WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Lake Michigan Management Reports

Written By:
Lake Michigan Fisheries Team and DNR Staff

The Research Vessel Coregonus is an important platform for the DNR sampling program. Photo credit: Tammie Paoli.

WISCONSIN
DEPT. OF NATURAL RESOURCES

Lake Michigan Committee
2025 LMTC Summer Meeting
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Introduction

These reports summarize some of the major studies and stock assessment activities by the Wisconsin Department of Natural Resources (DNR) on Lake Michigan and Green Bay in 2024. They provide specific information about the major sport and commercial fisheries and describe trends in some of the major fish populations.

The management of Lake Michigan fisheries is conducted in partnership with other state, federal and tribal agencies and in consultation with sport and commercial fishers. Major issues of shared concern are resolved through the Lake Michigan Committee, which is made up of representatives of Michigan, Indiana, Illinois, Wisconsin and the Chippewa Ottawa Resource Authority. These reports are presented to the Lake Michigan Committee as part of Wisconsin's contribution to that shared management effort.

This compilation is not intended as a comprehensive overview of available information about Lake Michigan fisheries. For additional information, we recommend you visit the DNR's Lake Michigan webpage at dnr.wi.gov/topic/fishing/lakemichigan.

For further information regarding any individual report, contact the author at the address, phone number or email address shown at the end of each report section.

2024 Green Bay Bottom Trawling Assessment Report

The RV Coregonus docked at Sturgeon Bay DNR on the last day of the trawling survey, with Wisconsin DNR Fisheries staff. Photo Credit: Jacob Steckmesser / WDNR

Introduction

Annual late summer trawling surveys on Green Bay have been conducted since the late 1970s by Wisconsin DNR. This is one of the longest running surveys on Lake Michigan. The original objective of the survey was to assess yellow perch year class strength at a time when commercial quotas were first being developed. Nearly 50 years later, yellow perch are still a primary focus of the survey. Data collected provides inputs to a catch-at-age model that is run annually to inform safe harvest limits to the commercial yellow perch fishery in Green Bay. Additionally, the survey provides historical trends and relative abundance for lake whitefish, another important commercial species, as well as gamefish and forage fish species.

Methods

In 2024, trawling was conducted at 75 index sites at 12 locations (Figure 1) using a 25-foot semi-balloon trawl with 1½-inch stretch mesh on the body, 1¼-inch stretch mesh on the cod end and a cod-end liner with ½-inch stretch mesh. The net was towed for five minutes at a speed of 2.8 knots for a distance of approximately 0.25 miles and sample area of 1 acre. Water depths at the trawl sites ranges from 7 to 75 feet. A 3:1 ratio of warp to water depth is used, rounded to the nearest 50-foot mark. At shallow sites, a minimum of 50 feet of warp is used in order for the net to be far enough behind the boat. Hauls were made during daylight hours on the *RV Coregonus*. Data from 2000 and later are used for this report.

Photo 1. Trawl net being deployed from the reel. Photo credit: T. Paoli.

At each of the 12 locations, 100 young of year (YOY) yellow perch were measured if captured, and yearling and older perch were subsampled for age, length and weight. A length cutoff of 100 mm for YOY yellow perch is used, and scales from the upper size range of YOY yellow perch are collected to confirm cutoff ranges of YOY and yearlings. For yearling and older yellow perch, aging structures (scales <150 mm; anal fin ray >150 mm) are collected from a subsample of five fish per 10 mm length bin. Once a length bin is filled, lengths are taken from up to 250 yearling and older yellow perch per location. White perch age and size structure data is collected at one location in southern Green Bay (Point Sable) following the same protocol for subsampling by length bin as yellow perch.

All species are counted. Young of year, juvenile, and adult lake whitefish are differentiated, and additional biological data is collected from lake whitefish per protocol from fisheries biologist Scott Hansen. For rainbow smelt, alewife, white perch, white bass, common carp, and walleye, YOY are differentiated from mature fish.

At each of the 12 locations, a temperature and dissolved oxygen profile using a YSI meter is taken along with a Secchi disk reading.

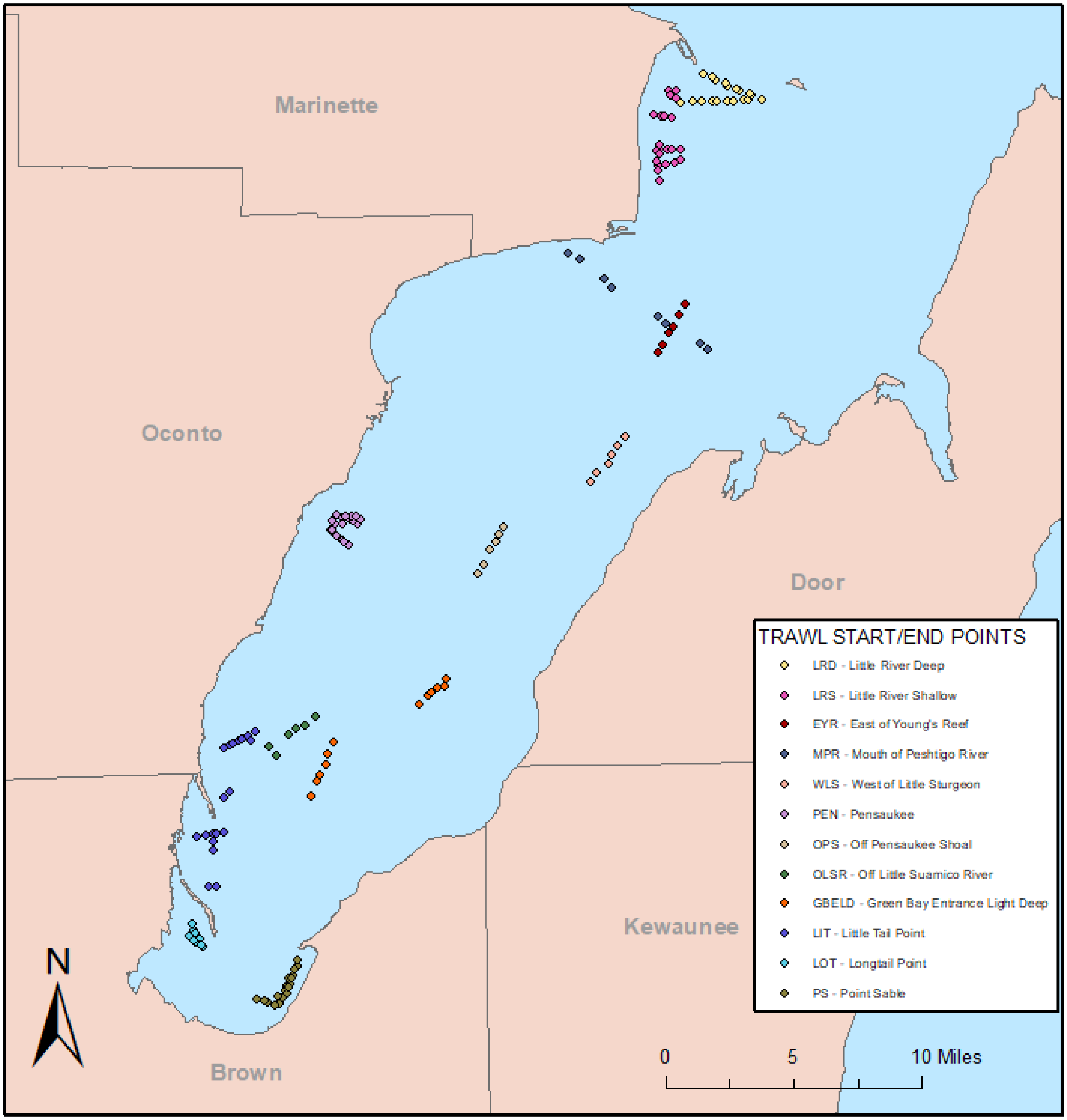

Figure 1. Map of start and end points of trawling survey, color-coded for each of the 12 locations.

Results

We captured a total of 3,474 fish in the 2024 survey, representing 19 different species. The survey was completed over 8 days between August 7 and 21, 2024.

Photo 2. DNR fisheries staff Devin Bort, Brandon Bastar, and Ron Rhode counting the catch from a trawl drag. Photo credit: T. Paoli.

YELLOW PERCH

The YOY yellow perch catch was 0.3/trawl (Figure 2), and the second lowest on record which is well below the long-term average of 101.9/trawl. Mean length of YOY yellow perch was 69 mm (2.8 inch; range 58-84 mm). Yearling and older yellow perch catch was also low, at 0.1/trawl (Figure 3) compared to the long-term average 9.2/trawl. All six of the age-1 and older fish captured were yearlings (2023 year class) with a mean length of 5.4 inches (range: 5.1-5.6 inches). See 2024 Green Bay Yellow Perch report (p. 17) for additional information, including sport and commercial harvest metrics.

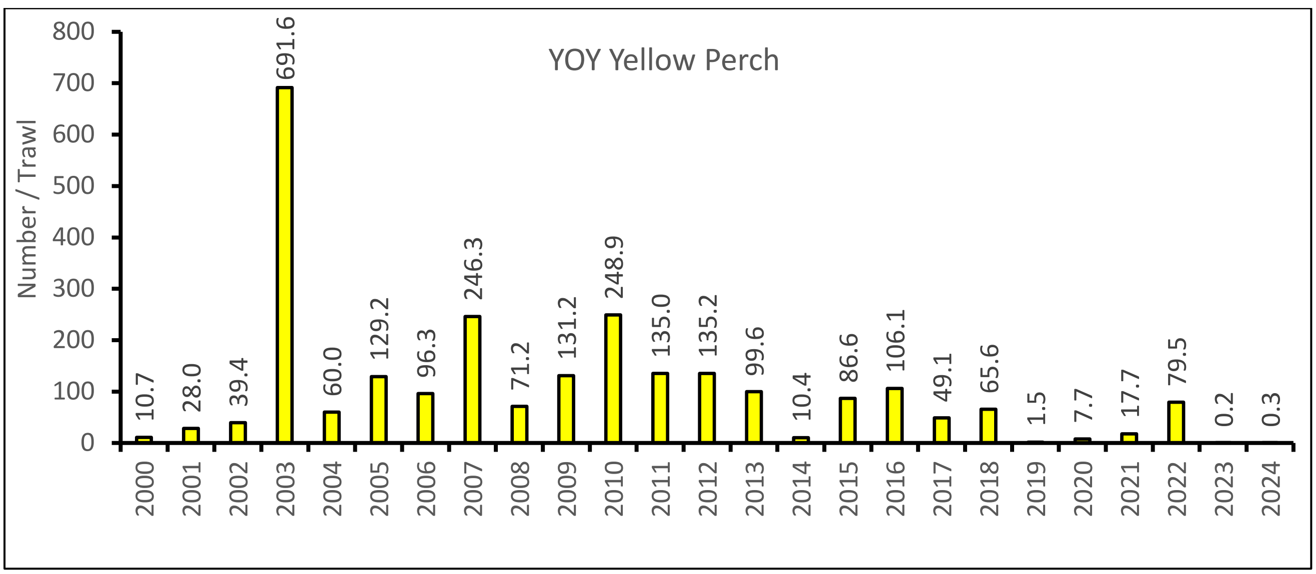

Figure 2. Average number of yellow perch YOY captured per trawl in the Green Bay trawling survey from 2000-2024.

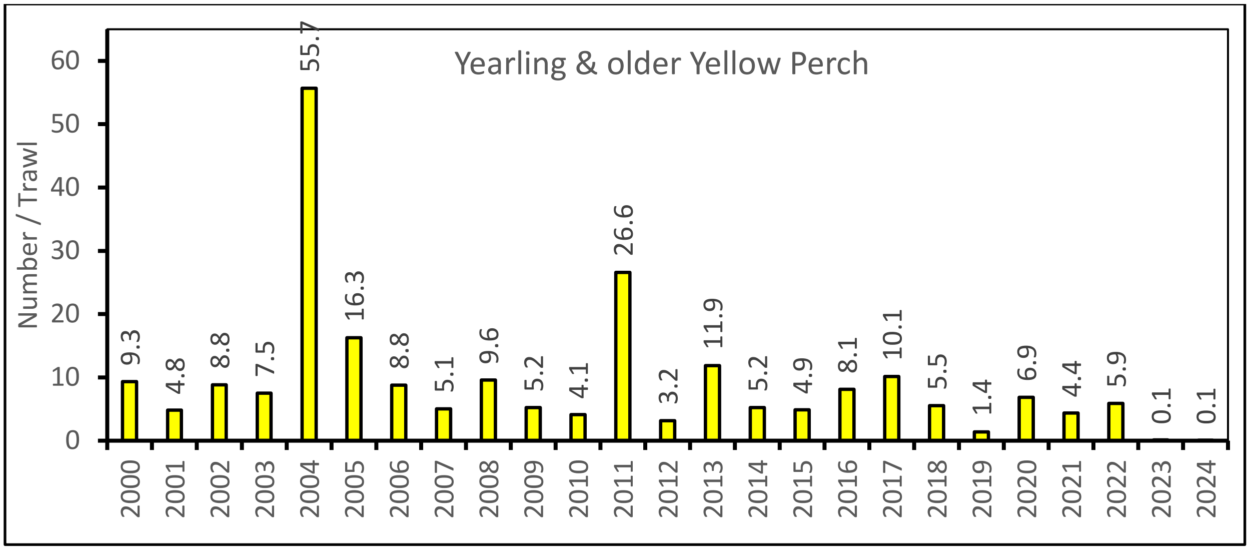

Figure 3. Average number of yellow perch adult (yearling and older) captured per trawl in the Green Bay trawling survey from 2000-2024.

WALLEYE

One YOY walleye was captured in the 2024 trawl survey. It should be noted that YOY walleye would not be expected to be caught in the deep-water sites which comprise about half of the survey. However, in years such as 2013 and 2018 when strong walleye year classes were later confirmed through other surveys, the trawling surveys also detected these strong year classes in shallow trawl sites (Figure 4).

See 2024 Green Bay walleye report (p. 35) for additional information on walleye and results from other surveys that target walleye including the creel survey to estimate sport catch and harvest.

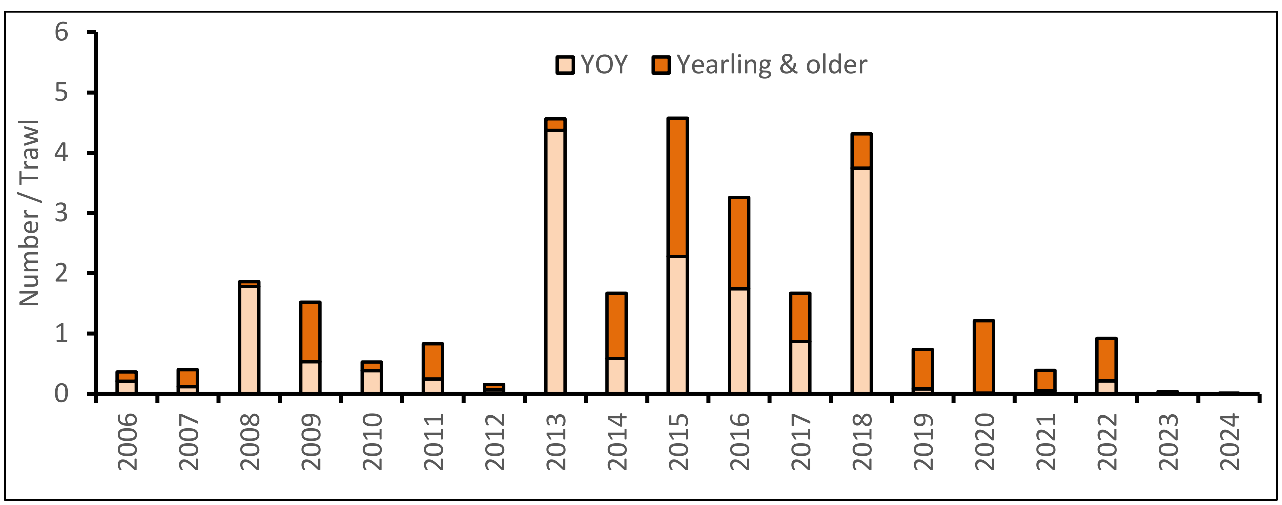

Figure 4. Average number of walleye YOY and adult (yearling and older) captured per trawl hour from 2006-2024 in trawl sites. Prior to 2006, adult and YOY walleye were combined in the counts. Therefore, only data from 2006 and later is included above.

LAKE WHITEFISH

Lake whitefish YOY catches in 2024 were 0.3/trawl, which is the lowest since YOY were separated out in the counts beginning in 2006 (Figure 5). Yearling and older lake whitefish catch was 1.7/trawl.

See 2024 Lake Michigan and Green Bay lake whitefish report by Scott Hansen for additional information on the status of the commercial and sport fishery and results from other surveys that target lake whitefish.

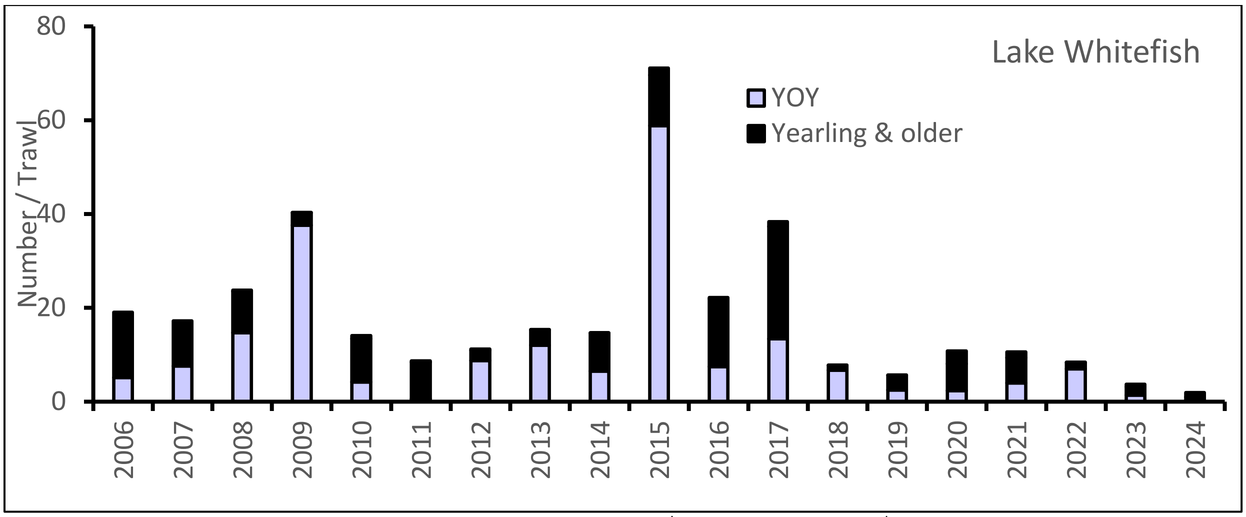

Figure 5. Average number of lake whitefish YOY and adult (yearling and older) captured per trawl hour from 2006-2024 in trawl sites. Prior to 2006, YOY and adult lake whitefish were combined in the counts. Therefore, only data from 2006 and later is included above.

NATIVE FORAGE SPECIES

Freshwater drum, or sheepshead, are a native species to Lake Michigan. The 2024 catch was 0.2/trawl and the lowest in the time series (Figure 6). Angler concerns over high incidental catches of freshwater drum while targeting other species prompted a further look into the ages of drum ages from 2017 to 2019. Particularly, we were interested to see if the record 2005 year class compromised the majority of adult drum captured. Otoliths were collected from a subsample of drum caught in the trawl survey from 2017 to 2019 and U.S. Fish and Wildlife staff in New Franken, WI provided otoliths in 2018 to supplement our dataset. The mean length of drum was 14.1 inches (n=158; range 3.8-26.6 inches). The oldest drum was a 15.0-inch fish estimated at 40 years old and the longest fish was 26.6 inches (10 lbs.) and was estimated at 35 years old (Figure 7). The 2005 year class only accounted for 5% of the ages collected. The 2014 and 2015 year classes were most represented, each at 12% of the sample. Drum in Lake Winnebago were estimated to be up to 58 years[1] old so the longevity of that species in Green Bay was no surprise, but the variability in ages of drum on Green Bay once they reach 15 inches was interesting. The freshwater drum aging information is included here because it was not previously reported.

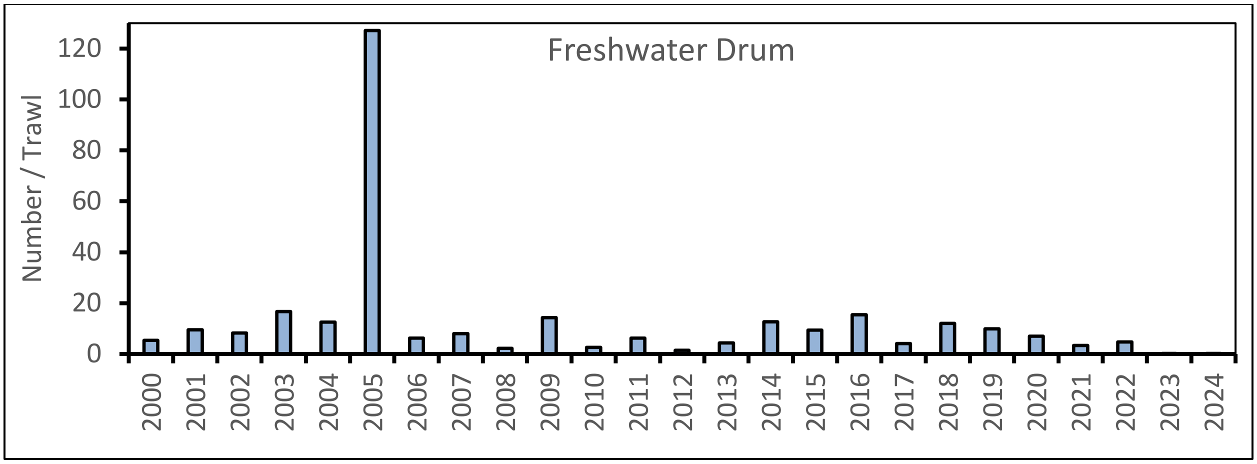

Figure 6. Average number of freshwater drum captured per trawl hour from 1988-2024 in trawl sites.

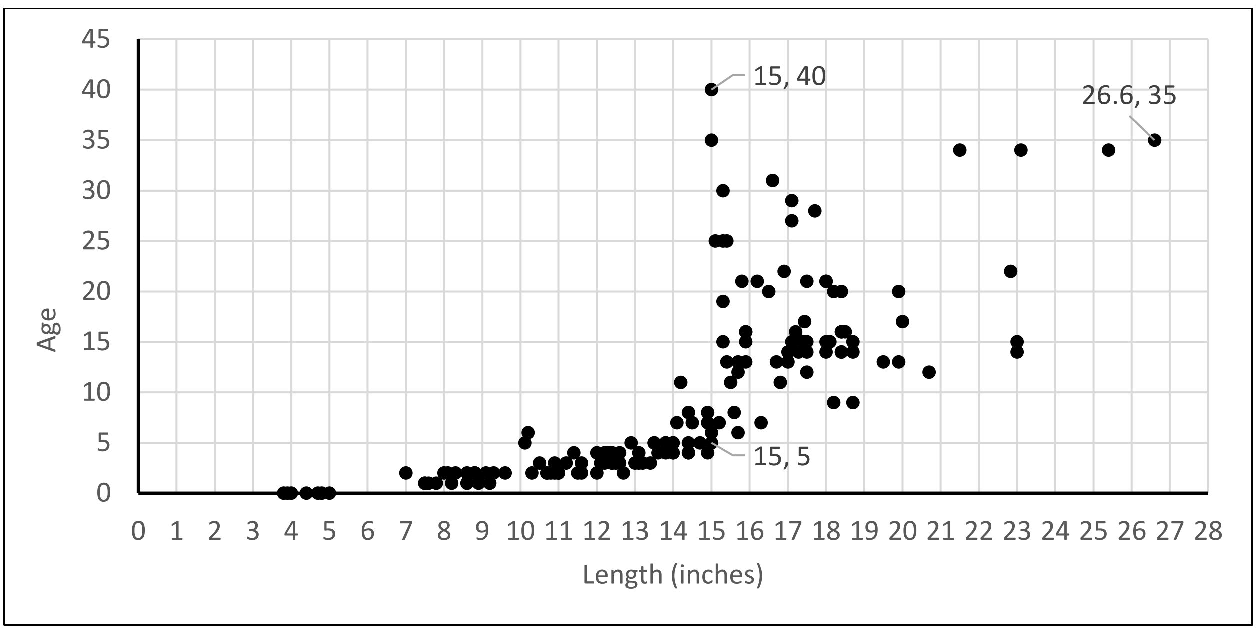

Figure 7. Length at age of freshwater drum collected in 2017, 2018, and 2019.

Gizzard shad are an important forage species that are typically more abundant in shallow waters in southern Green Bay. Gizzard shad tend to have a strong year class

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[1] Davis-Foust, S.L., R.M. Bruch, S.E. Campana, R.P. Olynyk, & J. Janssen. 2009. Age validation of freshwater drum using bomb radiocarbon. *Transactions of the American Fisheries Society*, *138*(2), 385-396. https://doi.org/10.1577/T08-097.1

every 3 to 5 years in Green Bay. The 2024 catch of gizzard shad was low, at 3.4/trawl (Figure 8), following a moderate year class in 2023 (23.7/trawl). The long-term average is 30.1/trawl.

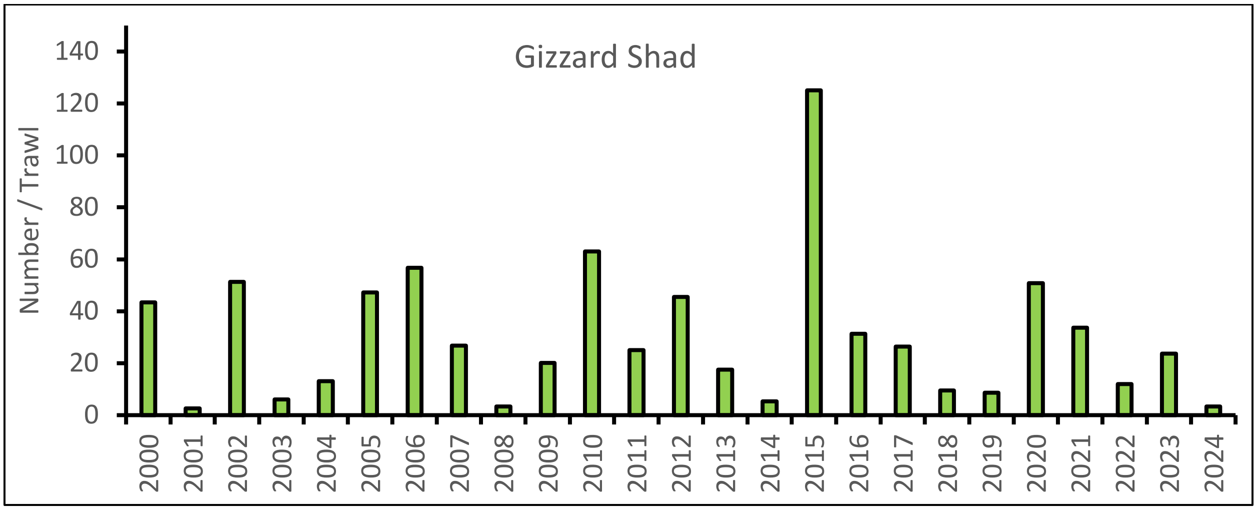

Figure 8. Average number of gizzard shad captured per trawl hour from 1988-2024 in trawl sites.

Spottail shiners are another important forage species in Green Bay and are typically present in both deep and shallow sites throughout the sampling area. Catches of spottail shiners have been low over the last three years, with 3.8/trawl caught in 2024 (Figure 9). This is below the long-term average of 13.2/trawl.

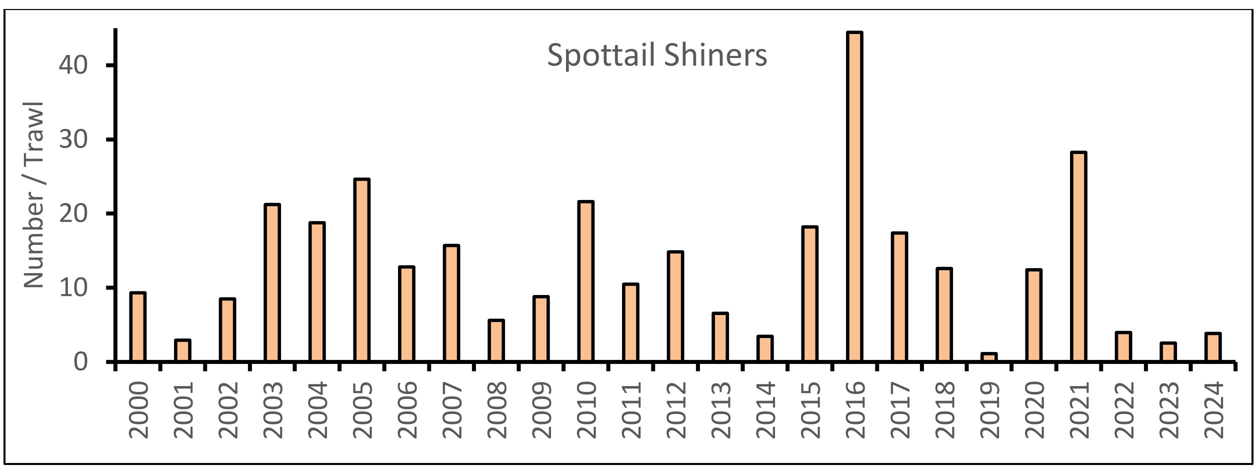

Figure 9. Average number of spottail shiners captured per trawl hour from 1988-2024 in trawl sites.

Trout perch are a small soft-rayed forage fish that inhabit shallow and deep areas of Green Bay. The long-term average catch of trout perch is 25.7/trawl. The 2024 catch was at a record low of 0.7/trawl. Catches of trout perch have been lower over the last decade compared to previous years (Figure 10).

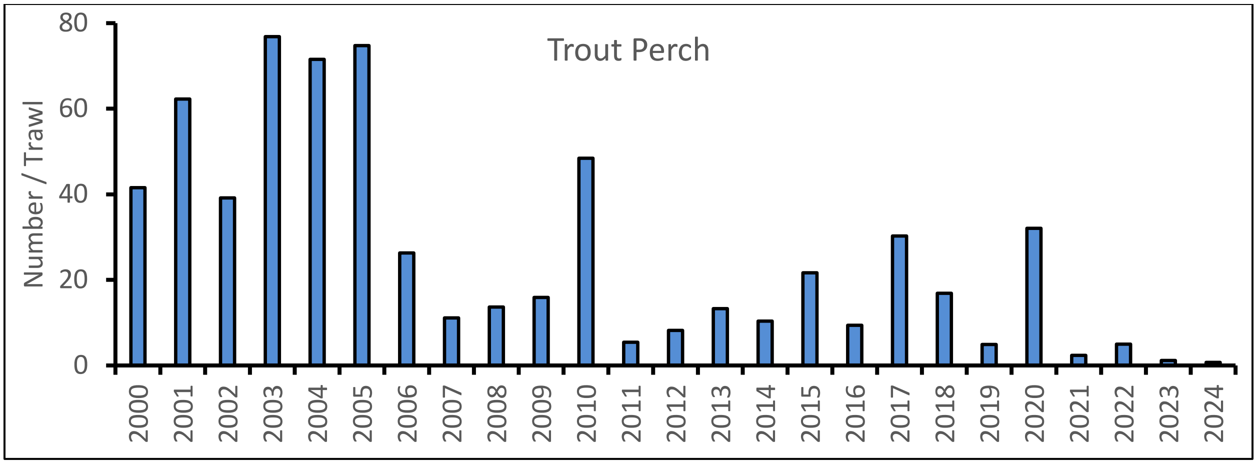

Figure 10. Average number of trout perch captured per trawl hour from 1988-2024 in trawl sites.

NON-NATIVE FORAGE SPECIES

Alewife are native to the Atlantic coastal waters but have been present in Lake Michigan since the late 1940s. Alewife are susceptible to large die-offs in periods of stress in early summer after spawning or during rapid changes in water temperature. When the alewife population was high in the 1960s and 1970s, die-offs along Lake Michigan shorelines were rather common. Since their introduction, alewife have become an important prey item for Pacific salmonids in Lake Michigan. The 2024 catch rate was 8.4/trawl for YOY and 3.2/trawl for adult alewife (Figure 11). This is low compared to the long-term average of 14.1 and 18.8/trawl, respectively. The last substantial year class was in 2020 (102.7/trawl).

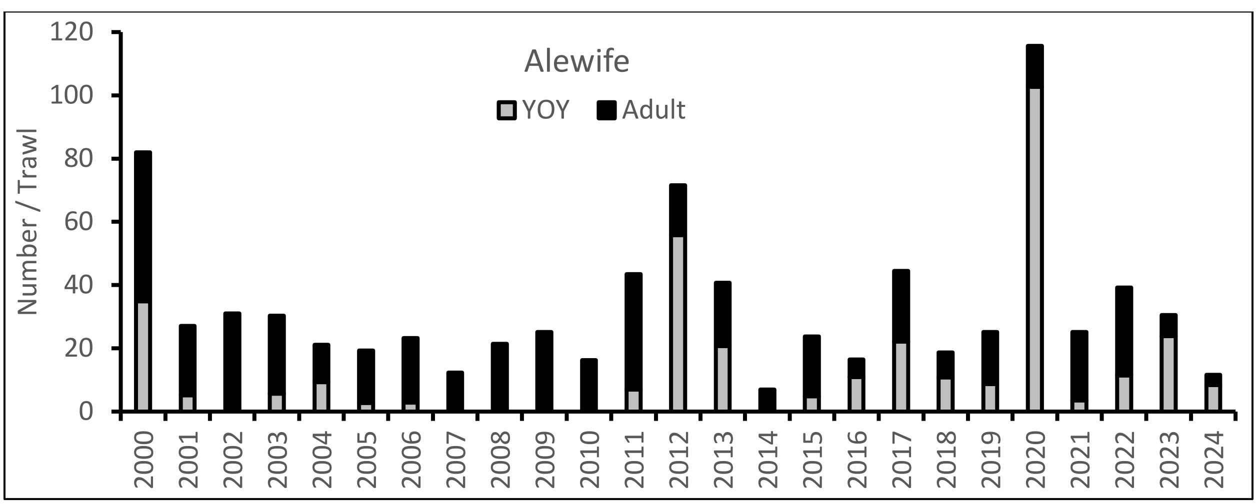

Figure 11. Average number of alewife captured in the Green Bay trawling survey from 2000-2024.

Rainbow smelt were accidentally introduced to Lake Michigan in 1912 from an inland lake in lower Michigan. Smelt spawn in shallow water and tributaries in the spring. Historically, dip netting for smelt in Lakes Michigan and Superior drew large crowds during their annual spawning runs. Rainbow smelt are still present in Green Bay, but their abundance is significantly lower than the 1980s and earlier when dip netting for smelt was popular. The 2024 catch of rainbow smelt was low at 1.4 and 1.7/trawl, respectively, for YOY and adult smelt (Figure 12). The long-term averages are 6.0 and 10.0/trawl, respectively.

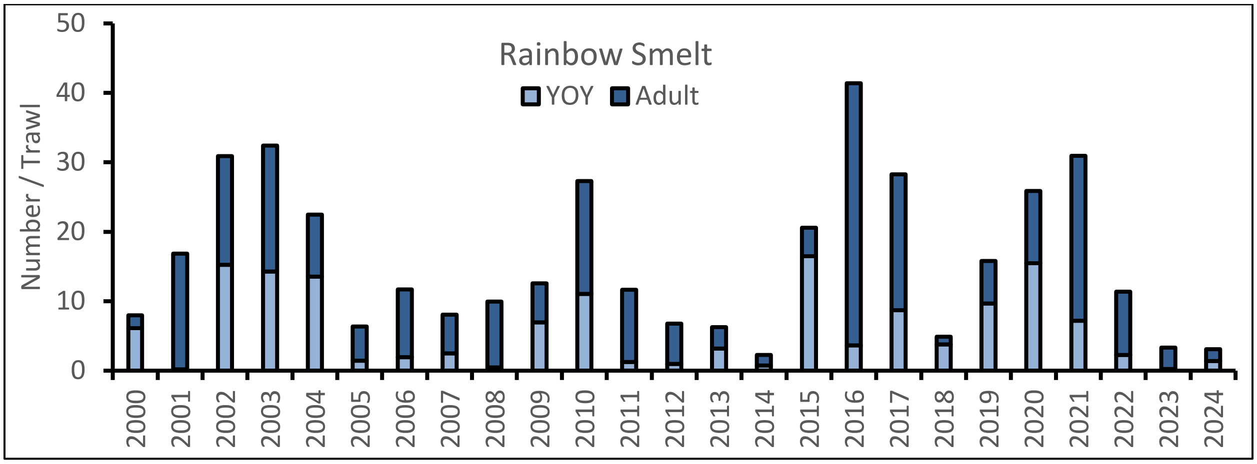

Figure 12. Average number of rainbow smelt captured in the Green Bay trawling survey from 2000-2024.

White perch are invasive to the Great Lakes but are native to the Atlantic coastal areas including the St. Lawrence River. White perch are closely related to native white bass and yellow bass and were first observed in the Green Bay trawling surveys in 1988. Various studies have shown that white perch can be significant egg predators and can compete with native fish species for food resources.[2] In addition to ecosystem level effects, adult white perch are a nuisance for yellow perch commercial fishers who reported large schools of white perch in areas as far north as Oconto in the summer of 2024. The heavy presence of white perch caught in gill nets in recent years has caused some commercial yellow perch fishers to temporarily pause efforts or to try new areas and depths to avoid picking out the spiny-finned fish. White perch are an allowed commercial species in Wisconsin. However, there is a limited market to sell white perch and a low market value. Some sport anglers keep white perch for consumption, but interest is limited. There is a year-round open season with no bag limit or minimum size for white perch on Green Bay and Wisconsin tributaries. In 2024, an estimated 87,495 white perch were caught by anglers, while only 8,745 were harvested.

[2] Roseman, E.F., W.W. Taylor, D.B. Hayes, A.L. Jones, & J.T. Francis. 2006. *Predation on walleye eggs by fish on reefs in western Lake Erie.* J. Gr. Lakes Res. 32(3), 415-423. https://doi.org/10.3394/0380-1330(2006)32[415:POWEBF]2.0.CO;2

White perch YOY were the most abundant species captured in the survey, at 14.6/trawl. Yearling and older white perch catch rate was 5.2/trawl (Figure 13). Age-1 white perch accounted for 52% of the adult catch and averaged 5.7 inches. Age-2 (12%) white perch average length was 7.0 inches. The record 2021 year class, now age-3, accounted for 32% of the adult catch with an average length of 8.3 inches. The largest white perch was 11.3 inches and was estimated as age-8 (2016 year class).

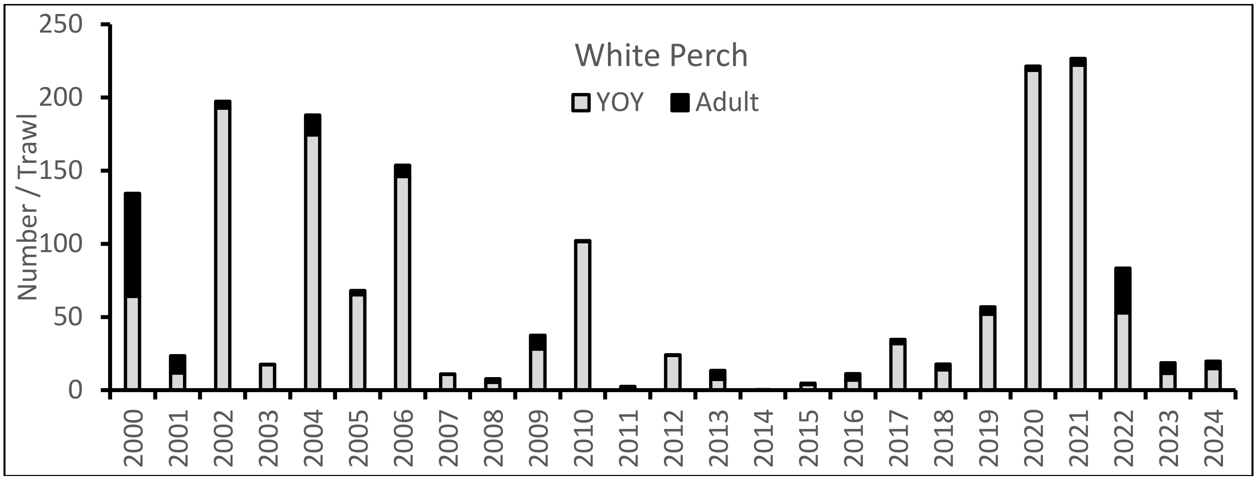

Figure 13. Average number of white perch captured in the Green Bay trawling survey from 2000-2024.

Round gobies are native to Eurasia (Black, Caspian, Azov Seas) and likely were introduced to the Great Lakes via ballast water in ships. Round gobies were first detected in the Green Bay trawling surveys in 2002 and have been present in the survey since. The 2024 catch of round goby was low, at 0.6/trawl (Figure 14). The long-term average is 15.4/trawl. However, the trawling surveys are not the best indicator of round goby abundance because gobies prefer rocky habitat, and the trawling surveys intentionally avoid these areas which can tear nets.

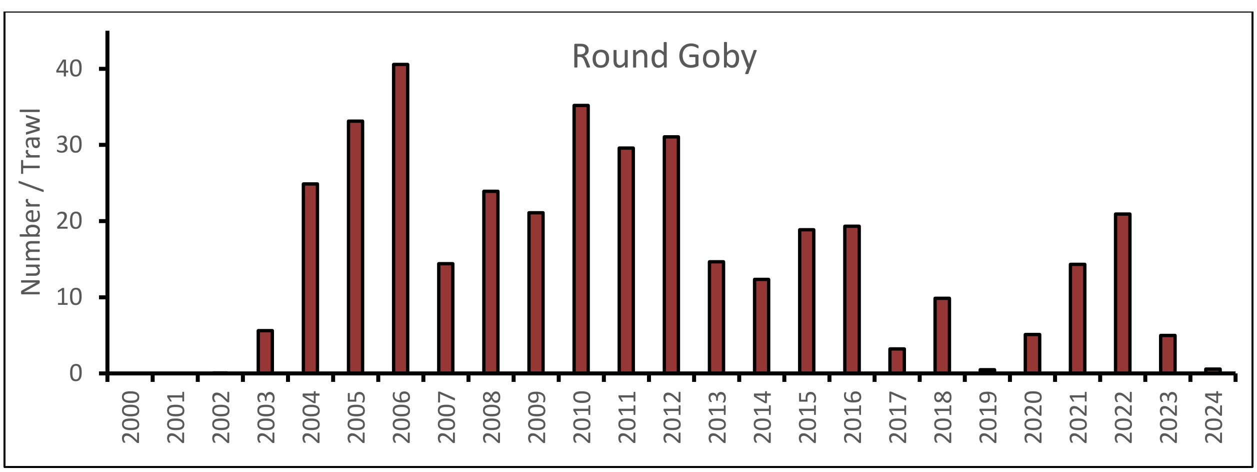

Figure 14. Average number of round gobies captured in the Green Bay trawling survey from 2000-2024.

OTHER SPECIES

Other species captured in the 2024 trawling surveys with total captured in parentheses include emerald shiner (36), white sucker (9), quillback carpsucker (5), common carp adult (2), longnose sucker (2), white bass YOY (2), northern pike (2) and bullhead spp. (1).

WATER QUALITY

Water clarity as measured by Secchi disk was lower than the last several years. Water clarity ranged from 10.5 feet (3.4 meters) in northern sites at Little River Deep (LRD) to as low as 1 foot (0.3 meters) in the southern Bay near Longtail Point (LOT). Contributing factors to the turbid waters may be little to no ice cover over the previous winter, early warming of the Bay, plus heavy rainfall and nutrient and sediment runoff in early summer.

Water temperatures at most locations were notably warm. For example, water temperature 62 feet down at Little River Deep (LRD) was 69°F, with the bottom layer being 58F. Near Little Tail Point (LIT), surface water temperature was just over 80°F. These observations are 10 to 20 degrees warmer compared to the last few years at the same locations and depths and are reminiscent of warm water documented in 2023. The “Dead Zone”, a layer of cold water on the bottom that has low oxygen, was documented at several deep sites during the 2024 survey. Since 2018, the “Dead Zone” has been more regularly documented during this survey.

AQUATIC VEGETATION

A quantitative index (0=no vegetation; 5=dense vegetation) of submergent vegetation connected to the net, cables, or doors upon retrieval of the net after each drag is recorded. The sites in deep water or in the southern Bay where water clarity is low typically have no vegetation (score=0). Three sites where vegetation is often encountered are Little River Shallow (LRS), Pensaukee (PEN) and Little Tail Point (LIT). In 2024, no vegetation was recorded at Pensaukee (PEN) and Little Tail (LIT). At Little River Shallow (LRS), vegetation scores for the ten drags ranged from 0 to 4, with an average of 1.4 across the 10 drags. Overall, aquatic vegetation density was lower than most years.

Summary

Catches of most fish species, with the exception of non-native white perch, were lower than most years in the 2024 trawling survey. Warm water temperature, low dissolved oxygen levels in some areas, and increased turbidity, which affects vegetation growth, may have contributed to low overall fish catches. In October 2024, DNR electrofishing surveys in nearshore areas of Green Bay targeting walleye noted high numbers of YOY yellow perch along with a good mix of yearlings and adult yellow perch. The fall walleye surveys may help to provide further insight into yellow perch trends. The Green Bay trawling survey conducted by the DNR is one of the longest running surveys on Lake Michigan and provides long-term trends in fish abundances, many of which are not assessed in any other survey on Green Bay.

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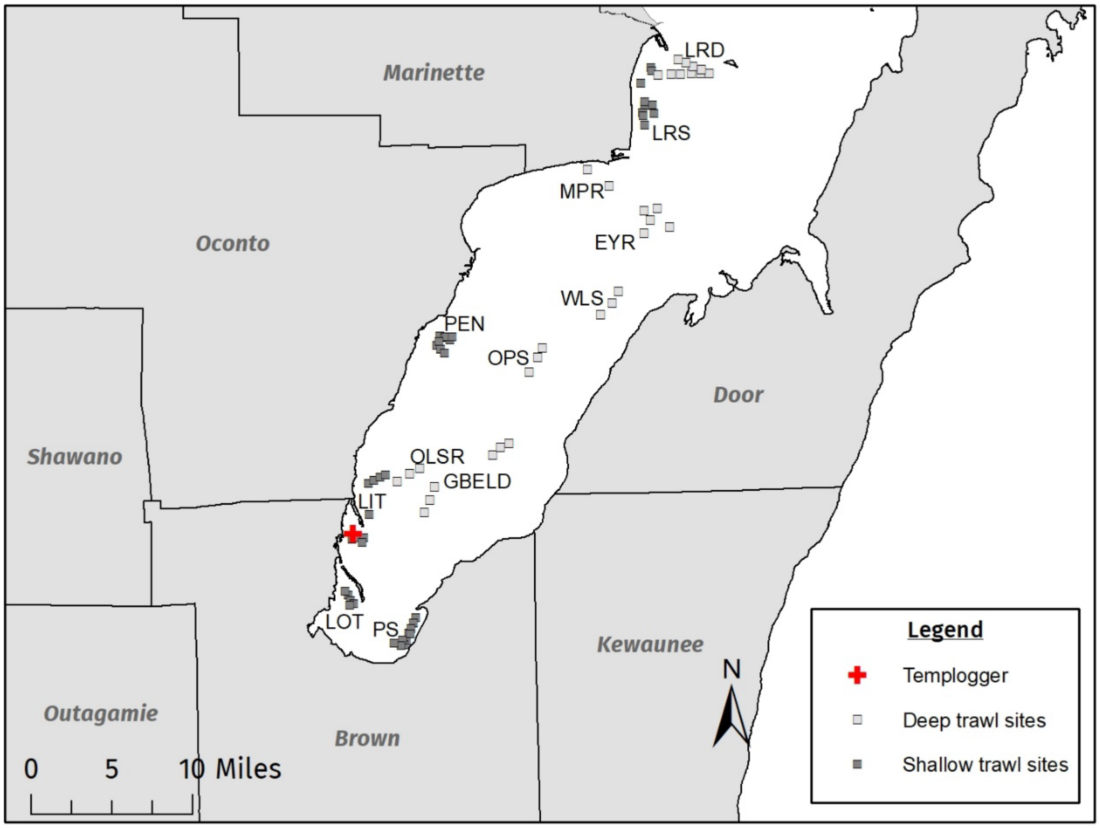
2024 Green Bay Yellow Perch

This report summarizes assessments and monitoring of yellow perch in southern Green Bay completed in 2024 by the Wisconsin Department of Natural Resources (DNR). Over the years, data obtained from various surveys have been used as inputs for a statistical catch-at-age model that estimates the abundance of adult yellow perch. These surveys include spring fyke netting, water temperature monitoring, shoreline seining, commercial monitoring, bottom trawling and recreational harvest creel surveys. Methods are described within each survey section.

Compared to current levels, yellow perch abundance in Green Bay was at high levels through the 1980s and early 1990s. During this time, the population ranged from 14 to over 35 million adult yellow perch. The population growth was fueled by strong year classes over several years in the 1980s. Yellow perch abundance began to decline in the mid-1990s, primarily due to poor recruitment. From 1988 to 2002, only two reasonably strong year classes appeared during summer trawling surveys: 1991 and 1998. Since 2000, moderately strong year classes were measured in many but not all years (Figure 2). Since the peak of the perch population in the 1980s, the Green Bay ecosystem has undergone significant changes, most notably the introduction of many invasive species.

Photo 1. A sample of market-size yellow perch harvested by a Green Bay commercial fisher.

MAP OF 2024 SAMPLING LOCATIONS



Spawning Assessment

The spring spawning assessment inside of Little Tail Point is currently completed every 3 to 5 years. The most recent survey was completed in 2023. See last year's report for additional information.

Water Temperature

Annual spring and summer temperature monitoring has been ongoing since 2003, with the exception of 2020. A HOBO Water Temp Pro v2® templogger U22 (Onset Computer Corporation) was deployed as soon as ice, weather and staffing conditions allowed (March 12, 2024) near Little Tail Point to record water temperature every 60 minutes until November 6, 2024. The templogger was 8 feet below the surface attached to a DNR buoy in approximately 12 feet of water. May 2024 water temperatures averaged 61.4°F and was the second warmest May recorded in the last 21 years (Table 2).

Yellow perch begin to spawn when water temperatures reach 50°F. In 2024, water temperature began to rise on April 8 and reached 50°F by April 13. By mid-June, water temperatures generally remained over 70°F until September 23, 2024, with a few days of exceptions (Figure 1). Occasional extreme fluctuations of 15-20°F have been recorded in previous summers such as 2022 on the Little Tail templogger (Figure 1), most often during warm weather with strong west or southwest winds that bring in cooler water. No cold water upwellings were documented in 2024.

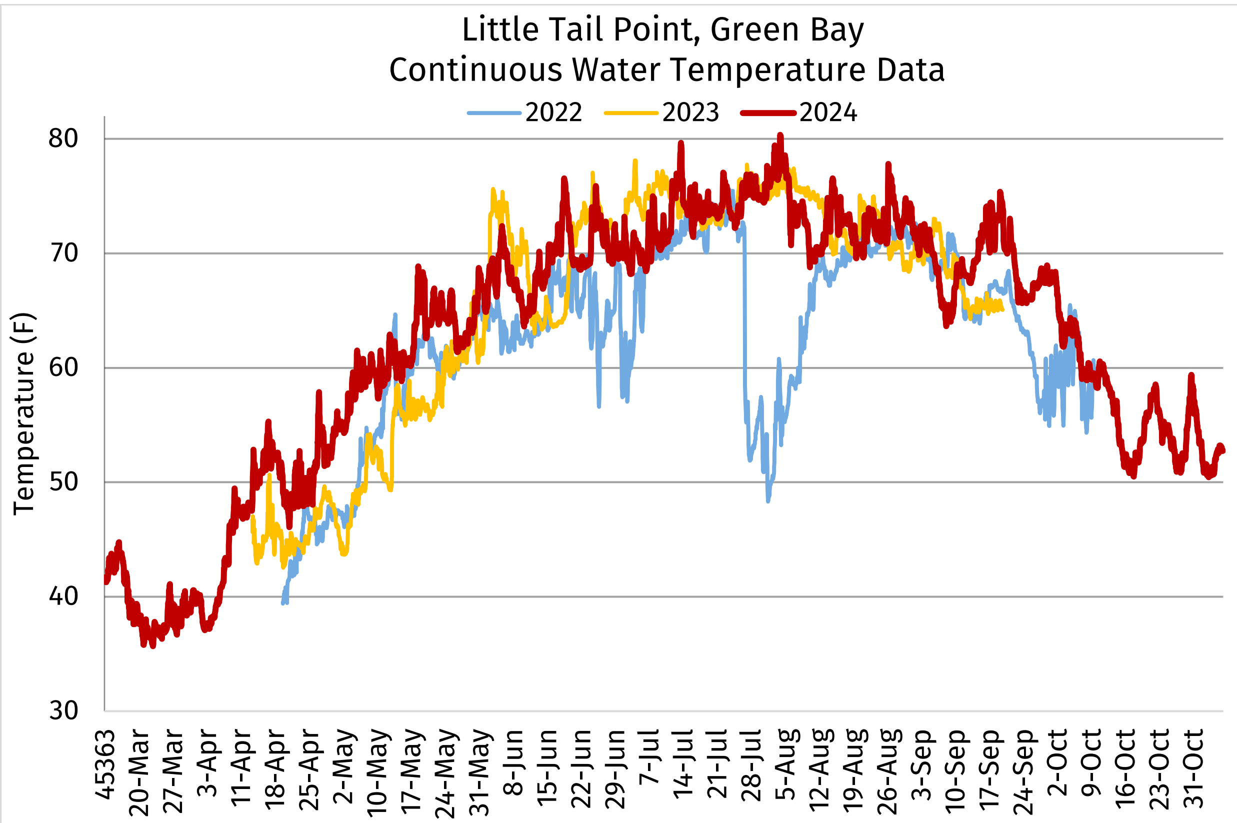


Figure 1. Continuous water temperature recorded at Little Tail Point in the last 3 years.

Table 2. Little Tail Point May water temperature average by year and date when 50°F was reached at the templogger depth of 8 feet below the surface. This is considered the temperature at which yellow perch will begin to spawn.

YEAR	MAY AVERAGE	50°F REACHED DATE	YEAR	MAY AVERAGE	50°F REACHED DATE
2024	61.4	13-Apr			
2023	54.8	16-Apr	2012	62.5	4-Apr
2022	57.3	6-May	2011	55.5	26-Apr
2021	55.4	12-Apr	2010	59.4	12-Apr
2019	52.8	24-Apr	2009	56.8	18-Apr
2018	59.3	Prior to deployment	2008	56.7	22-Apr
2017	55.4	17-Apr	2007	61.1	20-Apr
2016	56.4	17-Apr	2006	56.9	12-Apr
2015	58.8	16-Apr	2005	54.2	19-Apr
2014	55.2	6-May	2004	55.7	16-Apr
2013	56.7	30-Apr	2003	56.7	25-Apr

Trawling Survey

Annual late summer trawl surveys continued for the 47th year to monitor trends in yellow perch abundance. Trawling was conducted at 75 index sites at 12 locations: 43 shallow sites (established in 1978-1980) and 32 deep water sites (added in 1988) using a 25-foot semi-balloon trawl with 1½-inch stretch mesh on the body, 1¼-inch stretch mesh on the cod end and a cod-end liner with ½-inch stretch mesh. The net was towed for five minutes at a speed of 2.8 knots for a distance of approximately 0.25 miles and area of 1 acre. Hauls were made during daylight hours on the *RV Coregonus*.

At each of the 12 locations, 100 young of year (YOY) yellow perch were measured if captured, and yearling and older perch were subsampled for age, length and weight. A length cutoff of 100 mm for YOY yellow perch is used, and scales from the upper size range of YOY yellow perch are collected to confirm cutoff ranges of YOY and yearlings. For yearling and older yellow perch, aging structures (scales <150 mm; anal fin ray >150 mm) are collected from a subsample of five fish per 10 mm length bin. Once a length bin is filled, lengths are taken from up to 250 yearling and older yellow perch per location.

At each of the 12 locations, a temperature and dissolved oxygen profile using a YSI meter is taken along with a Secchi disk reading.

For all locations, the mean length of yellow perch YOY was 69 mm (range: 58-84 mm). The trawling surveys indicated that 2024 produced a weak year class with a total catch of 0.3/trawl, ranking as the second lowest since 2000 (Figure 2).

While the trawling surveys are designed to assess YOY distribution and abundance, yearling and older yellow perch were also measured, weighed, sexed and aged. The catch of age-1 and older fish was 0.1/trawl in 2024 (Figure 3) compared to the 25-year average of 9.2/trawl. All six of the age-1 and older fish captured were yearlings (2023 year class) with a mean length of 5.4 inches (range: 5.1-5.6 inches). See "2024 Green Bay Bottom Trawling Assessment Report" for additional information.

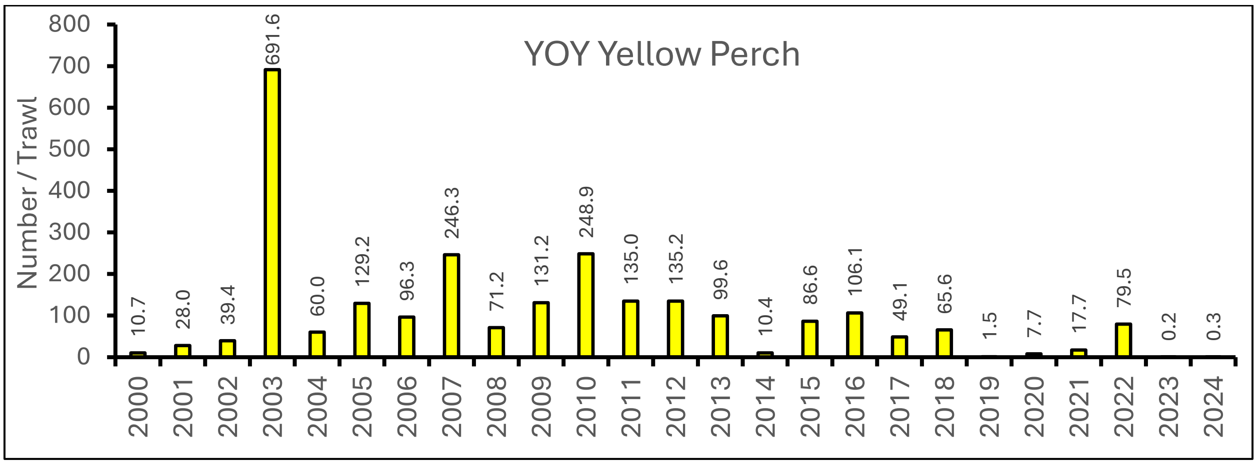


Figure 2. Average number of yellow perch YOY captured per trawl in the Green Bay trawling survey from 2000-2024.

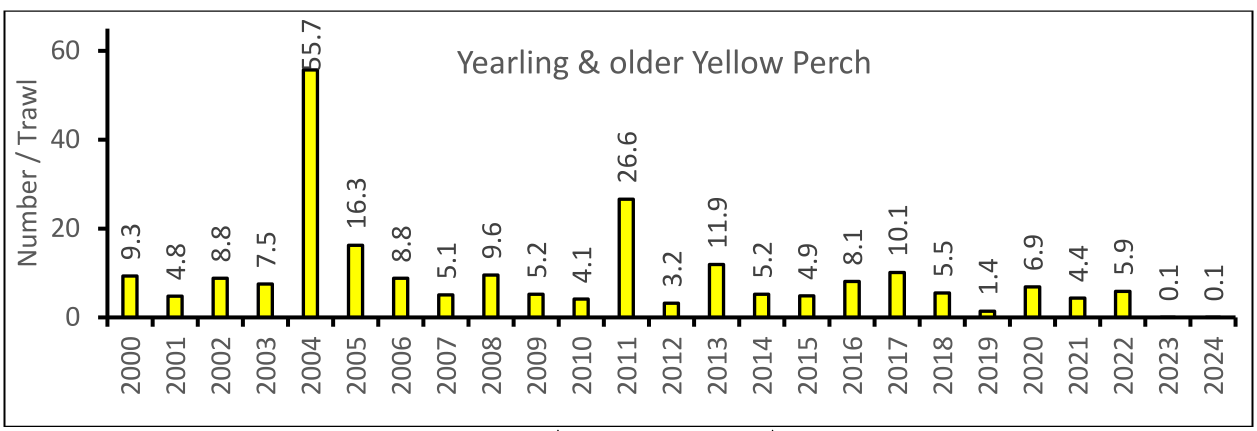


Figure 3. Average number of yellow perch adult (yearling and older) captured per trawl in the Green Bay trawling survey from 2000-2024.

Recreational Harvest

Since 2006, recreational fishing regulations for yellow perch in Wisconsin waters of Green Bay consists of a 15 fish daily bag limit during the open season from May 20 to March 15. Recreational harvest is estimated from an annual creel survey. Biological data from yellow perch collected through the creel survey were used to describe the age and size composition of the harvest.

Winter harvest is influenced largely by ice conditions, which can limit effort. This was certainly the case in the winter of 2024, when poor ice conditions prevailed in most areas of Green Bay for the second consecutive winter. Due to lack of ice, a transition to open water creel protocol began on March 1, 2024, two weeks earlier than scheduled. Overall angler effort (58,389 hours) for all species over the winter was the lowest recorded in over 22 years. The previous 20-year (2004-2023) average is 224,639 hours. An estimated 9,273 yellow perch were harvested between January and March 1, 2024, which is well below the previous 20-year (2004-2023) average of 43,253 yellow perch harvested in the winter.

Open water harvest of yellow perch as estimated through creel surveys (May 20 to October 31) in 2024 was 192,061 fish, up from 98,867 fish in 2023 (Figures 4 & 5). The majority of the open water harvest was by boat anglers launching at ramps in Door and Kewaunee counties (39%), Oconto County (24%), and Brown County (17%). The majority of the open water harvested fish were age-2 (2022 year class; 40%) or age-3 (2021 year class; 39%), but ages from 1-7 were present. The mean length of open water harvested yellow perch was 9.3 inches (n=227). Guided trips on Green Bay reported a total harvest of 4,696 yellow perch in 2024 (Figure 5).

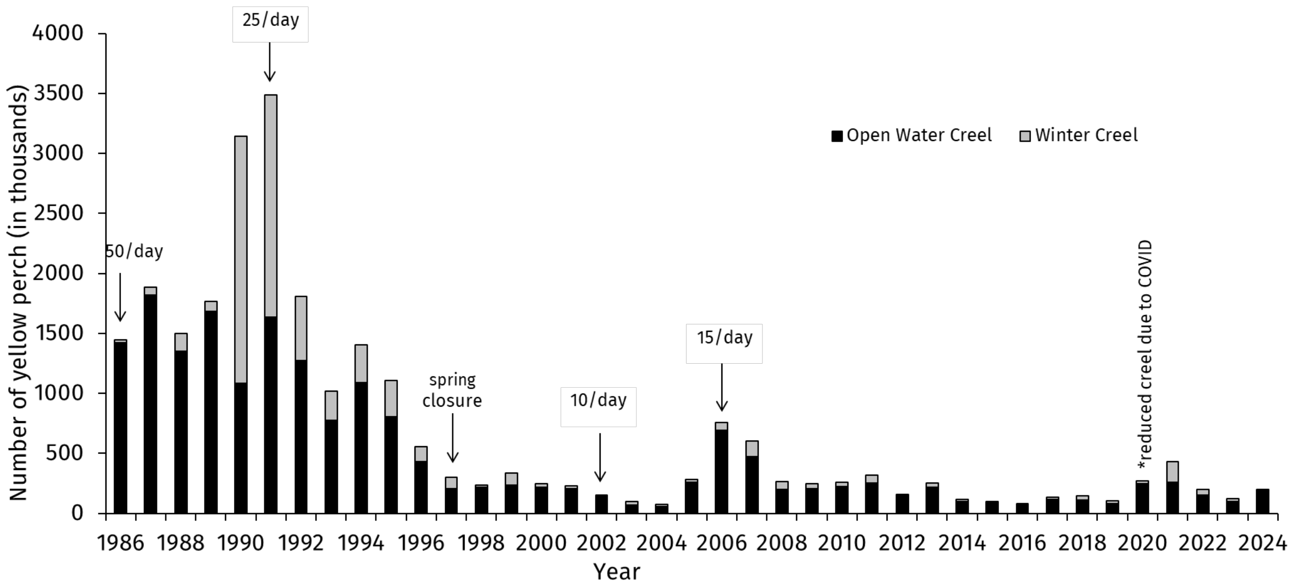


Figure 4. Estimated recreational harvest of yellow perch in Green Bay from 1986 to 2024. Regulation changes are indicated by arrows. Open water creel estimates for 2020 are from July-November only.

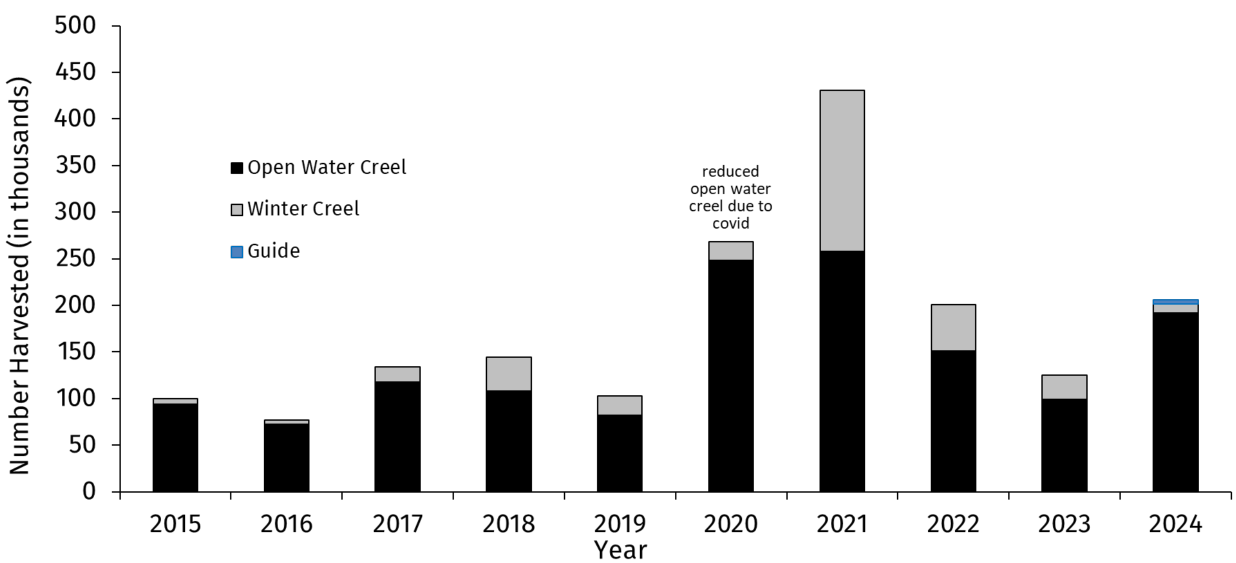


Figure 5. The last decade of recreational harvest estimates of yellow perch in Green Bay (2015 to 2024). Regulation changes are indicated by arrows. Open water creel estimates for 2020 are from July-November only.

Commercial Harvest

Beginning in 1983, the yellow perch commercial harvest in Green Bay (Zone 1) was regulated on a “quota year” basis beginning in July and running through June of the following year, with a closed period from March 16 to May 19. In 2012, the quota season began operating on a “calendar year” basis, from January 1 to December 31, with the same closed period in spring. The initial quota established in 1983 was set at 200,000 pounds. Since then, it increased several times up to 475,000 pounds during the 1989-90 quota year. The quota was adjusted to as low as 20,000 pounds in 2001-02. Following the strong 2003 year class, the quota was increased to 60,000 pounds in 2005-06 and again to 100,000 pounds in 2008-09. The total allowable commercial harvest has remained at 100,000 pounds since. The minimum size limit for yellow perch commercial harvest in Zone 1 is 7½ inches. Commercial fishing rules are further detailed in Wisconsin Administrative Code Chapter NR 25.[3]

The 2024 commercial harvest was reported by commercial fishers, who are required to weigh and report their harvest in pounds daily into an online database. Fish sampled by the DNR at commercial landings were used to describe the age and size composition of the catch and to convert pounds to numbers of fish harvested. Number of fish is used for the statistical catch-at-age model since the recreational harvest and trawling surveys are recorded as numbers.

In 2024, commercial fishers harvested 51,519 pounds of yellow perch (an estimated 138,276 fish), compared to 58,202 pounds in 2023. All of the commercial harvest was with gill nets. Drop nets were not utilized in 2024. The average harvest rate (CPUE) for gill nets in 2024 was 42 pounds per 1,000 feet fished. This is above the previous 10-year average of 28 pounds per 1,000 feet fished. Age-2 perch (2022 year class) comprised 52% of the total commercial harvest in 2024, while age-3 (2021 year class) comprised 30%. By fall, some age-1 perch have reached the minimum size for commercial harvest (7½ inches). In 2024, the age-1 year class comprised 10% of the commercial harvest.

Population Estimates

Data collected in 2024 was incorporated into the statistical catch-at-age model for yellow perch in the Wisconsin waters of Green Bay. The model was updated and re-run in May 2025. Inputs included harvest, effort and age composition from commercial and sport fisheries and YOY data from trawling surveys. Outputs of the model estimate that the adult (age-1 and older) yellow perch population in 2024 was 881,000 fish (Figure 6). This is a decrease from the previous 10-year average of 1.87 million yellow perch.

[3] https://docs.legis.wisconsin.gov/code/admin_code/nr/001/25

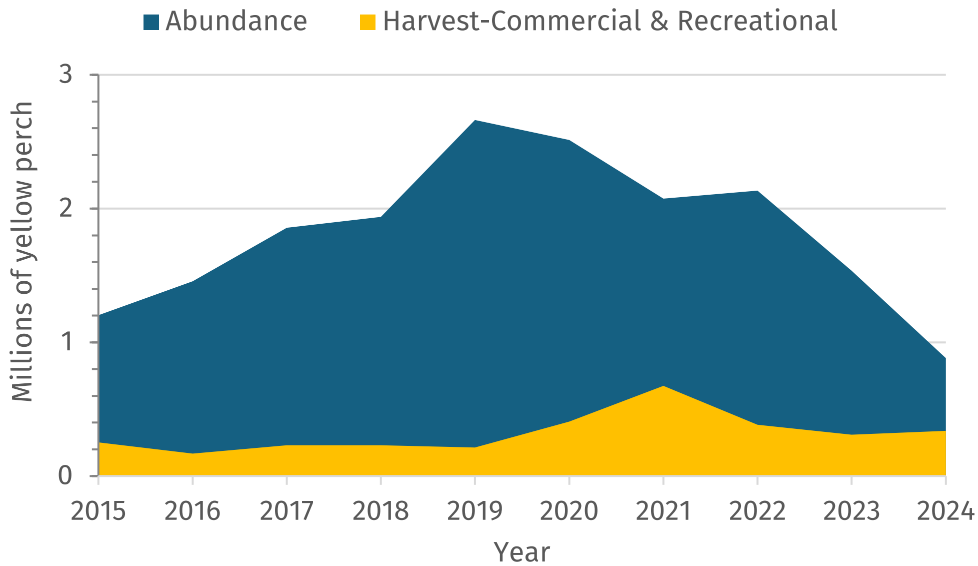


Figure 6. The last decade of abundance estimates and total harvest of yellow perch in Green Bay (2015 to 2024).

The Future of the Yellow Perch Fishery

Although very low numbers of YOY yellow perch were captured in both the 2023 and 2024 trawling surveys, environmental factors (warm water temperatures and low oxygen) at many sites likely affected catches during the two-week survey. Catches of several other species commonly encountered such as round goby, trout-perch, and common carp were also much lower than previous surveys. Anecdotal observations of YOY yellow perch during fall (Sept/Oct) walleye electrofishing surveys in Green Bay at sites at northern (Marinette), middle (Oconto), and southern (Suamico) sites suggest that the 2023 and 2024 year class of yellow perch may be more abundant than August trawling surveys indicated. The moderate 2022 year class of yellow perch made a strong showing in the sport and commercial harvest in 2024, as did the average 2021 year class. Additionally, the presence of age-1 (2023 year class) perch in the 2024 fall commercial gill nets is a positive signal. Yellow perch aging data collected in 2025 and later (creel, trawl surveys, commercial monitoring) will retrospectively show if the 2023 and 2024 trawling surveys were indeed an underestimate.

The yellow perch population in Green Bay has experienced fluctuations over the past decade. Early indicators from the 2024 population estimates suggest a decline in the overall population, however, as stated above there are many factors to consider in addition to the population estimates. This downward trend highlights the need for continued monitoring to determine if management adjustments such as adjustments to the commercial harvest limits or recreational bag limits are warranted. Water quality and habitat in Green Bay will continue to be evaluated by DNR and other agencies. This will help to inform future habitat restoration projects when possible.

Acknowledgements

DNR staff in Peshtigo and Sturgeon Bay assisted in various aspects of data collection, fish aging, and data entry for Green Bay yellow perch, including Brandon Bastar, Derek Apps, Ron Rhode, and Devin Bort. DNR creel clerks Scott Poquette, David Parker, and Josh Steckmesser collected catch, harvest, and effort information from anglers. Iyob Tsehaye with DNR Office of Applied Science administered population modelling for Green Bay yellow perch.

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2024 Green Bay Brown Trout Management

This report summarizes assessments and management actions for brown trout in Wisconsin waters of Green Bay/Lake Michigan completed in 2024.

Introduction

The Wisconsin DNR has stocked various salmonid species into Green Bay since the 1960s. The initial intent of that stocking effort was to control introduced prey species like alewives and rainbow smelt while providing a near-shore and offshore fishery for anglers. Creel survey results indicate that harvest and return rates for Green Bay brown trout were exceptional throughout the late 1980s and 1990s. Since 2000, brown trout harvest has experienced a sharp decline. Stocking numbers for Green Bay remained fairly consistent from the 1980s-2000s, until fingerling stocking was reduced in 2010 (Figure 1). Between 2011 and 2015, only yearling brown trout were stocked into Green Bay. Both fall fingerlings and yearlings have been stocked since 2016.

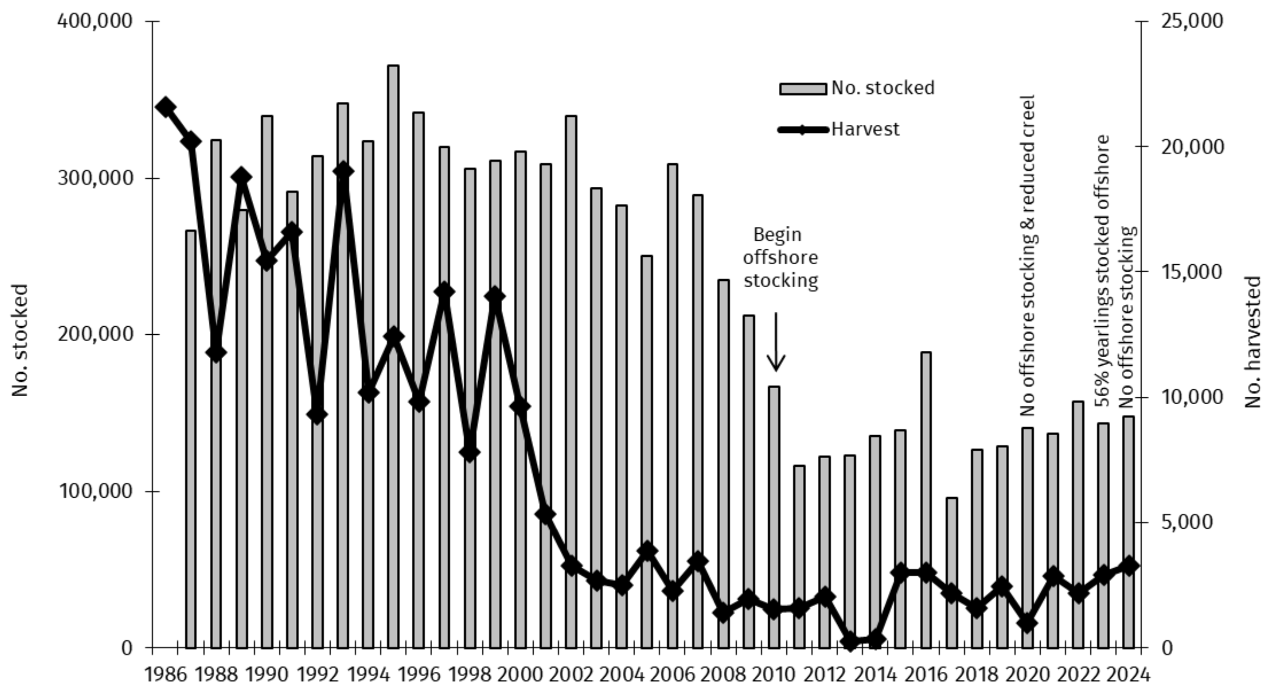

Figure 1. Number of stocked and harvested brown trout (fingerlings & yearlings combined) in Wisconsin waters of Green Bay by year.

Historically, the DNR has stocked several strains and age classes of brown trout into Green Bay and adjacent rivers. To provide a trophy fishery, the Seeforellen (German) brown trout program was initiated in Wisconsin waters of Lake Michigan in the early 1990s. This strain (*Salmo trutta lacustris*) originated from alpine lakes in Germany and was first brought to a New York state fish hatchery in 1979.[4] The Wisconsin DNR obtained Seeforellen eggs from New York in the winter of 1989-1990. Seeforellen generally live longer and grow faster than other strains, thus adding to the trophy element of the fishery.[5] Currently, Seeforellen brown trout are the only strain that Wisconsin stocks into the Great Lakes. Additional background on the Seeforellen strain of brown trout and changes in brown trout stocking strategies for Wisconsin's Lake Michigan can be found in the 2017 report.[6]

Following the closure of the Thunder River Hatchery in 2017 and the discontinuation of the Wild Rose (domestic) strain of brown trout that was previously stocked into Lake Michigan by Wisconsin, a stocking strategy for Seeforellen brown trout was developed with input from the Lake Michigan Fisheries Forum and several public meetings. The strategy evenly distributes 75% of the entire yearling brown trout quota across each Lake Michigan/Green Bay county.

The remaining 25% are allocated based on brown trout harvest rates and directed effort that are derived from open water creel surveys. Beginning in 2018, an additional 20,000 brown trout (fall fingerlings) were allocated to Green Bay and Milwaukee to further boost the local fisheries. Throughout 2019, the DNR conducted an extensive stakeholder outreach and engagement process to inform a management strategy for Lake Michigan stocking. As a result, lake-wide brown trout stocking numbers were increased from 376,000 to 450,000 beginning in 2020. In 2024, a total of 147,721 brown trout were stocked in Green Bay by the DNR (Table 1).

To ensure that known Seeforellen are collected as future brood stock to continue the genetic lineage, Seeforellen stocked into the brood rivers (Kewaunee, Milwaukee and Root) receive an adipose fin clip prior to stocking. The total number of fish clipped

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[4] Garrell, M.H., Strait, L.E. 1982. Seeforellen in New York. New York Fish and Game Journal 29:97-100.

[5] Belonger, B. 1996. Strain evaluation. Pages 55-56 *in* Lake Michigan Management Reports to Great Lakes Fishery Commission, Wisconsin Dept. of Nat. Res., Madison, WI.

[6] Paoli, T. 2018. Green Bay brown trout management and fall tributary surveys, 2017. Lake Michigan Management Reports to Great Lakes Fishery Commission. Wisconsin Dept. of Nat. Res., Madison, WI. https://dnr.wi.gov/topic/fishing/documents/lakemichigan/GreenBayBrownTrout2017.pdf

annually is approximately 104,000. Brown trout stocked at locations other than the brood rivers do not get fin clipped.

A sharp decline in brown trout harvest in the early 2000s prompted a comprehensive review of Green Bay brown trout data and related fisheries information in 2009. Following the review, the DNR adopted a plan to offshore stock fish to avoid nearshore predators and to discontinue stocking fall fingerlings into Green Bay. Stocking yearling brown trout into the tributaries later in May was not a viable option due to hatchery space limitations and warm water in the tributaries. The next best option was to stock yearling brown trout offshore in Green Bay, away from the concentration of nearshore predators, in hopes to increase survival.

In 2010 and 2011, the DNR utilized a pontoon barge and the USFWS *RV Spencer Baird* to stock yearling brown trout offshore in Green Bay. From 2012 to 2019, the DNR used the *RV Coregonus* and a 1000-gallon tank to stock yearling brown trout offshore in Green Bay. In 2020, due to COVID-19 restrictions, the DNR did not stock brown trout offshore; instead fish were stocked directly into tributaries or harbors. Offshore stocking of yearlings resumed in spring 2021 and continued into 2022 with fall fingerling quotas being directly stocking into tributaries. In 2023, 56% of the Green Bay brown trout yearlings were stocked offshore on the Door County side. The remainder of the yearlings planned for offshore stocking on the Marinette County side were stocked directly into west shore tributaries. Flows in excess of 24,000 cubic feet per second on the lower Menominee River in mid-April 2023 made it unsafe to tie up and depart the wall at Waupaca Foundry with a fully loaded stocking tank on the *RV Coregonus*. In 2024, no offshore stocking took place because the *RV Coregonus* was undergoing maintenance until late April.

Table 1. DNR brown trout stocking information for Green Bay in 2024.

DATE	COUNTY	LOCATION	STRAIN/SIZE	NUMBER	CLIP	# FISH PER LB.	REARING FACILITY
Mar 13, 2024	Door	Gills Rock ramp	Seeforellen yearling	5,895	--	9.0	Wild Rose SFH
Mar 25, 2024	Marinette	Menominee River at Menekaunee Harbor	Seeforellen yearling	17,862	--	10.0	Wild Rose SFH
Mar 25, 2024	Marinette	Peshtigo River at CTH BB landing	Seeforellen yearling	12,749	--	9.7	Wild Rose SFH
Mar 26, 2024	Door	Stone Quarry ramp	Seeforellen yearling	11,850	--	9.7	Wild Rose SFH
Mar 28, 2024	Door	Stone Quarry ramp	Seeforellen yearling	11,448	--	8.9	Wild Rose SFH
Mar 28, 2024	Door	Fish Creek ramp	Seeforellen yearling	16,669	--	9.7	Wild Rose SFH
Mar 28, 2024	Door	Egg Harbor ramp	Seeforellen yearling	15,054	--	8.9	Wild Rose SFH
Mar 29, 2024	Door	Sister Bay ramp	Seeforellen yearling	15,992	--	9.4	Wild Rose SFH
Apr 19, 2024	Oconto	Oconto River at CTH J bridge	Seeforellen yearling	17,404	--	11.4	Brule SFH
Sep 26, 2024	Door	Egg Harbor ramp	Seeforellen large fingerling	22,798	--	24.3	Wild Rose SFH
			Total yearlings	**124,923**			
			Total fingerlings	**22,798**			

Creel Results and Discussion

Following the data review in 2009, the DNR adjusted the Green Bay brown trout stocking strategies including reducing fall fingerlings, beginning the offshore stocking program, and developing the following target indices:

> *a) Total harvest greater than or equal to 4% of number stocked brown trout. This return rate is comparable to return rates for Green Bay prior to 2000;* OR

b) Total harvest of 5,000 or more fish based on 126,000 yearlings stocked annually into Green Bay, AND

c) Brown trout harvest rate less than or equal to 23 hours per fish based on targeted total salmonid fishing effort.

Only one of the target indices (harvest rate less than 23 hours per fish) have been regularly met since 2010. Return rate has ranged from 0.2% to 2.9% of yearlings stocked over the last 15 years but has not yet reached the target of 4%. Total harvest has not reached 5,000 fish even when adjusted for years when fewer yearlings were stocked.

The catch and harvest estimates for open water Green Bay brown trout in 2024 was 5,163 (catch) and 3,459 (harvest) during open water creel which was conducted from March 1 to October 31, 2024 (Figure 1). This was the highest harvest recorded since 2005. Green Bay comprised 38% of the total brown trout harvest for Lake Michigan in 2024 (Lake Michigan total: 9,183 fish), followed by Milwaukee County (23%) and Ozaukee County (12%). The goal is to have a harvest rate for Green Bay brown trout for anglers targeting salmonids to be at or below 23 hours per fish. In 2024, the brown trout harvest rate for anglers targeting salmonids in Green Bay was 9.4 hours/fish, an improvement from 11.6 hours/fish in 2023. The harvest rate for 2024 was the second best rate in the last 38 years (since 1986).

Since offshore stocking began in 2010, average harvest rate for anglers targeting salmonids has generally improved (2011-2024; 26 hours/fish) compared to the previous 10-year average (2001-2010; 35 hours/fish). A difference in 9 hours/fish may be meaningful, especially since stocking numbers before 2010 were generally twice the number of brown trout stocked after 2010. Much of the stocking reductions beginning in 2010 were fall fingerling brown trout that likely have lower survival rates than yearling trout.

Offshore stocking did not occur in 2020, so this provides an opportunity to compare harvest rates to years after offshore stocking occurred. Age-2 and age-3 brown trout typically comprise the majority of the angler harvest. Harvest rates from 2021 and 2022 (13 and 7 hours/fish, respectively) remained well within acceptable ranges. In 2023, only the Door County quotas of brown trout for Green Bay were stocked offshore, and no offshore stocking was done in 2024 due to boat maintenance. While the creel results from 2024 were favorable, results from 2025 and 2026 may further shed some light on the impacts of offshore stocking to the creel. DNR will consider options for a clipping study to further evaluate offshore stocking.

Seeforellen Gamete Collection Summary

Beginning each year in late October or November, DNR crews use electroshocking boats to collect Seeforellen adults (identified by an adipose fin clip) from the three brood rivers. Captured fish are transferred to Besadny Anadromous Fish Facility (BAFF), where they are held in ponds. Once a week, from mid-November to early December, propagation staff collect eggs and milt from ripe adults. Fertilized, disinfected eggs are transferred to the Wild Rose State Fish Hatchery. Fish that are not yet ripe are returned to the ponds to be spawned later. Enough eggs are collected to fulfill the Lake Michigan (450,000 fish) and Lake Superior (175,000 fish) stocking quotas for brown trout.

Photo 1. Brad Eggold with an adipose-clipped Seeforellen brown trout collected in Milwaukee.

The DNR sampled the Kewaunee River on Nov. 7, Nov. 12 and Nov. 19, 2024, using one boat. The Root River was sampled on Oct. 30, Nov. 6, Nov. 13, Nov. 20, and Nov. 26, 2024, with two boats each day. The DNR also sampled the Milwaukee River and harbor on Nov. 5 and Nov. 14, 2024, with two electrofishing boats. Fish captured at the Root River were given a top caudal clip, and fish from the Milwaukee River or harbor were given a bottom caudal clip before being transported to BAFF for data analysis purposes. Kewaunee River fish did not receive a clip during collection. The total effort for all three locations was 17 electrofishing boat days.

In 2024, Seeforellen gametes were collected at BAFF during five weekly spawning events between Nov. 20 and Dec. 17. Fertilized, disinfected eggs were transported to the Wild Rose State Fish Hatchery on each spawning date. Sixty fish were necropsied by DNR fish health staff on Nov. 20. Virology tests were negative. Fish that were not sacrificed for disease testing were released above the weir in the Kewaunee River on the day of gamete collection or on the last day if still green/hard.

Since 2008, the sex ratio of male to female brown trout collected has varied, with fewer males sampled in most years. In 2024, that trend continued at all three locations (Table 2).

A total of 458 brown trout were processed at BAFF in 2024 (Table 2). Gametes were not collected from every fish as some fish were spent or hard (last day), but biological data was collected from all fish. Unique fin clips (adipose + right ventral) were given to brood stock yearlings stocked in 2021. Those age-4 fish comprised 7% of the sample. 16% of the fish sampled were 30 inches or greater (Figure 2). There were no significant differences between the weight of females collected from the three rivers as determined by one-way ANOVA, $F(2,258) = 0.03$, $p = 0.97$.

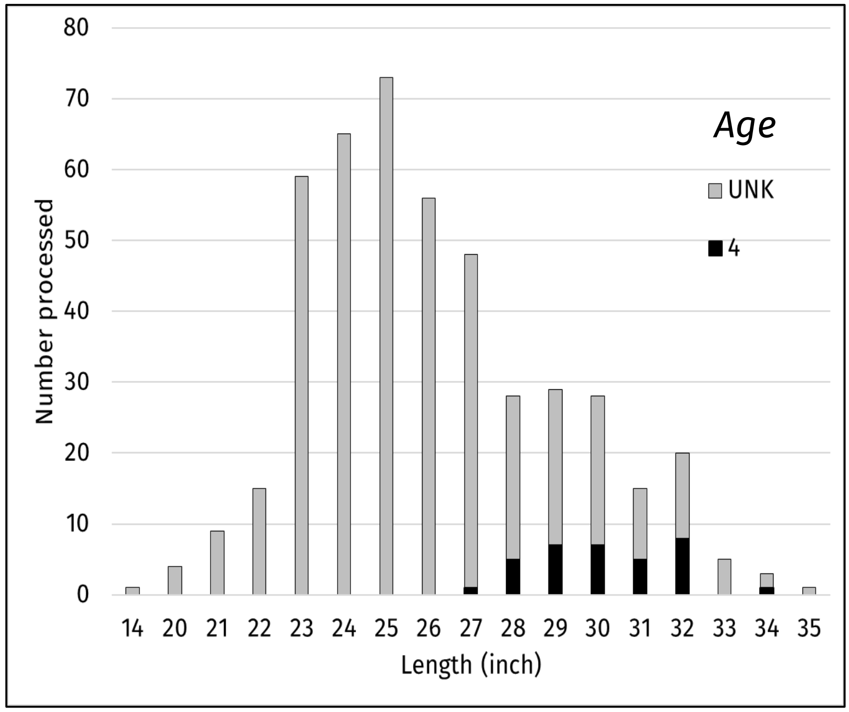

Figure 2. Length frequency by age of Seeforellen brown trout processed at BAFF in 2024. All rivers combined. Age-4 fish are black bars, unknown age fish in grey.

Table 2. Number of Seeforellen brown trout processed for biological data at BAFF by river source and sex in 2024. This includes all fish even if no gametes were collected. Mortalities removed from the ponds are not included in this table.

DATE	MILWAUKEE RIVER & HARBOR		ROOT RIVER		KEWAUNEE RIVER		EGGS COLLECTED
	Males	Females	Males	Females	Males	Females	
Nov 20, 2024	8	9	18	14	2	5	221,014
Nov 26, 2024	7	14	24	25	5	5	369,656
Dec 4, 2024	10	15	17	35	1	8	469,385
Dec 10, 2024	3	6	20	19	1	2	209,864
Dec 17, 2024	18	25	56	77	7	2	170,846
TOTAL	**46**	**69**	**135**	**170**	**16**	**22**	**1,440,765**

Summary

The open water harvest estimate for Green Bay brown trout in 2024 was 3,459 fish. Brown trout harvest rate for anglers targeting salmonids in Green Bay was 9.4 hours/fish in 2024. For the last six years, this has been within the acceptable range of the target harvest rate at or below 23 hours/fish. However, the target of 5,000 fish harvested has not been met since 2001 and a return rate of at least 4% has not been met since 1999.

Seeforellen brood river fish will continue to be hand-clipped with an adipose fin clip prior to stocking so adults can be identified and used for gamete collection when they return to the Milwaukee River and harbor, and the Kewaunee and Root rivers.

Due to lack of funding, the DNR did not plan to stock yearling brown trout offshore into Green Bay in 2025; however, the M&M Great Lakes Sportfishing Club donated gift funds to continue offshore stocking in April 2025.

Since offshore stocking began in 2010, the average brown trout harvest rate for anglers targeting salmonids has generally improved (26 hours/fish) compared to the previous 10-year average of 35 hours/fish. The DNR will continue to evaluate the brown trout fishery with the creel survey and assess stocking strategies.

Acknowledgements

Dozens of staff across several locations make this effort possible. DNR fisheries staff from Sturgeon Bay and Besadny Anadromous Fish Facility in Kewaunee collected brood fish on the Kewaunee River. DNR fisheries staff from Milwaukee and Eagle collected and transported brood fish from the Root River and Milwaukee Harbor and river. DNR fisheries staff from the Wild Rose Hatchery, Brule Hatchery, and BAFF were involved in various aspects of the Seeforellen gamete collection and rearing the fish. DNR fish health veterinarians Dr. Nicole Nietlisbach, Dr. Danielle Godard, and Kennedy Laessig and Stephanie Holt-Yopp collected fish health samples at BAFF. Peshtigo fisheries staff collected biological data at BAFF. Lake Michigan and Green Bay DNR creel clerks collected catch, harvest, and effort information from anglers. Data for trout and salmon for all surveys were entered into the DNR Lake Michigan Fish Tracking Database by Peshtigo staff.

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Status of Walleye in Green Bay, the Fox River and Other Major Tributaries

Background

Walleye stocks in southern Green Bay were decimated during the early to mid-1900s by habitat destruction, pollution, interactions with invasive species and over-exploitation. Following water quality improvements in the early 1970s, the Wisconsin Department of Natural Resources (DNR) began to stock fry and fingerling walleye to rehabilitate the population. This stocking program was so successful in re-establishing a naturally reproducing walleye fishery that stocking was stopped in all areas throughout southern Green Bay and its tributaries in 1984, except for the Sturgeon Bay area. Walleye stocking in Sturgeon Bay continued until 2012 when stocking was stopped in this area as well. Since 1984, surveys have been conducted to assess adult and young of the year (YOY) walleye in the Fox River, Green Bay and other major tributaries.

This report aims to summarize data collected on the walleye stocks in Green Bay, the Fox River and other major tributaries during the 2024 field season and to describe long-term trends in YOY production and angler catch and harvest.

Spring Electrofishing Surveys

In 2024, spring electrofishing surveys were conducted on each of the four major tributaries that support walleye spawning runs (i.e., the Fox River, Oconto River, Peshtigo River, and Menominee River) as well as the Sturgeon Bay area. The primary objectives of the adult walleye spawning population surveys include: 1.) marking adult walleye with anchor (floy) tags to estimate angler exploitation, 2.) evaluating the age and size distribution of the adult spawning population in each spawning location, 3.) monitoring adult growth rates, and 4.) assessing spawning habitat conditions in each spawning location.

Spring 2024 adult walleye surveys marked the first year of a new reward tag study that was formed as a partnership between the DNR and Walleyes for Tomorrow with the goal of getting an annual estimate of angler exploitation of the adult walleye population (i.e., the percentage of the adult population that is harvested by anglers each year) and attaining angler tag reporting rates for Green Bay walleye. Significantly more effort was put into sampling adult walleye in spring 2024 compared to previous years as the goal was to tag up to 5,000 walleye across all five spawning areas. The tagging goal for each spawning location was dependent on the estimated size of the spawning run in a given location with the goal of tagging 2,000 walleye from the Fox River as this river supports the largest walleye spawning run, tagging 1,500 walleye from the Menominee River as this river supports the second largest walleye spawning run and tagging 500 walleye in the Oconto River, Peshtigo River and Sturgeon Bay area as these are the smallest of the walleye spawning runs. The 5,000 walleye tagging goal included the majority of fish tagged with a yellow non-reward tag and 200 (100 male and 100 female walleye) receiving a red reward tag. The goal was to divide up reward tags in similar proportions to non-reward tags with the Fox River receiving 80 reward tags, the Menominee River 60 and the three smallest spawning locations each receiving 20 reward tags.

Anglers who reported catching a walleye with a yellow non-reward floy tag received the tagging history of that fish. Anglers who reported catching a walleye with a red reward tag received information about the tagging history of that walleye as well as a $100 reward from Walleyes for Tomorrow as long as the tag was still valid (reward tags are only valid until the "Valid Until" date printed on the tag which is approximately 1 year from the time of tagging), and they provided proper verification. Anglers had to have proper verification that they caught a reward tagged walleye with a tag that was still valid to receive the $100 reward. Proper verification could include mailing in the physical tag if the fish was harvested or emailing a picture of the tag that includes the three-digit tag number. The walleye did not need to be harvested to receive the $100 reward. Proper verification for a fish that was released includes a close-up picture of the tag in the fish including the three-digit tag number and a picture of the angler holding the fish showing the tag next to the dorsal fin. Anglers who wanted to release a tagged walleye were asked to leave the tag in place.

Along with floy tagging all captured walleye, we collected additional data on each fish including total length and sex. We collected a dorsal fin spine from up to 10 walleye per ½ inch length bin for each sex from each location to estimate the age composition of the adult spawning population in each location. We used a spawning location specific age-length key to assign an age to all walleye from a given spawning location that did not have a fin spine collected based on an individual walleye's length and the age composition of fish of a similar length and sex. The percentage of male and female walleye of each age (i.e., an age class) was calculated for each spawning location to evaluate the age structure of the spawning population in a given location. Mean lengths at age were calculated for male and female walleye across all spawning locations to get average growth rates for the adult population of male and female walleye across the Green Bay system. A von Bertalanffy growth curve was fit to mean lengths at age for each sex to get a predicted mean length at age for each sex that accounts for variability in growth rates among different ages in the population.

ALL SPAWNING LOCATIONS

Spring 2024 electrofishing surveys started on the Fox River on March 4 and ended on April 15 in Sturgeon Bay. A total of 44.2 hours of electrofishing effort was expended to capture 4,535 walleye for a catch rate of 102.6 walleye per hour of electrofishing across all spawning locations. Walleye catch rates were lower in 2024 compared to previous years as more effort was put into capturing walleye prior to the peak of the spawning runs to have as many tagged walleye in the system at the peak of the spawning runs when angler effort, catch and harvest are typically highest during spring. Tagging goals were met or exceeded in most spawning locations with 1,543 walleye being tagged in the Fox River, 500 walleye being tagged in the Oconto River, 511 walleye being tagged in the Peshtigo River, 1,500 walleye being tagged in the Menominee River and 481 walleye tagged in the Sturgeon Bay area.

Captured walleye ranged in size from 13.4-30.7 inches (340-781 mm) with an average length of 21.5 inches (546 mm; Figure 1). A total of 2,499 male walleye were captured ranging in size from 13.4-27.7 inches (340-704 mm) with an average length of 20.3 inches (515 mm; Figure 1). A total of 2,035 female walleye were captured ranging in size from 16.4-30.7 inches (416-781 mm) with an average length of 23.0 inches (585 mm; Figure 1). One walleye of an unknown sex was captured that was 16.7 inches long (425 mm).

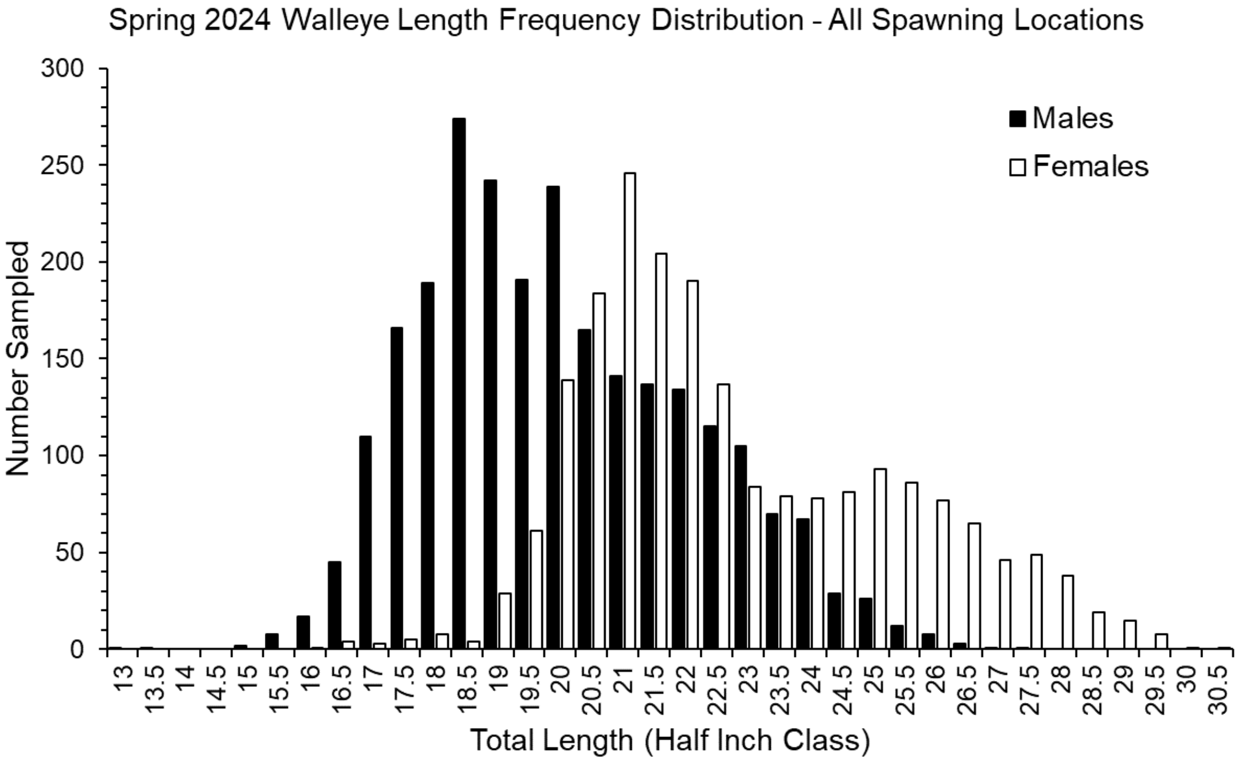


Figure 1. The length distribution of all male and female walleye captured during 2024 spring electrofishing surveys across all five spawning locations.

During the spring 2024 electrofishing surveys across all spawning locations, dorsal fin spines were collected from 1,770 walleye while an age length key was used to assign an age to 2,765 walleye. The percentage of male and female walleye in each age class in the adult spawning population is shown in Figure 2. Age-6 walleye were the largest age class in the spring adult spawning populations across all spawning locations, making up approximately 49% of the male walleye and 56% of the female walleye that were captured (Figure 2). It is not surprising that age-6 walleye were the largest age class in the adult spawning population since the 2018 year class (i.e., the age-6 adults) was the largest year class recorded in fall young of year (YOY) electrofishing surveys going back to 1993 when fall YOY surveys started.

Ages 11, 9, 8 and 10 were the next largest age classes for male walleye, with each of these age classes making up between 5-11% of all the male walleye that were captured across all spawning locations (Figure 2). Similarly, ages 11, 9 and 10 were the next largest age classes for female walleye, with each of these age classes making up 5-8% of all the female walleye that were captured across all spawning locations (Figure 2). All but one age class from 2-20 were present in the male walleye spawning population while all age classes from 3-21 were present in the female walleye spawning population meaning at least 20 age classes were captured during spring electrofishing surveys across all spawning locations (Figure 2).

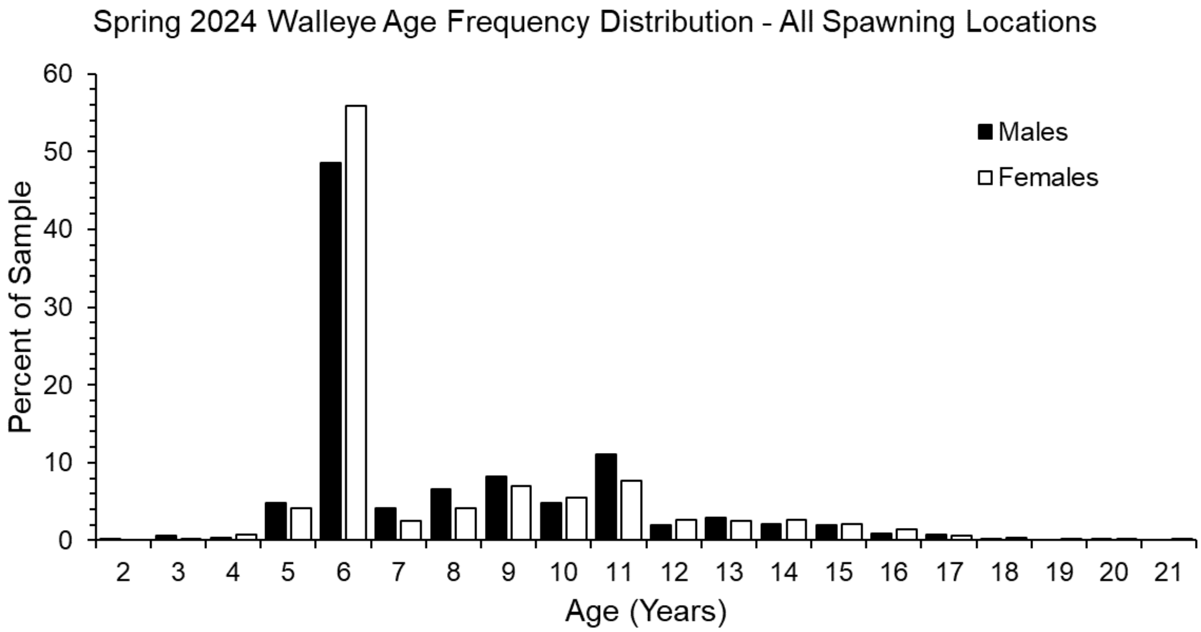


Figure 2. Age-frequency distribution of male and female walleye captured during spring electrofishing surveys across all five spawning locations in 2024. The data are presented as the percentage that each age class contributes to the total sample.

FOX RIVER

Spring 2024 electrofishing surveys of the Fox River started on March 4 and ended on April 5. A total of 16.75 hours of electrofishing effort was expended to capture 1,543 walleye for a catch rate of 92.1 walleye per hour of electrofishing. Captured walleye ranged in size from 13.9-29.5 inches (355-750 mm) and had an average length of 21.1 inches (537 mm).

Across all Fox River electrofishing surveys, a total of 1,057 female walleye were captured ranging in size from 16.4-29.5 inches (416-750 mm) with an average length of 22.5 inches (571 mm; Figure 3). Just under 70% of the female walleye that were captured were <23.0 inches (585 mm), whereas just over 11% were ≥26.0 inches (660 mm; Figure 3). A total of 485 male walleye were also captured, ranging in size from 13.9-22.9 inches (355-584 mm) with an average length of 18.2 inches (462 mm; Figure 3). Only 6.8% of the male walleye that were captured were ≥20 inches or 508 mm (Figure 3). Just one walleye of unknown sex was captured, and that walleye was 16.7 inches long (425 mm).

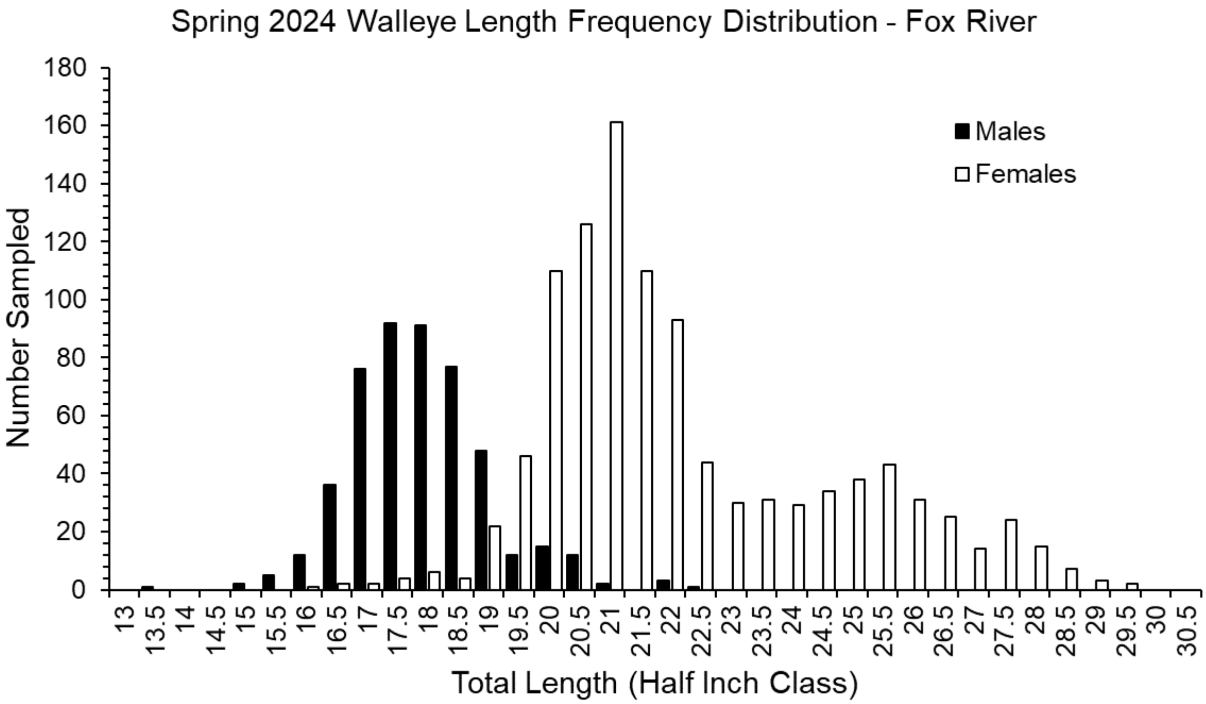


Figure 3. The length distribution of male and female walleye captured during spring 2024 electrofishing surveys on the Fox River.

During the spring 2024 Fox River surveys, dorsal fin spines were collected from 414 walleye while an age length key was used to assign an age to 1,128 walleye. The percentage of male and female walleye in each age class in the Fox River adult spawning population is shown in Figure 4. Age-6 walleye were the largest age class in the spring adult spawning population, making up approximately 80% of the male walleye and 62% of the female walleye that were captured (Figure 4). It is not surprising that age-6 walleye were the largest age class in the adult spawning population since the 2018 year class (i.e., the age-6 adults) was the largest year class recorded in fall young of year (YOY) electrofishing surveys going back to 1993 when fall YOY surveys started.

Ages 5, 7 and 3 were the next largest age classes for male walleye, with each of these age classes making up approximately 10, 4 and 2% of the male spawning walleye population, respectively (Figure 4). Ages 10, 11 and 5 were the next largest age classes for female walleye, with each of these age classes making up 5-8% of the female spawning walleye population (Figure 4). All age classes from 2-10 were present in the male walleye spawning population while all age classes from 3-17 were present in the female walleye spawning population (Figure 4). Additionally, one female walleye was estimated to be 21 years old (Figure 4), meaning at least 16 age classes were contributing to the population of walleye in the Fox River in spring 2024 (Figure 4).

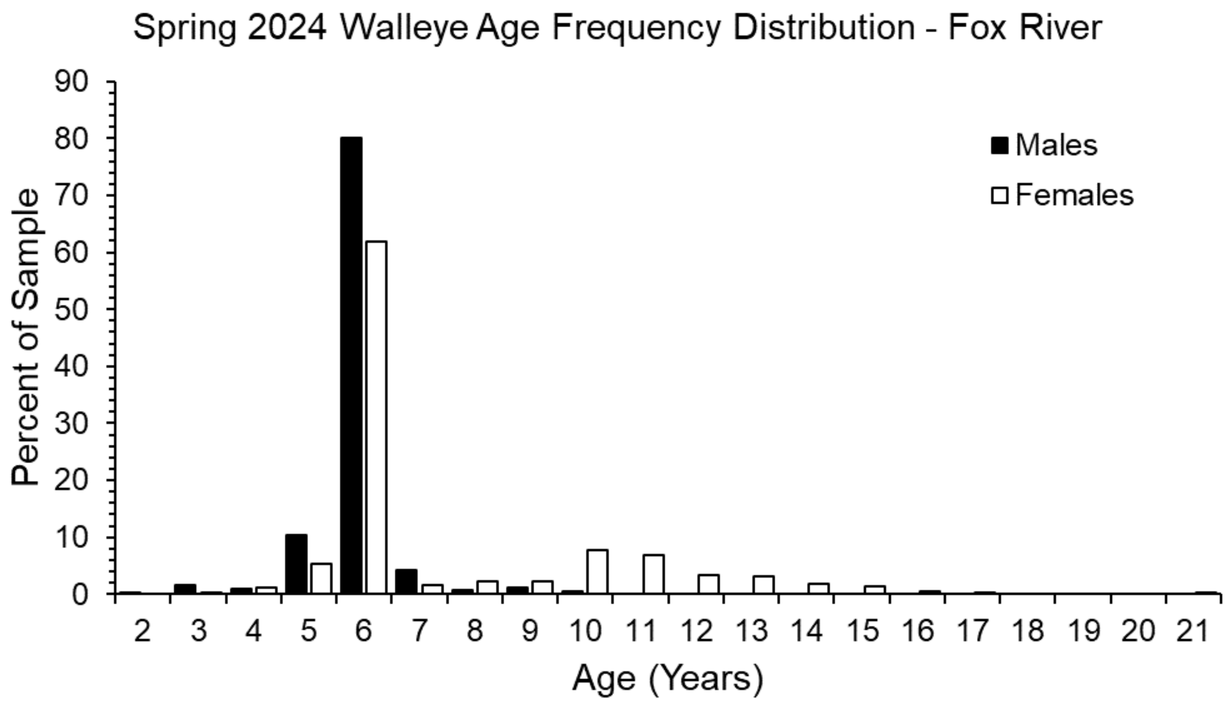


Figure 4. Age-frequency distribution of male and female walleye captured during spring electrofishing surveys of the Fox River in 2024. The data are presented as the percentage that each age class contributes to the total sample.

OCONTO RIVER

Spring 2024 electrofishing surveys of the Oconto River started on March 13 and ended on March 29. A total of 6.43 hours of electrofishing effort was expended to capture 500 walleye for a catch rate of 77.7 walleye per hour of electrofishing. Captured walleye ranged in size from 13.4-29.3 inches (340-745 mm) and had an average length of 21.6 inches (548 mm).

Across all Oconto River surveys, 286 female walleye were captured ranging in size from 16.9-29.3 inches (430-745 mm) with an average length of 23.2 inches (588 mm; Figure 5). Just over 60% of the female walleye that were captured were <23.0 inches (585 mm), whereas just over 15% were ≥26.0 inches (660 mm; Figure 5). A total of 214 male walleye were also captured ranging in size from 13.4-25.9 inches (340-660 mm) with an average length of 19.5 inches (495 mm; Figure 5). Just over 30% of the male walleye that were captured were ≥20 inches or 508 mm (Figure 5).

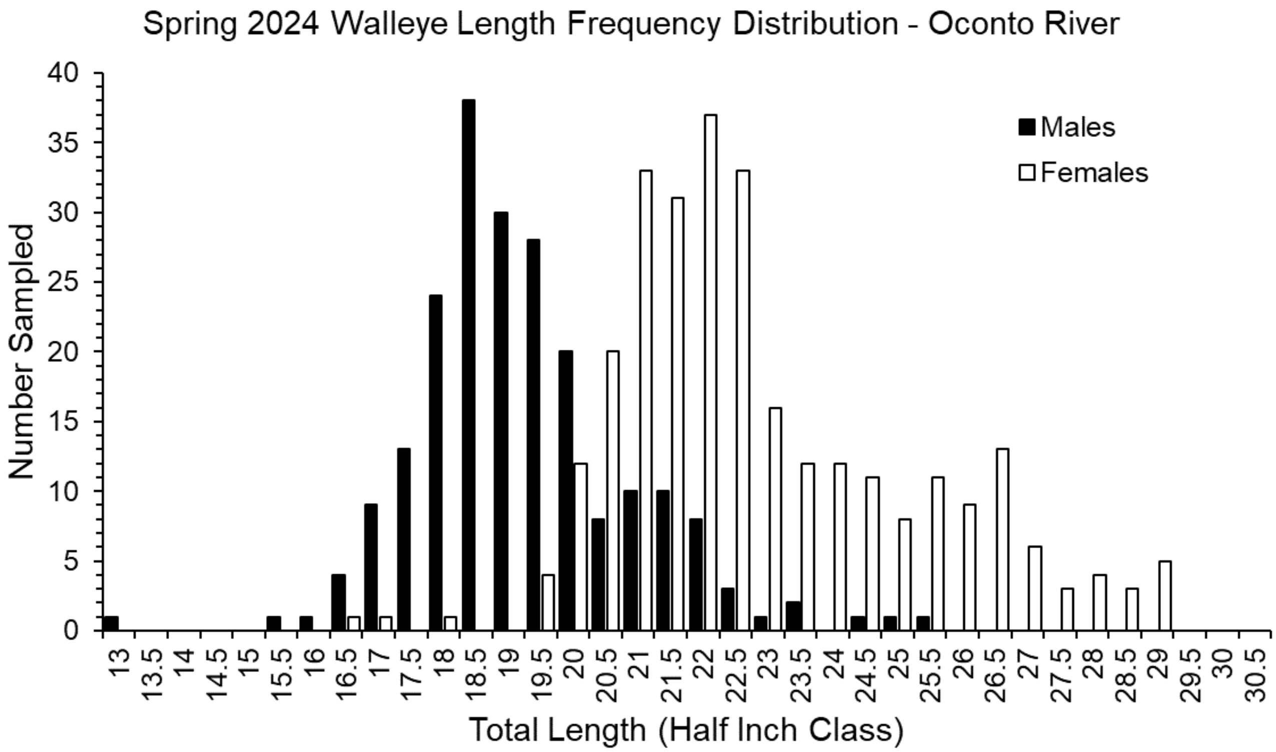


Figure 5. The length distribution of male and female walleye captured during spring 2024 electrofishing surveys on the Oconto River.

During the 2024 spring Oconto River surveys, dorsal fin spines were collected from 325 walleye while an age length key was used to assign an age to 175 walleye. The percentage of male and female walleye in each age class in the Oconto River adult spawning population is shown in Figure 6. Age-6 walleye were also the largest age class in the Oconto River spring adult spawning population, making up approximately 63% of the male walleye and 58% of the female walleye that were captured (Figure 6). It is not surprising that age-6 walleye were the largest age class in the adult spawning population since the 2018 year class (i.e., the age-6 adults) was the largest year class recorded in fall YOY electrofishing surveys going back to 1993 when fall YOY surveys started.

Ages 8 and 9 were the next largest age classes for male walleye with each of these age classes making up 7.5% of the male spawning walleye population while ages 5, 7 and 11 all made up just under 5% of the adult male spawning population (Figure 6). Ages 8, 9 and 11 were the next largest age classes for female walleye, with each of these age classes making up 6-13% of the female spawning walleye population (Figure 6). All age classes from 2-15 were present in the male walleye spawning population while all but three age classes from 4-17 were present in the female walleye spawning population, meaning at least 16 age classes were contributing to the adult population of walleye in the Oconto River in spring 2024 (Figure 6).

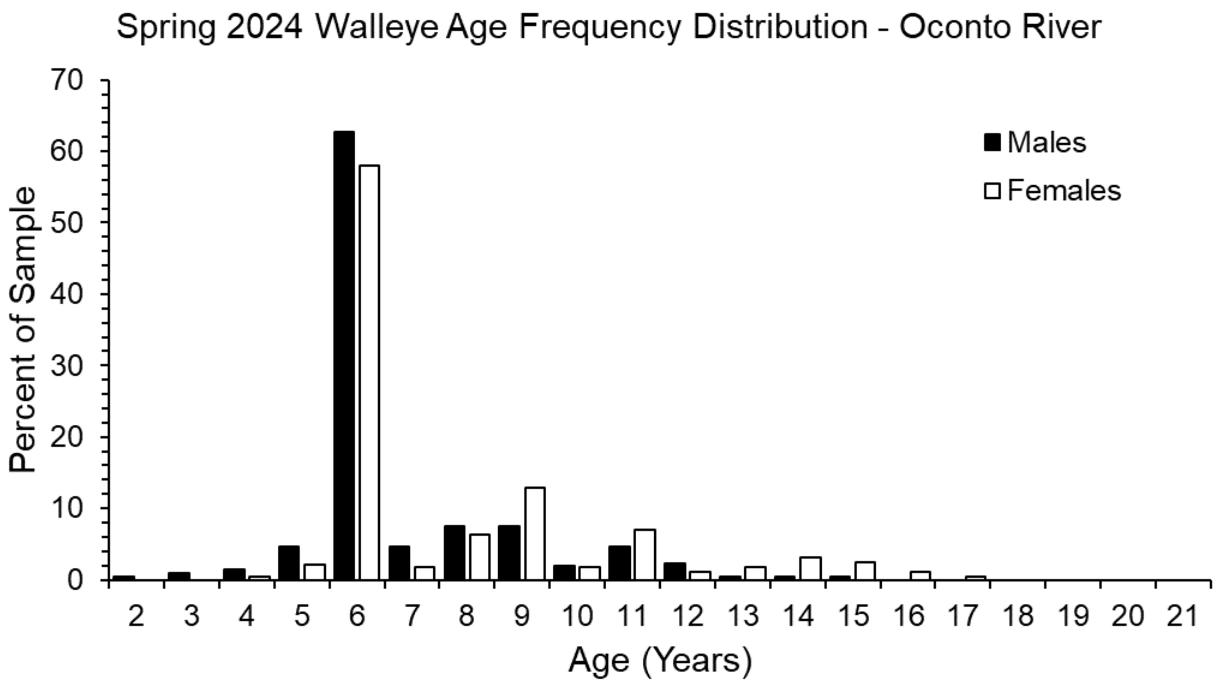


Figure 6. Age-frequency distribution of male and female walleye captured during spring electrofishing surveys of the Oconto River in 2024. The data are presented as the percentage that each age class contributes to the total sample.

PESHTIGO RIVER

Spring 2024 electrofishing surveys of the Peshtigo River started on March 26 and ended on April 10. A total of 2.9 hours of electrofishing effort was expended to capture 511 walleye for a catch rate of 176.2 walleye per hour of electrofishing. Captured walleye ranged in size from 17.1-29.9 inches (435-761 mm) and had an average length of 21.9 inches (555 mm).

Across all Peshtigo River surveys, 190 female walleye were captured ranging in size from 19.1-29.9 inches (485-761 mm) with an average length of 23.9 inches (608 mm; Figure 7). Just under 45% of the female walleye that were captured were <23.0 inches (585 mm), whereas just over 24% were ≥26.0 inches (660 mm; Figure 7). A total of 321 male walleye were also captured ranging in size from 17.1-25.4 inches (435-645 mm) with an average length of 20.6 inches (524 mm; Figure 7). Just over 60% of the male walleye that were captured were ≥20 inches or 508 mm (Figure 7).

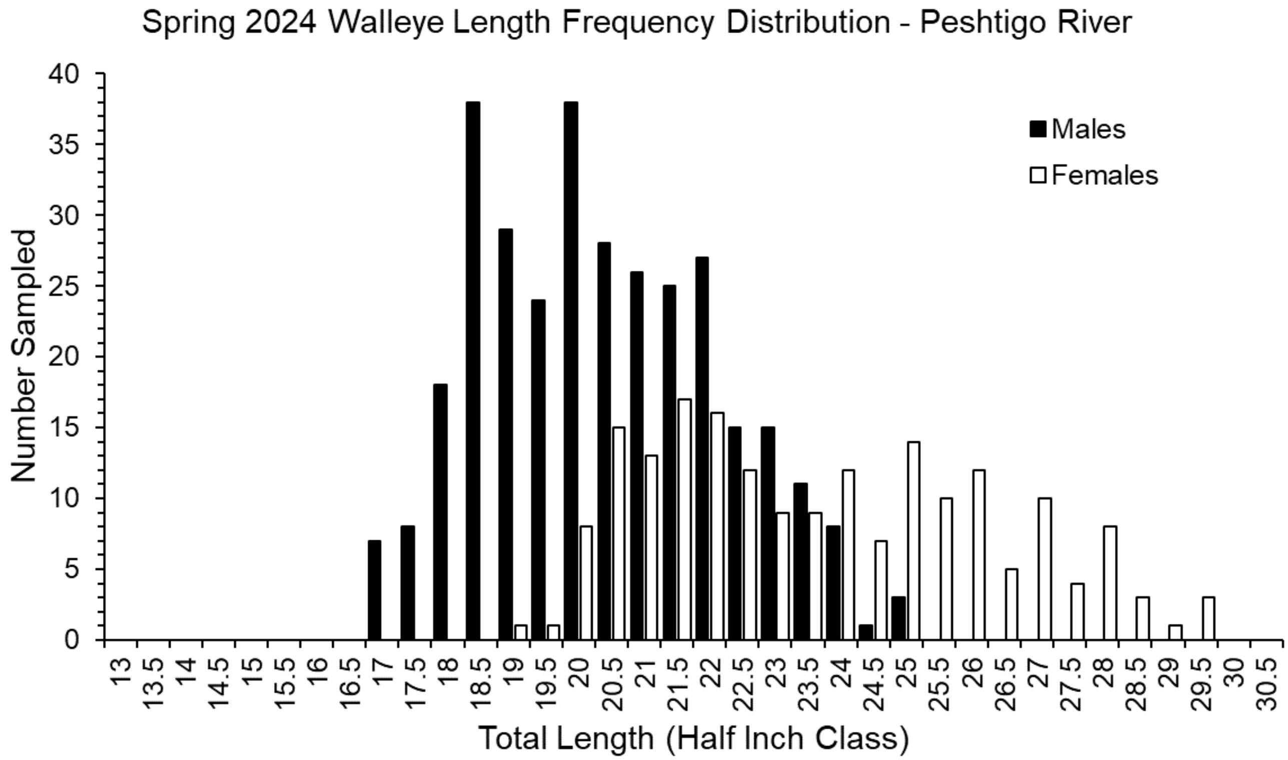


Figure 7. The length distribution of male and female walleye captured during spring 2024 electrofishing surveys on the Peshtigo River.

During the 2024 spring Peshtigo River surveys, dorsal fin spines were collected from 352 walleye while an age length key was used to assign an age to 159 walleye. The percentage of male and female walleye in each age class in the Peshtigo River adult spawning population is shown in Figure 8. Age-6 walleye were also the largest age class in the Peshtigo River spring adult spawning population, making up approximately 38% of the male walleye and 43% of the female walleye that were captured (Figure 8). It is not surprising that age-6 walleye were the largest age class in the adult spawning population since the 2018 year class (i.e., the age-6 adults) was the largest year class recorded in fall YOY electrofishing surveys going back to 1993 when fall YOY surveys started.

Ages 9, 8, 11 and 7 were the next largest age classes for male walleye, with each of these age classes making up 9-14% of the male spawning walleye population (Figure 8). Ages 9, 11 and 8 were the next largest age classes of female walleye, with each of these age classes making up 7-16% of the female spawning walleye population (Figure 8). All age classes from ages 5-17 were present in the male walleye spawning population while all age classes from ages 4-18 were present in the female walleye spawning population, meaning at least 15 age classes were contributing to the adult spawning population of walleye in the Peshtigo River in 2024 (Figure 8).

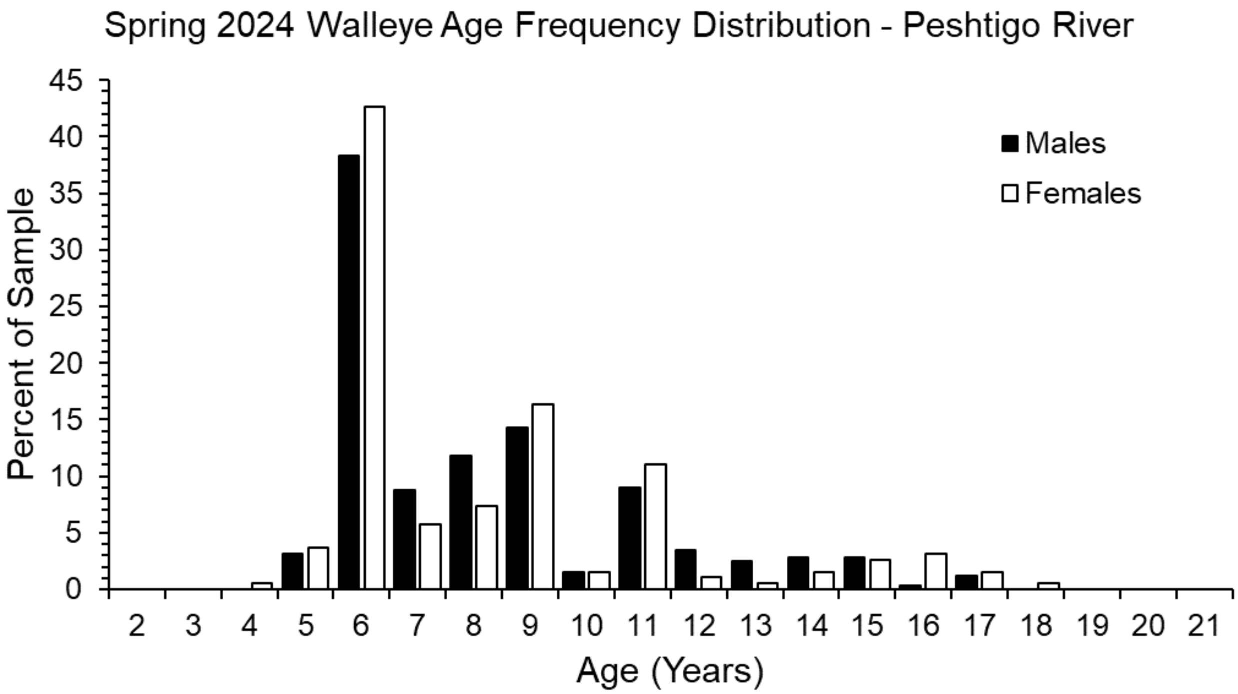


Figure 8. Age-frequency distribution of male and female walleye captured during spring electrofishing surveys of the Peshtigo River in 2024. The data are presented as the percentage that each age class contributes to the total sample.

MENOMINEE RIVER

Spring 2024 electrofishing surveys of the Menominee River started on March 11 and ended on April 10. A total of 11.6 hours of electrofishing effort was expended to capture 1,500 walleye for a catch rate of 128.9 walleye per hour of electrofishing. Captured walleye ranged in size from 15.9-30.1 inches (403-765 mm) and had an average length of 21.3 inches (540 mm).

Across all Menominee River surveys, 466 female walleye were captured ranging in size from 16.6-30.1 inches (422-765 mm) with an average length of 23.6 inches (598 mm; Figure 9). Just under half of the female walleye that were captured were <23.0 inches (585 mm), whereas just over 17% were ≥26.0 inches (660 mm; Figure 9). A total of 1,034 male walleye were also captured, ranging in size from 15.9-27.4 inches (403-697 mm) with an average length of 20.2 inches (513 mm; Figure 9). Just over 52% of the males that were captured were ≥20 inches or 508 mm including eight that were >25.0 inches (Figure 9).

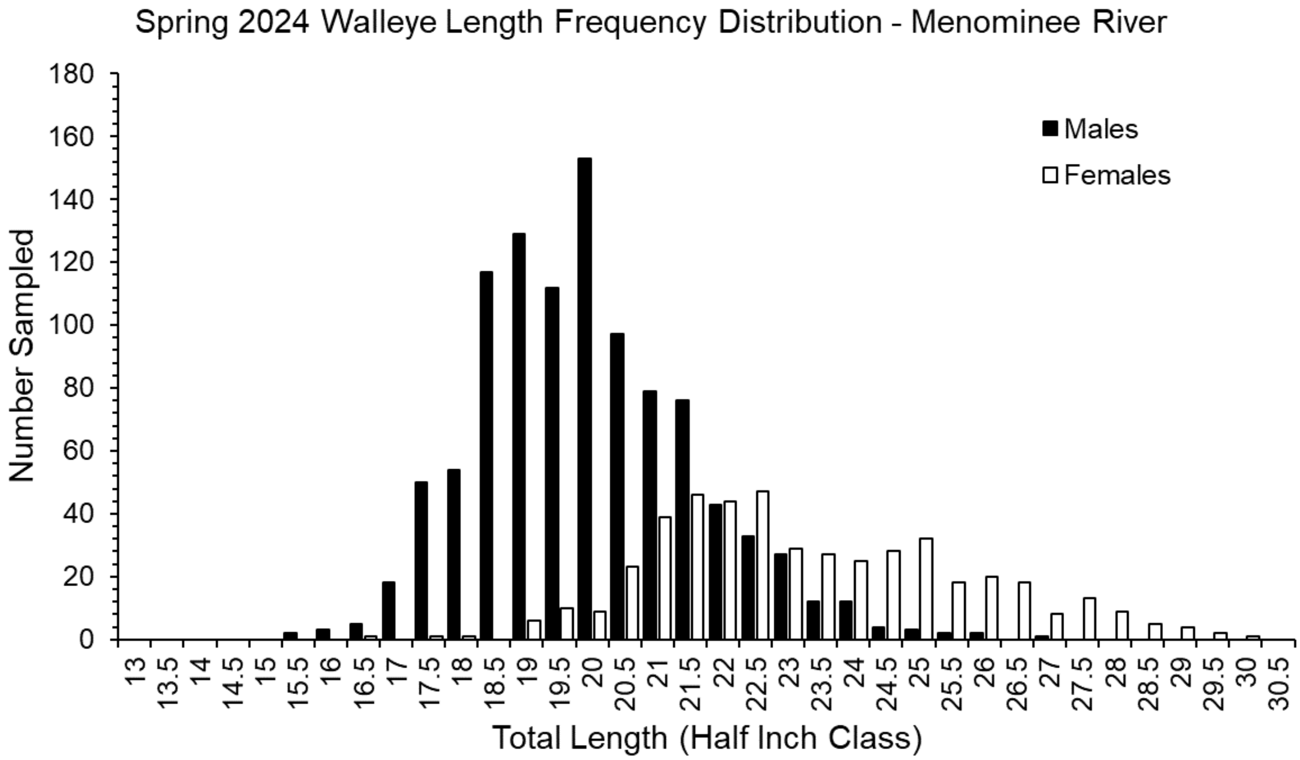


Figure 9. The length distribution of male and female walleye captured during spring 2024 electrofishing surveys on the Menominee River.

During the 2024 spring Menominee River surveys, dorsal fin spines were collected from 432 walleye while an age length key was used to assign an age to 1,068 walleye. The percentage of male and female walleye in each age class in the Menominee River adult spawning population is shown in Figure 10. Age-6 walleye were also the largest age class in the Menominee River spring adult spawning population, making up approximately 51% of the male walleye and 50% of the female walleye that were captured (Figure 10). It is not surprising that age-6 walleye were the largest age class in the adult spawning population since the 2018 year class (i.e., the age-6 adults) was the largest year class recorded in fall YOY electrofishing surveys going back to 1993 when fall YOY surveys started.

Ages 8, 9 and 11 were the next largest age classes for male walleye, with each of these age classes making up 8-10% of the male spawning walleye population (Figure 10). Ages 9, 11 and 8 were the next largest age classes of female walleye, with each of these age classes making up 6-10% of the female spawning walleye population (Figure 10). All but one age class from ages 3-18 were present in the male walleye spawning population while all age classes from ages 5-20 were present in the female walleye spawning population, meaning at least 17 age classes were contributing to the adult spawning population of walleye in the Menominee River in 2024 (Figure 10).

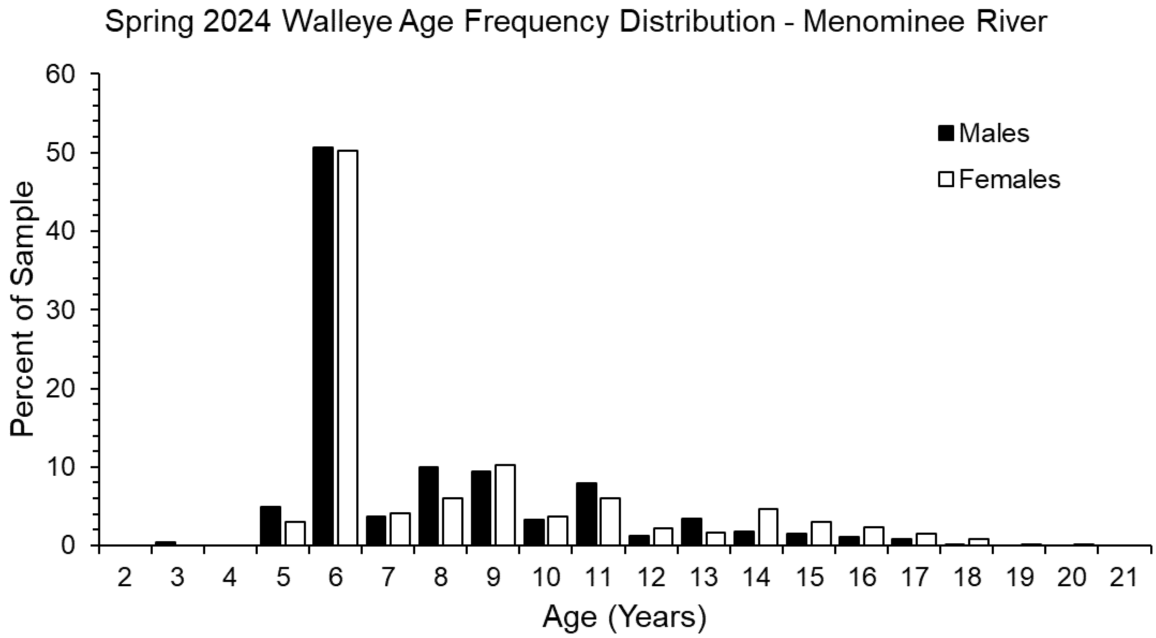


Figure 10. Age-frequency distribution of male and female walleye captured during spring electrofishing surveys of the Menominee River in 2024. The data are presented as the percentage that each age class contributes to the total sample.

STURGEON BAY AREA

Spring 2024 electrofishing surveys of the Sturgeon Bay area started on March 28 and ended on April 15. A total of 6.5 hours of electrofishing effort was expended to capture 481 walleye for a catch rate of 74.4 walleye per hour of electrofishing. Captured walleye ranged in size from 16.4-30.7 inches (416-781 mm) and had an average length of 23.1 inches (588 mm).

Across all Sturgeon Bay area surveys, 36 female walleye were captured ranging in size from 22.5-30.7 inches (572-781 mm) with an average length of 27.1 inches (688 mm; Figure 11). Of all the female walleye that were captured, only one was <23.0 inches (585 mm), whereas just over 80% were ≥26.0 inches (660 mm; Figure 11). A total of 445 male walleye were also captured, ranging in size from 16.4-27.7 inches (416-704 mm) with an average length of 22.8 inches (579 mm; Figure 11). Just over 92% of the males that were captured were ≥20 inches or 508 mm including 38 that were >25.0 inches (Figure 11).

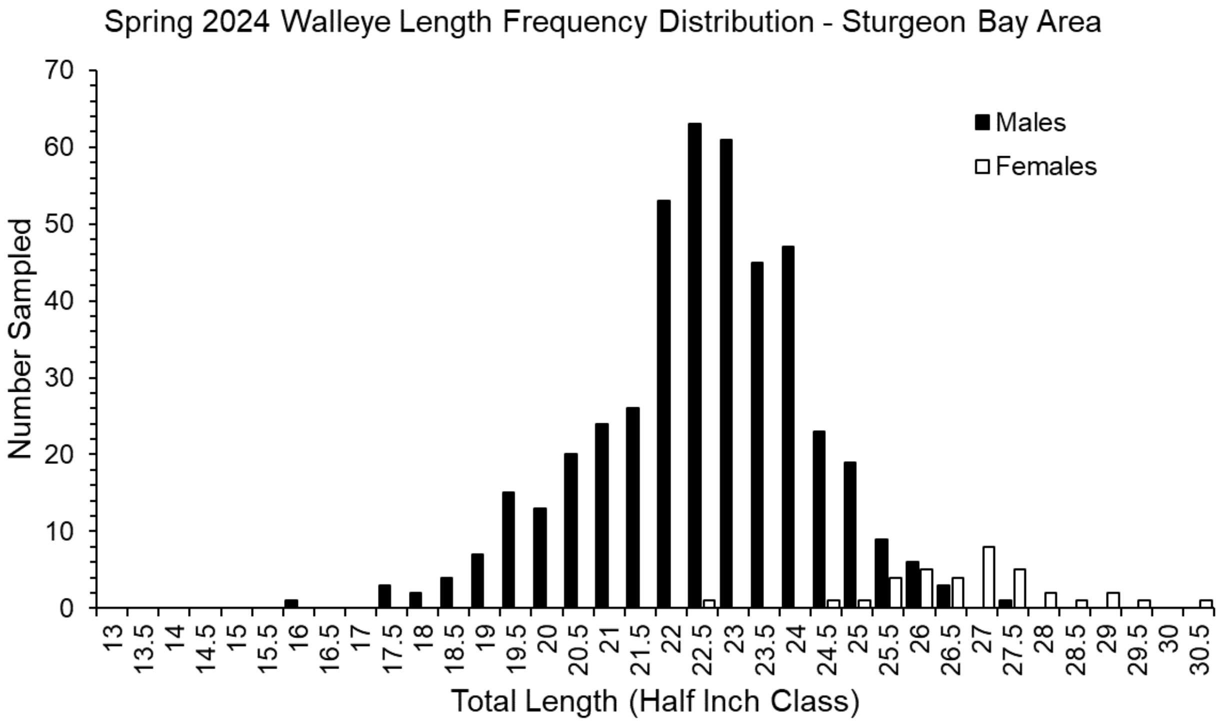


Figure 11. The length distribution of male and female walleye captured during spring 2024 electrofishing surveys in the Sturgeon Bay area.

During the 2024 spring Sturgeon Bay area surveys, dorsal fin spines were collected from 247 walleye while an age length key was used to assign an age to 234 walleye. The percentage of male and female walleye in each age class in the Sturgeon Bay area adult spawning population is shown in Figure 12. Age structure of the Sturgeon Bay spawning population differed from the other major spawning rivers in that age-11 was the dominant age class in the adult spawning population in this area, making up approximately 44% of the female walleye that were captured and 35% of the male walleye that were captured (Figure 12).

Ages 6, 9 and 10 were the next largest age classes for male walleye, with each of these age classes making up 9-17% of the male spawning walleye population (Figure 12). Ages 10, 13 and 16 were the next largest age classes of female walleye, with each of these age classes making up 11-14% of the female spawning walleye population (Figure 12). All but one age class from ages 6-20 were present in the male walleye spawning population while all but three age classes from ages 6-18 were present in the female walleye spawning population, meaning at least 15 age classes were contributing to the adult spawning population of walleye in the Sturgeon Bay area in 2024 (Figure 12). All walleye that are age-11 and younger would have been produced via natural reproduction as the last stocking in this area took place in 2012. The age distribution of the adult population in Sturgeon Bay aligns with catch rates of YOY walleye in fall electrofishing surveys of the Sawyer Harbor area that have been completed in most years since 2008 (DNR unpublished data). Results from these fall electrofishing surveys show the last big year classes of YOY walleye sampled in this area were from 2013 and 2014, which would be the 10 and 11 year old walleye from the 2024 adult survey.

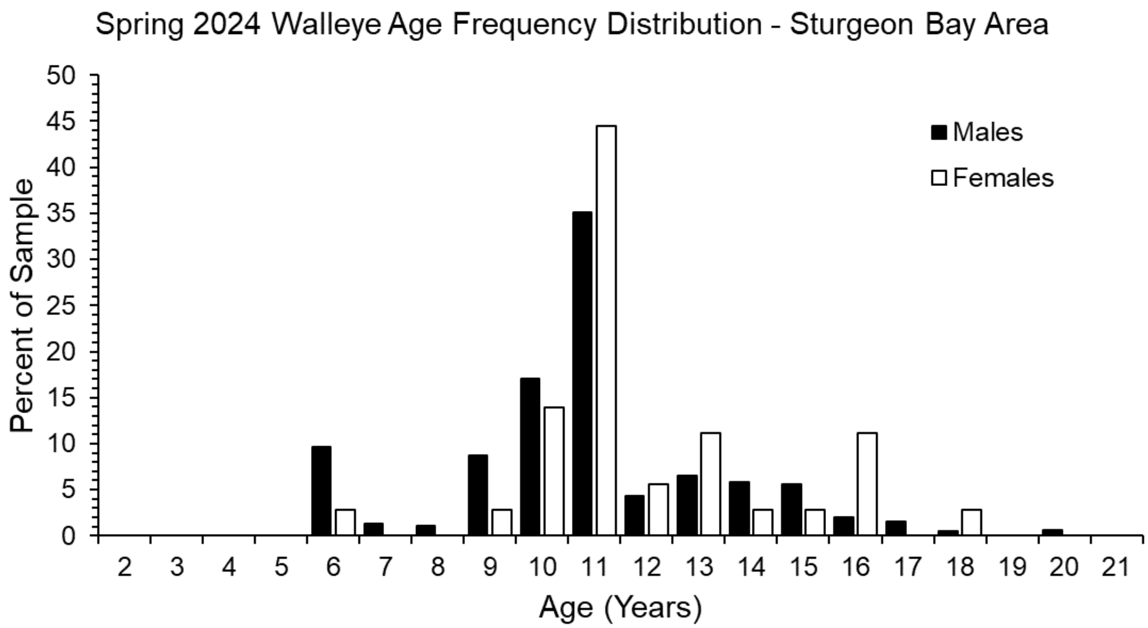
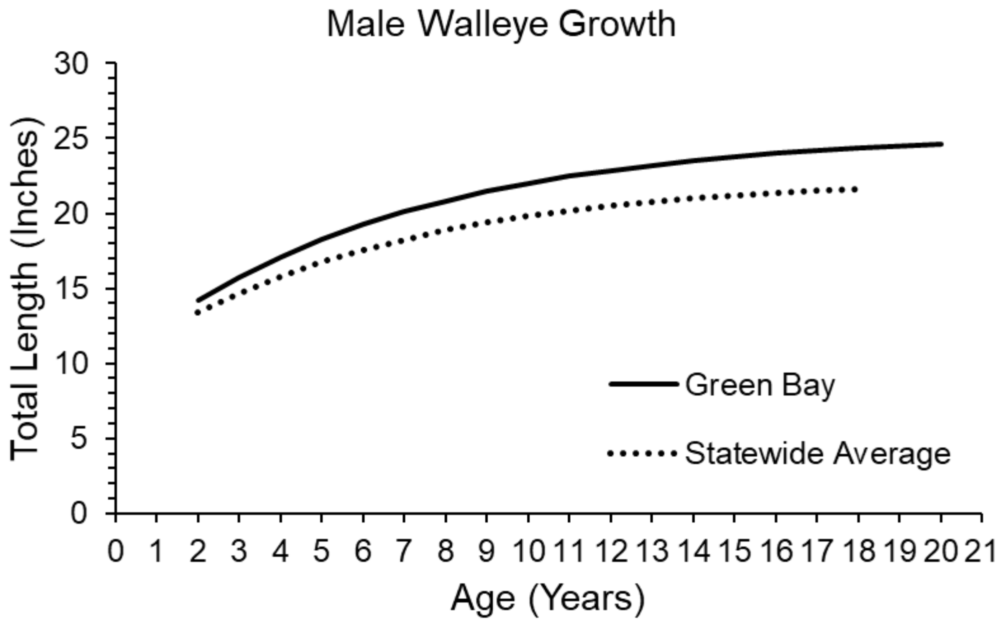


Figure 12. Age-frequency distribution of male and female walleye captured during spring electrofishing surveys of the Sturgeon Bay area in 2024. The data are presented as the percentage that each age class contributes to the total sample.

Walleye Growth Rates

Both male and female walleye from the Green Bay system are growing fast. By age-5, male walleye average just over 18 inches long and female walleye average about 20.5 inches long (Figure 13). Both male and female walleye from the Green Bay system are growing faster than the statewide average with both sexes tending to be 1.5-2 inches longer than an average walleye of the same age captured throughout the state of Wisconsin (Figure 13).



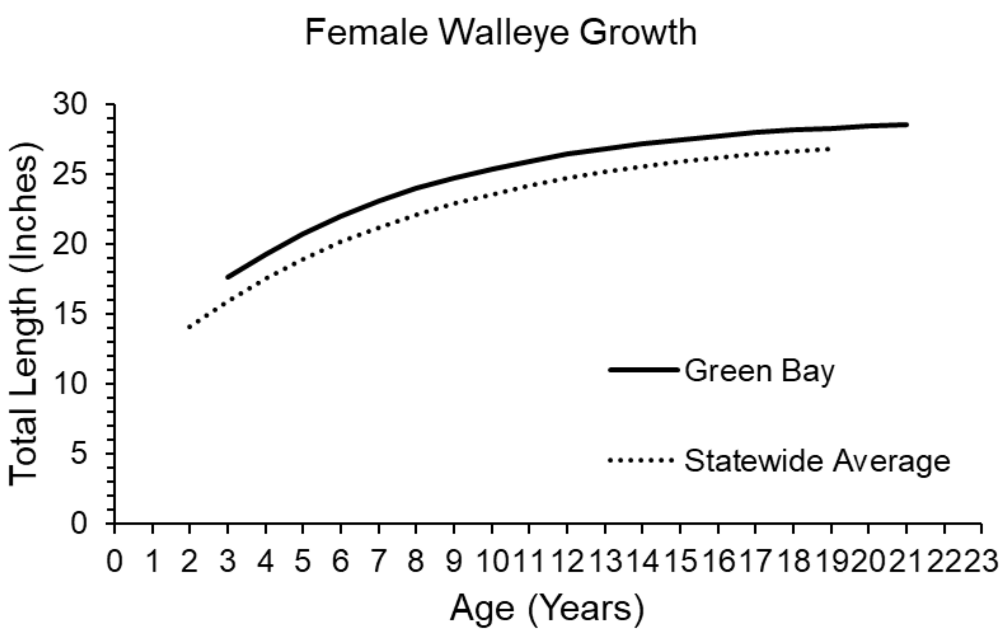


Figure 13. Predicted mean lengths at age (solid black line) for male (top) and female (bottom) walleye captured in 2024 spring electrofishing surveys across all spawning locations around Green Bay. The dotted black line represents the statewide average growth for male and female walleye.

Synopsis of Adult Spawning Populations

All five of the major spawning areas continue to support healthy walleye populations. Age-6 walleye were the dominant age class in all four of the major rivers, with this age class making up 35 percent or more of the adult spawning population for each sex in each river. Age-11 walleye were the dominant age class in the Sturgeon Bay area with a much lower percentage of age-6 walleye contributing to the age structure of the spawning population in the Sturgeon Bay area. Despite a different age structure in the adult walleye population in the Sturgeon Bay area, walleye do appear to be naturally reproducing in this area as all walleye age-11 and younger had to have been naturally reproduced since the last walleye stockings in this area took place in 2012. It should also be noted that walleye tend to live to be old in the Green Bay system as walleye that were age-15 or older were captured in all four tributaries as well as in the Sturgeon Bay area with most age classes younger than 15 years old being present in all five major spawning areas. Many large walleye were captured in each spawning location with the average length of a female walleye being 22.5 inches or larger across the five major spawning areas and walleye >29.0 inches being captured in each of these spawning locations as well.

Fall Electrofishing Index Surveys

During the fall of 2024, a total of 9.07 hours were spent electrofishing 16.5 miles of shoreline between lower Green Bay (7.7 miles and 4.42 hours) and the Fox River (8.8 miles and 4.65 hours) as part of the annual fall YOY walleye index electrofishing survey. A total of 450 walleye ranging in size from 7.8-26.9 inches (199-683 mm) were captured, with an average length of 14.5 inches (368 mm; Figure 14). Of the 450 walleye that were captured, 69 were YOY walleye and 381 were age-1 and older. The majority (i.e., 49 or 71%) of the YOY walleye were captured in the Fox River with 20 (i.e., 29%) being captured in lower Green Bay. The strong 2022 and 2023 year classes were evident in the fall 2024 electrofishing survey as 266 of the 381 age-1 and older walleye (i.e., 69.9%) were between 11 – 17 inches long, with the vast majority of the fish in this size range likely being from those two year classes.

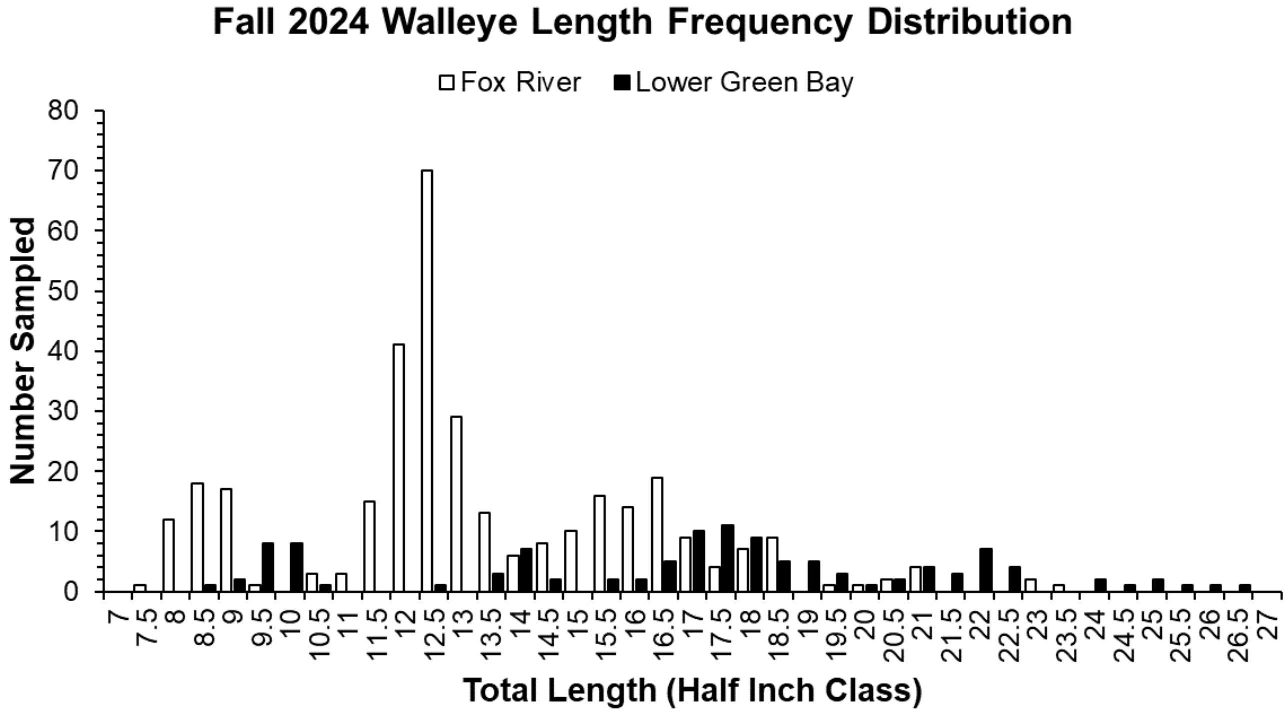


Figure 14. Length frequency distribution of walleye captured in fall 2024 electrofishing surveys of Lower Green Bay and the Fox River.

Recruitment of YOY Walleye

Results from our 2024 fall YOY electrofishing index surveys showed a below average but measurable year class of walleye in both the Fox River and lower Green Bay. Catch per unit effort of YOY walleye captured on the Fox River was 11.0 per hour of electrofishing, which is slightly below the long-term average catch rate of 17.6 YOY walleye per hour of electrofishing in the Fox River between 1993-2023 (Figure 15). The catch rate of YOY walleye in lower Green Bay in 2024 was 4.5 YOY walleye per hour of electrofishing (Figure 15). A catch rate of 4.5 YOY walleye per hour of electrofishing is about half of the long-term average catch rate for lower Green Bay from 1993-2023, which is 10.7 YOY walleye per hour of electrofishing (Figure 15). Catch rates of YOY walleye in both the Fox River and lower Green Bay showed more similar trends in 2024 in that catch rates in both areas were below the long-term averages.

Historically, strong and weak year classes have resulted in high and low catch rates of YOY walleye in both the Fox River and lower Green Bay. However, in 2022 and 2023, strong year classes were detected in the Fox River whereas weaker year classes were detected in lower Green Bay. It is unknown why there was such a large difference in catch rates of YOY walleye between the Fox River and lower Green Bay in 2022 and 2023. New YOY walleye index stations were added near the mouth of the Menominee, Peshtigo and Oconto Rivers in the fall of 2024. Despite no YOY walleye being captured in these locations in fall of 2024, they will continue to be surveyed in future years.

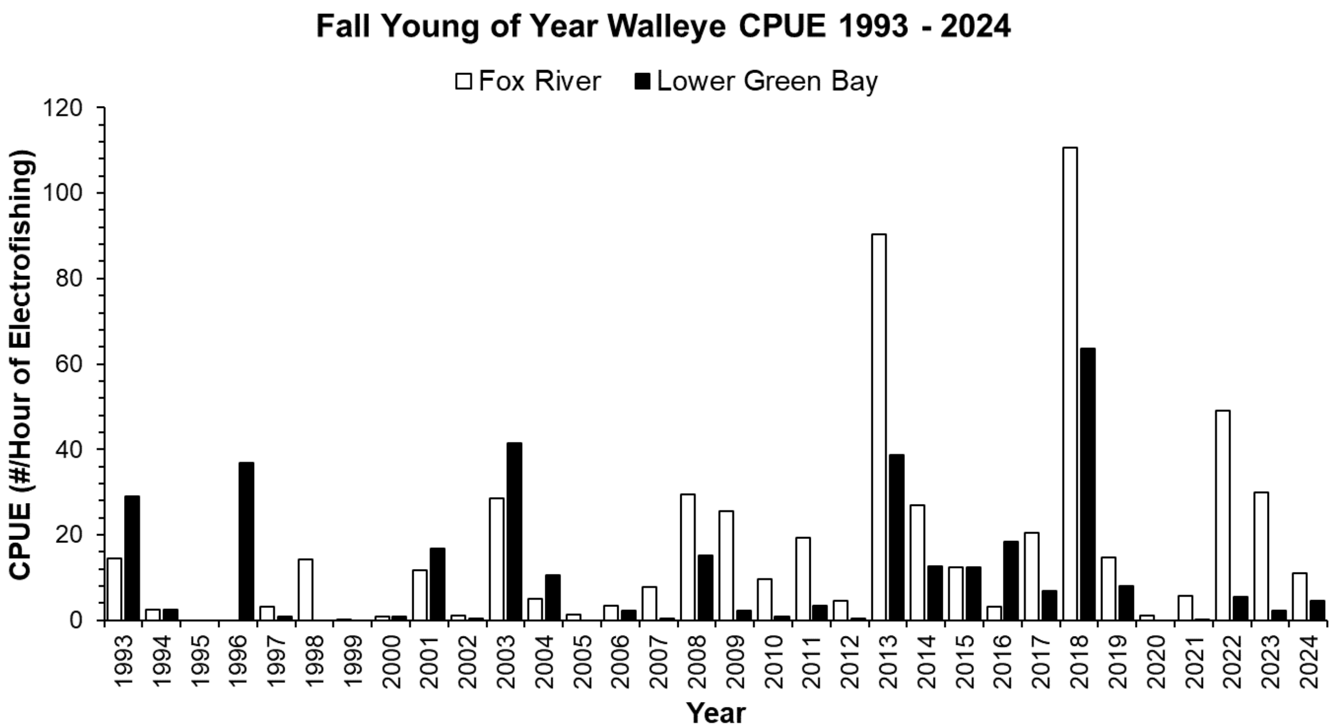


Figure 15. Catch per unit effort (CPUE) of young of year (YOY) walleye in the lower Fox River and lower Green Bay (south of a line drawn from Longtail Point to Point Sable), as measured by CPUE (number per hour) from data collected in electrofishing index surveys during 1993-2024.

Open Water Catch and Harvest Trends from Creel Surveys

Estimates of catch and harvest of walleye from Wisconsin waters of Green Bay and its tributaries have been generated from creel survey data collected during the open water fishing season in every year since 1986. From 1986-2012, open water creel surveys were conducted from March 15-Oct. 31. Starting in 2013, the end date of the open water creel was extended to Nov. 15 along the west shore of Green Bay and the Fox River. Due to budget limitations during the 2024 open water creel season, the east shore (from Bayshore County Park north) was not surveyed during the months of March and April and no creel surveys were completed during the month of November.

The estimated number of walleyes caught and harvested during the 2024 open water fishing season was considerably lower than estimates from 2021-2023 (Figure 16). The total catch of walleye during the 2024 open water season was estimated at 218,584 fish, which is about a 33% decline from the 328,366 walleye that were estimated to be caught during the 2023 open water season (Figure 16). Furthermore, the estimated catch of walleye during the 2024 open water season was about 30,000 fish below estimated average annual total catch of 245,191 walleye from 2013-2023.

Total open water harvest of walleye in 2024 was estimated to be 74,643 fish, which is about a 40% decline compared to the estimated number of walleye that were harvested during the 2021-2023 open water seasons (Figure 16). Harvest of walleye during the 2024 open water season was about 30,000 walleye lower than the average annual total harvest estimate of 106,183 walleye from 2013-2023.

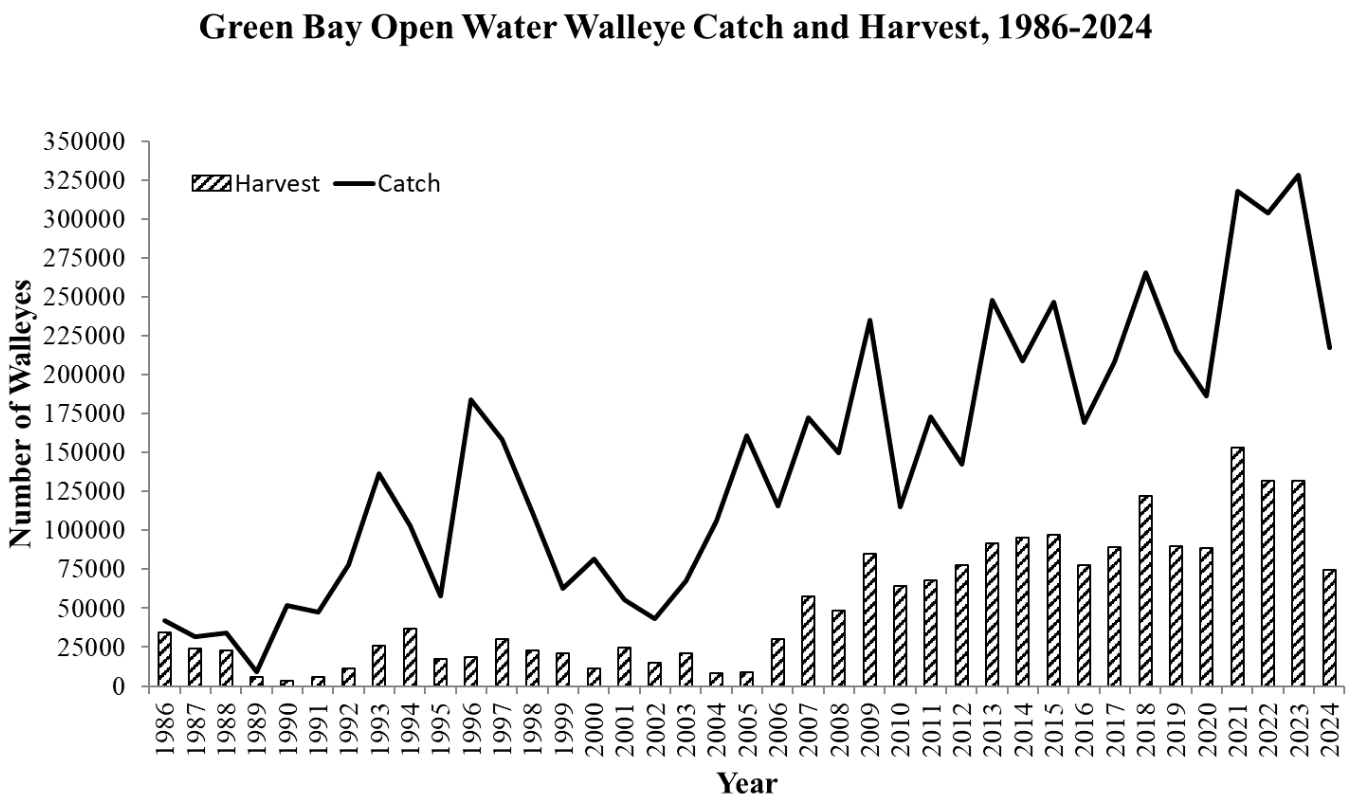


Figure 16. Estimated total open water season catch and harvest of walleye from Wisconsin waters of Green Bay and the lower Fox River from 1986 through 2024. 2020 data reflects only July-November data because of reduced creel effort due to the COVID-19 pandemic. Between 2013-2023, the end date for open water creel was extended from Oct. 31 to Nov. 15.

Trends in Angler Effort, Catch Rates and Harvest Rates from Creel Surveys

Between 2011-2023, the estimated number of hours that anglers have spent specifically targeting walleye has steadily increased (Figure 17). For example, in 2011 and 2012, anglers were spending about 350,000–450,000 hours targeting walleye across Wisconsin waters of Green Bay during the open water fishing season (Figure

17). Between 2021-2023 the number of hours spent targeting walleye increased to over 700,000 hours per year (Figure 17). In 2024, the estimated number of hours spent targeting walleye decreased to just 532,752 (Figure 17). This decline in effort was likely attributed to several factors. First off, budget limitations resulted in a reduced creel during the 2024 open water season including not completing creel surveys along the east shore of Green Bay from Bay Shore County Park and north during the months of March and April and not completing any creel during the month of November. However, the number of hours of effort spent targeting walleye in these locations during these months during the 2023 open water season was <22,000 hours or 2.7% of the total hours spent targeting walleye around the Green Bay system.

Fishing conditions likely played a much bigger role in the reduction in effort targeting walleye. For example, spring 2024 was very early and dry. This resulted in a long and drawn-out walleye spawn on the Fox River. Fisheries staff started tagging walleye on the Fox River on March 4th and encountered actively spawning walleye by March 15th. Tagging efforts were not completed on the Fox River until April 5th, and there were still plenty of actively spawning walleye around in the river at this time. The lack of flow and long, drawn-out spawn made for tougher fishing conditions on the Fox River. Results from creel surveys estimated that targeted walleye effort on the Fox River and Brown County water of Green Bay during March and April of 2024 was nearly 40,000 hours less than the number of hours spent targeting walleye in this area during the spring of 2023. Low water levels in spring may have also limited the areas where boat anglers could fish on west shore tributaries, particularly on the Oconto and Peshtigo rivers.

Despite significant declines in the amount of angling effort in 2024 compared to the last couple of years, estimated walleye catch rates and harvest rates from 2024 were very similar to previous years and have remained stable through time (Figure 18). Walleye catch rates show some year-to-year variability but have remained relatively stable with anglers catching between 0.30-0.45 walleye per hour of fishing effort (Figure 18). Catch rates in 2024 fell right in line with historical catch rates, as catch rates in 2024 were estimated to be at 0.39 walleye caught per hour of fishing (Figure 18). Walleye harvest rates have also shown some year-to-year variability but have remained relatively steady with anglers harvesting 0.10-0.20 walleye per hour of fishing effort (Figure 18). Similar to catch rates, the estimated walleye harvest rate in 2024 fell right in line with historical harvest rates as anglers harvested 0.13 walleye per hour of fishing in 2024 (Figure 18). Steady angler catch and harvest rates show that the walleye fishery remains strong in Green Bay and is not showing any signs of significant declines.

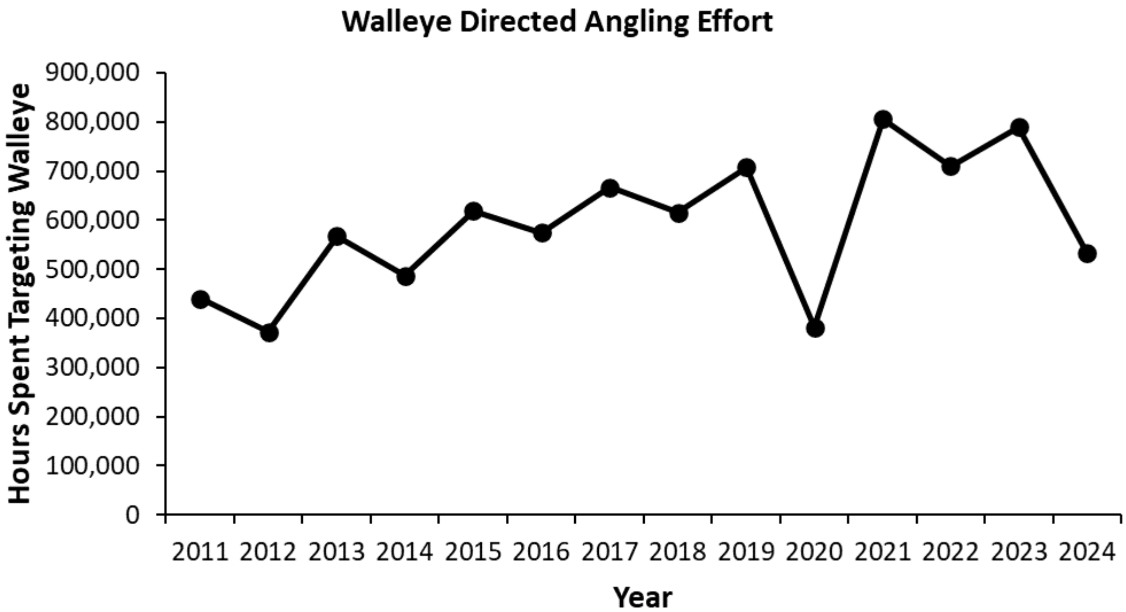


Figure 17. Estimated number of angling hours spent specifically targeting walleye in Wisconsin waters of Green Bay from 2011 through 2024. 2020 data reflects only July-November data because of reduced creel effort due to the COVID-19 pandemic. Between 2013-2023, the end date for open water creel was extended from Oct. 31 to Nov. 15.

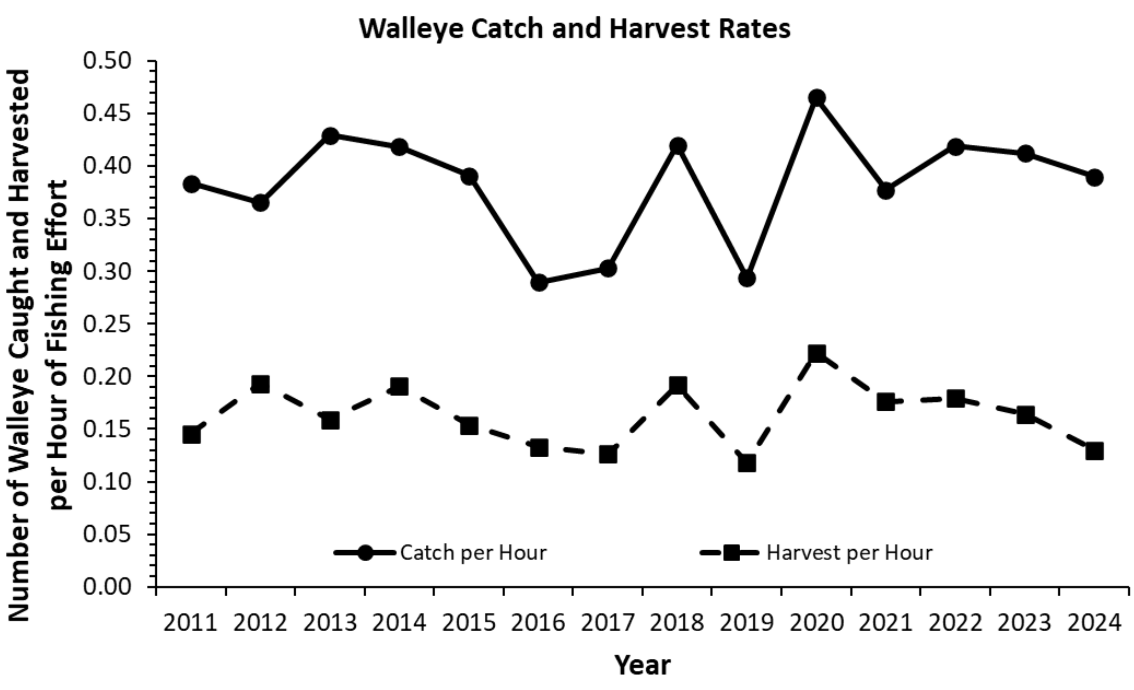


Figure 18. Estimated catch rates (solid black circles and solid line) and harvest rates (sloid black squares and dashed line) from anglers specifically targeting walleye in Wisconsin waters of Green Bay from 2011 through 2024. Between 2013-2023, the end date for open water creel was extended from Oct. 31 to Nov. 15.

Trends in catch and harvest from tag returns

TOTAL ANNUAL EXPLOITATION

Tagging of walleye in spring 2024 started on the Fox River on March 4 and ended on April 15 in Sturgeon Bay. Just under 2,000 walleye (including 105 with reward tags) were tagged by April 1, with the rest being tagged during the first two weeks of April. As such, angler exploitation was estimated using tag returns through March 31, 2025.

By March 31, 2025, anglers reported catching 172 of the walleye that were tagged in the spring of 2024. Of the 172 tag returns, 161 were non-reward tags with 11 being reward tags. Using proportions of non-reward tags reported in relation to reward tags reported, it was estimated that the reporting rate for non-reward tags was 68% during the first year of the walleye tagging project. One hundred nine of the 172 tag returns were reported as being harvested with 63 reported as being released. After correcting for angler tag reporting rate (%) and accounting for annual tag loss of Floy tags, the exploitation rate for walleye was estimated to be 4.8% for the first year of the Green Bay walleye tagging project. This means anglers harvested approximately 4.8% of the adult walleye population from the spring of 2024 through March 31, 2025.

INTERESTING TRENDS FROM TAG REPORTING

Exactly half of all tag returns (86 or 50%) from tagged walleye were reported as being caught and released or harvested during the spring open water fishery from March 1 through the first Saturday in May (the traditional fishing opener when the regulations become more liberal on the Green Bay system). This includes tag returns during the spring 2025 open water fishery through March 31, 2025. However, 50 of these walleye were reported as being released, meaning 36 (42%) were reported as being harvested. Only 15 (i.e., 8.7%) of the 172 walleye tag returns were reported from guided trips.

Tag returns from anglers varied based on the spawning location where walleye were tagged as well as by month. The Fox River had the lowest percent of tag returns by anglers as just 2.7% of walleye tagged in the Fox River in spring 2024 were reported as being caught and released or harvested by March 31, 2025 (Table 1). The majority the Fox River tag returns were reported as being caught and released (i.e., 31) whereas only 11 walleye were reported as being harvested. When tag non-reporting and tag loss are taken into consideration, the estimated exploitation rate for walleye tagged in the Fox River in spring 2024 was just 1.4% (Table 1).

Similar trends in the percent of tag returns by anglers were observed for walleye tagged in the west shore tributaries (i.e., the Oconto, Peshtigo, and Menominee rivers) as about 4-5% of walleye tagged in these rivers in spring 2024 were reported as being caught and released or harvested by March 31, 2025 (Table 1). Additionally, anglers were much more likely to harvest walleye that were tagged in these three west shore tributaries (i.e., the number of tagged walleye reported as being harvested from the Oconto, Peshtigo and Menominee rivers were 20, 19 and 49 respectively) as the estimated exploitation rate for walleye tagged in these three rivers ranged from 6.6-8.0% after accounting for tag loss and non-reporting rates (Table 1).

Walleye tagged in Sturgeon Bay in spring 2024 had a tag return rate similar to the Fox River as 2.7% of the walleye tagged in the Sturgeon Bay area were reported as being caught and released or harvested by anglers (Table1). Anglers who caught a walleye that was tagged in the Sturgeon Bay area were more likely to harvest that fish (i.e., 10 of the 13 tag returns were reported as being harvested) as the estimated exploitation rate for walleye tagged in this area was 4.2% (Table1).

TABLE 1. Number of walleye tagged in a specific spawning location, number of tagged walleye from a specific spawning location reported as being caught and released or harvested by anglers (Number Reported [percent of tagged walleye being reported as caught and released or harvested is provided in parentheses]), number reported as being released by anglers, number reported as being harvested by anglers and the exploitation rate for walleye tagged at a specific spawning location during spring 2024. Please note that reported tag returns could be from anywhere in the Green Bay system and not necessarily in the location where they were tagged.

SPAWNING LOCATION	NUMBER TAGGED	NUMBER REPORTED	NUMBER RELEASED	NUMBER HARVESTED	EXPLOITATION RATE
Fox River	1,543	42 (2.7%)	31	11	1.4%
Oconto River	500	27 (5.4%)	7	20	8.0%
Peshtigo River	511	21 (4.1%)	2	19	7.5%
Menominee River	1,500	69 (4.6%)	20	49	6.6%
Sturgeon Bay	481	13 (2.7%)	3	10	4.2%

Tag returns for walleye tagged in all five spawning locations were high during spring of 2024 (i.e., the months of March, April, and May; Figure 19). This is to be expected as fishing is very popular in all of these locations during spring. Tag returns dropped off significantly in June as only three walleye were reported as being caught and released or harvested by anglers during June (Figure 19). Green Bay has abundant forage populations right now fueled by a strong year classes of species such as alewife and white perch in recent years (DNR trawl data). Walleye are likely feeding heavily on spawning adults from some of these species during June, making fishing difficult due to the abundance of natural forage in the system. Tag returns picked back up again during the months of July and August (Figure 19).

However, walleye tagged in the Fox River were largely absent from tag returns in July and August (Figure 19). Even though more than three times as many walleye were tagged in the Fox River compared to the Oconto River, Peshtigo River and Sturgeon Bay, anglers returned 2-3 times as many tags from walleye tagged in the Oconto River, Peshtigo River and Sturgeon Bay than were returned for walleye tagged in the Fox River during July and August (Figure 19). Tag returns declined again during the fall months with a small uptick in tag returns from walleye tagged in the Fox River during October and November 2024 (Figure 19). Tag returns were almost completely absent from the ice fishery except for two tag returns that came in during the tail end of the ice fishing season in early March 2025. Tag returns increased again in March 2025 driven by the Fox River open water fishery (Figure 19).

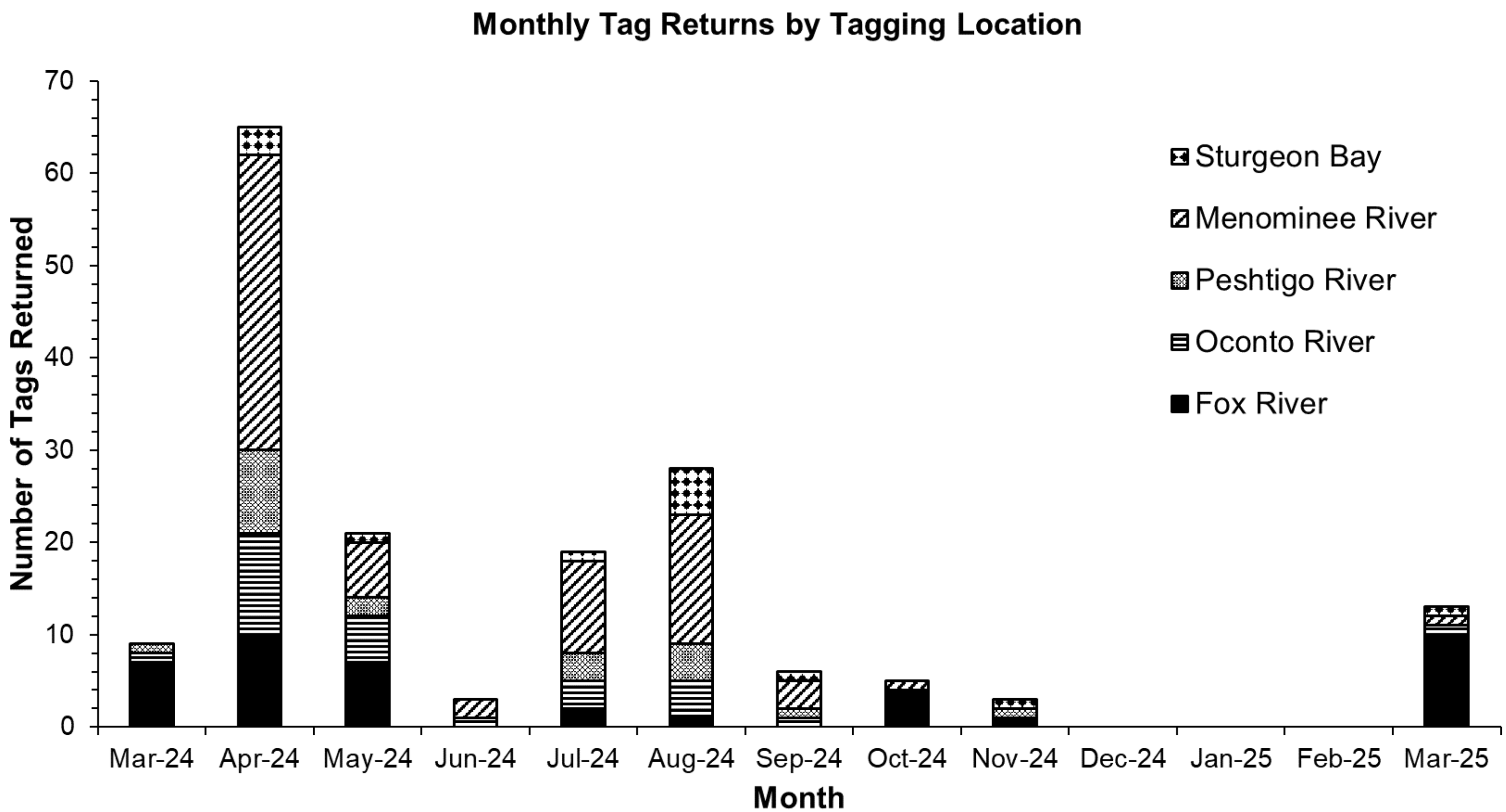


Figure 19. Number of tagged walleye reported as being caught and released or harvested by anglers each month and year based on the spawning location in which they were tagged during spring 2024.

Data from walleye tag returns also showed that anglers tend to harvest smaller walleye (Figure 20) as well as more male than female walleye. Walleye <25 inches had a higher likelihood of being harvested than released, whereas walleye >25 inches had a higher likelihood of getting released (Figure 20). Furthermore, 549 walleye >25 inches were tagged during spring 2024, with only 10 of these walleye reported as being harvested by March 31, 2025. When tag loss and non-reporting rates are taken into account, the exploitation rate of walleye >25 inches was estimated to be just 3.7%. Additionally, the exploitation rate for male and female walleye was estimated to be 6.1% and 3.3%, respectively, meaning male walleye had a much higher likelihood of being harvested if caught.

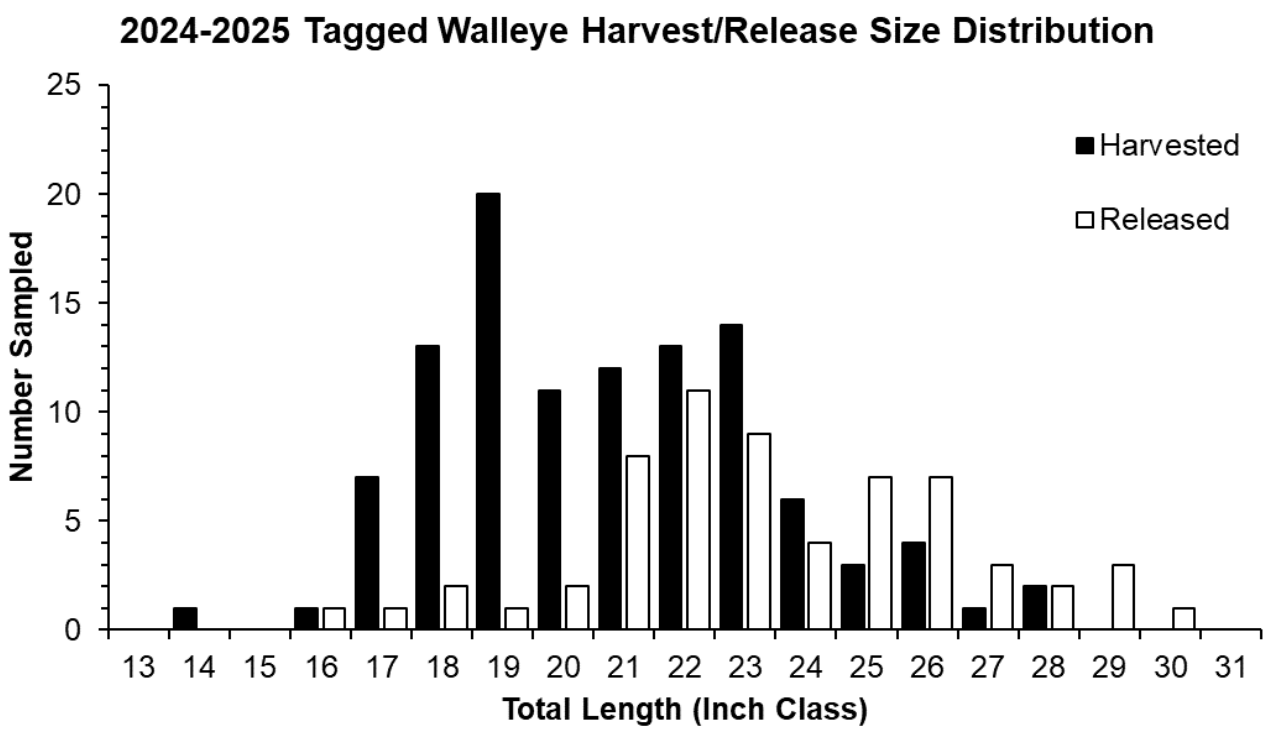


Figure 20. Number of tagged walleye reported as being harvested (black bars) and released (white bars) by anglers during the 2024 open water fishing season in one inch size intervals. Lengths used were lengths reported by anglers when the walleye was caught.

The Future of the Sport Fishery

The future of the Green Bay walleye fishery appears to be very promising. Substantial walleye year classes have been measured in 13 of the past 17 years during fall electrofishing surveys, with the 2018 cohort being the strongest year class measured since the DNR began monitoring walleye recruitment in 1993. As walleye from the 2018 year class continue to grow, the average size of walleye caught by anglers will likely increase for the next year or two. With the large 2022 and 2023 year classes recruiting to the fishery in the next year or two, the walleye population should remain strong for the foreseeable future.

As the popularity of the fishery continues to grow and as contaminant levels continue to decrease from the Fox River polychlorinated biphenyls (PCB) clean-up, walleye harvest will likely continue to remain high. Despite increases in the number of walleye caught and harvested by anglers in recent years, results from surveys show the Green Bay system continues to provide a high-quality walleye fishery that's showing no indications of significant declines that could jeopardize the long-term sustainability of the fishery. Even though creel survey estimates of the number of walleye that were caught and harvested during the 2024 open water season declined compared to recent years, results from the large reward tagging study showed that exploitation of the adult walleye population was very low in 2024. The decline in walleye catch and harvest was driven largely by a significant decrease in effort as catch rates and harvest rates in 2024 were similar to catch and harvest rates over the last 10-15 years. The fact that anglers harvested an estimated 74,506 walleye and this only accounts for approximately 4.8% of the adult population speaks to the health of the walleye fishery in Green Bay.

Furthermore, between 11.4-24.2% of the female walleye captured in spring electrofishing surveys across all four rivers were ≥26.0 inches with at least 12 walleye >28.0 inches being captured in each of the four rivers. Additionally, walleye age-17 or older were captured in all spawning locations with at least 15% of the adult walleye captured in each spawning location being age-10 or older. Walleye living this long, and the high percentage of large fish, are strong indicators of low exploitation as this does not happen in waters that have excessively high amounts of harvest and are experiencing significant overfishing. This additional evidence is consistent with the low tag returns and low exploitation estimated in 2024.

Even though the walleye fishery in Green Bay continues to produce large numbers of walleye as well as trophy walleye, increasing trends in angler effort and harvest have resulted in some anglers sharing their concerns about declines in the quality of the fishery along with the long-term sustainability of the fishery. Many of these anglers have also been asking if more restrictive walleye regulations are necessary. These concerns were the major driving force behind the implementation of the larger reward tag study starting in 2024, which will continue through at least 2026 and maybe longer. Results from the reward tag study will provide accurate estimates of exploitation and an angler tag reporting rate correction in each of the years walleye are tagged. These estimates of annual walleye exploitation rates will give fisheries managers a better understanding of the sustainability of current harvest trends and guide the future management of this fishery. Tools such as a tagging study and the Green Bay creel survey will continue to play a vital role in managing the walleye fishery in the future.

We appreciate the willingness from Walleyes for Tomorrow to pay the $100.00 rewards to anglers to help support this project. We also appreciate all the anglers who took time to report their tagged fish. Anglers who catch any Floy tagged walleye from the Green Bay system are encouraged to report their tags to DNRFHGBFISH@WI.GOV, 920-662-5411 or the following address: Attn Fish Biologist, 2984 Shawano Ave, Green Bay, WI 54313.

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Status of Great Lakes Muskellunge in Wisconsin Waters of Green Bay

Background

The Wisconsin Department of Natural Resources (DNR) in cooperation with several local Musky Clubs and the Musky Clubs Alliance of Wisconsin initiated a Great Lakes spotted muskellunge reintroduction program in 1989 for Green Bay waters of Lake Michigan. The goal of this restoration program was twofold – to diversify the predator population of the bay and to re-establish a muskellunge fishery. Since that time, the DNR has been actively managing the muskellunge population through a combination of stocking, population surveys, creel surveys, and research projects.

The purpose of this report is to summarize data collected for muskellunge during the 2024 field season on Green Bay and its tributaries and to describe long-term trends in survey results, stocking, and angler catch and harvest.

Annual Assessments

Assessments to determine the status of the Green Bay muskellunge population were conducted using both spring fyke nets and spring electrofishing. Spring fyke netting surveys to assess adult spawning populations have been conducted annually in the Fox River since spring 2003 and have also been conducted in some of the other major spawning areas (i.e., the Menominee River, Oconto River, and Peshtigo River) in some years. In 2024, spring fyke netting surveys were conducted in the Fox River and for the first time in the Sturgeon Bay area. Spring electrofishing surveys were also conducted in the Sturgeon Bay and Little Sturgeon Bay area in 2024 to collect additional data on the adult muskellunge populations in this area.

SPRING FOX RIVER FYKE NETTING

In 2024, a total of 163 adult muskellunge were handled during the spring Fox River fyke netting survey. Fyke nets were set on April 29 and lifted each day from April 30 – May 3 for a total of 16 net nights of effort (1 net night of effort equals one net fishing for a 24-hour period in between daily checks). This resulted in a catch-per-unit-effort (CPUE) of 10.2 adult muskellunge per net night, which is one of the highest catch rates of muskellunge in the state of Wisconsin.

Eight of the 163 captured muskellunge were captured twice, meaning a total of 155 unique muskellunge were captured as part of this year's fyke netting survey. Ninety six of the 155 muskellunge (61.9%) that were captured were males ranging in size from 34.7 – 51.7 inches (881 – 1,313 mm) with an average length of 42.8 inches (1,088 mm). Fifty nine of the 155 muskellunge (38.1%) that were captured were females ranging in size from 38.4 – 55.9 inches (881 – 1,313 mm) with an average length of 49.5 inches (1,257 mm). Furthermore, three female muskellunge >54.0 inches were captured in 2024 including two that were >55.0 inches. Also, four male muskellunge that were >49.0 inches were captured including one that was >51.0 inches in the spring 2024 Fox River fyke netting survey. The number of unique male and female muskellunge captured in one-inch size intervals is shown in Figure 1.

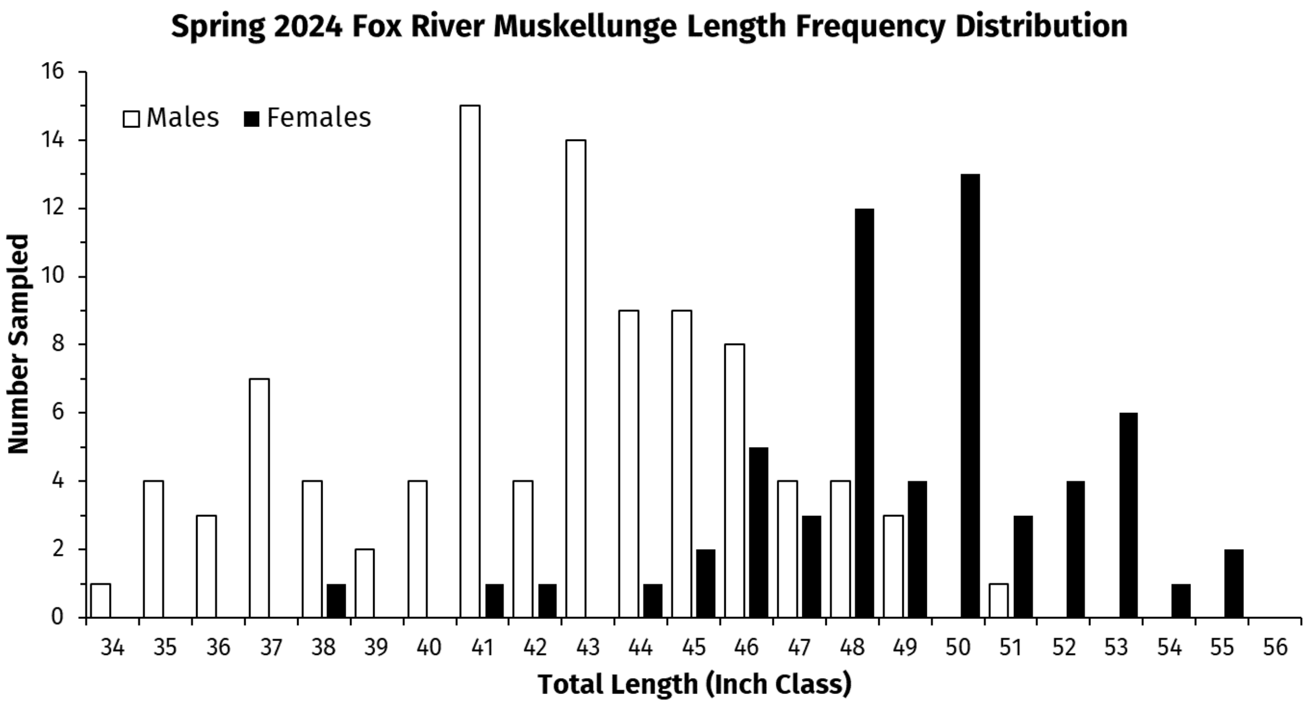
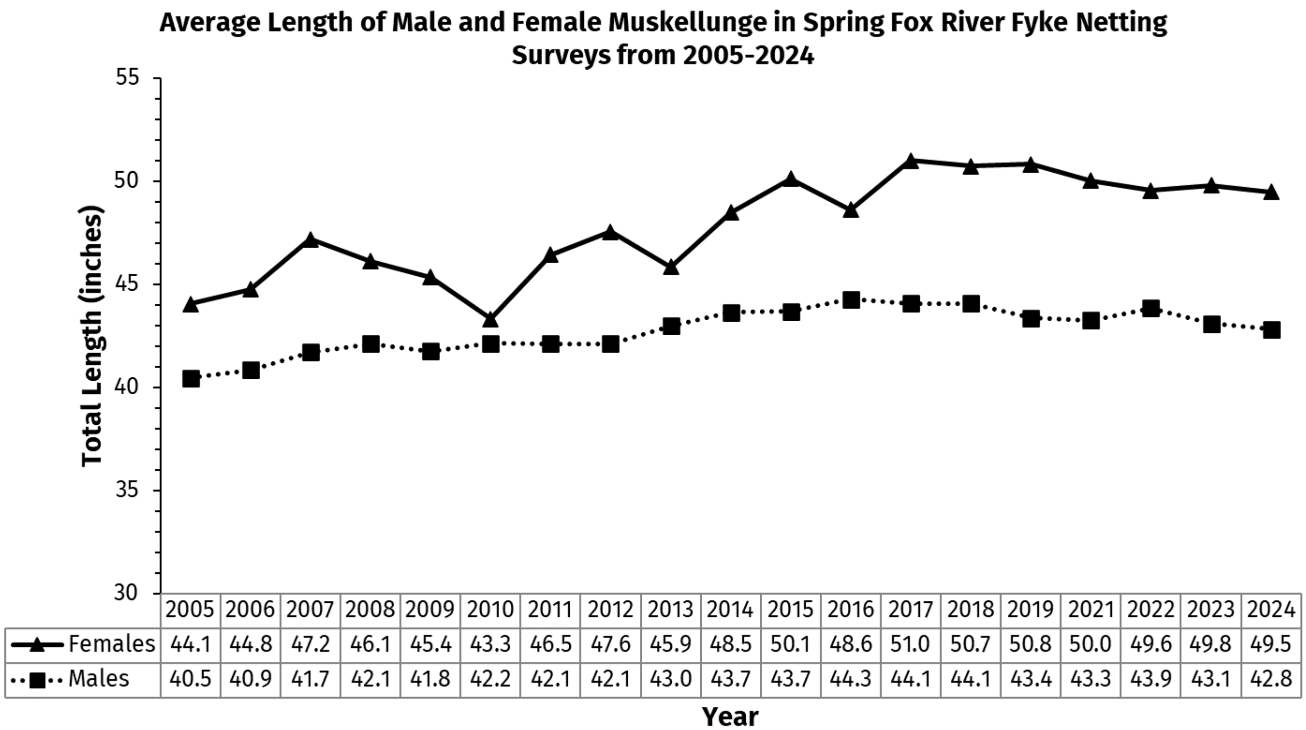


Figure 1. Length frequency distribution (i.e., the number of individuals caught in one-inch size intervals) for male (white bars) and female (black bars) muskellunge captured in the spring 2024 fyke netting survey of the Fox River.

Between 2005 – 2017, the average length for both male and female muskellunge captured in spring Fox River fyke netting surveys had steadily increased (Figure 2). Since 2017, average lengths of male and female muskellunge have been similar across years with females averaging 49.5 – 51.0 inches and males averaging 43.0 – 44.0 inches (Figure 2). The average lengths of male and female muskellunge captured in the spring 2024 Fox River fyke netting survey were similar to average lengths observed for each sex over the last seven years (Figure 2).



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2021	2022	2023	2024
Females	44.1	44.8	47.2	46.1	45.4	43.3	46.5	47.6	45.9	48.5	50.1	48.6	51.0	50.7	50.8	50.0	49.6	49.8	49.5
Males	40.5	40.9	41.7	42.1	41.8	42.2	42.1	42.1	43.0	43.7	43.7	44.3	44.1	44.1	43.4	43.3	43.9	43.1	42.8

Figure 2. Average length (inches) of male and female muskellunge captured during annual spring netting surveys of the lower Fox River from 2005-2019, 2021-2024.

In 2024, 33 muskellunge captured in the spring fyke netting survey in the Fox River had previously had a Passive Integrated Transponder (PIT) tag implanted just under their skin, meaning these muskellunge are recaptures and had been handled in previous netting surveys, electrofishing surveys or stocking events. Tables 1 and 2 at the end of this document provide information about the original tagging events for each of these fish as well as any other recaptures in DNR surveys or by anglers. Thirty of the 33 recaptured muskellunge were either PIT tagged at the time of stocking and stocked into the lower Fox River or were PIT tagged in previous fyke netting or electrofishing surveys of the lower Fox River (Table 1). The other three muskellunge were PIT tagged in the Lake Winnebago system including two that were PIT tagged at the time of stocking and stocked in the upper Fox River near Omro (Table 1). Seven muskellunge had also been recaptured in previous surveys, all of which were on the Fox River (Table 2). One muskellunge that was originally tagged as an adult male in a spring 2013 fyke netting survey on the Fox River was also captured in spring fyke netting surveys on the Fox River in 2019, 2022 and 2023 (Table 2).

Recapture data from PIT tagged muskellunge provides fisheries managers with information that is vital to managing this species including information on:

- spawning site fidelity
- the likelihood of muskellunge to return to their stocking location to spawn
- growth rates
- survival of stocked muskellunge based on factors such as size at stocking and stocking location
- the size of the adult population using mark-recapture models

The number of adult muskellunge spawning in the Fox River between the Porlier Street fishing pier and the De Pere Dam (i.e., the area that was surveyed each year) was estimated using PIT tag data from the 2023 spring fyke netting survey as the marking period and the PIT tag data from the 2024 fyke netting survey as the recapture period. Data from these two surveys was entered into the Bailey's modification of the Petersen single-census mark-recapture model, which estimated that there were 1,014 adult muskellunge (range 629 – 1,766 adult muskellunge) spawning in this stretch of the Fox River. Furthermore, evidence from PIT tag data from Fox River surveys as well as information from the Peshtigo River PIT tag array suggests that adult muskellunge tend to return to their stocking location to spawn and show spawning site fidelity. For example, approximately 90% of the muskellunge that have been detected on the Peshtigo River PIT tag array were muskellunge that were PIT tagged at the time of stocking and stocked in the Peshtigo River just downstream from the array.

SPRING STURGEON BAY AND LITTLE STURGEON BAY SURVEYS

Spring of 2024 marked the first time that targeted muskellunge surveys were conducted in either the Sturgeon Bay or Little Sturgeon Bay area. Initially, fyke nets were set in the Sturgeon Bay area on May 7 and run through May 18. Fyke nets were primarily set in Sawyer Harbor with a small amount of netting effort occurring near Big Creek. A total of 39 net nights of effort were expended over this time period with only four muskellunge being caught. Two of the four muskellunge that were captured were males that were 45.1 inches (1,146 mm) and 45.9 inches (1,165 mm) long and the other two muskellunge were females that were 50.6 inches (1,286 mm) and 53.5 inches (1,359 mm) long (Figure 3). As the fyke netting survey progressed, more muskellunge were observed swimming in the shallows while driving between nets than what were captured in nets. We hypothesized that the very clear water in the Sawyer Harbor/Big Creek area allowed the muskellunge to easily see the nets and avoid them. Smaller nets that had darker mesh were tried in hopes this would increase catch rates, but these nets did not increase muskellunge catches in this area.

Given that fyke nets proved ineffective at capturing muskellunge in the Sturgeon Bay area, fisheries managers switched gears and tried electrofishing in both the Sturgeon Bay and Little Sturgeon Bay area. Capturing esocids like northern pike and muskellunge can be challenging using electrofishing because their burst swimming allows them to escape the electrical field more easily than other species such as bass, walleye or panfish. Once fisheries managers were able to find the electrofishing settings and locations that proved effective at capturing muskellunge, seven muskellunge were captured in Little Sturgeon Bay on the night of May 29. Six of the seven muskellunge captured were males that ranged in size from 34.3 – 50.0 inches (870 – 1,270 mm) and averaged 40.9 inches (1,039 mm). One immature muskellunge that was 19.2 inches (488 mm) long was also captured. The number of muskellunge captured in one-inch size intervals in the spring 2024 Little Sturgeon Bay electrofishing survey is also shown in Figure 3.

Historically, nearly all muskellunge that have been stocked into the Green Bay system have received a fin clip to evaluate contributions of stocked muskellunge versus naturally reproduced muskellunge to the adult population. Stocked large fingerlings have received a left ventral (left pelvic fin) fin clip and stocked yearlings have received a right ventral (right pelvic fin) fin clip. Only the yearlings stocked in 2020 and the yearlings stocked in 2023 have not been fin clipped.

Interestingly, 7 of the 11 muskellunge (63.6%) captured in Sturgeon Bay and Little Sturgeon Bay surveys did not have a fin clip. This includes four muskellunge that were >45 inches long, so they were likely too large to be from either of the unclipped stocking events. In more recent Fox River muskellunge surveys, the number of captured muskellunge that have fin clips is around 95%. For example, only 10 of the 155 muskellunge (6.5%) captured in the spring 2024 Fox River fyke netting survey did not have a fin clip. A higher proportion of unclipped muskellunge in the Sturgeon Bay and Little Sturgeon Bay area could indicate higher potential for natural reproduction and a greater contribution of naturally reproduced fish to the adult population in this area. One or two unclipped young of the year muskellunge have been captured in past fall electrofishing surveys of the Sawyer Harbor area, making this one of the few areas that successful natural reproduction has been documented in the Green Bay system.

To expand our knowledge on potential for natural reproduction in coastal wetland habitats around Green Bay, the Sturgeon Bay and Little Sturgeon Bay area is one focal area for the current University of Wisconsin-Stevens Point (UWSP) research project documenting habitat features associated with muskellunge egg deposition in coastal wetland and larval sampling in these areas to document potential for successful natural reproduction. Additional electrofishing surveys will continue in the spring of 2025 to build on our knowledge of the adult muskellunge populations in these two areas.

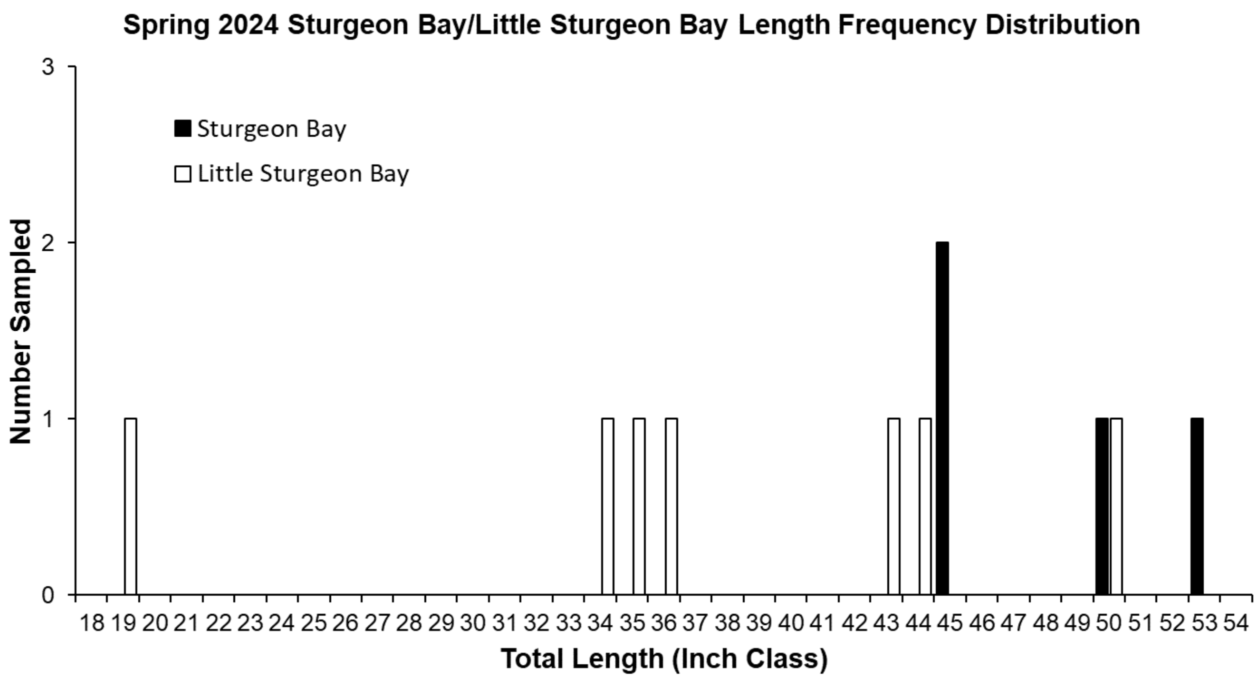


Figure 3. Length frequency distribution (i.e., the number of individuals caught in one-inch size intervals) for muskellunge captured in the spring 2024 fyke netting survey of the Sturgeon Bay area and electrofishing survey in Little Sturgeon Bay.

Stocking

In 2024, the DNR stocked 15,995 large fingerling muskellunge into Wisconsin waters of Green Bay and its tributaries. Since 1989, a total of 205,986 large fingerlings and 41,533 yearling muskellunge have been stocked into Green Bay and its tributaries (Figure 4). Stockings from 2010 - 2020 consisted of a combination of large fingerling muskellunge raised at the Besadny Anadromous Fish Facility (BAFF) near Kewaunee, WI and yearling muskellunge reared at Wild Rose State Fish Hatchery. During this time, eggs for muskellunge raised at BAFF were obtained from wild fish attempting to spawn in the Fox River, while the yearling muskellunge raised at Wild Rose were obtained from the Michigan DNR who collected eggs from adult muskellunge spawning in the Detroit River system.

In 2021 and 2022, large fingerling muskellunge were raised from eggs that were collected from adult muskellunge spawning in the Fox River at both BAFF and Wild Rose State Fish Hatchery. Starting in 2023, muskellunge were only raised at Wild Rose State Fish Hatchery and they will only be raised at Wild Rose in the future. Raising large fingerling muskellunge at Wild Rose State Fish Hatchery in the future will increase the number of large fingerling muskellunge that can be stocked in Green Bay as seen by the large increase in large fingerlings stocked in 2021 and 2024. These years of higher stocking numbers were welcomed as raising Great Lakes spotted muskellunge has also had challenges in recent years.

Stockings of some cohorts in 2022 and 2023 were limited because of poor hatching which resulted in low numbers of large fingerlings available for stocking in 2022, a fungal infection which resulted in low numbers of yearlings available for stocking in 2022, and a viral infection which resulted in all large fingerlings being euthanized in the hatchery in 2023. Unfortunately, no yearling muskellunge were available for stocking in 2024 due to hatchery capacity limitations, the prioritization of raising other species including Great Lakes salmonids at Wild Rose State Fish Hatchery, and a need for evaluating current Green Bay genetics and the Michigan DNR yearling program.

Several research projects are currently underway that will help guide the future of muskellunge stocking in Green Bay and its tributaries. The first research project aims to better understand the current genetic diversity of the adult muskellunge population in the Green Bay system and evaluate the need to stock muskellunge from the Detroit River system in the future. The primary reason that small fingerling muskellunge from the Detroit River system were transported to Wild Rose State Fish Hatchery and stocked into the Green Bay system as yearlings was to enhance the genetic diversity of the Green Bay muskellunge population by infusing genetics from a wild, self-sustaining population into the Green Bay system. Greater genetic diversity allows a population to better adapt to a changing environment, resist diseases, and increases the likelihood of natural reproduction under different environmental conditions and habitats.

To understand the current genetic diversity of the Green Bay system, fin clips for genetic analysis were collected from adult brood stock from the Fox River from 2021 – 2024. These fin clips were sent to the genetics lab at UWSP for diversity analysis. Fin clips for genetics analysis were also collected from muskellunge from the Detroit River system and sent to UWSP for analysis. Researchers from UWSP will then compare the genetic diversity of muskellunge from the Fox River to the diversity from the Detroit River system to determine if the Green Bay muskellunge population has similar genetic diversity to the Detroit River system. If the Green Bay muskellunge population does have a similar genetic diversity to the Detroit River system, then the DNR will no longer need to bring in muskellunge from the Detroit River system to continue to enhance the genetic diversity of the Green Bay population. If it is determined that the Green Bay muskellunge population is still lacking in genetic diversity, finding a source of small fingerlings from a population with good genetic diversity could be challenging in the future since the Michigan DNR is no longer using the Detroit River system as their brood stock source for Great Lake spotted muskellunge. Results from this analysis are still pending.

Another research project that the DNR is partnering with UWSP on is to better understand survival of stocked muskellunge based on size at stocking, environmental conditions at the time of stocking (e.g., water temperature) and stocking locations. Recaptures of yearling and large fingerling muskellunge that are PIT tagged at the time of stocking will be used in this analysis. Preliminary results from this analysis have shown that muskellunge that are larger at the time of stocking have a higher likelihood of being recaptured as juveniles or adults, indicating that stocking larger muskellunge increases the likelihood of survival. Recaptures from future DNR surveys as well as from anglers will be incorporated into this analysis to get a better understanding of how to maximize stocking efficiency based on size at stocking, stocking location and conditions at the time of stocking.

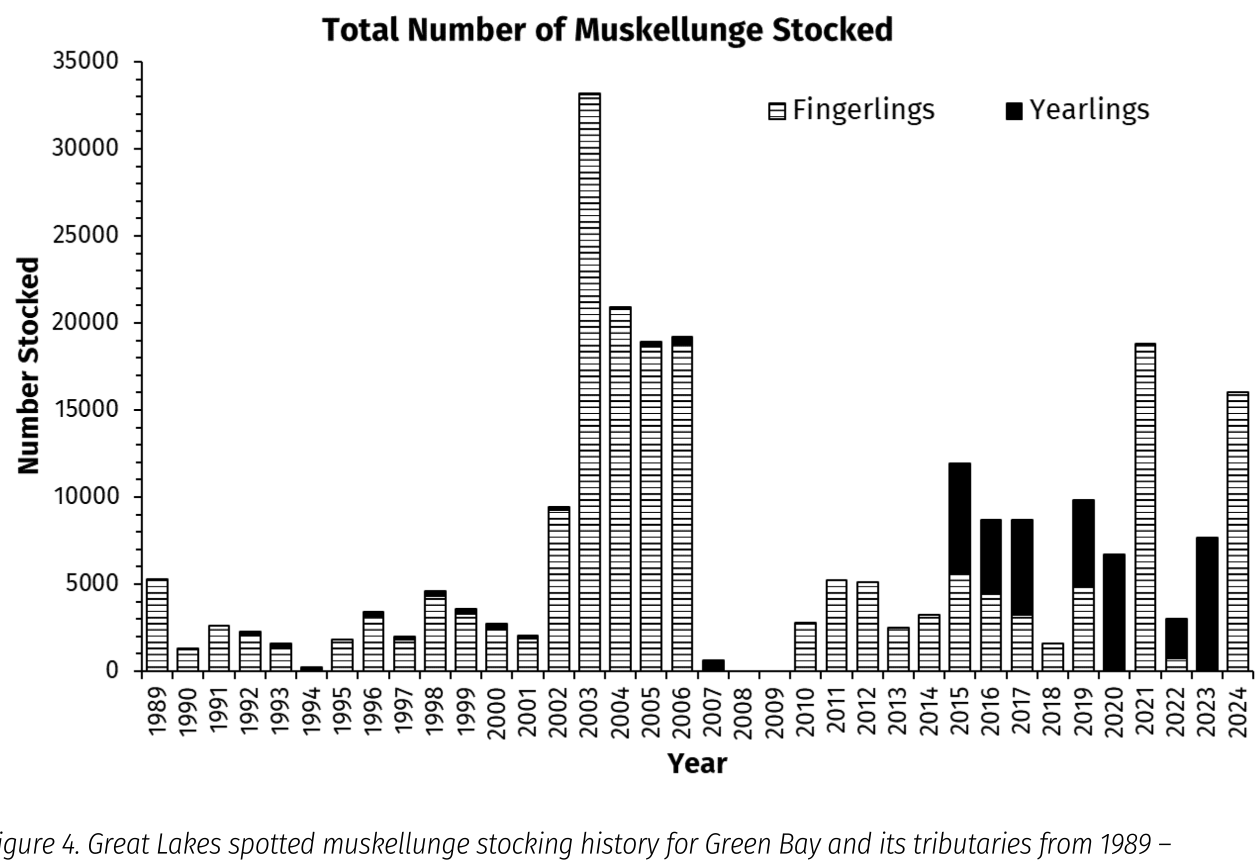


Figure 4. Great Lakes spotted muskellunge stocking history for Green Bay and its tributaries from 1989 – 2024.

Since 2010, most muskellunge have been stocked in locations capable of supporting juvenile and adult muskellunge. These locations include the Fox River in Brown County, the Menominee River in Marinette County and Sturgeon Bay and Little Sturgeon Bay in Door County. However, since 2010, smaller streams on the west shore of Green Bay that are also capable of supporting adult and juvenile muskellunge including the Peshtigo River, Oconto River, Pensaukee River and Suamico River have also been stocked. As results from recent research projects and surveys have shown that adult muskellunge display strong fidelity to stocking location to spawn and return to the same locations to spawn in most years, DNR staff have reprioritized stocking locations to areas thought to have the best spawning and nursery habitat. For example, a greater percentage of muskellunge will get stocked in the Sturgeon Bay and Little Sturgeon Bay areas in the future because these areas are thought to have some of the best muskellunge spawning and nursery habitat among the locations that get stocked with muskellunge and successful natural reproduction has been documented in the Sawyer Harbor area in the past.

Furthermore, four new stocking locations have been identified (i.e., Dead Horse Bay [a historical stocking location that had not been stocked in nearly 20 years], Point Au Sable, Seagull Bar natural area near the mouth of the Menominee River and Egg Harbor) as these areas are also thought to have high quality spawning and nursery habitat. The hope is that prioritizing stocking in areas that are thought to have the best spawning and nursery habitat will result in higher likelihood of successful natural reproduction in the future. All historical stocking locations will continue to receive stocked muskellunge; however, numbers stocked in these locations (e.g. the Fox River) may be lower due to higher prioritization of areas thought to have the best spawning and nursery habitat. Figure 5 shows a map with the stocking locations and numbers of stocked large fingerlings from the 2024 stocking cohort.

A new PIT tagging project was initiated in 2024 in which 20% of the large fingerling muskellunge stocked at each stocking location were PIT tagged prior to stocking. Historically, only stocked yearling muskellunge were PIT tagged prior to stocking, meaning 2024 marks the first year in which large fingerling muskellunge were PIT tagged prior to stocking. PIT tagging muskellunge at the time of stocking provides fisheries managers with opportunities to learn about many different aspects of the fishery. For example, known-age fish are now available in the population to better analyze growth rates. Therefore, calcified structures and the errors associated with age estimates from these structures are no longer needed to assess growth rates. Survival of stocked muskellunge can be evaluated based on stocking location, size at stocking, and environmental conditions at the time of stocking to refine stocking practices to maximize returns of stocked muskellunge in the future. Lastly, the fidelity of adult muskellunge to return to their stocking location to spawn can also be evaluated using fish that are PIT tagged at the time of stocking. All of these different aspects of the Green Bay muskellunge fishery have been analyzed or are currently being analyzed using data from yearlings that were PIT tagged at the time of stocking. When the large fingerlings that were stocked in 2024 and future years begin to recruit to the adult fishery, the same analyses will be run using PIT tag recaptures of large fingerlings.

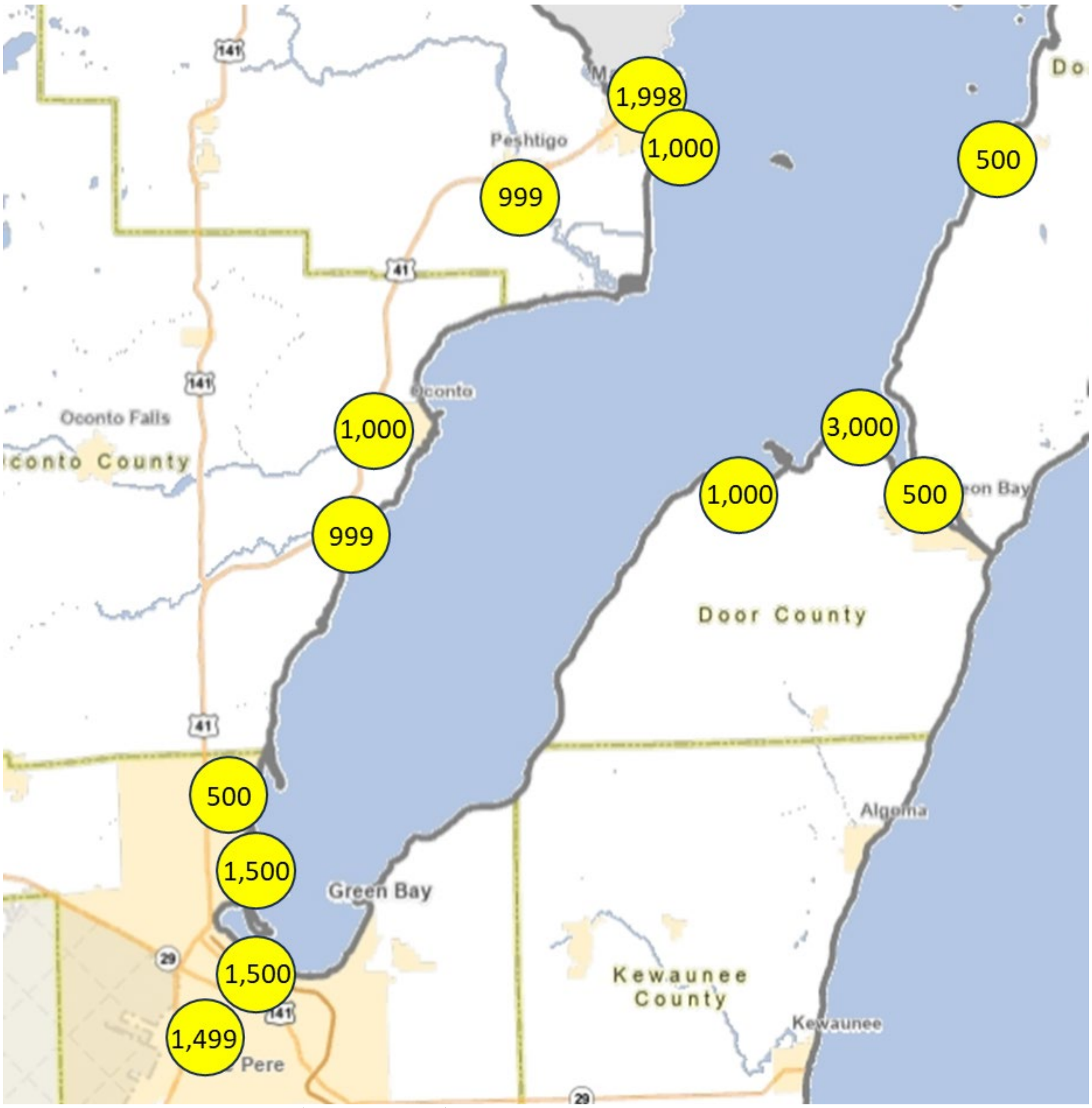


Figure 5. Stocking locations (yellow circles) of large fingerling Great Lakes spotted muskellunge and the number stocked at each location in fall of 2024.

Fishery

It was estimated that a total of 3,137 muskellunge were caught by anglers between DNR creel surveys (2,582 muskellunge caught) and guide reporting (555 muskellunge caught; Figure 6). The catch of muskellunge in 2024 was lower than what was observed in 2023, but in line with the number of muskellunge caught in most years between 2018 – 2022 (Figure 6). Catches of muskellunge in 2024 were still approximately 1.5 times higher than the longer-term average annual catch of 2,005 muskellunge per year since 2005 (Figure 6). It should be noted that DNR staff were unable to start conducting creel surveys until July of 2020, meaning estimates of the number of muskellunge caught in 2020 are likely low given creel surveys were not conducted from March – June.

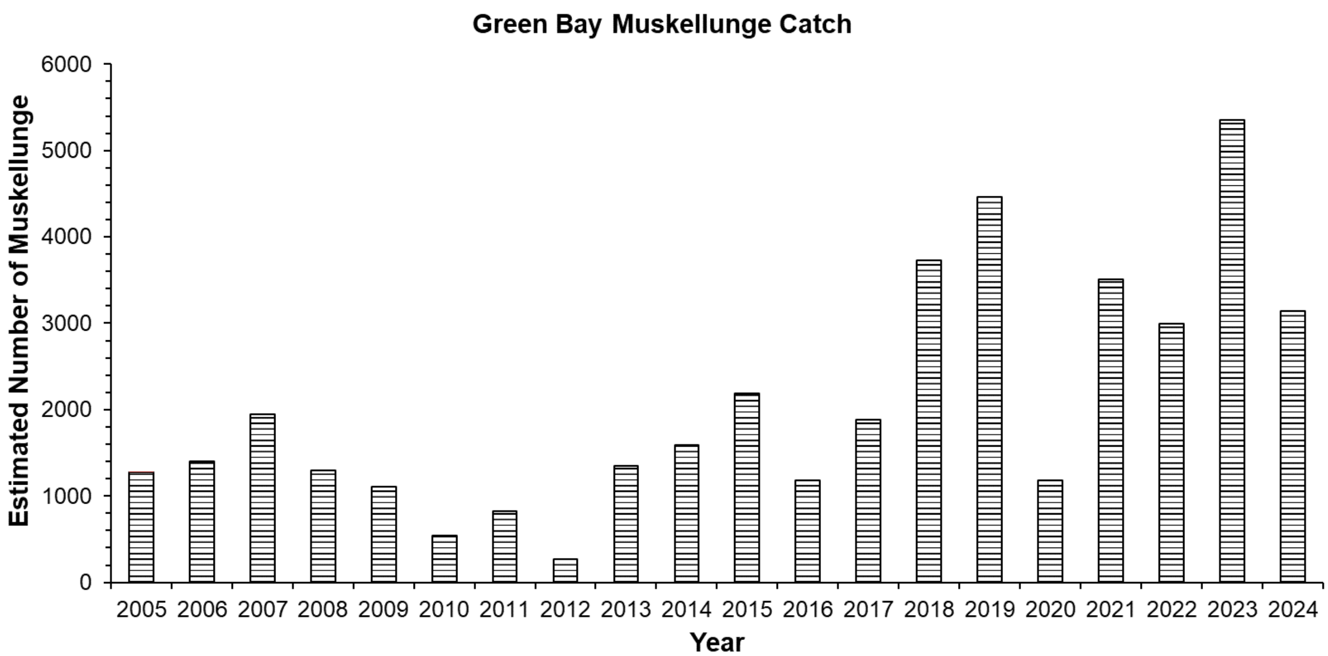


Figure 6. The estimated number of Great Lakes Spotted muskellunge caught by anglers on Green Bay during the 2005 – 2024 open water fishing seasons.

An estimated total of 73,994 hours of directed effort targeting muskellunge occurred on Green Bay and its tributaries from March 15 through October 31, 2024 (Figure 7). While effort in 2024 declined compared to effort in 2023, 73,994 hours of effort is still one of the highest amounts spent targeting muskellunge in any year going back to 2005 (Figure 7). The continued high amount of effort targeting muskellunge speaks to the growing popularity of the muskellunge fishery on Green Bay. Results from the 2024 creel survey showed that angler catch per unit effort was 0.028 muskellunge per hour of directed fishing effort or approximately 35.5 hours spent fishing to catch a muskellunge on Green Bay and its tributaries (Figure 7). Even though catch rates also declined in 2024 compared to 2023, catch rates in 2024 were higher than in most years between 2010 – 2018 (Figure 7). Higher catch rates in recent years can likely be attributed to increases in the number of muskellunge in the Green Bay system following the resumption of yearling stockings in 2015.

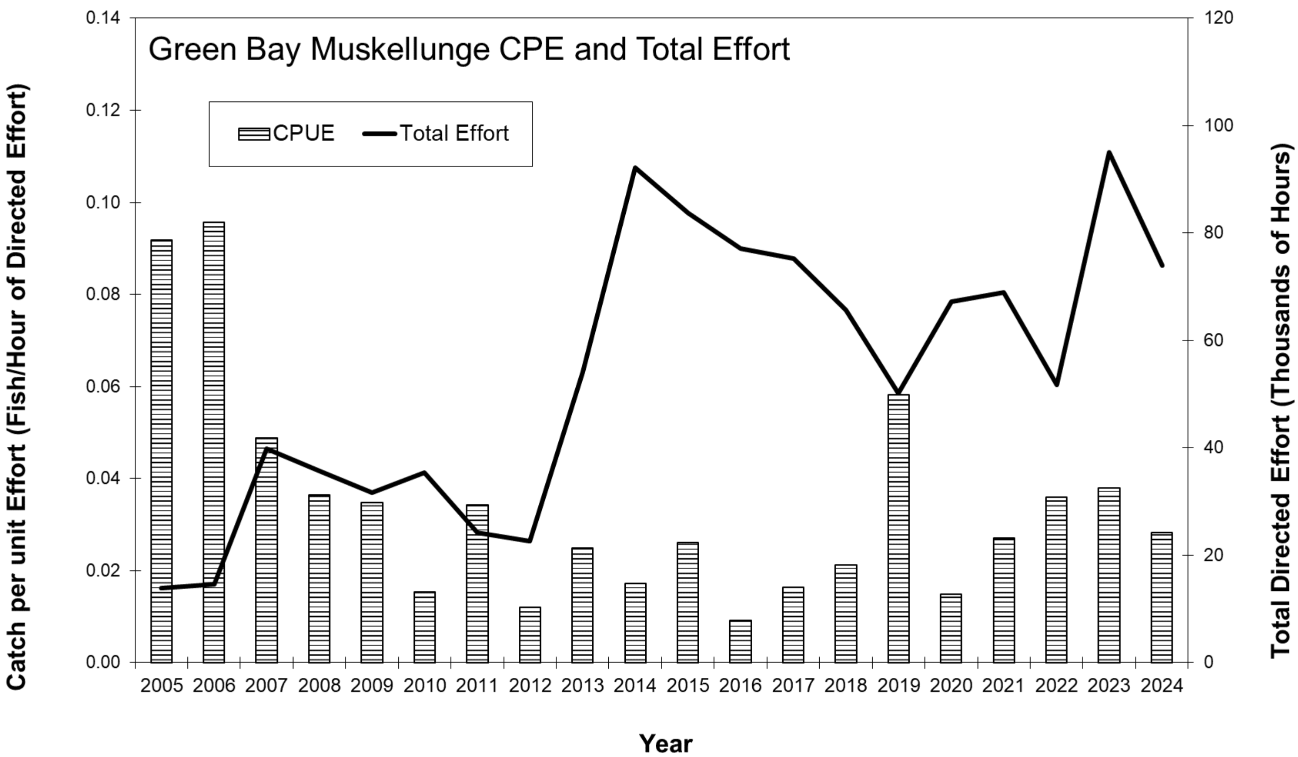


Figure 7. Total directed fishing effort for muskellunge on Green Bay waters of Lake Michigan from 2005-2024 is displayed by the solid black line on the right axis in thousands of hours fished. The left axis shows catch per unit effort (number of muskies caught per hour of directed effort) of muskellunge caught from 2005-2024.

As the popularity of muskellunge fishing has grown and anglers have become more interested in learning more about muskellunge and contributing to muskellunge management efforts, some anglers have purchased PIT tag readers to scan angler caught muskellunge for the presence of a PIT tag and are providing recapture information (e.g., size, location caught, etc.) from PIT tagged muskellunge back to fisheries managers.

During the 2024 fishing season on Green Bay and its tributaries, anglers reported catching 27 muskellunge that already had PIT tags. These muskellunge ranged in size from 37.0 – 55.7 inches long (940 – 1,416 mm) with an average length of 42.5 inches (1,080 mm). The number of PIT tagged muskellunge in different one-inch size intervals that were caught by anglers during the 2024 fishing season is shown in Figure 8. These 27 muskellunge were originally PIT tagged in a wide range of locations and were PIT tagged at both the time of stocking as well as in fisheries surveys. Figure 9 shows all of the different locations in Green Bay and its tributaries, the Lake Winnebago system and inland lakes where these recaptured muskellunge were originally PIT tagged. Yellow circles indicate PIT tagging at the time of stocking and blue circles represent PIT tagging in a fisheries survey. The number within each circle denotes the number of recaptured muskellunge that were PIT tagged in a specific location using a specific method (i.e., stocking versus fisheries survey). Interestingly, one angler caught recaptured muskellunge was PIT tagged at the time of stocking in Anderson Lake in Oconto County and seven were PIT tagged at the time of stocking in the Lake Winnebago system (Figure 9). It should also be noted that one angler caught a recaptured muskellunge that was PIT tagged at the time of stocking in the Peshtigo River was also detected during the spring of 2022 and spring of 2023 on the stationary PIT tag array located just below the Peshtigo Dam.

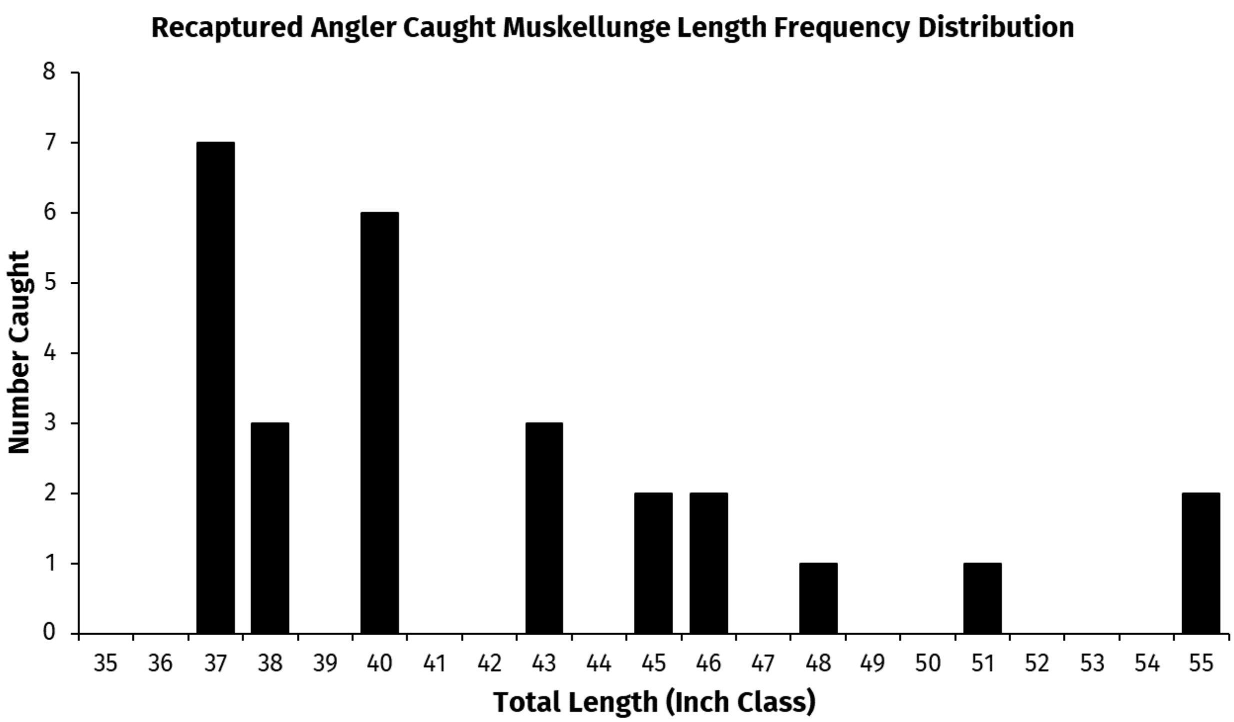


Figure 8. Length frequency distribution (i.e., the number of individuals caught in one-inch size intervals) for PIT tagged muskellunge that were caught by anglers during the 2024 fishing season on Green Bay and its tributaries.

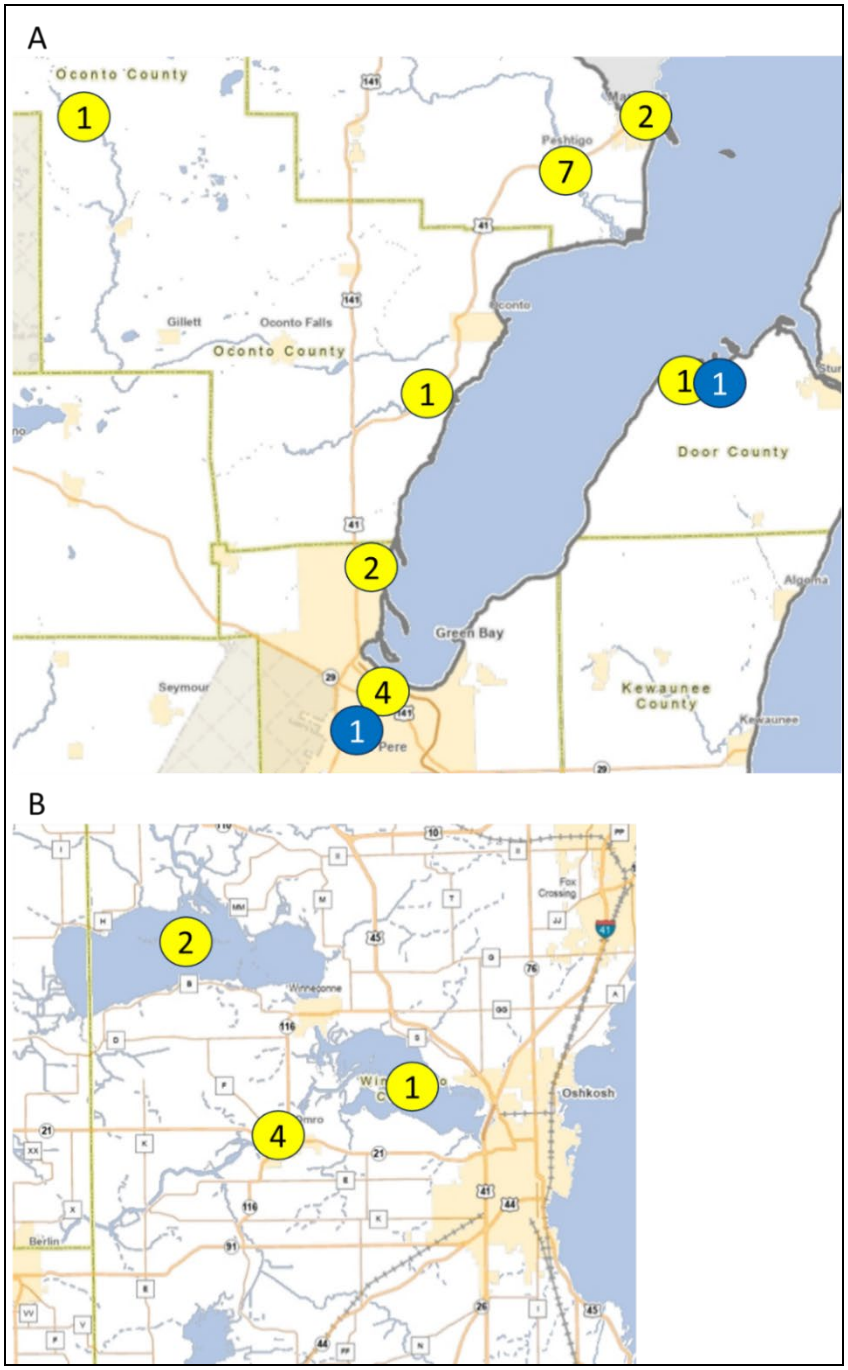


Figure 9. Maps showing the location where PIT tagged muskellunge that were caught by anglers during the 2024 open water fishing season were originally PIT tagged throughout Green Bay, its tributaries and other connected inland lakes (A) and the Lake Winnebago system (B). Yellow circles indicate PIT tagging at the time of stocking and blue circles represent PIT tagging in a fisheries survey (i.e., fyke netting or electrofishing). The number within each circle denotes the number of angler recaptured muskellunge that were originally PIT tagged in a specific location using a specific method (i.e., stocking versus fisheries survey).

During the spring of 2024, four members from Titletown Muskies Inc. were trained on how to properly insert PIT tags into muskellunge and were subsequently able to PIT tag angler-caught muskellunge that did not already have a PIT tag during the 2024 open water fishing season. This effort was part of a joint research project with the DNR and these anglers received a scientific collectors permit from the DNR to tag these fish (a scientific collectors permit from the DNR is required for any angler to tag any fish species in any water within the state). These four anglers PIT tagged 154 muskellunge ranging in size from 22.2 – 54.7 inches (565 – 1,390 mm) with an average length of 42.8 inches (1,087 mm). The number of muskellunge in different one-inch size intervals that were PIT tagged by these anglers during the 2024 fishing season is shown in Figure 10. Data from these PIT tagged muskellunge will be included in analyses looking at movements, spawning site fidelity, etc. in the future. It will be interesting to see how many of these muskellunge are caught by anglers or in fisheries surveys in future years.

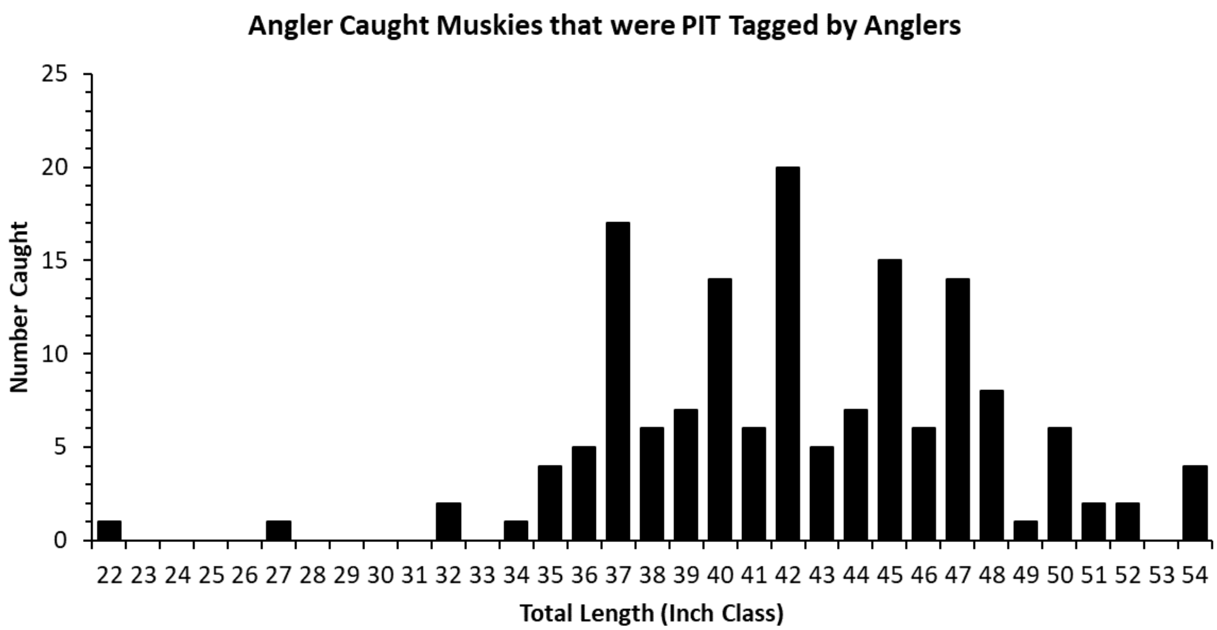


Figure 10. Length frequency distribution (i.e., the number of individuals caught in one-inch size intervals) for muskellunge that were given a PIT tag by anglers from Titletown Muskies Inc. during the 2024 fishing season on Green Bay and its tributaries.

The Future of the Sport Fishery

Currently, stocking maintains the Green Bay muskellunge population. Based on DNR surveys and historical research projects with UWSP, it appears that stocked muskellunge grow rapidly, reach maturity, and attempt to spawn in various tributaries and in other locations around Green Bay. Despite attempts by adult muskellunge to spawn, few natural recruits have been captured over the last 20 years, indicating a bottleneck is likely occurring during egg development or the early larval phase that is limiting natural recruitment. Researchers from UWSP initiated a new research project in the spring of 2024 to better understand muskellunge spawning in coastal wetland habitat around lower Green Bay and in the Sturgeon Bay/Little Sturgeon Bay area and the potential for successful natural reproduction in these habitats. Future research efforts should evaluate the likelihood of successful natural reproduction in smaller west shore tributaries such as the Peshtigo, Oconto, Pensaukee and Suamico rivers. While these smaller west shore tributaries likely can't support as many adult muskellunge as the Fox River or Menominee River, they are much less altered than the Fox and Menominee rivers and potentially have better spawning and nursery habitat. Several Area of Concern habitat restoration projects in the Fox River and lower Green Bay have muskellunge listed as a focal species meaning the habitat design for these projects should focus on improving muskellunge spawning and nursery habitat. These Area of Concern habitat projects should be implemented within the next 1 – 5 years and post implementation surveys will be conducted to evaluate whether they increased muskellunge natural reproduction in the Fox River and lower Green Bay.

Increased stocking since 2010, including large increases in the numbers of yearlings and large fingerlings stocked in some years, should increase the number of muskellunge available to anglers around the Green Bay system in upcoming years. However, stocking these large numbers of musky is increasingly expensive and in a large part supported by the Fox River Natural Resource Damage Assessment Fund. Stocking such high numbers will likely not be continued indefinitely. The long-term future of the Green Bay musky fishery will largely be determined by the degree to which muskellunge can successfully naturally reproduce in the Green Bay system. Creel survey results indicate that the Green Bay muskellunge fishery remains popular with anglers and that anglers have begun to target muskellunge throughout Green Bay as the population increases in other areas besides the Fox River and Menominee River.

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Table 1. Summary of the original tagging information for the 33 muskellunge captured in the spring 2024 fyke netting survey on the Fox River that were previously PIT tagged. Information provided includes capture date in 2024, PIT tag number, capture size in 2024, sex, observed fin clips, date originally PIT tagged, length when originally PIT tagged, location originally PIT tagged, and the gear used to capture the fish when it was originally PIT tagged. Stocking listed in the Survey Gear when Tagging means this fish was PIT Tagged at the time of stocking.

DATE CAPTURED	PIT TAG NUMBER	2023 CAPTURED LENGTH (INCHES)	SEX	FIN CLIP	DATE TAGGED	TAGGING LENGTH (INCHES)	TAGGING LOCATION	SURVEY GEAR WHEN TAGGING
5/1/2024	900067000017211	36.0	M	RV	8/7/2019	14.6	Fox River	Stocking
5/1/2024	900067000019578	43.7	M	LV	5/9/2023	43.2	Fox River	Fyke Net
4/30/2024	900067000019630	49.3	F	LV	5/10/2023	48.8	Fox River	Fyke Net
5/3/2024	900067000019649	44.5	M	LV	5/10/2023	42.8	Fox River	Fyke Net
5/1/2024	900067000019703	35.8	M	RV	8/7/2019	15.4	Lake Poygan	Stocking
4/30/2024	900067000019769	43.5	M	LV	5/9/2023	42.6	Fox River	Fyke Net
4/30/2024	900067000019787	44.3	M	NONE	5/9/2023	41.9	Fox River	Fyke Net
4/30/2024	900067000019835	47.4	F	NONE	5/9/2023	47.0	Fox River	Fyke Net
5/3/2024	900067000019864	50.7	F	LV	5/9/2023	49.7	Fox River	Fyke Net
5/1/2024	900067000019994	52.2	F	LV	5/10/2023	52.6	Fox River	Fyke Net
5/2/2024	956000003139449	41.9	M	LV	5/11/2022	41.1	Fox River	Fyke Net
4/30/2024	985121001302418	47.8	M	RV	8/29/2007	18.3	Fox River	Stocking
4/30/2024	985121001338362	51.7	M	LV	4/28/2010	43.7	Fox River	Fyke Net
5/1/2024	985121001366179	41.5	M	RV	8/29/2007	19.4	Upper Fox River	Stocking
4/30/2024	985121001366707	50.2	F	RV	8/29/2007	20.4	Fox River	Stocking
5/1/2024	985121001368798	50.3	F	LV	10/27/2009	39.5	Fox River	Electrofishing
5/3/2024	985121001368843	55.1	F	LV	4/28/2010	42.2	Fox River	Fyke Net
4/30/2024	985121013762147	44.3	M	LV	5/12/2021	43.3	Fox River	Fyke Net
5/2/2024	985121014715009	53.1	F	LV	5/13/2011	45.1	Fox River	Fyke Net
5/1/2024	985121014777297	46.7	M	LV	5/16/2013	42.8	Fox River	Fyke Net

Table 1 Continued. Summary of the original tagging information for the 33 muskellunge captured in the spring 2024 fyke netting survey on the Fox River that were previously PIT tagged. Information provided includes capture date in 2024, PIT tag number, capture size in 2024, sex, observed fin clips, date originally PIT tagged, length when originally PIT tagged, location originally PIT tagged, and the gear used to capture the fish when it was originally PIT tagged. Stocking listed in the Survey Gear when Tagging means this fish was PIT Tagged at the time of stocking.

DATE CAPTURED	PIT TAG NUMBER	2023 CAPTURED LENGTH (INCHES)	SEX	FIN CLIP	DATE TAGGED	TAGGING LENGTH (INCHES)	TAGGING LOCATION	SURVEY GEAR WHEN TAGGING
4/30/2024	985121014781062	41.7	M	LV	5/11/2022	42.2	Fox River	Fyke Net
5/3/2024	985121014795482	49.1	M	LV	5/11/2022	45.9	Fox River	Fyke Net
5/1/2024	985121014802201	45.7	M	LV	5/12/2021	44.1	Fox River	Fyke Net
5/1/2024	985121015097720	41.9	M	RV	9/14/2017	15.8	Upper Fox River	Stocking
4/30/2024	985121015344190	53.2	F	LV	5/18/2017	51.1	Fox River	Fyke Net
5/2/2024	985121015359609	45.5	M	LV	5/5/2015	42.0	Fox River	Fyke Net
5/3/2024	989001003975953	45.2	M	LV	5/10/2023	44.6	Fox River	Fyke Net
4/30/2024	989001003976004	52.1	F	LV	5/10/2023	50.8	Fox River	Fyke Net
5/1/2024	989001003981748	45.9	M	LV	5/9/2018	42.1	Fox River	Fyke Net
5/2/2024	989001003982070	48.0	M	LV	5/11/2022	47.5	Fox River	Fyke Net
5/1/2024	989001003982076	48.2	M	LV	5/11/2022	47.4	Fox River	Fyke Net
5/2/2024	989001003982077	40.7	M	LV	5/11/2022	39.2	Fox River	Fyke Net
4/30/2024	4703532D6B	49.3	M	LV	10/28/2008	41.0	Fox River	Electrofishing

Table 2. Summary of the recapture information (i.e., events when a muskellunge was recaptured after it was originally PIT tagged) for the seven muskellunge captured in the spring 2024 fyke netting survey on the Fox River that were also recaptured in previous DNR surveys or by anglers with PIT tag readers. Information provided includes capture date in 2024, PIT tag number, capture size in 2024, sex, observed fin clips, date recaptured, length when recaptured, recapture location, and the gear used when the muskellunge was recaptured. Note that one muskellunge was recaptured in multiple surveys.

DATE CAPTURED	PIT TAG NUMBER	2022 CAPTURED LENGTH (INCHES)	SEX	FIN CLIP	DATE RECAPTURED	RECAPTURE LENGTH (INCHES)	RECAPTURE LOCATION	SURVEY GEAR WHEN RECAPTURED
4/30/2024	985121001302418	47.8	M	RV	5/9/2018	45.4	Fox River	Fyke Net
5/1/2024	985121001366179	41.5	M	RV	5/12/2021	41.5	Fox River	Fyke Net
4/30/2024	985121001366707	50.2	F	RV	5/11/2021	48.9	Fox River	Fyke Net
5/1/2024	985121014777297	46.7	M	LV	5/16/2019	45.9	Fox River	Fyke Net
5/1/2024	985121014777297	46.7	M	LV	5/11/2022	46.3	Fox River	Fyke Net
5/1/2024	985121014777297	46.7	M	LV	5/10/2023	46.6	Fox River	Fyke Net
5/1/2024	985121014802201	45.7	M	LV	5/10/2023	44.9	Fox River	Fyke Net
5/2/2024	985121015359609	45.5	M	LV	5/11/2022	45.1	Fox River	Fyke Net
4/30/2024	4703532D6B	49.3	M	LV	5/9/2023	49.1	Fox River	Fyke Net

2024 Lake Michigan Weir Report

General Weir Overview

The Wisconsin DNR operates three salmon and trout egg collection facilities on Lake Michigan tributaries. The Strawberry Creek Salmon Spawning Facility or weir (SCW) is located on Strawberry Creek in Door County and has operated since the early 1970s. SCW is the DNR's primary egg collection facility for Chinook Salmon (*Oncorhynchus tshawytscha*) and typically provides the entire egg supply needed to produce Chinook Salmon for stocking into Lake Michigan. The Besadny Anadromous Fisheries Facility (BAFF) has been operated since 1990 and is located on the Kewaunee River in Kewaunee County. BAFF is a co-primary egg collection facility for steelhead (*Oncorhynchus mykiss),* Coho Salmon (*Oncorhynchus kisutch*) and Brown Trout (*Salmo trutta*). The Root River Steelhead Facility (RRSF), operated since 1994, is located on the Root River in Racine County. RRSF is also a co-primary egg collection facility for steelhead, Coho Salmon and Brown Trout. BAFF and RRSF both serve as backup egg collection facilities for Chinook Salmon.

This report summarizes the numbers of fish processed at each weir during 2024. Please note that reported values are not absolute numbers of fish returned to each river and many factors influence spawning runs, including stream flow, lake level, water temperature, stocking numbers, survival, harvest, dates of operation for each weir, etc. These factors vary annually and impact the numbers of fish available and processed at each egg collection facility. Egg collection goals also vary annually, depending on projected stocking quotas, DNR production needs and egg requests from other states or agencies. In addition, steelhead were sampled as part of an ongoing multi-agency, lake-wide study on natural reproduction and movement. Stocked steelhead were implanted with coded wire tags before release, and fish with tags were sampled from BAFF and RRSF. Analysis of the tags will provide fish managers with more information on the movement patterns of steelhead, growth rates and the occurrence of straying.

Overall, 2024 egg collection goals were met for salmon and trout to meet planned future stocking levels by the DNR for Wisconsin waters of Lake Michigan.

STRAWBERRY CREEK SALMON SPAWNING FACILITY

Fall 2024 Strawberry Creek Summary

SCW was operated for Chinook Salmon spawning from September 26 to October 21, 2024. The weir was open and fishing for 25 nights. Specific processing dates for egg and data collections were Sept. 30, Oct. 3, 7, 10, 14, 17 and 21. The number of Chinook Salmon processed for data each day, were 476, 161, 1,086, 836, 1,143, 673 and 205, respectively (a total of 4,580). In addition to the 4,580 spawning Chinook Salmon processed for data, another 141 mortalities were removed from the pond and tallied at SCW during 2024 (a total of 4,721). This number of Chinook (4,721) is near the long-term average of 4,612 (Figure 1). Overall, 598 female Chinooks were spawned, and nearly 3.5 million eggs were collected (Table 1). The Chinook eggs were transferred to Wild Rose State Fish Hatchery, where they were incubated, hatched, and raised until the following spring for stocking into several Lake Michigan tributaries.

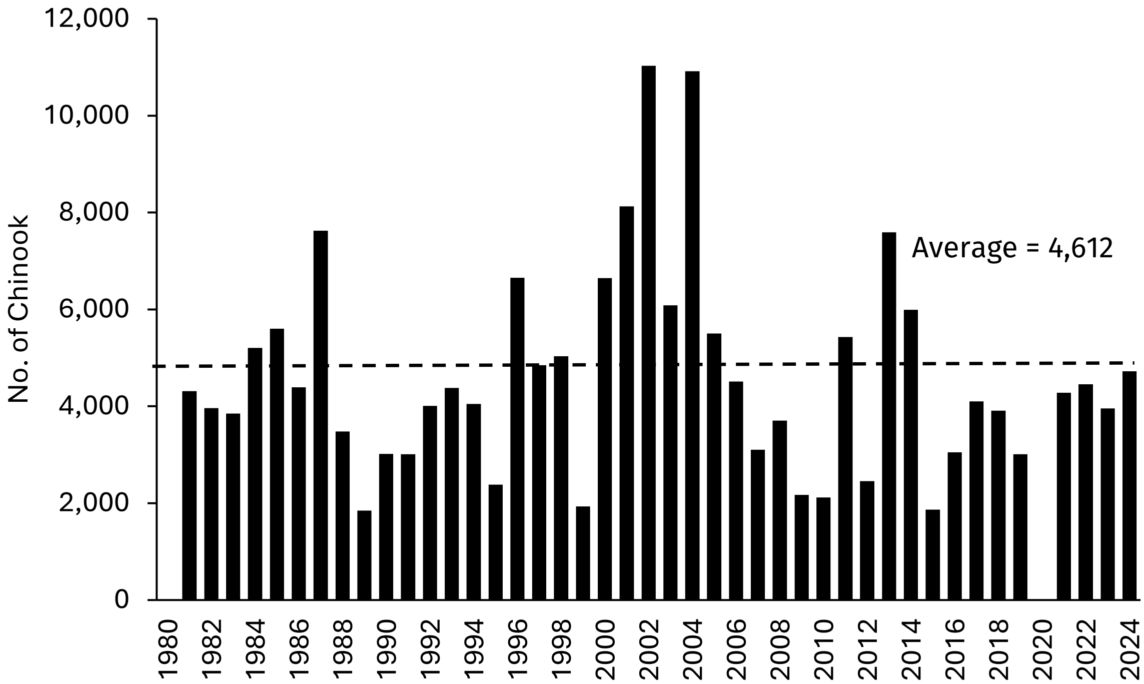

Figure 1. Numbers of Chinook Salmon handled during autumn spawning operations at the Strawberry Creek Weir per year from 1981-2024 (2020 data not available). The long-term average is 4,612 (dashed line). Several factors impact these numbers including stream flow from rainfall and supplemental water pumping, lake level, water temperature, stocking numbers, survival rates, dates of operation for the weir, etc.

Table 1. Numbers of Chinook Salmon processed for data, females spawned, eggs collected and average number of eggs per female at Strawberry Creek Weir during autumn 2024. (Note: All fish were not always removed from the pond each day, and instead fish were sometimes processed at a later date).

DATE	CHINOOKS PROCESSED	FEMALES SPAWNED	EGGS COLLECTED	AVG. EGGS PER FEMALE
9/30/2024	476	0	0	-
10/3/2024	161	0	0	-
10/7/2024	1,086	144	676,471	4,698
10/10/2024	836	200	1,166,359	5,832
10/14/2024	1,143	120	755,227	6,294
10/17/2024	673	134	865,739	6,461
10/21/2024	205	0	0	-
Total	**4,580***	**598**	**3,463,796**	**5,821**

**An additional 141 Chinooks were removed from the pond and stream and were only tallied from Sept. 29 to Oct. 21 (4,580 processed + 141 tallied = 4,721 total).*

Almost all Chinook Salmon at SCW were processed for data, including total length (mm), weight (kg), sex, lamprey scars and fin clips. Fish health veterinarians also collected samples from a subsample of fish. The total length for all Chinooks ranged from 11.1 to 43.4 inches (average = 32.4 inches) and ranged in weight from 0.4 to 28.4 pounds (averaged 12.6 pounds). A total of 2,985 males were sampled and ranged in total length from 11.1 to 43.4 inches (average = 32.2 inches) and in weight from 0.4 to 28.3 pounds (average = 10.7 pounds). A total of 1,595 females were sampled and ranged in total length from 25.0 to 42.1 inches (average = 35.1 inches) and in weight from 4.8 to 28.4 pounds (average = 16.1 pounds). The average weight of age-3 female Chinooks in 2024 was 16.96 pounds (N=266) based on known age-3 fish from fin clips at Strawberry Creek (Figure 2).

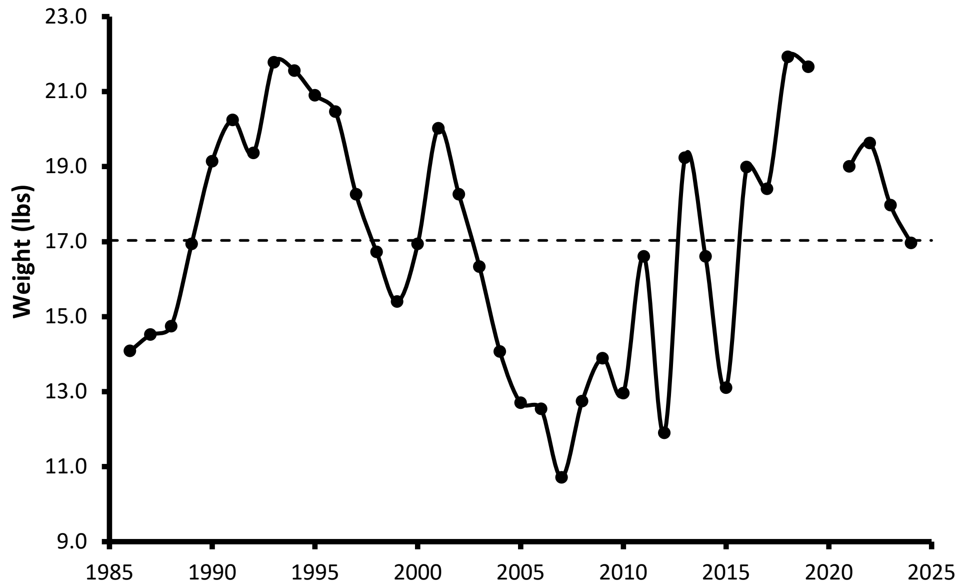

Figure 2. The average weight of age-3 female Chinook Salmon processed at the Strawberry Creek Weir per year from 1986-2024 (2020 data not available). The long-term average is 17.0 pounds (dotted line). Many factors impact Chinook size including alewife biomass, Chinook abundance and the ratio of predator/prey (etc.).

A water pump powered by a diesel engine was operated continuously to supplement stream flow at SCW from September 26 to October 21, 2024. The water level in Strawberry Creek was relatively low prior to pump operation. The pump increased flow and ensured that Chinook Salmon could easily swim upstream and seemed to trigger the annual Chinook spawning run by increasing stream flows.

BESADNY ANADROMOUS FISHERIES FACILITY (BAFF)

Spring 2024 BAFF Summary

Five steelhead processing days occurred at the BAFF on the Kewaunee River during 2024 on Mar. 27, Apr. 3, 10, 17, and 24. A total of 1,493 steelhead were processed for data. These steelhead were processed for data including length (mm), weight (kg), fin clips, gender, spawning condition, lamprey wounds and coded wire tags. Fish health samples were also collected from a subsample. A total of 1,584,303 eggs were collected from 376 female steelhead. Numbers of steelhead processed annually at BAFF during recent years include 806 (2023) 989 (2022), 408 (2021), 677 (2019), 710 (2018), 708 (2017), 535 (2016), and 429 (2015).

Fall 2024 BAFF Summary

A total of 624 Chinook salmon, 788 Coho salmon, 456 brown trout, and 279 steelhead were processed for data at BAFF during fall 2024 from Oct. 12 to Dec. 12 (Table 2). Salmon were sacrificed and nearly all brown trout and steelhead were passed upstream of the dam at BAFF. Fish processed for data including length (mm), weight (kg), sex, lamprey wounds and fin clips. Processed Chinook salmon averaged 28.0 inches and 7.9 pounds, Coho salmon averaged 19.7 inches and 2.9 pounds, brown trout averaged 26.5 inches and 11.0 pounds, and steelhead averaged 25.4 inches and 5.0 pounds. Eggs and fish health samples were collected from Coho salmon and brown trout. A total of 398,042 eggs were collected from 159 female Coho Salmon (Table 2). A summary of Chinooks processed at BAFF by year from 1990-2024 can be seen in Figure 3. Numbers of Coho processed annually at BAFF during recent years include 444 (2023), 1,522 (2022), 701 (2021), 1,857 (2020), 602 (2019), 1,480 (2018), 1,044 (2017), 861 (2016), 689 (2015), 786 (2014), 2,286 (2013), and 1,298 (2012).

Table 2. Numbers of Chinook salmon, Coho salmon, steelhead, and brown trout spawned, processed for data, and removed from ponds each day at the Besadny Anadromous Fisheries Facility (BAFF) during fall 2024. Tallies of dead fish routinely removed from holding ponds are not included in this table.

	CHINOOK	COHO	STEELHEAD	BROWN TROUT
Total Processed	624	788	279	456
Passed Upstream	0	0	276	396
Females Spawned	0	159	0	162
Egg Take	48	398,042	0	1,440,765

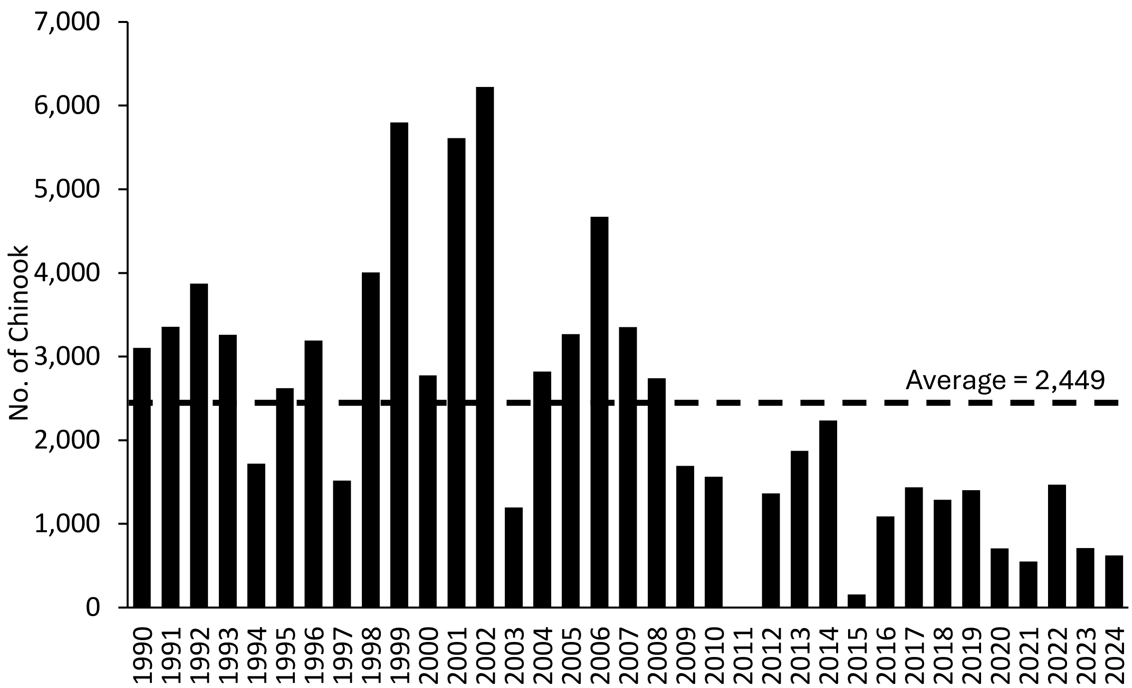

Figure 3. Number of Chinook Salmon handled during fall spawning operations at the Besadny Anadromous Fisheries Facility (BAFF) per year from 1990-2024. The average since 1990 is 2,449 (dashed line). Several factors impact these numbers including stream flow, water temperature, stocking numbers, survival rates, dates of operation for the weir, etc.

ROOT RIVER STEELHEAD FACILITY (RRSF)

Spring 2024 RRSF Summary

The RRSF was opened on February 26 and in operation for five processing dates during the spring 2024 spawning migration. A total of 1,236 steelhead were captured between March 4 and April 15. Our biological sampling goals were met, and fish health inspections were conducted.

The number of fish captured at RRSF is a sample of the 2024 steelhead run in the Root River. We do not stop every fish in the river, as they can move upstream past the facility before it is operational in early spring. Some fish can bypass the facility during the sampling season when the river is at high flows. Therefore, any comparison to past years' processing numbers will not provide a meaningful measure of the overall return of steelhead back to the Root River. The spring 2024 RRSF steelhead effort is summarized below (Table 3). Any unspecified strain steelhead reared will be stocked into non-brood rivers.

Table 3. Numbers of steelhead by strain processed for data, spawned and eggs collected during 5 processing dates during the spring 2024 at the RRSF.

	CHAMBERS CREEK	GANARASKA	UNSPECIFIED
Females Spawned	120	100	27
Egg Take	510,332	422,168	129,078

Fall 2024 Root River Summary

The RRSF was opened on Sept. 23 and in operation for 13 processing days during the fall 2024 spawning runs. Between Sept. 26 and Nov. 11, a total of 5,821 fish were captured and processed. Biological sampling goals were met, and fish health inspections were conducted on Coho Salmon. The Wisconsin Department of Natural Resources (DNR)'s fall 2024 Root River effort is summarized below (Table 4).

Table 4. Numbers of Chinook salmon, Coho salmon, steelhead, and brown trout spawned, processed for data, and removed each day at the RRSF during fall 2024. Tallies of dead fish routinely removed from holding ponds are not included in this table.

	CHINOOK	COHO	STEELHEAD	BROWN TROUT
Total Captured	1,899	3,839	60	23
Passed Upstream	1,854	3,704	15	23
Females Spawned	0	544	0	0
Egg Take	0	1,166,798	0	0

Due to a lack of precipitation and unseasonably warm temperatures, water levels in the Root River were low and water temperatures were warm for much of the fall season. Despite the low water levels, both Coho and Chinook Salmon moved upstream in large numbers in October.

For additional Lake Michigan fisheries information, please visit: dnr.wi.gov/topic/fishing/lakemichigan

For fishing information, please visit: dnr.wi.gov/topic/fishing/lakemichigan/OutdoorReport

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Sportfishing Effort and Harvest

The Lake Michigan Creel Survey program began in 1969 to determine the effort and harvest of the new salmon and trout program and was completed again in 2024, marking the 54th year of the survey. In most years, the survey is conducted from March 15 to October 31 but in 2024 it was reduced due to budget constraints. On Lake Michigan and the east shore of Green Bay, DNR creel clerks began the survey on May 1, and conducted the survey through September 30. On the west shore of Green Bay, creel clerks started March 15 and conducted the survey through October 31. In addition, Lake Michigan tributaries were not included in the survey.

For locations and months where the creel survey was not conducted in 2024, a statistical model was used to estimate total angling effort, harvest, and catch for trout, salmon, lake whitefish, yellow perch, smallmouth bass, northern pike, and walleye for the spring (March and April) time period in all fishery types (ramp, pier, shore, and stream). Stream fishery effort, catch, and harvest was also estimated for fall months (September and October). However, September and October are combined in the statistical analysis program and because of this stratification, the month of October was not included in modeled estimates for the ramp, pier and shore fisheries.

Wisconsin's Lake Michigan open water fishing effort was 2,281,228 hours during 2024, which was approximately 4.5% below the five-year average of 2,390,847 hours (Table 1). The most notable changes in the effort were in the shore fishery, which was down approximately 28% from the five-year average, and in the pier fishery, which was down 16% from the five-year average. Effort in the ramp fishery decreased from 2023 (1,644,268 hours in 2023 and 1,448,260 hours in 2024) but was within 5% of the five-year average. Effort in the charter fishery also decreased from 2023 (279,220 hours in 2023 and 257,976 in 2024) and was approximately 13% below the five-year average. Effort in the stream fishery increased slightly from the previous year and was almost 5% above the five-year average.

Overall, the 2024 season was very successful for Wisconsin's Lake Michigan trout and salmon anglers. Overall harvest was higher, with 466,199 salmonids harvested (Table 4). The harvest rate increased from 2023 to 0.2044 fish per hour, which was higher than the five-year average harvest rate. Harvest for all trout and salmon species except lake trout and brook trout were above the five-year average harvest. The 2024 Chinook harvest of 163,923 fish was the highest Chinook harvest on record since 2012 and approximately 37% above the five-year average. The 2024 Coho harvest of 210,891 fish was the highest harvest on record (going back to 1969) and was double the five-year average. The rainbow trout harvest of 67,566 was an increase from 2023 and was 28% above the five-year average. The brown trout harvest of 9,183 fish was an increase from 2023. The 2024 lake trout harvest of 14,636 was the lowest on record since 2006 and was 48% below the five-year average. The decrease in lake trout harvest can most likely be attributed to increased salmon harvest.

The standard weights for Chinook salmon, brown trout, and lake trout were above the five-year average (Table 5). The standard weights for rainbow trout and coho salmon were below the five-year average.

The open-water yellow perch harvest in 2024 was 195,856 fish (Table 2). This was an increase in harvest from 2023. Lake Michigan yellow perch harvest was 3,795 fish and the Green Bay harvest was 192,061 fish.

Table 1. Fishing effort (angler hours) by various angler groups in Wisconsin waters of Lake Michigan and Green Bay during 2024 and percent change from the 5-year average (2020-2024).

YEAR	RAMP	MOORED	CHARTER	PIER	SHORE	STREAM	TOTAL
2024	1,448,260	199,662	257,976	70,460	55,290	249,580	2,281,228
% change	-2.11%	-7.17%	-12.95%	-16.46%	-28.27%	4.65%	-4.58%

Table 2. Sport harvest by fishery type and species for Wisconsin waters of Lake Michigan and Green Bay during 2024.

SPECIES	RAMP	MOORED	CHARTER	PIER	SHORE	STREAM	TOTAL
Coho salmon	126,149	29,161	50,248	1,459	756	3,118	**210,891**
Chinook salmon	66,558	38,823	50,580	931	186	6,845	**163,923**
Rainbow trout	28,135	13,283	18,837	493	552	6,266	**67,566**
Brown trout	5,229	321	913	789	794	1,137	**9,183**
Brook trout	0	0	0	0	0	0	**60**
Lake trout	2,756	4,391	7,480	3	3	3	**14,636**
Northern pike	2,208	0	0	90	175	117	**2,590**
Smallmouth bass	1,577	515	0	203	59	33	**2,387**
Yellow perch	164,322	12,257	0	1,829	6,016	11,432	**195,856**
Walleye	58,458	719	0	91	63	8,384	**67,715**
TOTAL	**455,392**	**99,470**	**128,058**	**5,888**	**8,604**	**37,335**	**734,747**

Table 3. Total number of fish harvested by species across all angler groups in Wisconsin waters of Lake Michigan, 2015-2024.

SPECIES	2015	2016	2017	2018	2019	2020*	2021	2022	2023	2024	TOTAL (SINCE 1986)
Brook trout	0	0	0	0	0	0	0	8	60	0	39,108
Brown trout	20,335	23,885	20,404	12,625	8,013	3,317	9,178	9,013	6,963	9,183	1,211,638
Rainbow trout	59,127	77,004	66,599	57,141	50,258	54,430	58,597	35,304	47,322	67,566	2,579,332
Chinook salmon	114,528	138,110	84,163	84,228	63,043	80,890	100,323	120,148	130,811	163,923	7,663,753
Coho salmon	41,067	125,748	119,788	85,459	32,197	40,349	80,009	104,692	87,792	210,891	3,255,380
Lake trout	35,778	19,046	20,345	26,747	34,197	38,271	40,145	23,067	25,580	14,636	1,625,941
TOTAL	270,835	383,793	311,299	266,200	187,708	217,257	288,252	292,232	298,528	466,199	16,375,152
Harvest Per Hour	0.0989	0.1464	0.1222	0.1086	0.0795	0.1111	0.1054	0.1174	0.1201	0.2044	0.1402

Table 4. Total number of salmonids harvested by year by angler group in Wisconsin waters of Lake Michigan, 2015-2024.

FISHERIES TYPE	2015	2016	2017	2018	2019	2020*	2021	2022	2023	2024	TOTAL (SINCE 1986)
Ramp	103,602	163,103	135,785	103,356	59,786	51,777	95,194	109,698	126,298	228,827	6,347,721
Moored	53,182	74,000	46,638	50,785	43,816	47,463	67,073	52,521	49,160	85,979	4,068,772
Charter	91,255	112,150	100,333	89,446	73,521	92,845	106,351	98,387	100,659	128,058	4,140,797
Pier	8,197	10,153	4,963	2,493	695	1,066	2,396	2,419	3,509	3,675	376,713
Shore	4,935	9,446	7,119	4,242	2,946	4,460	2,643	4,647	1,637	2,291	469,996
Stream	9,664	14,941	16,461	15,878	6,944	19,646	14,595	24,560	17,265	17,369	971,153
TOTAL	**270,835**	**383,793**	**311,299**	**266,200**	**187,708**	**217,257**	**288,252**	**292,232**	**298,528**	**466,199**	**16,375,152**

**Note: Creel estimates for 2020 are from May-November only. Final column in Tables 3 and 4 represents total number of salmonids harvested from 1986-2024.*

Table 5. Standard weight (lbs) for salmonids from Wisconsin waters of Lake Michigan and Green Bay from 2019-2024 and percent change from the 5-year average.

SPECIES	2019	2021	2022	2023	2024	% CHANGE
Brown trout	5.48	3.93	3.22	3.26	5.16	22.51%
Rainbow trout	4.35	4.41	4.57	3.59	4.14	-1.74%
Chinook salmon	10.94	10.63	9.58	9.91	10.71	3.44%
Coho salmon	4.45	4.26	4.44	3.37	3.88	-4.89%
Lake trout	6.35	5.89	6.28	5.80	6.61	6.88%

** Note: No biological data was collected from sport-caught fish in 2020.*

Harvest of northern pike, smallmouth bass, and walleye decreased from 2023. Harvest was below the five-year average for all three species. The most significant decrease was seen in walleye harvest (132,393 fish in 2023 and 67,715 in 2024; Table 2).

For more summaries, check out Wisconsin's Lake Michigan website at:

http://dnr.wi.gov/topic/fishing/lakemichigan/ManagementReports.html

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Lake Whitefish

Stock Management

Lake whitefish *Coregonus clupeaformis* commercial harvest in Wisconsin waters of Lake Michigan and Green Bay was historically managed as originating from one stock spawning in the areas around North and Moonlight bays, which lie in the northern portion of WM-3 in Lake Michigan (Figure 1). The commercial quota was allocated to three commercial zones in Green Bay and Lake Michigan (See DNR 2022 for description of previous management protocols). The entire commercial quota had not been caught in decades, which was largely reflective of whitefish recruitment failures in Lake Michigan proper but also an artifact of the management zones established by the Individually Transferrable Quota system established in 1989-90. Meanwhile, lake whitefish production in Green Bay has increased considerably in recent decades and has remained relatively stable in recent years. The commercial lake whitefish harvest and effort have reflected these ecological changes including a large shift in effort to Green Bay. These changes prompted the development of two population models, one for Wisconsin waters of Green Bay and one for Lake Michigan. Tagging studies of lake whitefish spawning populations in Green Bay and northwest Lake Michigan indicated that fish originating from these respective areas maintain a relatively discrete distribution, generally remaining in their natal waters throughout the year (I.e. staying in Lake Michigan or Green Bay). This mark-recapture information provided confidence that lake whitefish from Lake Michigan and Green Bay could be managed independently and that individual population models could be developed to manage stocks separately.

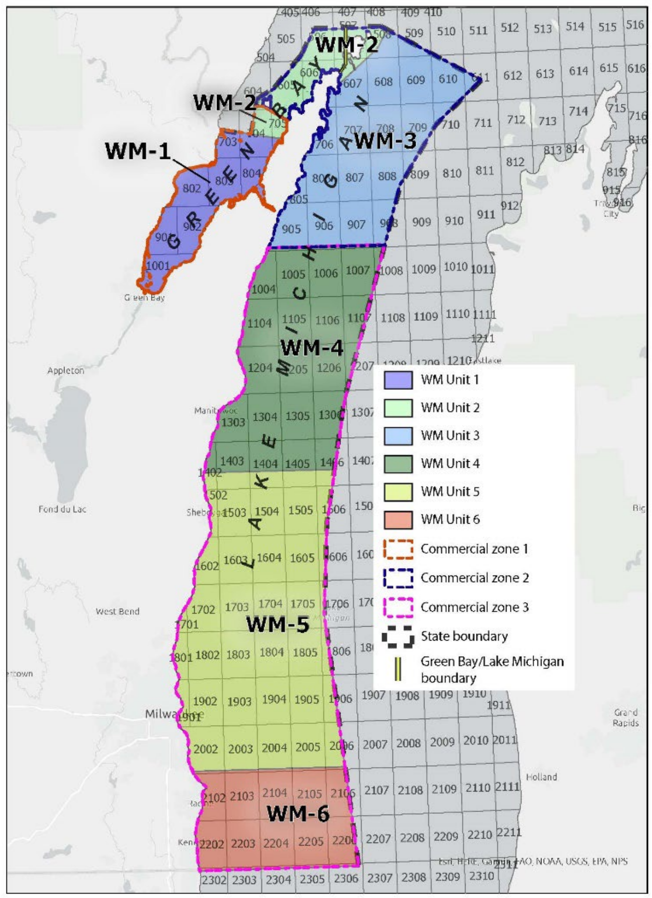

Figure 1. Wisconsin Green Bay and Lake Michigan commercial fishing management units and zones.

During August of 2022, Wisconsin formally implemented one total harvest quota each for Green Bay (WM 1 and 2) and Lake Michigan (WM 3 through 6) waters as a reflection of the waterbody-specific population changes described above. Statistical-catch-at-age (SCAA) models were developed for each waterbody to best describe lake whitefish population dynamics in these waters. Due to the relatively short history of the contemporary Green Bay lake whitefish commercial fishery, this population model is considerably more limited in scope compared to the Lake Michigan SCAA model. Furthermore, the advent of the large winter lake whitefish sport ice fishery in 2007 required incorporating sport fishing data into a model that was historically based mainly on input data from commercial fishing. The differing population dynamics are reflected in estimates of spawning stock size with biomass declining precipitously in Lake Michigan due to recruitment failures while strong recruitment events in Green Bay have resulted in an increase in stock size in those waters (DNR 2024). The annual quota for Green Bay waters is approximately 2.28 million pounds, evenly split between the commercial and sport fisheries. The quota for Lake Michigan proper is set at approximately 874,000 pounds. These total allowable catch recommendations were implemented in 2024 and were made using data through 2021. Quota recommendations will be made every three years.

Commercial Effort and Harvest

Trap and gill nets are the primary gear used to harvest lake whitefish in Wisconsin waters of Lake Michigan. Pound nets were used historically but have not been employed since 2009. In 2020, a bottom trawl fishery for lake whitefish was implemented; but it is restricted to only a 'trawling zone' offshore from the Manitowoc/Two Rivers areas of Lake Michigan. Changes in whitefish population dynamics and gear preference/catchability account for some dramatic shifts in the amount and type of commercial effort between these two waterbodies. These changes have generally favored the use of trap nets although trawling has accounted for the largest portion of the harvest on Lake Michigan in recent years. The lake whitefish population increase in Green Bay has resulted in increased gill net effort there including the practice of 'day setting' where nets are only fished for hours before lifting as opposed to overnight. Day setting has been a very successful approach in limiting bycatch although it is generally practiced early in the season when water temperatures are low and fish are concentrated in southern Green Bay waters.

The amount of overall trap net effort was historically higher in Lake Michigan waters through the early 2000s (Figure 2). The following 10 years effort was roughly divided evenly between Green Bay and Lake Michigan as commercial fishing in Green Bay improved. By 2016 the effort in Lake Michigan began to decline and has dropped considerably, partially as a function of fishers in the Two Rivers area switching from trap nets to trawl gear. However, considerable reductions in trap net effort in historically heavily fished spawning areas in Lake Michigan is largely responsible for the overall effort decline in Lake Michigan in recent years. Meanwhile, the effort in Green Bay has shown a gradual increase with 2024 the highest effort recorded since 1990.

Gill net effort has followed a long-term decline in both waterbodies, although it has stabilized somewhat in recent years (Figure 3). Preference for trap net-caught fish is largely responsible for the overall decline in gill net use. Although, the decline in gill net catchability brought on by ecological perturbations from invasive species is also a major contributor (increased water clarity and algal fouling).

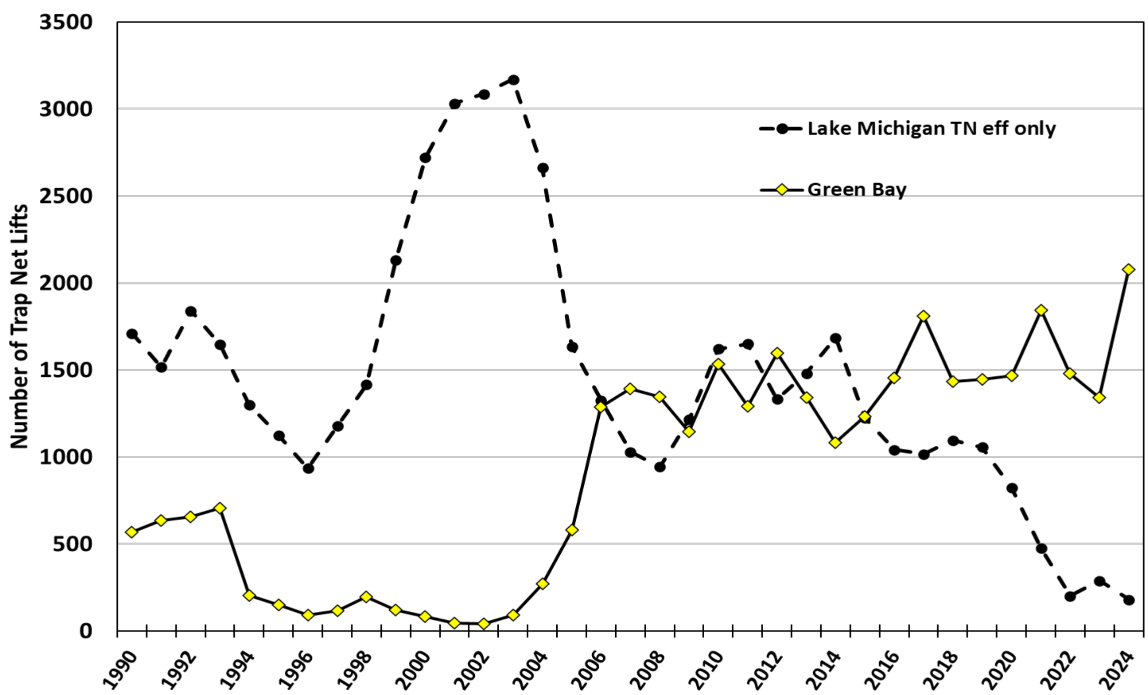

Figure 2. Trends in trap net commercial fishing effort for lake whitefish in Wisconsin waters of Lake Michigan and Green Bay, 1990-2024.

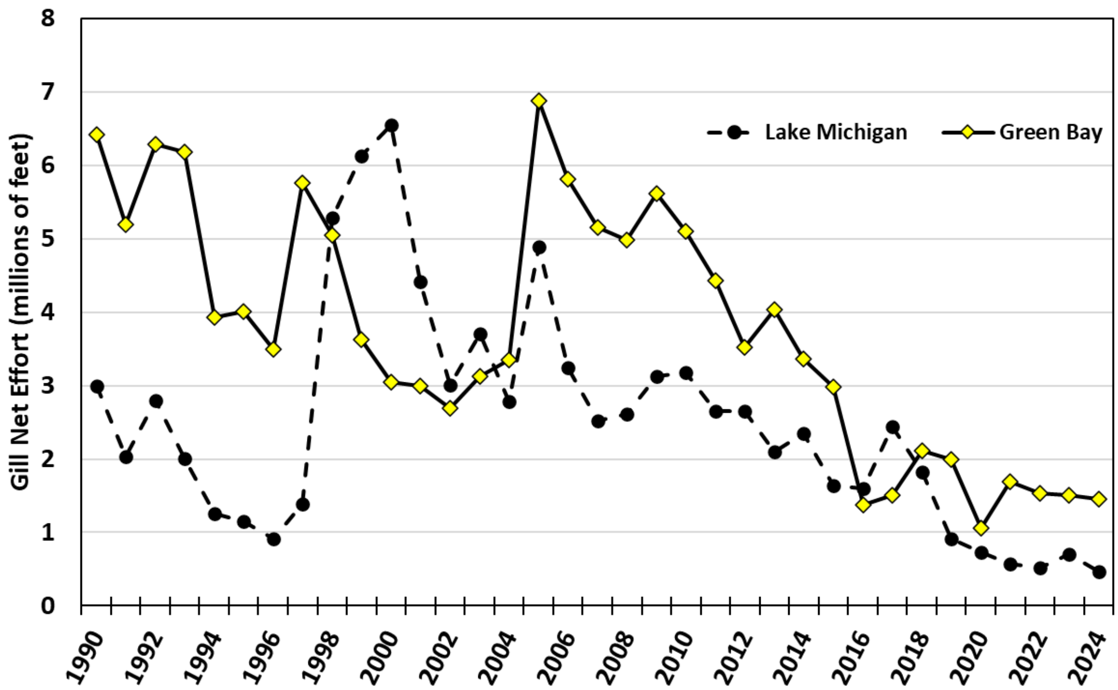

Figure 3. Trends in gill net commercial fishing effort for lake whitefish in Wisconsin waters of Lake Michigan and Green Bay, 1990-2024.

Harvest levels and gear type follow very different trends between the waters of Green Bay and Lake Michigan (Figures 4 and 5). Lake whitefish harvest patterns followed the high Lake Michigan productivity during the 1990s, with increasing harvest levels into the early 2000s. However, recruitment failures beginning in the early 2000s have resulted in a continually decreasing harvest trend and lower fishing mortality rates. Recently, trawling has the exceedingly highest proportion of harvest in Lake Michigan, likely due to its characteristic as an active versus passive fishing gear. Harvest in Green Bay has shown a very different pattern with contemporary levels that reflect the high whitefish production in the bay. Relatively high gill net catches during the 1990s generally originated from northern Green Bay waters and were associated with the high abundance of lake whitefish originating from Lake Michigan stocks. While the amount of lake whitefish harvested by gill nets has declined over time, it has increased in recent years in Green Bay mostly as a reflection of the high density of lake whitefish in the southern part of the bay. Meanwhile, southern Green Bay waters (focused on areas offshore of Sturgeon Bay) are largely responsible for increased harvest beginning around 2006, albeit using trap nets. The relatively steady harvest levels since then are somewhat reflective of southern Green Bay being in a commercial zone historically that had a low allocation (~9%) of the total quota until recent increases of allowable catch beginning in 2021.

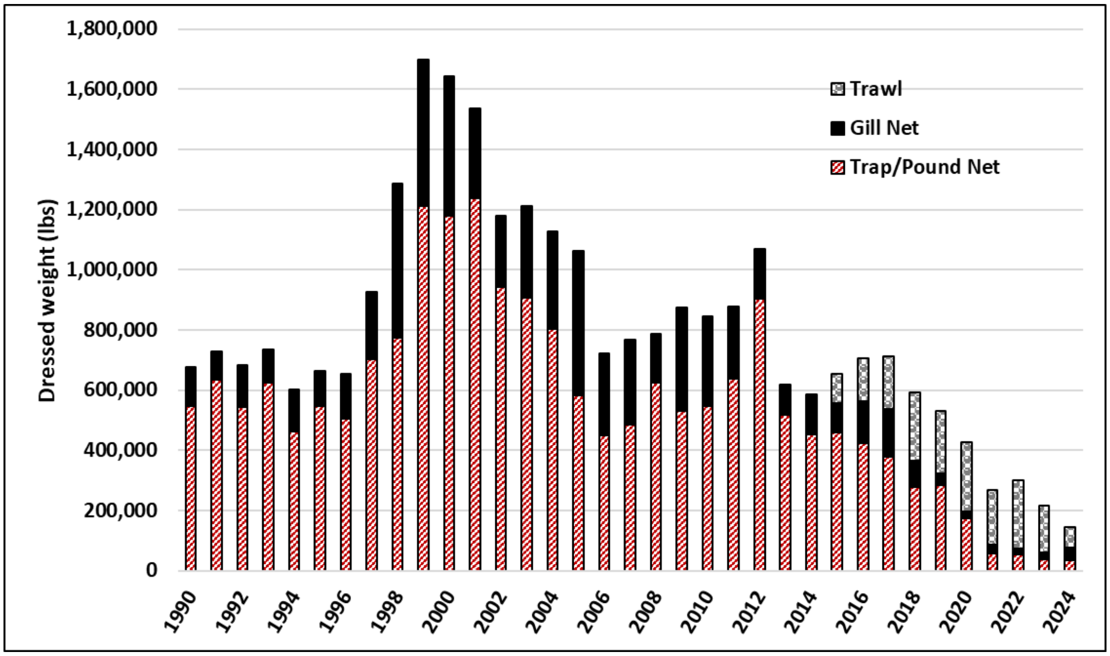

Figure 4. Trends in commercial fishing harvest for lake whitefish in Wisconsin waters of Lake Michigan, 1990–2024.

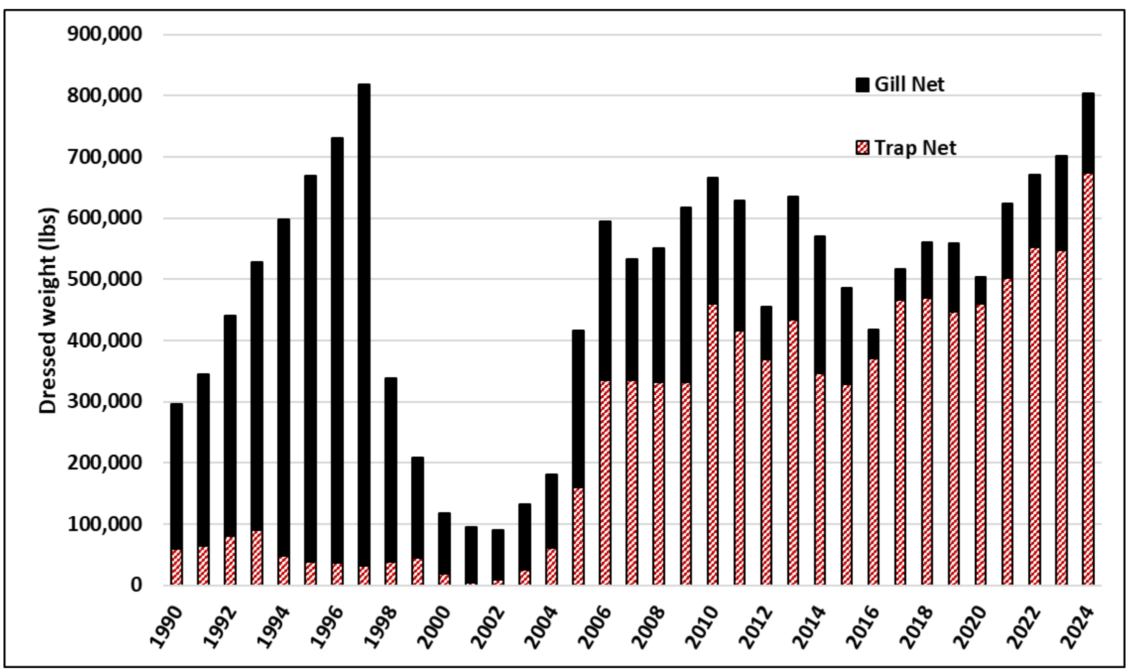

Figure 5. Trends in commercial fishing harvest for lake whitefish in Wisconsin waters of Green Bay, 1990–2024.

Measurements of catch per unit of effort (CPUE) have demonstrated different trends between Green Bay and Lake Michigan (Figure 6). While the Lake Michigan CPUE has shown a general decreasing trend over the last 6 years, most abruptly in recent years, the Green Bay CPUE has increased. While Green Bay has long accounted for a considerable amount of lake whitefish yield, the majority of it came from the approximate northern 1/3. However, the southern waters of Green Bay now are responsible not only for the increased catch rates but make up the overwhelming proportion of harvest in Green Bay and now account for over 70% of the trap net harvest (Figure 7). The momentous decline of commercial fishing effort and the advent of trawling in Lake Michigan has also resulted in a considerable decline in annual spatial and temporal effort there. Aside from some effort in far southern Wisconsin waters of Lake Michigan, the greatest trap net effort is now focused during the month before and after the spawning period in November. The same decreasing CPUE trend is reflected in the relatively short-term trawl fishery. This provides even greater concern for the declining condition of the Lake Michigan lake whitefish population given the active-gear characteristics of this fishery (Figure 8).

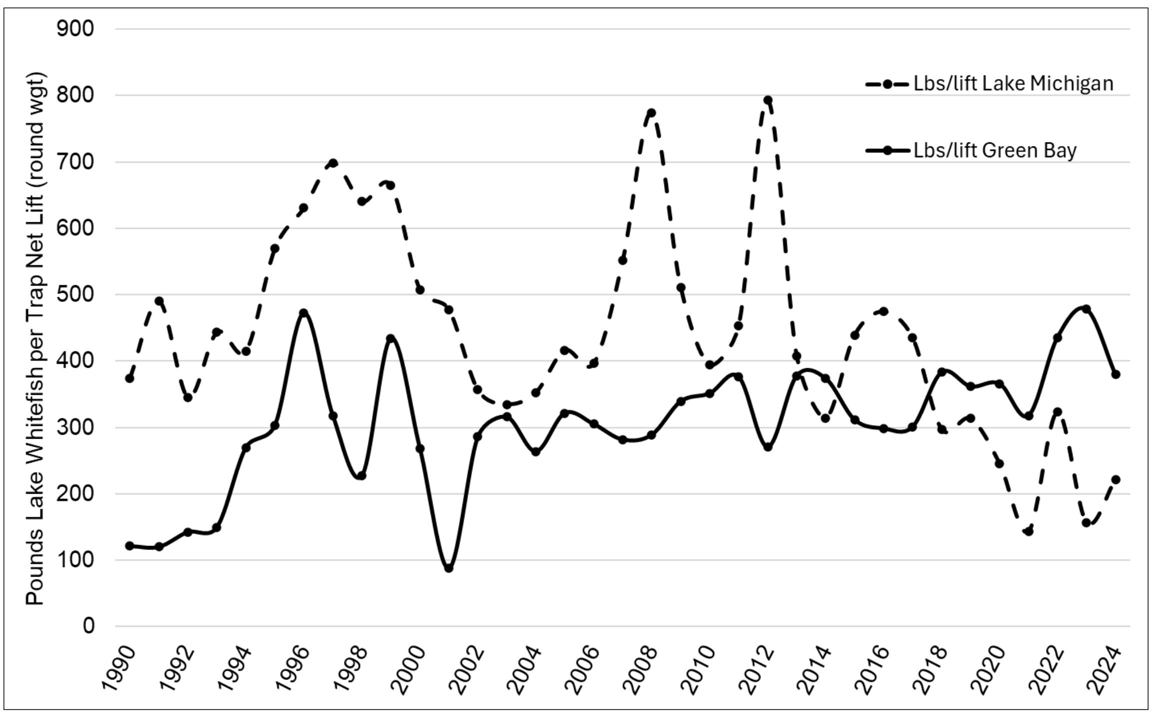

Figure 6. Trends in commercial catch per trap net lift for lake whitefish in Wisconsin waters of Lake Michigan and Green Bay, 1990–2024.

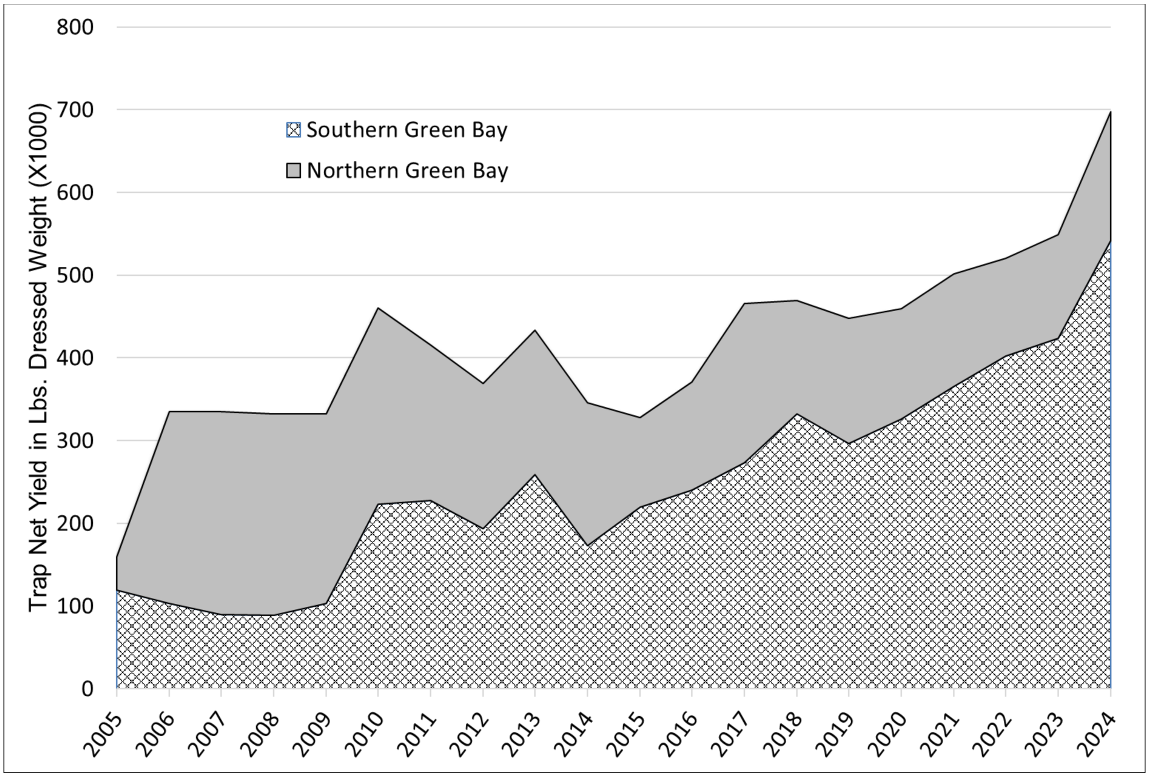

Figure 7. Trends in commercial trap net yield in Wisconsin waters of Green Bay from 2005 to 2024.

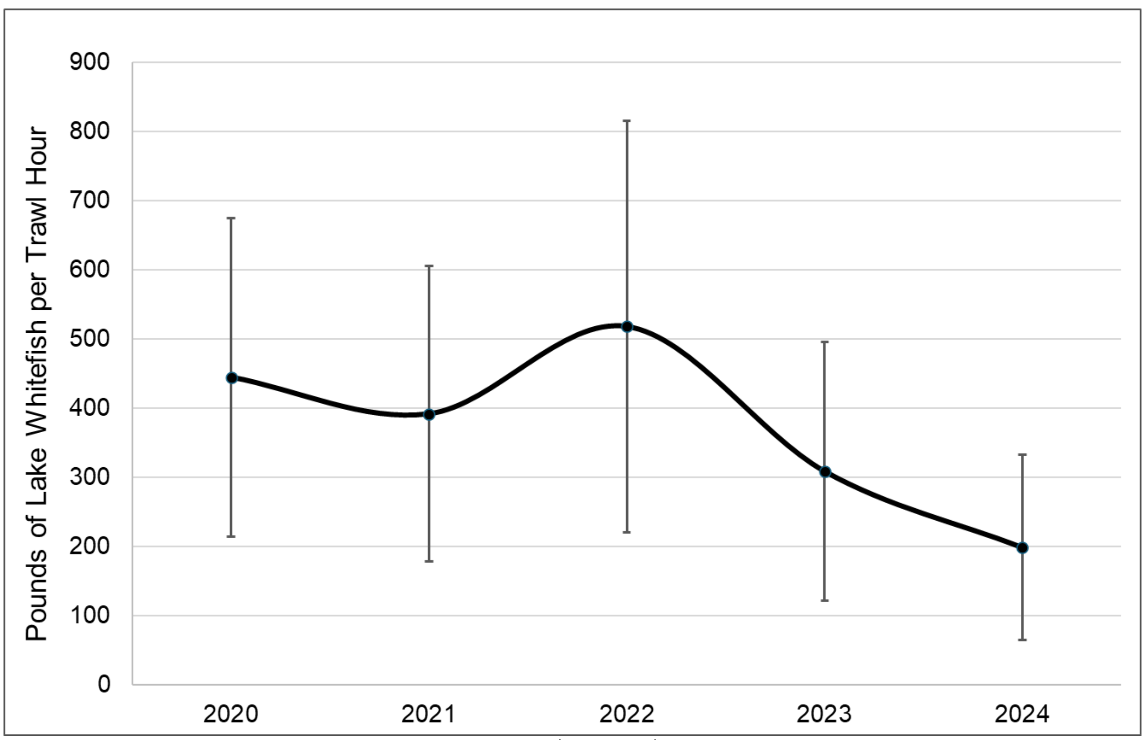

Figure 8. Trends in commercial catch per trawl hour (+/- 1 SD) for lake whitefish in Wisconsin waters of Lake Michigan, 2020–2024.

Tributary Populations

During the mid-1990s, lake whitefish began a recolonization of the Menominee River where spawning populations had not been observed since the late 1800s (Belonger 1995). The lake whitefish population gradually increased, and by the mid-2000s, the number during the November spawning period was estimated to be in the thousands. Formal surveys to collect biological data from lake whitefish in the Menominee River during the November spawning period began in 2009. Starting in 2013, DNR staff began assessing other major west shore Wisconsin rivers in Green Bay for lake whitefish during November. These surveys revealed that lake whitefish were also making spawning migrations into the Fox, Peshtigo and Oconto rivers to varying degrees of relative abundance and successful recruitment was eventually documented in each of these rivers (Ransom et al., 2021). The ability to accurately estimate these individual populations has been confounded by the influence of the dams artificially concentrating fish on most rivers. Therefore, sampling efforts, particularly in earlier years, have typically been restricted to collecting a viable sample to assess the size and age composition of the spawning population. While several tagging studies have occurred, the relatively low number of recaptured fish relative to the total number tagged likely constrains accurate population estimates as well.

Recruitment survey

Strong young-of-year recruitment events have been measured intermittently within the last couple decades in the waters of southern Green Bay. Bottom trawling assessment, conducted annually during August targeting juvenile yellow perch, has captured this trend of increasing numbers since the mid-1990s (Figure 9). This survey is particularly successful at catching the young-of-year and yearling stages of lake whitefish, while adult catches are likely limited due to gear avoidance. The initial occurrence of large year classes of young-of-year lake whitefish generally follows trends of adults colonizing the tributaries suggesting these river populations are important sources for lake whitefish recruitment into the Green Bay fishery. However, emerging evidence suggests that some lake whitefish recruitment is also occurring in Green Bay's open waters as larval escapement estimates cannot account for the population levels observed (Ransom et al., 2021). After some relatively strong recruitment events between 2012 and 2018, recruitment was measured to be relatively low over the last six years with the first and third lowest levels observed the past two years.

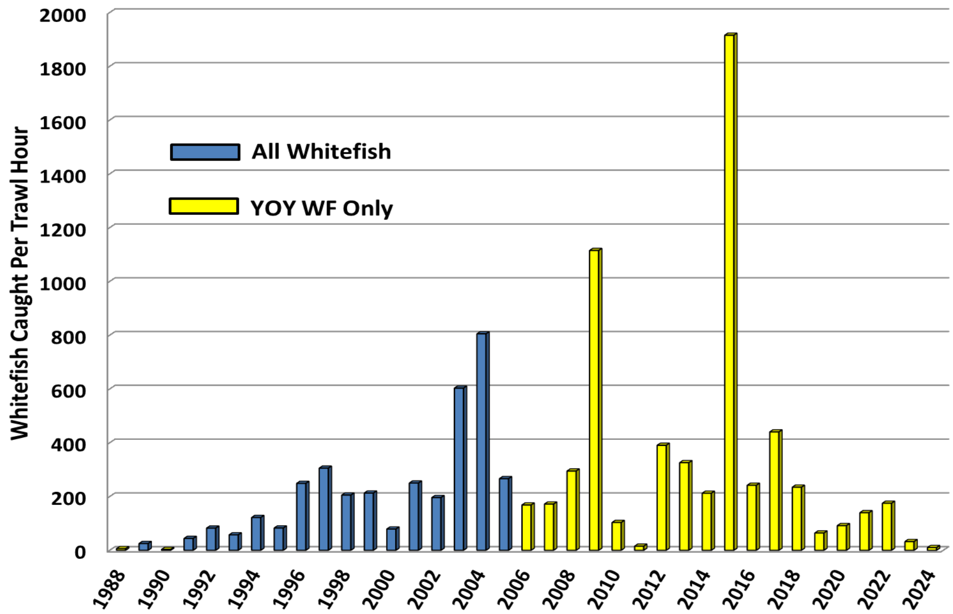

Figure 9. Lake whitefish captured during August bottom trawling assessments in Green Bay between 1988 and 2024. Young-of-year (YOY) whitefish were not separated in counts until 2006; years before this represent all whitefish combined in the catch.

Sport Angler Harvest

In 2007, the first significant lake whitefish harvest recorded an estimated 1,559 fish during the ice fishing season. The harvest increased substantially during the winter of 2008 and has remained relatively high until recently. The advent of lake whitefish fishing is largely responsible for the resurgence of the cumulative ice fishing effort on the Wisconsin waters of Green Bay (Figure 10). A formal Guide Reporting Program for ice fishing on Green Bay was implemented in 2017 in response to the substantial lake whitefish guide fishery. Before the reporting program, guide harvest was included as part of standard creel interviews though it was likely underestimated.

Winter creel surveys for Green Bay are conducted during January, February and March. For winter 2024, the estimated whitefish harvest was 7,711 fish, a decrease of 2,700 from the previous year and over 80,000 fewer than harvested in 2022. The low harvest levels of the last two years were primarily due to poor ice conditions as overall effort reached its third lowest level in the last 30 years. Whitefish catch per unit of effort (CPUE), measured in lake whitefish caught per hour of fishing specifically for that species, decreased dramatically in 2023, again likely due to poor ice conditions. However, catch rates did increase slightly between 2023 and 2024 (Figure 11). Since 2019 annual angler catch rates for lake whitefish have generally been among the lowest in the overall time series. These CPUE values are calculated from the sport angler creel survey and do not include catch data from guided trips.

As the lake whitefish spawning population increased in the Menominee River, a robust sport fishery evolved with considerable effort targeting lake whitefish as they aggregated below the Hattie Street Dam during the November spawning migration. In 2022, a focused creel survey was designed to estimate the harvest and effort for lake whitefish during November in the Menominee River. While various angler access points along the Menominee River were considered and evaluated, nearly all of the harvest and effort has been restricted to the area just below the Hattie Street Dam. The survey included most of the month of November and dates were randomized to cover all weekends and three days per week of either morning or evening/night creel clerk shifts of six hours each. Angler harvest and directed effort (effort targeting lake whitefish) increased in each of the three years (Table 1). Although anglers also target walleyes and brown trout below the dam, effort for lake whitefish accounted for 40% - 72% of the total fishing effort.

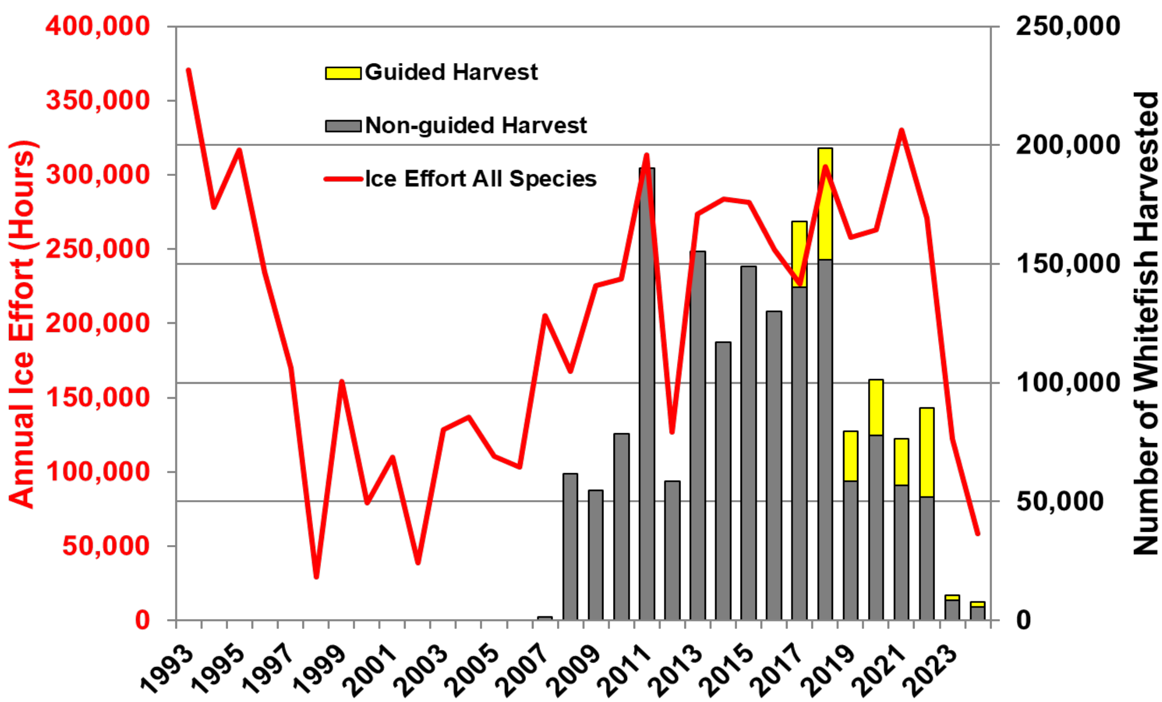

Figure 10. Estimated number of lake whitefish harvested and total effort for all species in Wisconsin waters of Green Bay during the winter creel season (January-March) for 2007-2024. Formal guide reporting for ice fishing on Green Bay was implemented in 2017.

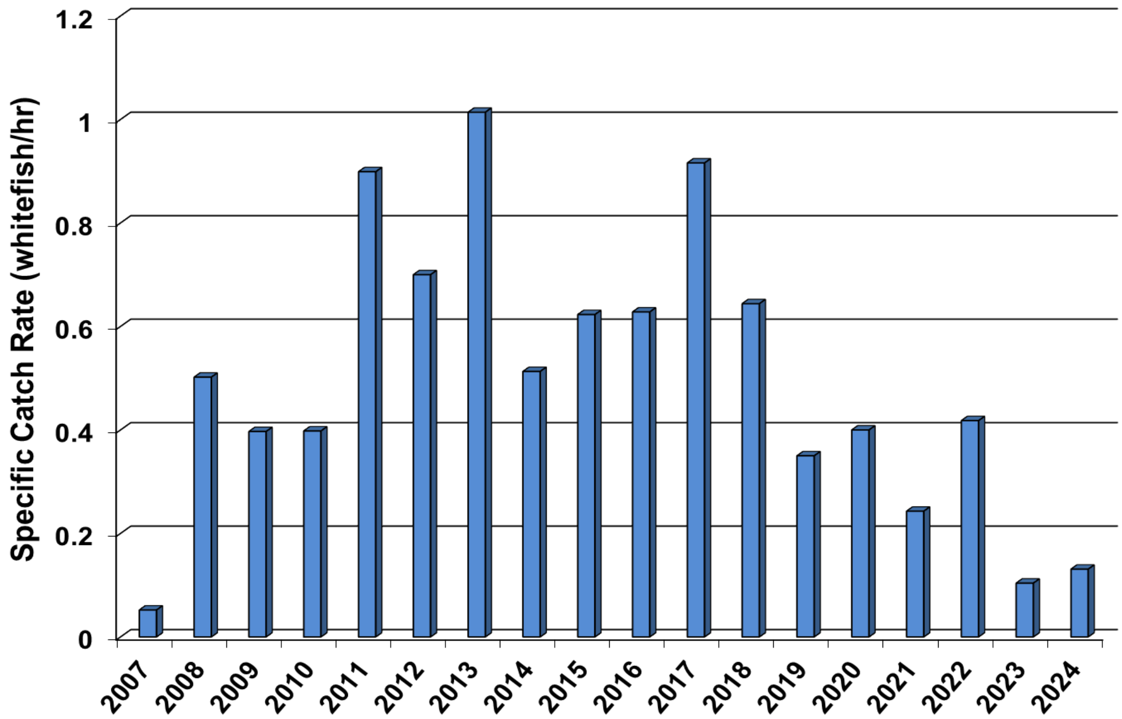

Figure 11. Specific catch rate estimates of lake whitefish caught per hour for anglers targeting lake whitefish in Wisconsin waters of Green Bay during the winter creel season (January-March) for 2007-2024.

Table 1. Harvest (% coefficient of variation (CV)), catch (% coefficient of variation (CV)), directed effort and total fishing effort (+/- 1 standard deviation (SD)) for lake whitefish for the month of November, 2022-2024 in the Menominee River, Wisconsin.

YEAR	HARVEST(CV)	CATCH(CV)	DIRECTED EFFFORT	TOTAL EFFORT (SD)
2022	626 (24)	868 (21)	964	2,398 (237)
2023	936 (22)	1,162 (24)	1,318	2,323 (340)
2024	1,406 (20)	1,494 (19)	2,200	3,053 (367)

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2024 Status of Lake Trout in Southern Lake Michigan

Background

The purpose of this report is to summarize data collected during the 2024 field season and to describe long-term trends in relative abundance, catch-at-age, natural recruitment and spawning populations of lake trout in the southern Wisconsin waters of Lake Michigan. Please refer to the Sportfishing Effort and Harvest report (p. 90) for changes in sport harvest.

The rehabilitation goals and objectives referenced in this report are outlined in more detail in "A Stocking Strategy and Evaluation Objectives for the Rehabilitation of Lake Trout in Lake Michigan" (Wesley et al. 2024; referred to in this document as "Strategy").

Spring Lakewide Assessment Surveys

The Lakewide Assessment Plan for Lake Michigan Fish Communities was developed in 1998 as a multi-agency effort to assess fish communities in a standardized and coordinated effort. The primary objective is to assess the relative abundance of lake trout.

In 2024, the Wisconsin DNR surveyed one nearshore reef off Milwaukee (the South Milwaukee Reef) and two reefs within the Southern Refuge (the Northeast and East Reefs) between May 16 and May 21. Four nets were set on the South Milwaukee Reef. Protocols established by the Lake Trout Working Group specify twelve nets per location. The primary goal of the nearshore set was to determine if lake trout are utilizing the South Milwaukee Reef in the spring, and therefore effort was reduced. Each net set consisted of two 800-foot gangs of graded-mesh multifilament net, with 100 ft panels each of 2.5 inch, 3.0 inch, 3.5 inch, 4.0 inch, 4.5 inch, 5.0 inch, 5.5 inch and 6.0 inch mesh. Gillnets are set for 24 hours at multiple depth strata. Nets on the South Milwaukee Reef were set from 54 to 80 feet of water. When nets were lifted, the surface water temperature was 53°F.

Overall, catches were low. Nets were clogged by Cladophora and diatoms which influenced catch rates, so this data will not be used for catch-per-unit effort (CPUE) trends. A total of 27 fish were caught, including 1 round whitefish, 6 burbot, 13 yellow perch and 7 lake trout. Lake trout caught ranged between 25.5 and 33.5 inches in length. Two lake trout were unclipped and presumed to be wild, 1 was adipose-clipped and the remaining 4 had differential fin clips. While most lake trout were released, a snout was collected from the adipose-clipped fish. Coded-wire tag analysis showed this fish was 8 years old, and a Seneca-strain lake trout stocked on the Sheboygan Reef (Southern Refuge).

Five nets were set on the Northeast Reef and two were set on the East Reef. Effort was reduced on both reefs due to very high catches in 2023 and high catches in early sets in 2024. Net configurations matched those used on the nearshore location. Nets were set from 172 to 231 feet of water. When nets were lifted, the surface water temperature was 46°F. Bycatch is typically minimal; in 2024, two burbot caught on the Northeast Reef were the only fish except lake trout caught on the offshore reefs.

Catch-per-unit-effort (CPUE) on the two reefs sampled increased annually from 2014-2022. CPUE decreased slightly in 2023, then rebounded in 2024 (Figure 1). In 2024, spring CPUE was 97.3 fish/1,000 feet of net on the Northeast Reef and 106.9 fish/1,000 feet of net on the East Reef.

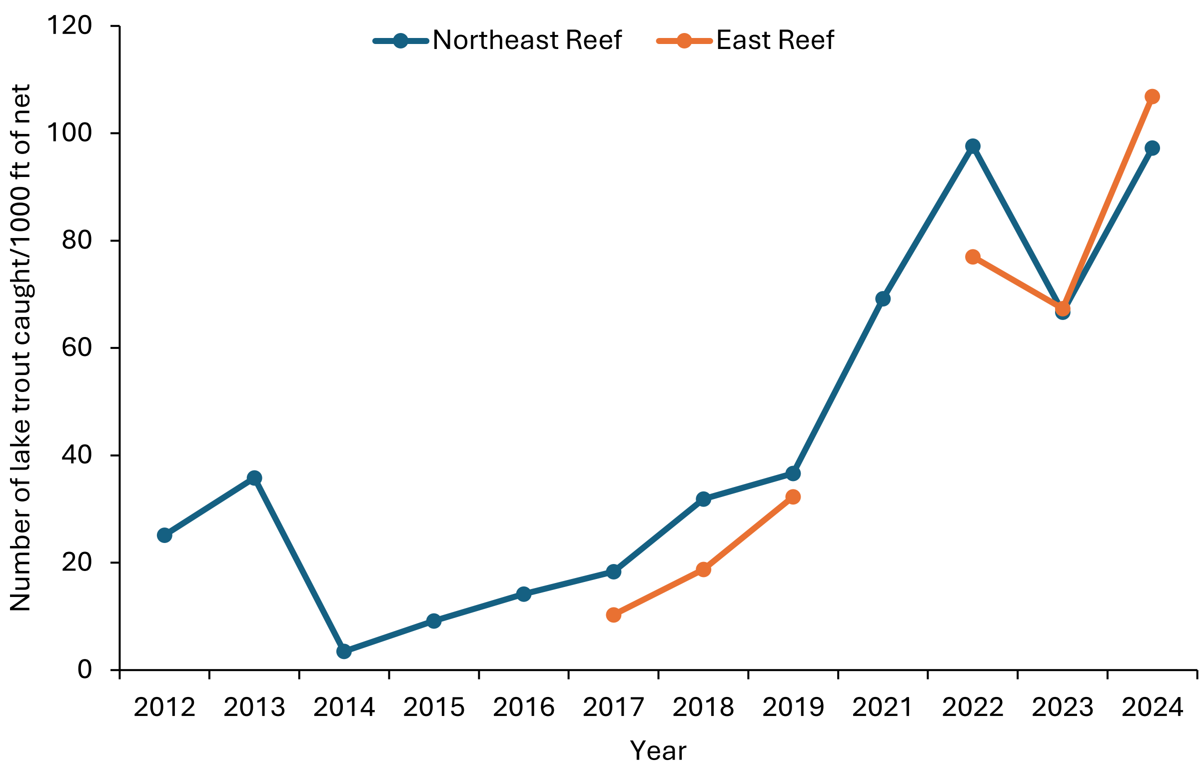

Figure 1. Spring catch-per-unit effort of lake trout by year for offshore reefs.

Objective 1 outlined in the Strategy for lake trout rehabilitation is to increase the average CPUE in spring assessments of targeted rehabilitation areas to 25 or more lake trout per 1,000 feet of graded-mesh gill net. This objective has been met on the Northeast Reef since 2018 and on the East Reef since 2019 (Figure 1).

Every lake trout caught was examined for the presence of fin clips. Unclipped lake trout were presumed to be wild fish. In 2024, of 1,120 lake trout captured, 1,111 (99%) were adipose-clipped, 1 had a left pectoral and right ventral fin clip, 2 had adipose and right pectoral fin clips and 6 (2 on the Northeast Reef and 4 on the East Reef) were unclipped.

Objective 7 outlined in the Strategy for lake trout rehabilitation is to increase the mean number of wild lake trout captured in spring assessments to 19 lake trout per 1,000 feet of net. This objective has not yet been met on either offshore reef (Figure 2). In 2024, for both offshore reefs combined, CPUE of stocked fish was 100 lake trout/1,000 feet of net, while wild fish CPUE was 0.54 lake trout/1,000 feet.

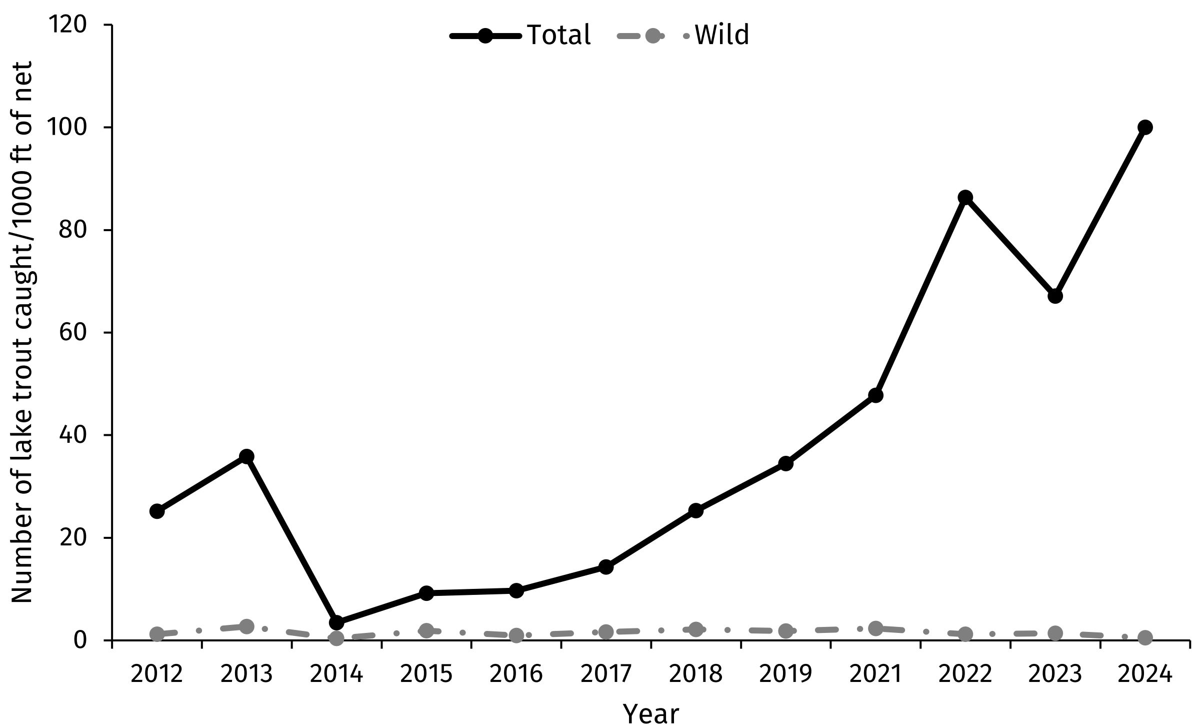

Figure 2. Spring catch-per-unit effort of stocked and wild lake trout by year for offshore reefs.

Lake trout stocked in Lake Michigan have been tagged with coded-wire tags (CWT) by the U.S. Fish and Wildlife Service every year since 2011. Before 2011, only a subset of the 1985 and 1988-2003 year-classes were tagged. Snouts were collected from adipose-clipped lake trout for CWT extraction for age determination, strain identification and stocking location.

In 2024, 714 CWTs were recovered from adipose-clipped lake trout offshore. Of these, 710 (99%) were Klondike Reef strain. The remaining lake trout were Seneca Lake strain. The Klondike Reef strain is a deep-water strain stocked only on the Southern Refuge, and these fish are more likely to remain on the offshore reefs, while other strains stocked into Lake Michigan make use of a variety of habitat. Klondike-strain lake trout were stocked on the Southern Refuge from 2012-2020. Although the first year-classes of stocked Klondikes began showing up in the spring survey in 2015, catch rates did not begin to significantly increase until 2018, when these fish were 7 years old. The majority (85%) of the catch on offshore reefs in spring 2024 consisted of Klondike-strain lake trout from the 2013, 2014, and 2015 year-classes. These three year-classes have made up the majority of the catch since 2021.

The age structure of stocked lake trout caught during spring assessments offshore was relatively young (Figure 3). Seneca-strain fish were removed from this analysis due to low numbers. Captured Klondike-strain fish ranged between ages 7 and 13, with a mean age of 10 years. Lengths ranged from 15 to 29 inches (Figure 4). The oldest year-class of Klondikes, stocked in 2012, was age 13 in 2024. The youngest year-class, stocked in 2020, was age 5; however, these fish were stocked nearshore due to travel restrictions from the COVID-19 pandemic.

It is possible that the low number of wild lake trout encountered in spring assessments is influenced by the higher number of stocked fish encountered. Other possible explanations, such as differential behavior of wild fish, may be explored by future telemetry studies.

Photo: Unclipped lake trout caught on the Northeast Reef in 2024. Photo credit: Wisconsin DNR

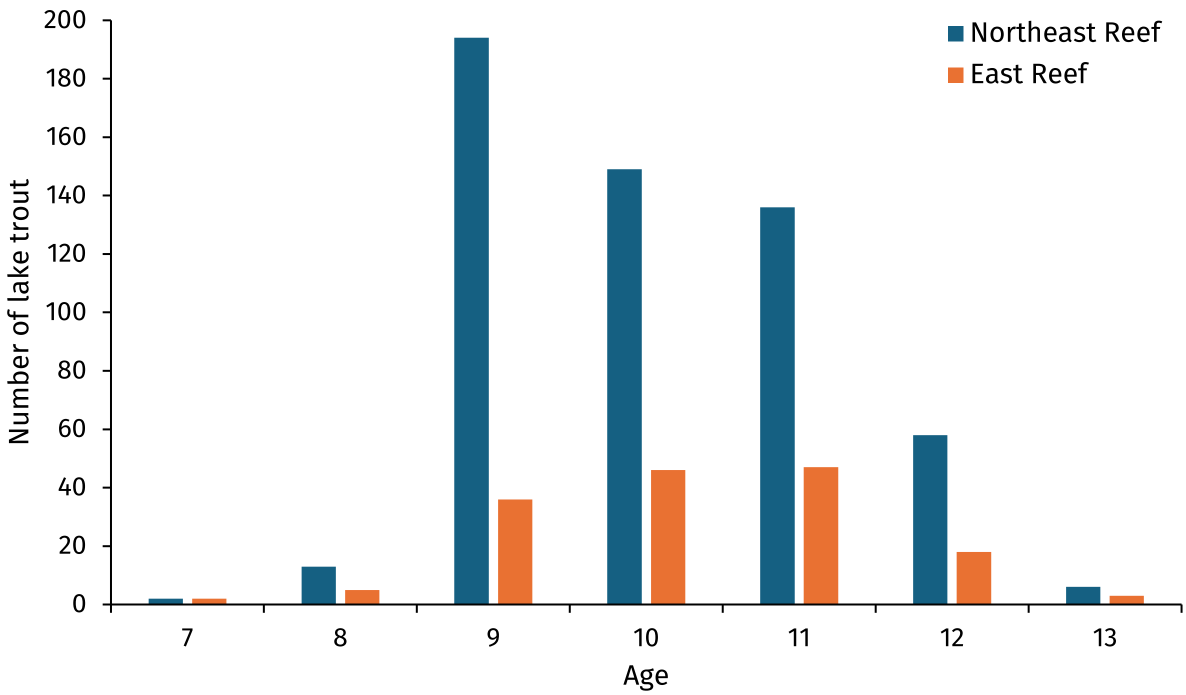

Figure 3. Age distribution of known-age Klondike-strain lake trout caught on offshore reefs in spring 2024.

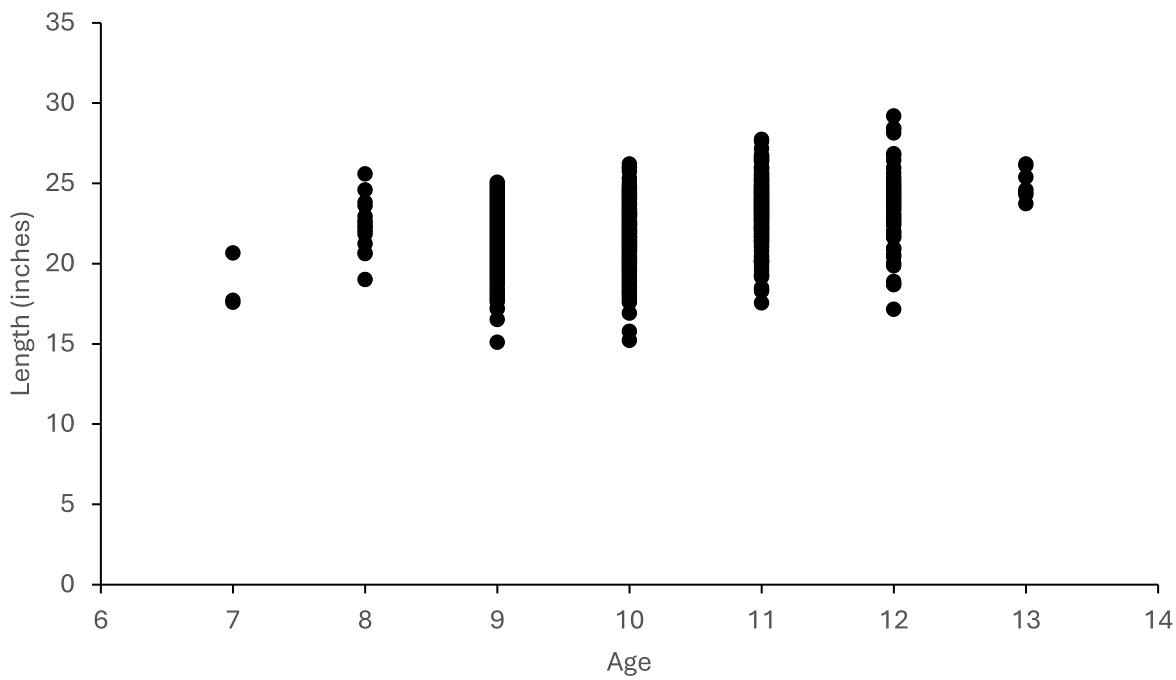

Figure 4. Length-at-age of known-age Klondike-strain lake trout caught on offshore reefs in spring 2024.

Fall Spawning Assessment

The DNR annually conducts lake trout spawning surveys on nearshore and offshore reefs. Two nearshore reefs off Milwaukee (Green Can Reef and South Milwaukee Reef) have been sampled annually since the late 1980s. The Northeast Reef within the Southern Refuge has been sampled annually since 2009 and the East Reef has been sampled occasionally since 2009.

Both nearshore reefs were sampled on Oct. 24, 2024. Each nearshore reef was set with two 800-foot gangs of graded-mesh gill net with 200-foot panels each of 4.5 inch, 5.0 inch, 5.5 inch and 6.0 inch mesh. In 2024, nets were set from 37 to 56 feet of water, and the bottom temperature was approximately 50 degrees. Of the 256 fish caught on the nearshore reefs, 23 were species other than lake trout (19 longnose sucker, 2 burbot, 1 brown trout and 1 rainbow smelt).

Overall CPUE on the nearshore reefs has been variable, with the highest catch occurring in 2012. Catch rates declined overall from 2012 to 2023, then increased in 2024. In 2024, the CPUE of lake trout on the Green Can Reef was 73.8 lake trout/1,000 feet of net, while CPUE on the South Milwaukee Reef was 71.9/1,000 feet (Figure 5).

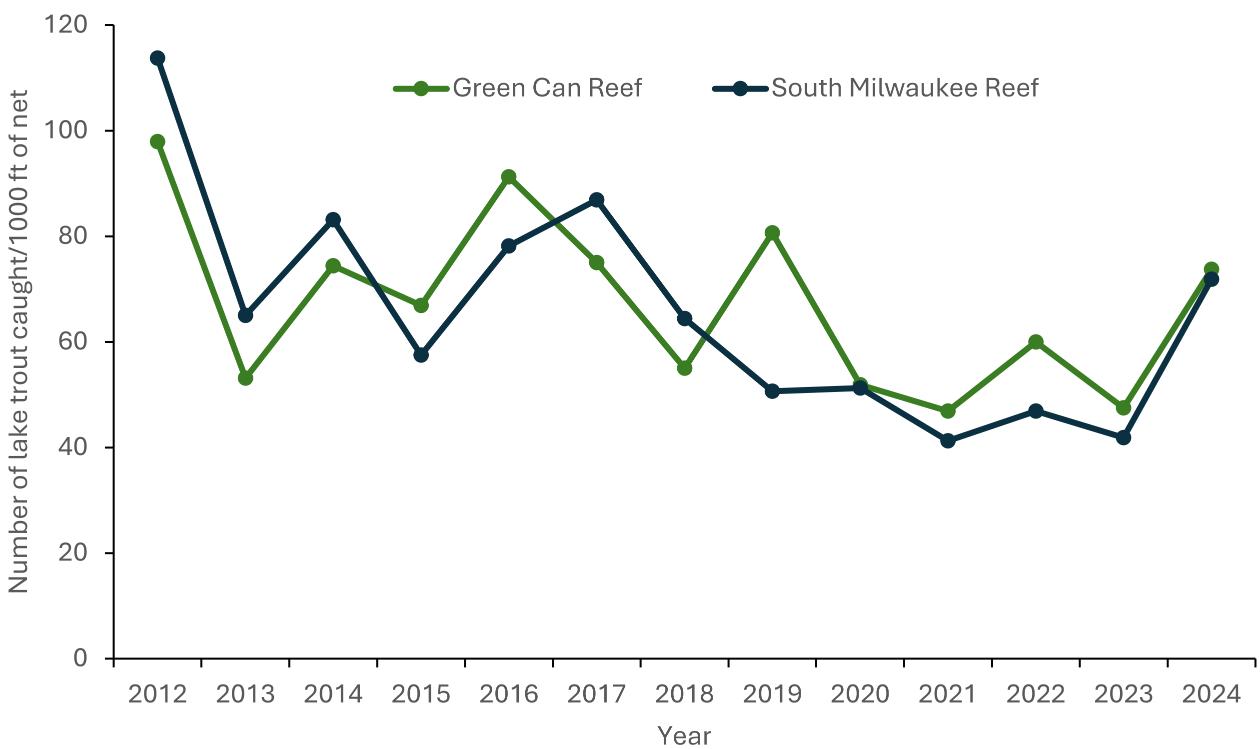

Figure 5. Fall catch-per-unit effort of lake trout by year for nearshore reefs.

Catch rates on the nearshore reefs have been primarily driven by stocking (Figure 6). Wild catch-per-effort is shown in Figure 6 compared to the overall catch-per-effort to reflect increasing wild catches as naturally reproduced fish mature with simultaneous declines in catches of stocked lake trout nearshore. Nearshore stocking of lake trout in Wisconsin waters decreased in 2013 as focus shifted towards offshore stocking to prioritize utilization of historical spawning habitat in addition to increased survival. Nearshore stocking was ceased entirely in 2017. As nearshore stocking declined, catch rates also declined. However, there was a sharp increase in the number of stocked lake trout caught in fall 2024.

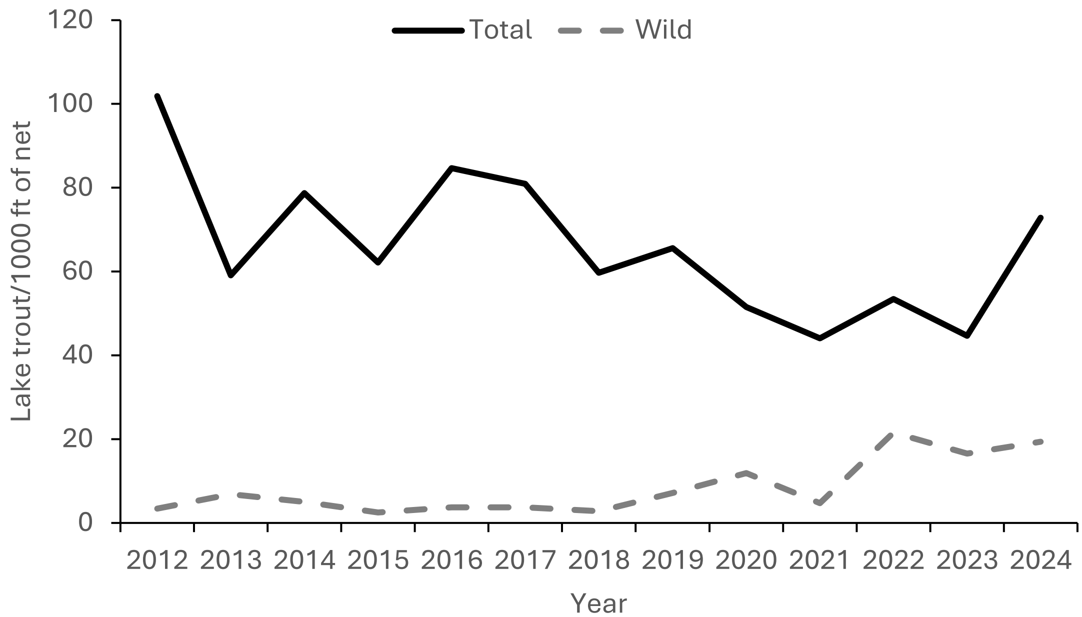

Figure 6. Catch-per-unit effort of lake trout captured in fall assessment surveys on nearshore reefs from 2012-2024. The solid black line shows total catch, while the dashed line shows wild lake trout only.

Coded-wire tags recovered from 55 adipose-clipped lake trout revealed that the increase in lake trout catch was influenced primarily by lake trout stocked into Julian's Reef (Illinois waters, Figure 7). 70% of coded-wire tags recovered were from lake trout stocked in Julian's Reef.

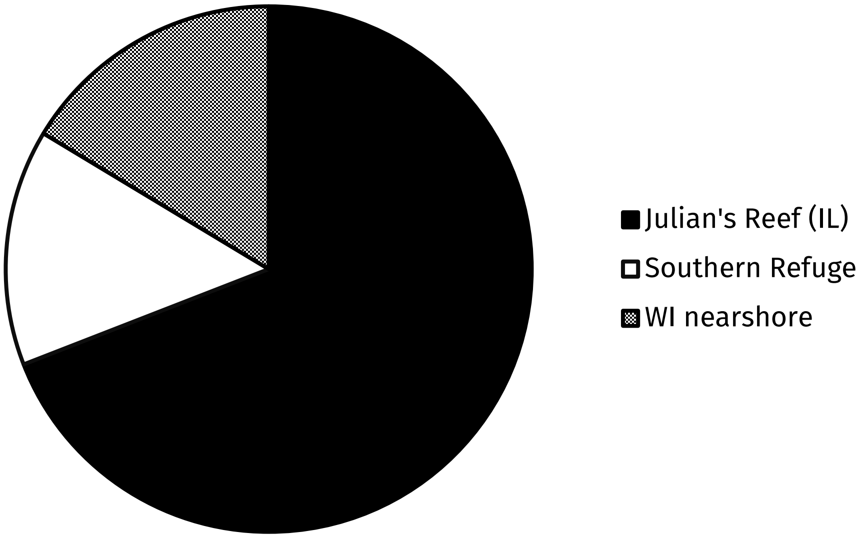

Figure 7. Stocking location of stocked lake trout caught on nearshore reefs in fall 2024.

Photo: A 41-inch lake trout caught on the South Milwaukee Reef during fall 2024. Coded-wire tag analysis revealed this fish was a 33-year-old Lake Ontario strain lake trout stocked on the Southern Refuge. Photo credit: Wisconsin DNR

The Northeast Reef was sampled on Nov. 1, 2024. One net set consisted of two 800-foot gangs with the same net configuration as the nearshore sets. In addition, one 800-foot gang of graded-mesh gill net with spring configurations was set. The spring net was set in deeper water, with the goal of determining if composition of lake trout utilizing the spawning reef was different off the peak of the reef. Based on catch, no difference was detected. Nets were set between 187 and 224 feet of water, and there was no bycatch.

Overall, catch rates on offshore reefs have been consistently higher than those nearshore, and CPUE on the Northeast Reef has remained relatively consistent since 2012 (Figure 8), with an average CPUE of 122 lake trout caught/1,000 feet of net. During this time period, the highest catch rate occurred in 2015 (154 lake trout/1,000 feet). Catch rates dropped in 2024 to 94 lake trout caught per 1,000 feet.

Objective 2 outlined in the Strategy is to increase the abundance of adults in fall surveys to a minimum CPUE of 50 lake trout/1,000 feet of graded-mesh gillnet in targeted rehabilitation areas, including the Northeast and East Reefs. This objective has been met consistently since 2012 (Figure 8).

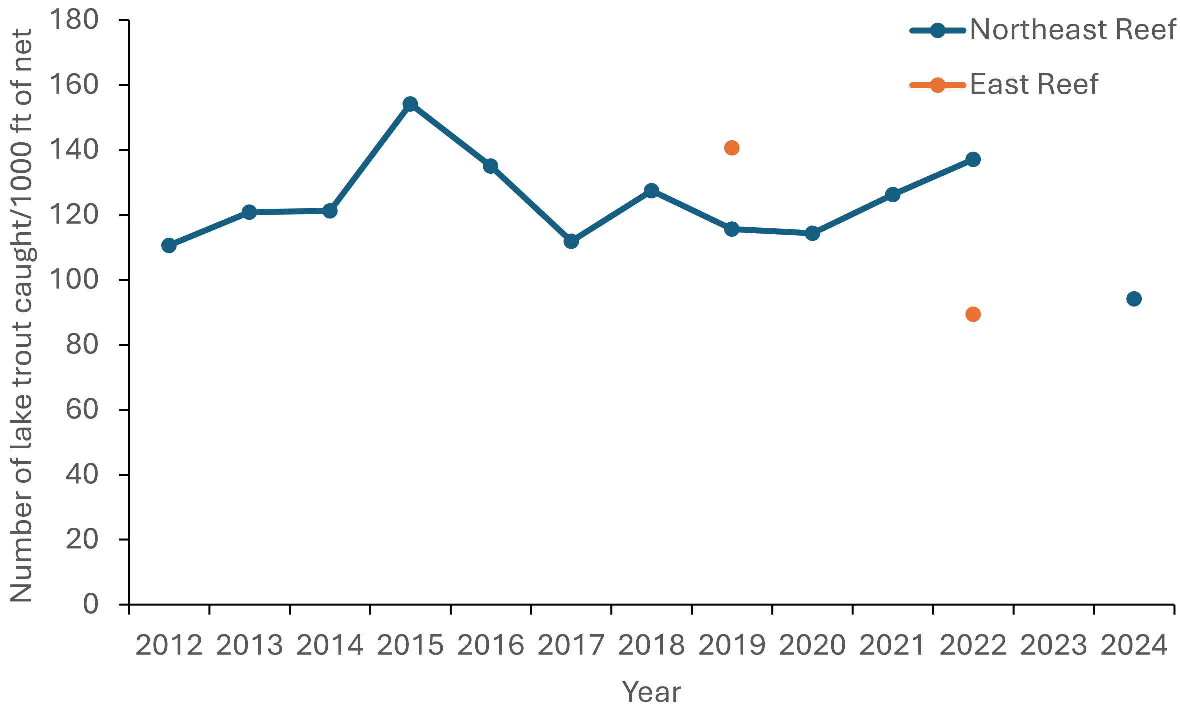

Figure 8. Fall catch-per-unit effort of lake trout by year for the Northeast Reef and East Reef.

Wild catch-per-effort is shown in Figure 9 compared to the overall catch-per-effort. Variations in overall CPUE can likely be attributed to the decrease in overall stocking numbers of lake trout into Wisconsin waters, the maturing of Klondike-strain lake trout which resulted in recruitment to gear set, and an increase in natural reproduction.

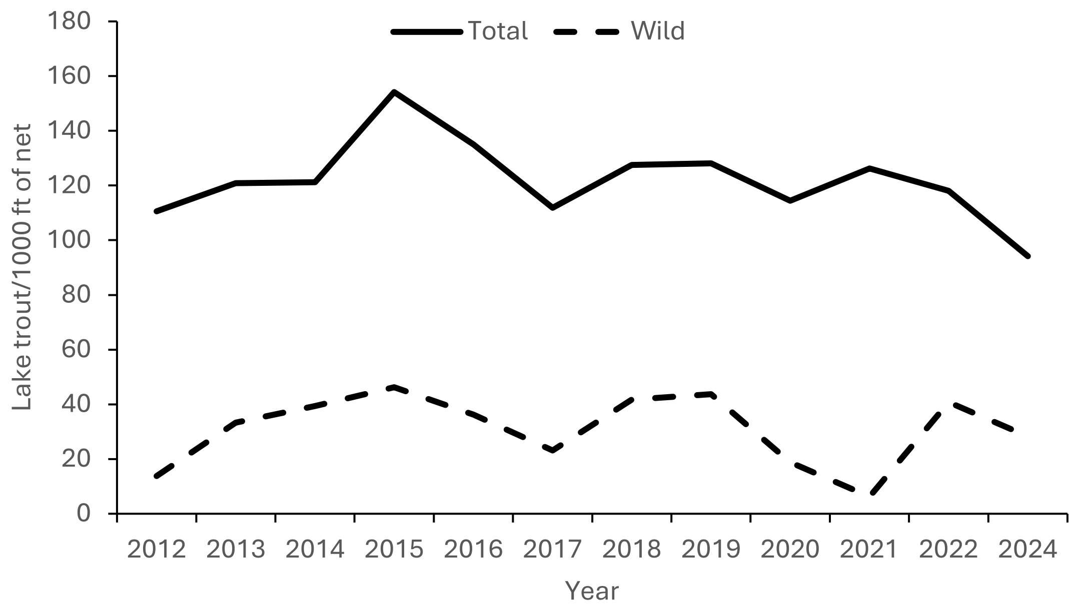

Figure 9. Catch-per-unit effort of lake trout captured in fall assessment surveys on offshore reefs from 2012-2024. The solid black line shows total catch, while the dashed line shows wild lake trout only.

The age structure of lake trout captured during fall assessments is shown in Figures 10 and 12. Lake trout captured on the nearshore reefs in 2024 ranged between ages 6 and 33, with a mean age of 11.5 years (Figure 10). Lengths ranged between 22 and 41 inches (Figure 11). It is important to note that the reefs are only sampled one day each fall, and the fish captured are a snapshot of lake trout currently utilizing the reefs. However, the mean age of fish captured nearshore has remained consistent over the past few years.

The mean age of lake trout captured on the offshore reefs in 2024, for comparison, was 11.4 years (Figure 12), with a range between ages 7 and 34. This was a younger mean age than what was seen on offshore reefs in previous years and could be a result of the Klondike Reef strain fish maturing and showing up on spawning reefs. Lengths ranged between 18 and 38 inches (Figure 13).

Ages shown in Figures 10 and 12 are from stocked and wild lake trout combined. Wild lake trout and stocked lake trout that were not coded-wire tagged were aged using otoliths. On the nearshore reefs, a total of 91 lake trout were aged, with 55 aged using CWTs and 36 using otoliths. The mean age of otolith-aged fish was 12.7 years, and the mean age of coded-wire tagged fish was 10.6 years. On the offshore reefs, a total of 131 lake trout were aged, with 109 aged using CWTs and 22 using otoliths. The mean age of otolith-aged fish was 9.3 years, and the mean age of coded-wire tagged fish was 11.9 years.

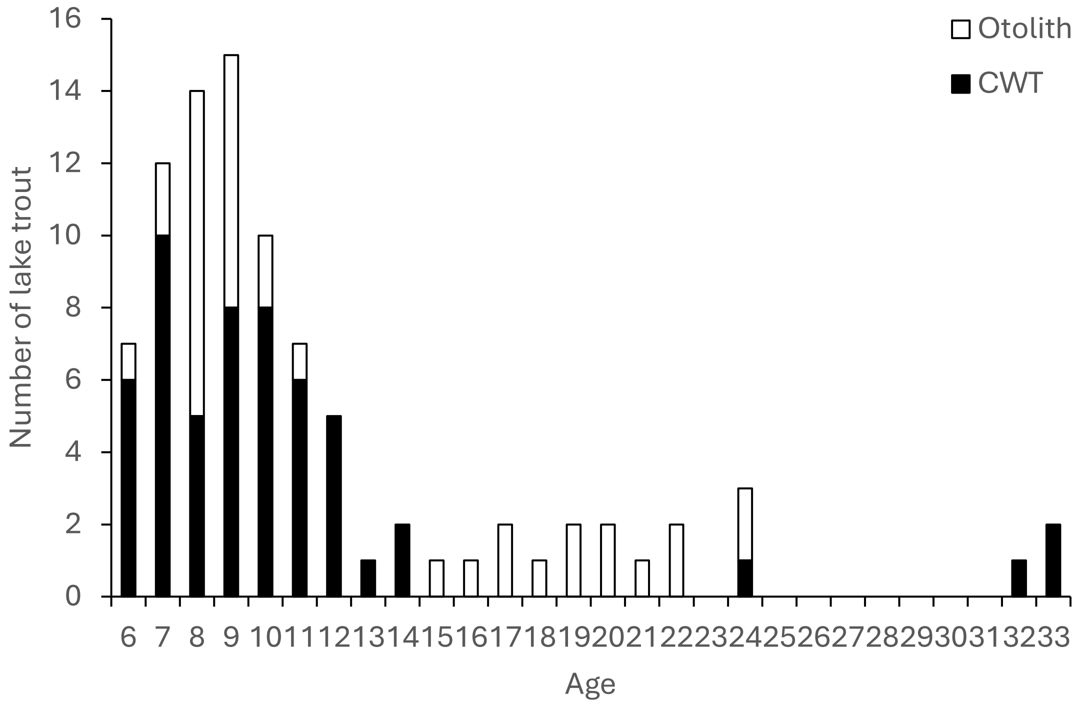

Figure 10. Age distribution of lake trout caught in the 2024 fall assessment survey on nearshore reefs.

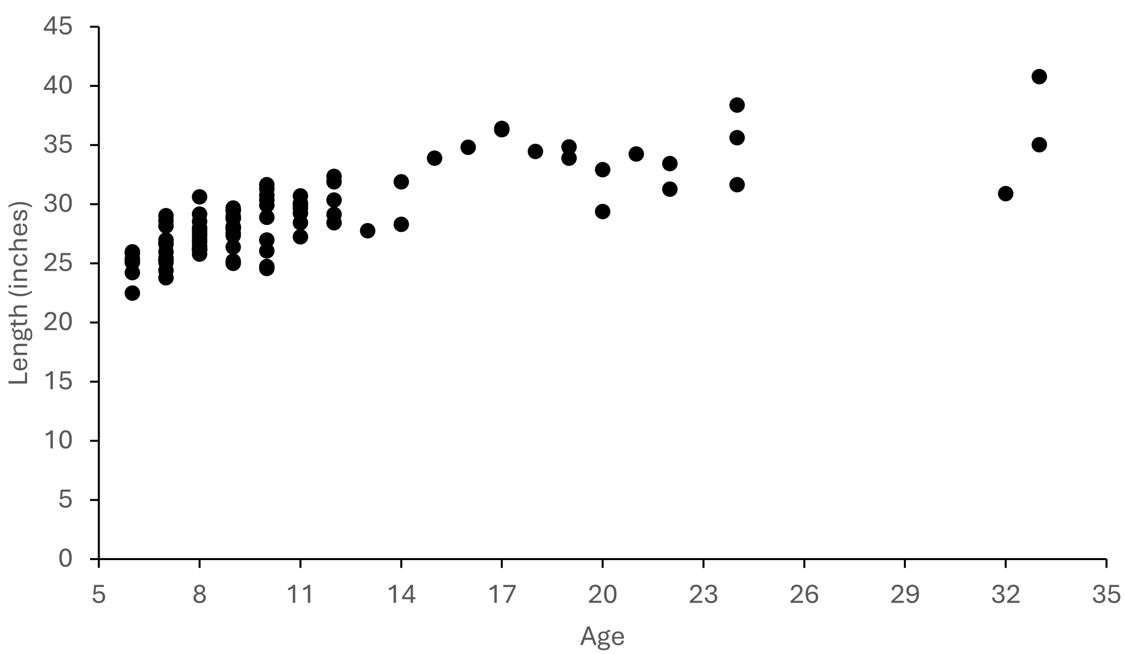

Figure 11. Length-at-age of lake trout caught in the 2024 fall assessment survey on nearshore reefs.

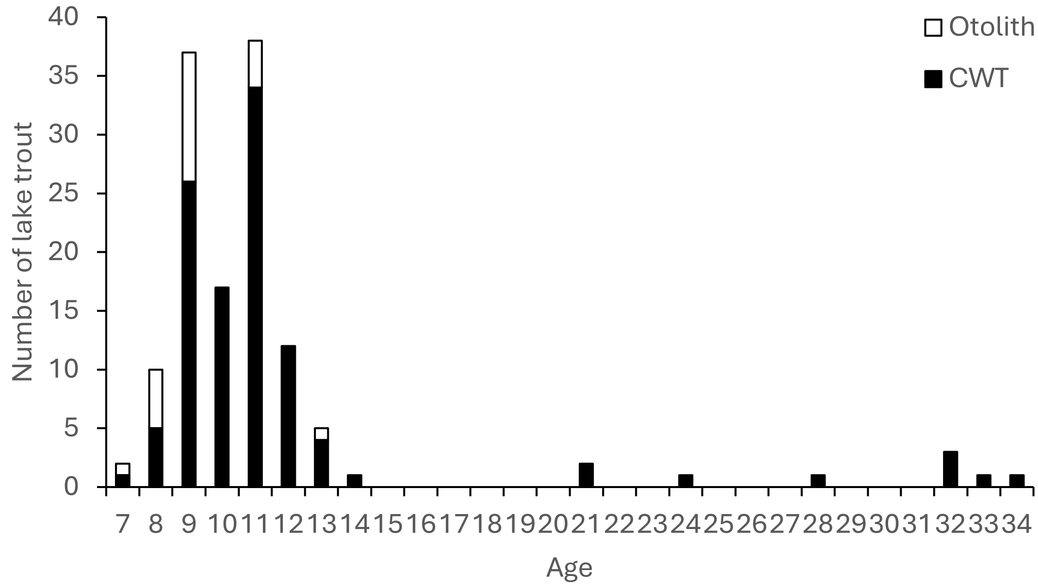

Figure 12. Age distribution of lake trout caught in the 2024 fall assessment survey on offshore reefs.

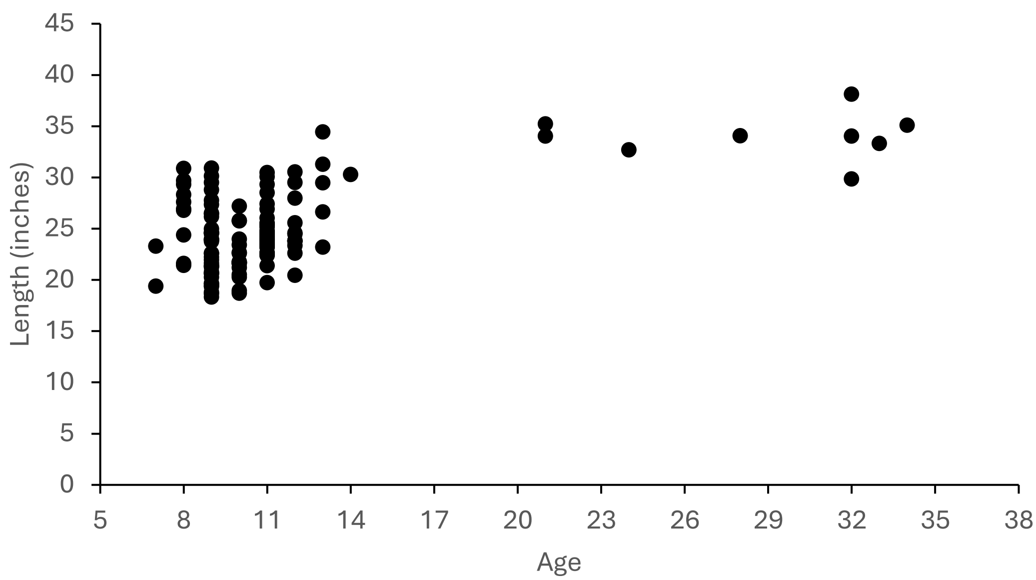

Figure 13. Length-at-age of lake trout caught in the 2024 fall assessment survey on offshore reefs.

The strain composition of coded-wire tagged fish caught in the nearshore fall assessment is shown in Figure 14. The Lewis Lake strain, stocked in Illinois waters, made up the majority of nearshore returns, though the Seneca Lake, Klondike Reef, and Lake Ontario strains were also present. In some years, the same lot code was used for multiple strains of lake trout stocked as fall fingerlings, and therefore strain cannot be definitively determined; these fish are listed as unknown strain in Figure 14.

Photo: A Klondike Reef-strain lake trout captured on the Northeast Reef in fall 2024. Photo credit: Brandon Gerig

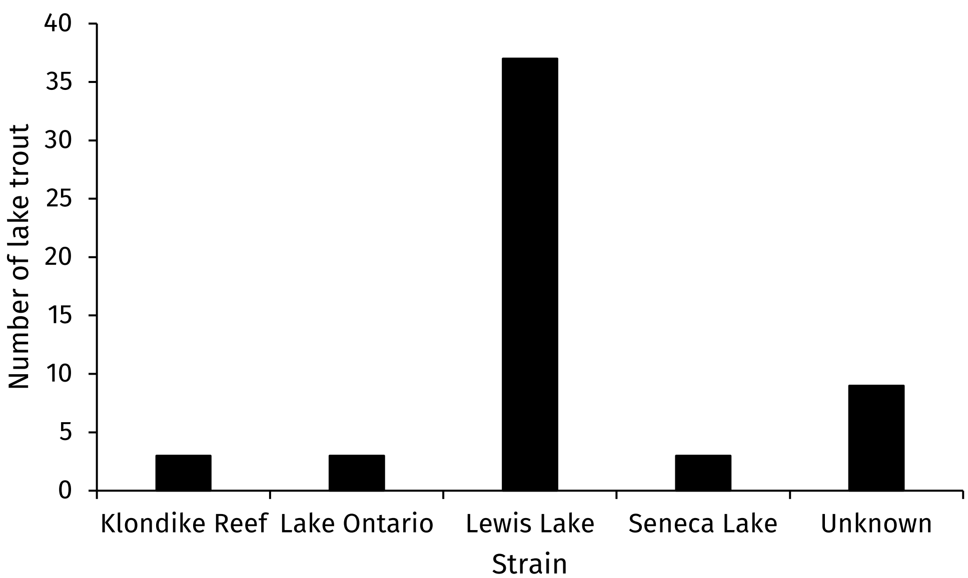

Figure 14. Strain composition of coded-wire tagged lake trout caught in fall assessment surveys on nearshore reefs in 2024.

Similar to the spring survey, the Klondike Reef strain made up the majority of offshore coded-wire tagged lake trout encountered in the fall (Figure 15).

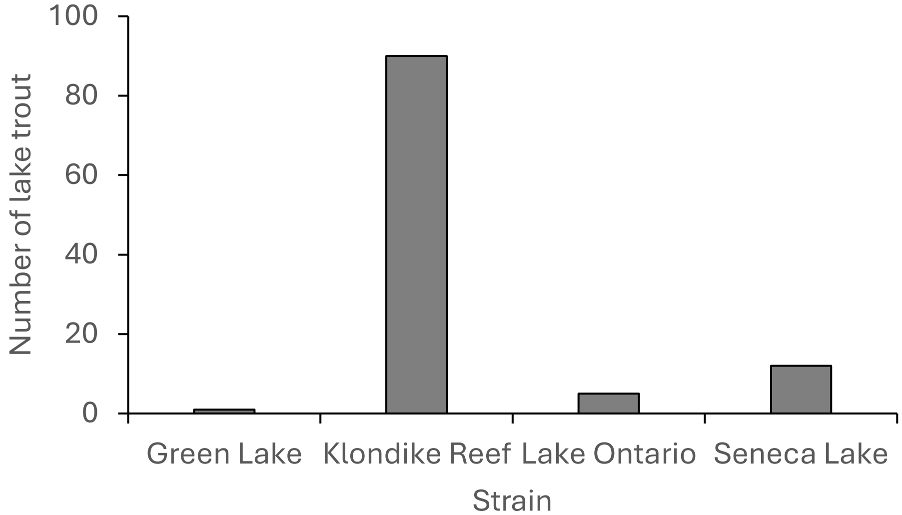

Figure 15. Strain composition of coded-wire tagged lake trout caught in fall assessment surveys on offshore reefs in 2024.

Objective 3 outlined in the Strategy addresses achieving progress towards attaining spawning populations; specifically, spawning populations in targeted rehabilitation areas should be at least 25% female and contain 10 or more age groups older than age-7. We observed 10 or more age groups older than age-7 on the offshore reefs (Figure 12). Although we did not meet the 25% female metric on nearshore reefs in 2024, this metric was met on the refuge, where 42% of lake trout caught were female.

Not every objective outlined in the Strategy was addressed in this report.

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Milwaukee River Lake Sturgeon Rehabilitation 2024 Update

Introduction

Lake sturgeon rehabilitation is currently a focus of many Great Lakes agencies. Lake sturgeon were once very prevalent in the Milwaukee River system, however, habitat loss due to dam construction and overfishing have resulted in lake sturgeon being extirpated from the Milwaukee River. Recent efforts to remove dams on the Milwaukee River (North Avenue, Estabrook and Lime Kiln), provide fish passage (Mequon-Thiensville Dam fish passage, Ozaukee County, Kletzsch Park Dam fish passage), habitat improvements and control of point and non-point source pollution have made it possible for the re-introduction of lake sturgeon into this system. Wisconsin's Sturgeon Management Plan outlines efforts to re-establish lake sturgeon in areas around Wisconsin including the Milwaukee River system.

Lake sturgeon rehabilitation in the Milwaukee River began with stocking in 2003. In the first three years adults, larvae, fingerlings and yearlings were all stocked into the Milwaukee River. The adult lake sturgeon were transferred from the Wolf River in 2003, 2004 and 2005. Gametes were also taken from adults in the Wolf River before being transferred and raised in Wild Rose State Fish Hatchery. Stocking of lake sturgeon into the Milwaukee River from Wild Rose stocking began in 2003 and concluded in 2006.

The use of a streamside rearing facility in the Milwaukee River was identified as the method that would maximize the likelihood of imprinting to the river and thus minimize the risk of straying of stocked fish. Streamside rearing is a technique of rearing gametes and fish by using water from the river they are planned to be stocked into, allowing the young fish to imprint to that river and increase returns to that river when they mature. Beginning in spring of 2006, a streamside rearing facility (SRF) was built for the Milwaukee River where fish could be raised using Milwaukee River water to increase the likelihood of the sturgeon imprinting to the river. The SRF was built in collaboration with Michigan DNR, US Fish and Wildlife Service, Little River Band of Ottawa Indians, Great Lakes Fishery Trust and Northern Environmental. The Milwaukee River SRF is located at Riveredge Nature Center Inc. in Newburg, Wisconsin. This non-profit organization agreed to be a cooperator with the Wisconsin DNR on this project by providing the land and access to the Milwaukee River.

Riveredge also provides a group of volunteers that conduct the daily feeding and maintenance of the SRF allowing for continued fish production using the SRF.

2024 Update

MILWAUKEE RIVER STREAMSIDE REARING FACILITY

The SRF was put into service mid-April for the 2024 season. Wisconsin DNR personnel artificially spawned eight females and forty males from the Wolf River and transferred those fertilized eggs to the SRF trailer on April 17, 2024. Eggs from each female were placed into separate hatching jars.

Lake sturgeon larvae began to hatch on April 28 and could be seen in the incubation jars. By the next day, all larvae were hatched and moved to the smaller fry tanks. The initial feedings of brine shrimp began mid-May. In 2024, an experimental feeding trial was initiated for two of the four tanks in the trailer. This experimental diet consisted of formulated feed of various sizes and feeding rates that were adjusted to the average size of the fish. The other two tanks acted as a control and those tanks were fed the same diet as previous years consisting of brine shrimp, bloodworms and krill. The formulated feeds were adjusted based on data compiled from previous lab-based studies done by Dr. Dong Fang Deng with the UWM School of Freshwater Sciences. Additional detail on the feeding regime and final results will be compiled in an independent report. In the meantime, questions can be sent to Aaron.Schiller@Wisconsin.gov.

Our normal fish health screening process was conducted on June 12, 2024. Increased mortality among all tanks was observed from June 12 through June 22. We alternated treatments between salt and Halamid beginning June 14. Another round of mortalities in the control feed tanks began July 8. At this time, peroxide treatments were given to these tanks every other day until the mortalities subsided on July 14. On July 19, the size difference between the control and experimental feeds was so great that all the control fish were placed in one tank and the pellet fed fish were placed in the other 3 tanks to lower the density of the fish in pellet fed tanks. Weekly salt treatments occurred until August 25.

On August 28, 2024, the largest 232 fingerlings averaging 46.4g were stocked at the School of Freshwaters Sciences building while the remaining fish were kept at the SRF trailer until 925 large fingerlings were released at the School of Freshwater Sciences building on September 29, 2024. In total, 1,157 large fingerlings were stocked. The average size of the pellet fed fingerlings was much larger than the control tank and produced the largest cohort of lake sturgeon ever raised in the SRF trailer except in year 1 when 27 fish were released. The size of the pellet fed fingerlings released in September averaged 51.4g and 8.66 inches while the traditional diet fed fingerlings averaged 18.1g and 6.53 inches.

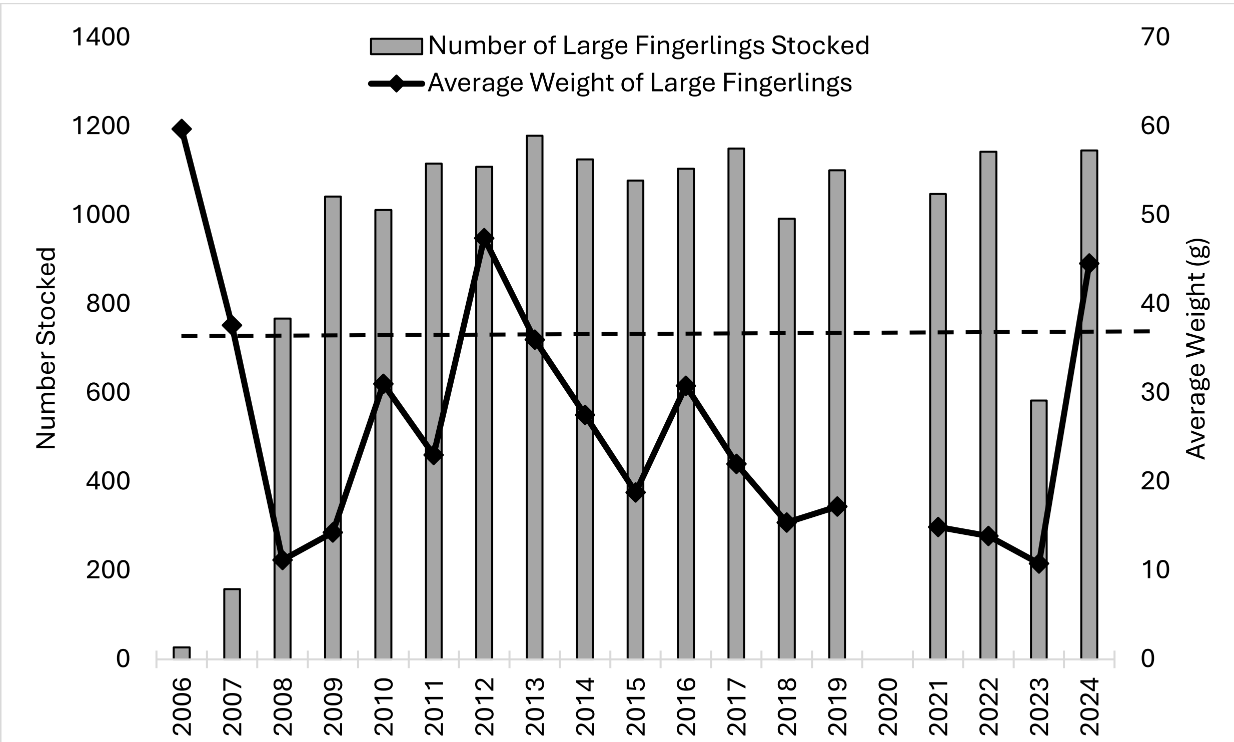

Figure 1. Number and average weight of large fingerling lake sturgeon stocked from the Milwaukee River SRF 2006-2024. The dashed line indicates the average weight of 35g that correlates with higher relative survival and PIT tag retention.

SUMMER JUVENILE SAMPLING

Each year a summer gill net survey targeting juvenile lake sturgeon in the Milwaukee Harbor area is conducted. This survey began in 2013 and is designed to evaluate the survival of stocked lake sturgeon and monitor the retention of marks, both PIT tags and fin clips. It also establishes an index of relative abundance for juvenile lake sturgeon in the Milwaukee estuary under the current stocking plan. Two gangs of gill nets are tied together to create a 1,000-foot set, including 600 feet of 4.5-inch mesh, 200 feet of 8-inch mesh, and 200 feet of 10-inch stretch mesh panels. One net gang per day is set in a random location within or just outside of the Milwaukee Harbor and soaked for less than 24 hours. Nets are set opportunistically, with the target of at least one set per week beginning in June and ending in September. When a juvenile sturgeon is captured, the fish is scanned for tags and checked for fin clips. If it does not have a PIT tag, a new one is implanted underneath the second scute. The weight, length and girth are recorded, a genetic sample is taken, and some pictures are often snapped before release. Bycatch species are identified, and numbers of each species are recorded.

Since 2013, 159 lake sturgeon from the Milwaukee River SRF have been captured during this survey. The Milwaukee juvenile survey has also captured five more from the Kewaunee SRF. In 2024, twelve sets were made, and 33 lake sturgeon were captured. Of the sturgeon captured, all had RV fin clips, 23 had PIT tags and 10 did not. The age of the recaptured lake sturgeon ranged from 1-6 years old (Figure 2), and the size ranged from 14-32 inches. On average, the lake sturgeon from the Milwaukee SRF are growing more than 4.5 inches annually for the first six years following release (Figure 3).

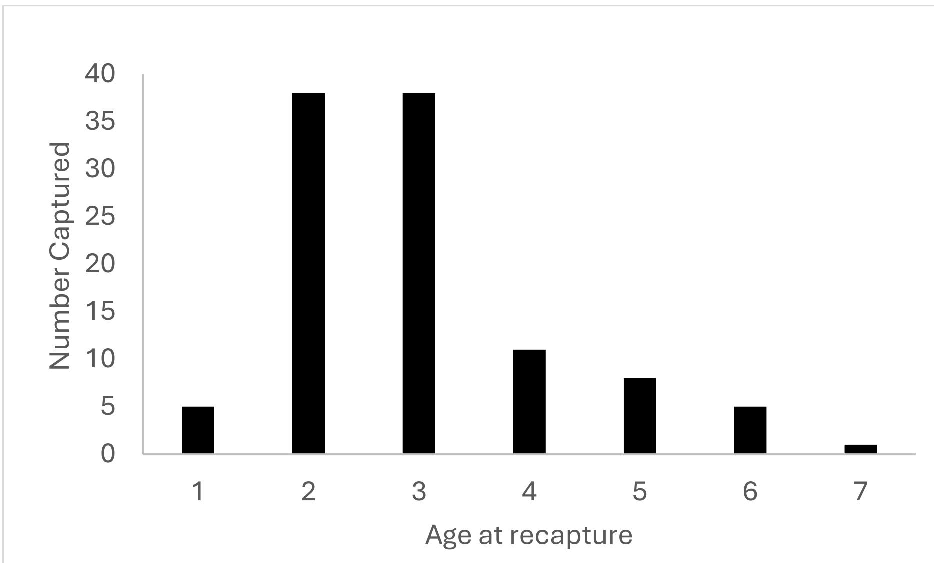

Figure 2. Age at recapture for known age lake sturgeon stocked from the Milwaukee River SRF and recaptured during juvenile gill netting surveys in the Milwaukee Harbor 2013-2024.

*Table 1 . Number and average weight of sturgeon stocked from Milwaukee River SRF 2006-2024. * In 2024, the largest fish in the tanks were stocked in August and counted as large fingerlings due to their larger than normal size. These fish were not included in the average weight but would have increased the average weight significantly if they remained in the trailer through September.*

YEAR	YEARLINGS STOCKED	SMALL FINGERLINGS STOCKED	LARGE FINGERLINGS STOCKED	TOTAL STOCKED	AVERAGE WEIGHT (G) OF LARGE FINGERLINGS
2006			27	27	59.7
2007			158	158	37.6
2008			767	767	11.2
2009		996	1,042	2,038	14.3
2010		180	1,012	1,192	31
2011		500	1,116	1,616	23
2012		500	1,106	1,609	47.4
2013		500	1,179	1,679	36
2014		523	1,126	1,649	27.5
2015		419	1,078	1,497	18.8
2016		500	1,105	1,605	30.8
2017		500	1,150	1,650	22
2018	11		992	1,003	15.4
2019	15	145	1,101	1,261	17.2
2020	3			3	
2021	6	440	1,048	1,494	14.9
2022	15		1,143	1,158	13.9
2023	12		583	595	10.8
2024	11		1,128	1,139	44.6*
Total	**73**	**5,203**	**16,864**	**22,140**	**AVG 24.7**

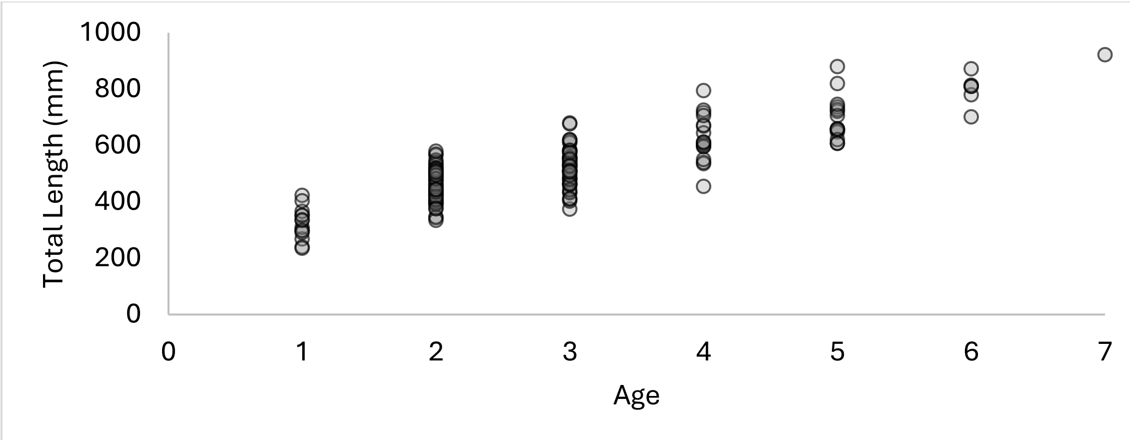

Figure 3. Length at age for known age lake sturgeon stocked from the Milwaukee River SRF and recaptured during juvenile gill netting surveys in the Milwaukee Harbor 2013-2024.

ADULT MONITORING

Electrofishing and Dip Netting

In spring of 2024, a handful of lake sturgeon sightings were reported, but fisheries staff were only able to net 2 lake sturgeon in April. Both sturgeon originated from the Milwaukee SRF with RV fin clips and existing PIT Tags. The first fish was a male measuring 53.1 inches long and was stocked in 2007. The second sturgeon captured in 2024 was originally stocked 2010 and was also captured in 2021 below Estabrook Falls. This male sturgeon measured 54.3 inches when it was captured in 2024. Since it's capture in 2021, this male sturgeon grew 3.8 inches in length and was visually in better condition when it was captured in 2024. The girth measurement of this fish increased from 19.5 inches in 2021 to 25.8 inches in 2024.

Image. Lake sturgeon captured on the Milwaukee River in both 2021 (left) and 2024 (right). In three years at large the sturgeon grew 3.8 inches in length and 6.3 inches in girth. This sturgeon was also one of the first to be documented using the Kletzsch Park Fish Passage. Photo Credit: Wisconsin DNR

PIT Tag Arrays

Adult lake sturgeon can be difficult to sample in the spring in the Milwaukee River. To gather quality and consistent data, the WDNR utilizes three PIT arrays in the Milwaukee River. Two of these arrays scan for tags 24 hours a day, 365 days a year and the third is active when the river is not iced up. The arrays have been installed separately but at the end of 2024, all three were operational.

In 2024 on the most downstream array (11 on figure), twenty-seven PIT tagged lake sturgeon were detected. Detections began in early March and peaked in April. Detections continued through May when most sturgeon likely left the river but there were two detections on this array in both June and July (Table 2).

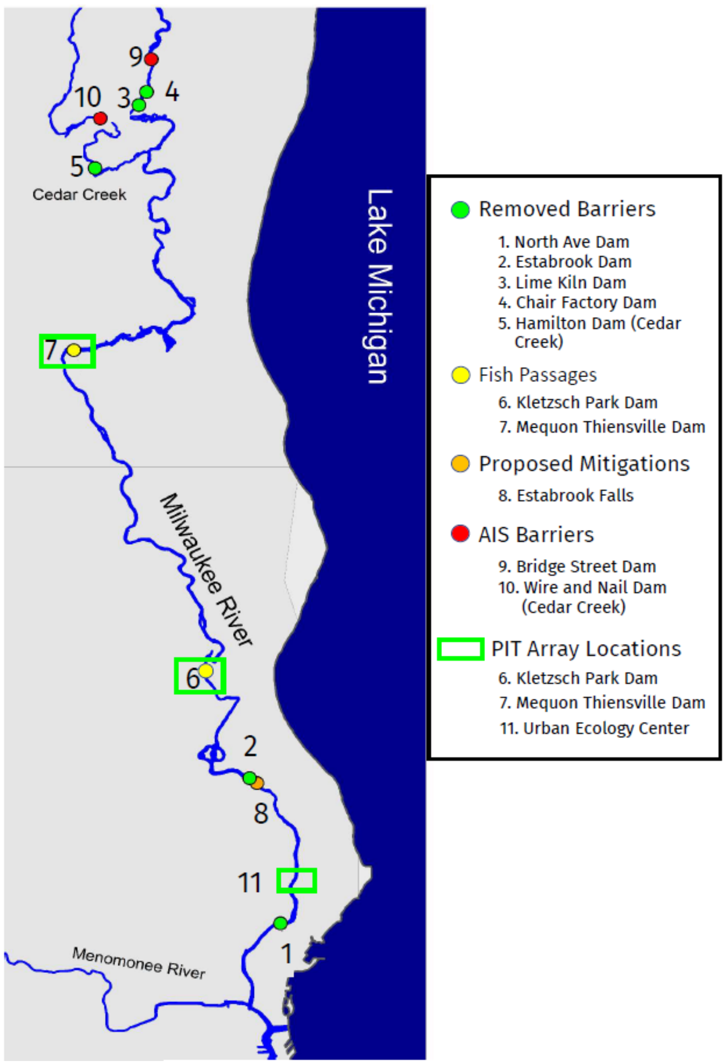

Figure 4. Map depicting the current PIT tag arrays and how their locations relate to fish passage impediments removed, mitigated, or remaining on the Milwaukee River.

Table 2. Fish species detected in 2024 on the Urban Ecology Center PIT array on the Milwaukee River. This table is not representative of the populations of fish passing the array as it only detects tagged fish, and the number of tagged individuals varies greatly for each species.

	Urban Ecology Center PIT Array 2024	
	NUMBER OF INDIVIDUALS DETECTED	**TOTAL NUMBER OF DETECTIONS**
Brown trout	11	230
Channel catfish	1	1,039
Flathead catfish	2	94
Largemouth bass	1	1
Longnose sucker	1	7
Northern pike	1	9
Quillback	1	3
Redhorse	3	154
Smallmouth bass	11	551
Steelhead	2	19
Sturgeon	27	177
Walleye	7	769
White sucker	50	133
Unknown tag numbers	5	17
Total	**123**	**3,203**

The middle array is located in the newly constructed Kletzsch Park Fish Passage (number 6 in Figure 4) and 2024 was the first spring that the passage was open. This fish passage has two PIT arrays to evaluate successful fish passage and monitor the movement of tagged species utilizing the fishway.

Image. Aerial photo of Kletzsch Park Fish Passage during construction. The white boxes depict the three antennas on the upstream side of the fishway and the black boxes depict the location of the downstream antennas. Photo Credit: MMS

During the traditional spawning window of late-April and early May, the river was not high enough to allow sturgeon passage over Estabrook Falls (8 on Figure 4) to reach the fishway further upstream. Modeled data suggests that sturgeon are not able to pass over the falls until the river reaches at least 2500 cfs. This did not occur until May 28, 2024. The first sturgeon detection in the fishway was shortly after on May 29, 2024, however, this was almost a month later than the ideal spawning timing and river temperature. This late movement was likely triggered by significant rain events increasing river flow and attracting the fish to move upstream as well as opening up the potential for sturgeon to pass over the falls and migrate upstream to use the fish passage (Figure 5).

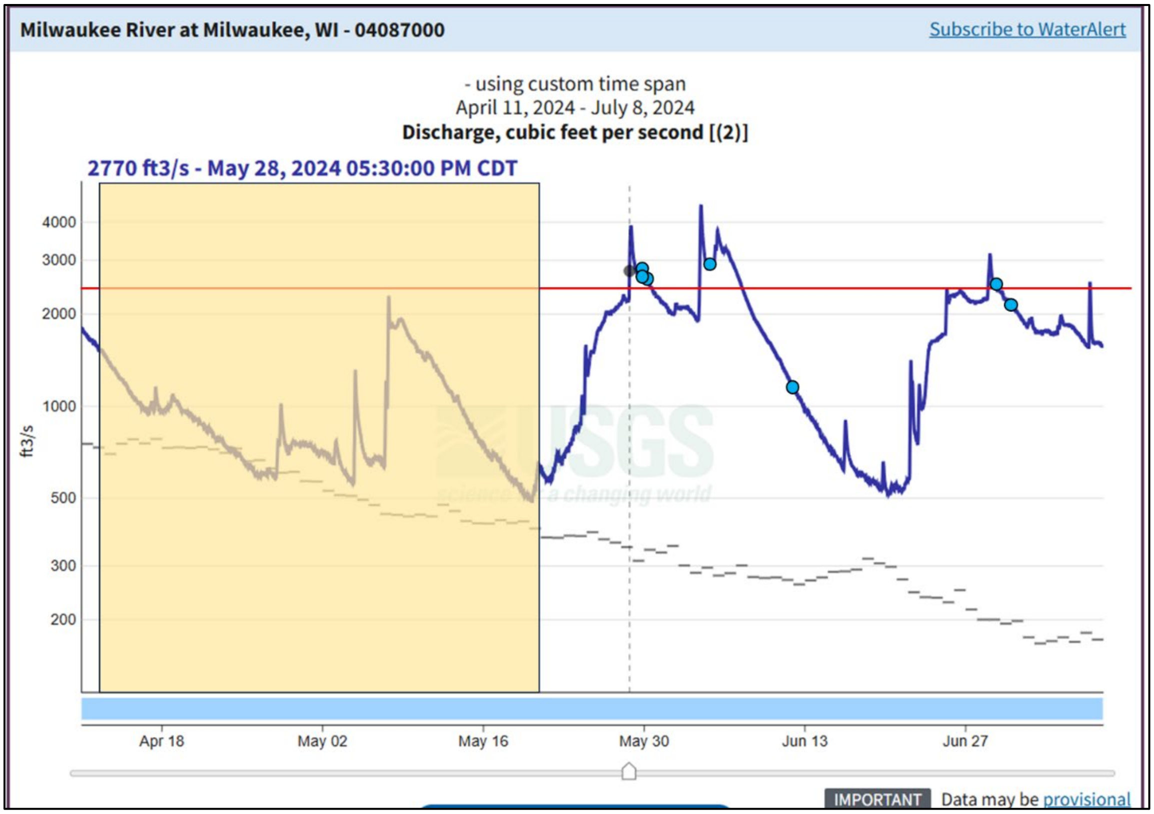

Figure 5. Hydrograph of the Milwaukee River from April 11 to July 8, 2024. The red line indicates the threshold required for sturgeon passage above Estabrook Falls. The tan shaded region is the typical lake sturgeon spawning window and the blue dots are when sturgeon were detected entering the Kletzsch Park fishway.

By the end of June, five sturgeon were detected on the array using the Kletzsch Fish passage (Table 3). All five of the sturgeon were detected on the upstream array indicating they all were able to migrate around the dam. One of those sturgeon was not detected at the lower array at all. It is possible this fish swam around the antenna or above the read range of the array when the flows were high. An additional fish was only detected once at the upstream array and on a separate occasion on the downstream array. The remaining three tagged sturgeon that were detected in the fishway were detected first on the downstream array, then on the upstream array within the fishway. We can confidently say that those three sturgeon successfully used the fishway to pass around and upstream of the dam.

Table 3. Detection of tagged fish in the Kletzsch Park Fishway in 2024, Milwaukee River, Glendale WI.

	Kletzsch Park Fish Passage PIT Array 2024	
	NUMBER OF INDIVIDUALS DETECTED	**TOTAL NUMBER OF DETECTIONS**
Sturgeon	5	21
Smallmouth bass	6	262
Steelhead	3	1,220
Walleye	2	11
Brown trout	1	4
Unknown tag	2	15
TOTAL	**19**	**1,533**

The most upstream PIT array is located in the Mequon-Thiensville fish passage at river mile 20 (number 7 in Figure 4) surrounding the entrance and exit of the camera box. These two antennas were updated in 2023 however, the equipment was not tuned and operating properly until mid-May of 2024. Despite delays and low abundance of tagged fish in this reach, five tags were detected in 2024, but no lake sturgeon have been detected on this array (Table 4).

Table 4. Detection of tagged fish in the Mequon Thiensville Fishway in 2024, Milwaukee River, WI.

	Mequon Thiensville Fish Passage PIT Array 2024	
	NUMBER OF INDIVIDUALS DETECTED	**TOTAL NUMBER OF DETECTIONS**
Smallmouth bass	1	61
Quillback	1	3
Brown trout	3	163
TOTAL	**5**	**227**

HABITAT

Through the Great Lakes Research Initiative, the EPA funded a lake sturgeon habitat mapping project that included the Milwaukee and Kewaunee rivers. The main objective of this effort was to highlight potential spawning locations in each river. Likely spawning locations will be closely monitored when spawning may be occurring. The mapping was completed in 2024. Additional site investigation following this project will determine which sites, if any, will be candidates for habitat improvement projects or for fish refuge designation.

NEW PROJECTS

Juvenile Lake Sturgeon Habitat Use- Acoustic Tracking

In 2023, an array of 30 acoustic receivers were deployed in strategic locations within the Milwaukee Estuary. In 2023, 12 yearling lake sturgeon were implanted with acoustic transmitters before release into the harbor. In 2024, an additional 11 juvenile lake sturgeon were implanted with acoustic transmitters. Acoustic receivers were collected and redeployed during the summer of 2024. Data from the first year has been downloaded but not analyzed. The receivers will record the location of the tagged lake sturgeon to identify seasonal use of the outer harbor, inner harbor and rivers by juveniles. This information will also be used to highlight habitats frequently utilized by juvenile lake sturgeon considering the upcoming work in the Milwaukee Estuary. Researchers at UWM School of Freshwater Sciences will be expanding on this project in the coming years.

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Yellow Perch Assessments in Wisconsin Waters of Lake Michigan

2024 Spawning Survey

SPRING GILL NET SURVEY DATES (MAY 20 – MAY 30, 2024)

In 2024, the Wisconsin Department of Natural Resources (DNR) conducted a yellow perch spawning survey near the Green Can Reef outside of the Milwaukee Harbor. The survey used gillnets containing one 100-foot panel of each 2.0-inch, 2.25-inch, 2.5-inch, 2.75-inch, 3.0-inch and 3.25-inch mesh.

The Green Can Reef area off the coast of Milwaukee is the established index site for our annual yellow perch spawning assessment. For 2024, the *RV Sturgeon* was used to set gillnet sets. The survey began May 20, 2024, and continued through May 30, 2024. Depths from 19 to 48 feet of water were sampled. Water temperature on the bottom of the lake ranged from 49°F to 53°F during the survey. The total effort for the 2024 survey was 5,400 feet of gillnet set for one night.

The first nets were lifted on May 20, capturing 94 perch. This set consisted of 3,000 feet of gill net set from 23 to 48 feet of water. The bottom temperature was 49°F.

The second nets lifted set on May 29 capturing 74 perch. This set consisted of 2,400 feet of gill net set from 19 to 35 feet of water. The bottom temperature was 53°F at the time nets were set.

In total, 168 yellow perch were captured, including 158 ripe males, and 10 females (Figure 1). Aging structures were collected from 147 individuals. The most well represented cohort was the 2021 cohort with 57 fish (3-years old) followed by the 2020 cohort (35 fish) that were 4-years old. The 2016 and 2017 cohorts continued to show up strong with a combined 43 fish. The age composition of perch captured in the 2024 survey closely reflected that of the 2023 survey with the addition of a strong 2021 cohort as those fish were now fully recruited to the sampling gear (Figure 2). The 2016 cohort is producing some large fish, while the 2020 and 2021 cohorts may support the recreational fishery. This is the second year in a row where more than 150 perch were encountered in this survey. The increase in adult abundance and the presence of multiple significant cohorts in the fishery is a promising trend.

In addition to yellow perch, round whitefish, alewife, burbot, lake trout, longnose sucker, white sucker, rock bass and round goby were also captured.

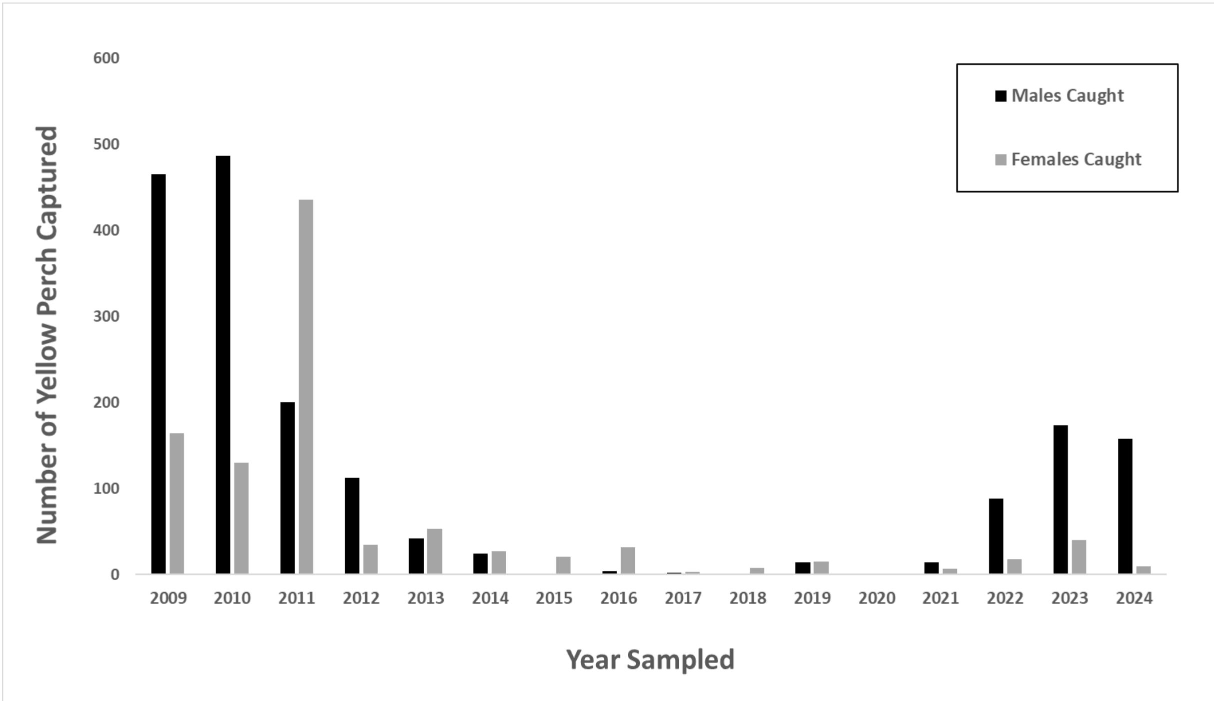

Figure 1. Yellow perch spawning assessment at the Green Can Reef, Lake Michigan, Milwaukee, DNR 2009-2024. No spawning survey was conducted in 2020.

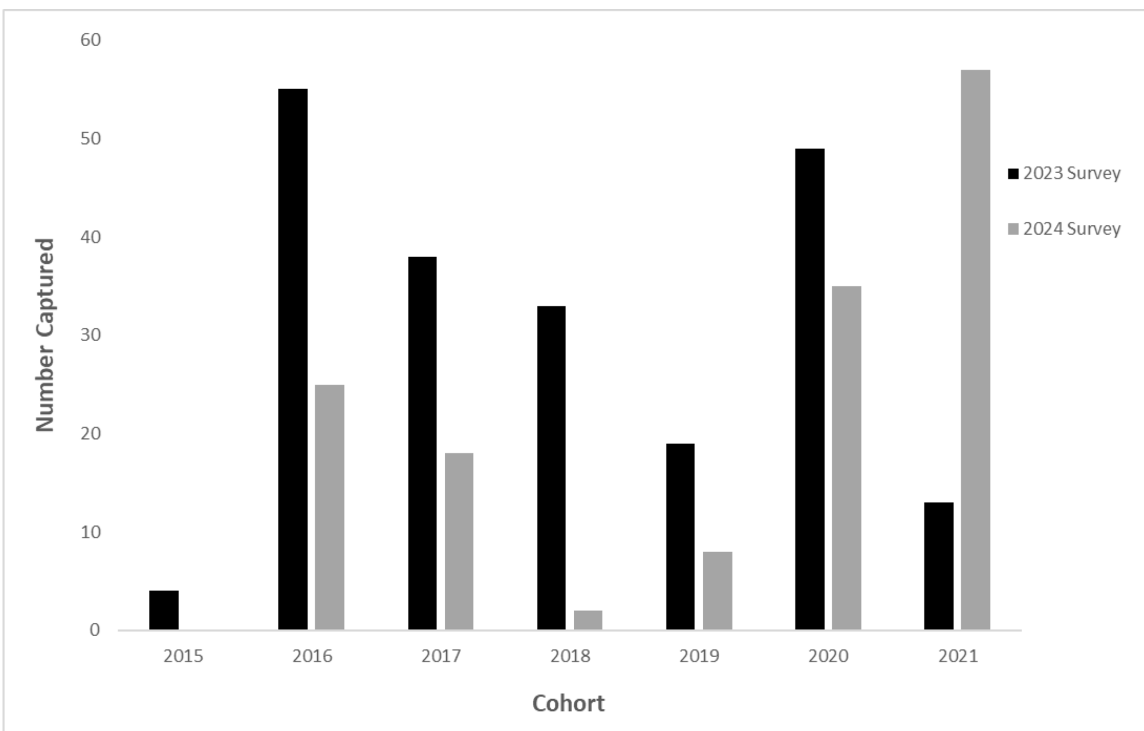

Figure 2. Cohorts of yellow perch captured during annual spawning assessments on Green Can Reef, Lake Michigan, Milwaukee, DNR 2023 and 2024.

Young of Year Survey

NOT CONDUCTED IN 2024

An annual survey of young-of-the-year (YOY) yellow perch along the Lake Michigan shoreline typically consists of both seining and micromesh gill netting efforts encompassing sampling sites from Sheboygan to Kenosha. In 2024, no young of year surveys were conducted due to funding constraints. A cost-effective sampling protocol is being evaluated to estimate the abundance of young perch in nearshore waters.

Winter Graded Mesh Assessment

NOT CONDUCTED IN 2024

Our annual winter graded mesh assessment of the yellow perch population in Lake Michigan is typically conducted in early December and is an index of the age structure of the yellow perch population. The survey was not conducted in December of 2024. This survey may resume in the future to monitor for significant cohorts recruiting to the fishery. With the recent increased catch rate in the spawning survey, the age structure of the perch population may be better informed by those estimates for perch ages 3 and older. Sampling locations and effort have changed in recent years to increase catch in the winter graded mesh survey with minimal results. It is possible that the perch are no longer using historical wintering grounds. Modifications to this survey are being considered to better sample yellow perch in winter months.

2024 Survey Year Summary

The yellow perch population around Milwaukee remains lower than the long term average and struggles to consistently produce significant year classes, however, the recreational fishery should be improving with a few signigificant cohorts. Yellow perch from the 2016 cohort continue to produce the majority of the large perch but the 2020 and 2021 cohorts are producing the most fish. The spawning stock biomass is increasing with the addition of the 2021 cohort on top of the strong 2020 cohort. Overall, the catch of yellow perch is increasing and the population is relying heavily on a few years of successful recruitment. Hopefully, an increase in spawner biomass and some favorable weather trends will help continue the trend of increasing abundance of yellow perch in the Milwaukee area.

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The Status of the Commercial Chub Fishery and Chub Stocks in Wisconsin Waters of Lake Michigan, 2024

The total bloater chub harvest from commercial gill nets was 6,332 pounds for the calendar year 2024. This was a minimal increase from last year in the southern zone. Although there were 13 permits in the northern zone and 53 in the southern zone, no fishers reported fishing for chubs in the North and only two in the South (Tables 1 and 2). There was no reported chub harvest in the commercial smelt trawlers as incidental to the targeted smelt harvest.

Table 1. Harvest, quota, number of fishers and effort (feet) for the Wisconsin Southern Zone gill net chub fishery, 1986-2023.

YEAR	HARVEST	QUOTA	FISHERS	EFFORT (X 1,000 FT)	CPE
1986	1,610,834	2,700,000		34,606.1	46.5
1987	1,411,742	3,000,000	59	32,373.9	43.6
1988	1,381,693	3,000,000	60	58,439.0	23.6
1989	1,368,945	3,000,000	64	48,218.1	27.6
1990	1,709,109	3,000,000	54	41,397.4	41.3
1991	1,946,793	3,000,000	58	45,288.3	43.0
1992	1,636,113	3,000,000	53	40,483.7	40.4
1993	1,520,923	3,000,000	58	42,669.8	35.6
1994	1,698,757	3,000,000	65	35,085.5	48.4
1995	1,810,953	3,000,000	59	28,844.9	62.8
1996	1,642,722	3,000,000	56	0.0	59.5
1997	2,094,397	3,000,000	53	28,441.8	73.6
1998	1,665,286	3,000,000	49	23,921.1	69.6
1999	1,192,590	3,000,000	46	25,253.2	47.2
2000	878,066	3,000,000	41	22,394.7	39.2
2001	1,041,066	3,000,000	44	26,922.8	38.7
2002	1,270,456	3,000,000	47	24,940.5	50.9
2003	1,069,148	3,000,000	43	22,613.0	47.3
2004	1,057,905	3,000,000	43	21,468.9	49.3
2005	1,213,345	3,000,000	43	24,119.8	50.3
2006	807,031	3,000,000	40	19,110.4	42.2
2007	410,025	3,000,000	43	13,837.4	29.6
2008	227,026	3,000,000	39	9,823.2	23.1
2009	165,158	3,000,000	37	7,960.8	20.7
2010	90,879	3,000,000	38	5,645.6	16.1

2011	34,262	3,000,000	35	2,169.6	15.8
2012	8,583	3,000,000	32	784.0	11
2013	10,146	3,000,000	31	867.0	11.7
2014	25,436	3,000,000	31	1,267.0	20.08
2015	51,351	3,000,000	29	2,722.0	18.86
2016	32,140	3,000,000	31	1,944.0	16.53
2017	9,644	3,000,000	28	688.9	14
2018	7,301	3,000,000	25	424.0	17.2
2019	742	3,000,000	25	83.0	8.9
2020	2,393	3,000,000	25	167.0	14.3
2021	3,272	3,000,000	25	234.8	13.9
2022	4,866	3,000,000	26	304.7	15.9
2023	4,879	3,000,000	24	409.0	12.1
2024	6,332	3,000,000	53	364.0	17.4

Table 2. Harvest, quota, number of fishers and effort (feet) for the Wisconsin Northern Zone gill net chub fishery, 1986-2024.

YEAR	HARVEST	QUOTA	FISHERS	EFFORT (X 1,000 FT)	CPE
1986	360,118	400,000		7,037.20	51.2
1987	400,663	400,000	23	6,968.60	57.5
1988	412,493	400,000	23	8,382.30	49.2
1989	329,058	400,000	25	8,280.80	39.7
1990	440,818	400,000	23	8,226.40	53.6
1991	526,312	400,000	22	9,453.50	55.7
1992	594,544	500,000	24	11,453.10	51.9
1993	533,709	500,000	24	15,973.60	33.4
1994	342,137	500,000	24	8,176.20	41.8
1995	350,435	600,000	24	5,326.40	65.8
1996	332,757	600,000	24	4,589.70	72.5
1997	315,375	600,000	23	4,365.60	72.2
1998	266,119	600,000	23	3,029.00	87.9
1999	134,139	600,000	23	1,669.70	80.3
2000	77,811	600,000	21	2,199.50	35.4
2001	36,637	600,000	21	972.4	37.7
2002	63,846	600,000	21	1,098.60	58.1
2003	102,692	600,000	21	2,326.50	44.1
2004	50,029	600,000	21	1,354.00	36.9
2005	50,831	600,000	21	1,376.80	36.9
2006	36,285	600,000	19	1,011.10	35.9
2007	6,590	600,000	18	216	30.5
2008	23,942	600,000	18	845	28.3
2009	17,091	600,000	18	831.4	20.6
2010	5,551	600,000	18	474.2	11.7

2011	5,368	600,000	17	313	17.1
2012	6,633	600,000	16	497	13.3
2013	8,813	600,000	17	492.5	17.89
2014	6,807	600,000	17	393	17.32
2015	3,163	600,000	14	171	18.49
2016	7,850	600,000	17	159	49.37
2017	828	600,000	17	72	11.5
2018	200	600,000	17	12	16.7
2019	0	600,000	16	0	0
2020	0	600,000	16	0	0
2021	87	600,000	16	2.4	36.6
2022	0	600,000	16	0	0
2023	0	600,000	13	0	0
2024	0	600,000	13	0	0

Note: For the years 1990, 1991, & 1998-2024 totals were by calendar year. For the years 1986-89 & 1992-97 the totals were through Jan. 15 of the following year. For the years 2023 and 2024, the harvested weight of chubs was reported in both round and dressed weight. All weights were converted to dressed and reported combined in the table above.

Harvest in the southern zone, including waters from Algoma south to Illinois, was 6,332 pounds in 2024. The total catch in the southern zone remains at less than 1% of the allowed quota of approximately 2.9 million pounds for the southern zone. In the northern zone, essentially waters from Baileys Harbor to Michigan, zero pounds were reported. The southern zone CPUE was slightly up compared to 2023, though the total gill net effort decreased in the southern zone compared to 2023. In the south, 53 permits were issued, with 2 reporting harvesting chubs in 2024, while 0 of 13 permit holders reported harvesting chubs in the north.

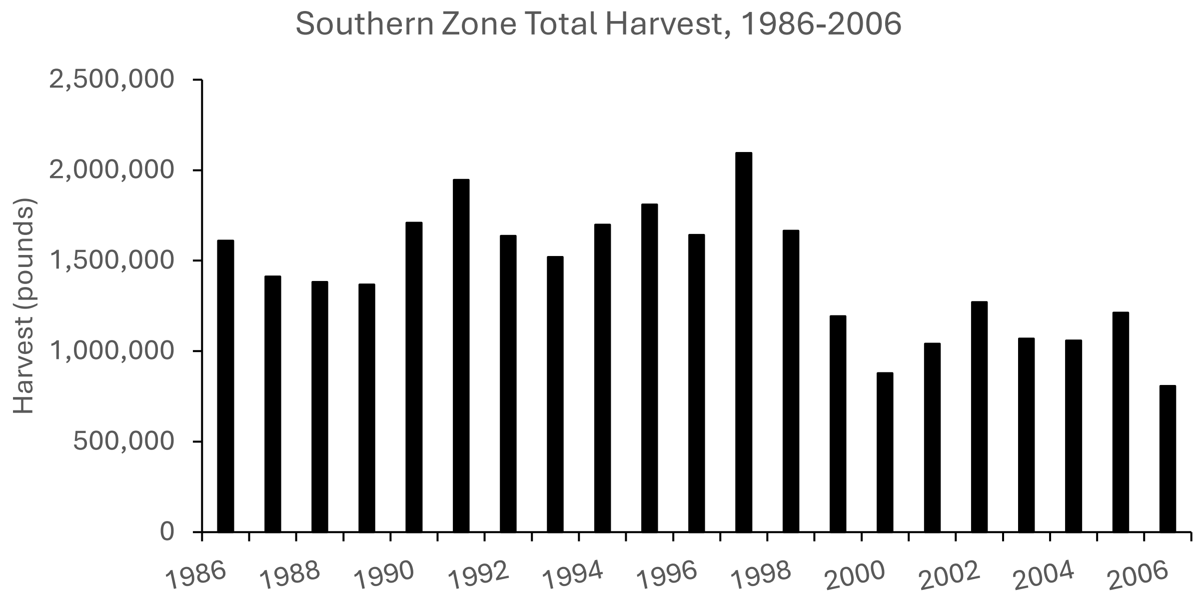

Figure 1. Total harvest (pounds) by year for the Wisconsin gill net chub fishery in the southern zone, 1986-2006.

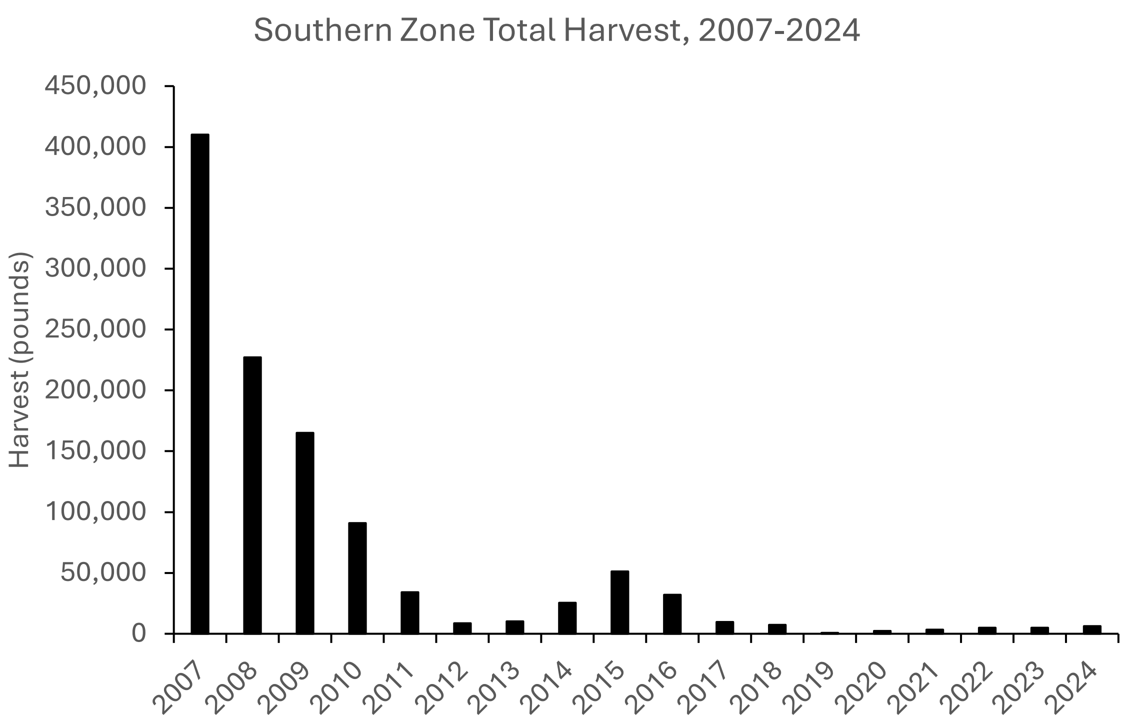

Figure 2. Total harvest (pounds) by year for the Wisconsin gill net chub fishery in the southern zone, 2007-2024.

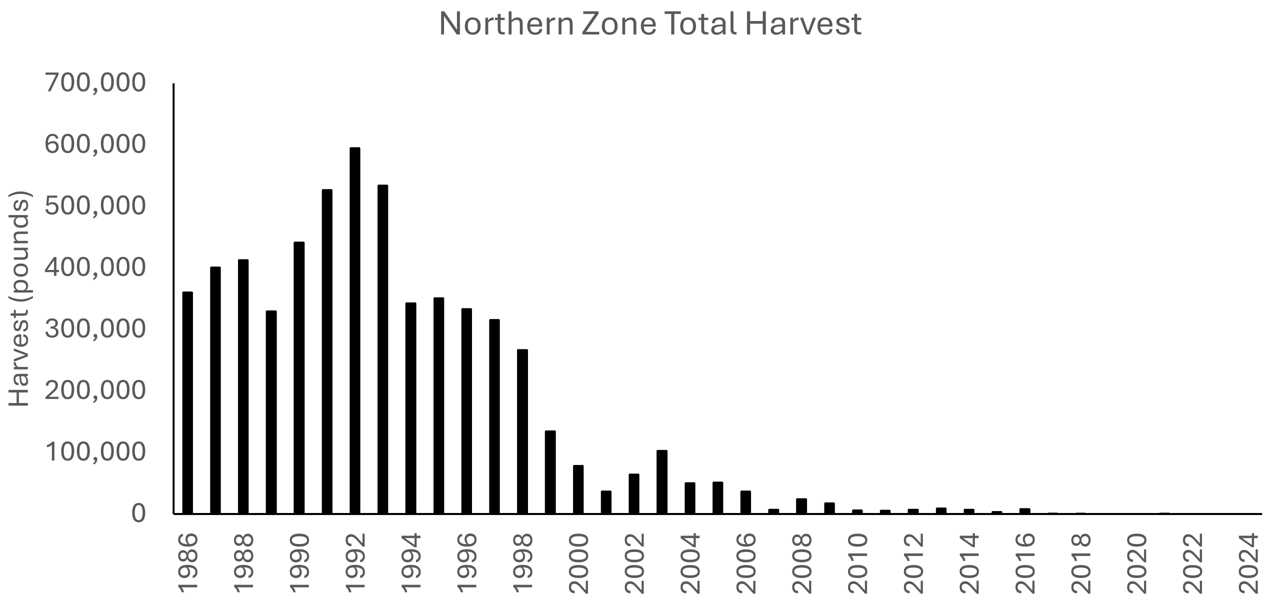

Figure 3. Total harvest (pounds) by year for the Wisconsin gill net chub fishery in the northern zone, 1986-2024.

Population assessments off Baileys Harbor and Sheboygan were not conducted in 2024 due to budget constraints.

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