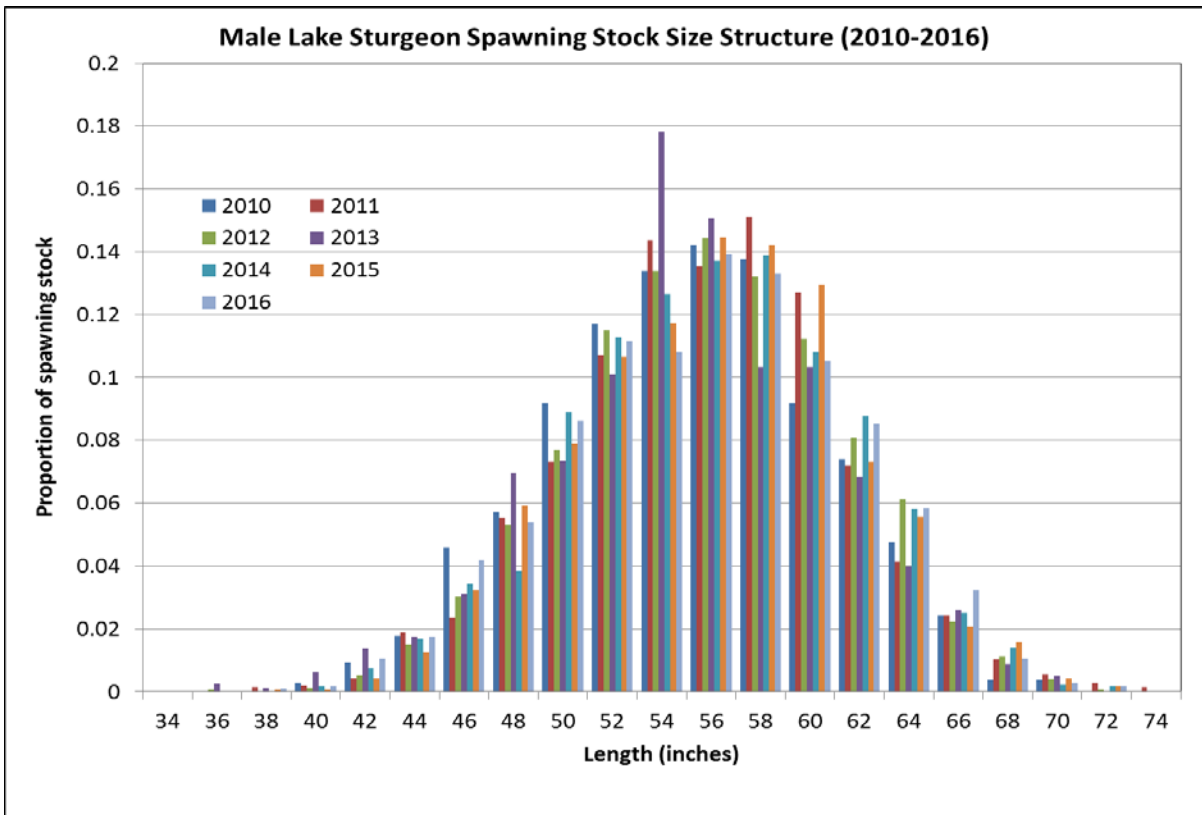
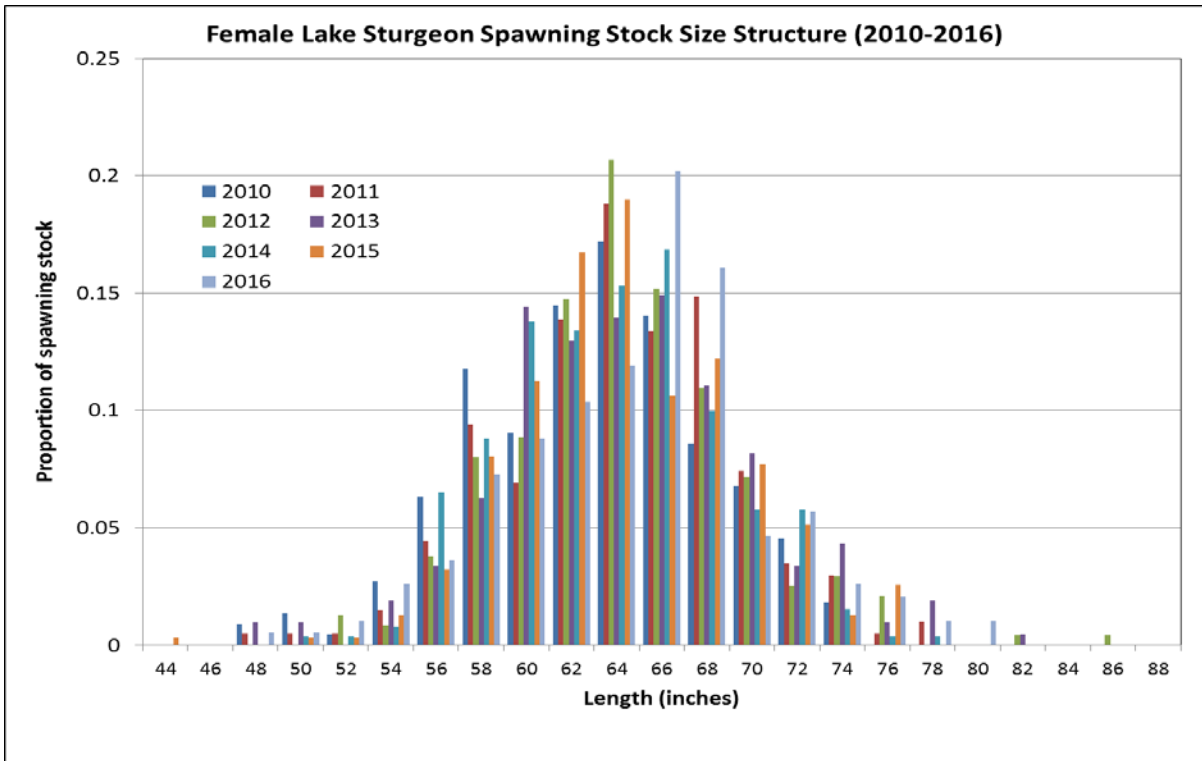


Figure 1. Displays the size distribution of adult female (top) and male (bottom) lake sturgeon captured during spawning stock assessments conducted from 2010-2016.

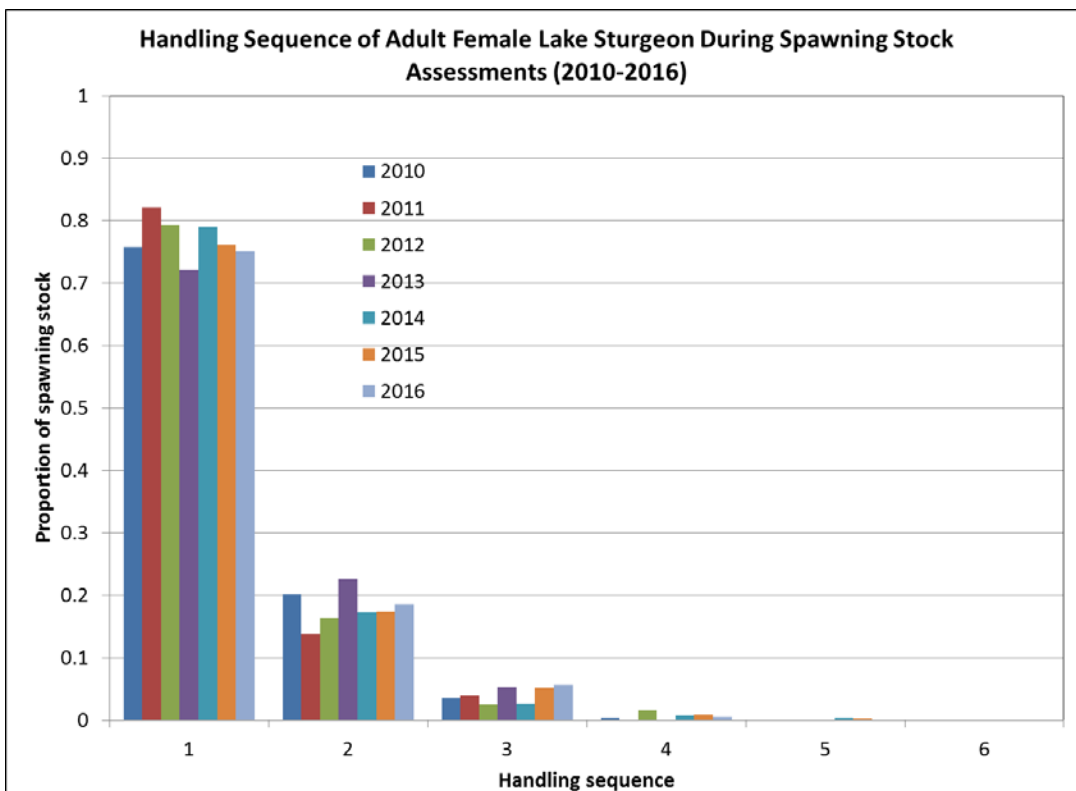
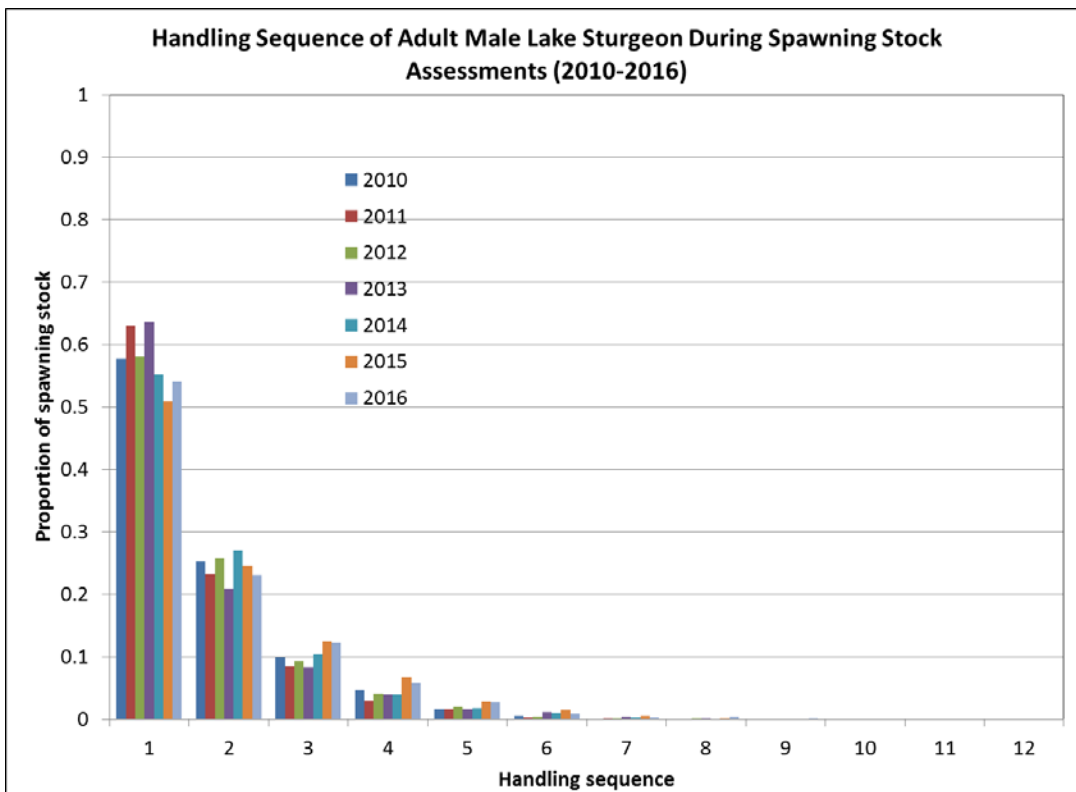


Figure 2. Displays the handling sequence number for adult male (top) and female (bottom) lake sturgeon captured during spawning stock assessments conducted from 2010-2016. A handling sequence of 1 indicates this was the first time the fish was ever handled where sequence 2 fish had been captured once in the past, sequence 3 fish had been captured twice in the past, etc.