Inland Seas Angler

GREAT LAKES BASIN REPORT©

Special Report – Lake Michigan Part 2

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Highlights of the Annual Lake Committee Meetings

Great Lakes Fishery Commission proceedings, Ypsilanti, MI

This third of a series of annual special reports is a two-part summary of Lake Michigan. This lake committee report is from the annual Lake Committee meetings hosted by the Great Lakes Fishery Commission in March 2019. We encourage reproduction with the appropriate credit to the GLSFC and the agencies involved. Our thanks to IL DNR, IN DNR, MI DNR; USFWS; USGS and the many other DNR biologists who make this all happen, and also thanks to the staffs of the GLFC and USGS for their contributions to these science documents. Thanks also to the Great Lakes Fishery Commission, its staff, Bob Lamb & Marc Gaden, for their efforts in again convening and hosting the Lake Committee meetings in Ypsilanti, MI.

Lake Michigan – Part 2

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Abbreviation	Expansion
CPH	Catch per hectare
CWT	Coded Wire Tag
LMC	Lake Michigan Committee
KT	1,000 metric tons
MDNR	MI Dept. of Natural Resources
SLCP	Sea Lamprey Control Program
USFWS	U.S. Fish and Wildlife Service
WTG	Walleye Task Group
YAO	Age 1 and older
YOY	Young of the year (age 0)

Lake Michigan Management Reports (WIDNR)

Green Bay Yellow Perch

Yellow perch abundance in Green Bay increased steadily through the 1980's. The estimated total biomass of yearling and older yellow perch rose from under 1 million pounds in 1978 to nearly 9 million pounds in 1987. The population growth was fueled by the production of strong year classes in 1982, 1985, 1986, and 1988. Following the late 1980's, yellow perch abundance began to decline and the biomass estimate dropped to between 500 and 600 thousand pounds by 2002. The decline in the population during the 1990's and early 2000's can be attributed to poor recruitment. From 1988 to 2002, only two reasonably strong year classes (1991 and 1998) appeared during summer trawling surveys **(Fig 1**). More recent summer trawling surveys, however, show improved recruitment.

Surveys from 2002 to 2013 indicate reasonably strong year classes but a reduced 2014 year class size was observed in trawling surveys **(Fig 1).** Year class strength rebounded in 2015 and 2016, with moderately strong year classes represented in southern Green Bay surveys. The trawling surveys indicated that 2017 produced a fair year class and the relative abundance of YOY yellow perch was estimated at 437/hour.

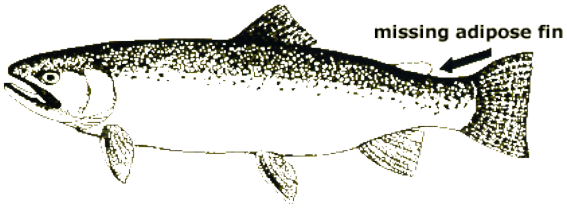
The spring spawning assessment was not completed in 2017. It is scheduled to occur in 2019.

Steelhead Fishing

Steelhead fishing and catching tagged fish contribute to Great Lakes research efforts. With spring steelhead fishing underway on Lake Michigan tributaries, state fisheries biologists are asking anglers to assist with an important steelhead research program currently underway. Wisconsin DNR fish biologists are asking anglers to report marked fish by submitting reports about what they caught, where and when.

Steelhead stocked into Lake Michigan tributaries during 2018 and recently in spring 2019 were marked with an adipose fin clip and tagged internally with coded wire tags. Steelhead are typically stocked as yearlings or at age 1, so steelhead initially marked and tagged in 2018 are now two years old and about 15 to 20 inches.

"These fish have now reached catchable and harvestable size, so we're asking anglers who catch steelhead with the adipose fin clip to let us know," says Nick Legler, DNR fisheries biologist based in Sturgeon Bay.



This diagram shows a fish with ONLY a missing adipose (back) fin.

DNR fisheries technicians Derek Apps (front) and Roman Frey (back) with a steelhead processed at the Besadny Anadromous Fish Facility on April 10, 2019.

Anglers have already caught some marked steelhead, with a few also showing up in reports from state egg collection facilities: the Besadny Anadromous Fisheries Facility on the Kewaunee River and Root River Steelhead Facility on the Root River. Anglers are encouraged to help, by collecting information and samples through either a volunteer return program accessible through dnr.wi.gov, search "missing fin," or the Great Lakes Angler Diary at https://glanglerdiary.org/.

Overall, the Great Lakes Mass Marking program seeks to evaluate salmonid wild production, movements, growth, and stocking methods. Also important to steelhead management is an evaluation of different genetic strains, such as Chambers Creek and Ganaraska strains. These will be interesting things to learn about steelhead, that will help guide steelhead management.

Collectively, all Chinook salmon and lake trout were marked with adipose fin clips and coded wire tags from 2011-2016, in a process shown in the video below. Since 2017, lake trout are still clipped and tagged, Chinooks are now just clipped, while steelhead are now clipped and tagged.

"Great information has and continues to be collected from past and remaining tagged Chinooks," Legler says. "This new focus on tagged steelhead is an exciting next chapter for the Great Lakes Mass Marking program. With anglers' help, it is sure to provide useful information to help manage and sustain a great fishery in Lake Michigan for years to come."This effort is thanks to the Great Lakes Mass Marking Program, USFWS, Kettle Moraine Fish Hatchery, and many collaborators around Lake Michigan. For more information, contact DNR fisheries biologist Nick Legler at 920-746-5112 or nicholas.legler@wisconsin.gov.

Beach seining

Nine index sites and two new sites (north side of Longtail Point and north side of Peat's Lake) along the west shore of Green Bay were sampled once using a beach seine. At each site, two 50ft hauls were pulled in perpendicular to shore. The number of YOY both retained and escaped from the seine bag when it was placed in a tub was recorded. YOY yellow perch were captured at all 11 sites (mean CPE=163) during the June sampling period and at 7 out of 11 sites in July (mean CPE=14). The 19-year average CPE is 74. The site with the highest abundance was Suamico/Sunset Beach access (CPE=731). Mean length of YOY yellow perch during the late June survey period was 34 mm (range: 20-56 mm). Mean length of YOY yellow perch during the July survey period was 50 mm (range: 38-72 mm).

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Trawling survey

Annual late summer trawl surveys continued for the 40th year to monitor trends in yellow perch abundance. Trawling was conducted at 74 index sites at 12 locations: 43 shallow sites and at 31 deep water sites using a 25-ft semi-balloon trawl At each of the 12 locations, 100 YOY yellow perch were measured if captured and yearling and older perch were subsampled for age, length, weight, and diet analysis. Mean length of yellow perch YOY was 68 mm (range: 46-118 mm). The trawling surveys indicated that 2017 produced a fair year class with the relative abundance of YOY yellow perch (437/hr), ranking as 20th out of the last 30 years since the deep water sites were added in 1988 (**Fig 1**). Greatest abundance of YOY was at Pensaukee (PEN). The location with the second highest abundance of YOY in 2017 was Little Tail Point (LIT).

Abundance of age-1 and older fish was 108/hr compared to the 30-year average of 448/hr. Excluding yellow perch, other common species in decreasing order of abundance captured at shallow sites were white perch YOY, gizzard shad, trout perch, and spottail shiner. In deep sites, juvenile lake whitefish were the most abundant species sampled. Other common species in decreasing order of abundance captured at deep sites were adult alewife, adult smelt, and YOY whitefish.

Mussels incidentally caught in the trawl are weighed to the nearest pound and are visually inspected for the relative composition of zebra and quagga mussels. From 1999 to 2011, zebra mussels comprised most of the dreissenid mussels incidentally caught in the trawling survey. However, since 2012, quagga mussels have dominated the dreissenid mussels caught. A total of 10 pounds of mussels were collected in 2017, which is the lowest over the 14 years that mussels were consistently weighed at each drag.

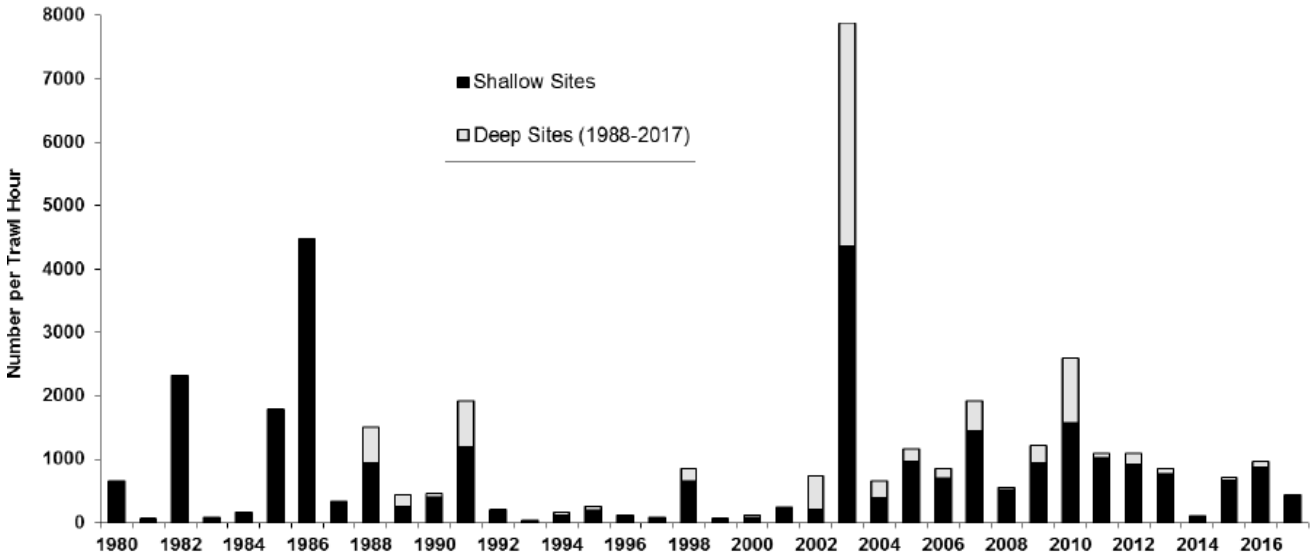


Fig 1- Relative abundance (weighted area average) of young-of-year yellow perch collected during late summer index trawling surveys in Green Bay from 1980 to 2017.

Sport harvest

Sport fishing harvest is estimated from an annual creel survey. Fish obtained through that survey were used to describe the age and size composition of the catch. Open water harvest of yellow perch in 2017 was 117,412 fish, compared to 72,223 fish in 2016 **(Fig 2**). Much of the open water harvest (45%) was by boat anglers launching at ramps in Door and Kewaunee Counties, followed by boat anglers in Oconto County (26%). A majority (47%) of the open water harvest was from the 2015 year class, while the 2014 year class comprised 43%. The mean length of open-water harvested yellow perch was 8.6 inches (n=122), compared to 8.7 inches in 2016.

Winter harvest is influenced largely by ice conditions, daily bag limits, angler effort, and abundance of adult perch. Harvest of perch through the ice continues to be a minor component of the overall harvest, with an estimated 16,294 fish taken between January 1 and March 15, 2017 (Figure 2). Much of the targeted ice fishing effort on Green Bay has focused on lake whitefish for the past several years.

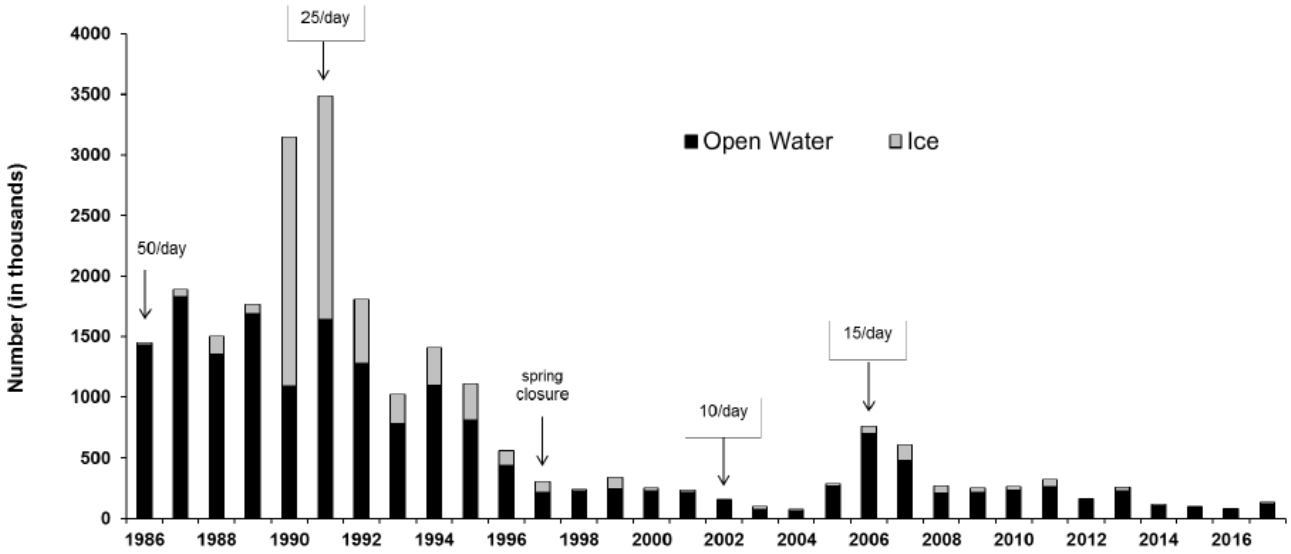


Fig 2-Estimated sport harvest of yellow perch in Green Bay from 1986 to 2017; regulation changes indicated by arrows.

Commercial harvest

The annual commercial harvest was reported by commercial fishermen who are required to weigh their harvest daily. Fish sampled by WDNR at commercial landings were used to describe the age and size composition of the catch. Since 1983, the yellow perch commercial harvest in Green Bay has been managed under a quota system. The zone 1 (Green Bay) quota has ranged over the past decade from 20,000 pounds to a high of 475,000 pounds and is currently set at 100,000 pounds.

In 2017, commercial fishers harvested a total of 30,730 pounds of yellow perch (an estimated 96,145 fish), compared to 31,201 pounds in 2016. The total allowable commercial harvest has remained at 100,000 pounds since 2008. Low market prices have led to decreased effort by commercial fishers in recent years. The harvest rate (CPE) for gill nets in 2017 was 18 pounds per 1000 ft fished, up slightly from 16 pounds per 1000 ft fished in 2016. Age-2 perch (2015 year class) made up 69% of the total commercial harvest in 2017, while age-3 comprised 20%.

Summary

Yellow perch recruitment has been relatively steady for the last decade, with the exception of the poor 2014 year class. The trawling surveys indicated that 2017 produced a fair year class with the relative abundance of YOY yellow perch (437/hr), ranking as 20th out of the last 30 years since the deep water sites were added in 1988. WDNR will continue to monitor the status of the yellow perch fishery and adjust commercial harvest limits and sport bag limits as needed.

The statistical-catch-at-age model for Wisconsin waters of Green Bay yellow perch was updated and run during the spring of 2018. Outputs of that model suggest that the adult (age 1 and older) yellow perch population has ranged between 1.5 million and 2.9 million fish from 2007 to 2017. The yellow perch (age 1 and older) abundance was estimated around 1.8 million fish in 2017.

Status of Yellow Perch Stocks – Lake Michigan

Micromesh gill net assessment

Eight micromesh gill net lifts were taken on 8/22, 8/30, 9/13, 9/19, and 9/21 with four sets off Bradford Beach using our larger boat capturing 17 YOY yellow perch and 16 juvenile yellow perch. A total of ten species of fish were captured. Alewife were the most abundant followed by round goby and spot tail shiner **(Table 1).** All the YOY yellow perch were caught in the gill net sets at the north end of Bradford beach. The average total length of YOY yellow perch was 62.76 mm. The catch per 100 ft. of gillnet was 0.94 YOY yellow perch (CPE=.94) **(Fig 1**), and the temperature ranged 62 to 66 F.

Species	# of fish
Alewife	1437
Bloater chub	1
Rainbow smelt (adult)	45
Spottail shiner	121
Longnose dace	13
Redhorse	1
Yellow perch (YOY)	17
Yellow Perch juvenile	16
Round Goby (YOY and juvenile)	368

Table 1- Numbers of fish captured in the YOY yellow perch micromesh gillnet survey at index stations (Lake Michigan nearshore waters), WDNR – 2017.

The nets were effective in capturing multiple species of fish The CPE of micromesh gill net was .94 YOY yellow perch per 100 ft. of gill net. The average size of YOY yellow perch was 62.76 mm which is a healthy growth at the end of the summer. The 2017 CPE of YOY Perch was down considerably from 2016.

Sportfishing Effort and Harvest

Wisconsin's Lake Michigan open water fishing effort was 2,542,842 hours during 2017, 4.40% below the five-year average of 2,659,761 hours **(Table 1**). Effort was below the five-year average for all fishery types except for ramp effort (up 3.67%). The 2017 moored boat effort was down from the 2015 moored boat effort (276,462 in 2015 and 238,179 in 2017). While the charter boat effort was lower than the five-year average (-4.06%), it was only slightly down from the 2016 charter boat effort (312,911 in 2016 to 310,435 in 2017). Pier fishing effort was the lowest it has been since 2011 (125,443 in 2011, 125,961 in 2017).

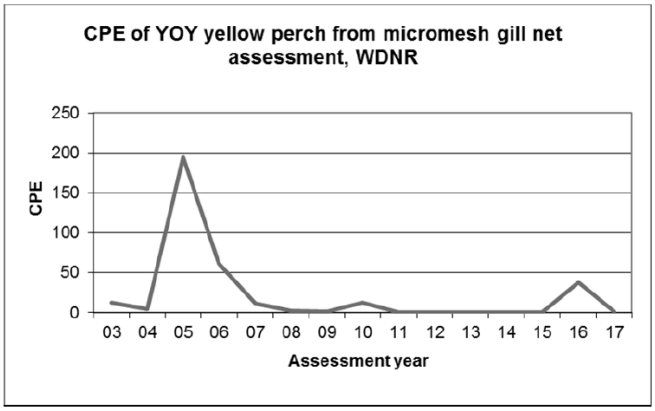


Fig 1- Micromesh gill net catch per 100 feet of young-of-the-year perch in the nearshore waters of Lake Michigan.

Wisconsin's Lake Michigan trout and salmon anglers had a decent season in 2017. Overall harvest was down, with 310,743 salmonids harvested; the harvest rate decreased to 0.1222 fish per hour, which was still slightly up from the five-year average (up 0.96%, **Table 3**) and higher than harvest rates in 2013, 2014, and 2015 (0.1213, 0.1163, and 0.0990, respectively). Fishing for coho salmon continued an upward trend; coho compromised the majority of the catch with 119,686 fish harvested, a substantial increase from the five-year average of 85,604 fish harvested (a 40% change). Chinook salmon harvest was lower in 2017 with 83,873 fish harvested, which is still below the five-year average (-31.58%) as well as below the harvest totals for the previous four seasons. Lake trout harvest remained similar to 2016; harvest increased to 20,345 fish (19,137 in 2016).

The open-water yellow perch harvest increased in 2017 with a harvest of 119,893 fish (**Table 2),** an increase from the 2016 record low harvest of 74,355 fish. The Lake Michigan yellow perch harvest was 2,451 fish and the Green Bay harvest was 117,442.

Table 1- Fishing effort (angler hours) by various angler groups in Wisconsin waters of Lake Michigan and Green Bay during 2017 and percent change from the 5-year average (2013-2017)

YEAR	RAMP	MOORED	CHARTER	PIER	SHORE	STREAM	TOTAL
2017	1,534,891	238,179	310,435	125,961	108,884	224,492	2,542,842
% change	3.67%	-18.78%	-4.06%	-20.87%	-17.42%	-17.26%	-4.40%

Table 2- Sport harvest by fishery type and species for Wisconsin waters of Lake Michigan and Green Bay during 2017

SPECIES	RAMP	MOORED	CHARTER	PIER	SHORE	STREAM	TOTAL
Coho salmon	61,202	15,462	39,971	1,073	532	1,446	**119,686**
Chinook	28,544	15,545	27,275	1,925	1,692	8,892	**83,873**
Rainbow trout	28,410	12,148	20,529	698	768	3,888	**66,441**
Brown trout	10,665	654	2,048	1,227	4,127	1,677	**20,398**
Brook trout	0	0	0	0	0	0	**0**
Lake trout	6,966	2,829	10,510	40	0	0	**20,345**
Northern pike	3,947	0	0	39	448	49	**4,483**
Smallmouth	5,093	1,444	0	400	582	623	**8,142**
Yellow perch	103,397	9,399	0	3,430	1,823	1,844	**119,893**
Walleye	79,521	4,789	0	0	37	5,491	**89,838**
TOTAL	**327,745**	**62,270**	**100,333**	**8,832**	**10,009**	**23,910**	**533,099**

Table 3- Total number of fish harvested by year by species across all angler groups in Wisconsin waters of Lake Michigan, 2002-2017

Species	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Since 1986)
Brook Trout	144	126	1	18	17	62	13	27	0	26	18	0	0	0	0	0	39,040
Brown Trout	35,220	23,654	20,918	27,489	17,769	37,947	23,763	15,792	13,029	9,936	21,337	17,094	23,324	20,174	23,879	20,398	1,153,028
Rainbow Trout	74,031	48,548	25,529	48,490	48,420	62,249	41,552	46,529	49,121	75,442	75,981	58,311	73,105	59,106	76,846	66,441	2,208,640
Chinook Salmon	275,454	317,619	360,991	418,918	398,905	431,143	256,796	214,621	315,294	169,752	390,385	145,301	130,698	113,973	139,082	83,873	6,921,475
Coho Salmon	102,313	50,625	76,944	59,244	56,136	94,677	25,453	42,690	42,445	157,367	73,395	89,061	52,297	41,010	125,964	119,686	2,614,176
Lake Trout	39,865	23,881	14,209	14,139	10,638	19,281	12,763	14,946	17,483	17,788	29,094	27,240	25,425	35,715	19,137	20,345	1,423,321
TOTAL	**527,027**	**464,453**	**498,592**	**568,298**	**531,885**	**645,359**	**360,340**	**334,605**	**437,372**	**430,311**	**590,210**	**337,007**	**304,849**	**269,978**	**384,908**	**310,743**	**14,359,680**
Harvest Per Hour	0.1789	0.1719	0.1904	0.2036	0.1916	0.2108	0.1443	0.1171	0.1539	0.1693	0.2337	0.1213	0.1163	0.0990	0.1464	0.1222	0.1479

Table 4. Total number of salmonids harvested by year by angler group in Wisconsin waters of Lake Michigan, 2002-2017.

Fisheries Type	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	(SINCE 1986)
Ramp	236,241	196,235	195,953	241,535	197,833	254,231	115,698	113,446	161,917	172,438	261,944	112,150	115,239	102,749	164,540	135,787	5,574,019
Moored	110,094	111,148	130,418	149,845	128,666	164,286	92,635	91,986	127,356	103,547	122,008	77,929	57,004	53,182	74,000	46,638	3,671,975
Charter	106,631	100,037	123,995	137,922	152,749	173,250	110,481	91,333	117,004	121,043	174,776	105,427	97,186	91,255	112,150	100,333	3,451,530
Pier	10,629	8,464	11,329	9,284	8,835	15,440	6,487	7,975	8,203	4,432	9,023	5,961	7,834	8,159	10,089	4,963	360,277
Shore	20,111	14,995	11,175	8,557	13,472	16,394	10,191	8,519	6,398	8,544	6,900	10,205	9,949	4,931	9,477	7,119	447,164
Stream	43,321	33,574	25,722	21,155	30,330	21,758	24,848	21,346	16,494	20,307	15,559	25,335	17,637	9,702	14,652	15,903	854,715
TOTAL	**527,027**	**464,453**	**498,592**	**568,298**	**531,885**	**645,359**	**360,340**	**334,605**	**437,372**	**430,311**	**590,210**	**337,007**	**304,849**	**269,978**	**384,908**	**310,743**	**14,359,680**

Walleye harvest was estimated at 89,838 fish, an increase from 2016 (78,440 fish). The 2017 northern pike harvest was substantially higher than the previous few years, with 4,483 fish harvested. Smallmouth bass harvest was 8,142 fish, a substantial decrease from 2016 (16,880 fish harvested).

Green Bay Brown Trout Management and Fall Tributary Surveys, 2017

Since 2000, brown trout fishing has experienced a sharp decline. Stocking numbers for Green Bay have varied somewhat since the 1980's but, in general, remain fairly consistent until 2010 when fingerling stocking was greatly reduced. Between 2011 and 2015, only yearling brown trout were stocked into Green Bay **(Fig 1).**

Historically WDNR has stocked several strains and age classes of brown trout into Green Bay and adjacent rivers including: Wild Rose domestic, Wild Rose feral, and St. Croix domestic. To promote an extended trophy fishery, the seeforellen (German) brown trout program was initiated in

Green Bay waters in the early 1990's. From 1991 to 2016, Wild Rose domestic and seeforellen strains comprised the majority of brown trout stocking into Wisconsin waters of Lake Michigan although limited numbers of St. Croix brown trout have been stocked as surplus or substituted for Wild Rose domestics throughout the years. A 1996 strain evaluation on Wild Rose domestic, Wild Rose feral, and seeforellen indicated similar rates of returns for age-2 BNT, while seeforellen appeared to live longer and grow faster, thus adding to the trophy element of the fishery.

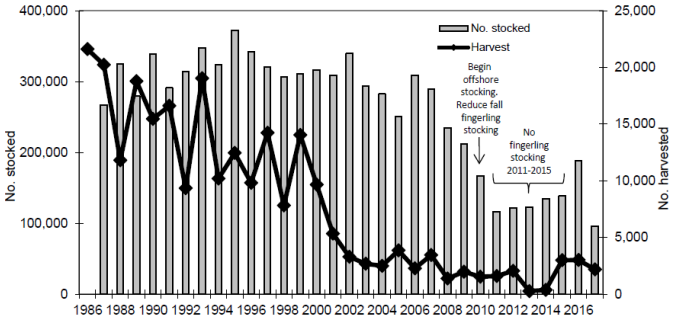


Fig 1-Number of stocked and harvested brown trout in Wisconsin waters of Green Bay by year. Fingerling stocking was reduced in 2010 and eliminated from 2011-2015.

In October 2016, the WDNR decided to reduce brown trout stocking in Wisconsin waters of Lake Michigan in response to a declining forage base, poor returns, and high cost of production. For 2017, brown trout stocking was reduced from approximately 693,000 to 356,000 for Wisconsin waters of Lake Michigan. As a result, the Wild Rose strain of brown trout was discontinued and the Thunder River Hatchery in Crivitz, WI was decommissioned. WDNR decided to stock only seeforellen brown trout beginning in 2017 and moving forward. Wild Rose strain brown trout being raised at Thunder River and Brule Hatcheries were stocked in 2016 as fall fingerlings instead of as yearlings in 2017. As a result, Green Bay received a one-time surplus of fall fingerling brown trout in 2016 **(Fig 1).**

The 2017 quota included 75,557 yearlings and 20,000 fall fingerlings. Because fewer yearling brown trout were stocked in Green Bay in 2017, all yearlings were planned to be stocked offshore with the RV Coregonus and none stocked through the ice directly into rivers. However, a load of 9,285 yearlings were stocked into Little River in April instead of offshore due to high winds on the Bay.

Menominee River Summary

Although the Menominee River is not currently a brood stock river for seeforellen, that river is surveyed regularly to collect information on fall runs of fish due to local angling interest in salmonids and to serve as a fishery-independent index of brown trout abundance. Between 2010 and 2015, WDNR stocked brown trout offshore and not directly into the Menominee River. In 2016, 28,884 uniquely clipped (adipose + right pectoral) yearling seeforellen brown trout, along with 30,708 unclipped Wild Rose domestic strain fingerlings were stocked into the Menominee River.

Electrofishing surveys targeting trout and salmon on the lower Menominee River were completed weekly beginning on October 11 and ending on November 16, 2017. Fifty-one brown trout were captured (27 males; 24 females)**,** with a mean length of 26.4 inches. One brown trout had a floy tag and was stocked by the M&M Great Lakes Sportfishing Club in the Menominee Marina in 2014. Seven brown trout had an adipose + right pectoral clip.

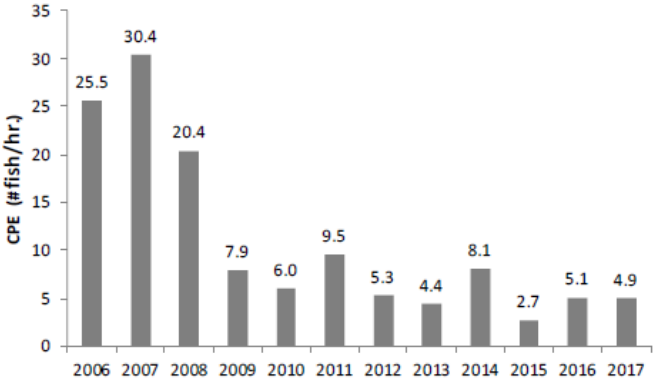


Fig 2-CPE (# fish/hour) of brown trout captured during fall electrofishing surveys on the lower Menominee River, 2006-2017.

The combined CPE for brown trout was 4.9 fish/hour, down from 5.1 fish/hour in 2016 **(Fig 2).** Forty-eight rainbow trout were captured in 2017, up from 29 in 2016. Only three pink salmon were captured in 2017, but sampling efforts did not begin until mid-October and after the peak of the pink salmon run. Chinook salmon with an adipose fin clip were collected and heads were sent to USFWS-GBFRO for coded wire tag analysis. Chinook heads that were collected by Michigan DNR in the Menominee dam fish lift are also listed in Table 8. Forty-eight percent of tagged Chinook salmon that were recovered in October were stocked into tributaries of the west shore of Green Bay.

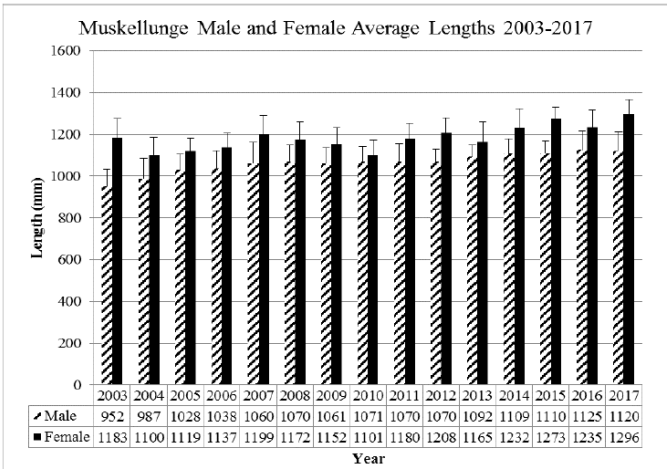
Summary

Beginning in 2017, all yearling brown trout that Wisconsin stocks into Lake Michigan receive an adipose fin clip through the efforts of the USFWS-GBFRO mass marking trailer. This will allow WDNR to further evaluate relative contributions of Wisconsin brown trout compared to unclipped brown trout stocked by Michigan DNR in northern Green Bay. We will utilize creel surveys, fall electroshocking surveys, fish registered at the Brown Trout Derby, and voluntary fishery logbooks to continue to evaluate the status of Green Bay brown trout. Seeforellen brood stock will continue to be collected in the Root, Sheboygan, and Kewaunee Rivers but greater flexibility on collecting brood stock from other rivers will be possible now that all seeforellen will be uniquely clipped. Fall assessments will also be conducted in the Menominee and Peshtigo rivers. WDNR plans to continue offshore stocking the yearling

brown trout into Green Bay at least through 2018. Since offshore stocking using the *RV Coregonus* began in 2010, harvest rate has generally improved compared to the previous 8 years. Two exceptions are 2013 and 2014, which were late ice-out springs which prevented early season nearshore trolling for brown trout. The target indices will continue to be evaluated and any major changes to management actions will be discussed with stakeholders.

Great Lakes Muskellunge in Wisconsin Waters of Green Bay

Annual assessments to determine the status of the Green Bay Muskellunge population have been conducted using fyke nets in spring and electrofishing in fall since 2003. In 2017, the average length of the 14 males captured in fyke nets was 1125 mm (44.1") **(Fig 1).** Although the average length of male Musky declined slightly in 2017 from the 2016 peak, the overall trend has been increasing since 2003. The average length of the 12 female Musky captured in 2017 was 1296 mm (51.0") which is the longest average length during the period. In general, average length for both male and female Musky has been increasing since 2011.



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Male	952	987	1028	1038	1060	1070	1061	1071	1070	1070	1092	1109	1110	1125	1120
Female	1183	1100	1119	1137	1199	1172	1152	1101	1180	1208	1165	1232	1273	1235	1296

Fig 1-The average lengths (mm) of male and female Muskellunge captured during spring netting surveys of the lower Fox River from 2003-2017.

During the 2017 fall electrofishing survey, we captured three Musky, with two of these fish greater in length than 450 mm (17.7"). No captured Musky were greater than 760 mm (30") in length (Figure 2). Likely warm fall Fox River temperatures during the survey reduced our catch in 2017. During the 2017 fall electrofishing survey, we captured three Musky, with two of these fish greater in length than 450 mm (17.7"). No captured Musky were greater than 760 mm (30") in length. Likely warm fall Fox River temperatures during the survey reduced our catch in 2017.

In 2017, WDNR stocked 3,246 fingerling Musky and 5,426 yearling Musky into the Wisconsin waters of Green Bay. Total stocking since 2015 has exceeded 8,000 fish per year using a combination of fingerling Musky raised at the Besadny Anadromous Fisheries Facility (BAFF) near Kewaunee, WI and yearling Musky reared at Wild Rose State Fish Hatchery and are the highest stocking numbers since 2006. Eggs for Musky raised at BAFF were obtained from wild fish attempting to spawn in the Fox River. Yearling Musky raised at Wild Rose were obtained from Michigan DNR from fish spawning in the Detroit River.

Since 2010, the majority stocking has focused on locations that have fingerling habitat and are also able to support adult Musky. These locations in include the Fox River in Brown County, the Menominee River in Marinette County and Sawyer Harbor and Little Sturgeon Bay in Door County. However, with the availability of Musky for stocking since 2010, smaller streams on the west shore of Green Bay including the Peshtigo River, Oconto River, Pensaukee River and Suamico River have been stocked. All recently stocked fingerling Musky received a Left Ventral (LV) fin clip and all recently yearling stocked Musky received a Right Ventral (RV) clip and 20% of the yearling Musky were also PIT tagged.

The Lake Michigan creel survey estimated that a total of 1,893 Muskellunge were caught by anglers in 2017, with a harvest of 105 Musky **(Fig 2).** The 2017 catch of Musky increased from the estimated 2016 catch of 1,120 fish and was above the average annual catch of 1,300 noted since 2005. The 2017 estimated catch of Musky was the third highest on record since 2005. Harvest in this fishery has been very low since 2005 but was estimated to be 105 in 2017 which is the highest harvest since 2005. Since there is a large variance in the estimated harvest, the harvest estimate should be viewed with caution. Catch and release fishing and the 1372 mm (54") minimum size limit will likely limit harvest for the foreseeable future in the Green Bay Musky fishery.

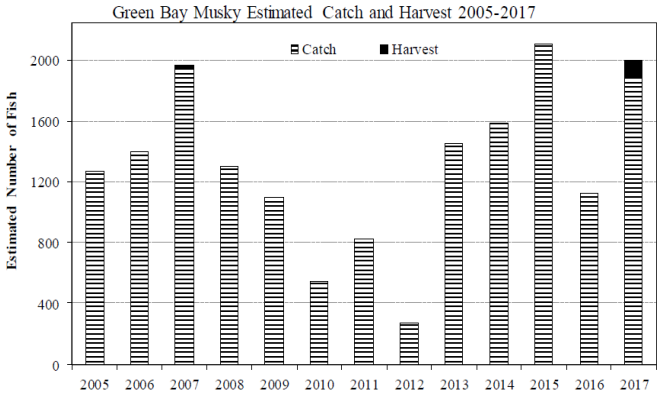


Fig 2- The estimated catch and harvest of Great Lakes Spotted Muskellunge from Green Bay from 2005 through 2017 during the open water fishing season.

A total of 72,127 hours of directed effort for Muskellunge occurred on Green Bay and the lower Fox River from March 15th through October 31st, 2017. This effort was similar to directed effort in 2016 but less than the 2014 peak total of 91,485 hours. The creel survey estimated that CPUE was 0.026 fish per hour in 2017 or 38.5 hours to catch a Musky.

Creel survey results indicate that the Green Bay Musky fishery remains popular with anglers and that anglers have begun to target Musky throughout Green Bay as the population spreads out from the Fox River and lower Green Bay to more northern waters. Ongoing projects will focus on increasing hatchery production and on spawning habitat restoration.

2017 Status of Walleye in Southern Green Bay and Fox River

Spring Electrofishing Surveys

Since 2013, Wisconsin has assessed the magnitude of Walleye spawning migrations into the Fox River located in southern Green Bay by using daytime electroshocking. Electrofishing is conducted just below the dam in De Pere to capture Walleye during the estimated peak of the spring spawning run with a goal to tag 500 Walleye and to collect biological information from captured Walleye.

The Fox River below the DePere Dam was electroshocked to capture Walleye on March 28, April 3 and April 4, 2017. A total of 510 Walleye (159 male and 351 female) were captured during sampling **(Fig 1).** Water temperature in the Fox River ranged from 39°F to 42°F during shocking events. The total shocking effort was 4.7 hours for a total CPE of 109.1 Walleye per hour shocked. Captured Walleye ranged from 378 mm to 749 mm (14.9" to 29.5") which is similar to the size distribution observed in previous years. Unlike past surveys when male and female Walleye were captured in near equal number, female Walleye dominated the catch in 2017.

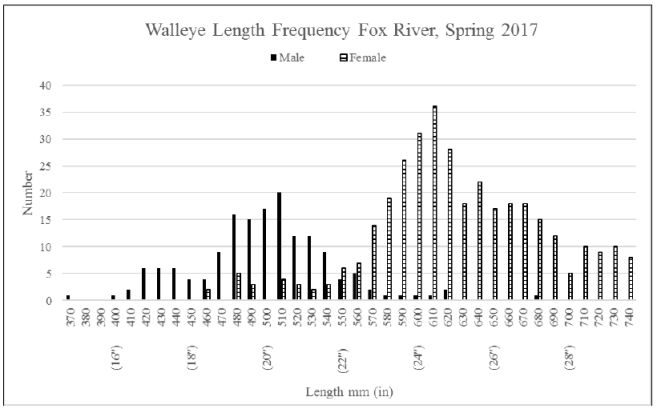


Fig 1- Length distribution of Walleye captured during 2017 spring electroshocking on the Fox River.

The 159 male Walleye that were captured ranged in length from 378 mm to 686 mm (14.9" to 27.0") and had an average length of 503 mm (19.8") (**Fig 1)** A total of 351 female Walleye were captured during shocking. Female Walleye ranged in length from 461 mm to 749 mm (18.1" to 29.5") and had an average length of 630 mm (24.8") (**Fig 1**).

During these surveys, we removed a dorsal spine from captured Walleye for age analysis. Up to ten spines per centimeter length interval for male and female Walleye were collected from the Fox River. In 2017, we analyzed 510 spines (157 male and 350 female) to develop our Year Class (YC) distribution table. YC 2009 (age 8) and YC 2010 (age 7) were the most common YC's that we captured. and these Walleye YC's represented nearly 29.4% of the run **(Fig 2).** Age class 2008 (age 9) was also well represented in the 2017 run.

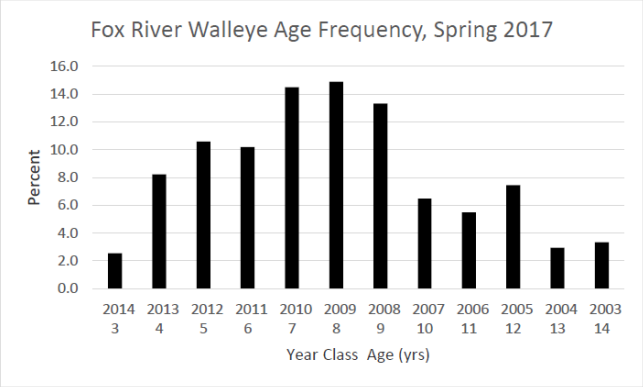


Fig 2- The year class distribution of Walleye captured during the spring spawning run from the Fox River in 2017. Male and female ages are pooled to determine the percentage of the run represented by each year class.

Fall Electrofishing Index Surveys

In 2017, during the nighttime YOY Walleye index electroshocking survey on the Fox River, we captured 425 Walleye that had average length of 353 mm (range 161 mm to 562 mm) **(Fig 3**). 22.3% (119) of the captured Walleye were classified as YOY Walleye.

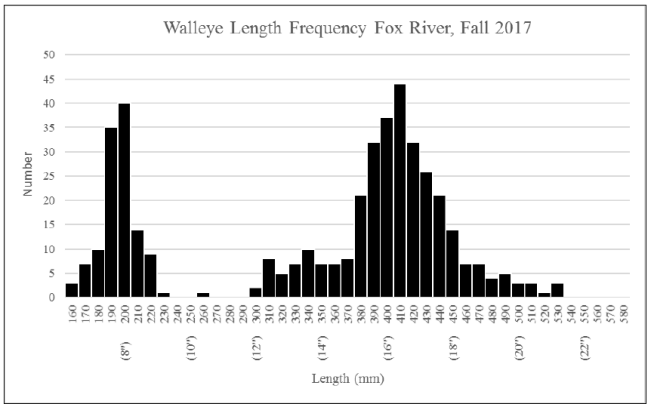


Fig 3- Length-frequency distribution of Walleye sampled while electrofishing the lower Fox River during fall 2017.

Walleye from the 2014 year class (Age 3) and from YC 2017 (Age 0) dominated our catch (**Fig 4).** Age 4 (2013 YC) was also well represented in our sample. Poor to fair water clarity and river dredging likely reduced our ability to capture Walleye in the fall of 2017. The length and age frequencies of captured Walleye indicates that the stock's age structure is dominated by young Walleye with few large Walleye were captured in fall despite good numbers of large (old) Walleye captured during spring surveys.

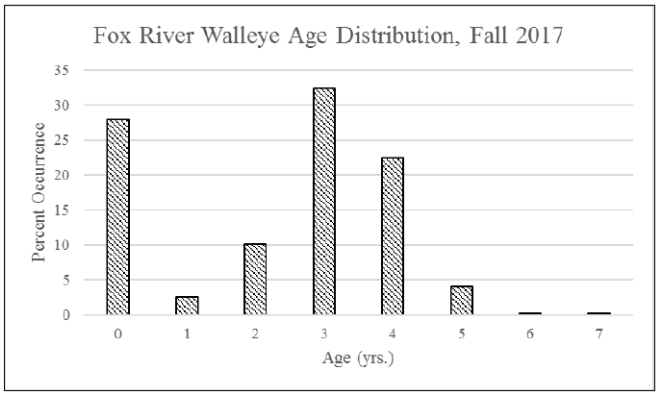


Fig 4- The age distribution of walleye captured from the Fox River during fall 2017 electroshocking surveys.

During YOY Walleye assessments on Green Bay, we captured 111 Walleye that ranged in length from 167 mm to 583 mm (6.6" to 23.0") and had an average length of 345 mm (13.6")**.** The distribution of age was typical for fall electroshocking with most Walleye small in length and young in age. Most Walleye were less than 450 mm (17.7") in length with few fish greater than 500 mm (19.7") in length captured. In 2017, ages 3 and 2 (year classes 2014 and 2015) dominated our catch with age 0 and age 4 less abundant **(Fig 5).** Walleye older than age 5 were not captured.

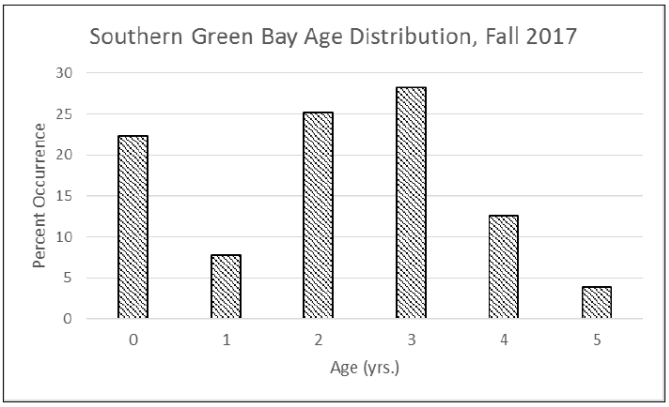


Fig 5- The age distribution of walleye captured from southern Green Bay during fall 2017 electroshocking surveys.

Recruitment of YOY Walleye

Results of our 2017 fall electrofishing index surveys show that the relative abundance of young of the year (YOY) Walleye at the fall fingerling stage was above the average YOY catch (1983-2016) for the Fox River and could indicate that 2017 year class produced on the Fox River may be above average **Fig 6).** (The 2017 age 0 catch per unit effort (CPUE) from the Fox River was 19.6 YOY/hour of electrofishing which is above the 1993-2016 average of 14.6 YOY/hour. The southern Green Bay catch was 6.6 YOY/hour, which is below the 1993-2016 average of 9.7 YOY/hour. Likely poor water clarity along the Green Bay shoreline reduced our catch of YOY Walleye in 2017. It is likely that based on the total 2017 YOY catch, that 2017 will be an average Walleye year overall. Year-class failures have not been observed in more than two consecutive years from the Fox River and Green Bay since the springs of 1999 and 2000 although 2015 and 2016 were below average as indicated by fall YOY surveys **(Fig 5).**

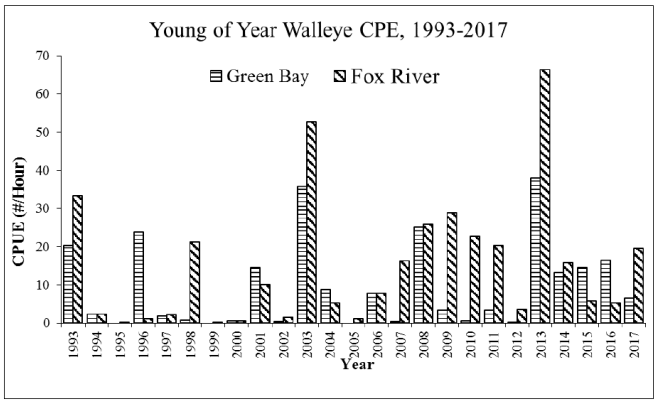
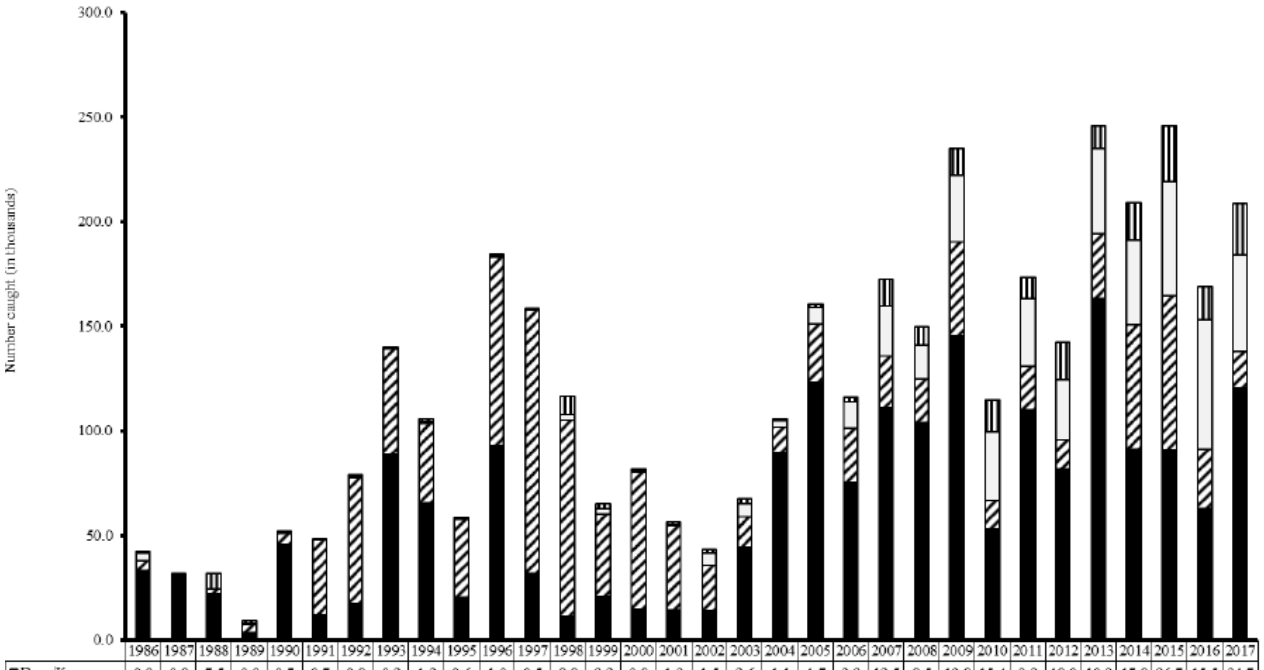


Fig 6- Relative abundance of young-of-year Walleye in the lower Fox River (DePere Dam to mouth), lower Green Bay (south of a line drawn from Longtail Point to Point Sable), as measured by catch per unit effort (CPUE; number per hour) from data collected in electrofishing index surveys during 1993-2017.

Catch and Harvest

The total catch of Walleye from Wisconsin waters of Green Bay was estimated by DNR creel survey at 208,729 fish during the 2017 open water fishing season (March–October 31) **(Fig 7).** This was a 23.6% increase from the estimated 168,886 Walleye that were caught during the 2016 open water fishing season. The 2017 Walleye catch was well above the average catch of 119,000 and was the fifth highest on record since 1986. Anglers fishing in Brown and Door/Kewaunee Counties reported catching more Walleye in 2017 than in 2016, while anglers in Oconto and Marinette Counties caught fewer Walleye. The largest increase was in Brown County with the largest decrease was for anglers fishing in Oconto County.

The total open water fishing season harvest of Walleye from Wisconsin waters of Green Bay increased by 14.9% from 77,567 Walleye harvested in 2016 to 89,137 in 2017**.** The 2017 harvest of Walleye was more than double the average harvest of 39,100 and was the fourth highest estimated harvest since 1986. Similar to catch, the 2017 harvest of Walleye increased in Brown and Dorr/Kewaunee Counties with declines noted in Marinette and Oconto Counties with the largest increase in Brown County and largest decline in Marinette County.



	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Door/Kewaunee	0.9	0.9	7.5	0.9	0.7	0.7	0.8	0.2	1.2	0.6	1.0	0.5	8.8	2.2	0.8	1.2	1.5	2.6	1.1	1.7	2.2	12.5	8.5	12.8	15.4	9.9	18.0	10.9	17.8	26.7	15.5	24.7
Oconto	3.3	0.5	0.3	0.6	0.1	0.0	0.3	0.5	0.9	0.4	0.9	0.4	2.5	2.7	0.7	0.8	5.9	6.1	3.1	7.9	12.5	24.1	16.4	31.6	32.7	32.3	28.9	40.6	40.6	54.2	62.0	46.1
Marinette	4.9	0.7	1.9	4.0	5.3	35.6	60.3	50.6	38.3	36.8	89.9	125.9	93.9	39.2	65.3	39.9	21.9	14.3	11.8	28.1	25.8	24.9	20.8	45.1	13.6	20.7	14.1	31.0	59.2	74.0	28.4	17.4
Brown	33.1	29.8	22.4	3.5	45.7	12.2	17.5	88.8	65.3	20.6	92.9	31.7	11.5	20.8	15.1	14.6	13.9	44.6	89.7	122.9	75.4	110.8	104.0	145.4	53.3	110.2	81.6	163.2	91.4	90.7	62.9	120.5

Fig 7- Estimated total open water season (March-October) Walleye catch from Wisconsin waters of Green Bay and the lower Fox River by county during 1986-2017.

The estimated Walleye catch since 2013 has been above 200,000 fish each year except in 2016 and the estimated harvest has been above 90,000 Walleye except in 2017 when the catch was just below 90,000 and in 2016 when the catch was below 80,000. Although there have been yearly fluctuations in catch and harvest, the general trend for catch and harvest has been steady to increasing. Good

Walleye catch and harvest numbers are the result of strong year classes in southern Green Bay since 2007 and favorable weather conditions during the fishing season. The largest contribution to the fishery has been from the lower Fox River, lower Green Bay and more recently from Oconto and Marinette Counties.

The Future of the Sport Fishery

The future of the southern Green Bay/lower Fox River Walleye stock and sport fishery appears to be very promising. Substantial Walleye year classes have been measured the past ten of the past twelve falls during electroshocking with the 2013 cohort being the strongest year class measured since 2003. Recent year classes have been rated as average or slightly above average although the 2016 YC appears to be weak. As the 2013 and 2014 year classes fully recruit to the fishery, yearly catch and harvest are likely to increase because these fish will obtain a size desired by anglers. Additionally, as contaminant levels continue to decrease from the Fox River PCB clean-up, Walleye harvest will also likely continue to increase.

Lake Whitefish

Commercial Harvest

Lake whitefish harvest in Wisconsin waters of Lake Michigan and Green Bay was approximately 1.23 million pounds in 2017, an increase of nearly 100,000 pounds from 2016 **(Fig 1).** Harvest remains among the lowest levels since the 1990/91 quota year and below the 20-year average of approximately 1.41 million pounds.

The commercial whitefish harvest in Wisconsin was formerly regulated on a "quota year" basis beginning in July and running through June of the following year, with a closed period during spawning in November. In 2012 the quota season began operating on a "calendar year" with the same November closed period. The initial quota established in 1989-90 was 1.15 million pounds. It increased several times thereafter and reached 2.47 million pounds during the 1998-99 quota year. The quota was again increased during the 2009-10 quota year resulting in the current total allowable catch limit of 2.88 million pounds. The Wisconsin quota is allocated to three zones at roughly 9% of the quota for zones 1 and 3, and 82% for zone 2. However, the 2009-2010 quota increase of approximately 410,000 pounds was treated as a "Special Increase" and split equally among the zones.

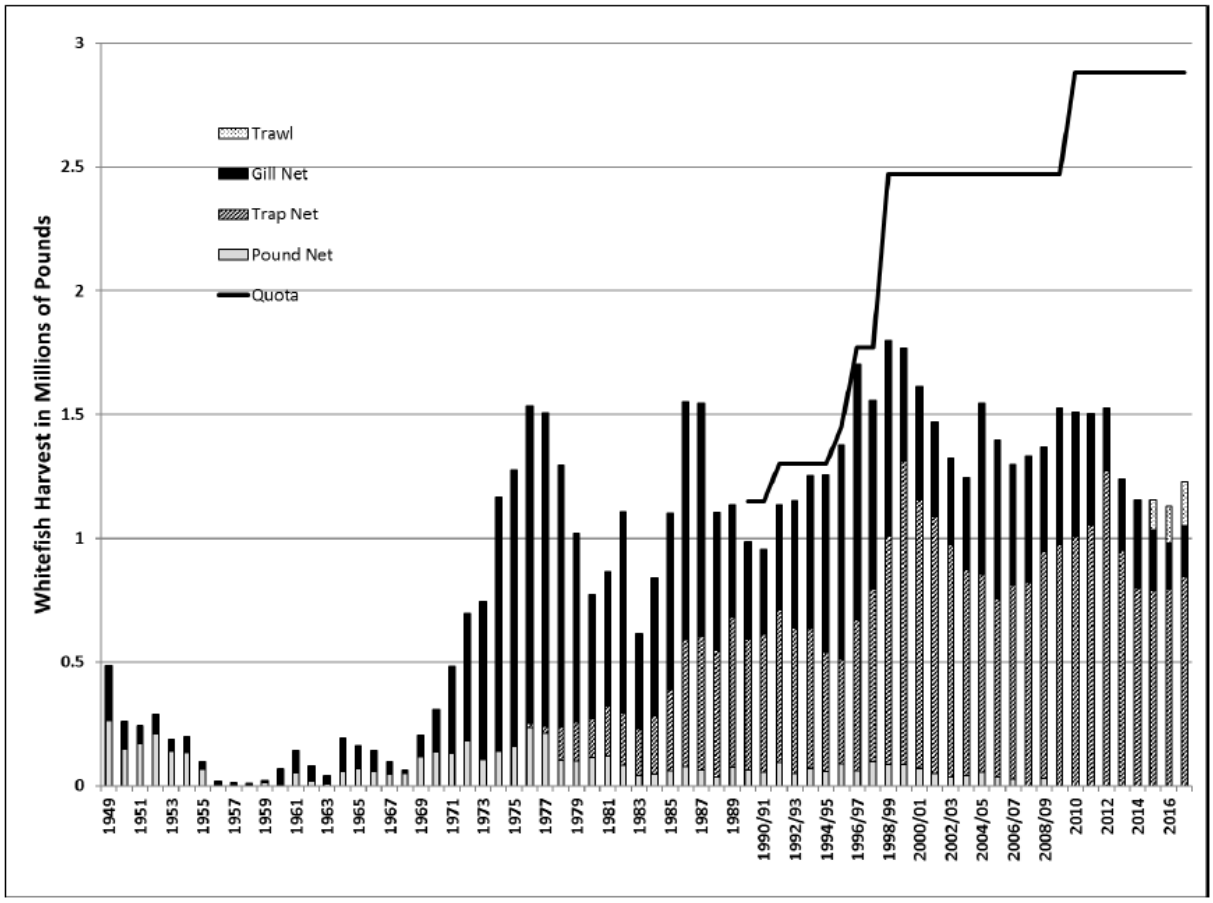


Fig 1- Lake Whitefish reported commercial harvest by gear in pounds (dressed weight) from Wisconsin waters of Lake Michigan including Green Bay, from 1949 through 2017.

Trap and gill nets are the primary gear types used to harvest lake whitefish in Wisconsin waters of Lake Michigan. Pound nets were used historically but have not been employed since 2009. In 2015 an experimental trawl fishery for lake whitefish was implemented; but it is restricted to only the Manitowoc/Two Rivers area of Lake Michigan. Commercial fishers have used trap nets as a legal gear to harvest lake whitefish from Lake Michigan since 1976. Trap net use has generally increased over the last few decades and is now the primary gear for lake whitefish **(Fig 1).**

Though trap net effort has declined steadily since reaching its third highest level in 2010, there was an increase of 341 lifts between 2016 and 2017 (Figure 2). Meanwhile, after a spike in 2005, gillnet effort has followed a longer-term decline. The 2.87 million feet of net fished in 2016 is the lowest level on record since 1979. However, gill net effort between 2016 and 2017 did increase by around 1 million feet, the first increase in nearly 10 years. Preference for trap net caught fish is largely responsible for the overall decline in gill net use although the decline in gill net efficiency brought on by ecological perturbations (increased water clarity, algae fouling) from invasive species is also a major contributor.

Sport Angler Harvest

The winter creel season of 2007 recorded the first significant lake whitefish harvest of an estimated 1,559 fish. The harvest increased substantially during the winter of 2008 and has remained relatively high ever since.

Winter creel surveys for Green Bay are conducted during the months of January, February, and March. For winter 2017, the estimated whitefish harvest was the second highest on record at 167,812, an increase of nearly 38,000 fish from 2016 **(Fig 2).** Angler effort directed toward whitefish decreased for the second straight year from 202,663 hours fished in 2016 to 179,991 in 2017. However, poor ice conditions in March of 2017 likely affected effort totals as the sport creel survey ended after February. Harvest rates specific to whitefish in 2017 were 0.855 and 0.706 whitefish harvested per hour of fishing in January and February, respectively. The overall season's average whitefish specific harvest rate increased from 0.610 fish per hour of fishing in 2016 to 0.751 fish per hour of fishing in 2017. The 2017 harvest rate is the third highest on record, just below 2013.

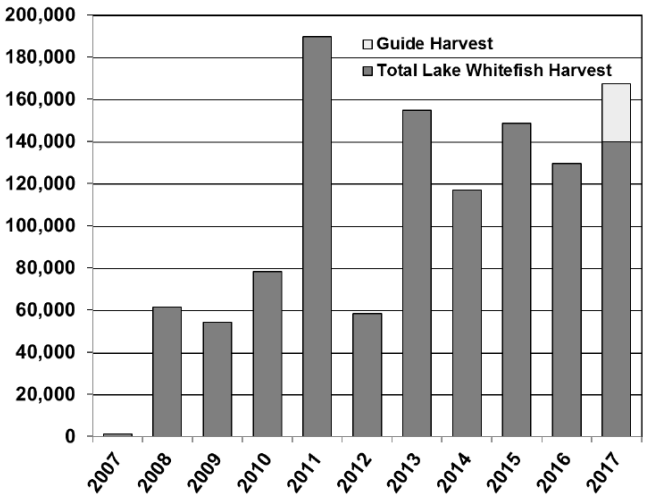


Fig 2- Estimated number of lake whitefish harvested in Wisconsin waters of Green Bay during the winter creel season (January- March) for 2007-2017.

Status of Lake Sturgeon in Lake Michigan Waters

In 2015-17, data collected from lake sturgeon stemmed from fish passage efforts at the Menominee dam. Those efforts produced data from 179 lake sturgeon and those fish have been passed upstream of the lower 2 dams. Electrofishing surveys yielded a total of 1,940 lake sturgeon from 2002-2017. Most of the fish (88%) were subjectively labeled as adults (>107 cm in total length), but several sub-adults sturgeon were observed during the surveys. The smallest sturgeon recorded was 39 cm and several fish were over 160 cm in length. The overall mean total length during these sampling events was 125.2 cm. Based on 1999-2013 tagging data, the population estimate for the 127 cm inch and larger segment of the population was 823 in 2013.

The Milwaukee SRF was deployed in 2017 the week of April 4 and put into service on April 20, 2016. Wisconsin DNR personnel artificially spawned 8 females from the Wolf River and transferred those fertilized eggs to the trailer on April 20, 2017. Approximately 50,000 eggs from eight females were transferred to the trailers. Eggs from each female were placed into a separate hatching jar.

Over the course of the next three days hatching continued until all larvae were in the smaller fry tanks. During the month of May and into the start of June, sturgeon were fed brine shrimp followed by grated blood worms and finally whole blood worms. Following hatching, there were approximately 800 – 4,000 larvae per fry tank. Numbers of larvae were lowered to 1,000 fish in all four tanks. Rearing continued throughout the spring and early summer season with normal activities. On day 128 the average length of the fish were within 30 mm (20%) but weight deviated 7.0 grams or 45%.

Sturgeon eggs were collected from the Wolf River at Shawano on April 19th, 2017. On August 30th and 31st a total of 210 fish with LV clip were stocked to reduce tank densities. A total of 1,248 lake sturgeon (210 surplus LV clipped fish) were stocked into the Kewaunee River in 2017.

The Menominee River is the only river open to sport harvest in Lake Michigan waters. Licensed, modern day harvest of lake sturgeon on the Menominee River has occurred since 1946. A mandatory registration system was enacted in 1983. The harvest in that year was 19 sturgeon and the minimum size limit was 50". The bag limit was reduced from 2 to 1 fish per season in 1992. The hook and line harvest of lake sturgeon from the Menominee River increased to the following in selected years: 80 in 1989, 109 in 1998, 167 in 1999, 185 in 2001, and 210 in 2003. The harvest in the three 70" size limit years (2000, 2002, and 2004) averaged at 0 fish. While the alternating year's size limits reduced the overall harvest, the average harvest for the last 6 years (1999- 2004) was 94 fish. Fishing pressure since 1999 has increased by 12%/ harvest year.

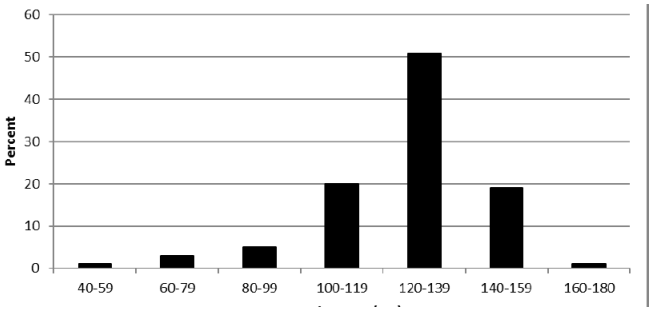


Fig 1- Length distribution of Lake Sturgeon captured in the Menominee River (2002-2016)

From 2005-2015, we surgically inserted have acoustic tags into 190 adults (Menominee (30%), Peshtigo (27%), Oconto (30%), and Fox 13%)). The sex distribution from that sample was 33% female and 67% male. The average length of the females was 156.5 cm and males were 140.1 inches. The movements between rivers will be monitored through 2025 **(Fig 1**).

2018 Lake Michigan Weir Report

Fall 2018 Root River Weir Summary

The Root River Steelhead Facility (RRSF) was in operation for thirteen processing dates during the Fall 2018 migration. We captured and processed 3,712 fish between September 24th and November 8th. Our egg-take and biological sampling goals were met, and coho health inspections were conducted. The Fall 2018 Root River effort is summarized below.

	Captured	Spawned	Eggs Taken	Passed upstream
Chinook	1,125	0	0	326
Coho	2,487	510	555,000	2,397
Rainbow	20	0	0	20
Brown	80	0	0	79
Totals	3,712	510	555,000	2,822

Water levels in the Root River were high for much of September and early October, meaning some fish had already moved upstream by the time the facility was running for the season. However, high but decreasing flows allowed for an early run of coho, followed by a slow but steady run of Chinook, and a second run of coho that peaked at the end of October.

Throughout the fall season, Chinooks were sampled as part of an ongoing multi-agency, lakewide study on natural reproduction. Stocked Chinooks were implanted with small coded wire tags prior to release, and tags were recovered from 799 fish at RRSF. Analysis of the tags will provide fish managers with more information on movement patterns of Chinooks in the lake, growth rates, and the occurrence of "straying", when a mature fish returns to a stream other than the one where it was originally stocked.

Spring 2019 Root River Weir Summary
Root River Steelhead Facility

Root River Fishing Report for April 22, 2019

Our fifth spring processing day for the Root River Steelhead Facility was April 22nd. This was our final spring processing day for the year. The spawning crews hit their egg take goal last week, so no additional spawning occurred this week. The run appears to be slowing down. We only handled 40 new steelhead at the facility. We did have approximately another 20 fish that were recaptured from previous processing days.

The department would like to extend a HUGE THANK YOU to the Salmon Unlimited Club volunteers who diligently opened and closed the viewing window every day this spring! The facility will now be closed over summer. We look forward to seeing you all again in the fall!

Final Totals: April 22, 2019	
	Rainbow Trout
Total Captured	742
Passed Upstream	651
Taken to Hatchery	N/A
Spawned at Facility	445
Egg Take	Chambers – 632,758 Ganaraska – 559,925

Strawberry Creek Weir Report

The final Chinook salmon egg collection at Strawberry Creek for this season occurred on Thursday October 18, 2018. This was the sixth fish processing day at Strawberry Creek this fall. Numbers of Chinook salmon processed each day respectively were 244, 717, 1,322, 487, 298, and 798 (total 3,866). A total of 348 female Chinooks were spawned and over 1.9 million eggs collected. Overall, this was a successful spawning season, with decent numbers of Chinooks salmon and egg collection goals met. These Chinook eggs were transferred to the Wild Rose State Fish Hatchery, where they will be incubated, hatched, and raised until next spring for stocking into several Lake Michigan tributaries.

	Chinook Salmon	**Coho Salmon**
Total Captured	3,866	
Passed Upstream	0	
Taken to Hatchery	0	
Spawned at Facility	348 females	
Egg Take	1.9 million	

2019 Besadny Anadromous Fisheries Facility

Two steelhead rainbow trout processing days have occurred this spring (2019) on the Kewaunee River at the Besadny Anadromous Fisheries Facility (BAFF) on April 1 and 8. Numbers of new steelhead processed each day respectively were 206 and 211 (total 417). These steelhead were sorted by genetic strain, with Chambers Creek and Ganaraska kept in holding ponds for upcoming egg collections. The first egg collection at BAFF is scheduled for Wednesday April 10. Fish are not being passed upstream of the dam, but instead are released down at the harbor.

	Rainbow Trout
Total Captured	417
Passed upsteram	0
Taken to Hatchery	0
Spawned at Facility	0
Egg take	0

The 708 steelhead processed at BAFF during 2017 was down from 708 in 2017, from 535 in 2016 and 429 in 2015, but slightly below a recent annual average of about 800 for 2013-2017. Numbers of steelhead and/or rainbow trout handled during recent years at BAFF include: 417(2019), 708 (2017), 535 (2016), 429 (2015), about 1,500 (2014), and 878 (2013). ✧

Summary of Chinook/Coho Salmon Harvest from Michigan Weirs on Tributaries of Lakes Michigan/Huron, 2018

This report summarizes the harvest of Chinook and Coho salmon from Michigan weirs by the Michigan DNR during the fall of 2018. The harvested fish from all the weirs were taken by American Canadian Fisheries, Inc. and shipped to their plant in Bear Lake, Michigan for processing. The harvest weirs are located on tributaries of Lakes Michigan and Huron and designated in the report as:

Weir name	Weir code	Lake	Species harvested
Boardman River	BOR	Michigan	Chinook salmon Coho salmon
Little Manistee River	LMR	Michigan	Chinook salmon Coho salmon
Lower Platte River	LPR	Michigan	Chinook salmon Coho salmon
Medusa Creek	MEC	Michigan	Chinook salmon Coho salmon
Swan River	SWR	Huron	Chinook salmon Coho Salmon
Upper Platte River (Platte Hatchery)	*UPR*	Michigan	Chinook salmon Coho salmon

2018 Salmon Weir Harvest

For 2018, the coded-wire tag information revealed that the inclusion of Chinook salmon males less than 26" total length in the jack category would represent 95% or more of the total jacks returning, while reducing the error of including the smaller 0.2-year-old or older male Chinook salmon in this category. The 2018 analysis of the coded-wire tag information demonstrated a very distinct break in the length distribution between 0.1- and 0.2-year-old or older male Chinook salmon, and any error resulting from the inclusion of age-0.2 or older male Chinook salmon as jacks was found to be insignificant.

All Weirs

Species	Sex	Number harvested	Pounds harvested
Chinook salmon	Jacks	2,211	10,026
	Males	2,040	27,634
	Females (whole)	2,333	33,150
	Females (stripped)	637	10,073
	SPECIES TOTALS	7,221	80,883
Coho salmon	Jacks	2,551	2,572
	Males	16,368	97,226
	Females (whole)	15,963	98,531
	Females (stripped)	2,635	17,306
	SPECIES TOTALS	37,517	215,635
All species	Jacks	4,762	12,598
	Males	18,408	124,860
	Females (whole)	18,296	131,681
	Females (stripped)	3,272	27,379
GRAND TOTALS		44,738	296,518

Chinook Salmon

Harvest weir	Sex	Number harvested	Pounds harvested
Boardman River	Jacks	160	744
	Males	414	6,255
	Females (whole)	395	5,405
	Females (stripped)	0	0
	Weir totals	969	12,404
Little Manistee River	Jacks	290	1,252
	Males	416	5,682
	Females (whole)	127	1,987
	Females (stripped)	467	7,485
	Weir totals	1,300	16,406
Lower Platte River	Jacks	30	133
	Males	211	3,128
	Females (whole)	173	2,907
	Females (stripped)	0	0
	Weir totals	414	6,168
Medusa Creek	Jacks	472	2,230
	Males	365	4,764
	Females (whole)	823	10,186
	Females (stripped)	0	0
	Weir totals	1,660	17,180
Swan River	Jacks	1,258	5,666
	Males	634	7,805
	Females (whole)	815	12,665
	Females (stripped)	170	2,588
	Weir totals	2,977	28,724
Upper Platte River (Platte Hatchery)	Jacks	1	1
	Males	0	0
	Females (whole)	0	0
	Females (stripped)	0	0
	Weir totals	1	1

Harvest weir	Sex	Number harvested	Pounds harvested
All weirs	Jacks	2,211	10,026
	Males	2,040	27,634
	Females (whole)	2,333	33,150
	Females (stripped)	637	10,073
SPECIES TOTALS		7,221	80,883

Coho Salmon

Harvest weir	Sex	Number harvested	Pounds harvested
Boardman River	Jacks	37	54
	Males	2,511	16,594
	Females (whole)	2,763	17,368
	Females (stripped)	0	0
	Weir totals	5,311	34,016
Little Manistee River	Jacks	0	0
	Males	0	0
	Females (whole)	0	0
	Females (stripped)	0	0
	Weir totals	0	0
Lower Platte River	Jacks	71	108
	Males	6,992	41,466
	Females (whole)	9,130	57,179
	Females (stripped)	0	0
	Weir totals	16,193	98,753
Medusa Creek	Jacks	5	5
	Males	37	221
	Females (whole)	41	233
	Females (stripped)	0	0
	Weir totals	83	459
Swan River	Jacks	0	0
	Males	1	4
	Females (whole)	0	0
	Females (stripped)	0	0
	Weir totals	1	4
Upper Platte River (Platte Hatchery)	Jacks	2,438	2,405
	Males	6,827	38,941
	Females (whole)	4,029	23,751
	Females (stripped)	2,635	17,306
	Weir totals	15,929	82,403

Harvest weir	Sex	Number harvested	Pounds harvested
All weirs	Jacks	2,551	2,572
	Males	16,368	97,226
	Females (whole)	15,963	98,531
	Females (stripped)	2,635	17,306
SPECIES TOTALS		37,517	215,635

All Species

Harvest weir	Sex	Number harvested	Pounds harvested
Boardman River	Jacks	197	798
	Males	2,925	22,849
	Females (whole)	3,158	22,773
	Females (stripped)	0	0
	Weir totals	6,280	46,420
Little Manistee River	Jacks	290	1,252
	Males	416	5,682
	Females (whole)	127	1,987
	Females (stripped)	467	7,485
	Weir totals	1,300	16,406
Lower Platte River	Jacks	101	241
	Males	7,203	44,594
	Females (whole)	9,303	60,086
	Females (stripped)	0	0
	Weir totals	16,607	104,921
Medusa Creek	Jacks	477	2,235
	Males	402	4,985
	Females (whole)	864	10,419
	Females (stripped)	0	0
	Weir totals	1,743	17,639
Swan River	Jacks	1,258	5,666
	Males	635	7,809
	Females (whole)	815	12,665
	Females (stripped)	170	2,588
	Weir totals	2,978	28,728
Upper Platte River (Platte Hatchery)	Jacks	2,439	2,406
	Males	6,827	38,941
	Females (whole)	4,029	23,751
	Females (stripped)	2,635	17,306
	Weir totals	15,930	82,404

Harvest weir	Sex	Number harvested	Pounds harvested
All weirs	Jacks	4,762	12,598
	Males	18,408	124,860
	Females (whole)	18,296	131,681
	Females (stripped)	3,272	27,379
GRAND TOTALS		44,738	296,518

Swan River (Lake Huron)

Species	Harvest date	Sex	Number harvested	Pounds harvested
Chinook salmon	10/09/18	Jacks	73	335
		Males	58	712
		Females (whole)	28	388
		Females (stripped)	30	435
	Date totals		189	1,870
	10/11/18	Jacks	1,185	5,331
		Males	576	7,093
		Females (whole)	887	12,277
		Females (stripped)	140	2,153
	Date totals		2,788	26,854
	All dates	Jacks	1,258	5,666
		Males	634	7,805
		Females (whole)	815	12,665
		Females (stripped)	170	2,588
Species totals			2,977	28,724

Species	Harvest date	Sex	Number harvested	Pounds harvested
Coho salmon	10/09/18	Jacks	0	0
		Males	0	0
		Females (whole)	0	0
		Females (stripped)	0	0
	Date totals		0	0
	10/11/18	Jacks	0	0
		Males	1	4
		Females (whole)	0	0
		Females (stripped)	0	0
	Date totals		1	4
	All dates	Jacks	0	0
		Males	1	4
		Females (whole)	0	0
		Females (stripped)	0	0
Species totals			1	4

(Some 14 additional charts referencing individual Weirs were omitted for brevity. Ed.)

2018 Salmon Weir Harvest

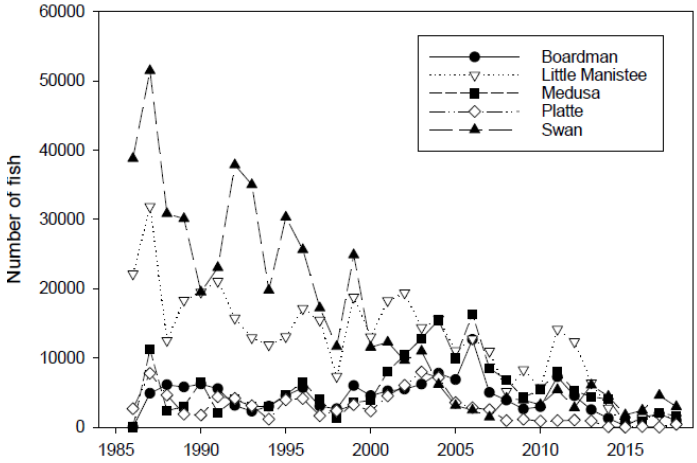


Fig 1. Total numbers of Chinook salmon harvested at weirs on the Boardman, Little Manistee, Medusa, Platte, and Swan Rivers, 1986-2018.

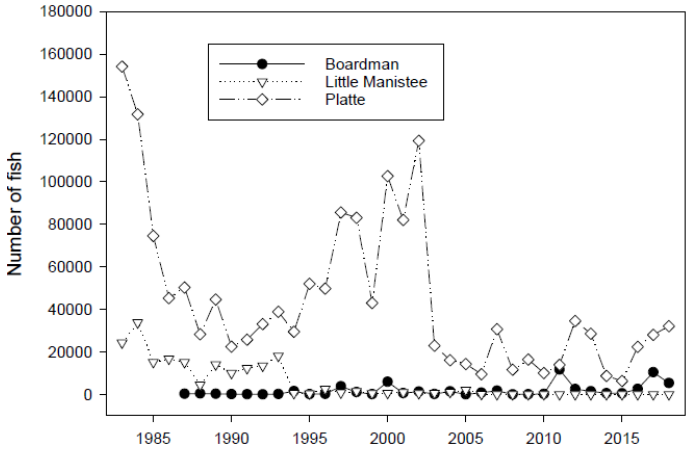


Fig 2. Total numbers of coho salmon harvested at weirs on the Boardman, Little Manistee, and Platte Rivers, 1983-2018. All coho salmon at the Little Manistee River weir were passed upstream in 2007-2018.

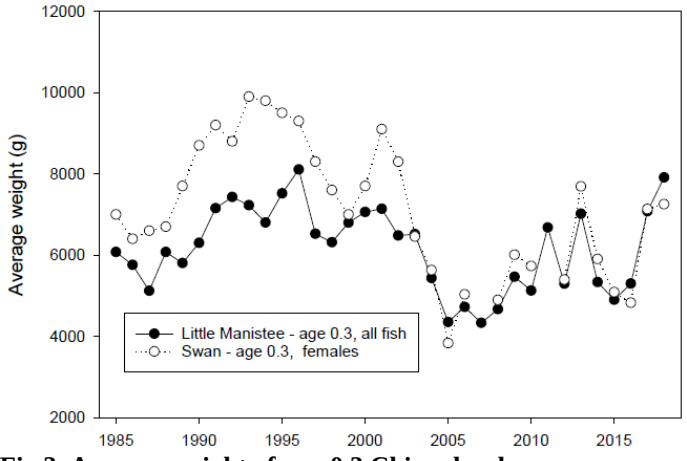


Fig 3. Average weight of age-0.3 Chinook salmon harvested at Little Manistee and Swan River weirs, 1985-2018. (Note: No known age-0.3 female Chinook salmon were harvested from the Swan River weir in 2007 or 2011).

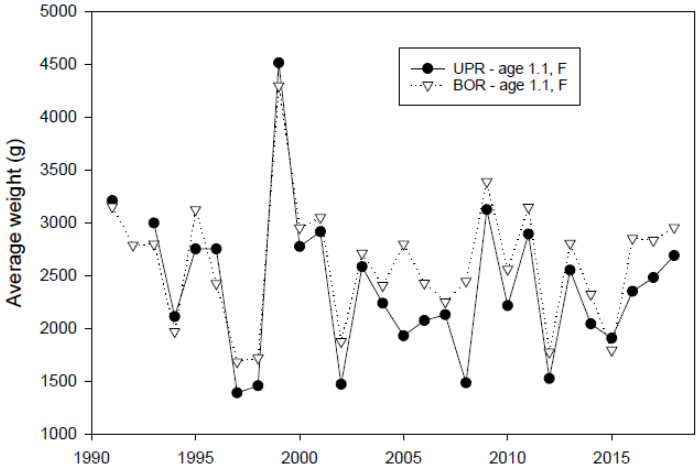


Fig 4. Average weight of age-1.1 female Coho salmon harvested at Boardman River (BOR) and Upper Platte (UPR) weirs, 1991-2018. (Note: No Coho salmon were harvested from the Upper Platte weir in 1992).

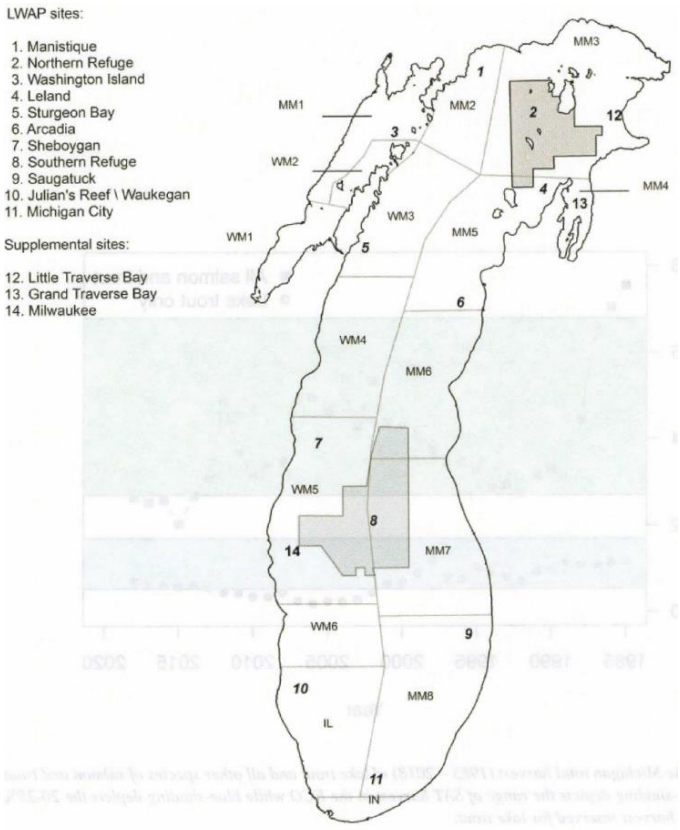
✧

2018 Lake Michigan Lake Trout Working Group Report (USFWS)

This report provides a review on the progression of lake trout rehabilitation towards meeting the Salmonine Fish Community Objectives (FCOs) for Lake Michigan and the interim goal and evaluation objectives articulated in *A Fisheries Management Implementation Strategy for the Rehabilitation of Lake in Lake Michigan* (hereafter the "Strategy). We also include lake trout stocking and mortality data to portray progress towards lake trout rehabilitation.

Evaluation OF Attainment Of Fish-Community Objectives

In 2018, salmon and trout (SAT) harvest was 2.64 million kg and for the fourth consecutive year has been below the 2.7 million kg minimum threshold of the FCO harvest objective **(Fig 1)**. Lake trout harvest in 2018 was 0.71 million kg. The lake trout harvest objective (0.54 - 1.7 trillion kg) was previously met from 1985 -2001 and more recently from 2013 -2017 **(Fig 1)**. Lake trout comprised 26.72% of the total salmonid catch in 2018 and thus exceeded the FCO harvest objective 20 -25% **(Fig 2)**.



Map I- Reporting of spring and fall graded mesh gillnet data has been aggregated into the 11LWAP sites and 3 supplemental sites; generally each reported lift is within 18 km of the site numerical label. Statistical district boundaries are outlined and shading is used to outline the Northern and Southern Refuges

Natural Reproduction

A total of 690 (10.6%) of the 6,5281ake trout examined for fin clips from 2018 gillnet assessments were unclipped and presumed to be wild. Wild fish accounted for 37% of lake trout in Illinois waters, and 10 -23% in Wisconsin (WM3, WM4, and WM5) and southern Michigan (MM6, MM7 and MM8) waters of the lake**.**

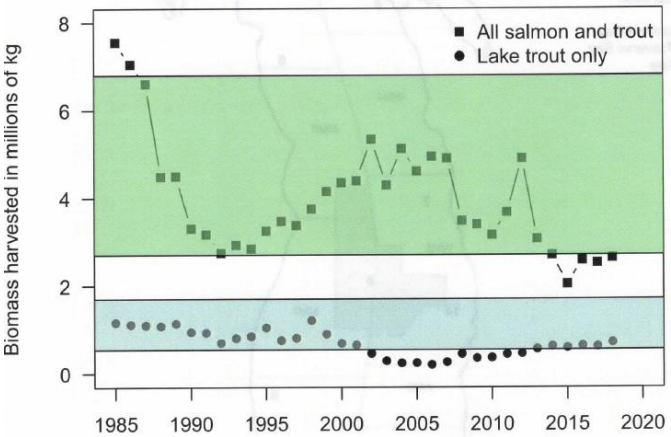


Fig 1- Lake Michigan total harvest (1985 -2018) of lake trout and all other species Of salmon and trout (SAT). Green-shading depicts the range Of SAT harvest in the FCO while blue-shading depicts the 20-25% range of SAT harvest reserved for lake trout.

Fewer wild fish, between 0 and 9% of lake trout, were present in northern Michigan (MM2, MM3, MM4, and MM5) waters of Lake Michigan. An additional data source, recreationally caught fish that were examined by the Great Lakes Fish Tagging and Recovery Lab, reported 745 (30.2%) of 24651ake trout examined were wild. In that survey, wild fish accounted for 50% of lake trout in Illinois waters, 18 - 46% in Wisconsin (WM4, WM5, and WM6) and southern Michigan (MM6, MM7 and MM8), and 0 - 13% in northern Michigan (MM2, MM3, MM4 and MM5).

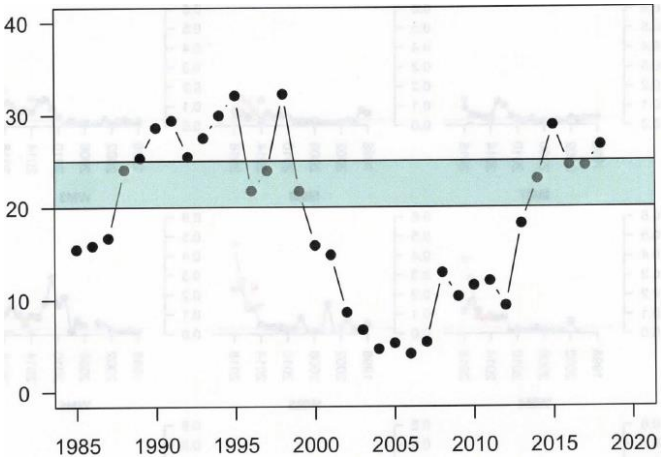


Fig 2-The percentage of SAT harvest (1985-2018) comprised of lake trout; blue shading represents the 20 - 25% specified in the FCO

The proportion of wild fish from recreational catches in southern Lake Michigan was roughly double that reported from assessment surveys in management units ILL, IND, MM7, MM8, WM4, WM5, and WM6. This discrepancy was primarily caused by differences in the length distribution of fish from each data source: the recreational fishery was comprised of a higher proportion of small fish (S 580 mm) than the gillnet assessments. A higher percentage of smaller, younger fish are wild relative to larger, older fish because wild recruitment is a relatively recent development in Lake Michigan**,** and stocking rates have declined in southern management units since 2015. It is possible that the recreational catch includes smaller fish that have yet to recruit to the assessment surveys, or that anglers selectively harvest smaller fish; data are not available on fish that anglers release. Notably, the percentage of wild fish are more comparable between the assessment surveys and the recreational fishery for fish > 580 mm, and the trajectories of percentage wild from both surveys track one another over time.

Wild lake trout had a modal age of 5 and were represented by all consecutive age-classes between 1 to 13 years of age, and also included two fish that were 19 years of age **(Fig 3)**. We conclude that natural reproduction has contributed to the lake trout population since 2005.

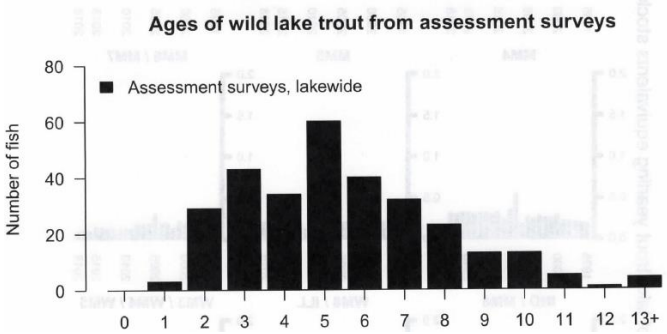


Fig 3- Wild lake trout age structure determined from assessment surveys in 2018; age estimates were derived from 300 fish (42% of all wild lake trout captured in assessment surveys).

Fish Stocking

Stocking hatchery-reared fish to achieve rehabilitation is the primary tool of the Strategy. The maximum stocking target is 3.31 million yearlings and 550,000 fall fingerlings, or 3.53 million yearling equivalents where one fall fingerling = 0.4 yearling equivalents, however the Lake Michigan Committee adopted an interim stocking target not to exceed 2.74 million yearling equivalents when the Strategy was approved. In 2017 the Lake Committee reduced this interim target to 2.54 million though actual stocking within ±10% of the interim target is allowed. Roughly 65% of the fish are stocked in first priority areas (Northern and Southern Refuges) with rehabilitation as the primary objective. The remaining fish are stocked in second priority areas to support local fishing opportunities in addition to rehabilitation. Stocking reductions since 2017 have been achieved through reduced stocking of nearshore secondary priority areas in southern Lake Michigan. Higher stocking rates could be adopted when Federal hatcheries are capable of more production but only with Lake Committee consensus.

In 2018, 2.52 million lake trout yearlings were stocked with 96% of these raised in USFWS hatcheries. Lean strains, consisting of Lewis Lake, Seneca Lake, and Huron Parry Sound, represented 92% of all lake trout stocked. Klondike Reef strain, a humper morphotype from Lake Superior, were also stocked (n = 200,797) at Sheboygan Reef within the Southern Refuge following a Strategy recommendation to introduce a deep-water morphotype to occupy deep-water habitats. Priority rehabilitation areas (Charlevoix, East and West Beaver Island reef complexes in or near the Northern Refuge and the Southern Refuge reef complex including Julian's Reef) received 76% of the lake trout. The Service's M/V *Baird* was used to stock 97% of all stocked lake trout in offshore waters.

In 2018, 159 gillnet lifts were completed lakewide to assess spring lake trout abundance. This included at least 61 lifts at most nearshore LWAP sites; no lifts occurred at the Washington Island LWAP site in 2018. Increased effort was again directed at the offshore reef complexes with 6 lifts on Northeast Reef and 6 lifts on East Reef within the Southern Refuge reef complex and a total of 34 lifts at 6 reefs within the Northern Refuge reef complex (Charlevoix, Dahlia Shoal, Fox Islands, Ile aux Galets, Irishman's Ground, and Middle Ground).

Conclusions

Since 2013, lake trout harvest from Lake Michigan has partly met the specified Fish-Community Objectives, as lake trout annual harvest has exceeded 0.54 million kg. The majority of lake trout harvest has been from northern Lake Michigan. Over the last few years lake trout annual mortality in MM1/2/3 has approached the 40% target level due to recent reductions in sea lanprey-induced mortality and regulation of fishing mortality through Consent Decree oversight. Due to increased lake trout survival and elevated spawner surveys stocking, Northern Refuge populations are currently building. However northern populations remain below spring abundance targets though these areas have achieved fall abundance metrics. Northern spawning populations are relatively young. Further, the proportion of wild fish in MM3 recovered from either assessment surveys or sport-caught fish is indistinguishable from the 3% fin-clipping error rate. Therefore, initial progress toward lake trout rehabilitation in this northern priority area is recently evident but must demonstrate continued progress towards population objectives to achieve recovery.

In the Southern Refuge and at Julian's Reef, population objectives have been achieved more consistently compared with northern populations. Lake trout in these areas are characterized by high spawner densities, a more diverse age structure including older age-classes, and mortality rates in proximate areas below 40%. Assessment surveys in the

Southern Refuge also met the spring abundance metric, which was last achieved in 2013. Most importantly, the proportion of wild fish caught in the recreational fishery for these management units is increasing and currently ranges between 30-50%. However, these populations are not considered self-sustaining yet as they are still stocked and the proportion of wild fish in assessment surveys is lower (10 - 37%) than that observed in the recreational fishery.

Detectable and sustained natural reproduction since 2004 by lake trout in Lake Michigan, as documented by Hanson and Patterson, continues to increase among sport-caught fish caught in southern Lake Michigan. Large increases in the proportion of wild fish, based on ages of recovered wild fish, began with 2005-2013 year classes, especially in areas with denser and older parental stocks. Large increases in natural reproduction in northern Lake Huron also coincided with relatively high densities and high age diversity of the adult lake trout population that were attained by a reduction in total mortality.

In summary, widespread recruitment of wild fish is now occurring in the southern Lake Michigan where evaluation objectives for spawner abundance, spawner age composition, percent spawning females, target mortality, and thiamine egg concentrations (in most years) have generally been achieved.(Emphasis Ed). Recruitment of wild fish, albeit lower, is now evident with wild fish comprising 20 - 40% of all recreationally caught lake trout in mid-latitude management units on both the eastern and western shores, but, remains inconsequential in northern Lake Michigan based on the recent gillnet assessments. Therefore, we conclude that lake trout populations are still in the early stages of recovery, and we recommend adhering to the implementation strategy objectives, which are appropriate management tools to measure continued progress toward lake trout rehabilitation in Lake Michigan.

Fish Community Status in the Bays de Noc and Nearshore Waters of Northern Lake Michigan, 2018

Since 2009, MDNR has been conducting a standardized fish community assessment in nearshore waters of northern Lake Michigan. The objectives of the project are to describe the status and trends in the overall fish community, provide data on abundance, growth, and reproductive success for species of management importance, including walleyes, yellow perch, smallmouth bass, northern pike, lake sturgeon, and others. Data are collected in August and September using experimental mesh gill nets and trawling. Sampling occurs annually in **Little Bay de Noc (LBDN)** and **Big Bay de Noc (BBDN)**, and during alternate years in Lake Michigan near eastern ports (Manistique and Naubinway) or western ports (Cedar River and Menominee). Information from this survey also supports various projects with agency and university collaborators. Data to track the sport fishery are collected through an on-site creel survey at some locations.

Recent trends

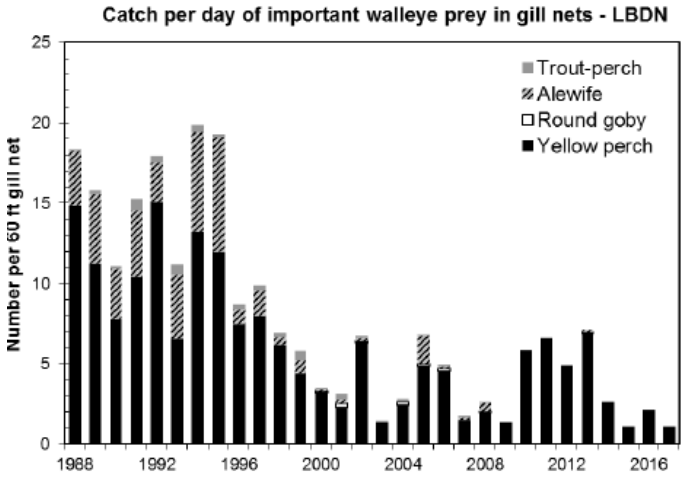
The table below shows the catch rate (number of fish per 320 ft of gill net) for important fishes in northern Green Bay. In 2014, Lake Michigan water levels rose above the long-term average value for the first time since 1999, and these changes may relate to patterns in catch rates observed for several important species in assessment nets. For example, the near doubling of catch rates for northern pike in the Bays de Noc and their increased presence at other locations may reflect strong reproduction associated with increased availability of wetland spawning areas due to higher water levels.

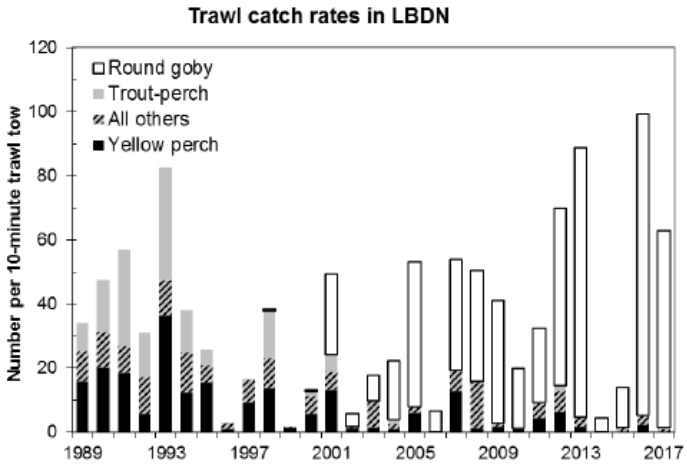
In contrast, catch rates of smallmouth bass and walleye in the Bays since 2014 are roughly half of what they were during the several years prior to 2014. Yellow perch abundance varies among locations. Yellow perch reproduction across the sample region was average to slightly above average in 2016 and 2017, compared to catch rates of age-0 yellow perch in micromesh gill nets since 2013. Catch rates of reintroduced native lake sturgeon and invasive Eurasian ruffe in 2017 were the highest since surveys began in 2009.

	WALLEYE		YELLOW PERCH		SMALLMOUTH BASS		NORTHERN PIKE	
Year	LBDN	BBDN	LBDN	BBDN	LBDN	BBDN	LBDN	BBDN
2009	3.2	0.7	4.7	11.0	0.7	1.4	0.7	0.3
2010	4.8	2.8	20.4	7.6	1.4	3.2	0.9	0.4
2011	5.9	2.7	22.8	13.5	0.4	3.1	0.5	0.3
2012	5.8	2.1	27.2	5.0	1.5	3.9	0.5	0.3
2013	10.2	2.3	17.9	7.0	0.3	6.7	0.3	0.4
2014	2.5	0.7	27.1	11.7	0.0	1.5	1.5	0.4
2015	3.0	1.1	17.5	8.7	0.8	1.7	1.0	1.2
2016	2.7	0.9	9.5	5.3	0.5	1.9	1.2	1.0
2017	4.2	1.2	12.4	8.3	0.3	0.6	1.1	0.9
Year	Menominee	Cedar River	Menominee	Cedar River	Menominee	Cedar River	Menominee	Cedar River
2009	8.0		8.4		0.1		0.4	
2011	4.6	3.0	4.6	3.8	0.3	0.3	0.3	0.1
2013	3.0	2.8	19.6	1.0	0.0	0.8	0.3	0.0
2015	2.2	1.9	5.1	0.4	0.4	2.5	0.2	0.0
2017	2.9	2.6	43.7	0.0	0.0	0.9	0.4	0.2
Year	Manistique	Naubinway	Manistique	Naubinway	Manistique	Naubinway	Manistique	Naubinway
2010	0.6	0.3	0.4	2.8	0.0	0.2	0.5	0.3
2012	1.3	0.1	0.7	4.0	0.3	0.0	0.6	0.2
2014	0.1	0.0	2.9	0.4	0.0	0.0	0.0	0.1
2016	1.6	0.1	2.2	13.4	0.8	0.0	0.6	0.1

Forage fish community

Bottom fishes are also sampled via daytime trawling from a small boat. The forage fish community of northern Green Bay has changed as the bottom trawl catch rate data for LBDN shows (see below). Round goby began dominating the catch in 2001, and lower catches of several formerly-common species (such as trout perch, johnny darter, spottail shiner, and yellow perch) have been the norm since then. These changes likely reflect a combination of factors including competition among species, and changes in water clarity and quality; also the trawl's ability to catch each species as water conditions have changed. Catch rates of important walleye prey items (other than round goby) in gill nets are also low relative to the 1980s and early 1990s, prior to dreissenid mussel invasion.

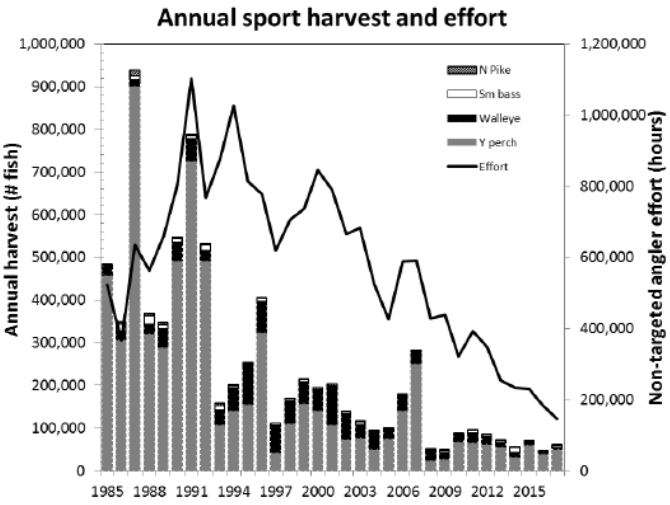


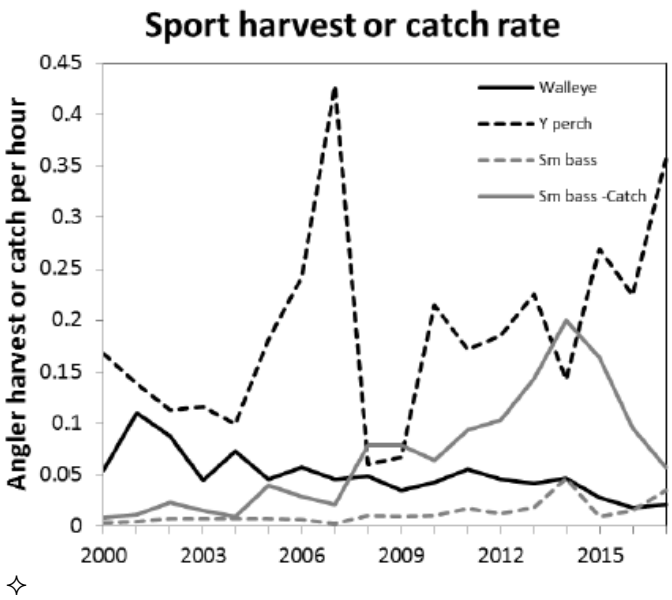


Angling

Michigan DNR's Statewide Angler Survey Program has been collecting information from anglers in northern Green Bay since 1985. Shown below are angler effort, harvest, and catch estimates for all Michigan waters of Green Bay, from Fayette to Menominee. Angler effort has continued a declining trend that began in the early 1990's. This trend also occurs in other Great Lakes waters of Michigan. Though angler catch rates for walleye and yellow perch have remained fairly stable since 2000, harvests of the two species have generally declined. Catch and harvest rates of smallmouth bass have been increasing during this time, possibly reflecting a growing bass population. Estimates for 2017 indicate that anglers spent 146,019 hours fishing this area, harvesting an estimated 63,703 fish of 13 different fish species. In 2017,

northern Green Bay anglers harvested an estimated 52,117 yellow perch, 3,062 walleyes, 5,012 smallmouth bass, and 704 northern pike.



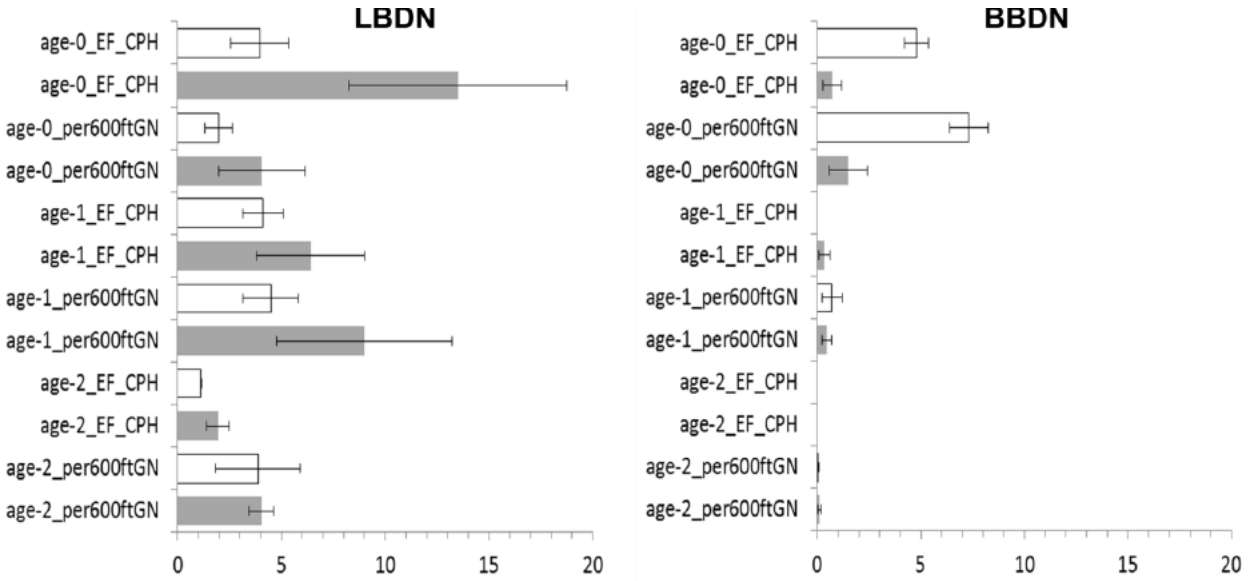


Contributions of Stocked and Wild Walleyes to Little and Big Bay de Noc, Lake Michigan

Background

Since walleye populations collapsed in Little Bay de Noc (LBDN) and Big Bay de Noc (BBDN) in the late-1960's and early-1970's, MDNR Fisheries Division and partners have stocked over 11 million fingerling walleyes into these waters to help restore populations. This resulted in a resurgence in their walleye fisheries, and indications of some natural reproduction in LBDN. Data were needed to determine the contribution of stocked walleyes to existing populations and to support future decisions on the use of stocked fish in these waters. Our study objective was to determine extent of natural reproduction and contribution of hatchery-reared fish to the walleye populations of LBDN and BBDN. We accomplished this by marking hatchery walleyes with oxytetracycline (OTC) and stocking them into the bays during 2004-2009. We then captured juvenile walleyes using electrofishing boats and gill nets, and examined each walleye's otoliths (earbones) using fluorescence microscopy to determine if they had an OTC mark indicating hatchery origin.

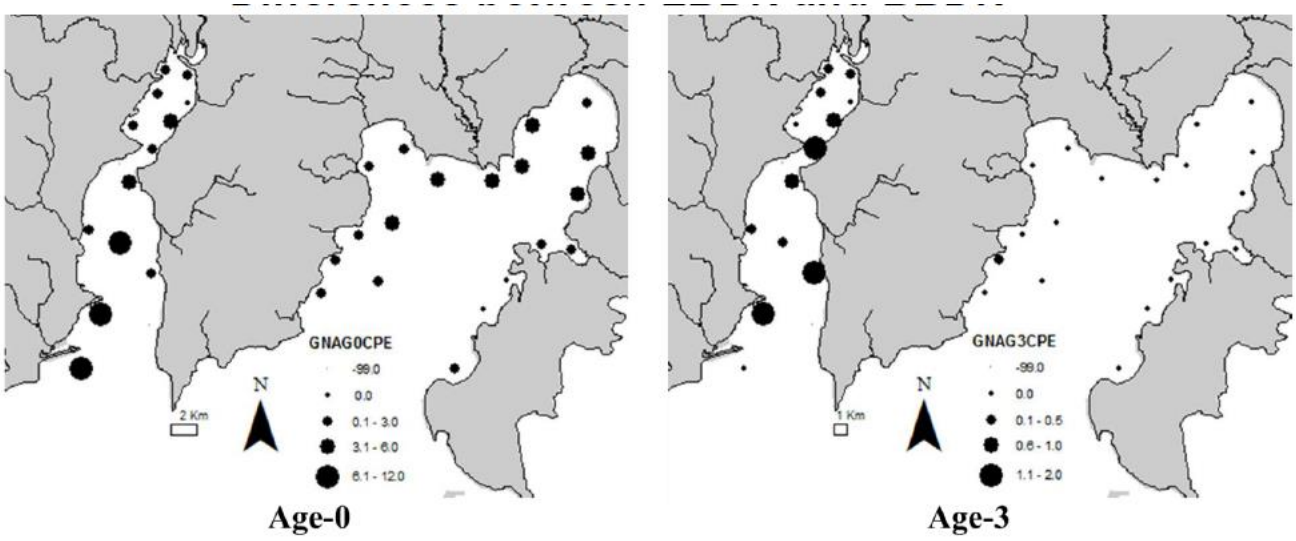
Catch rates of stocked vs. unstocked year classes of walleyes from electrofishing or gill nets



Above

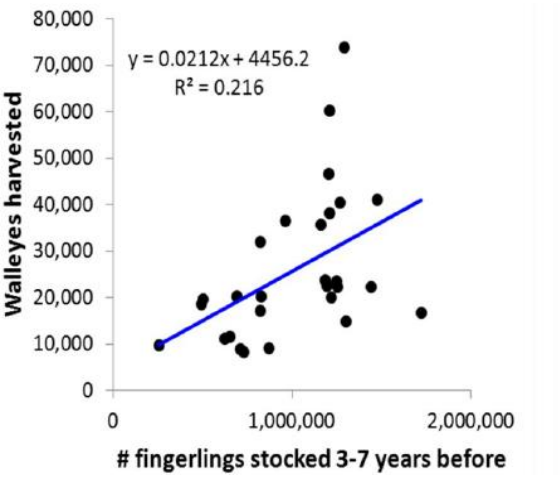
Except for age-0 walleyes in BBDN, we saw no significant difference in abundance of walleyes from stocked (white bars) and unstocked (gray bars) year classes at age-0, age-1, or age-2, based on electrofishing catch rates (fish caught per hour or CPH in figure) or gill net catch rates (fish caught per 600 feet of net) of walleyes. We saw significantly higher catch rates of age-1 and age-2 walleyes in LBDN compared to BBDN using either type of sampling gear. We found no difference in growth between wild and hatchery walleyes, but walleyes in BBDN grew faster than those in LBDN.

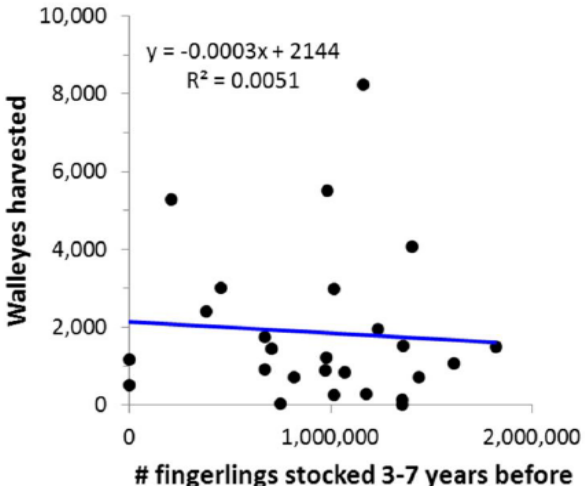
Differences between LBDN and BBDN



Above

The maps show average gill net catch of age-0 and age-3 walleyes for each sampling location in LBDN and BBDN; larger dots indicate higher catch rates. The patterns indicate that age-0 walleyes were broadly distributed in each bay. In LBDN they persisted to age-3, but in BBDN they declined after age-0 and were not caught at age-3. Lack of persistence at sample sites in BBDN may be due to poor survival, offshore migration, or both.





Above
To get another assessment of the degree to which stocked walleyes may be contributing to the fishery in each bay, we looked at relationships between angler harvest and the numbers of walleyes stocked 3-7 years earlier (it takes a few years for walleyes to reach the minimum size limit for harvest). We found a positive relationship in LBDN, which suggests stocking contributes to walleye harvests, but this relationship was not significant when angler effort was included in the model. We found no relationship between harvests and prior stocking in BBDN, which suggests little if any effect of stocking on walleye harvests.

Conclusions: Our findings demonstrated that stocked walleyes were detectable in both bays at age-0, and in LBDN, they likely persisted to contribute to the sport fishery. The fate of walleyes stocked into BBDN was less clear, and their contribution to the BBDN walleye fishery was uncertain. The management potential of BBDN for walleyes differs from that of LBDN. Since BBDN lacks high-quality spawning rivers, future efforts to rehabilitate walleyes in BBDN should consider the use of reef-spawning strains rather than current (likely river-spawning) strain. ✧

Asian Carp 2019 Regional Action Plan

The Asian Carp Regional Coordinating Committee released the 2019 Asian Carp Action Plan April 29.. The updated Action Plan includes aggressive new prevention and control efforts, including expanded Asian carp population reduction along established fronts, large-scale field trials of potential barriers and deterrent technologies, and actions to address black and grass carp threats. The Action Plan also addresses priorities for early detection and monitoring of all life stages of Asian carp, support for the electric dispersal barriers in the Chicago Area Waterway System, contingency response, secondary pathway mitigation, and stakeholder communication and outreach.

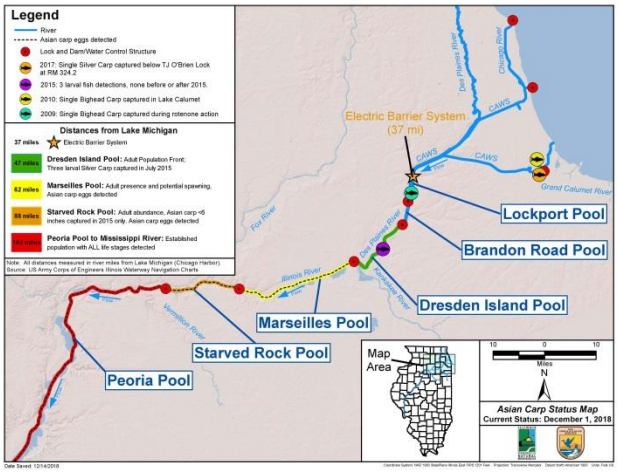
Key initiatives for 2019 include:

- Multiple efforts to field test potential Asian carp deterrents including underwater sound and carbon dioxide.
- Expansion, refinement and use of more effective sampling and harvest strategies.
- Continued coordination of strategic efforts to address the growing threats of black and grass carp.
- Increased use of focused contract commercial fishing to remove adult Asian carp in the upper Illinois River to support Committee management goals.

Developed annually since 2010, the Action Plan works to prevent the spread of invasive Asian carp in the Great Lakes. The strategy incorporates the most current advances in science and technology for Asian carp prevention and control, and also supports the goals and recommendations of the national **Management and Control Plan for Bighead, Black, Grass, and Silver Carps in the United States.** **2019 Asian Carp Action Plan (11.1 MB PDF)**

The Asian Carp Problem

Asian carp" refers to several species of related fish that originated from Asia. As many as ten types of Asian carp are considered invasive around the world, but in the United States and Canada we use "Asian carp" to refer to four of these species – black carp, grass carp, bighead carp, and silver carp. All are fast growing and prolific feeders that out-compete native fish and leave a trail of environmental destruction in their wake.



The four types of Asian carp currently found in the United States were imported into the country for use in aquaculture ponds. Through flooding and accidental releases, black, grass, bighead and silver carps found their way into the Mississippi River system. The Mississippi River system is like a giant freshwater highway that has given invasive Asian carp access to many of the country's rivers and streams.

After decades of swimming northward, silver and bighead carps are now in the Illinois Waterway and within striking distance of Lake Michigan and the Great Lakes. Black carp are currently encroaching on the Illinois River, and ongoing research is revealing the growing threat of grass carp to Lake Erie. With a valuable Great Lakes economy tied to fishing, boating and hunting in peril, the Asian Carp Regional Coordinating Committee partners continue to stand united in their efforts stop the spread of these fish.

Newly hatched grass carp found in Maumee River, Ohio

A genetic analysis conducted by the U.S. Geological Survey recently confirmed that larval, or newly hatched, fish collected from the Maumee River during the summer of 2018 are grass carp, one species of invasive Asian carps that threaten the Great Lakes. The Maumee River is a tributary to Lake Erie.

These young fish are the first grass carp collected in their larval stage from within the Great Lakes watershed. Other life stages, including fertilized eggs, juveniles and adults, have been previously documented in tributaries and shoreline areas of Lake Erie. Identifying locations with larval grass carp in the Maumee River will help inform management decisions and allow natural resource agencies to better focus limited resources on grass carp removal efforts.

Juvenile black carp discovered in Western Kentucky

A juvenile black carp has been discovered in Ballard County, according to the Fisheries Division of the Kentucky Department of Fish and Wildlife Resources. The fish, a member of the invasive Asian carp species, came from Gar Creek near the Ohio River.

"Assuming this fish was spawned locally, it provides further evidence that black carp are becoming more established in the lower Ohio River drainage in Kentucky," said Fisheries Biologist Matt Thomas. "The specimen was verified as a black carp by experts at the U.S. Geological Survey Environmental Research Center."

Black carp are native to Asia and look similar to grass carp. They first came to the United States in the 1970s accidentally mixed in with imported grass carp. Black carp cause serious concern because they feed on native snails and mussels. They are part of a group of Asian carp that pose a threat to native fisheries.

Juvenile Black Carp

"Black carp can be potentially devastating to freshwater mussel populations," said Sunni Carr, wildlife diversity coordinator for Kentucky Fish and Wildlife. "Our department is working to restore sensitive mussel populations in big rivers such as the Ohio and Mississippi. Mussels do not move, so they are very vulnerable to predation by black carp."

Black carp first showed up in western Kentucky in 2016 based on two fish captured from the Minor Slough system in Ballard County. Other documented reports in 2017 and 2018 found black carp at the Ohio and Mississippi River confluence, the lower Ohio River, Lake Barkley and Kentucky Lake. These individuals ranged from 17 to 44 inches long. ✧

Sea Lamprey Control in Lake Michigan 2018

The Sea Lamprey continues to affect efforts to restore and rehabilitate the fish community. Sea Lampreys subsist on the blood and body fluids of host fish. Approximately half of Sea Lamprey attacks result in the death of their prey and up to 18 kg (40 lbs) of fish are killed by every adult Sea Lamprey. The Sea Lamprey Control Program (SLCP) is a critical component of fisheries management in the Great Lakes because it facilitates the rehabilitation of important fish stocks by significantly reducing Sea Lamprey induced mortality.

Fish Community Objectives

The Lake Michigan Committee established the following goal for Sea Lamprey control in Lake Michigan:

● Suppress the Sea Lamprey to allow the achievement of other fish-community objectives.

● Establish self-sustaining Lake Trout populations.

● Establish a diverse salmonine community capable of sustaining an annual harvest of 2.7 to 6.8 million kilograms (6 to 15 million pounds), of which 20-25% is Lake Trout.

●The Lake Trout marking rate target for Lake Michigan is 5 A1-A3 marks per 100 fish >532 mm. The number of A1-A3 marks on Lake Trout from spring assessments in 2018 has not yet been analyzed.

Lampricide Control

Tributaries harboring Sea Lamprey larvae are treated periodically with lampricides to suppress larval populations before they recruit to the lake as feeding juveniles.

Lake Michigan has 511 tributaries. One hundred twenty-eight tributaries have historical records of larval Sea Lamprey production, and of these, 85 tributaries have been treated with lampricides at least once during 2009-2018. Thirty-one tributaries are treated every 3-5 years. Details on lampricide applications to Lake Michigan tributaries and lentic areas during 2018 are found in **Fig 1**.

● Lampricide applications were conducted in 9 streams and 1 lentic area.

● Rogers Creek was successfully treated after being deferred in 2017.

● Campbell Creek, a tributary to the Paw Paw River, tributary to the St. Joseph River, was added to the treatment schedule after large larvae were found by larval assessment.

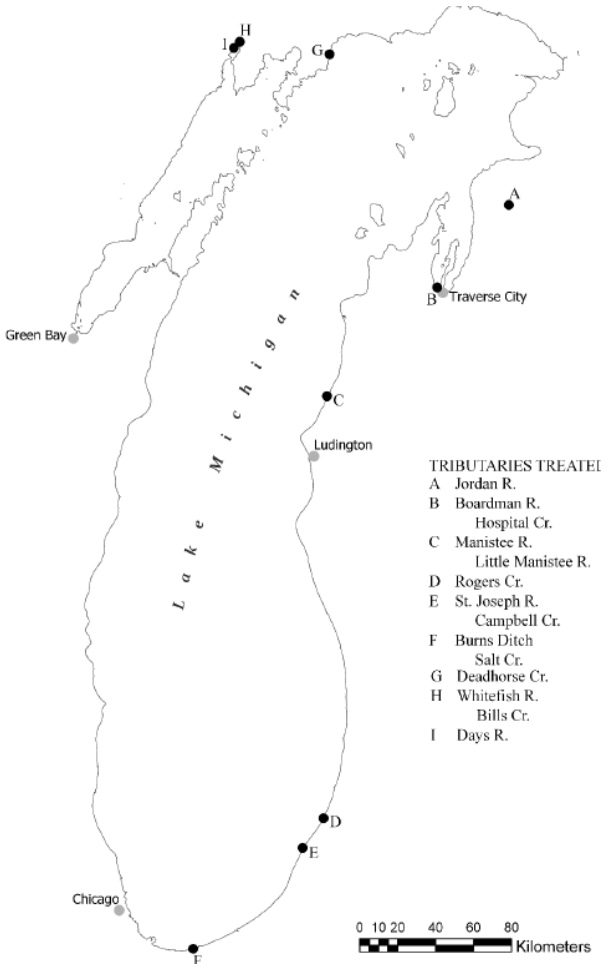


Fig 1- Location of Lake Michigan tributaries treated with lampricides during 2018

Alternative Control

● Other control methods that are currently being investigated include the use of attractants (e.g. pheromones), repellents (e.g. alarm cues), and new trap designs.

● The Commission has invested in 15 barriers on Lake Michigan **(Fig 2**).

● Routine maintenance, spring start-up, and safety inspections were performed on 16 barriers.

● Boardman River – Removal of the Sabin Dam was completed during 2018. The removal of Sabin Dam was contingent on Union Street Dam continuing to perform as a blocking structure to Sea Lamprey.

New Construction

● Manistique River – The U.S. Army Corps of Engineers (USACE) is the lead agency administering a project to construct a Sea Lamprey barrier to replace a deteriorated structure in the Manistique River.

● Little Manistee River – The Service has been working with MIDNR and USACE staff to improve the blocking capability of the Little Manistee Weir and egg take facility during concurrent facility upgrade work that is being conducted by the State of Michigan.

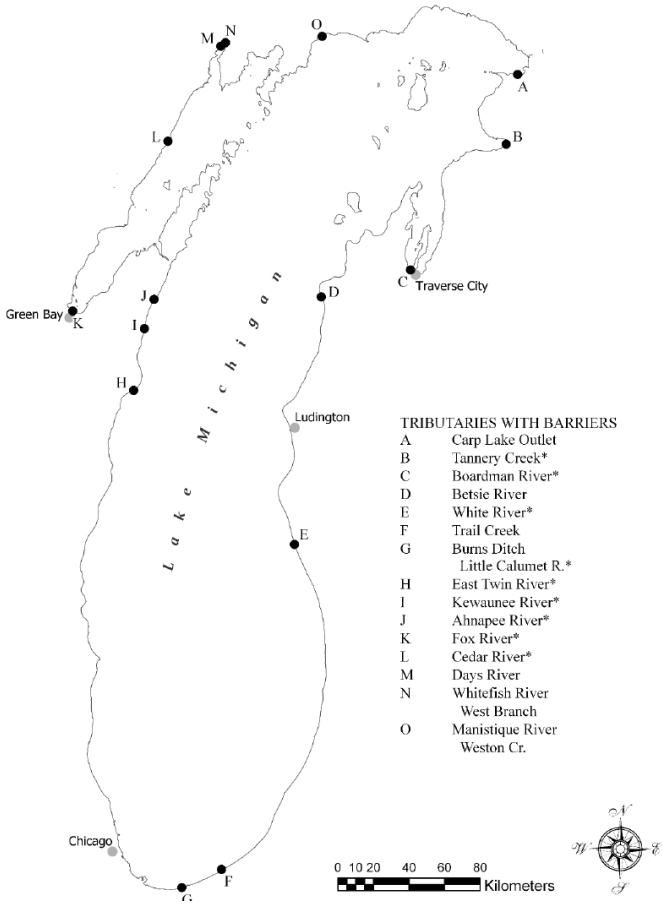


Fig 2- Location of Lake Michigan tributaries with Sea Lamprey barriers; structures that have been modified to prevent the upstream migration of Sea Lampreys are indicated by an asterisk (*).

Larval Assessment

Larval assessments were conducted on 86 tributaries and 15 lentic areas. The status of larval Sea Lamprey populations in historically infested Lake Michigan tributaries and lentic areas is presented in Tables 3 and

● Surveys to estimate abundance of larval Sea Lamprey were conducted in 26 tributaries.

● Surveys to detect the presence of new larval Sea Lamprey populations were conducted in 13 tributaries. No new Sea Lamprey infestations were discovered.

● Post-treatment assessments were conducted in 24 tributaries to determine the effectiveness of lampricide treatments conducted during 2017 and 2018. Hudson Creek, Crow River, Platte River, Betsie River and Muskegon River are scheduled for treatment in 2019 based on the presence of residual Sea Lampreys.

● Surveys to evaluate barrier effectiveness were conducted in 21 tributaries. All barriers were found to be effective in limiting Sea Lamprey infestations.

● Larval assessment surveys were conducted in 19 non-wadable lentic/lotic areas using 32.76 kg active ingredient of 3.2% gB .

Juvenile Assessment

Based on standardized fall assessment data, the marking rate during 2017 was 4.5 A1-A3 marks per 100 Lake Trout >532mm, which is less than the target of 5 marks per 100 Lake Trout (**Fig 3**).

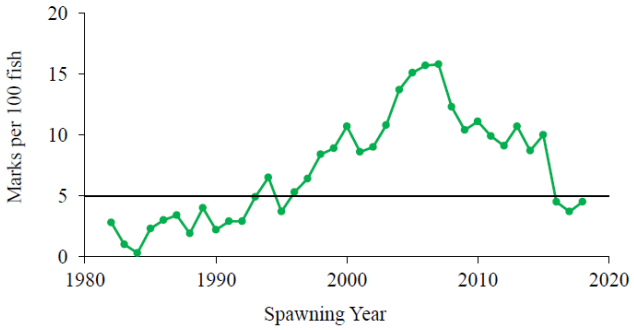


Fig 3- Average number of A1-A3 marks per 100 Lake Trout >532 mm from standardized fall assessments in Lake Michigan. The horizontal line represents the target of 5 A1-A3 marks per 100 Lake Trout.

Adult Assessment

An annual index of adult Sea Lamprey abundance is derived by summing individual population estimates from traps operated in a specific suite of streams (index streams) during spring and early summer. A mark-recapture estimate is attempted in each index stream; however, in the absence of an estimate due to an insufficient number of marked or recaptured Sea Lampreys, abundance is estimated using the annual pattern of adult abundance observed in all streams and years, and adjusted to the stream-specific average abundance estimate in the time series. The index target is estimated as the mean of indices during a period within each lake when marking rate was considered acceptable, or the percentage of the mean that would be deemed acceptable. During 2018, the SLCP discontinued use of the Schaefer method in favor of the simpler Petersen method to calculate population estimates from mark-recapture data. The estimates were updated for all index streams from 1980 to 2018.

● A total of 11,491 Sea Lampreys were captured at nine tributaries during 2018, six of which are index locations. Adult population estimates based on mark-recapture were obtained for each index location.

● The index of adult Sea Lamprey abundance was 26,999 (95% CI; 22,968 – 31,031), which was less than the target of 38,703 **(Fig 4).** The index target was estimated as the mean of indices during a period with acceptable marking rates (1995-1999).

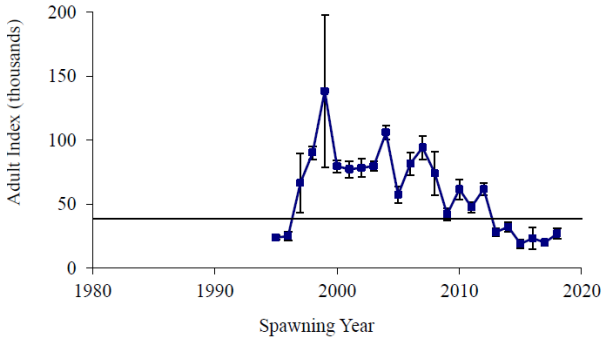


Fig 4- Index estimates with 95% confidence intervals (vertical bars) of adult Sea Lamprey. The adult index in 2018 was 26,999 (95% confidence interval 22,968 – 31,031). The point estimate is less than the target of 38,703 (black horizontal line)

End Lake Michigan Part 2