

**WISCONSIN DEPARTMENT OF NATURAL RESOURCES**

# **2022 Lake Winnebago Bottom Trawling**

## **Assessment Report**

Waterbody Code 131100



*Photo credit: Michael Cooney*



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Dec. 20, 2022

## Introduction

The Oshkosh fisheries management and operations staff, along with 30+ volunteers, have wrapped up another trawling season on Lake Winnebago. This annual survey has been conducted since 1986, providing insight into the fish community and species year class strengths of Lake Winnebago for 36 years. This allows readers to compare species abundance of the past and present, and potentially for upcoming years through the young of the year (YOY) catch. In 2022, we were able to return to our normal volunteer participation following two years of pandemic protocols out on the Calumet. Our dedicated volunteers had a key role in the completion of the survey, and we were glad to have them back at full capacity.



*Photo 1, Calumet Research Vessel (RV) at the dock in Asylum Bay. Photo credit: Michael Cooney*

## Methods



*Photo 2, Oshkosh fisheries staff deploying trawl net. Photo credit: Michael Cooney.*

The Lake Winnebago bottom trawling assessment has been conducted with the same standardized method for the last 36 years. This involves a total of 138 net pulls split up into three sampling events. We conduct 46 net pulls during the first week of August, September, and October. An average day on the trawl consists of 10-12 net pulls. The 27-foot-wide trawl net is deployed behind the boat and pulled along the bottom of the lake at 4 miles per hour (mph) for 5 minutes. When the net is pulled in, the fish are emptied onto the counting table, and the trawling crew counts the fish and separates the gamefish into

a holding tank. The gamefish are then measured for length and released. The long-term data set from the survey allows for the comparison of year class strength and adult fish relative abundance over the past 36 years, giving fisheries managers and interested anglers insight on the status of the Winnebago fishery.

## Results

The trawl survey captured a total of 176,336 fish, representing 22 different species. A total of 45,849 adult fish were caught, representing 21 species. Most notable adult fish results include the second-highest Yellow Perch catch on record, above-average Walleye catch, measurable recruitment of the strong 2021 Sauger hatch (age-1 this year), a strong Bluegill catch, and Freshwater Drum remaining well-below average for the fifth consecutive year. The YOY catch was less diverse, with ten different species captured, but a higher total catch with 130,487 fish captured. Highlights from the YOY catch include the third highest Walleye catch on record, a record-setting Yellow Perch catch, an all-time high Trout Perch catch, a high Emerald Shiner catch, and another year of low catch rates for Gizzard Shad and White Bass.

### WALLEYE

Winnebago System Walleye pulled off a near record year class in 2022 with a catch rate of 17.4 YOY/trawl (Figure 1). This is over triple the long-term average of 5.0 YOY/trawl and the highest YOY Walleye catch since 2008. One of the primary indicators for Walleye year class strength in Lake Winnebago is spring water levels on the Wolf River. Higher spring water levels allow for increased access to the spawning grounds as well as consistent water flow through the spawning marshes for proper egg aeration and to facilitate drift for newly hatched fry.

Spring water levels on the Wolf River in 2022 were above average and showed little fluctuation during the Walleye spawning window (Appendix 1). The gauge height at New London first reached 7 feet on March 24, peaked at 8.6 ft on April 13, and remained above 7 feet until May 9. This sustained high-water period showed much less variation than what is typical on the Wolf River in spring. Both the level and consistency of the river flow on the Wolf River during the Walleye spawning window were likely a large contributor to the near record hatch. Water temperatures also play a role in the success of the hatch. The spring adult Walleye assessment, as well as the ongoing Walleye movement study, indicate the majority of fish entered the marshes

to spawn between April 7 and April 20. The Wolf River at New London first hit 40 degrees on April 7 and rose steadily for the duration of the spawn providing suitable temperatures. Following the spawn, water temperatures continued to steadily increase, only briefly dropping below 50 degrees before climbing to over 70 degrees by May 15, which likely provided favorable conditions for zooplankton, the primary food source of larval fish.

In addition to environmental factors lining up for Walleye in 2022, the current adult stock was also favorable for the spawn. Male Walleye can reach reproductive maturity at age 3, while the majority of females reach maturity at age 4 or 5. There were measurable Walleye year classes from 2016 to 2019, with above-average hatches in both 2018 and 2019 and a substantial YOY catch of 9.9/trawl in 2016. The fish from these year classes are now in the 3 to 6 age range and are a strong component of the adult spawning population. The adult spring survey of 2021 showed the spawning adult males were dominated by fish from the 2016 to 2018-year classes representing 63% of the total sample. The fish from the 2016 class were the largest contributors in 2021, making up 29% of the sample. The 2021 spring survey also showed a considerable contribution of 16% from the substantial hatch in 2013 (Figure 1).



*Photo 3. Fisheries Biologist Angelo Cozzola (right) and volunteer Bob Stammer of Lake Poygan Sportsmen Club (left) with a Walleye from the 2022 Wolf River spring survey. Photo credit: Mark Palm.*

The strong 2022-year class is a great sign for the replenishment of the Winnebago Walleye stock, though overwinter survival will be critical for their recruitment into the adult population. We can assess the overwinter survival of Walleye year classes by looking at yearling catch the following year. Walleye had a relatively strong year class in 2021 and showed measurable survival with an increase in yearling catch in the 2022 survey (Figure 2B). Time will tell how this year's walleye class recruits to the population though this near-record catch is a positive sign for the future of the fishery. It is likely that the Walleye year classes of 2021 and 2022 will provide good angling opportunities for years to come.

Adult Walleye catch was 6.4/trawl which is an increase from the two previous years and also above the long-term average of 5.2/trawl (Figure 2C). This year's non-YOY catch was comprised of 889 fish. Of the 889 non-YOY fish, 493 were yearling size, comprising 55% of the total catch. Looking forward, anglers will likely run into a fair number of smaller fish from the strong year classes of 2021 and 2022, though the earlier year classes will remain a large component of the population, providing opportunities for larger fish.

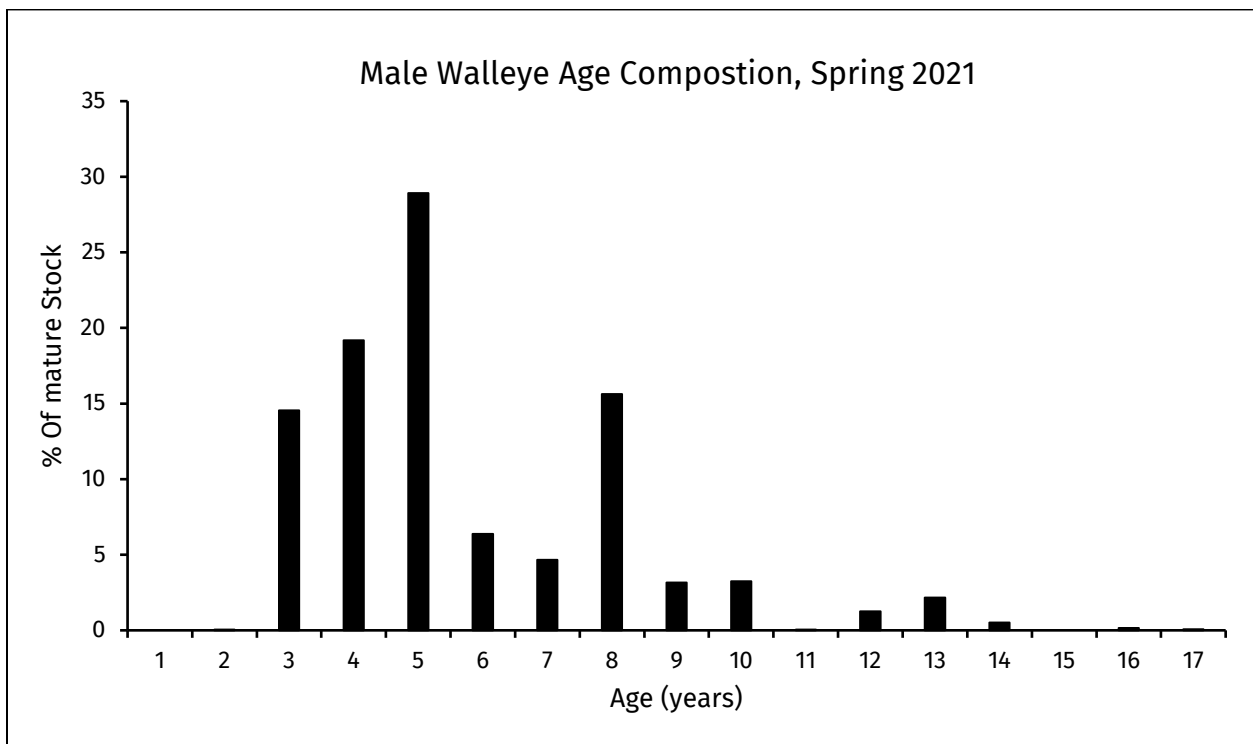


Figure 1. Adult male Walleye age composition from the 2021 spring adult stock assessment.

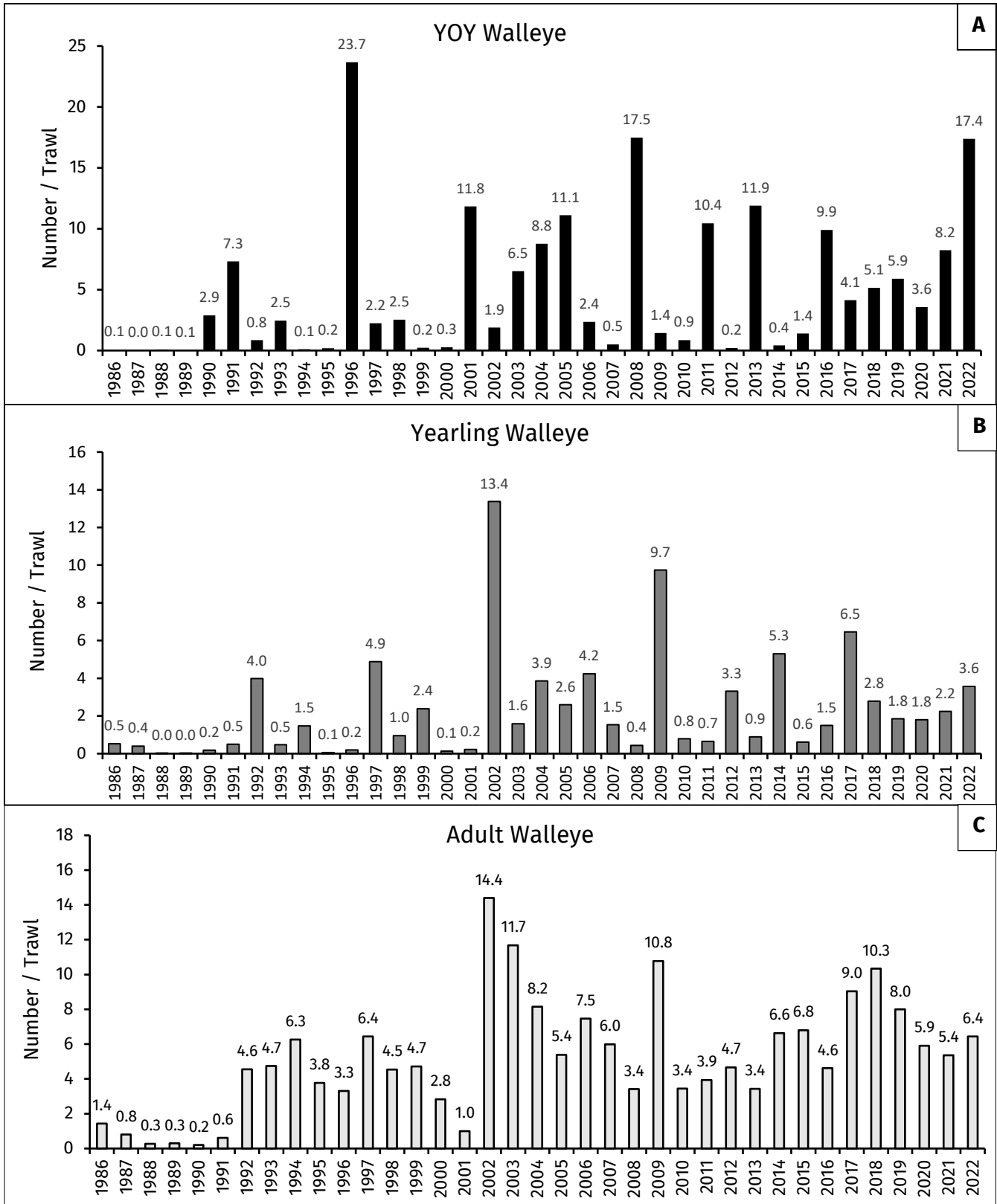


Figure 2 A, B and C. (A) Average number of YOY Walleye/trawl, (B) average number of yearling Walleye/trawl and (C) average number of adult Walleye/trawl captured during bottom trawl assessments conducted on Lake Winnebago from 1986-2022.

## SAUGER

There was a total of 80 adult Sauger captured in the 2022 trawl resulting in a catch rate of 0.6/trawl. This is a slight increase from the most recent years for Winnebago's lower density Sauger population. The uptick in adult abundance is largely comprised of yearling-sized fish (Photo 4), though there were some larger fish present (19 fish > 15 inches). The higher yearling catch indicates measurable survival of the 2021-year class which was the largest seen in the survey since 2009.



*Photo 4. A yearling size sauger captured in 2022 trawl with a caudal fin clip for use in genetic evaluation. Photo credit: WI DNR*

(Figure 3AB). There were also reports from anglers catching these yearling-sized Sauger. There were no YOY Sauger captured in the 2022 survey.

The Sauger genetic study evaluating the contribution to the Lake Winnebago Sauger population from the Walleyes for Tomorrow (WFT) portable hatchery effort on the Upper Fox River has yet to detect a hit. Fin clips from Sauger < 15 inches were taken in the 2022 survey, and we are currently awaiting results. Regardless of genetic results, it is difficult to say how successful the effort was, as the fry stocked into the Upper Fox River near Princeton had many other places within the system to reside. The goal of the effort was to release the newly hatched Sauger in the upper Fox River with hopes of imprinting the young fish and creating a future spawning event as natural reproduction within Lake Winnebago has been limited. The fish from the WFT effort could benefit the Sauger population in this intended way and residing elsewhere, though the genetic testing so far has yet to detect contribution to the Lake Winnebago population. Future assessments on the upper Fox River and the upriver lakes will likely consider genetic testing to determine if this is the case.

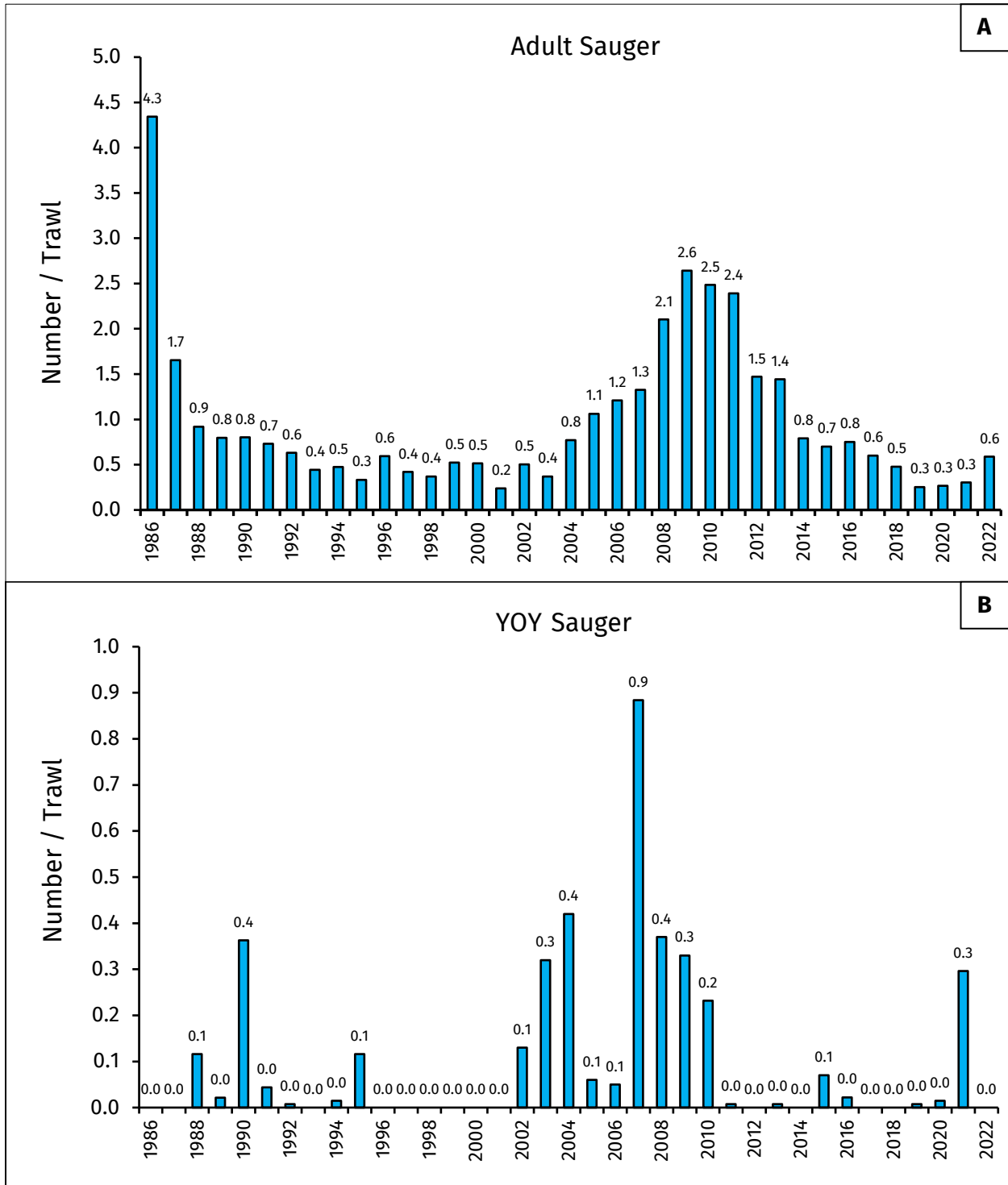


Figure 3 A and B. (A) Adult Sauger and (B) YOY Sauger catch per effort in the trawl survey from 1986-2022.



## YELLOW PERCH

YOY Yellow Perch showed a recording breaking catch at 19.5/trawl. This record year class is preceded by a strong catch of 5.1/trawl in 2021 and the previous record of 13.8/trawl in 2020 (Figure 4B). These recent strong year classes have shown measurable recruitment into the adult population with a 2022 adult catch of 15.5/trawl, the second all-time high (Figure 4A). Adult fish lengths in the survey ranged from 4.0 to 12.0 inches. Adult abundance is highest for fish in the 5-to-8-inch range, but catch remains strong for fish up to 10.5 inches. We will hope to see strong recruitment next year, contributing further to the system's abundant adult population.



*Photo 5. Fish counting table with a high Yellow Perch catch. Photo credit: WI DNR.*

Yellow Perch continue to be one of the most targeted species in the Winnebago System. Anglers on the system have reported a lot of success this past open water season as well as the ice season of 2021-2022. The record year class of 2022 is great news for the system's highly harvested population and will provide good angling opportunities over the next few years. The previous record year-class of 2020 is finishing its third growing season and should produce some quality-sized fish in 2023. Seasoned staff and volunteers alike were impressed with the number of Yellow Perch in the 2022 survey (Photo 5). Altogether, the Yellow Perch population in Lake Winnebago is looking strong and looks to continue to produce numbers of harvestable size fish.

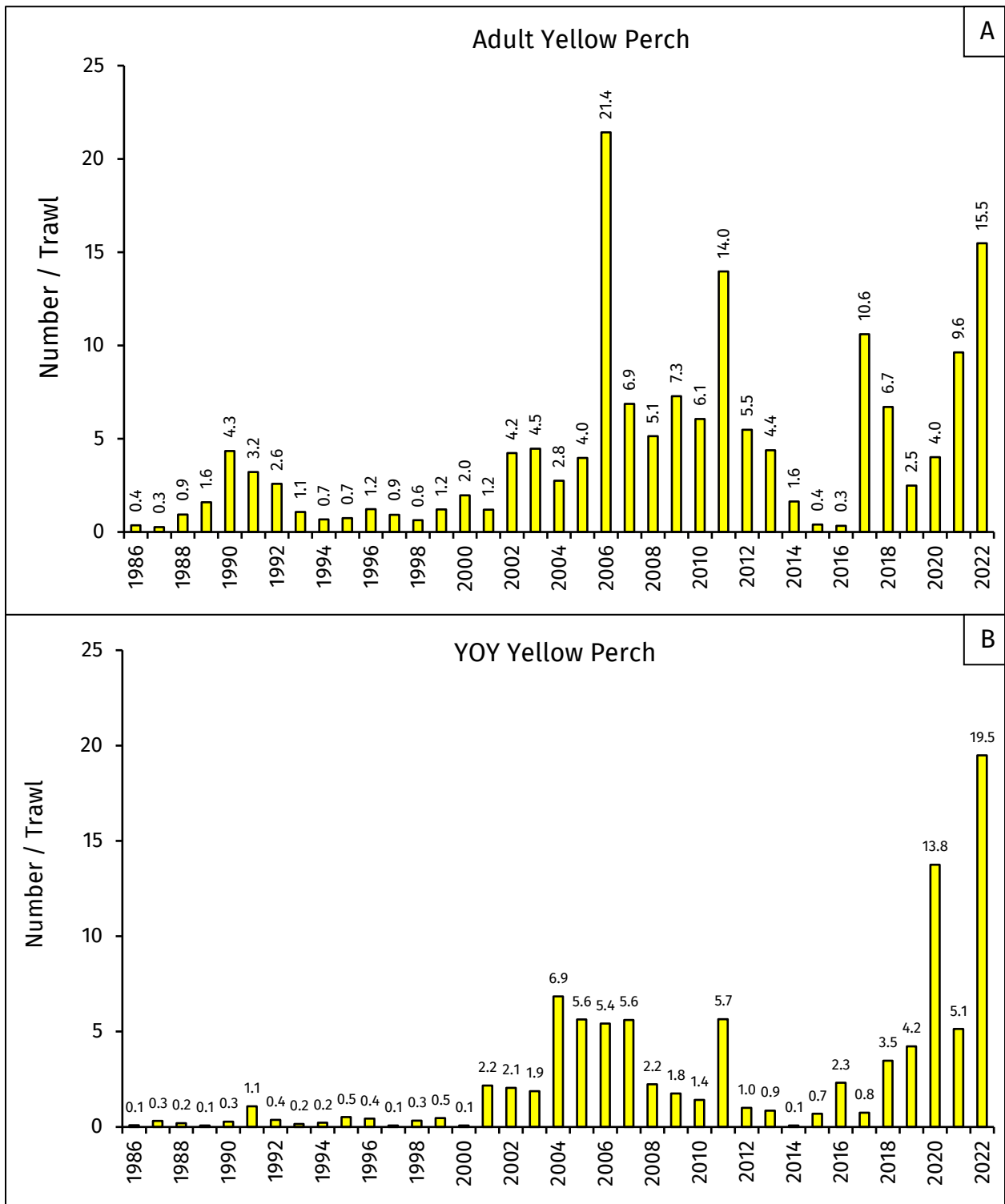


Figure 4 A and B. (A) Adult Yellow Perch and (B) YOY Yellow catch per effort in the trawl survey from 1986-2022.

## WHITE BASS

White Bass are considered a valued sportfish in the Winnebago System. Over the years, angler reports vary drastically for White Bass, with some experiencing very high catch rates while others have challenges finding fish. More recently, there have been more reports of challenges, and these reports reflect what we have been observing in the trawl survey. White Bass show at least some level of reproduction each year, but a substantial hatch has not occurred since 2011. While this is frustrating for some anglers, it is not abnormal for White Bass populations to behave like this. White Bass in the Winnebago system exhibit a cyclic population, often showing periods of lower “Bust” year classes with higher “Boom” year classes occurring intermittently. The 2022 survey had a YOY catch of 4.2/trawl, which is the same as in 2021 (Figure 5B). The most recent strong year classes were in 2016 and 2020, with catch rates of 18.0/trawl and 17.6/trawl, which are still below the long-term average of 28.6/trawl. The last true “Boom” year class occurred in 2011, with a catch rate of 102.4/trawl. The 2022 adult White Bass catch was 4.6/trawl which is slightly higher than in most recent years (Figure 5A). Although the trawl survey has indicated the Winnebago White Bass population has been relatively lower over the past ten years, it is likely only a matter of time until White Bass are able to pull off a “Boom” year class again, hopefully boosting the population.

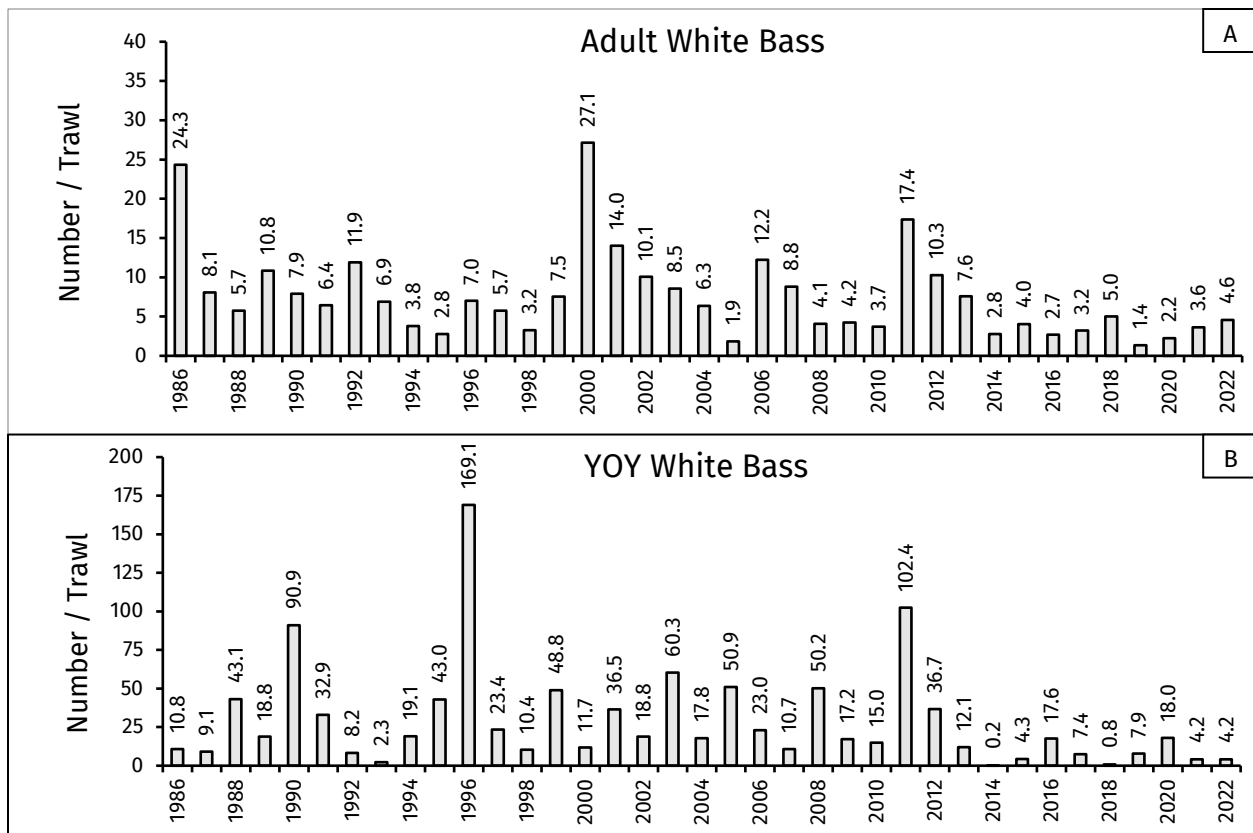


Figure 5 A and B. (A) Adult White Bass and (B) YOY White Bass catch per effort in the trawl survey from 1986-2022.

## CRAPPIE

Winnebago Crappie showed a measurable year class in 2022 with a catch of 3.0 YOY/trawl. This follows two high-ranking catch rates in 2020 and 2021 (Figure 6A). The length frequency of the 2022 survey shows two distinct size classes within the adult population (Figure 6B). While adult Crappie are not typically caught in high numbers in the trawl survey, likely due to their habitat preference, length frequency shows that both of the strong recent year classes are contributing to the adult population. The 2020-year class will be entering its fourth growing season in 2023 and will hopefully provide some angling opportunities.

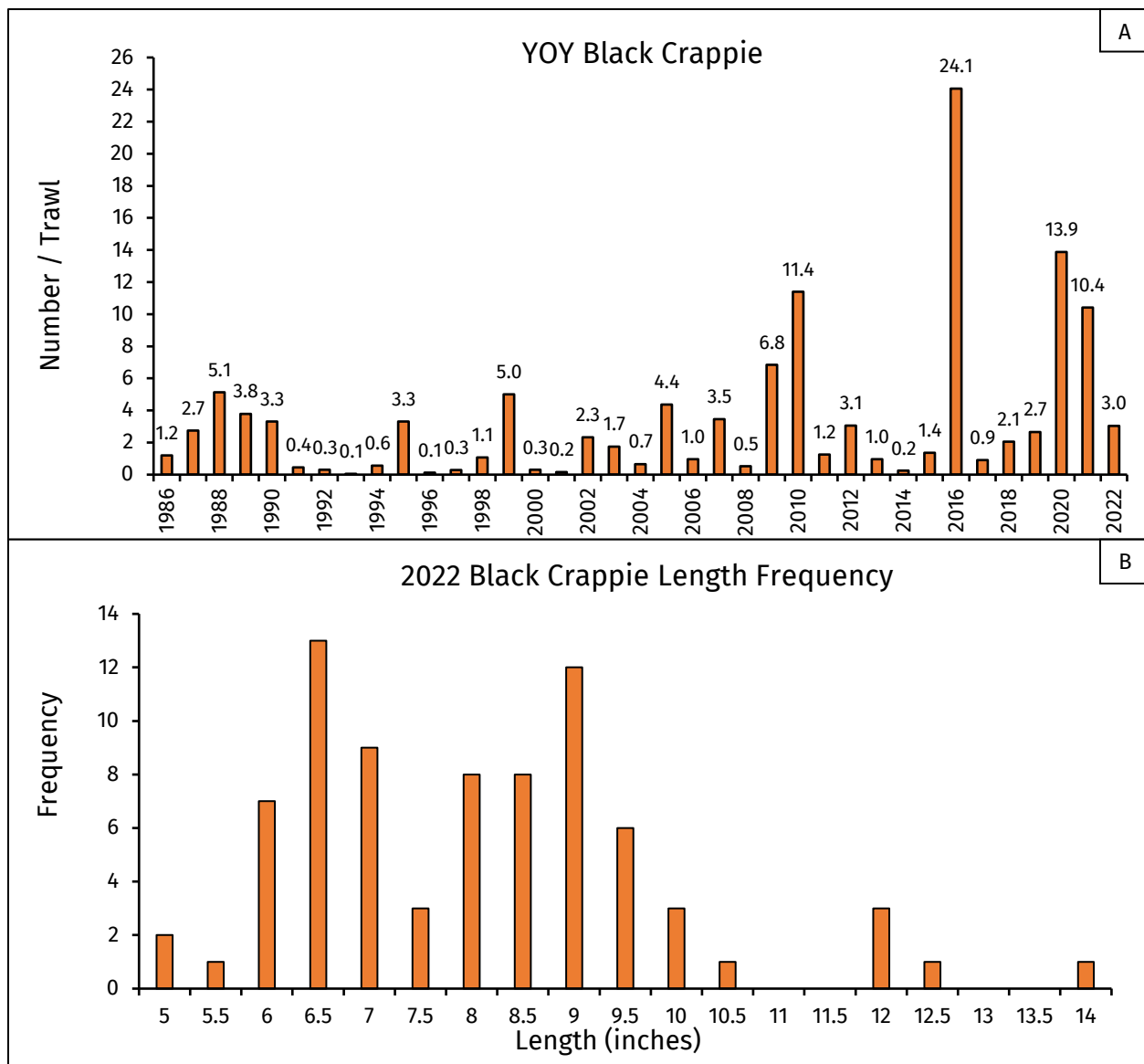


Figure 6 A and B. (A) YOY Crappie catch per effort in trawl survey from 1986-2022 and (B) length frequency of adult Crappie captured in 2022 trawl survey.

# Forage Species

## TROUT PERCH

YOY Trout Perch were caught in record numbers for the second consecutive year with a catch rate of 802.3/trawl (Figure 7). Trout Perch are a highly utilized forage fish on the system by gamefish such as walleye. During periods of low forage in the lake, anglers tend to have more success. This is good for anglers but can result in higher gamefish exploitation. The record year class of Trout Perch will benefit our recent large game and panfish year classes, providing forage and shielding from angler pressure.



Photo 6. Fish counting table with a high Trout Perch catch. Photo credit: Michael Cooney

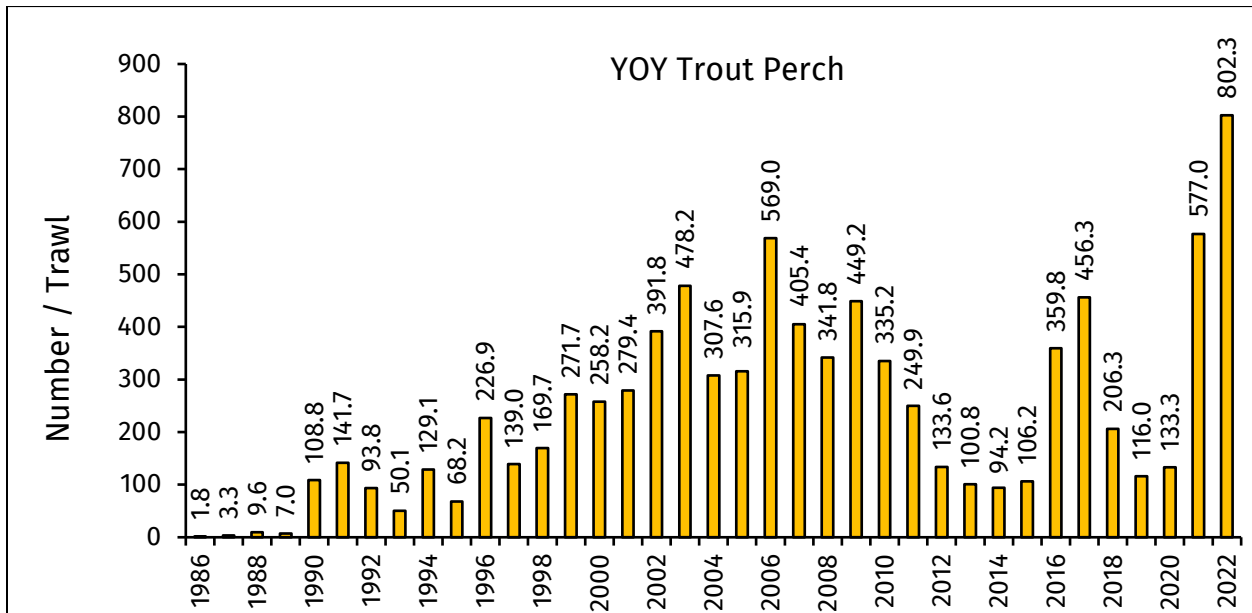


Figure 7. YOY Trout Perch catch per effort in the trawl survey from 1986-2022.

## EMERALD SHINERS

Emerald Shiners are typically caught in lower numbers in the trawl survey, with an average YOY catch of 1.3/trawl and an average adult catch of 0.5/trawl (Figure 8AB). While adult Emerald Shiners decreased in 2022, this year's results show a relatively strong year class (ranking third). It will be interesting to see how the strong year class contributes to the adult catch next year. In addition to Trout Perch, it was positive to see another forage species with an increased catch rate, as other staple forage fish in the system (YOY Gizzard Shad and Freshwater Drum) were relatively low.

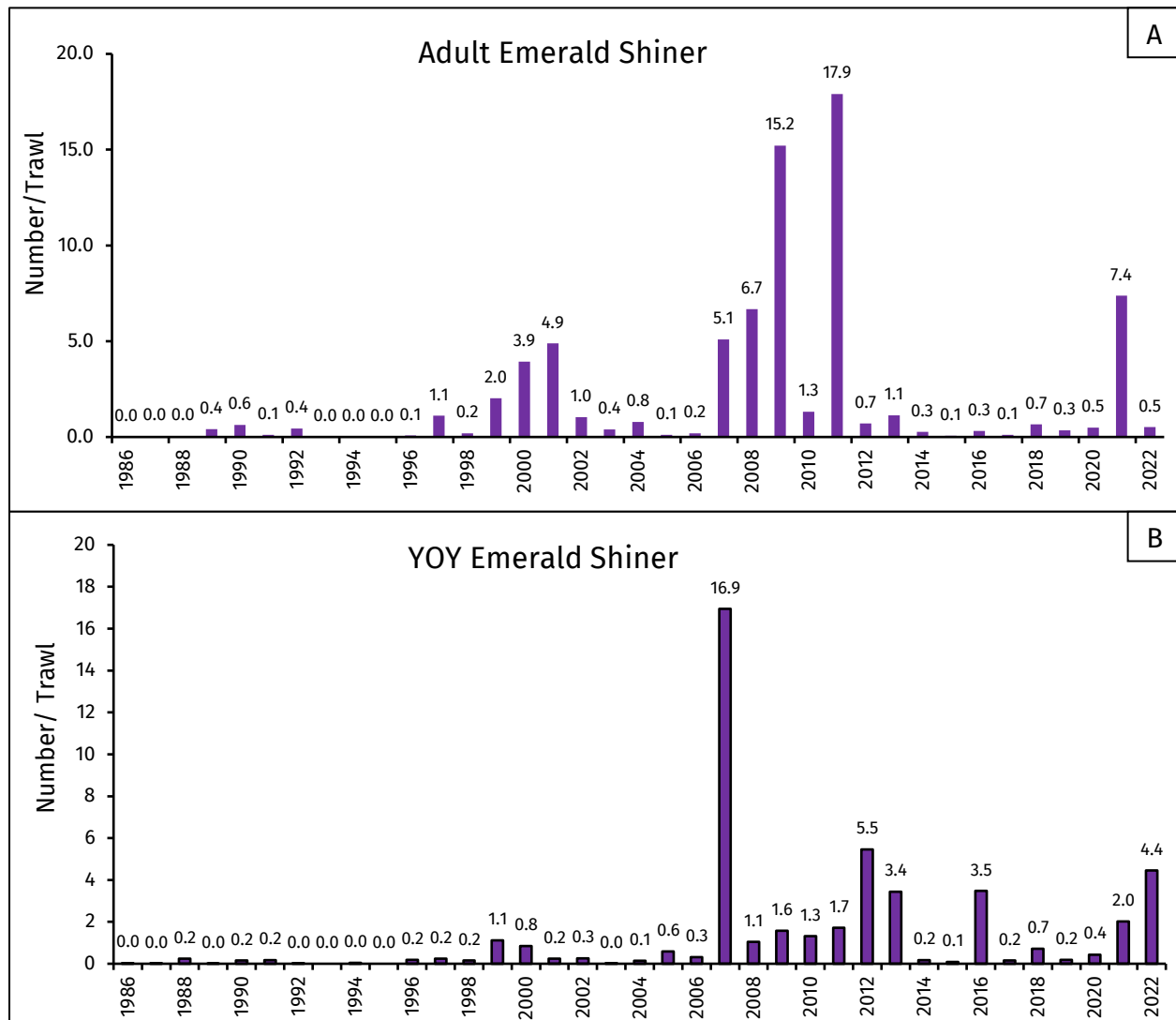


Figure 8 A and B. (A) Adult Emerald Shiner (B) YOY Emerald Shiner catch per effort in the trawl survey from 1986-2022.

## FRESHWATER DRUM

Freshwater Drum continues to dominate the adult fish catch, with a total of 40,938 individuals captured accounting for 89.3% of all adult fish in the survey. This equates to a catch rate of 296.7/trawl (Figure 9A). While drum strongly remain the most abundant adult fish in the survey, 2022 marks the fifth consecutive year of adult drum catch well below the long-time average of 467.4/trawl. Adult catch since 2018 has ranged from 230.1 to 396.8/trawl. The beginning of this recent decline began with a Viral Hemorrhagic Septicemia (VHS) kill in the spring of 2018. Since 2018, drum have had two substantial year classes with a YOY catch of 185.4/trawl in 2019, and a record YOY catch of 393.8/trawl in 2020 (Figure 9B). Adult drum numbers were expected to increase following these stronger year classes, though our survey has not reflected this. Regardless of the recent adult decline, drum remain very abundant in Lake Winnebago, and it is likely a matter of time before the adult catch returns to pre-2018 levels. YOY freshwater drum had a catch rate of 91.4/trawl in 2022, which is right around the average of 96.2/trawl.

Freshwater Drum in the Winnebago System are often viewed negatively as a rough fish competing for resources and angling opportunities with more highly valued gamefish species. This being said, Freshwater Drum are a native species that serve multiple ecological functions. YOY Freshwater Drum can provide abundant forage opportunities for our gamefish species. Freshwater Drum have also been shown to be a major diet



*Photo 7. DNR fisheries staff and team of volunteers counting fish from a high Freshwater Drum net pull. Photo credit: Michael Cooney.*

component of avian predators, which may lessen predation on more valued species such as perch and Walleye (<https://doi.org/10.1111/fme.12466>). In addition to their ecological value, drum also provide plentiful angling opportunities with multiple rough fish tournaments that occur on the system annually, including a tournament for kids. Drum provide a good angling opportunity for beginner and kid anglers, as they are plentiful in the system, can be caught on a variety of baits/gears and put up

a good fight. Surprisingly to some, drum also make for good table fair, especially when prepared correctly. Some of the most important factors for preparation include cutting out any red or darker colored portions of flesh and getting the fish on ice quickly. Drum are often by-catch for anglers targeting species such as Walleye or perch, and I encourage anglers to try their drum catch alongside their usual favorites to see how they compare.

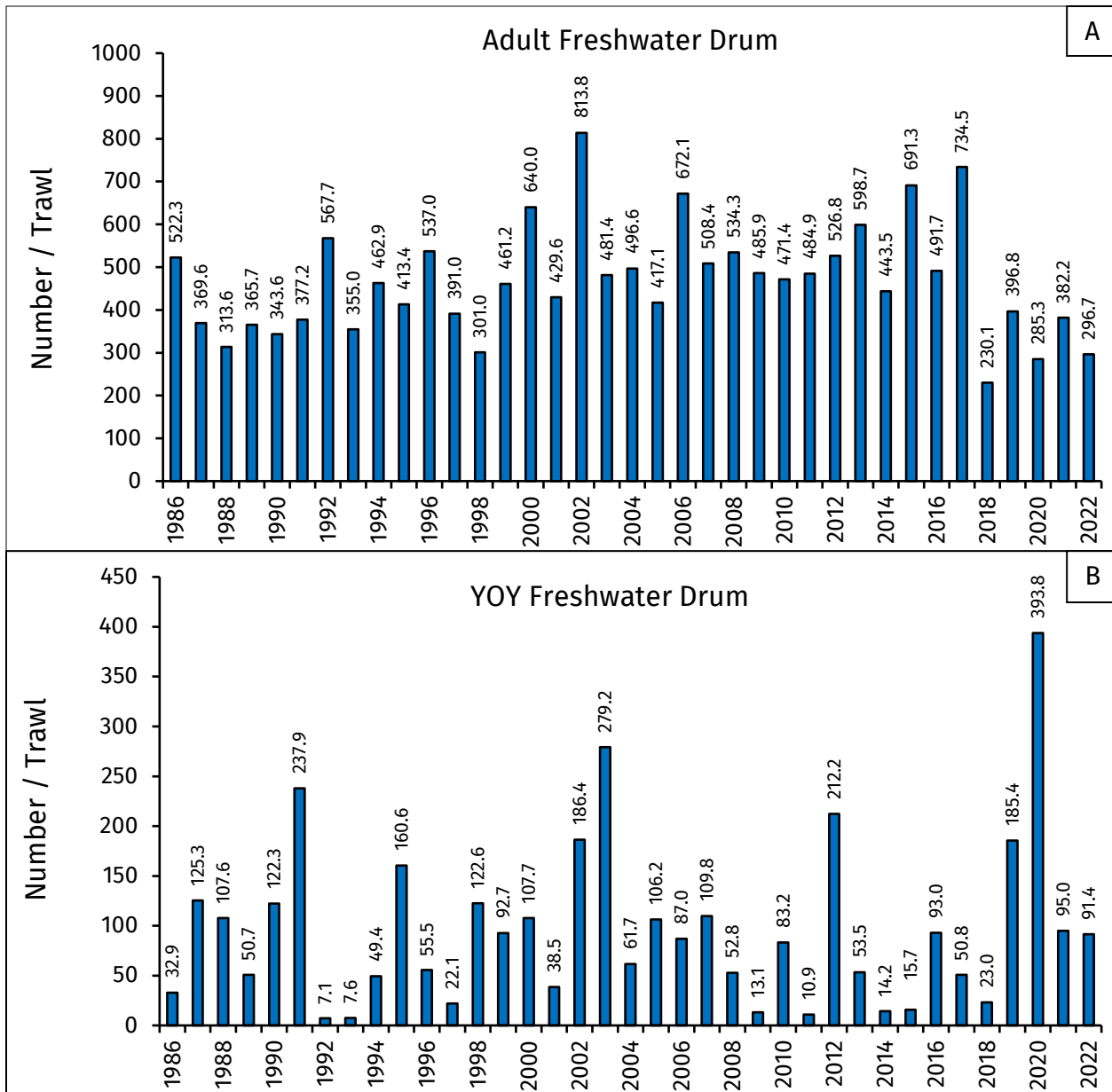


Figure 9 A and B. (A) Adult Freshwater Drum and (B) YOY Freshwater Drum catch per effort in the trawl survey from 1986-2022.



## GIZZARD SHAD

Gizzard Shad are one of the most inquired about species in the trawl survey. There is good reason for this as the Gizzard Shad population in Lake Winnebago follows a “boom” or “bust” recruitment cycle, and the year class strength of this forage fish has many implications on the rest of the fishery. For example, when there is a “boom” year class, Gizzard Shad are found in very high densities, and this can result in an abundance of natural forage for gamefish, which can lead to less angler success. Alternatively, when there is a “bust” year class and other forage in the system are relatively low, such as Trout Perch and Freshwater Drum, anglers tend to have higher success. This can lead to increases in gamefish exploitation, specifically our Walleye harvest estimates the year following a Gizzard Shad “boom” year (Figure 11). Sturgeon spearers are also interested in the Gizzard Shad catch as Lake Winnebago is in the northern portion of Gizzard Shad’s native range, and there is often significant winter die off, which sturgeon feed on heavily and can result in heavier fish coming in on the spear.

Gizzard Shad catch in the 2022 survey indicate a “bust” year class for the sixth consecutive year. YOY Gizzard Shad catch did increase (3.1/trawl) (Figure 10) relative to the other recent “bust” years. This increase in catch was almost solely comprised of Gizzard Shad captured in the October trawl, the latest sampling event of the survey. There were also higher than average numbers of Gizzard Shad seen in a fall electrofishing survey, and early season ice fishermen have reported seeing some on cameras. The 2022 trawl survey indicates another “bust” year for Winnebago Gizzard Shad, though they do seem to be in higher abundance than in most recent years.

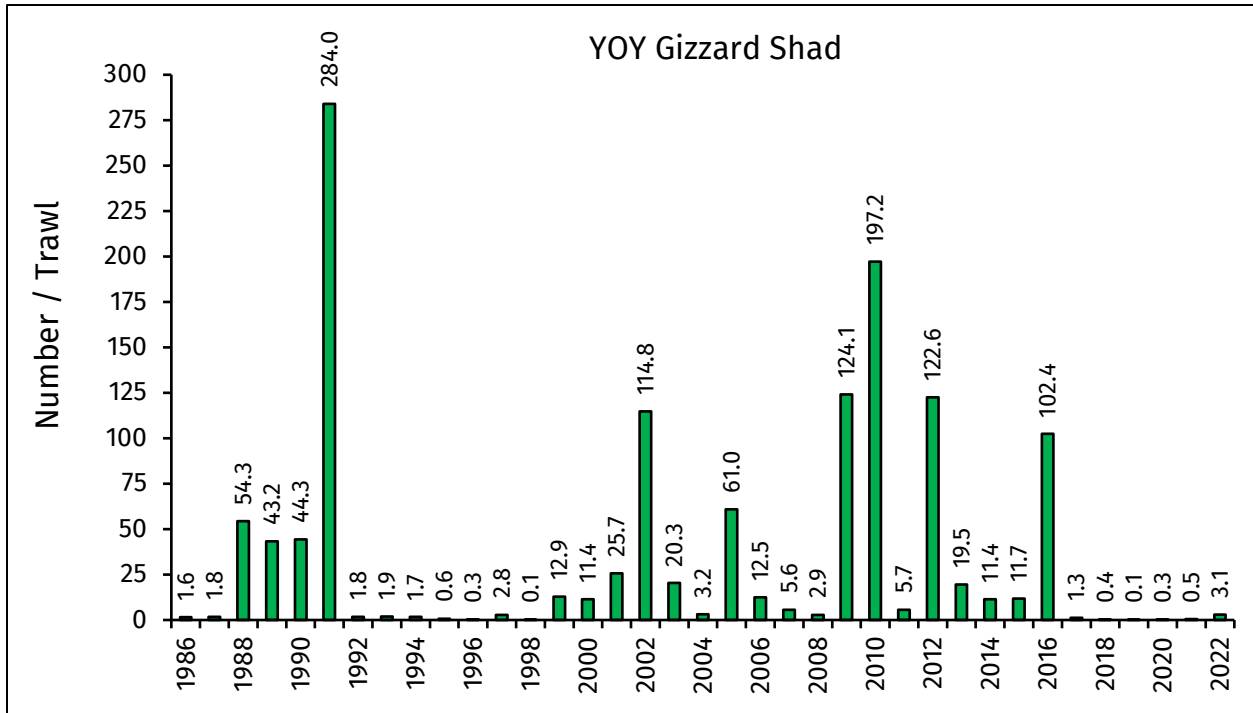


Figure 10. YOY Gizzard Shad catch per effort in the trawl survey from 1986-2022.

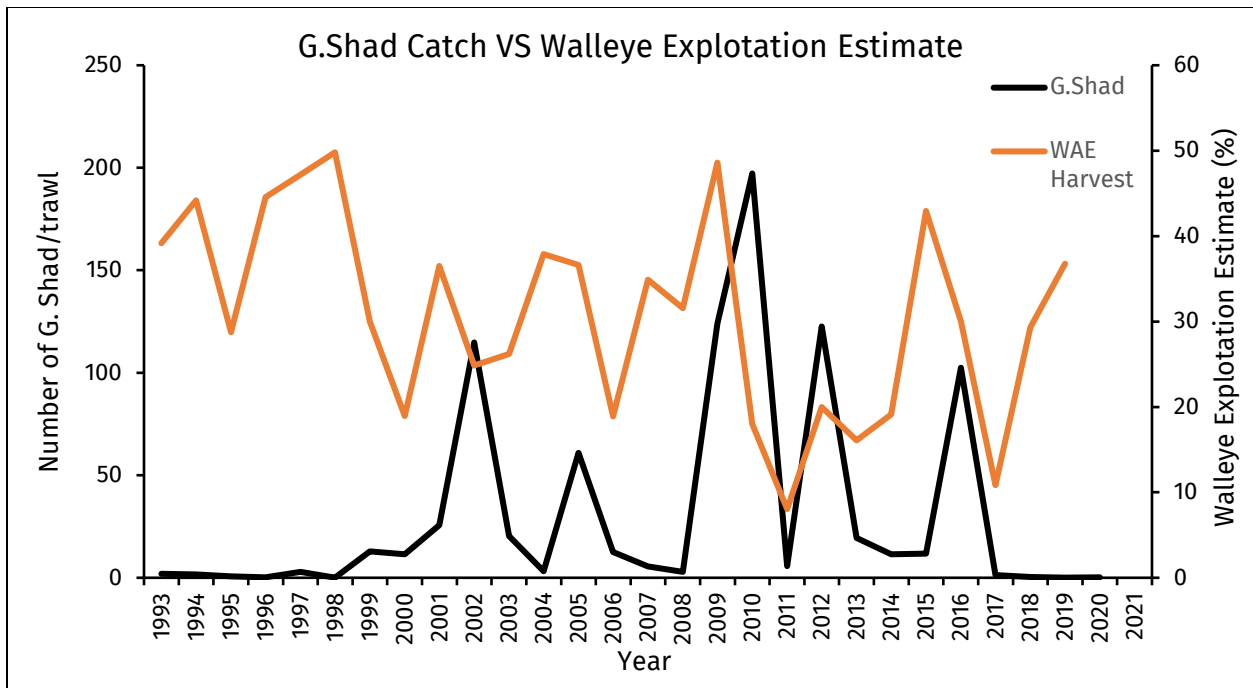


Figure 11. Gizzard Shad catch per effort in the Winnebago trawl survey from 1993-2020 (left axis) and Walleye exploitation estimates (right axis) from 1993-2020

## Other Species

### BLUEGILL

Similar to crappie, Bluegill are not well recruited by the trawl survey due to habitat preference. This being said, the 2020 trawl survey showed a YOY Bluegill catch rate of 1.3/trawl. The 2020 catch was over three times the previous record YOY catch (0.4/trawl). The record year class of 2020 has been well reflected in the following two trawl surveys, with adult catch rates of 1.3/trawl and 1.6/trawl in 2021 and 2022 (ranking 3<sup>rd</sup> and 4<sup>th</sup>). There were a good number of fish over 7 inches in the survey, with a max length of 8.3. Again, similar to crappie, the 2020-year class will be entering its fourth growing season in 2023, hopefully providing some angling opportunities for nice-sized fish.

### LAKE STURGEON

Lake Sturgeon consistently show up in the trawl survey between 0.1 and 0.3/trawl. The trend continued in 2022 and indicates the population is at its normal healthy level. There were six juvenile Sturgeon captured in 2022, ranging from 11 to 32.3 inches in length. Juvenile sturgeon are rarely captured in fisheries surveys making for a memorable catch for DNR staff and volunteers alike. The largest sturgeon captured in 2022 was 69.0 inches.



*Photo 8. Trawl volunteer and WFT representative Mike Arrowood with a juvenile sturgeon captured in the 2022 trawl survey. Photo credit: Michael Cooney.*

## Summary

This year's trawl survey had some exciting results, including a near-record Walleye hatch and adult Yellow Perch catch, as well as record-setting YOY Yellow Perch and Trout Perch catches. These results indicate the potential for great angler opportunities in the years to come for these two highly targeted species on the system. Additionally, the record catch of YOY Trout Perch should provide excellent forage for the strong gamefish classes of 2022. Time will tell how the Walleye and Yellow Perch classes of 2022 recruit into the adult population, though our high catch rates and abundant forage indicate a prosperous outlook.



*Photo 9. DNR fisheries staff and team of volunteers counting fish during the 2022 trawl survey. Photo credit: Michael Cooney.*

I would like to extend a final thank you to all of our amazing volunteers. We had a great team of volunteers this year, including many seasoned vets and new faces, with some individuals donating over 30 hours of their time. Utilizing volunteers out on the trawl allows for valuable knowledge sharing between DNR staff and those around the system who care about the resource. The trawl survey would be a much larger workload for the DNR staff without our volunteers, and their donated time is much appreciated.

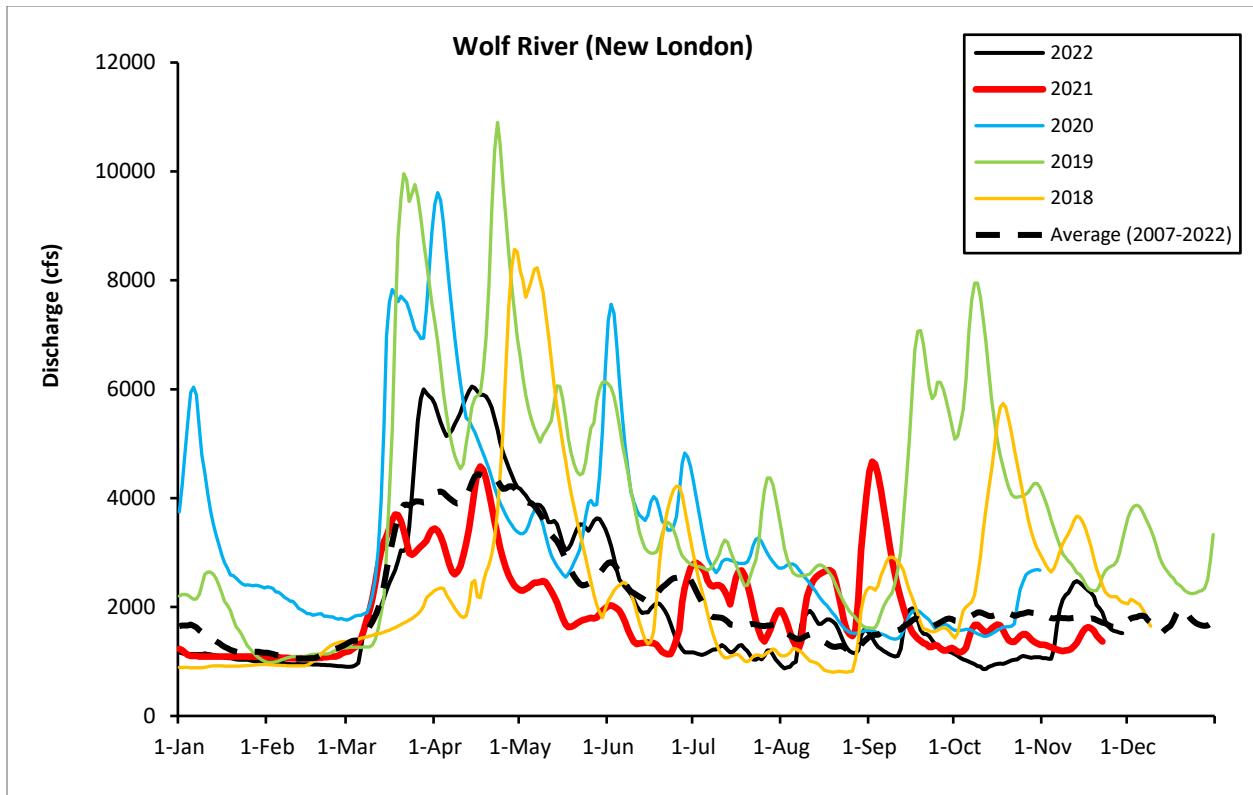
I hope you enjoyed reading the 2022 Winnebago Trawling Report. If you are interested in becoming a trawl volunteer, please contact myself at the number or email below or fisheries technician Jason Kohls at (920) 420-9943 or [Jason.Kohls@wisconsin.gov](mailto:Jason.Kohls@wisconsin.gov) for more information. Best of luck to all Winnebago System anglers in 2023!

Sincerely,

*Angelo Cozzola*

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Wisconsin Department of Natural Resources  
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Appendix 1. Wolf River hydrograph for 2018-2022 and average discharge (dashed line) from 2007-2022.



Appendix 2. List of trawling records (#/trawl) for the YOY fish species with the top ten catch rates in the Lake Winnebago trawl survey.

Year	DRUM	W. BASS	WALLEYE	SAUGER	Y. PERCH	B. CRAPPIE	WC	T. PERCH	EM. SHINER	G. SHAD
1986	32.9	10.8	0.1	0.0	0.1	1.2	0.1	1.8	0.0	1.6
1987	125.3	9.1	0.0	0.0	0.3	2.7	0.1	3.3	0.0	1.8
1988	107.6	43.1	0.1	0.1	0.2	5.1	0.0	9.6	0.2	54.3
1989	50.7	18.8	0.1	0.0	0.1	3.8	0.2	7.0	0.0	43.2
1990	122.3	90.9	2.9	0.4	0.3	3.3	0.1	108.8	0.2	44.3
1991	237.9	32.9	7.3	0.0	1.1	0.4	0.2	141.7	0.2	284.0
1992	7.1	8.2	0.8	0.0	0.4	0.3	0.2	93.8	0.0	1.8
1993	7.6	2.3	2.5	0.0	0.2	0.1	0.0	50.1	0.0	1.9
1994	49.4	19.1	0.1	0.0	0.2	0.6	0.0	129.1	0.0	1.7
1995	160.6	43.0	0.2	0.1	0.5	3.3	0.0	68.2	0.0	0.6
1996	55.5	169.1	23.7	0.0	0.4	0.1	0.0	226.9	0.2	0.3
1997	22.1	23.4	2.2	0.0	0.1	0.3	0.0	139.0	0.2	2.8
1998	122.6	10.4	2.5	0.0	0.3	1.1	0.0	169.7	0.2	0.1
1999	92.7	48.8	0.2	0.0	0.5	5.0	0.0	271.7	1.1	12.9
2000	107.7	11.7	0.3	0.0	0.1	0.3	0.0	258.2	0.8	11.4
2001	38.5	36.5	11.8	0.0	2.2	0.2	0.0	279.4	0.2	25.7
2002	186.4	18.8	1.9	0.1	2.1	2.3	0.0	391.8	0.3	114.8
2003	279.2	60.3	6.5	0.3	1.9	1.7	0.0	478.2	0.0	20.3
2004	61.7	17.8	8.8	0.4	6.9	0.7	0.0	307.6	0.1	3.2
2005	106.2	50.9	11.1	0.1	5.6	4.4	0.0	315.9	0.6	61.0
2006	87.0	23.0	2.4	0.1	5.4	1.0	0.0	569.0	0.3	12.5
2007	109.8	10.7	0.5	0.9	5.6	3.5	0.0	405.4	16.9	5.6
2008	52.8	50.2	17.5	0.4	2.2	0.5	0.0	341.8	1.1	2.9
2009	13.1	17.2	1.4	0.3	1.8	6.8	0.0	449.2	1.6	124.1
2010	83.2	15.0	0.9	0.2	1.4	11.4	0.0	335.2	1.3	197.2
2011	10.9	102.4	10.4	0.0	5.7	1.2	0.0	249.9	1.7	5.7
2012	212.2	36.7	0.2	0.0	1.0	3.1	0.0	133.6	5.5	122.6
2013	53.5	12.1	11.9	0.0	0.9	1.0	0.0	100.8	3.4	19.5
2014	14.2	0.2	0.4	0.0	0.1	0.2	0.0	94.2	0.2	11.4
2015	15.7	4.3	1.4	0.1	0.7	1.4	0.0	106.2	0.1	11.7
2016	93.0	17.6	9.9	0.0	2.3	24.1	0.0	359.8	3.5	102.4
2017	50.8	7.4	4.1	0.0	0.8	0.9	0.0	456.3	0.2	1.3
2018	23.0	0.8	5.1	0.0	3.5	2.1	0.0	206.3	0.7	0.4
2019	185.4	7.9	5.9	0.0	4.2	2.7	0.0	116.0	0.2	0.1
2020	393.8	18.0	3.6	0.0	13.8	13.9	0.1	133.3	0.4	0.3
2021	95.0	4.2	8.2	0.3	5.1	10.4	0.0	577.0	2.0	0.5
2022	91.4	4.2	17.4	0.0	19.5	3.0	0.0	802.3	4.4	3.1
Average	96.2	28.6	5.0	0.1	2.6	3.4	0.0	240.2	1.3	35.4

Appendix 3. List of trawling records (#/trawl) for adult fish species with the top ten catch rates in the Lake Winnebago trawl survey.

Year	DRUM	W. BASS	WALLEYE	SAUGER	Y. PERCH	B. CRAPPIE	WC	T. PERCH	EM. SHINER	SU	CA	L. STURGEON	C. CATFISH
1986	522.3	24.3	1.4	4.3	0.4	0.6	0.0	0.1	0.0	1.6	1.1	0.1	0.3
1987	369.6	8.1	0.8	1.7	0.3	0.1	0.0	0.2	0.0	1.5	0.8	0.2	0.1
1988	313.6	5.7	0.3	0.9	0.9	0.1	0.0	1.0	0.0	1.2	0.9	0.1	0.3
1989	365.7	10.8	0.3	0.8	1.6	1.5	0.0	3.1	0.4	1.2	1.3	0.1	0.4
1990	343.6	7.9	0.2	0.8	4.3	1.0	0.1	4.0	0.6	1.4	0.8	0.1	0.3
1991	377.2	6.4	0.6	0.7	3.2	0.2	0.0	47.7	0.1	1.1	0.7	0.1	0.5
1992	567.7	11.9	4.6	0.6	2.6	0.5	0.0	20.7	0.4	1.8	1.2	0.1	0.6
1993	355.0	6.9	4.7	0.4	1.1	0.1	0.0	5.5	0.0	2.2	1.6	0.1	0.4
1994	462.9	3.8	6.3	0.5	0.7	0.0	0.0	13.8	0.0	1.6	2.3	0.1	0.5
1995	413.4	2.8	3.8	0.3	0.7	0.0	0.0	8.0	0.0	1.2	1.4	0.1	0.4
1996	537.0	7.0	3.3	0.6	1.2	0.1	0.0	18.5	0.1	2.0	0.8	0.2	0.3
1997	391.0	5.7	6.4	0.4	0.9	0.0	0.0	0.6	1.1	1.7	0.9	0.1	0.6
1998	301.0	3.2	4.5	0.4	0.6	0.0	0.0	0.5	0.2	2.0	1.5	0.1	0.6
1999	461.2	7.5	4.7	0.5	1.2	0.1	0.0	3.7	2.0	2.0	1.9	0.1	0.6
2000	640.0	27.1	2.8	0.5	2.0	0.4	0.0	2.1	3.9	2.2	1.9	0.1	0.9
2001	429.6	14.0	1.0	0.2	1.2	0.3	0.0	7.9	4.9	1.6	1.1	0.1	0.7
2002	813.8	10.1	14.4	0.5	4.2	0.4	0.0	4.8	1.0	2.9	1.0	0.2	0.9
2003	481.4	8.5	11.7	0.4	4.5	0.5	0.0	6.3	0.4	2.1	1.4	0.2	1.4
2004	496.6	6.3	8.2	0.8	2.8	0.7	0.0	1.7	0.8	1.2	1.8	0.1	0.8
2005	417.1	1.9	5.4	1.1	4.0	0.3	0.0	1.4	0.1	1.8	1.4	0.1	0.6
2006	672.1	12.2	7.5	1.2	21.4	2.9	0.0	3.2	0.2	1.4	2.3	0.1	0.8
2007	508.4	8.8	6.0	1.3	6.9	1.1	0.0	0.3	5.1	2.7	2.4	0.2	0.7
2008	534.3	4.1	3.4	2.1	5.1	0.8	0.0	0.3	6.7	2.0	3.4	0.1	0.8
2009	485.9	4.2	10.8	2.6	7.3	0.9	0.0	1.9	15.2	2.3	2.2	0.2	0.9
2010	471.4	3.7	3.4	2.5	6.1	0.6	0.0	0.1	1.3	2.0	2.7	0.1	0.8
2011	484.9	17.4	3.9	2.4	14.0	21.8	0.0	8.9	17.9	5.1	3.6	0.2	1.3
2012	526.8	10.3	4.7	1.5	5.5	5.1	0.0	0.2	0.7	5.4	1.9	0.2	2.2
2013	598.7	7.6	3.4	1.4	4.4	3.2	0.0	8.7	1.1	4.0	2.0	0.2	3.3
2014	443.5	2.8	6.6	0.8	1.6	0.5	0.0	0.5	0.3	4.6	1.6	0.1	1.7
2015	691.3	4.0	6.8	0.7	0.4	0.6	0.0	8.7	0.1	4.4	1.8	0.2	1.5
2016	491.7	2.7	4.6	0.8	0.3	0.4	0.0	4.8	0.3	3.6	0.8	0.2	1.7
2017	734.5	3.2	9.0	0.6	10.6	7.8	0.0	0.8	0.1	3.0	1.3	0.2	1.5
2018	230.1	5.0	10.3	0.5	6.7	1.8	0.0	0.5	0.7	3.2	1.6	0.2	1.4
2019	396.8	1.4	8.0	0.3	2.5	0.4	0.0	0.3	0.3	4.4	2.3	0.2	1.7
2020	285.3	2.2	5.9	0.3	4.0	0.2	0.0	1.3	0.5	2.9	2.1	0.3	1.4
2021	382.2	3.6	5.4	0.3	9.6	0.9	0.1	0.5	7.4	2.7	1.8	0.2	1.9
2022	296.7	4.6	6.4	0.6	15.5	0.6	0.0	0.2	0.5	1.9	1.4	0.2	1.3
Average	467.4	7.5	5.2	1.0	4.3	1.5	0.0	5.2	2.0	2.4	1.6	0.1	1.0