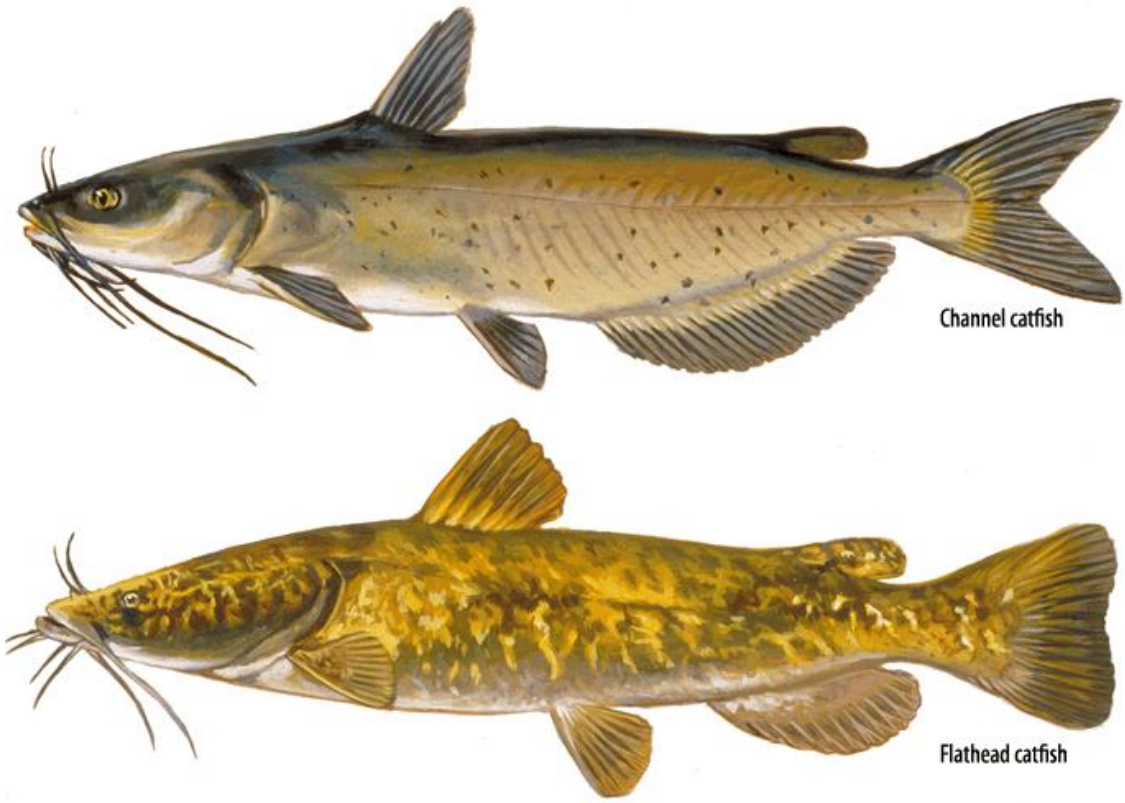
WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Sugar River Hoop Net Survey
Rock County, Wisconsin
2023

Photo credit: Wisconsin DNR

Mitchell Trow
Fisheries Technician-Advanced
November 2024

Table Of Contents



Executive Summary

Channel catfish and flathead catfish are two popular species targeted by Wisconsin anglers. Due to the popularity of catfish species, the Wisconsin Department of Natural Resources (DNR) monitors channel and flathead catfish populations within Rock County using baited hoop net surveys on the Sugar River, Rock River, and Yahara River on a 4-year rotation basis. When compared to recent surveys on the Rock and Yahara River, the Sugar River has lower channel catfish abundances as well as slower growth rates. Extreme drought conditions during the 2023 baited hoop net survey on the Sugar River may have led to lower catch rates when compared to the previous survey in 2014. Additionally, discharge rates and water levels over the last few years may have negatively impacted channel catfish reproduction. Average size of both channel catfish and flathead catfish has increased in the Sugar River over the last 9 years.

Introduction

The Sugar River flows for 91 miles and begins as a small cold-water stream in Dane County to the east of Mount Horeb where a series of agricultural ditches meet near Witte Road. As the Sugar River flows south it transitions from a coldwater Class II trout stream in Dane County to a warmwater river that supports multiple gamefish species such as channel catfish in Green and Rock County. The Sugar River enters Illinois near the town of Avon and flows for 5 miles after the state line where it empties into the Pecatonica River in northern Winnebago County near Shirland, IL.

There are four dams on the Sugar River located in Belleville, Albany, Decatur, and Brodhead. Lake Albany, locally known as Lake Winnetka, and Decatur Lake are the only two impoundments on the Sugar River. Lake Belle View was a former impoundment on the Sugar River created by the Belleville dam, but a lake rehabilitation project in 2010 separated both waterbodies. The Brodhead dam is on a 3.1-mile manmade channel locally called the “millrace” that is parallel to the natural channel of the Sugar River. Like other many large rivers in Wisconsin, the purpose of the Sugar River dams was to create power for sawmills and flourmills in the late 1800s. Now these manmade structures provide habitat and spawning areas for gamefish species.

The Wisconsin Department of Natural Resources (DNR) conducted a post spawn baited hoop net survey on the Sugar River for catfish species in August 2023 in the town of Avon at Nelson Road in Avon Bottoms Wildlife Area. The goal of this survey was to determine the relative abundance and size structure for channel catfish and flathead catfish populations. Aging structure samples for multiple size classes were also collected to assess growth rates for channel and flathead catfish.

PUBLIC ACCESS

Public access points can be found throughout the Sugar River, especially in parks or large wildlife areas. The most popular shore fishing locations on the Sugar River in Green County are found directly below any of the 4 dams where anglers can catch a variety of gamefish species like smallmouth bass, northern pike, walleye and channel catfish. Shore fishing opportunities with easy access are available at Legion Park in Albany and Headgates Park near Decatur Lake. The Falk Wells Sugar River Wildlife Area, Albany Wildlife Area and Avon Bottoms Wildlife Area also provide unique opportunities to explore floodplains and wetlands for fishing or hunting locations. Undeveloped parking lots with gravel boat ramps are found all along the Sugar River. These locations are popular to launch kayaks or small john boats with “mud” motors. Decatur Lake provides the best boating opportunity and has the only boat ramp with a dock on the Sugar River system.

SURVEY LOCATION

In 2023, a baited hoop net survey was conducted on a 1.75-mile section of the Sugar River in Avon Bottoms Wildlife Area near Sugar River Park on Nelson Road (Figure 1). The Sugar River within the survey area is shallow with average depths of 2 to 3 feet and the substrate is mainly composed of sand with cobble and gravel being found in areas with higher water velocities. River bends have an average depth of 5 to 6 feet with a maximum depth of 11 feet in deep scour holes created by large woody debris. Shallow water and fallen trees make navigation in this section of the Sugar River very difficult. Large pieces of wood, tree roots and undercut banks within the river provide optimal habitat for catfish species. The Nelson Road bridge crossing was in the upper portion of the survey area. The riparian area along this section of the Sugar River features side channels, oxbow lakes, wetland complexes, flooded woodlands and agricultural fields.

FISH ASSEMBLEGE

Gamefish sampled during this survey include bluegill, black crappie, channel catfish, flathead catfish, northern pike, rock bass, smallmouth bass, walleye and white bass. Other non-gamefish species collected include common carp, freshwater drum, golden redhorse, shorthead redhorse and white sucker.

Methods

Catfish species were targeted within the Sugar River by performing a baited hoop net survey following standard procedures listed in the Wisconsin DNR fish management handbook (Simonson 2015). Hoop nets were set in the month of August and typically sampled every 48 hours with a few exceptions for the survey. Sample dates for the survey can be found in Table 1. This survey used hoop nets with 42-inch fiberglass hoops and 1 inch mesh made of nylon.

Hoop nets were set parallel with the shoreline having the cod end pointing upstream and the mouth facing downstream. Nets were set near optimal catfish habitat in deep runs, above pools, or near woody debris to maximize catfish catch rates. Refer to Table 2 for net locations. The cod end of each net was secured by embedding a large spade anchor into the substrate. The downstream end of each net was secured to the river bottom by a 10-pound mushroom anchor with an attached DNR buoy. Net retrieval was completed by pulling the buoy and mushroom anchor on the downstream end of each net and working towards the upstream end of each net hoop by hoop. Nets were baited by placing roughly 2 pounds of pressed soy cake into a 1/8-inch mesh bag. Bait was checked and replaced every 48 hours.

Catfish species were measured to the nearest tenth of an inch and weight measurements were taken in kilograms which was later converted to pounds. All other gamefish had lengths and weights recorded while all non-gamefish were only counted. Top caudal fin clips were given to each channel catfish. This method allowed staff to detect recaptured fish from previous sampling efforts. Pectoral spines were taken from channel catfish and flathead catfish for aging structures. Spines were clipped using a pair of side cutters and cross sections of each spine were cut using a slow speed precision saw. Cross sections were sanded down and aged by two different readers under a dissecting microscope (Figure 3).

Results

A total of 117 channel catfish were sampled during 100 net nights which resulted in a catch per unit effort of 1.17 channel catfish per net night. The average length of channel catfish collected was 18.9 inches with sizes varying from 9.7 inches to 29.2 inches (Figure 4). The average weight of channel catfish collected was 2.08 pounds with a maximum weight of 8.2 pounds. Channel catfish that were 16 inches or greater made up 82 % of the total number of channel catfish sampled which results in a Proportional Size Distribution (PSD) value of 82. Refer to Table 4 for more PSD values as well as historical values. Pectoral spines were collected from 91 channel catfish with ages ranging from 3 to 18 (Table 5). Channel catfish average age was 9 years old and mean length at a given age is shown in Figure 7.

A total of 10 flathead catfish were sampled during 100 net nights which resulted in a catch per unit effort of 0.10 flathead catfish per net night. The average length of flathead catfish collected was 26.9 inches with sizes varying from 16.2 inches to 37.8 inches (Figure 6). The average weight of flathead catfish collected was 10.9 pounds with a maximum weight of 37.8 pounds.

Multiple other gamefish and panfish species were found, in order of abundance, including bluegill (9), walleye (9), northern pike (4), white bass (4), black crappie (3), smallmouth bass (2) and rock bass (1). The survey also found a few roughfish species including 28 common carp, 8 shorthead redhorse, 5 golden redhorse, 2 freshwater drum and 1 white sucker. Hoop nets are made to specifically target catfish species so

lower abundances of other gamefish species does not necessarily reflect a low population. Electrofishing is a much more effective method to collect gamefish species commonly found in rivers such as walleye, smallmouth bass, and panfish.

Discussion

In 2014, the DNR performed a similar hoop netting survey on a similar stretch of the Sugar River extending 1.9 miles near Avon where a total of 233 channel catfish were collected (Figure 2). Fisheries Management staff set 10 hoop nets for 10 nights; channel catfish catch per unit effort was 2.33 per net night. The 2014 survey found that channel catfish had an average length of 14.6 inches with sizes ranging from 6.6 to 29.2 inches (Figure 5).

In 2023, the number of channel catfish sampled decreased by nearly 50% when compared to the previous survey in 2014. Catch rates of channel catfish decreased by 1.16 fish per net night; however, channel catfish average size has increased by 4.3 inches over the last 9 years with size ranges being slightly different in each survey. (Table 3). The 2014 survey saw a larger proportion of smaller fish in the survey with a PSD_{16} of 73 compared to the PSD_{16} of 82 from 2023 survey. When compared the to the 10 year statewide average CPUE from 2010 to 2019 of 8.7 channel catfish per net night, the Sugar River in 2023 ranks low with a catch rate of 1.17 channel catfish per net night. When compared to other local rivers such as the Rock River and Yahara River, channel catfish abundances in the Sugar River are low (Table 6.)

Channel catfish within the Sugar River have slower growth rates compared to other populations in nearby river systems like the Rock River or Yahara River; however, channel catfish maximum size is similar in all three rivers (Figure 8). No aging structures were collected in 2014, but the 2014 length frequency shows that a few large year classes of 7-10” channel catfish were born in the year(s) prior to the 2014 survey (Figure 5). Aging data from 2023 suggests that these large year classes of channel catfish found in 2014 successfully recruited to the population and represents a large proportion of the current population as 10 to 12 year old fish over 18 inches long (Figure 4).

CHANNEL CATFISH MOVEMENT PATTERNS

According to Becker (1983), channel catfish are most active at night or during high water levels. Rain events wash new terrestrial food sources into the water which increases channel catfish movement and feeding activity. It’s plausible the decrease in channel catfish sampled on the Sugar River from 233 fish in 2014 to 117 fish in 2023 could be attributed to the water levels throughout each survey. The 2014 survey experienced high water levels and increasing flows throughout most of the sampling period while the 2023 survey had slow flows and a decrease in water level during extreme drought conditions resulting in low catch rates (Figures 9). The 2023 survey also had a rapid decrease in water temperature from nearly 83˚F to 66 ˚F while water temperatures steadily decreased during the 2014 survey. Rapid changes in water

temperature can affect feeding behavior of channel catfish. This temperature fluctuation also could have played a factor in the decreased catch rates of channel catfish observed in 2023.

CHANNEL CATFISH REPRODUCTION

Channel catfish reproductive success and recruitment can be negatively impacted by low discharge rates and low water levels. A study done in Oklahoma suggests that channel catfish have more successful reproduction and recruitment in years with high water levels (Griffin et al. 2022). High water can inundate terrestrial wood and vegetation which can serve as refuges for juvenile catfish to hide from predators. Increased water levels also provide additional spawning areas for adult catfish. Over the last several years, a few extended drought periods occurred on the Sugar River during the typical channel catfish spawning period from May through August. Aging data suggests there was little reproductive success in multiple years since the last survey in 2014 with only a few individual fish being represented each year class from age 3 to age 7 (Table 5). These smaller year classes of channel catfish found in 2023 could be related to the previous droughts the area has experienced over the last decade. Hopefully future wet years allow channel catfish to have a successful spawn and the next survey finds multiple large year classes of small catfish.

Management Recommendations

The Sugar River has multiple year classes of channel catfish which suggest that no management changes are necessary. The statewide regulation for general inland waters of 10 channel catfish / flathead catfish per day with no minimum length limit should remain in effect on the Sugar River (Table 7). DNR will continue to monitor catfish populations in the Sugar River on a 4-year rotation basis and will return to perform another hoop net survey on the Sugar River in the future. Upcoming survey efforts will focus on looking for large year classes of small channel catfish to ensure a fishable catfish population will be present in the future.

Acknowledgements

Data collection for these surveys was completed by DNR staff Josh Jonet, Clayton Roberts and Mitchell Trow. David Rowe and Tim Simonson provided feedback and edits for this report.

If you have questions or comments about this report, please contact Fisheries Technician Mitchell Trow or Fisheries Biologist Kyle Olivencia.

Mitchell Trow – DNR Fisheries Technician:
mitchell.trow@wisconsin.gov or (608) 206-4518

Kyle Olivencia – DNR Fisheries Biologist
kyle.olivencia@wisconsin.gov or (608) 910-1843

References

Becker, G. C. 1983. Fishes of Wisconsin. The University of Wisconsin Press. Madison, Wisconsin.

Griffin, A. D., Porta, M. J., and Snow, R. A. 2022. Population characteristics and potential factors influencing recruitment variability of blue catfish, channel catfish and flathead catfish in Thunderbird Reservoir, Oklahoma. Lakes and Reservoirs Science, Policy and Management for Sustainable Use 27 (1).

Simonson, T. 2015. Surveys and Investigations – Inland Fisheries Surveys. Fish Management Handbook Chapter 510, Wisconsin Department of Natural Resources internal publication. Madison, Wisconsin.

Trow, M.R. and Jonet, J.S. 2023. Rock River and Yahara River Hoop Net Surveys, Rock County, Wisconsin 2020, 2021, and 2022. Wisconsin Department of Natural Resources, Madison, Wisconsin. 20pp.

Figure 1. *2023 catfish species survey area and hoop netting locations on the Sugar River near Nelson Road. Yellow dots represent nets 1-10 and the blue dot represents the Sugar River Park boat ramp (Table 2).*

Figure 2. *2014 catfish species survey area and hoop netting locations on the Sugar River near Nelson Road. Yellow dots represent nets 1-10 and the blue dot represents the Sugar River Park boat ramp. The green squares represent the relocation of nets 1 and 10 (Table 3).*

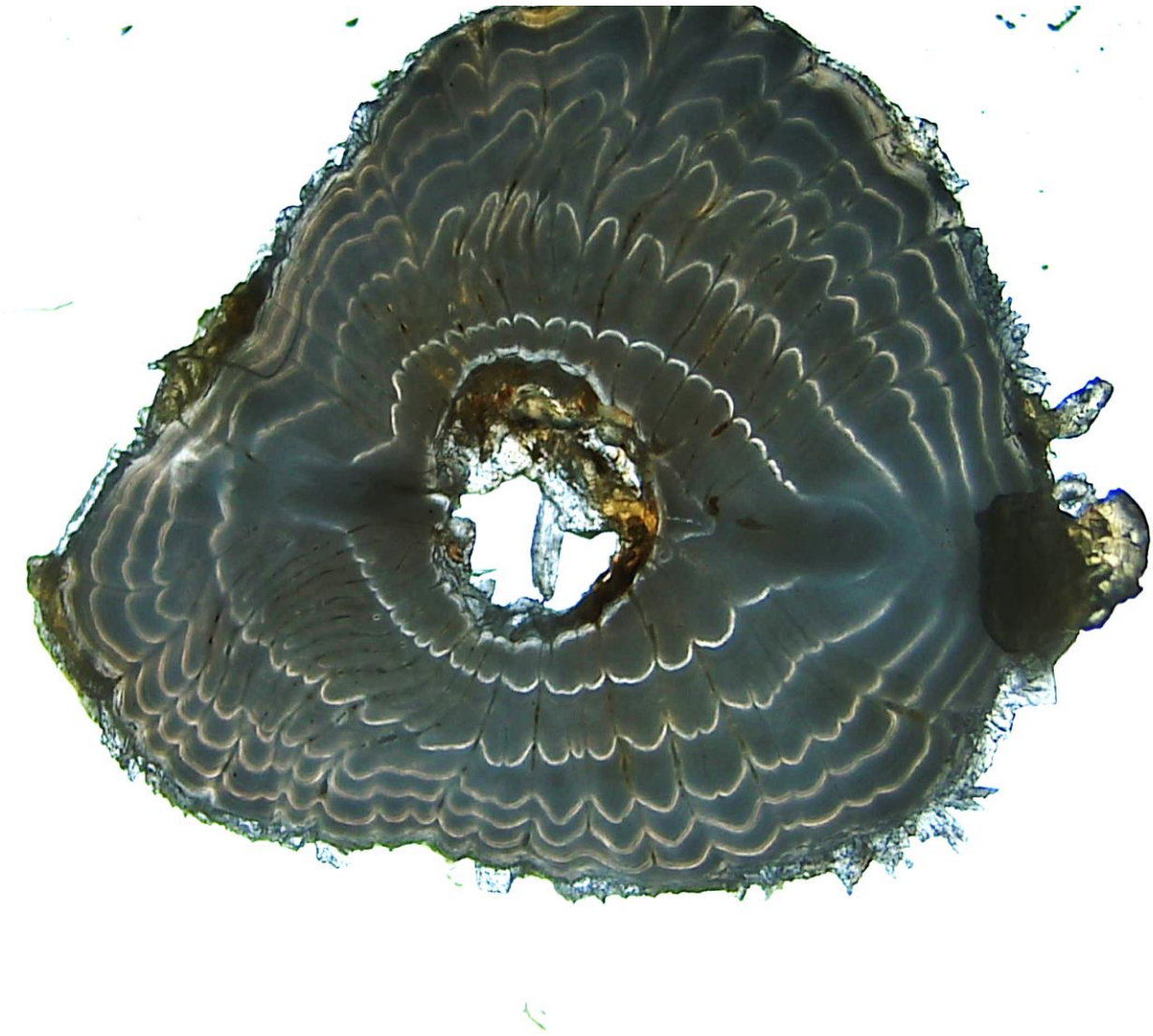


Figure 3. *A cross sectioned pectoral spine of a channel catfish aging structure from the Sugar River under a microscope.*

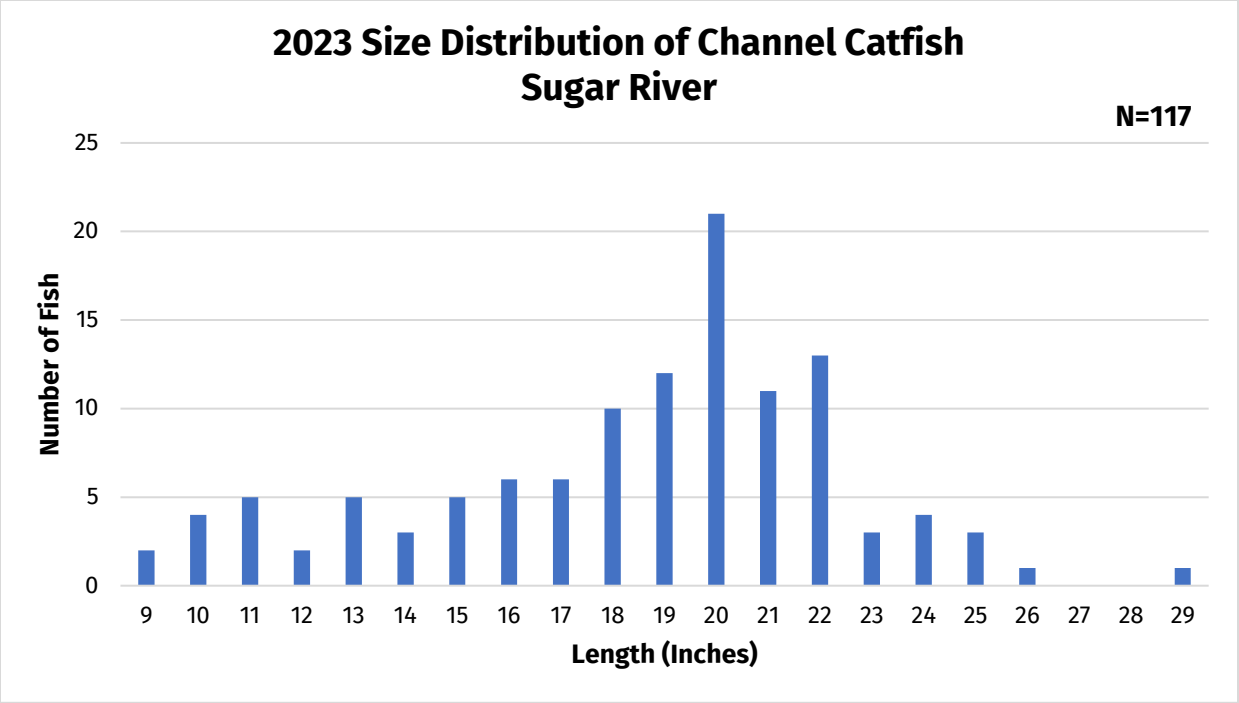


Figure 4. *Length frequency of channel catfish surveyed during the 2023 baited hoop net survey on the Sugar River near Nelson Rd.*

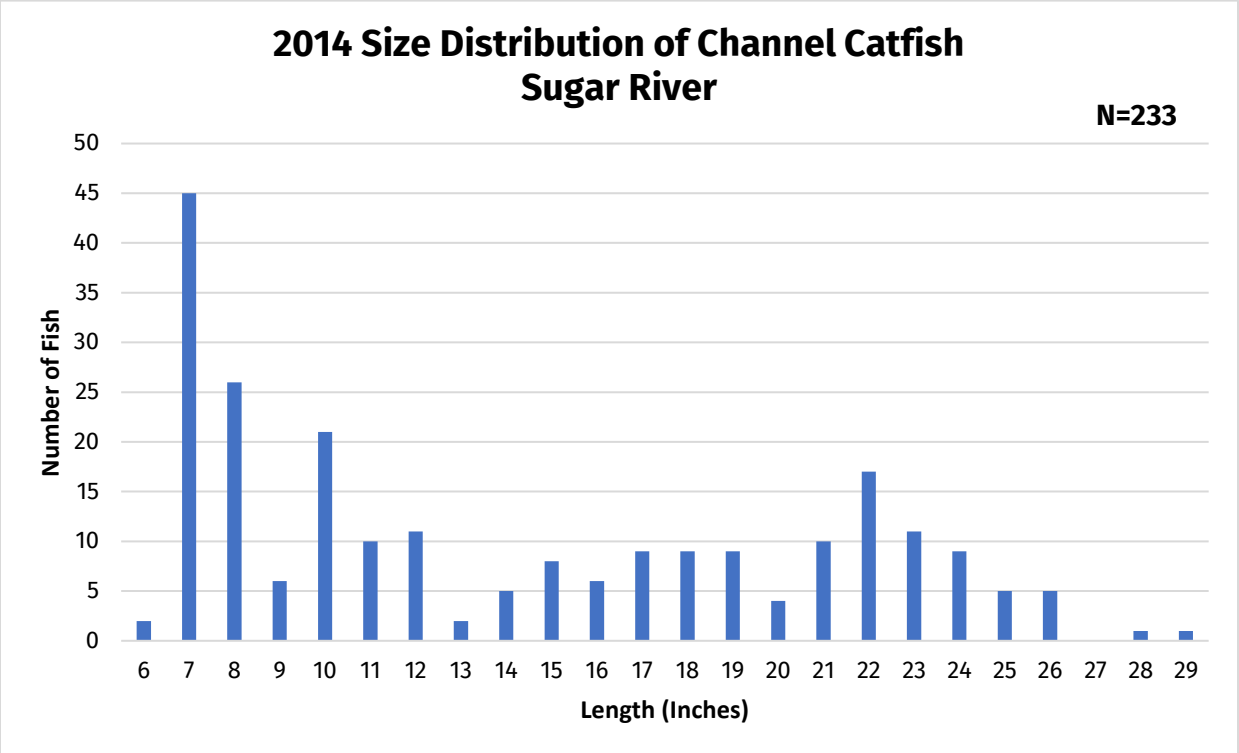


Figure 5. *Length frequency of channel catfish surveyed during the 2014 baited hoop net survey on the Sugar River near Nelson Rd.*

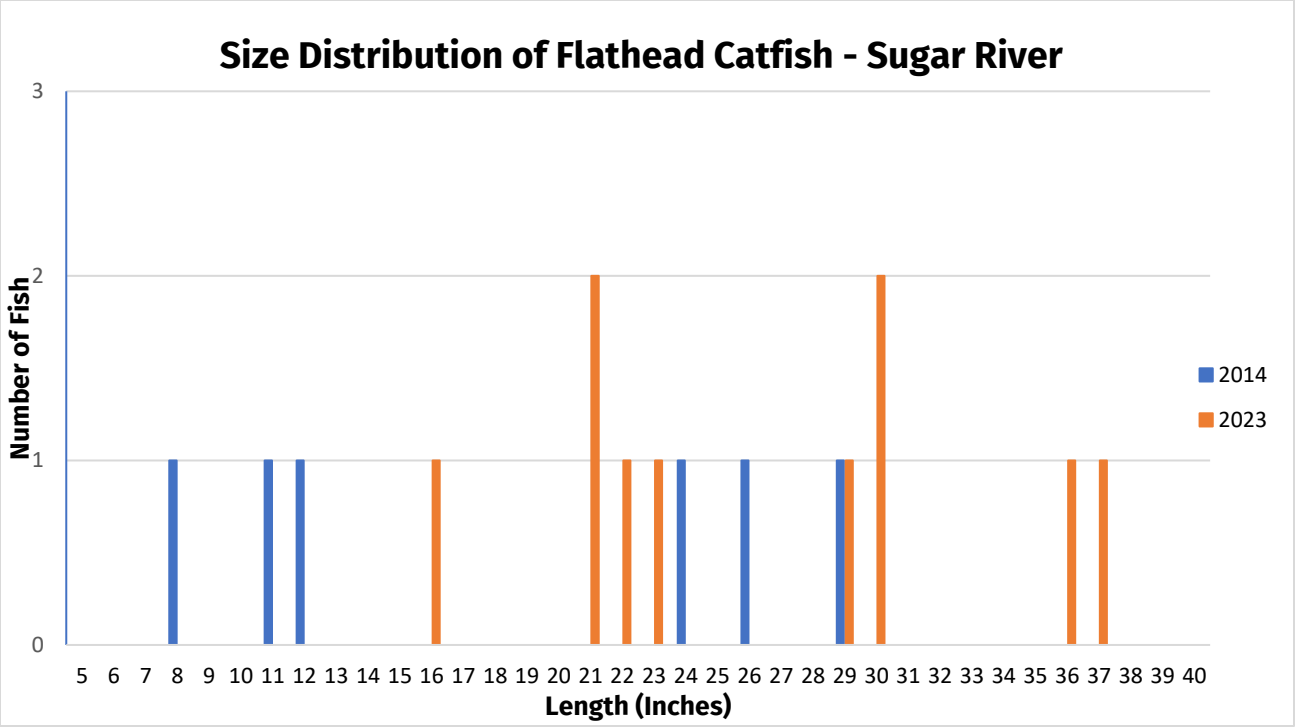


Figure 6. *Length frequency of flathead catfish surveyed using baited hoop nets on the Sugar River in Avon during 2014 and 2023.*

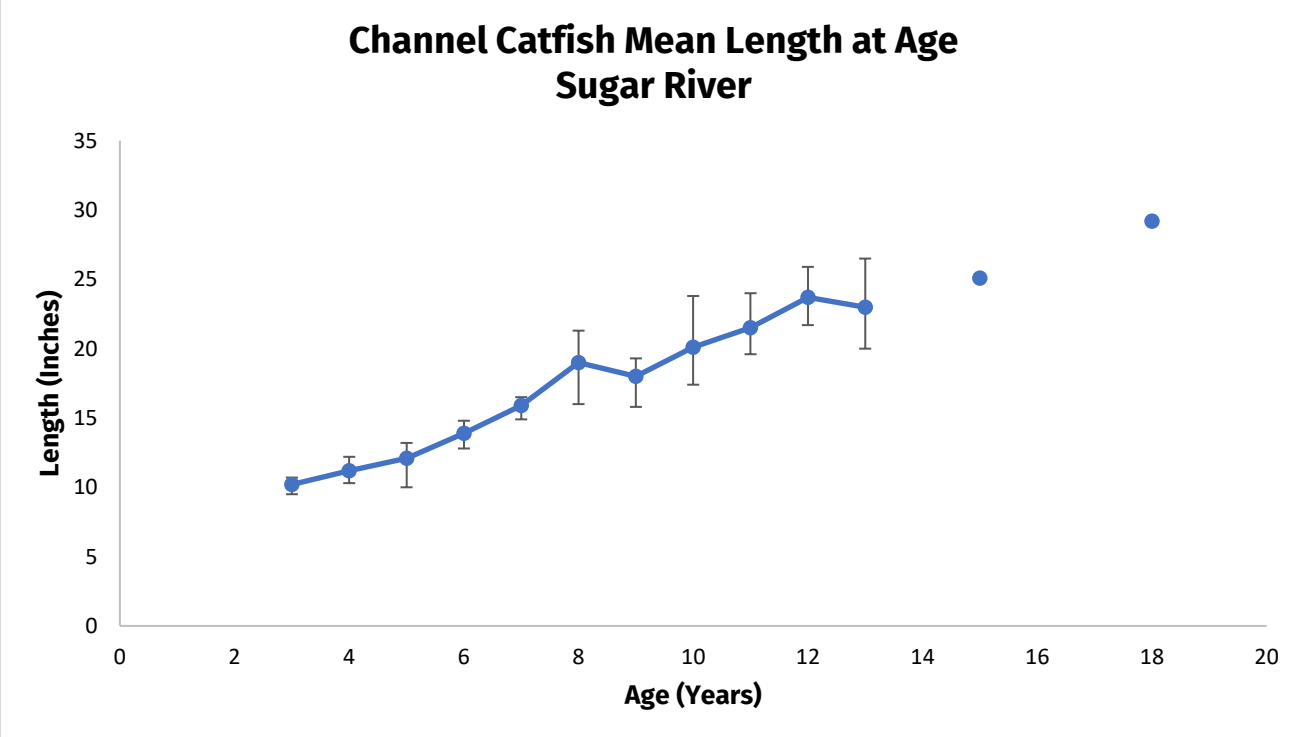


Figure 7*. Mean length at age for channel catfish collected during the 2022 hoop net survey on the Rock River in Afton. Channel catfish ages were estimated using sectioned pectoral spines. Error bars represent the size distribution at a given age.*

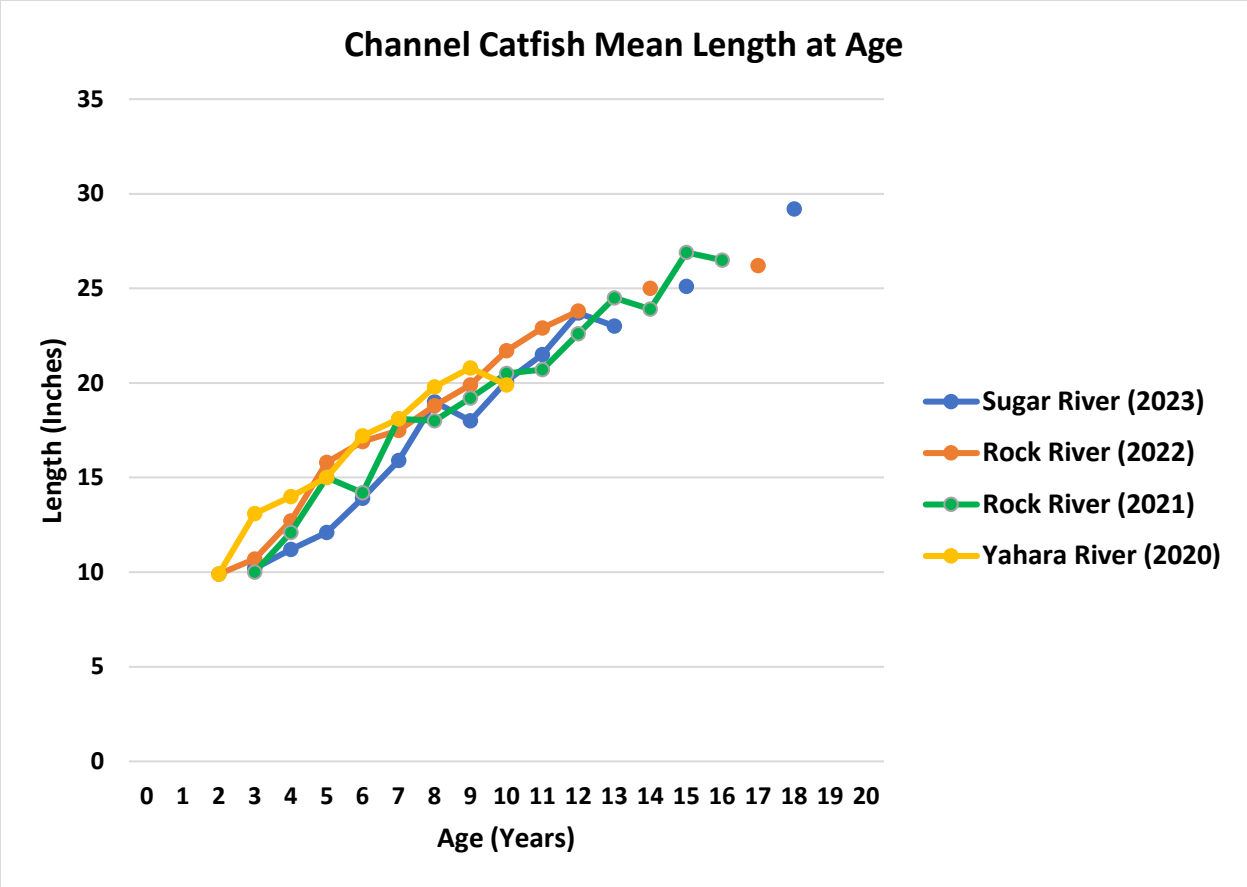


Figure 8. *Mean length at age for channel catfish collected during the most recent hoop net surveys on the Sugar River, Rock River, and Yahara River. Channel catfish ages were estimated using sectioned pectoral spines. Channel catfish growth on the Sugar River is represented in blue.*

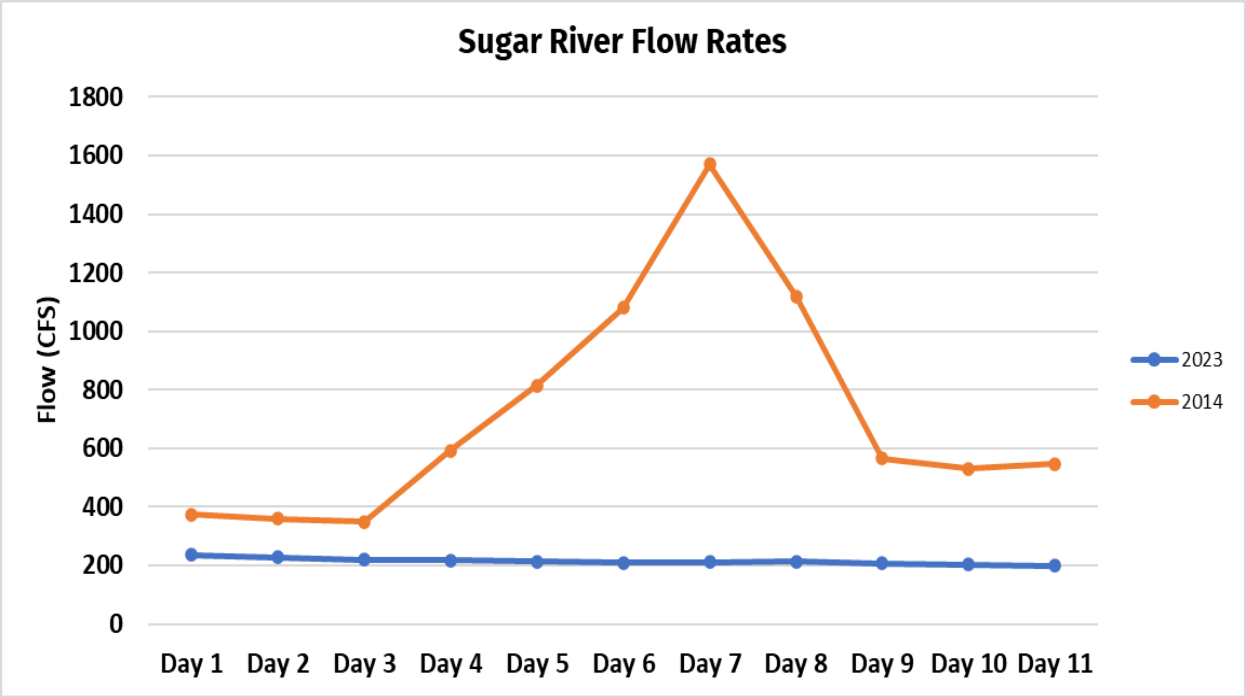


Figure 9. *Flow rates on the Sugar River each day during the sampling period for the 2023 and 2014 baited hoop net surveys. Flow was calculated in cubic feet per second. Flow rates were recorded from USGS stream gauge upstream of survey area located on Ten Eyck Road.*

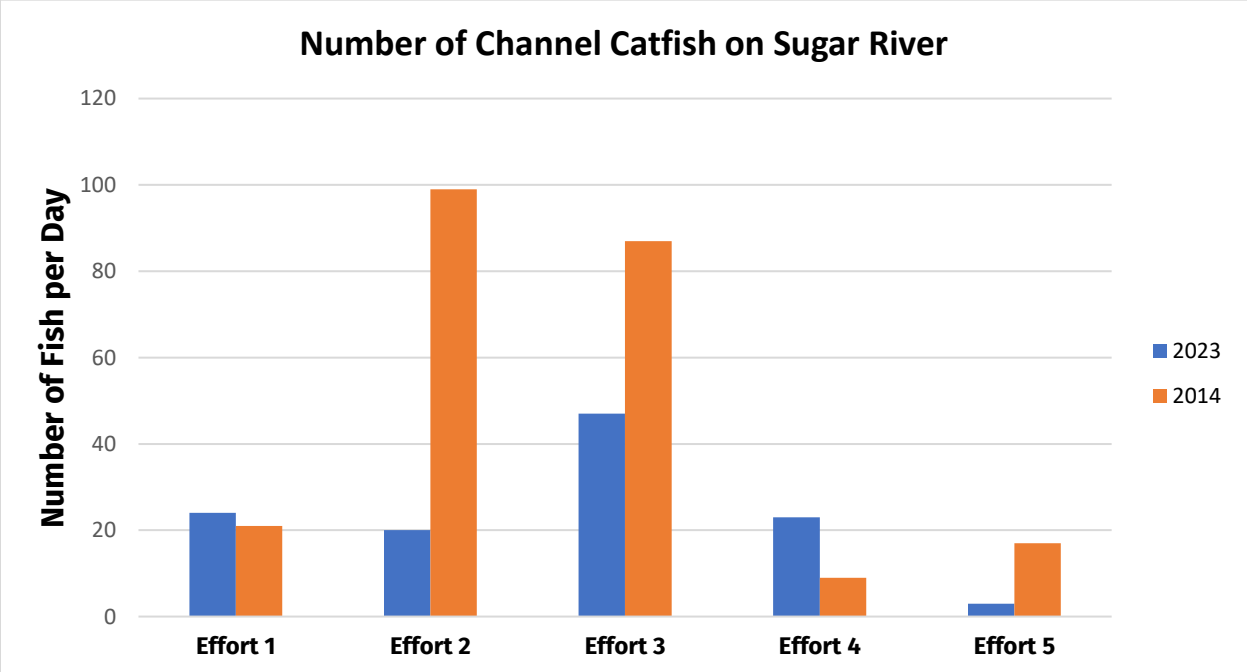


Figure 10. *Number of channel catfish collected on each netting day during the 2023 and 2014 Sugar River baited hoop net surveys in Avon Bottoms Wildlife Area. The 2023 survey had a 6th netting day where zero Channel Catfish were sampled and 1 Flathead Catfish was sampled.*

Table 1. *Survey dates for the 2023 and 2014 Sugar River hoop net surveys in Avon near Nelson Road.*

Location/Year	Set Date	End Date	Total Nets	Total Net Nights
Sugar River – Avon / 2023	8/21/2022	8/31/2022	10	100
Sugar River – Avon / 2014	9/02/2014	9/12/2021	10	100

Table 2*. Latitude and longitude coordinates with set dates for 2023 hoop net locations on the Sugar River in Avon Bottoms Wildlife Area.*

Net Number	Date Set	Latitude	Longitude
1	8/21/2023	42.5191573	-89.3081465
2	8/21/2023	42.5205372	-89.3055457
3	8/21/2023	42.5172065	-89.3046918
4	8/21/2023	42.5167238	-89.3025997
5	8/21/2023	42.516193	-89.2986567
6	8/21/2023	42.5149700	-89.2976497
7	8/21/2023	42.5136848	-89.2956998
8	8/21/2023	42.5121738	-89.2939843
9	8/21/2023	42.5105510	-89.2911268
10	8/21/2023	42.513610	-89.289100

Table 3. *Catch summary of channel catfish and flathead catfish surveyed during the 2023 and 2014 baited hoop net surveys on the Sugar River near Avon.*

Species	Year	Total Fish Collected	CPUE	Average Length	Minimum Length	Maximum Length
Channel Catfish	2023	117	1.17	18.9	9.7	29.2
Channel Catfish	2014	233	2.33	14.6	6.6	29.2
Flathead Catfish	2023	10	0.10	26.9	16.2	37.8
Flathead Catfish	2014	6	0.06	18.8	8.2	29.9

Table 4. *Proportional Size Distribution values for channel catfish during the 2023 and 2014 baited hoop net surveys on the Sugar River near Avon.*

Species/Year	Location	PSD	PSD_{24} Preferred	PSD_{28} Memorable	PSD_{36} Trophy
Channel Catfish 2023	Avon	82	8	1	0
Channel Catfish 2014	Avon	73	16	2	0

Table 5. *Age summary of channel catfish found during the 2023 baited hoop net survey on the Sugar River near Avon.*

Age (Observed)	Number in Group	Average Length	Minimum Length	Maximum Length
3	4	10.2	9.7	10.9
4	4	11.2	10.2	12.1
5	5	12.1	11.0	14.2
6	7	13.9	13.0	15.0
7	3	15.9	15.3	16.9
8	9	19.0	16.7	22.0
9	13	18.0	16.7	20.2
10	19	20.1	16.4	22.8
11	10	21.5	19.0	23.4
12	8	23.7	21.5	25.7
13	5	23.0	19.5	26.0
14	0			
15	1	25.1		
16	0			
17	0			
18	1	29.2		

Table 6. *Catch summary of channel catfish from the most recent baited hoop net surveys on the Sugar River, Rock River, and Yahara River.*

Species	River	Location	Year	Total Fish Collected	CPUE	Average Length
Channel Catfish	Sugar River	Avon	2023	117	1.17	18.9
Channel Catfish	Rock River	Afton	2022	419	4.19	21.3
Channel Catfish	Rock River	Janesville	2021	949	10.9	18.4
Channel Catfish	Yahara River	Fulton	2020	1069	13.9	17.0

Table 7. *General fishing regulations for the Sugar River in Rock and Green, Wisconsin. The Sugar River has fish refuges below the Albany, Brodhead, and Decatur dams where no fishing (including catch and release) is allowed from March 1st to the 1st Saturday in May to protect gamefish during their spawning periods. *Panfish includes bluegill, pumpkinseed, sunfish, crappie and yellow perch.*

SPECIES	SEASON DATES	DAILY BAG LIMIT	SIZE LIMIT
Largemouth Bass and Smallmouth Bass	1st Saturday in May to 1st Saturday in March;	5	14" or larger
Northern Pike	1st Saturday in May to 1st Saturday in March	2	26" or larger
Panfish*	Open All Year	25	None
Walleye	1st Saturday in May to 1st Saturday in March	3	15
Channel and Flathead Catfish	Open All Year	10	None
Bullheads & Roughfish	Open All Year	Unlimited	None