Inland Seas Angler

GREAT LAKES BASIN REPORT©

Special Report – Lakes Erie & St. Clair

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Highlights of the Annual Lake Committee Meetings

Great Lakes Fishery Commission proceedings, Ypsilanti, Michigan

This first of a series of annual special reports is an extensive summary of Lakes Erie & St. Clair. These lake committee reports are from the annual Lake Committee meetings hosted by the Great Lakes Fishery Commission in March 2019. We encourage reproduction with appropriate credit to the GLSFC and the agencies involved. Our thanks to the staffs of the GLFC, OMNRF, USFWS, USGS, NYSDEC and Michigan & Ohio DNRs 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 Erie

Index of Reports

Abbreviation	**Expansion**
CPH	Catch per hectare
CWT	Coded Wire Tag
DEC	NY Dept. of Environment Conservation
DFO	Dept. of Fisheries and Oceans
LEBS	Lake Erie Biological Station
LEC	Lake Erie Committee
MDNR	MI Dept. of Natural Resources
ODNR	Ohio Dept. of Natural Resources
OMNR	ON Ministry Natural Resources
OSU	The Ohio State University
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)

Highlights

- Great walleye hatches last five years are expected to contribute to exceptional fishing opportunities.
- Walleye recruitment was well above average in 2018 with trawl catches near or above record highs.
- The total allowable walleye catch for 2019 was 8.531 million, up from 7.109 last year.
- The total allowable yellow perch catch for 2019 of 8.552 million lbs., down from 10,498 last year.
- Western Basin anglers can expect good perch fishing thanks to recent years of recruitment.

- Yellow perch hatches continue to be near or above average in the western basin, with consistent fishing opportunities across multiple year classes.
- Central Basin perch anglers should expect fishing to be similar to 2018.
- Smallmouth bass and largemouth bass fishing in 2019 should provide both good catch rates and trophy size opportunities.
- The Ohio daily bag limit will be six walleye from May 1 through Feb. 28, 2019. From March 1, 2019 through April 30, 2019 the daily walleye bag limit will be four. A 15-inch minimum size limit is in effect during the entire season for walleye.
- The Ohio yellow perch daily bag limit will be 30 from May 1 through April 30, 2019, with no minimum size limit.
- Size limits on Michigan walleye have been reduced to 13 inches, and the daily limit increased to eight.
- White bass continue to provide excellent seasonal fishing opportunities in the Maumee and Sandusky rivers and in the open lake.
- Lake Erie has 842 tributaries (525 Canada, 317 U.S.).
- Thirty tributaries (11 Canada, 19 U.S.) have historical records of larval Sea Lamprey production.
- 18 tributaries (7 Canada, 11 U.S.) have been treated with lampricides at least once during 2009-2018.

2019 Lake Erie Sport Fishing Outlook again Great News for Anglers

COLUMBUS, OH – Lake Erie anglers have the chance to experience excellent fishing opportunities on Lake Erie in 2019, according to Ohio DNR. Walleye angler harvest rates set records in 2018, and numerous large hatches point to a bright future for the Walleye Capital of the World.

Ohio's Lake Erie daily bag limit for walleye is four fish per angler and the yellow perch daily bag limit is 30 fish per angler through April 30, 2019. The daily bag limit will be six walleye per angler from May 1 through Feb. 29, 2020. A 15-inch minimum size limit is in effect during the entire season for walleye. The yellow perch daily limit will remain at 30 in all of Ohio's Lake Erie waters through April of 2020, with no minimum size limit.

"Lake Erie walleye and yellow perch fisheries are managed through an interagency quota system," according to Kendra Wecker, Chief of the Division of Wildlife. "Each jurisdiction regulates its catches to comply with annually determined safe harvest levels that minimize the risk of over-fishing. Bag limits are based on the quota allocations determined by the interagency group."

The binational Lake Erie Committee (LEC), comprising fishery managers from Michigan, New York, Ohio, Ontario and Pennsylvania—the five jurisdictions that manage the Lake Erie fishery—set a total allowable catch (TAC) for 2019 of 8.552 million pounds of yellow perch and 8.531 million walleye. Yellow perch are allocated in pounds and walleye are allocated by number of fish. This TAC represents a decrease for yellow perch from 10.498 million pounds of fish last year and an increase in walleye from 7.109 million fish. Specific allocations of both species are presented below by jurisdiction.

TAC decisions are reflective of the status of Lake Erie's fish populations and take into account the goal of consistent and sustainable harvest each year. The allocations are determined by the LEC after extensive, lakewide biological assessments, analyses, discussions, and consultations with stakeholders. The individual state and provincial governments implement the TAC in their jurisdiction in accordance with their respective regulations and management objectives.

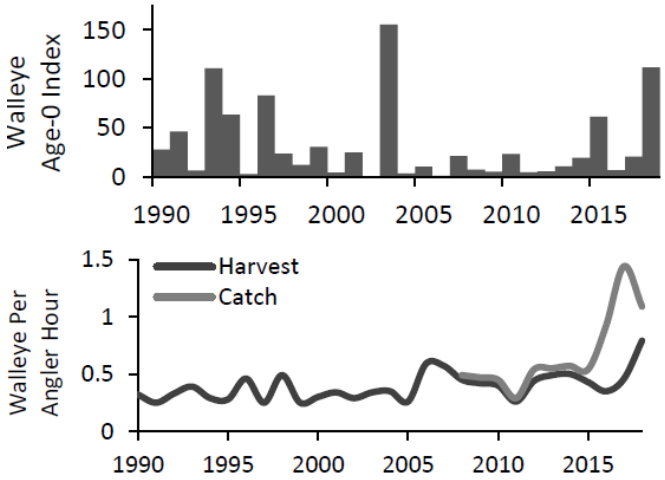
Overall, the LEC believes that yellow perch populations are lower compared to last year's abundance. As a result, the 2019 TAC in each of the three western most management units is lower than the 2018 level. A Management Strategy Evaluation process was recently completed and used to inform this year's decisions regarding sustainable yellow perch harvest. Walleye populations are managed as a single stock and are increasing throughout Lake Erie due to average or better hatches in four of the past five years. These conditions support an increase in the walleye TAC as prescribed by the Walleye Management Plan.

The LEC operates by consensus and relies on biological assessments to inform their TAC decisions. The LEC also supports the Lake Erie Percid Management Advisory Group, or LEPMAG, a structured process that engages commercial and recreational fishers. The LEPMAG, which has existed since 2010, reflects the committee's interest in involving the fishing community in actions related to management of Lake Erie's percid fisheries.

Walleye

Anglers can expect excellent walleye fishing to continue thanks to strong hatches during the last 5 years. Recruitment was well above average in 2018, with trawl catches near or above record highs in some months, indicating strong recruitment to the fishery in coming years. Angler harvest increased from 1.3 million in 2017 to 2.0 million fish in 2018. This large increase in harvest can be attributed to fish from the strong 2015-year class reaching and exceeding the 15-inch minimum limit. The overall expectation for 2019 is for high catch rates with most of the catch coming from the 2014 and 2015 cohorts.

The Lake Erie yellow perch commercial fishery had decreases in harvest in the central basin as dictated by lower quota allocations. It also experienced mixed fishing rate trends with a slight increase from 2017 in the western basin and contrasting trends in the central basin including a 48% increase to 336lbs/lift in District 2 and 26% decline in District 3 to 197 lbs/lift.



Ohio's Lake Erie walleye – Top: western basin recruitment index of age-0 fish (catch-per-hectare). Bottom: Targeted fishing rates for combined charter and private anglers.

Walleye anglers will mostly catch abundant 4 to 5-year-old fish that will average 19 to 21 inches and could be as large as 26 inches. Abundant young fish from the 2017 and 2018 hatches will show up in anglers' catches ranging from 9 to 14 inches. Anglers are encouraged to release these sub-legal fish with as little handling as possible, so they can contribute to the fishery in the future.

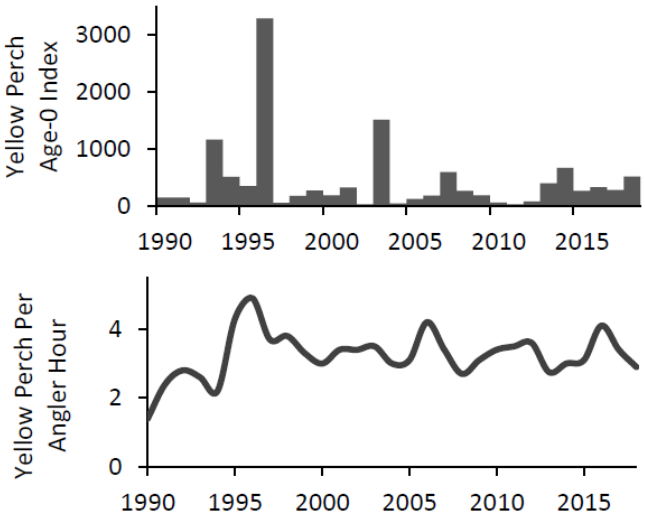
Guided by the Walleye Management Plan, the LEC set a 2019 walleye TAC of 8.531 million fish, a 20% increase over the 2018 TAC of 7.109 million fish. The increased TAC reflects positive recruitment during the previous few years and increases in population biomass. The LEC is optimistic about the status of walleye populations.

The Province of Ontario and the states of Ohio and Michigan share the TAC based on a formula of walleye habitat within each jurisdiction in the western and central basins of the lake. Under a 2019 TAC of 8.531 million fish, Ohio will be entitled to 4.360 million fish, Ontario 3.673 million fish, and Michigan 0.497 million fish. Jurisdictions in the eastern end of the lake are outside of the TAC area and harvest limits there are set consistent with lakewide objectives.

The walleye TAC is the result of extensive discussions among scientists, managers, and stakeholders. The Walleye Task Group, whose membership consists of scientists and field biologists from all Lake Erie jurisdictions, meet regularly to share data and reach consensus on biological conditions and population abundance estimates. The LEC's Walleye Management Plan, which incorporates suggestions from the LEPMAG, serves as the foundation for the LEC's discussions and TAC decisions. Each Lake Erie jurisdiction is responsible for implementing its portion of the TAC.

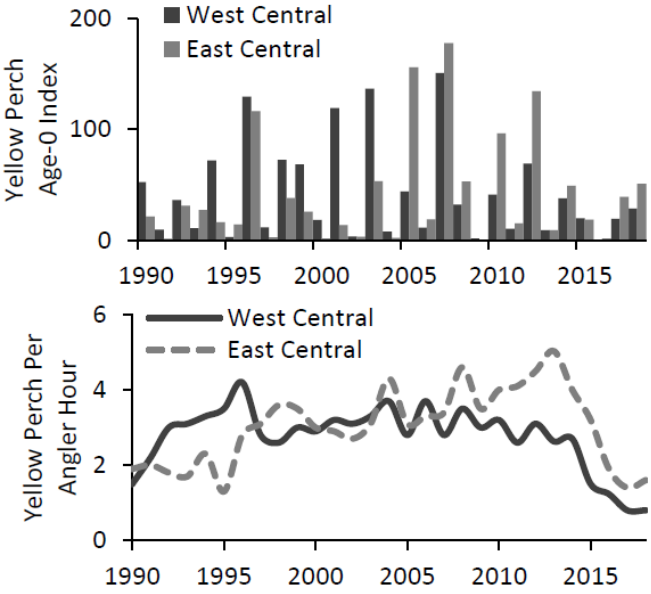
Yellow Perch

Western basin anglers can expect good perch fishing thanks to recent years of recruitment. Hatches continue to be near or above average in the western basin, signaling consistent fishing opportunities across multiple year classes. Angler harvest for 2018 was estimated at 1.6 million perch with a harvest rate of 2.9 fish per angler hour. Fish from the large 2014 hatch are approaching sizes up to 13 inches. Hatches from 2015 through 2017 will also provide some smaller 7- to 9-inch fish. The 2018-year class is projected to be larger than the 2014-year class and will provide increased numbers of fish in upcoming years.



Ohio's western basin Lake Erie yellow perch – Top: Recruitment index of age-0 fish (catch-per-hectare). Bottom: Targeted fishing rates for combined charter and private anglers.

Central basin anglers should expect fishing to be similar to 2018. Recruitment trends seem to be increasing over the last two years following one of the lowest hatches in 2016. Since 2013, there have been several years of below average recruitment, which may be a due to environmental factors. Angler harvest and targeted angler hours in 2018 were the lowest since the creel survey began 1975.



Ohio's central basin Lake Erie yellow perch- Top: Relative abundance of age-0 fish (catch-per-hectare) Bottom: Targeted fishing rates for combined charter and private anglers.

Central basin anglers should expect the best fishing to be in eastern waters from Fairport Harbor to Conneaut, where the 2012- and 2014-year classes will provide numerous large fish. Central basin populations have declined from the record levels set over 10 years ago and are lacking large hatches that were more common in the past. Hatches in the area from Huron to Fairport Harbor have been consistently below average recently. Anglers' catches in this region will mostly come from the 2014 and 2015-year classes and will average 9 inches long.

Yellow perch TAC is the result of deliberations among scientists, managers, and stakeholders through the LEPMAG process. Based on science and those extensive discussions, the LEC today set a 2019 TAC of 8.552 million pounds of yellow perch.

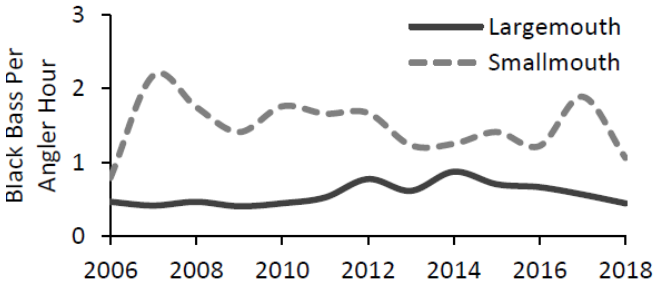
The yellow perch fishery is divided into four management units, which generally correspond to the eastern, east-central, west-central and western basins of Lake Erie. The LEC has strived to maintain a stable and sustainable harvest while responding to changing population trends and other environmental conditions. The LEC acknowledges reduced recruitment of yellow perch in the central basin and expects that allowable catch could continue to decline here.

The five jurisdictions on the lake share Lake Erie's yellow perch under an area-based formula. Pursuant to the 2019 TAC, Ontario will receive 4.072 million lbs, Ohio 3.514 million lbs, Michigan 0.221 million lbs, New York 0.169 million lbs, and Pennsylvania 0.576 million lbs. As with walleye, each Lake Erie jurisdiction is responsible for implementing its portion of the TAC.

Smallmouth and Largemouth Bass

Smallmouth bass fishing in 2018 is expected to be strong and consistent with recent years. A new trophy regulation will be imposed in 2019 where an angler may harvest one fish greater than 18-inches from May 1 through June 21. Prior to this year, the spring season has been closed since 2004. The average size of smallmouth bass was 17-inches long with a weight of 3.2 pounds. Best fishing for smallmouth bass will continue to be in the spring when fish are concentrated in shallower waters around good bottom structure.

Largemouth bass fishing also should continue to be strong in 2019. The average length of largemouth bass was 17-inches in 2018. This fishery continues to produce exceptional catch and some large fish in nearshore areas and harbors across Ohio's Lake Erie waters.



Smallmouth and largemouth bass targeted fishing rates for private Anglers

Steelhead Trout

Tributary and open lake fisheries should remain stable with continued annual stocking of yearling steelhead. In 2018, ODNR-DOW hatchery personnel raised and stocked 478,408 steelhead that were a mix of Little Manistee, Chambers Creek and Ganaraska strains. Annual targeted steelhead stocking numbers will remain the same for 2019 (450,000). Stocking locations will also remain the same as previous years. The combined 2018 recreational harvest primarily came from the central basin and was above the 10-year mean with harvest and release rates around 0.11 to 0.14 fish per angler hour, respectively.

Forage Fish Community

Indices of forage abundance were near the ten-year averages for most species in the western basin in August. Adult and young emerald shiner abundances have increased for two straight years but remain well below average. Young freshwater drum and all ages of troutperch were well above their ten-year averages. August forage indices in the central basin were below long-term means, with most species being below long-term means for the last two years. September forage indices did not improve over August, relative to long-term trends. The main forage species, rainbow smelt, emerald shiner, and gizzard shad indices were some of the lowest in the time series.

Additional Opportunities

Please note that new regulations were implemented for largemouth and smallmouth bass for the 2019 fishing season. The previously closed spring season now allows the harvest of one black bass per day, with a minimum size limit of 18 inches from May 1 until the fourth Saturday of June (June 22), and the daily bag limit will continue to be five black bass per day with a 14-inch minimum size limit the remainder of the season through April 30, 2020.

Updated Lake Erie fishing reports are available at **www.wildohio.gov** or by calling 888-HOOKFISH (888-466-5347). Information is available from ODNR Division of Wildlife staff from 8 a.m. to 5 p.m. weekdays at the Fairport Harbor station (440-352-4199) for the Central Basin and at Sandusky Station (419-625-8062) for the Western Basin. Information on the ODNR Lake Erie research and management programs, fisheries resources, fishing reports, maps and links to other Lake Erie web resources are available at **www.wildohio.gov**.

The Lake Erie Committee and TACs

The LEC comprises fishery managers from Michigan, New York, Ohio, Ontario and Pennsylvania. The committee's work is facilitated by the Great Lakes Fishery Commission, a Canadian and U.S. agency on the Great Lakes. Each year the committee sets a TAC for walleye and yellow perch. The TAC represents the number or weight of fish recommended by the Yellow Perch and Walleye Task Groups to be harvested by sport and commercial fishers without putting the fisheries at risk. The individual agencies implement the total allowable catch. ✧

Lake Erie Walleye Task Group, 2019 (LEC)

2018 Fishery Review

The total allowable catch (TAC) for 2018 in the quota area (MUs 1 to 3) was 7.109 million fish. This allocation represented a 20% increase from the 2017 TAC of 5.924 million fish. Total harvest in the quota area was 5.627 million fish, or 79% of the 2018 TAC **(Table 1)**. Harvest in the non-TAC area (MUs 4&5) was 0.644 million fish. Lake-wide Walleye harvest was estimated at 6.271 million fish. The reported sport fishery (2.627 million fish) and commercial fishery (3.657 million fish) harvest were above the 1975-2017 time series mean 2.259 million fish and 2.037 million fish, respectively.

Table 1. Summary of walleye harvest by jurisdiction in Lake Erie, 2018

in number	TAC Area (MU-1, MU-2, MU-3)				Non-TAC Area (MU-4 & MU-5)				All Areas
of fish	Michigan	Ohio	Ontario	Total	NY	Penn.	Ontario	Total	Total
TAC	414,455	3,633,410	3,061,135	7,109,000	-	-	-	-	7,109,000
TAC % Share	5.83%	51.11%	43.06%	100.00%	-	-	-	-	100.00%
Harvest	176,089	1,972,295	3,478,713	5,627,097	123,503	270,189	250,345	644,037	6,271,134
Harvest %TAC	42.5%	54.3%	113.6%	79.2%					

Table 2. Ontario walleye gillnet effort in 2018.

	Unit 1	Unit 2	Unit 3	Units 4 & 5
Effort (km)	5,215	7,421	2,636	1,896
change from 2017	-35%	3%	-28%	24%

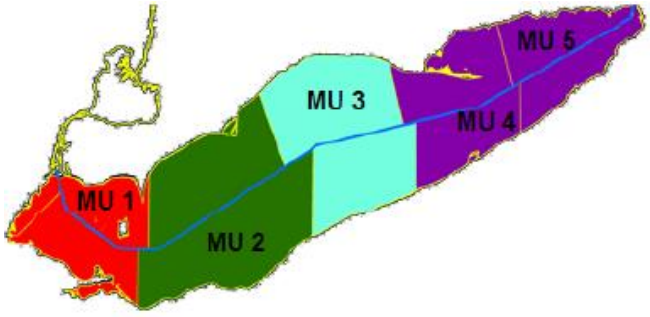


Fig 1. Lake Erie Walleye management units

Total lake-wide commercial Walleye fishery effort was 17,168 km of gill net, which represented a 16% decrease from 2017 and was 8% below the 1975-2017 time series mean (18,755 km). Commercial effort decreased in MU 1 and MU 3 and increased in MU 2 and MUs 4&5 (**Table 2**). Historically MU 1 has been the largest component of the commercial effort, but in 2018 the greatest effort was in MU 2 **(Table 2).** Lake-wide sport effort was 3.144 million angler hours which represented a 2% increase from 2017, but 38% below of the 1975-2017 time series mean (5.059 million angler hours). Sport effort increased in Michigan (MU1), Ohio (MU 2), PA and NY (MU 4&5) waters but declined in Ohio MU1 and MU3 waters from 2017**.**

The 2018 harvest rates in the lake-wide sport fishery (0.81 fish/hour) and commercial fishery (213 fish/km gill net) increased from 2017 and are above 1975-2017 time series mean (0.43 fish/hour and 121.0 fish/km gill net). Sport harvest rates increased in all MUs (MU 1 = 79%; MU 2 = 88%; MU 3 = 41%; and MU4&5 = 56%) compared to 2017. Gill net catch rates increased in MU1 (36%), MU 2 (52%),

MU3 (22%), and MUs 4&5 (73%). Age composition of harvested fish was dominated by age 3 (73%) and age 4 (15%) Walleye from the 2015 and 2014 year classes, respectively. In 2018, Age 7 and older Walleyes, represented 5% of the total lake-wide harvest.

Catch-at-Age Analysis Population Estimate and Projected Recruitment for 2019 and 2020

Based on the 2019 integrated SCAA model, the 2018 MU 1 to 3 population estimate was 49.848 million age 2 and older Walleye **(Fig 2**). An estimated 30.625 million age 3 (2015 year class) fish comprised 61% of the age 2 and older Walleye population. Age 4 (2014 year class) represented the second largest (15%) and age 2 (2016 year class) the third largest (12%) components of the population. Using the 2019 integrated SCAA model, the number of age 2 recruits entering the population in 2019 (2017 year-class) and 2020 (2018 year-class) will be 13.514 million and 94.071 million, respectively.

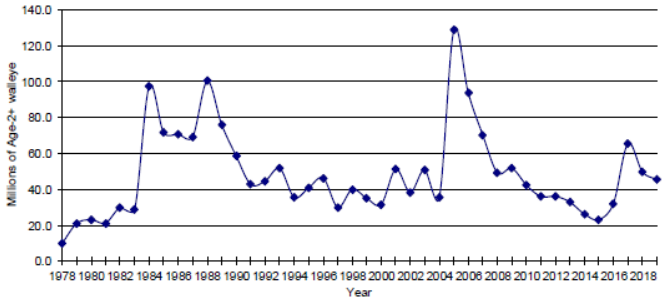


Fig 2. Population estimate of Lake Erie Walleye ages 2 and older from 1978 to 2018, and the projection for 2019, from the integrated SCAA model.

Using the 2019 integrated SCAA model, the projected abundance of age 2 and older Walleye in the MUs 1 to 3 population is 45.338. million Walleye in 2019 **(Table 4**). The most abundant year class (43%) in the population is projected to be age 4 Walleye from the 2015 cohort (19.3 million fish). The next most abundant are age 2 (2017 year class),13.514 million fish (30%). The age 3 (2016 year class), age 5 (2014 year class) and age 6 (2013 year class) are expected to contribute 9%, 10%, and 2% to the population, respectively. Age 7 and older fish are expected to account for 6% of the 2019 population size. The projected spawning stock biomass (SSB) for 2019 is 49.777 million kilograms.

2019 Harvest Strategy and Recommended Allowable Harvest (RAH)

Beginning in 2015, the current Walleye management plan was implemented, which includes the integrated Walleye assessment model and a Walleye harvest control rule (HCR). The HCR sets the target fishing rate at 60% of F_{msy}, with an accompanying limit reference point that will reduce the target fishing rate beginning at 20% of the unfished spawning stock biomass (20%SSB_0). A probabilistic control rule, P-star (P*) was set at 0.05 and incorporated to ensure that SSB in 2020 is not below the 20% SSB_0 threshold after fishing in 2019. In addition, there is a limitation of TAC variation from one year to the next of ± 20% to implement a measure of fishery stability. Using results from the 2019 integrated SCAA model, the harvest policy, and selectivity estimates from the current fisheries, a mean RAH of 8.683 million fish was calculated for 2019, with a range of 6.504 to 10.861 million fish **(Table 4)**. The TAC range for 2019 based on the integrated SCAA model, the harvest policy, and the ± 20% TAC constraint from the previous year is 6.504 to 8.531 million fish.

	2019 Stock Size (millions of fish)	60% F_{msy}		Rate Functions			2019 RAH (millions of fish)			Projected 2020 Stock Size (millions)
Age	**Mean**	**F**	**Sel(age)**	**(F)**	**(S)**	**(u)**	**Min.**	**Mean**	**Max.**	**Mean**
2	13.514		0.300	0.100	0.657	0.082	0.809	1.105	1.401	94.071
3	4.233		0.970	0.324	0.525	0.239	0.768	1.010	1.252	8.878
4	19.300		0.978	0.326	0.524	0.240	3.508	4.638	5.769	2.224
5	4.629		0.913	0.305	0.535	0.227	0.781	1.049	1.317	10.113
6	1.027		0.921	0.307	0.534	0.228	0.172	0.235	0.297	2.478
7+	2.635		1.000	0.334	0.520	0.245	0.466	0.645	0.825	1.919
tal (2+)	45.338	0.334				0.192	6.504	8.683	10.861	119.684
tal (3+)	31.824						5.695	7.577	9.460	25.613
SSB	49.777	mil. kgs								56.410

Table 4. Stock size estimates and RAH values for mean and one standard error.

Statistical Catch-at-Age Analysis (SCAA): Abundance

The WTG uses a SCAA model to estimate the abundance of Walleye in Lake Erie from 1978 to 2018. The stock assessment model estimates population abundance of age 2 and older Walleye using fishery-dependent and fishery-independent data sources. The model includes fishery-dependent data from the Ontario commercial fishery (MU 1-3) and sport fisheries in Ohio (MU 1-3) and Michigan (MU 1). Since 2002, the WTG model has included data collected from three fishery-independent gill net assessment surveys (i.e., Ontario Partnership, Michigan, and Ohio). Beginning in 2011, Michigan and Ohio gill net survey data were pooled in the SCAA because of similarities between the surveys. In 2016, Ohio switched from multifilament to monofilament gill nets1 after completing several years (2007, 2008, 2010-2013) of comparisons between the two gear types. Michigan did not similarly change gear types. In 2017, to address the change in gear types, age-specific corrections of monofilament to multifilament catches were created using age-specific linear regression models for the Ohio survey data and again pooled with Michigan data in the SCAA model. The same methods were used again for this 2019 report as the WTG and the Quantitative Fisheries Center at Michigan State University continue to evaluate options for incorporating the new Ohio data set into the SCAA model.

The Lake Erie Percid Management Advisory Group (LEPMAG) developed an updated Walleye model, which the WTG began using in 2013. This model includes: 1) estimated selectivity for all ages within the model without the assumptions of known selectivity at age; 2) integrated age-0 trawl survey data into the model; 3) a multinomial distribution for the age composition data; and 4) time-varying catchability using a random walk for fishery and

survey data including the age-0 trawl survey. Instantaneous natural mortality (*M*) is assumed to be constant (0.32) among years (1978-2018) and ages (ages 2 through 7and older). The abundances-at-age were derived from the estimated parameters using an exponential survival equation.

Based on the 2019 integrated SCAA model, the 2018 west-central population (MU1-3) was estimated at 49.849 million age 2 and older Walleye. An estimated 30.625 million age 3 (2015 year class) fish comprised 61% of the age 2 and older Walleye population. Age 4 (2014 year class) represented the second largest (15%) and age 2 (2016 year class) the third largest (12%) components of the population. Based on the integrated model, the number of age 2 recruits entering the population in 2019 (2017 year class) and 2020 (2018 year class) are estimated to be 13.514 and 94.071 million Walleye, respectively**.** The 2019 projected abundance of age 2 and older Walleye in the west-central population is estimated to be 45.338 million fish**.**

Recruitment

Evidence of multiple Walleye stocks in Lake Erie exists, with decreasing stock productivity from west to east. However, migrations and mixing of stocks throughout the lake make evaluation of individual stock productivity difficult. For example, adult Walleye from western basin spawning grounds in the spring, to the cooler waters of the central and eastern basins in the summer, and then return to the west basin before spawning. While juvenile Walleye from both the western and eastern basin are believed to disperse from natal basins during the summer and fall, it is unknown if their migrations are similar to those of adults. To address uncertainty surrounding juvenile dispersal and productivity of Walleye stocks across Lake Erie, the WTG has reported basin-specific densities of yearling Walleye with standardized gill net indices since 2011 (WTG 2012).

Catches were standardized for net length (50 ft [15.2 m] panels) of mesh sizes ≤ 5.5" (140 mm) but correction factors were not applied to standardize fishing power between monofilament and multifilament nets. New York and Ontario monofilament nets share the same configurations with the exception that Ontario nets contain 2 panels instead of the one 50 ft (15.2 m) panel for mesh sizes ≥ 2" (51 mm). New York's index gill nets were fished exclusively on bottom and were confined to shallower depths than nets fished in Ontario's waters of eastern Lake Erie**.**

In 2018, yearling Walleye catches occurred lake-wide where index nets were fished but densities were very low on the north shore of the east basin**.** Yearling catches have decreased from 2016 in west and central Lake Erie, suggesting the 2016 and 2017 year classes are both smaller than the 2015 cohort for western stocks. Yearling Walleye catches in New York bottom set nets on the south shore decreased from 2017 and were similar to 2016, suggesting that the 2016 cohort was stronger than the 2015 and 2017 hatches in New York waters. When bottom set and suspended nets were fished in the same area, yearling catches in bottom set nets exceeded suspended nets in the east and central basin, whereas suspended nets exceeded bottom set nets in the west basin. In Ontario Partnership index nets, average catches of age 1 Walleye are often greater in suspended nets than in bottom nets, however this phenomenon varies by year and basin.

Currently, the young-of-the-year (YOY) index from the interagency west basin bottom trawl survey (Table 10) is integrated into the SCAA model to estimate age-2 Walleye abundance and forecast recruitment. While the interagency bottom trawl survey is considered to be a robust recruitment predictor, inclusion of additional YOY and yearling indices to form a composite recruitment index could supplement recruitment estimates.

However, there are two factors limiting the integration of a composite recruitment index into the SCAA model:
1. Yearling indices are not available far enough in advance to forecast age-2 recruitment, as required for the probabilistic harvest control rule (P*) of the current Walleye Management Plan (Kayle et al. 2015). Options for overcoming this limitation would be exclusion of yearling indices from a composite recruitment index, removal of the P* control rule from the Walleye Management Plan Harvest Policy, or running two integrated SCAA models (one with YOY and yearling data and the second model using only YOY data). It is important to note that the two SCAA model options could result in conflicting abundance estimates.

2. Spatial, temporal, and gear type (bottom set vs. suspended gill nets) variability exist in Walleye YOY and yearling indices, along with inconsistencies in sampling intensity and effort. Previous examination of the available recruitment indices using a Principal Components Analysis (PCA) approach revealed challenges for integrating a composite recruitment index into the SCAA model (WTG 2016). Data transformations and missing years of data in some indices were primary concerns.

The WTG will continue to update the dataset of recruitment indices. However, composite Walleye recruitment indices will not be presented until concerns related to data transformations, missing years of data, and recent changes in index gear configuration are addressed. The WTG will also continue to explore and evaluate alternative recruitment estimation approaches to be considered for adoption in future Lake Erie Walleye Management Plans.

Table 5 Annual Lake Erie walleye total allowable catch (TAC, top) and measured harvest (Har; bottom, bold), in numbers of fish from 1999 to 2018.

		TAC Area (MU-1, MU-2, MU-3)				Non-TAC Area (MUs 4&5)				All Areas
Year		Michigan	Ohio	Ontario [a]	Total	NY	Penn.	Ontario	Total	Total
1999	TAC	477,000	4,626,000	3,897,000	9,000,000				0	9,000,000
	Har	**140,269**	**1,033,733**	**3,454,250**	**4,628,252**	**23,133**	**89,038**	**87,000**	**199,171**	**4,827,423**
2000	TAC	408,100	3,957,800	3,334,100	7,700,000				0	7,700,000
	Har	**252,280**	**932,297**	**2,287,533**	**3,472,110**	**28,599**	**77,512**	**67,000**	**173,111**	**3,645,221**
2001	TAC	180,200	1,747,600	1,472,200	3,400,000				0	3,400,000
	Har	**159,186**	**1,157,914**	**1,498,816**	**2,815,916**	**14,669**	**52,796**	**39,498**	**106,963**	**2,922,879**
2002	TAC	180,200	1,747,600	1,472,200	3,400,000				0	3,400,000
	Har	**193,515**	**703,000**	**1,436,000**	**2,332,515**	**18,377**	**22,000**	**36,000**	**76,377**	**2,408,892**
2003	TAC	180,200	1,747,600	1,472,200	3,400,000				0	3,400,000
	Har	**128,852**	**1,014,688**	**1,457,014**	**2,600,554**	**27,480**	**43,581**	**32,692**	**103,753**	**2,704,307**
2004	TAC	127,200	1,233,600	1,039,200	2,400,000				0	2,400,000
	Har	**114,958**	**859,366**	**1,419,237**	**2,393,561**	**8,400**	**19,969**	**29,864**	**58,233**	**2,451,794**
2005	TAC	308,195	2,988,910	2,517,895	5,815,000				0	5,815,000
	Har	**37,599**	**610,449**	**2,933,393**	**3,581,441**	**27,370**	**20,316**	**17,394**	**65,080**	**3,646,521**
2006	TAC	523,958	5,081,404	4,280,638	9,886,000				0	9,886,000
	Har	**305,548**	**1,868,520**	**3,494,551**	**5,668,619**	**37,161**	**151,614**	**68,774**	**257,549**	**5,926,168**
2007	TAC	284,080	2,755,040	2,320,880	5,360,000				0	5,360,000
	Har	**165,551**	**2,160,459**	**2,159,965**	**4,485,975**	**29,134**	**116,671**	**37,566**	**183,371**	**4,669,346**
2008	TAC	209,530	1,836,893	1,547,576	3,594,000				0	3,594,000
	Har	**121,072**	**1,082,636**	**1,574,723**	**2,778,431**	**29,017**	**74,250**	**34,906**	**138,173**	**2,916,604**
2009	TAC	142,835	1,252,195	1,054,970	2,450,000				0	2,450,000
	Har	**94,048**	**967,476**	**1,095,500**	**2,157,024**	**13,727**	**42,422**	**27,725**	**83,874**	**2,240,898**
2010	TAC	128,260	1,124,420	947,320	2,200,000				0	2,200,000
	Har	**55,248**	**958,366**	**983,397**	**1,997,011**	**34,552**	**54,056**	**23,324**	**111,932**	**2,108,943**
2011	TAC	170,178	1,491,901	1,256,921	2,919,000				0	2,919,000
	Har	**50,490**	**417,314**	**1,224,057**	**1,691,861**	**31,506**	**45,369**	**28,873**	**105,748**	**1,797,609**
2012	TAC	203,292	1,782,206	1,501,502	3,487,000				0	3,487,000
	Har	**86,658**	**921,390**	**1,355,522**	**2,363,570**	**36,975**	**44,796**	**28,260**	**110,031**	**2,473,601**
2013	TAC	195,655	1,715,252	1,445,094	3,356,000				0	3,356,000
	Har	**54,167**	**1,083,395**	**1,274,945**	**2,412,507**	**34,553**	**60,332**	**30,591**	**125,476**	**2,537,983**
2014	TAC	234,774	2,058,200	1,734,026	4,027,000				0	4,027,000
	Har	**42,142**	**1,303,133**	**1,324,201**	**2,669,476**	**61,982**	**84,843**	**52,675**	**199,500**	**2,868,977**
2015	TAC	239,846	2,102,665	1,771,488	4,114,000				0	4,114,000
	Har	**65,740**	**1,073,263**	**1,382,600**	**2,521,603**	**55,201**	**46,523**	**89,882**	**191,606**	**2,713,209**
2016	TAC	287,827	2,523,301	2,125,872	4,937,000				0	4,937,000
	Har	**65,816**	**855,820**	**1,959,573**	**2,881,209**	**50,963**	**32,937**	**112,743**	**196,643**	**3,077,852**
2017	TAC	345,369	3,027,756	2,550,874	5,924,000				0	5,924,000
	Har	**56,938**	**1,261,327**	**3,232,817**	**4,551,082**	**70,010**	**162,949**	**129,217**	**362,176**	**4,913,258**
2018	TAC	414,455	3,633,410	3,061,135	7,109,000				0	7,109,000
	Har	**176,089**	**1,972,295**	**3,478,713**	**5,627,097**	**123,503**	**270,189**	**250,345**	**644,037**	**6,271,134**

Table 6. Annual harvest (thousands of fish) of Lake Erie walleye by gear, management unit, and agency from 1999 - 2018. Means contain data from 1975 to 2017.

	Sport Fishery															Commercial Fishery					
	Unit 1				Unit 2			Unit 3			Units 4 & 5					Unit 1	Unit 2	Unit 3	Unit 4		Grand
Year	OH	MI	ON[a]	Total	OH	ON[a]	Total	OH	ON[a]	Total	ON[a]	PA	NY	Total	Total	ON	ON	ON	ON	Total	Total
1999	812	140	34	986	139	5	144	83	5	88	19	89	23	131	1,349	2,461	631	317	68	3,477	4,827
2000	674	252	34	961	165	5	170	93	5	98	19	78	29	125	1,354	1,603	444	196	48	2,291	3,645
2001	941	160	34	1,135	171	5	176	46	5	51	19	53	15	87	1,449	1,004	310	141	20	1,475	2,924
2002	516	194	34	744	141	5	146	46	5	51	19	22	18	59	1,000	937	309	146	17	1,409	2,409
2003	715	129	34	878	232	5	237	68	5	73	2	44	27	73	1,261	948	283	182	14	1,427	2,688
2004	515	115	34	664	272	2	274	72	0	72	2	20	8	30	1,040	866	334	175	11	1,386	2,426
2005	374	38	27	438	110	2	112	126	0	126	2	20	27	49	725	1,878	625	401	15	2,920	3,645
2006	1,194	306	27	1,526	503	2	505	170	0	170	2	152	37	191	2,392	2,137	784	545	66	3,532	5,924
2007	1,414	166	27	1,607	578	2	580	169	0	169	2	116	29	147	2,502	1,348	450	333	35	2,167	4,669
2008	524	121	44	689	333	2	335	225	0	225	2	74	29	105	1,354	954	335	241	35	1,565	2,919
2009	553	94	44	691	287	2	288	128	0	128	2	42	14	58	1,166	705	212	135	28	1,079	2,244
2010	587	55	44	686	257	2	259	114	0	115	2	54	37	93	1,152	607	184	147	23	962	2,115
2011	224	50	44	318	104	2	106	89	0	90	2	45	32	79	593	736	262	181	29	1,208	1,801
2012	596	87	44	726	233	2	235	93	0	93	2	45	37	84	1,138	834	285	191	28	1,338	2,476
2013	757	54	44	855	190	2	192	136	0	136	2	60	35	97	1,280	737	297	195	31	1,260	2,540
2014	909	42	45	996	177	13	190	218	13	231	13	85	62	160	1,577	756	259	238	40	1,292	2,869
2015	746	66	45	857	187	13	200	140	13	153	13	47	55	115	1,325	633	354	325	77	1,388	2,713
2016	577	66	45	688	139	13	152	140	13	153	13	33	51	97	1,090	946	594	348	100	1,988	3,078
2017	592	57	45	694	316	13	330	353	13	367	13	163	70	246	1,636	1,735	918	508	116	3,277	4,913
2018	955	176	45	1,177	666	13	679	351	13	365	13	270	124	407	2,627	1,523	1,433	451	250	3,657	6,284
Mean	1,469	250	40	1,758	268	10	275	170	12	179	8	70	39	67	2,259	1,363	445	292	41	2,037	4,296

Table 7. Annual fishing effort for Lake Erie walleye by gear, management unit, and agency from 1999 to 2018.

	Sport Fishery [a]															Commercial Fishery [b]				
	Unit 1				Unit 2			Unit 3			Units 4 & 5					Unit 1	Unit 2	Unit 3	Units 4&5	
Year	OH	MI	ON[c]	Total	OH	ON[c]	Total	OH	ON[c]	Total	ON[c]	PA	NY	Total	Total	ON	ON	ON	ON	Total
1999	2,368	411	–	2,779	603	--	603	323	--	323	--	397	171	568	4,273	21,432	10,955	7,630	1,444	41,461
2000	1,975	540	–	2,516	540	--	540	281	--	281	--	244	177	421	3,757	22,238	11,049	7,896	1,781	43,054
2001	1,952	362	–	2,314	697	--	697	261	--	261	--	241	163	404	3,676	9,372	5,746	5,021	639	20,778
2002	1,393	606	–	1,999	444	--	444	246	--	246	--	130	132	262	2,951	4,431	4,212	4,427	445	13,515
2003	1,719	326	–	2,045	675	--	675	236	--	236	30	159	162	321	3,277	4,476	3,946	3,725	365	12,512
2004	1,257	504	–	1,761	736	27	736	178	7	178	--	88	101	189	2,864	3,875	2,977	2,401	240	9,493
2005	1,180	212	40	1,392	573	--	573	261	--	261	--	109	142	251	2,477	7,083	4,174	4,503	174	15,934
2006	1,757	587	–	2,344	899	--	899	260	--	260	--	239	137	376	3,879	5,689	4,008	3,589	822	14,107
2007	2,076	448	–	2,524	1,147	--	1,147	321	--	321	--	232	135	367	4,358	4,509	2,927	2,665	383	10,484
2008	1,027	392	63	1,419	809	--	809	356	--	356	--	187	156	343	2,927	4,990	3,193	1,909	497	10,590
2009	1,063	310	–	1,373	777	--	777	289	--	289	--	124	100	224	2,663	3,537	2,164	1,746	478	7,925
2010	1,403	226	–	1,629	652	--	652	219	--	219	--	188	140	328	2,828	1,918	1,371	1,401	247	4,937
2011	862	165	–	1,026	346	--	346	217	--	217	--	156	145	301	1,891	2,646	1,884	1,572	489	6,591
2012	1,283	242	–	1,525	560	--	560	182	--	182	--	160	169	329	2,597	4,674	2,480	2,298	352	9,804
2013	1,424	182	–	1,606	503	--	503	236	--	236	--	154	143	297	2,641	3,802	2,774	2,624	304	9,503
2014	1,552	131	101	1,683	459	85	459	441	71	441	70	171	187	358	2,940	7,351	4,426	2,911	254	14,943
2015	1,430	165	–	1,595	564	--	564	341	--	341	--	162	215	377	2,876	6,980	6,487	5,379	792	19,637
2016	1,514	236	–	1,750	439	--	439	397	--	397	--	141	217	358	2,944	6,980	7,969	4,523	1,448	20,920
2017	1,351	187	–	1,538	726	--	726	501	--	501	--	228	213	441	3,207	8,056	7,239	3,636	1,527	20,458
2018	1,239	261	–	1,500	813	--	813	354	--	354	--	248	229	477	3,144	5,215	7,421	2,636	1,896	17,168
Mean	2,907	665	102	3,632	747	62	762	416	111	448	106	209	231	268	5,059	8,856	5,616	4,495	675	18,755

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Yellow Perch Task Group Report, 2019 (LEC)

2018 Fisheries Review

The lakewide total allowable catch (TAC) of Yellow Perch in 2018 was 10.498 million pounds. This allocation represented a 1% increase from a TAC of 10.375 million pounds in 2017. For Yellow Perch assessment and allocation, Lake Erie is partitioned into four management units (MUs; **Fig 1).** The 2018 TAC allocation was 3.031, 3.237, 3.776, and 0.454 million pounds for MUs 1 through 4, respectively. The lake-wide harvest of Yellow Perch in 2018 was 6.782 million pounds, or 65% of the total 2018 TAC. This was a 13% decrease from the 2017 harvest of 7.789 million pounds. Harvest from MUs 1 through 4 was 2.326, 1.830, 2.323, and 0.303 million pounds, respectively **(Table 1).** The portion of TAC harvested was 77%, 57%, 62%, and 67%, in MUs 1 through 4, respectively. In 2018, Ontario harvested 4.614 million pounds, followed by Ohio (1.976 million lbs.), Michigan (0.108 million lbs.), Pennsylvania (0.056 million lbs.), and New York (0.029 million lbs.).

Targeted (i.e., small mesh) commercial gill net effort in 2018 decreased from 2017 in MU1 and MU2 (-9%, and -2%, respectively), but increased in MU3 and MU4 (+9%, and +57%, respectively). Sport angling effort in U.S. waters decreased in 2018 from 2017, in all management units, by 35%, 62%, 84%, and 41% in MU1, MU2, MU3, and MU4 respectively, and was at its lowest for the time series in MU2 and MU3. Compared to 2017, commercial trap net effort (lifts) in U.S. waters in 2018 decreased by 9% in MU1, 40% in MU2, and 35% in MU4, but increased by 32% in MU3.

Fishing effort by jurisdiction and gear type is presented in **Table 2.**

Targeted gill net harvest rates in 2018 increased relative to 2017 rates by 8% in MU1, and decreased by 14% in MU2, 19% in MU3, and 2% in MU4. Angling harvest rates, in fish harvested per angler hour, decreased in Michigan (-47%) and Ohio waters of MU1 (-11%), and Pennsylvania waters of MU3 (-85%) and MU4 (-72%), but increased in the in Ohio waters of MU2 (+21%) and MU3 (+34%), and New York waters of MU4 (+13%). In 2018, trap net harvest rates increased in MU1 (+8%), MU2 (+48%), and MU4 (+33%), and decreased in MU3 (-25%) compared to 2017 harvest rates.

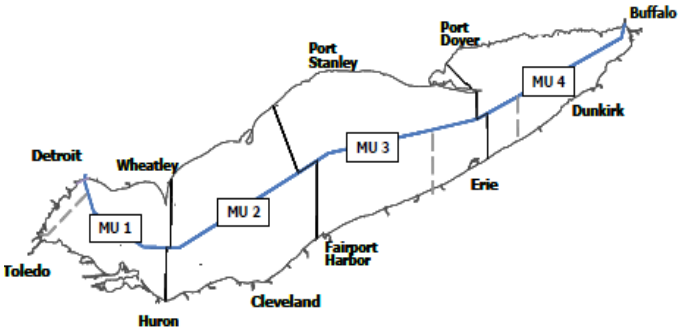

Fig 1 Yellow Perch Management Units (MUs) of Lake Erie

Table 1 Lake Erie Yellow Perch harvest by jurisdiction and gear type for 2018

MU	Harvest by jurisdiction (lbs)								Total (lbs)
	Michigan	Ontario	Ohio		Pennsylvania		New York		
	sport	all commercial*	sport	commercial trap net	sport	commercial trap net	sport	commercial trap net	
1	107,789	1,262,229	516,296	439,720					2,326,034
2		1,271,365	30,888	528,234					1,830,487
3		1,807,645	21,564	439,233	2,992	51,093			2,322,527
4		272,733			1,452	0	18,502	10,657	303,344
Total	107,789	4,613,972	568,748	1,407,187	4,444	51,093	18,502	10,657	6,782,393

Table 2 Lake Erie Yellow Perch fishing effort by jurisdiction and gear type for 2018.

MU	Effort by jurisdiction							
	Michigan	Ontario	Ohio		Pennsylvania		New York	
	sport (angler hours)	commercial (km gill net)*	sport (angler hours)	commercial (trap net lifts)	sport (angler hours)	commercial (trap net lifts)	sport (angler hours)	commercial (trap net lifts)
1	137,930	5,143	500,695	3,500				
2		5,964	45,683	1,551				
3		5,204	16,805	2,233	7,836	324		
4		887			3,940	0	19,035	135
Total	137,930	17,198	563,183	7,284	11,776	324	19,035	135

Abundance Estimate for 2019

Population size for 1975 to 2019 for each MU was estimated by statistical catch-at-age analysis (SCAA). The PR ADMB model incorporates a recruitment index which is used to project total abundance estimates to 2019. Using the PR model, abundance estimates of age-2-and-older Yellow Perch in 2019 are projected to decrease by 3%, 1%, and 25% in MU1, MU2, and MU4, respectively, and to increase by 13% in MU3, compared to the 2018 abundance estimates. Age-2-and-older Yellow Perch abundance in 2019 is projected to be 38.237, 45.871, 85.684, and 13.911 million age-2-and-older Yellow Perch in MUs 1 through 4, respectively. Using mean weight-at-age information from assessment surveys, biomass estimates in 2019 are projected to decrease in MU1 (-19%), MU2 (-18%), and MU3 (-3%), and be approximately the same in MU4 (-0.1%), compared to 2018 estimates.

Recommended Allowable Harvest (RAH) for 2019

In 2019 the Lake Erie Percid Management Advisory Group (LEPMAG) completed a management strategy evaluation to evaluate current and alternative harvest strategies in each management unit. From this exercise new harvest control rules for Yellow Perch were selected. These harvest control rules will form the foundation of the Yellow Perch Management Plan for the next 5 years. The harvest control rules are comprised of:

- Target fishing mortality as a percent of the fishing mortality at maximum sustainable yield (Fmsy)
- Limit reference point of the biomass at maximum sustainable yield (Bmsy)
- Probabilistic risk tolerance, P*=0.05
- A limit on the annual change in TAC of ±20%

Target fishing rates and limit reference points are estimated annually using results from the SCAA models. Limit reference points and target fishing rates for each management unit are presented in Table 3. Target fishing rates are reduced when the probability of the projected spawning stock biomass being equal to or less than the limit reference point (Bmsy) is greater than 5% (P*). Target fishing rates are applied to population estimates and their standard errors, to determine minimum, mean, and maximum RAH values for each management unit (**Table 3).**

Table 3. Parameters used in the harvest control rule 2019. F actual may be reduced from F target if P*>5%.

MU	Spawning Stock Biomass			Limit Reference Point		Fishing Rate			
	SSB_0	2019	2020 *	B_{msy}	P*	F_{msy}	% F_{msy}	F_{target}	F_{actual} **
MU1	5,645,560	2,795,920	3,171,970	1,585,743	0.54%	2.38	28%	0.666	0.666
MU2	12,378,700	4,700,430	4,076,090	3,395,611	18.12%	2.06	35%	0.721	0.353
MU3	12,895,400	6,775,030	7,236,280	3,542,554	0.30%	2.03	32%	0.650	0.650
MU4	1,791,990	2,087,220	1,791,180	506,007	0.00%	1.46	34%	0.496	0.496

Table 4 Lake Erie Yellow Perch harvest in pounds by management unit (Unit) and agency, 2009-2018

		Ontario*		Ohio		Michigan		Pennsylvania		New York		Total
	Year	Harvest	%	Harvest	%	Harvest	%	Harvest	%	Harvest	%	Harvest
Unit 1	2009	853,137	61	463,564	33	87,319	6	--	--	--	--	1,404,020
	2010	879,358	47	889,512	48	83,725	5	--	--	--	--	1,852,595
	2011	870,802	48	796,447	44	145,960	8	--	--	--	--	1,813,209
	2012	752,872	44	883,245	51	93,291	5	--	--	--	--	1,729,408
	2013	648,884	43	789,088	52	76,994	5	--	--	--	--	1,514,966
	2014	620,667	56	391,361	36	87,511	8	--	--	--	--	1,099,539
	2015	541,938	48	485,744	43	94,225	8	--	--	--	--	1,121,907
	2016	947,052	42	886,068	40	397,044	18	--	--	--	--	2,230,164
	2017	1,277,587	46	1,239,575	45	255,605	9	--	--	--	--	2,772,767
	2018	1,262,229	54	956,016	41	107,789	5	--	--	--	--	2,326,034
Unit 2	2009	2,495,611	58	1,801,978	42	--	--	--	--	--	--	4,297,589
	2010	1,888,876	56	1,457,823	44	--	--	--	--	--	--	3,346,699
	2011	1,665,258	54	1,399,503	46	--	--	--	--	--	--	3,064,761
	2012	1,877,615	50	1,851,846	50	--	--	--	--	--	--	3,729,461
	2013	1,803,684	51	1,721,668	49	--	--	--	--	--	--	3,525,352
	2014	1,679,175	52	1,543,226	48	--	--	--	--	--	--	3,222,401
	2015	1,489,433	57	1,131,993	43	--	--	--	--	--	--	2,621,426
	2016	1,283,379	62	792,869	38	--	--	--	--	--	--	2,076,248
	2017	1,498,437	70	643,554	30	--	--	--	--	--	--	2,141,991
	2018	1,271,365	69	559,122	31	--	--	--	--	--	--	1,830,487
Unit 3	2009	2,266,727	74	597,214	20	--	--	190,742	6	--	--	3,054,683
	2010	3,370,099	85	476,808	12	--	--	117,640	3	--	--	3,964,547
	2011	3,366,412	81	636,686	15	--	--	153,233	4	--	--	4,156,331
	2012	3,768,183	81	746,999	16	--	--	161,751	3	--	--	4,676,933
	2013	2,983,539	76	796,307	20	--	--	155,193	4	--	--	3,935,039
	2014	2,668,921	70	979,937	26	--	--	168,690	4	--	--	3,817,548
	2015	2,131,211	77	572,736	21	--	--	77,558	3	--	--	2,781,505
	2016	2,020,470	76	522,549	20	--	--	107,972	4	--	--	2,650,991
	2017	2,027,235	77	504,223	19	--	--	107,335	4	--	--	2,638,793
	2018	1,807,645	78	460,797	20	--	--	54,085	2	--	--	2,322,527
Unit 4	2009	272,579	72	--	--	--	--	37,991	10	70,030	18	380,600
	2010	467,612	89	--	--	--	--	19,989	4	37,730	7	525,331
	2011	468,001	80	--	--	--	--	37,040	6	80,848	14	585,889
	2012	502,778	77	--	--	--	--	41,362	6	106,499	16	650,639
	2013	496,666	72	--	--	--	--	74,277	11	119,869	17	690,812
	2014	485,899	74	--	--	--	--	16,671	3	149,668	23	652,238
	2015	297,716	76	--	--	--	--	10,055	3	85,535	22	393,306
	2016	231,063	87	--	--	--	--	6,791	3	28,078	11	265,932
	2017	179,730	76	--	--	--	--	16,078	7	39,598	17	235,407
	2018	272,733	90	--	--	--	--	1,452	0	29,159	10	303,344
Lakewide Totals	2009	5,888,054	64	2,862,756	31	87,319	1	228,733	3	70,030	1	9,136,892
	2010	6,605,945	68	2,824,143	29	83,725	1	137,629	1	37,730	<1	9,689,172
	2011	6,370,473	66	2,832,636	29	145,960	2	190,273	2	80,848	1	9,620,190
	2012	6,901,448	64	3,482,090	32	93,291	1	203,113	2	106,499	1	10,786,441
	2013	5,932,773	61	3,307,063	34	76,994	1	229,470	2	119,869	1	9,666,169
	2014	5,454,662	62	2,914,524	33	87,511	1	185,361	2	149,668	2	8,791,726
	2015	4,460,298	64	2,190,473	32	94,225	1	87,613	1	85,535	1	6,918,144
	2016	4,481,964	62	2,201,486	30	397,044	5	114,763	2	28,078	0	7,223,335
	2017	4,982,989	64	2,387,352	31	255,605	3	123,413	2	39,598	1	7,788,958
	2018	4,613,972	68	1,975,935	29	107,789	2	55,537	1	29,159	0	6,782,393

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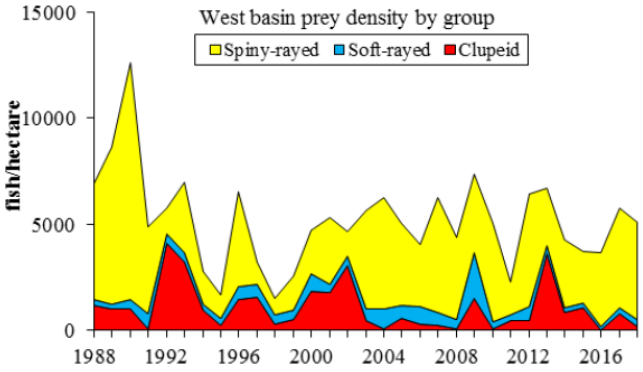
Forage Task Group Report, 2019 (LEC)

West Basin Status of Forage

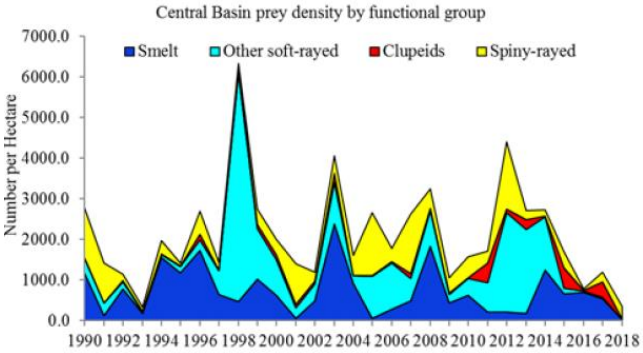
In 2018, hypolimnetic dissolved oxygen levels were below the 2 mg per liter threshold at three sites during the August trawling survey (all located near the eastern interface with the central basin). In total, data from 71 sites were used in 2018. Total forage abundance declined but was near the ten-year mean. Total forage biomass increased 33%. Age-0 Walleye relative abundance in 2018 was the highest ever recorded in the time series (255/ha), twelve times greater than the ten-year mean (21/ha) and 40% higher than the historic 2003-year class. Young-of-the-year (age-0) Yellow Perch (959/ha) was well above the long-term mean (340/ha).



Young-of-the-year Gizzard Shad declined 75% from 2017 and remain highly variable. Young-of-the-year Rainbow Smelt (0.1/ha) and yearling-and-older (age-1+) Rainbow Smelt densities (0.3/ha) returned to minimal levels after high densities in 2017. Age-0 Freshwater Drum and all ages of Troutperch densities were well above ten-year averages. Densities of age-0 and age-1+ Emerald Shiners have increased for two years straight but remain very low (~20% of the ten-year mean). Round Goby abundance was the lowest since the fish was first detected in the west basin (1997).

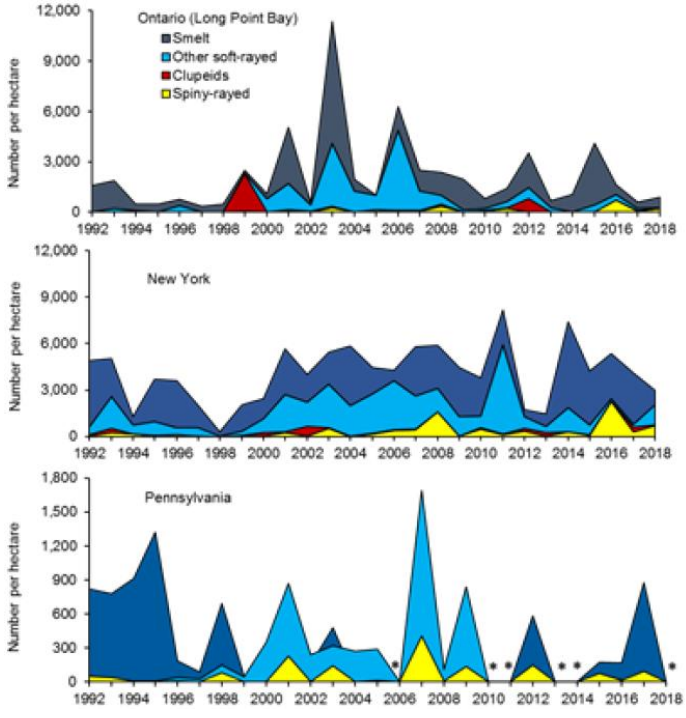
Central Basin Status of Forage

Forage abundance in Ohio waters has generally decreased since 2012. In 2018, most forage species continued to decline and are at the lowest densities since 1993. Spiny-rayed species increased slightly from 2017 but remain well below average. Emerald Shiner indices continue to be well below long-term means throughout the basin. In 2018, indices for the primary forage species, Rainbow Smelt, Emerald Shiner, Round Goby and Gizzard Shad were all well below long-term means in Ohio. Young-of-the-year and age-1+ indices for all species were some of the lowest in the last ten years. In 2018, Yellow Perch age-0 indices in Ohio increased over the last two years and are slightly above long-term means.



East Basin Status of Forage

Total forage fish abundance in 2018 increased in Ontario over 2017 but remained well below the long-term mean. Abundance decreased in New York. Pennsylvania did not sample due to vessel constraints. Catches of age-0 and age-1+ Rainbow Smelt were below long-term means in both jurisdictions. Young-of-the-year Emerald Shiner catches were low in both jurisdictions. Yearling-and-older catches were low in Ontario but high in New York, above long-term means. Catches of age-0 Yellow Perch have generally been above long-term means in recent years. Round Goby densities were generally consistent with long-term means. Catches of all other species were low.

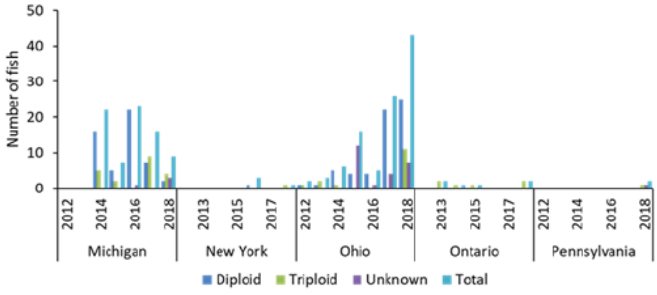


Hydroacoustic Assessments

The Forage Task Group introduced fisheries hydroacoustic technology on Lake Erie to provide a more comprehensive assessment of pelagic forage fish species abundance and distribution. Beginning with surveys of the eastern basin in 1993, coverage was expanded to the central basin in 2000 and western basin in 2004. In 2018, the east basin survey was conducted from July 8-11, the central basin survey from July 16-20, and the west basin survey on July 12 and 19. East basin forage fish density was low (17th percentile in the time series), with a mean of 642 forage fish the size of age-1+ Rainbow Smelt per hectare. In the central basin, hydroacoustic densities and midwater trawl catch rates of Rainbow Smelt were some of the lowest in the time series. Emerald Shiner have been generally declining since 2011 and have been in very low abundance in the survey since 2015. In the west basin, average forage fish densities were highest on the middle transect (7,300 fish/ha), while densities peaked at the northern and southern ends of the eastern transect. Average western basin forage fish densities (6,435 fish/ha) were slightly higher than 2017 densities (4,726 fish/ha), but below the time series average (15,143 fish/ha).

Aquatic Invasive Species

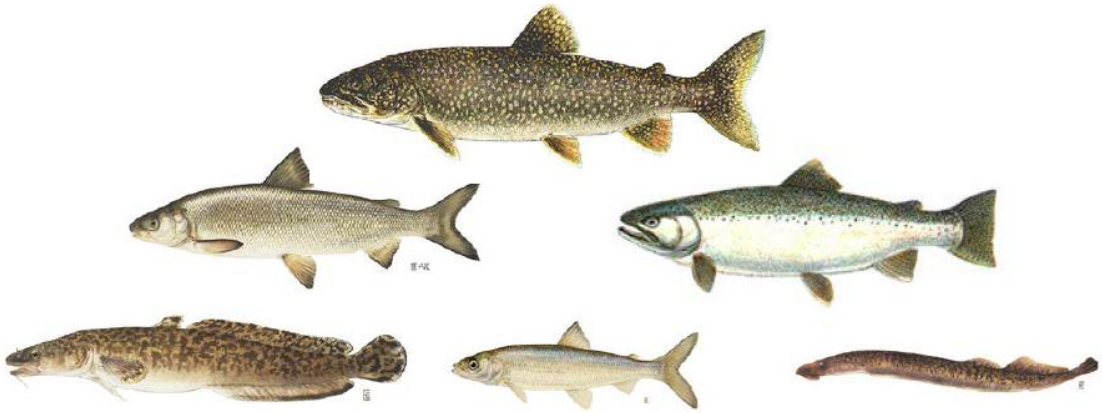
The Aquatic Invasive Species charge was developed in recognition of the need for a systematic, centralized, lake-wide effort to track records of new, non-native species that might become invasive. In 2018, FTG members reported 3 species on the Injurious Species list or other unusual non-native species. Two Rudd were captured 8 August by electrofishing in Ashtabula Harbor, which is within the known geographic range of Rudd in the Great Lakes. Fifty-seven Grass Carp were captured in Lake Erie or its tributaries in 2018. Forty-three were reported from Ohio, nine in Michigan, two in Pennsylvania, two in Ontario and one in New York.



The number of diploid, triploid, and total Grass Carp captured in Lake Erie has increased since recording began in 2012. The increase in 2014 reflects the first year state agencies began targeting capture of Grass Carp. Tubenose Goby has been captured in Ontario and Michigan waters of western Lake Erie every year since 2015. Tubenose Goby captured since 2015 have been in deeper waters and farther south and east since 2011, representing an expansion of known habitats used by this non-native species. Annual fish community surveys (electrofishing, gill nets, trawls, seines, and trap nets) provide extensive spatial coverage on Lake Erie. There were no Bighead or Silver carp captured in assessment surveys in 2018. In addition, neither species was reported from commercial or recreational fisheries. ✧

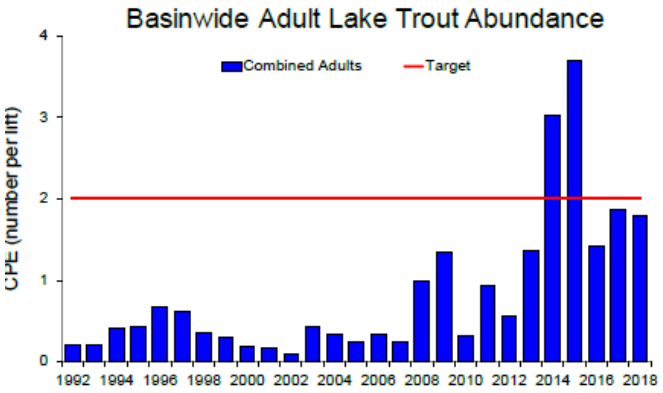
Coldwater Task Group Report, 2019 (LEC)

Lake Trout



A total of 403 Lake Trout were collected in 110 unbiased gill net lifts across the eastern basin of Lake Erie in 2018. Basin-wide Lake Trout abundance (weighted by area) was 2.9 fish per lift, which is near average for the time series but

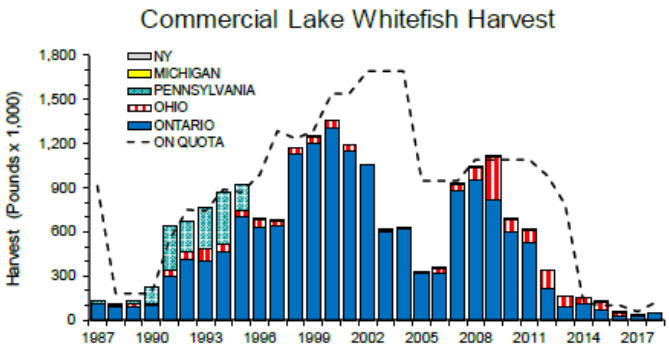
well below the rehabilitation target of 8.0 fish/lift. However, adult abundance (ages 5+) was at its fourth highest measure in the time series and slightly below the target of 2.0 fish/lift.



Lake Trout ages 3, 6, 8, and 9 were the dominate cohorts; Lake Trout older than age-10 are increasing in abundance. Finger Lakes and Lake Champlain strain Lake Trout comprise the majority of the population. The Lake Erie Lake Trout population continues to be supported by binational stocking efforts; natural reproduction has not been documented in Lake Erie despite more than 30 years of restoration efforts.

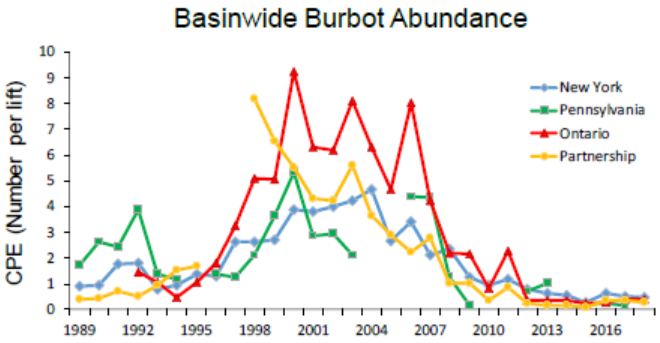
Lake Whitefish

Lake Whitefish harvest in 2018 was 52,722 pounds, distributed among Ontario (84%), Ohio (8%), Michigan (8%) and Pennsylvania (<1%). Harvest in 2018 was second lowest since 1987 but increased 67% from 2017. Gill net fishery age composition ranged from ages 3 to 15. The 2015 year class (age 3) comprised the largest fraction (65%) of the Lake Whitefish gill net fishery. Gill net surveys caught Lake Whitefish from age 0 to 33, with age 3 most abundant. Central and east basin bottom trawl surveys forecasted significant recruitment from 2014, 2015 and 2018 cohorts. These year classes are expected to improve Lake Whitefish status over the next several years. Continued, conservative harvest is recommended until the Lake Whitefish population recovers to moderate or higher levels.



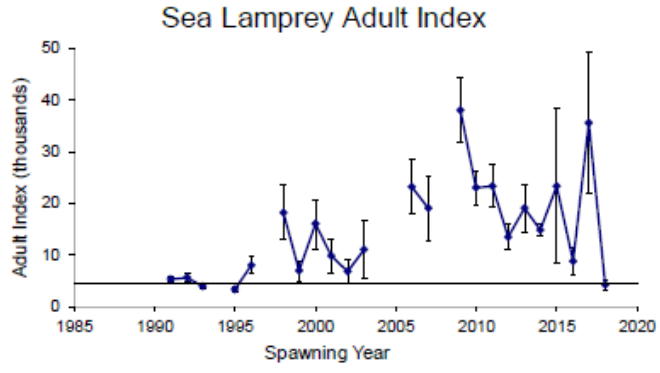
Burbot

Total commercial harvest of Burbot in Lake Erie in 2018 was 2,400 pounds. All harvest was incidental. Burbot abundance and biomass indices from annual Coldwater and Ontario Partnership Gillnet Assessment Surveys remained stable but at low levels compared to the highs in the early-2000s. The catch rate in the Interagency Coldwater Assessment Survey averaged 0.4 Burbot per lift and in the Ontario Partnership Assessment Survey averaged 0.3 Burbot per lift. Burbot in the Coldwater Assessment Survey ranged in age from 4 to 27 and mean age was 12.4 years. Round Goby was the dominant item in Burbot diets.



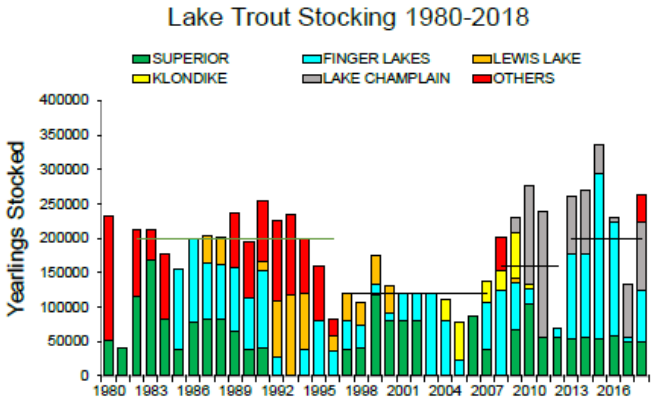
Sea Lamprey

The A1-A3 wounding rate on Lake Trout over 532 mm was 9.7 wounds per 100 fish in 2018. This was lower than the 10-year wounding rate (13.5 wounds/100 fish) but nearly 2 times the target rate of 5.0 wounds per 100 fish. Wounding rates have been above target for 22 of the past 23 years. Large Lake Trout over 635 mm continue to be the preferred targets for Sea Lamprey in Lake Erie. The Index of Adult Sea Lamprey Abundance (4,149) represents a substantial decrease compared to recent estimates and was below the target population of 4,435 for the first time since 1995. Comprehensive stream evaluations continued in 2018, including extensive detection surveys around the basin to inventory all sources contributing to the Lake Erie population.



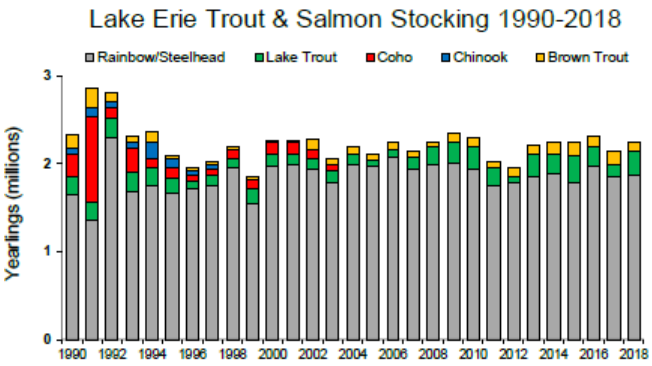
Lake Erie Salmonid Stocking

A total of 2,236,843 yearling salmonids were stocked in Lake Erie in 2018, which was near the long-term average (1990-2017). Lake Trout stocking was above targets for the fifth time in the past six years, and four different strains were stocked in 2018. By species, there were 270,275 yearling Lake Trout stocked in all three basins of Lake Erie, 98,966 Brown Trout stocked in Pennsylvania waters, 54,150 domestic Rainbow Trout stocked in New York waters, and 1,813,452 Steelhead stocked across all five jurisdictional waters.



Steelhead

All agencies stocked yearling Steelhead in 2018. The summary of Steelhead stocking in Lake Erie by jurisdictional waters for 2018 is: Pennsylvania (979,851; 54%), Ohio (478,408; 26%), New York (257,693; 14%), Michigan (62,000; 3%) and Ontario (35,500; 2%). Total Steelhead stocking in 2018 (1.87 million) was slightly above the long-term average. Annual stocking numbers have been consistently in the 1.7-2.0 million fish range since 1993. The summer open lake Steelhead harvest was estimated at 6,950 Steelhead across all US agencies in 2018, about an 23% decrease compared to 2017 estimates and below the long-term than average harvest of 8,600. Overall open lake catch rates remain near the long-term average, but reported effort remains small relative to percids. Tributary angler surveys, representing the majority (>90%) of the targeted fishery effort for Steelhead, found average catch rates of 0.56 fish/hour in 2017-18 in New York tributaries, which are among the highest in the country.



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New York Lake Erie 2018 Annual Report

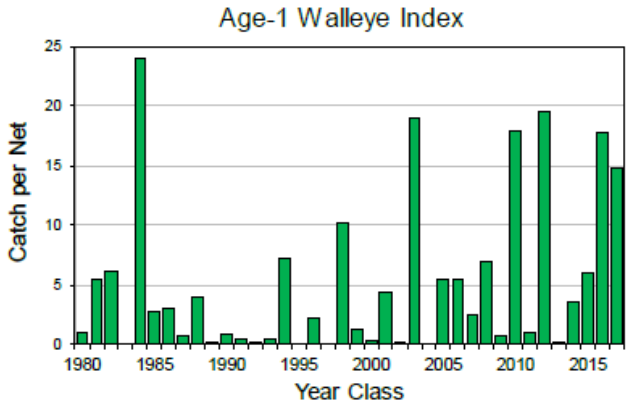
The New York State Department of Environmental Conservation's Lake Erie Fisheries Research Unit (LEFRU) is responsible for research, assessment and fisheries management activities for one of New York's largest and most diverse freshwater fishery resources. Our annual monitoring programs are designed to improve our understanding of the Lake Erie fish community, guide fisheries management, and safeguard this valuable resource for current and future generations. This document shares just a few of the highlights from the 2018 program year. Our complete annual report is available on DEC's website **at *http://www.dec.ny.gov/outdoor/32286.html*, or by contacting DEC's LEFRU office (contact information below).**

Tributary Angler Survey

New York's Lake Erie tributaries consistently produce some of the highest quality fishing for steelhead in the nation. The tributary angler survey is conducted on a three-year cycle to monitor fishery performance and determine progress towards goals stated in the Steelhead Management Plan. The average steelhead catch rate from the 2017-18 survey indicated excellent fishing quality (0.56 fish/hr.) and represented a significant improvement compared to the 2011-12 and 2014-15 surveys.

Walleye

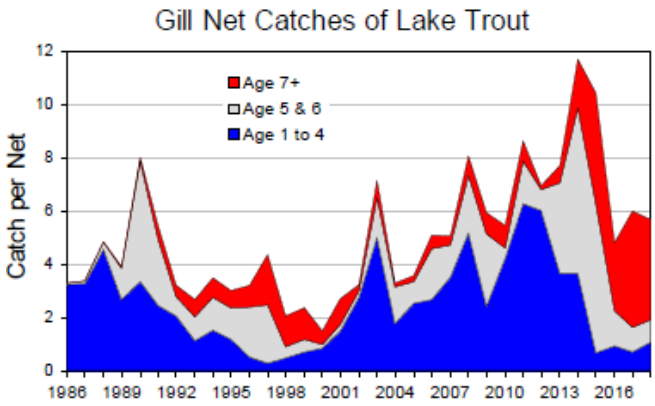
Lake Erie's eastern basin walleye resource is comprised of adult walleye from local spawning stocks and substantial contributions from summertime movements of adults from west basin spawning stocks. Walleye fishing quality in New York waters has been at record levels for the past two years with 2018 representing the highest catch rate in the 31-year survey.



Recent increases in fishing quality are largely attributable to excellent east basin spawning success in 2010, 2012, & 2016, and western basin walleye spawning success in 2015. Recent juvenile walleye surveys indicate an exceptional spawning year in 2017 for local stocks and a potentially unprecedented level of west basin spawning success in 2018. Overall good recruitment through recent years suggests adult walleye abundance and fishing quality in the east basin will remain high for the next several years.

Lake Trout Restoration

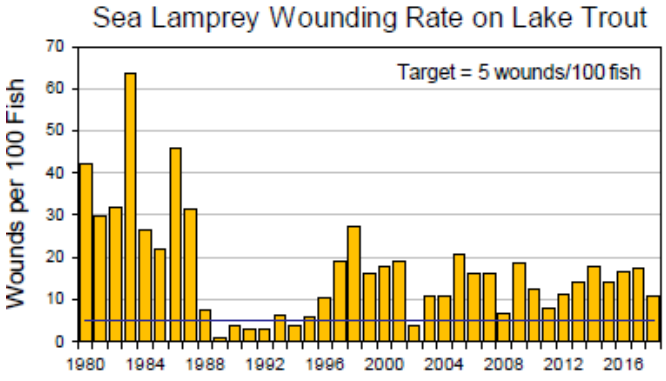
Re-establishing a self-sustaining lake trout population in Lake Erie continues to be a major goal of Lake Erie's coldwater program. Lake trout have been stocked since 1978 and annual assessments monitor progress towards lake trout rehabilitation plan restoration objectives. The overall index of abundance of lake trout in the New York waters of Lake Erie has remained stable for the past three years but below the plan objective of 8.0 fish/lift.



Adult lake trout (age 5+) abundance decreased slightly in 2018 but remains high relative to the entire time series; older fish (age 10+) are increasing in abundance. Natural reproduction has not yet been detected in Lake Erie. Significant stocking and sea lamprey control efforts must be continued to build and maintain the adult population necessary to support natural reproduction. An acoustic telemetry study began in 2016 to determine spawning locations used by stocked lake trout.

Sea Lamprey

Sea lamprey invaded Lake Erie and the upper Great Lakes in the 1920s and have played an integral role in the demise of many native coldwater fish populations. Great Lakes Fishery Commission (GLFC) coordinated sea lamprey control in Lake Erie began in 1986 in support of lake trout rehabilitation efforts, and regular treatments are conducted to reduce sea lamprey populations. Annual monitoring undertaken by

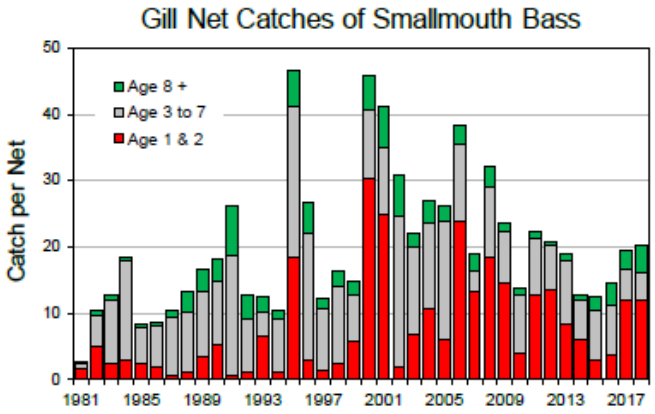


LEFRU includes observations of sea lamprey wounds on lake trout and other fish species, and lamprey nest counts on selected stream sections. Wounding rates on lake trout have been relatively stable over the past 20 years but remain well above targets. Inspections of sportfish documented sea lamprey wounding on warmwater species as well. GLFC

surveys conducted in recent years indicate the largest source of Lake Erie's sea lamprey production may be the St. Clair River rather than traditionally monitored and treated eastern basin Lake Erie streams.

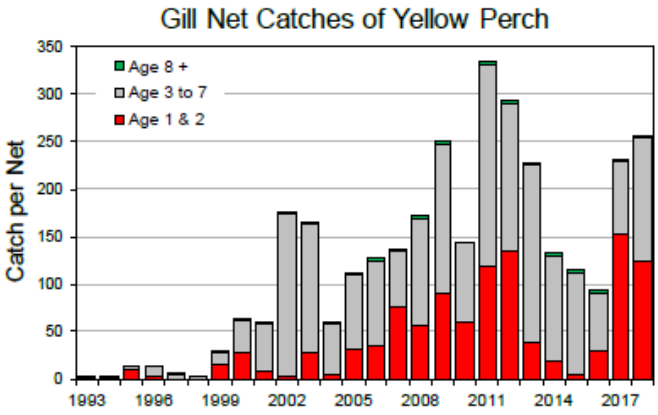
Smallmouth Bass

Lake Erie supports New York's, and perhaps the country's, finest smallmouth bass fishery. Bass fishing quality in 2018 was the second highest measured in the 31-year survey. Generally stable spawning success, coupled with very high growth rates and increasing survival produce high angler catch rates (1.3 fish/hr.) and frequent encounters with trophy-sized fish. Over the past 30 years increasing preference for catch-and-release angling has drastically reduced harvest of smallmouth to only 3% of the overall catch. Recent data indicate relatively stable overall abundance over the last decade with an increase in older bass over the last four years. Juvenile abundance measures from 2018 suggest 2016 was an above average bass year class.



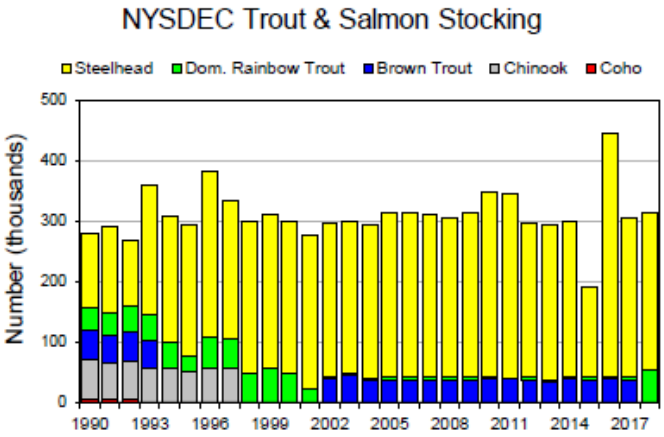
Yellow Perch

Lake Erie yellow perch populations have experienced wide oscillations in abundance over the last 30 years, from extreme lows in the mid-1990's to an extended recovery that has now lasted well over a decade. Poor recruitment in 2011-2013 resulted in a declining adult population and more recently a decline in angler catch rates. However, perch fishing quality began to increase in 2017 and 2018 and is now above the long-term average. Strong year classes observed in 2014, 2015 & 2016 should result in continued improvements in fishing quality in upcoming years. Juvenile abundance measures from 2018 suggest 2017 was a below average yellow perch year class.



Salmonid Management

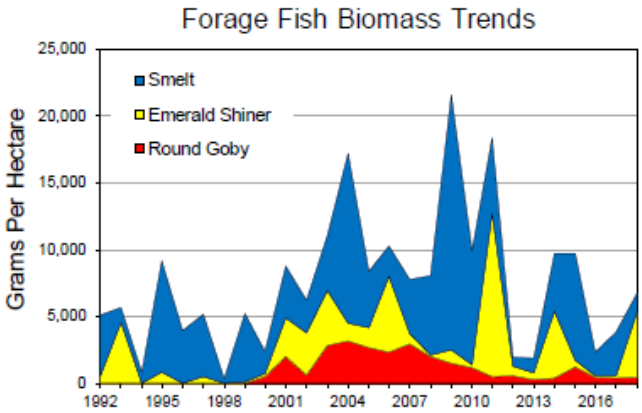
New York annually stocks approximately 255,000 steelhead and 50,000 domestic rainbow trout into Lake Erie and its tributaries to provide recreational angling opportunities. Wild reproduction of steelhead also occurs in some tributaries but remains a minor contributor to the fishery. Steelhead stocking was slightly above target in 2018 due to surplus fish. A study examining two different steelhead stocking sizes and two stocking locations was completed in 2018, providing guidance on the role of stocking size and location on adult returns with the goal of improving fishing quality.



Prey Fish

The LEFRU conducts several surveys focused on understanding factors that influence fish community structure. These include trawling to assess prey fish abundance, predator diet studies, and lower food web monitoring. Since the onset of our trawl survey, rainbow smelt have been the dominant component of the open lake forage fish community. Round goby became a prominent

component of the forage fish community following their introduction in the late 1990's. Goby abundance increased rapidly initially but has since stabilized at a lower level. In recent years overall prey fish biomass has been generally lower due in large part to reductions in adult smelt abundance and variability in emerald shiner recruitment. Overall biomass of soft-rayed forage fishes increased in 2018 due to an increase in emerald shiners and is near average levels. Over the past three years we have observed a general shift in predator diets from a reliance on smelt to a more diverse diet that includes goby, yellow perch, and other fishes. Lower trophic monitoring indicates near shore waters are within the mesotrophic productivity zone typically favored by yellow perch and walleye.



Ontario 2018 Lake Executive Summary (OMNR)

Table 1 Total annual commercial fishery landings (landed weight in pounds) and value dollars by fish and statistical district for the Canadian waters of Lake Erie, 2018.

Species	Landings by Statistical District					Total Landing	Total Value
	OE-1	OE-2	OE-3	OE-4[a]	OE-5		
Burbot	0	44	48	15	6	113	$13
Carp	6,150	830	29	0	10	7,019	$1,285
Catfish	9,579	12,907	879	36	26	23,427	$7,420
Freshwater Drum	27,852	90,848	40,068	1,098	5,524	165,390	$24,812
Gizzard Shad	821	155	0	0	0	976	$0
Lake Whitefish	34,455	8,344	1,149	348	328	44,624	$61,196
Rainbow Smelt	0	59	107,450	1,153,126	1,297,200	2,557,835	$588,252
Rock Bass	25	4	0	0	0	29	$10
Suckers	15,511	17,880	1,868	0	744	36,003	$8,337
Walleye	2,990,803	2,725,870	872,368	361,836	272,181	7,223,058	$20,534,525
White Bass	702,503	1,029,706	256,362	68,552	24,541	2,081,664	$2,089,585
White Perch	885,692	1,665,429	1,050,505	46,917	5,157	3,653,700	$2,146,277
Yellow Perch	1,262,229	1,271,365	1,694,028	144,669	241,681	4,613,972	$11,713,723
Mixed[b]	2,792	153	0	0	0	2,945	$1,726
Total Landing (lbs)	5,938,412	6,823,594	4,024,754	1,776,597	1,847,398	20,410,755	
Total Value ($)	$12,909,641	$13,152,276	$7,642,352	$1,766,882	$1,706,010		$37,177,161

In 2018, Ontario commercial landings in Lake Erie totaled 20.4 million pounds with a landed value of $37 million (**Table 1**). Harvest (pounds) in 2018 was composed of Walleye (35%), Yellow Perch (23%), White Perch (18%), Smelt (13%), White Bass (1 0%), and other species (1 %). Landed value was highest for Walleye (55%) followed by Yellow Perch (32%), White Perch (6%), White Bass (6%), Rainbow Smelt (2%) and other species(<1%). Total commercial harvest in 2018 (20.4 million pounds) was second lowest from 1960 to present, due primarily to near record low Rainbow Smelt harvest. In addition to commercial harvest summaries, results from Lake Erie Management Unit (LEMU) bottom trawl surveys, hydroacoustic forage species assessment, and Partnership gill net surveys are presented. Partnership gill net surveys were completed annually with Lake Erie's commercial fishing industry since 1989 and in cooperation with the Ontario Commercial Fisheries' Association (OCFA) since

1997. Characteristics of recreational fisheries in Fisheries Management Zone 19 (FMZ19) are described annually by the Angler Diary Program and periodically by creel surveys.

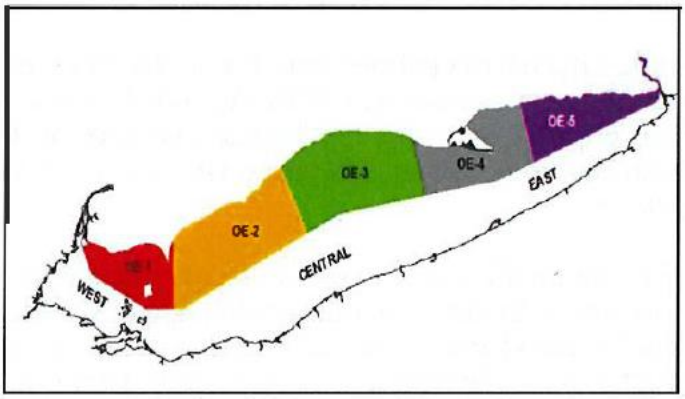


Fig 1 Ontario statistical districts (OE 1-5) of Lake Erie

Walleye

The lakewide commercial Walleye harvest (7.2 million lbs.) in 2018 represented 102% of the 7.0 million pound quota. The 2018 harvest was well above the mean harvest from 2000 to present (5.0 million lbs.) and the mean harvest from the inception of individual transferable quotas (ITQs) (1984 to present; 6.3 million lbs.; **Fig 2).** Walleye harvest (lbs.) across statistical districts OE1 to OE5 during 2018 was 41%, 38%, 12%, 5% and 4%, respectively. The commercial Walleye fishery age composition (range: 1-19) in the west and central basins (OE-1, OE-2, OE-3), consisted mostly of age 3 and age 4 fish. Age composition of walleye harvested in the east basin (range: 1-19) was dominated by ages 3, 4, 8 and 10+.

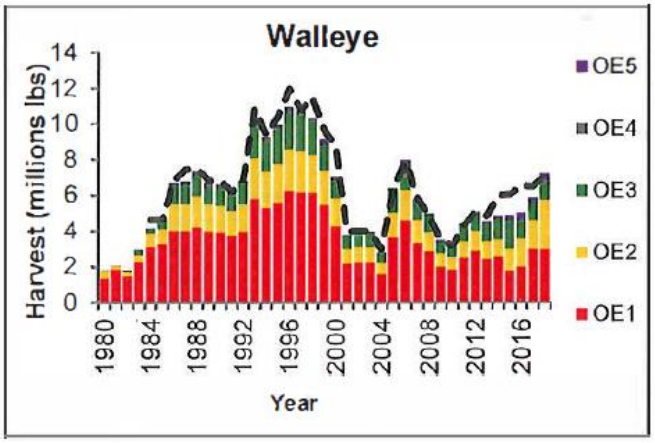


Fig 2. Walleye commercial harvest by statistical district, 1980-2018; lakewide quota presented as dotted line.

Lakewide Partnership gill net surveys were comprised of Walleye ranging in age from 0 to 15. Lakewide, gill net index catches were dominated by age 3 Walleye (2015 cohort). In west and central Lake Erie, ages 1, 2 and 0 contributed significantly to catches. In the east basin, age 2 Walleye were the second most abundant age group in 2018. In 2018, the interagency west basin trawl survey caught record high numbers of age 0 Walleye whereas catches of yearlings were near average. Commercial and recreational fishing in 2019 is expected to thrive, benefiting mostly from age 4 Walleye.

Walleye in Lake Erie are assessed and managed cooperatively by Lake Erie jurisdictions and partners. The current exploitation policy adopted in 2014 for the Total Allowable Catch (TAC) area which includes OE1-3 was developed through the Lake Erie Percid Management Advisory Group (LEPMAG) as part of a revised Walleye Management Plan (WMP). Walleye migrations from the T AC area into the east basin are evident from Great Lakes Acoustic Telemetry Observation System (GLATOS) studies. East basin fishery performance is influenced by the abundance of local and migratory stocks. Continuous improvements to our understanding of the lakewide dynamics are accomplished through ongoing cooperative research and assessment for potential incorporation into future management plans.

Yellow Perch

The commercial fishery harvested 4.6 million pounds of Yellow Perch in 2018, attaining 93% of the quota allocated. The Yellow Perch harvest in 2018 was below the mean harvest from 2000 to present (5.4 million lbs.) and the long term mean harvest from when ITQs were introduced in 1984 (5.9 million lbs.). The distribution of harvest across statistical districts OE1 to OE5 in 2018 was 27%, 28%, 37% 3% and 5%, respectively **(Fig 3**). Overall, Yellow Perch harvest in 2018 decreased 7% from 2017. Lakewide, harvest age composition was highest for ages 4, 3 and 2, respectively. Fishery age compositions varied seasonally and spatially. Age 2 Yellow Perch were significant in the harvest from OE5, but less common in 0Es1 to OE4 and were absent from OE's 2 and OEs 3 spring commercial fisheries. In general, older Yellow Perch were less common, however, 6 year old fish were common in OE3 and OE4 spring fisheries. Fisheries in 2019 will continue to benefit from the 2014 cohort in west and central Lake Erie with more contribution from younger Yellow Perch in eastern Lake Erie.

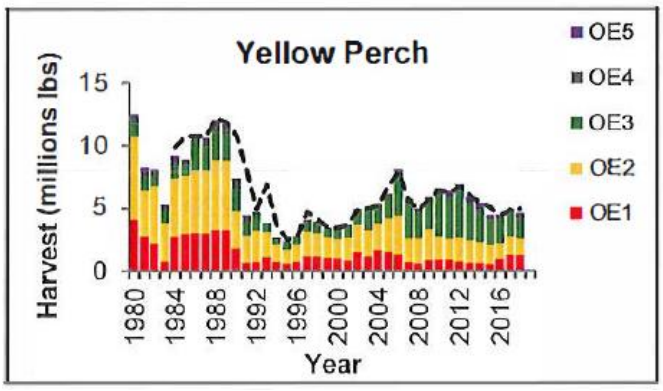


Fig 3 Yellow Perch commercial harvest by statistical district, 1980-2018; lakewide quota presented as dotted line.

Partnership gill net indices were low in the west and central basin surveys and moderate in Pennsylvania Ridge and east basin surveys assessed in 2018. Ages 4, 2, 1 and 3

represented most of the Yellow Perch caught in the west and central basin projects with variation between surveys. In the east basin survey, age 2 Yellow Perch dominated catches. Yellow Perch age composition was youngest in the east, followed by the west, east-central, west-central and Pennsylvania Ridge surveys.

Based on the Partnership gill net index, along with trawl indices of age 0 and yearlings, recruitment in 2019 is expected to be moderate in the west, east central and east basins but weaker in the west-central basin. Indices of cohort strength vary spatially, but also between gear types and age groups. Age 0 trawl abundance indices in 2018 were strong in the west and east basins, indicating good recruitment potential for 2020, depending on survival of juvenile fish. Following a process developed by the Lake Erie Percid Management Advisory Group (LEPMAG), a broader assemblage of interagency Yellow Perch recruitment indices are analyzed by the Yellow Perch Task Group using multi model inference to forecast age 2 recruitment by management unit annually.

A bottom trawl survey began in 2016 in Ontario waters of the central basin after fall turnover. OMNRF and United States Geological Survey (USGS) research vessels completed this extensive survey again in 2018. In 2018, catch rates of age 0 Yellow Perch were 50% lower compared to 2017 while yearling Yellow Perch were 47% higher than observed in 2017. Catch rates were lower in the west-central area than in the east-central for age 0 and yearlings. The benefits of this survey will accumulate over continued years of field work.

Ontario gill net fishery harvest and effort data, along with trawl and gill net survey data contribute to interagency assessment and quota recommendations. Ontario commercial and recreational fishery representatives, U.S. management agencies and stakeholders, and the Quantitative Fisheries Center at Michigan State University have been collating in the Lake Erie Percid Management Advisory Group (LEPMAG) process. In 2019, the LEPMAG selected a .new Yellow Perch harvest policy, setting the foundation for the Lake Erie Yellow Perch Management Plan.

Lake Whitefish

Declining Lake Whitefish recruitment and abundance in Lake Erie resulted in major quota reductions in Ontario beginning in 2014 and continuing until 2017, with a slight increase in 2018 **(Fig 4).** The commercial harvest of Lake Whitefish is currently incidental and mainly occurs in large mesh gill net fisheries targeting Walleye and White Bass and to a lesser extent in trawls targeting Rainbow Smelt and in small mesh gill nets. Lake Whitefish harvest in 2018 was 44,624 pounds, distributed across OE1 to OE5 as follows: 77%, 19%, 3%, <1% and <1% **(Fig 4).** The age composition of Lake Whitefish in the large mesh gill net fishery was comprised mainly of fish between the ages of 3 and 15, with age 3 (2015 year class), being most abundant. Age 4 Lake Whitefish was the 2nd most
abundant age group represented in the large mesh gill net fishery.

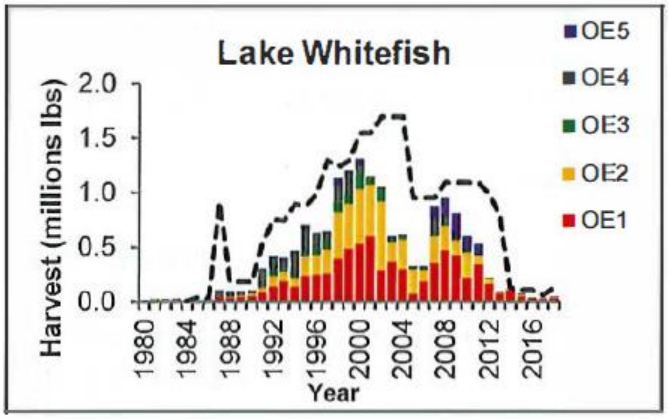


Fig 4 Lake Whitefish commercial harvest by statistical district, 1980-2018.Lakewide quota presented as dotted line.

Partnership gill net catch rates in central and eastern Lake Erie improved in 2018, due mainly to contributions from age 3 (2015 cohort) and 4 (2014 cohort) Lake Whitefish. The age composition from central basin, Pennsylvania Ridge and east basin surveys ranged from
0-15, with a mean age of 3.4, reflecting the appearance of new year classes during recent years. Young-of-the-year Lake Whitefish were also present in the Long Point Bay offshore trawl survey in 2018. Fishery and survey data indicate that young fish are contributing to the recovery of the Lake Whitefish population. Future Lake Whitefish status is dependent upon ongoing recruitment and conservative management. OMNRF is working with partners to improve assessment and develop management strategies for Lake Whitefish through collaborative efforts of the Lake Erie Committee,· the Coldwater Task Group, the Great Lakes Telemetry and Observation System (GLATOS) network, the Great Lakes Fishery Commission and the Data Deficient Work Group.

Rainbow Smelt

Although Rainbow Smelt are not native, they are a dominant forage species in Lake Erie and contribute significantly to Ontario's commercial fish landings. Rainbow Smelt harvest in 2018 (2.6 million lbs.) amounted to 16% of the lakewide quota (15. 5 million lbs.) **(Fig 5).** Harvest in 2018 was well below the mean harvest from 2000 to present (7.2 million lbs.) and below the long term mean harvest from when ITQs were introduced in 1984 (11.3 million lbs.). Landings of Rainbow Smelt in 2018 were greatest in OE5 (51%), followed by OE4 (45%) and OE3 (4%).

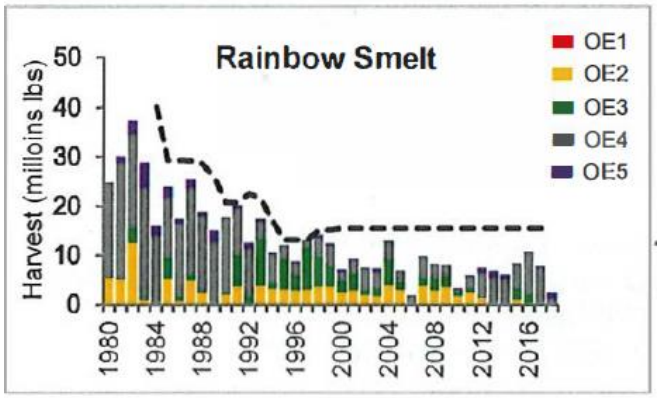


Fig 5 Rainbow Smelt commercial harvest by statistical district,1980-2018.Lakewide quota presented as dotted line.

Harvest age composition ranged from 1 to 7 with ages 1 and 2 most abundant in the trawl harvest. Long Point Bay (LPB) trawl survey catch rates of age 0 and older Rainbow Smelt were below average in 2018. Hydroacoustic surveys in eastern Lake Erie describe the abundance and distribution of Rainbow Smelt available as forage and to the Rainbow Smelt fishery. Hydroacoustic analyses described Rainbow Smelt abundance (642 fish/hectare) in 2018 as the 171h percentile of the 12 year time series (2007 -2018).

White Bass

White Bass harvest, which is not regulated by quota in Lake Erie, totaled 2.0 million pounds in 2018. Harvest in 2018 was below the mean harvest from 2000 to present (3.5 million lbs.) and the long term mean harvest since 1984 (3.1 million lbs.). Distribution of harvest across statistical districts OE1 to OE5 in 2018 was 34%, 49%, 12%, 3% and 1%, respectively **(Fig 6).** The White Bass harvest was composed of ages ranging from 2 to 13; age 6 was most abundant.

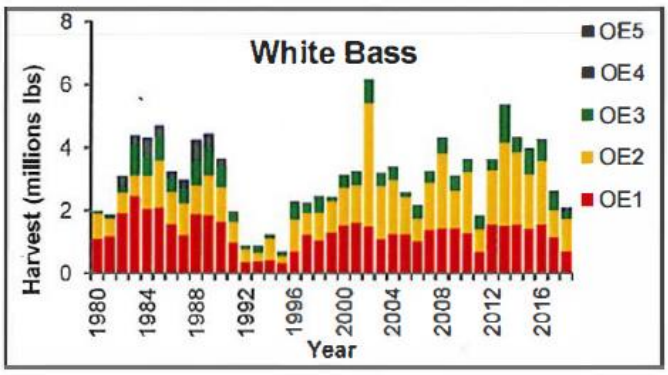


Fig 6 White Bass commercial harvest bystatistical district, 1980-2018.

White Bass Partnership abundance indices were low in the west, and central basin surveys in contrast with the Pennsylvania Ridge and east basin surveys where catch rates were above average in 2018. Catch rates declined from 2017 surveys by varying degrees across the lake. Ages 5 and 2 were the most abundant age groups lakewide; however, age 0 White Bass contributed more to the west-central basin age composition than other age groups. The youngest age composition observed in 2018 was in the west-central basin, followed by the east-central, west, Pennsylvania Ridge and east basin. International agency and stakeholder collaboration from the Data Deficient Working Group has focused on White Bass status as part of the Marine Stewardship Council certification process for the Walleye gill net fishery. White Bass are a significant by-catch species in Walleye gill nets and MSC placed a condition on the Walleye fishery requiring that White Bass be sustainably harvested in Lake Erie. The DDWG developed a White Bass assessment model with biological reference points to evaluate the sustainability of the White Bass harvest and found that the current harvest levels are within biological limits. As a result, MSC has waived the White Bass condition for the Walleye gill net fishery.

White Perch

The White Perch is a non-native species that is not managed by quota. The commercial harvest of White Perch in 2018 totaled 3.7 million lbs. The 2018 harvest exceeded the mean harvest from 2000 to present (2. 0 million lbs.) and was above the long term mean harvest since 1984 (2.1 million lbs.). White Perch harvest across statistical districts OE1 to OE5 in 2018 was: 24%, 46%, 29%, 1% and <1% (**Fig 7**). The White Perch harvest was composed of ages ranging from 2 to 13. Ages 3, 6, 4 and 7 White Perch were prevalent in the large mesh nets. Ages 3 and 2 White Perch were common in the small mesh nets with age 3 and 6 most common overall.

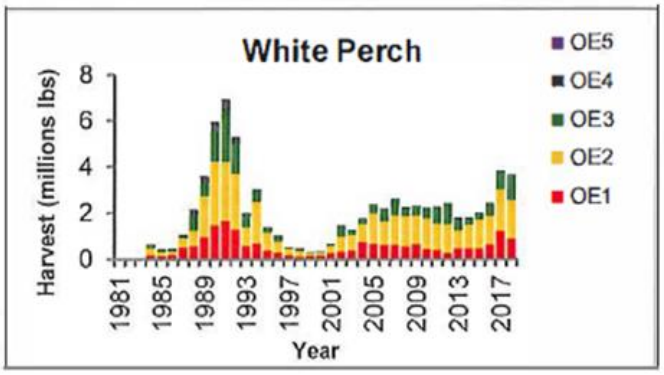


Fig7 White Perch commercial harvest by statistical district, 1981-2018.

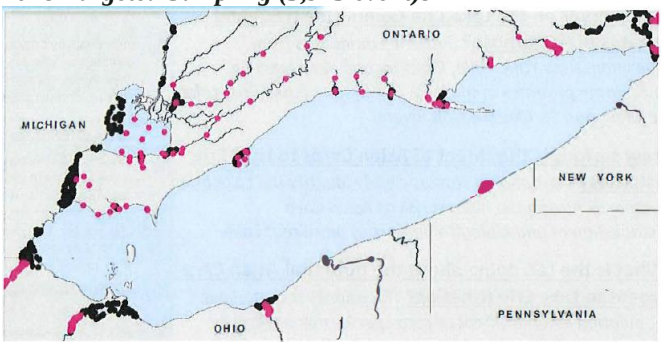
In 2018, Partnership gill net survey catch rates of White Perch were low in the west basin, moderate in central basin and the Pennsylvania Ridge surveys and higher in the east basin. Catch rates decreased from 2017 in the west, west-central basin and Pennsylvania Ridge surveys but increased significantly in the east-central and east basin surveys. Ages 0 to 9 were present lakewide in 2018 with ages 3 and 2 most abundant in varying proportions among surveys.

✧

Bighead & Silver Carp in the Lake Erie System 2018 (LEC)

- **No positive detections of either Bighead or Silver Carp eDNA in 2018 .**
- **No Bighead or Silver Carp were observed in targeted sampling, agency core fish community assessments or commercial and recreational fisheries**
- **Bighead Carp have not been observed since 2000.**
- **Silver Carp have never been observed in the system.**

2018 Targeted Sampling (3,913 event)s



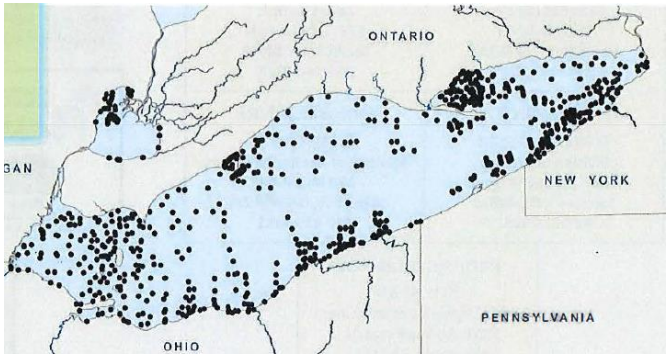
No Bighead or Silver Carp collected from standard gears, No detections of Bighead or Silver Carpusing eDNA

Gear used

Electrofishing, gill nets, trawls, seines and trap nets as well as commercial hoop net, pound net, seine, and trawl fisheries, and non-Percid recreational fisheries.

Sampling by

MDNR, NYSDEC, ODNR, OMNRF, PFBC & USGS



Effort of major fisheries monitored by LEC jurisdictions during 2018

Fishery	West Basin	Central Basin	East Basin
Ontario	11,025	24,411	2,842
U.S commercials	4,755	3,807	459
U.S. Rec anglers	2,1238,625	1,388,577	499,975

The threat of Asian Carps to Lake Erie fisheries

Bi-national studies clearly identify the Lake Erie system as having the highest risk of Asian Carp establishment and biological impact of any Great Lake

Bighead & Silver Carp History in Lake Erie

Individual adult Bighead Carp have been captured by commercial fishers in Sandusky Bay, OH (1995) and near Point Pelee , ON and Cedar Point, OH (2000). Silver Carp have never been observed in the system.

eDNA surveillance

2011- 2012: sampling in Sandusky River(R) & Bay (B) and Maumee R/B (Notre Dame and USACE)

- Bighead Carp, 4 positive (+) detections/200 samples in Sandusky Bay in 2011; 0 (+)/1SO samples in 2012.
- Silver Carp, 200 samples in Maumee Bay in 2011; 150 samples (Sandusky R/B) and /350 samples (Maumee R/B) in 2012.

2013: 817 samples, lakewide (USFWS and DFO) -Silver Carp, 1 (+)I 207 samples, Maumee River, OH.

2014: 1,457 samples, lakewide (USFWS and OMNRF)

- Bighead Carp, 1 (+)I 30 samples Canard River and 2 (+) /129 samples , Grand River, ON.

2015: 1,997 samples, lakewide (USFWS and OMNRF)

- Silver Carp 2 (+)I 54 samples, in the hames R.; 1 (+)I 42 samples, Colchester Harbour, ON.

2016: 1,520 samples, lakewide (USFWS and OMNRF)

- Bighead Carp, 1 (+)I 72 samples , Thames R., ON.

Some of the (+) eDNA signals, have proven difficult to replicate and/or have possible sources of contamination; e.g. 2016 (+) in only 1/3 replicates, collected at one site, close to Water Pollution Control Plant outflow. Regardless, No Bighead or Silver Carp have been found in follow-up assessment, or in targeted or core fish assessment programs in the Lake Erie system. ✧

Status of Fisheries in Michigan Waters of Lake Erie/Lake St. Clair, 2018

Highlights for 2018

The purpose of this report is to provide an update on the status of the fisheries in the Great Lakes and connecting waters of Southeast Michigan. Sources of information used in compiling this report include creel surveys, charter boat reports, an angler diary program, the Michigan Department of Natural Resources (MDNR) Master Angler program, commercial fishery records, and fisheries survey results.

Some of the highlights described in detail include:

- Recreational anglers spent over 411 thousand hours fishing each Lake St. Clair and Lake Erie in 2018, for a total of 822 thousand hours
- The 2018 Lake Erie Walleye year class as assessed by the August trawl survey was the largest in our survey time series, which started in 2014
- Lake Erie Walleye harvest by non-charter anglers more than tripled to 176 thousand fish compared to 2017
- More master angler Smallmouth Bass were awarded in Lake St. Clair in 2018 than any previous year
- Smallmouth Bass mortality rates dropped compared to 2017, and have remained steady or declined since 2012, despite changes in Michigan's fishing regulations
- Ten Muskellunge were implanted with acoustic tags in Anchor Bay of Lake St. Clair in 2018, providing a growing dataset of Muskellunge movement
- Strong year classes of Yellow Perch were observed in the Michigan waters of Lake Erie and Lake St. Clair

Lake Erie

Sport Fishery Summary

The annual creel survey conducted by the MDNR during 2018 produced an effort estimate of 411,581 hours of fishing and a total harvest estimate of 490,372 fish **(Table 1**) for Michigan's Lake Erie non-charter sport fishery. Angling effort increased slightly **(Fig 1)** compared to 2017 (2017 effort: 405,855 hours), but harvest declined sharply compared to harvest in 2017 (948,062 fish). Harvest was dominated by Yellow Perch and Walleye in 2018 (99% of total harvest).

In 2018, Michigan charter boat operators reported a total harvest of 40,256 fish of all species from Michigan waters of Lake Erie. Walleye and Yellow Perch made up over 99% of all fish harvested. The total number of charter excursions was up 10% from 2017, to 1,117, the highest level observed since 2006.

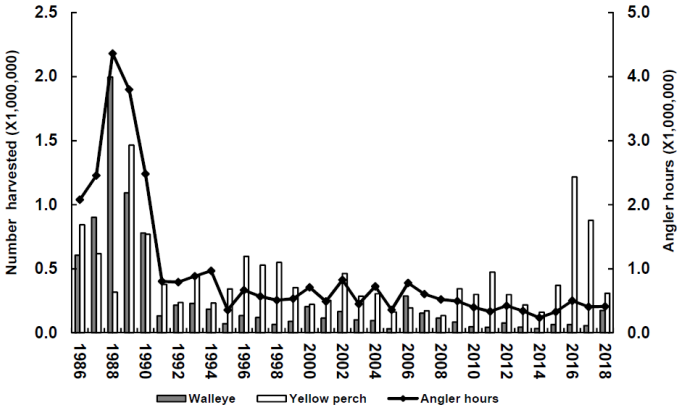


Fig 1 Estimated harvest and effort for Michigan's Lake Erie sport fishery, 1986-2018

Yellow Perch

A total of 314,807 Yellow Perch were harvested by non-charter anglers in 2018, a decline of 65% compared to 2017. Total harvest rate declined to 0.76 fish/hr compared to 2.17 fish per hour in 2017 **(Fig 2).** The targeted Yellow Perch harvest rate (harvest rate of anglers specifically targeting Yellow Perch) was 2.28 fish/angler hour in 2018. 33% of total fishing effort was directed at Yellow Perch.

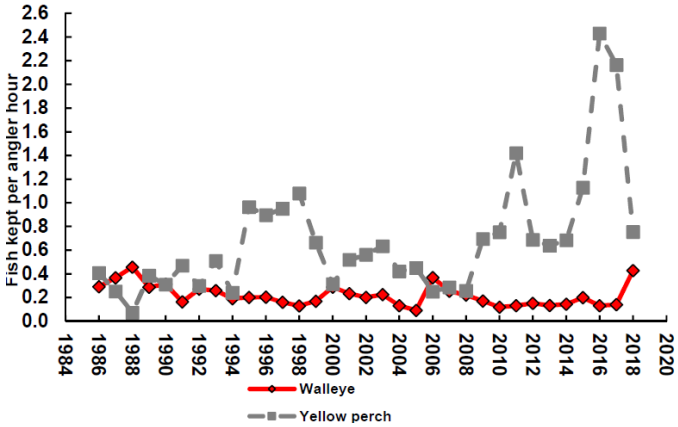


Fig 2-Walleye and Yellow Perch harvest rates for Michigan's Lake Erie sport fishery, 1986-2018

Yellow Perch harvest was dominated by age 4 fish (2014 year-class), which accounted for 46% of the total harvest **(Fig 3).** The overall average length of Yellow Perch harvested in the sport fishery in 2018 was 9.2". The mean length-at-age for Yellow Perch taken in the Michigan sport fishery increased for ages 2, 3, and 4 fish in 2018 relative to 2017, likely reflecting lower densities of fish.

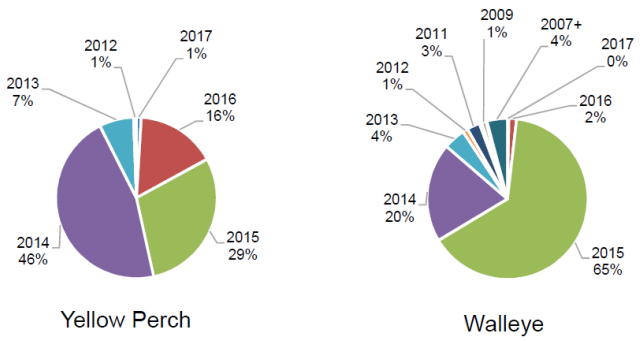


Fig 3 Year-class contribution to Michigan sport harvest for Yellow Perch and Walleye from Lake Erie in 2018

The Yellow Perch charter total harvest rate declined from 2017 to 0.83 fish per hour (2017: 2.002 fish per hour), but still exceeded the longterm mean of 0.70 fish/angler hour for the 9th consecutive year**.** Targeted Yellow Perch charter catch rate was 4.05 fish per hour almost twice as high as the targeted catch rate for non-charter boat anglers (2.19 fish per hour).

Finally, we captured 678 age-0 Yellow Perch per 10-minute tow during our August trawl survey, the highest observed catch rate since 2014.

Walleye

Non-charter anglers harvested an estimated 176,089 Walleyes in Michigan waters of Lake Erie **(Fig 1),** a substantial increase from 2017 (56,938 fish). Total Walleye catch rate was 0.43 fish/hr **(Fig 2),** up from 0.14 fish/hr in 2017, and above the long term mean. Targeted Walleye catch rate (the catch rate of anglers specifically targeting Walleye) was 0.63 fish/hr, with 64% of total angler effort on Lake Erie directed towards Walleye.

Harvest of Walleye during the 2018 on-site creel survey indicated that harvested Walleye were primarily comprised of age 3 and 4 individuals (2014 and 2015 year-classes), collectively representing 85% of the harvest **(Fig 3).** However, the 2015 year class (age 3) singlehandedly made up 65% of the catch. Age 5 and older Walleye accounted for only 15% of the harvest (Figure 3). The average length of Walleye harvested in the sport fishery in 2018 was 17.9 inches, nearly an inch lower than in 2017 and reflecting the high abundance of age 3 walleye from the 2015 year class.

The total harvest rate of Walleye reported by charter operators in 2018 was 0.97 fish per hour, which was above the long-term average of 0.72 fish per hour for the first time since 2007. The observed total harvest rate was the highest since 1998. Charter targeted harvest rate was 1.22 fish per hour, about twice as high as for non-charter anglers (targeted harvest rate of 0.63 fish per hour).

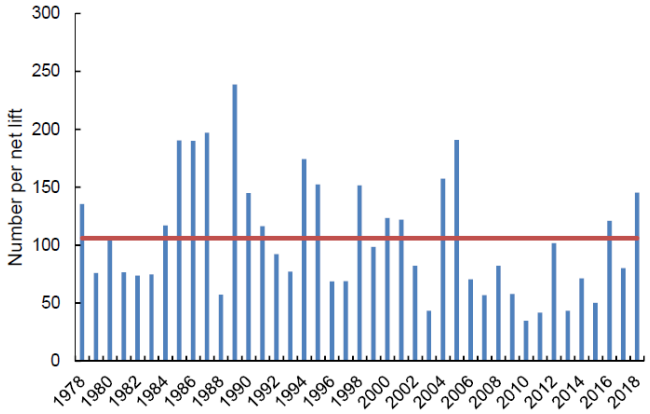


Fig 4 Average total Walleye catch per unit effort, by year for Michigan Lake Erie index gill nets, 1978-2018. The horizontal line represents the average for the time series.

The average Walleye gillnet catch rate for the two index sites (145 fish/lift) in 2018 was almost double that observed during 2017 **(Fig 4**), and above the long-term average. Three-year-old fish from the robust 2015 year class accounted for 35% of the total catch, followed by age 1 (2017 year class; 34%) and age 2 (2016 year-class; 22%) walleye.The average catch rate of yearling Walleye (50 fish/lift) increased 276% from 2017 and was above the average of 37 fish/lift for the 1978-2018 time series **(Fig 5**), which reflects the relatively higher abundance of the 2017 year class compared to the smaller 2016 year class. The 2015 Walleye year class, which became fully recruited to the fishery in 2018, is expected to be a strong contributor to the Lake Erie fishery in upcoming years.

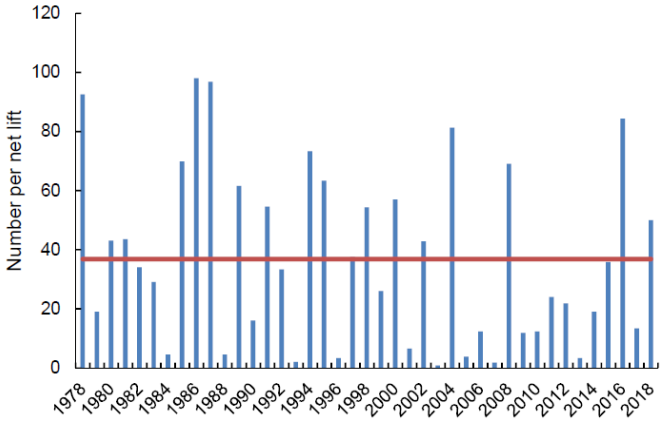


Fig 5 Average yearling Walleye catch per unit effort for Michigan Lake Erie index gill nets,1978-2018. The horizontal line represents the average of the time series.

Additionally, the 2018 year class, sampled by our August trawl survey, was the highest observed (20 fish/10-minute tow) since the survey began in 2014. This indicates that 2018 was an exceptional year for Walleye reproduction. Pending the overwinter survival of these fish, the 2018 year class should be a strong contributor to the fishery in the future.

Table 1 Estimated harvest, total harvest rate, effort and released catch for Michigan's 2018 Lake Erie non-charter boat fishery. Released numbers represent legal sized fish where applicable.

	Harvest	Month							
Species	rate (fish/hr)	Apr	May	Jun	Jul	Aug	Sep	Oct	Season
HARVEST									
Yellow Perch*	2.280	25	2,975	6,084	55,970	148,477	74,501	26,773	314,807
Walleye*	0.626	6,885	56,584	73,658	30,736	8,017	68	114	176,089
Channel Catfish	0.002	0	139	124	305	80	144	0	792
White bass	0.012	15	3,970	672	35	51	68	40	4,851
White Perch	0.011	51	1,534	837	1,964	33	0	0	4,419
Freshwater Drum	0.002	0	94	224	229	118	14	0	679
Smallmouth Bass	<0.001	0	0	0	0	65	0	0	65
Total Harvest	1.191	6,998	59,768	79,902	89,267	157,125	70,384	26,928	490,372
EFFORT									
Angler hours		20,713	67,824	89,316	96,834	90,784	30,479	15,631	411,581
Angler trips		3,870	13,384	19,954	21,439	16,974	6,274	3,484	85,379
RELEASED									
Yellow Perch*	0.439	18	387	1,225	7,185	27,837	21,453	5,342	63,447
Walleye*	0.068	900	4,179	10,521	2,434	23	0	34	18,091
Largemouth Bass	0.023	0	36	750	1,221	321	3,320	3,900	9,548
Smallmouth Bass	0.005	0	193	107	367	626	316	302	1,911
White bass	0.222	1,153	43,958	15,071	20,860	7,209	1,866	1,086	91,203

Forage fish

A total of 33,670 forage fish representing 17 different species were captured during 8 trawl tows for an average catch-per-effort (CPE) of 4,277 fish/10-minute tow. Age-0 White Perch had the highest average CPE (3,240 fish/10-minute tow). Trout Perch (139 fish/10 minute tow), Gizzard Shad (104 fish/10-minute tow), Round Goby (26 fish/10-minute tow), White Bass (21 fish/10-minute tow), Mimic Shiner (18 fish/10-minute tow), and Freshwater Drum (18 fish/10-minute tow) were also substantial contributors to the catch. Emerald Shiner, Spottail Shiner, Silver Chub, age-0 Smallmouth Bass, Logperch, Tubenose Goby, Rock Bass, and Johnny Darter were also captured.

The 2018 forage catch rate was the highest overall forage CPE observed since Michigan's modern day bottom trawl survey began in 2014. Since this was only the fifth annual trawl survey in recent memory, it is difficult to put the catch rates that we observed into a broader context for the West Basin of Lake Erie. However, Michigan's young-of-year Yellow Perch and Walleye CPE paralleled those of the decades-long Ontario and Ohio bottom trawl survey, which indicated a record Walleye year class, and near record Yellow Perch year class, in 2018.

Commercial Fishery Summary

Since 1979 the commercial fishery in Michigan waters of Lake Erie has primarily harvested rough fish species using seines in the shallow embayments along the shoreline, although a small-mesh trap net license has been active since 2006. In 2018, a total of three Michigan commercial fishing licenses were active on Lake Erie. The 2018 commercial harvest included 12 types of fish for a total of 308,517 pounds**.** In combination, Gizzard Shad (38%), Channel Catfish (17%), White Bass (16%) and Common Carp (11%) accounted for 83% of the total harvest by weight. The total value of the 2018 Lake Erie commercial harvest from Michigan waters was estimated at $176,782. The 2018 total harvest was the lowest since 2004 with harvest declining for all species besides Gizzard Shad, Sucker species, and Whitefish**.** The harvest of Common Carp was the lowest since 1981.

St. Clair River – Lake St. Clair

About the Lake St. Clair Fisheries Research Station

The Lake St. Clair Fisheries Research Station is a unit of the Research Section of the MDNR Fisheries Division. The station conducts research and stock assessment on fish populations of Lake Erie, the St. Clair-Detroit River System, and Saginaw Bay. Results of this work are instrumental in fisheries management decisions affecting these waters. The station works closely with fisheries managers in the MDNR's Lake Erie Management Unit and routinely collaborates in joint projects with other state and federal partner agencies, local units of government, non-government organizations, academic institutions, and stakeholder groups.Federal Sport Fish Restoration (SFR) Program dollars provide support for the majority of the station's assessment activities. The SFR Program provides grant funds to restore and better manage America's fishery resources through excise taxes on the purchase of fishing equipment, motorboat and small engine fuels, import duties, and interest. For more information on the SFR Program: http://wsfrprograms.fws.gov/Subpages/GrantPrograms/SFR/SFR.htm.

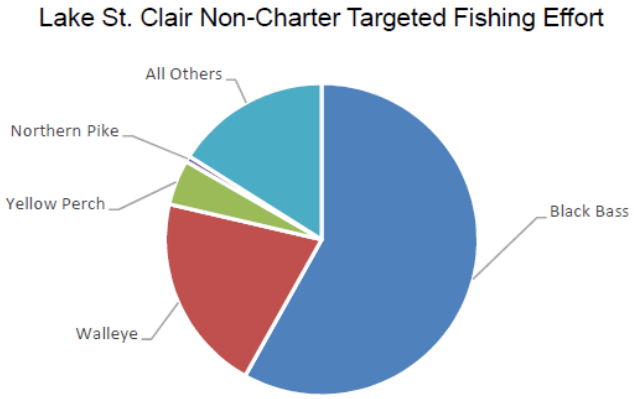


Fig 6 Proportion of recreational angling effort targeting various Lake St. Clair fish species.

Sport Fishery Summary

In 2018 the MDNR conducted a creel survey of the American waters of Lake St. Clair. Non-charter recreational anglers spent 411,416 hours fishing Lake St. Clair; down from 540,779 hours in 2017). Anglers seeking Black Bass (Smallmouth Bass and Largemouth Bass) accounted for the majority of fishing effort on Lake St. Clair **(Fig 6**; 58% of total fishing effort). Non-charter recreational anglers harvested a total of 87,865 fish, down from 137,511 fish in 2017 **(Table 2**). Walleye made up 52% of the total harvest in 2018.

Table 2 Estimated harvest and total harvest rate for the 2018 Lake St.Clair non-charter boat fishery.

	Harvest	Month							
Species	rate (fish/hr)	Apr	May	Jun	Jul	Aug	Sep	Oct	Season
HARVEST									
Yellow Perch*	0.506	1,949	229	2,472	2,514	5,817	2,021	1,668	16,670
Walleye*	0.489	47	14,046	16,197	9,855	3,130	1,953	122	45,351
Bluegill	0.029	587	189	3,400	4,579	1,047	538	1,509	11,849
Pumpkinseed	0.007	1,612	43	203	668	70	107	64	2,767
Smallmouth Bass*	0.012	0	350	2315	243	714	72	0	3,695
Rock Bass	0.009	71	1,977	1,107	49	316	0	0	3,520
Total Harvest	0.214	4,599	17,773	26,692	18,541	11,459	5,139	3,662	87,865

For the St. Clair-Detroit River System (St. Clair River, Lake St. Clair and Detroit River), charter boat anglers reported a harvest of 29,271 fish of all species. Walleye accounted for (79%) of total charter harvest in 2018.

In 2018, charter boat captains reported a total of 2,198 excursions on the St. Clair-Detroit River System a 9% increased from 2017, continuing a trend of increased charter activity since 2012.

Yellow Perch and Walleye

A total of 16,670 Yellow Perch were harvested by non-charter recreational anglers in 2018, yielding a total non-targeted harvest rate of 0.04 fish/hr. Both harvest and total catch rate were down compared to 2017 (2017 harvest: 66,946; 2017 total harvest rate: 0.12 fish/hr). However, anglers targeting Yellow Perch accounted for only 5% of total fishing effort, such that targeted catch rate for Yellow Perch was 0.51 fish per hour.

Charter anglers harvested a total of 4,043 Yellow Perch in the American waters the St. Clair-Detroit River System, up slightly from 2017 (3,227 fish). Total charter catch rates of Yellow Perch were also up slightly to 0.09 fish per hour, but still well below the long-term average of 0.45 fish per hour**.** Targeted charter Yellow Perch harvest rates were 3.01 fish per hour, nearly six times higher than for non-charter anglers.

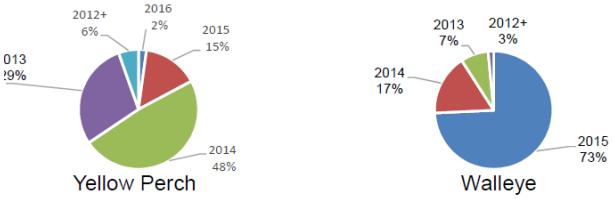


Fig 7 Year-class contribution to Michigan sport harvest for Yellow Perch and Walleye from Lake St. Clair in 2018

Walleye were the most commonly harvested species in the American waters of Lake St. Clair by non-charter recreational anglers during 2018, accounting for 51% of the total harvest. A total of 45,351 Walleye were harvested, yielding a total harvest rate of 0.11 fish/hr, both up slightly from 2017. A total of 21% of all fishing effort specifically targeted Walleye, with a targeted catch rate of 0.49 fish per hour.

Charter anglers harvested a total of 23,179 Walleye from the American waters of the St. Clair- Detroit River system, up 46% from 2017 (16,270 fish harvested). Total charter harvest rates were 0.51 fish per hour, above the long-term average of 0.22 fish per hour, and the highest observed in the time series**.** Targeted charter catch rate of Walleye was 0.92 fish per hour, just under twice the rate of non-charter anglers fishing Lake St. Clair.

Similar to Lake Erie, biological data were collected from Walleye and Yellow Perch during the 2018 on-site Lake St. Clair creel survey. The age composition of harvested Walleye was dominated by age 3 and age 4 (2015 and 2014 year-class), which together accounted for 89% of the harvest **(Fig 7.** The average length of Walleye harvested in the sport fishery in 2018 was 16.95inches.

Yellow Perch harvest by recreational anglers was dominated by age 4 and age 5 fish (2014 and 2013 year-classes), which together accounted for 77% of the total harvest **(Fig 7**). The average length of yellow perch harvested in the sport fishery in 2018 was 8.65 inches.

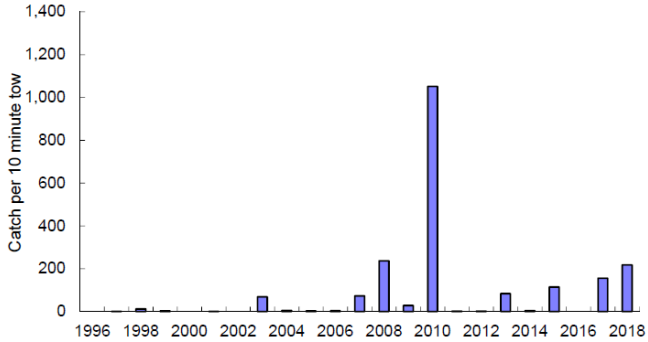


Fig 8 Year-class strength for Yellow Perch in Lake St. Clair as indicated by fall trawl age 0catch rates, 1996-2018.

There are currently no Walleye-specific programs taking place in the St. Clair River and Lake St. Clair. However, Walleye catch rates in the trap net survey were the highest on record in 2017 and second highest in 2018**.** This is likely a result of the large 2015 Walleye year class from Lake Erie. Age-0 Walleye are rarely captured during the fall trawl survey, indicating low amounts of reproduction from Lake St. Clair and its tributaries.

Yellow Perch reproductive success as indexed by age-0 catch rate in the fall trawl survey increased from 2017 and was the highest observed since 2010 **(Fig 8**. However, high reproductive success doesn't necessarily lead to increased recruitment to the adult population. For example, 2017 age-0 Yellow Perch catch rate in the fall trawls is the second highest since 2010; however, this did not translate to higher catch rates of age-1 fish in the spring 2018 trawls **(Fig 9).**

Growth of Yellow Perch in Lake St. Clair continues to be below the statewide average. Mean-length-at-age for Yellow Perch is below the statewide average at all consistently observed ages (age-1 to age-5**.** Additionally, Yellow Perch growth is lower than it has been historically as seen by mean-length-at-age estimates from pervious time periods.

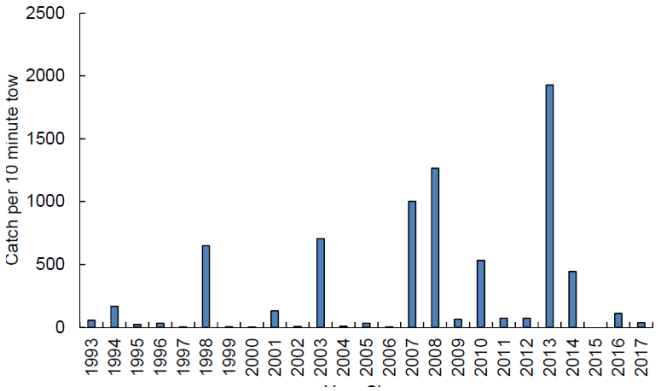


Fig 9 Strength of Yellow Perch year classes as assessed by June trawls. Note: survey year is year class + 1.

Black Bass (Smallmouth Bass and Largemouth Bass)

A total of 172,944 legal sized Black Bass (145,491 SMB and 27,453 LMB) were captured and released by non-charter anglers compared with 4,065 Black Bass (3,695 SMB and 370 LMB) harvested on Lake St. Clair in 2018. Total capture rate of legal sized fish was 0.43 fish per hour, and total harvest rate was 0.01 fish per hour. A total of 58% of all fishing effort specifically targeted Black Bass, yielding a targeted total capture rate of legal sized fish of 0.57 fish per hour, and a targeted harvest rate of 0.012 fish per hour.

For charters targeting Smallmouth Bass in the St. Clair-Detroit River System 14,600 fish were captured and released, while 657 fish were harvested resulting in a total release rate of about 96%. Targeted Smallmouth Bass catch rates were 1.46 fish per hour, about 2.5 times higher than non-charter anglers fishing Lake St. Clair.

Statistics from the Master Angler program indicate that Lake St. Clair is one of the premier waterbodies in the state for trophy Smallmouth Bass. With 43 entries in the Master Angler program in 2018, Lake St Clair represented 31% of the total entries statewide. The next highest waterbody had 8 total entries and that was the adjoining St. Clair River. This represents the highest number of Master Angler Entries ever entered for Lake St. Clair**.** The continued strong representation of Lake St. Clair Smallmouth Bass in the statewide Master Angler program is likely a reflection of an abundance of trophy-size Smallmouth Bass in the lake, a high degree of angler effort targeting the species, and widespread practice of catch-and-release among Smallmouth Bass anglers.

A total of 252 Smallmouth Bass were captured in the spring Anchor Bay trap net survey, for a catch rate of 4.18 fish/lift

which equaled the long term average (Trap Net average CPUE 2002-2018: 4.18 fish/lift). Of these 252 captures, 242 individuals received jaw tags, with the remainder being too small to tag. Concurrent with our spring trap net survey, we sampled additional Smallmouth Bass by electrofishing near the "Mile Roads" area of Lake St. Clair, east of St. Clair Shores. An additional 142 Smallmouth Bass were sampled, and tagged as part of this electrofishing effort, such that the total sample size is 394 Smallmouth Bass handled, 384 ofwhich were tagged, and valid age estimates were obtained for 379 individuals.

Analysis of age composition and annual mortality includes individuals from both of these efforts pooled together. Year-class contribution to Smallmouth Bass catch was relatively uniform; the 2015 year class was most abundant (20% of the catch), but strong contributions by the 2014, 2013, 2012, 2011 continued to be evident (range 12-16% of total catch). Smallmouth Bass averaged 16.8 inches in length across the two surveys. Smallmouth Bass sampled in the Anchor Bay trap net surveys had an average weight of 3.23 lbs (weights are not collected electrofishing). Annual mortality rate was estimated using catch curve analysis which assumes that abundance of year classes in a given sample is related to the population mortality rate. For 2018 annual mortality rate was estimated at 21.8% which is the lowest observed since 2012 and represents the continuation of a decreasing trend in Smallmouth Bass annual mortality since 2012.

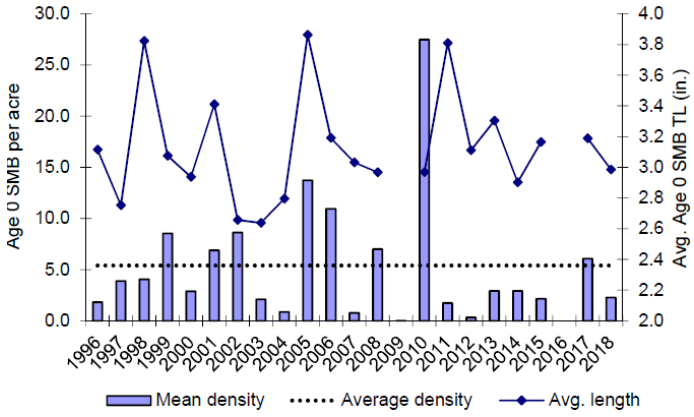


Fig 10 Year-class strength for Lake St. Clair Smallmouth Bass as indicated by fall age-0catch rates (bars) and average length (solid line), 1996-2018. Average year class strengthindicated by the horizontal dashed line.

Recruitment of age-0 Smallmouth Bass as indexed by our August Lake St. Clair Trawl survey was down 64% from 2017 to 2.3 age-0 Smallmouth Bass per acre **(Fig 10;** 2017 value: 6.1). However, the average size of age-0 recruits, which is a critical indicator of overwinter survival was 3 inches, only slightly below the long-term average (1996-2018 average age-0 Smallmouth Bass length: 3.1 inches). While monitoring of age-0 Smallmouth Bass abundance is a useful indicator of summer conditions and nesting success, strong compensatory effects are known to occur for Smallmouth Bass, such that a strong or weak year class is not necessarily correlated with high abundance of adults in the future. For example, the 2012-2015 year classes were similar in strength to the 2018 year class, and comprised a very substantial component of the current fishery based on spring trap net and electrofishing catches.

Generally, few Largemouth Bass are captured during spring trap netting in Anchor Bay. 2018 was no exception with seven individuals sampled. These seven individuals averaged 14.6 inches in total length, with an average weight of 1.9 lbs. Age ranged from four to ten years old.

During the fall nearshore electrofishing survey 236 Largemouth Bass were captured of all sizes (2.4 to 18 inches). Size structure of Largemouth Bass indicated many large catchable size individuals, and no apparent cropping at the legal harvest size (14 inches = 36 cm). The nearshore survey will provide a strong basis for evaluating change in size structure and recruitment of Largemouth Bass in Lake St. Clair.

Since 2002, a total of 5,342 Smallmouth Bass captured in survey trap nets in Anchor Bay have been tagged and released. Smallmouth Bass movements are rather localized, with nearly all the Smallmouth Bass tag recoveries reported to date coming from the Michigan waters of Lake St. Clair. The northernmost Smallmouth Bass tag recovery has been from the Port Huron area of the St. Clair River, and the southernmost recovery came from the Oak Harbor area in Ohio waters of Lake Erie. On average, recaptured Smallmouth Bass tagged during 2002-2018 traveled less than 6 mi (9.7 km) from the Anchor Bay tagging site.

In 2018, Michigan tagged a total of 233 Smallmouth Bass with non-reward jaw tags in Anchor Bay of Lake St. Clair. A total of 25 non-reward tags placed on Smallmouth Bass in 2018 were recovered by anglers for a single-season reporting rate of 7.7%. This is higher than the 5.9% single-season reporting rate observed during 2017.

A total of seven non-reward tags placed on Smallmouth Bass in the Mile Roads area during 2018 were recovered by anglers for a single season reporting rate of 5.0%, which is lower than the 7.6% single-season reporting rate observed during 2017 and nearly identical to that observed from Smallmouth Bass tagged in nearby Anchor Bay during 2017. This suggests that, all else being equal, the intensity of the Smallmouth Bass fishery in the Mile Roads area and Anchor Bay is similar. Like tagged Anchor bay fish, recaptured Smallmouth Bass that were jaw-tagged during 2016-2018 did not travel far, ranging an average of 5.0 mi (8.0 km) from the Mile Roads tagging site.

Northern Pike and Muskellunge

Non-charter anglers released 6,131 Northern Pike, and 1,208 legal sized Muskellunge from Michigan waters of Lake St. Clair in 2018 **(Table 2).** Releases of Northern Pike and Muskellunge were both down slightly from 2017 (Northern Pike 2017: 6,472 fish released; Muskellunge 2017: 1,300 fish released). A total of 347 Northern Pike were reported harvested in 2018, up from 2017 (200 fish reported harvested). No Muskellunge were reported harvested to creel agents. However, 2018 was the first year of mandatory harvest reporting of Muskellunge in the State of Michigan, which resulted in five Muskellunge being registered as harvested from Lake St. Clair in 2018. Anglers are reminded to report harvested Muskellunge within 24 hours by visiting www.michigan.gov/registerfish or calling 1-844-345-3474.

Charter captains reported a total catch of 1,040 Muskellunge in 2018 throughout the St. Clair – Detroit River System, with only one fish harvested. Charter targeted catch rates were 2.69 fish per angler hour.

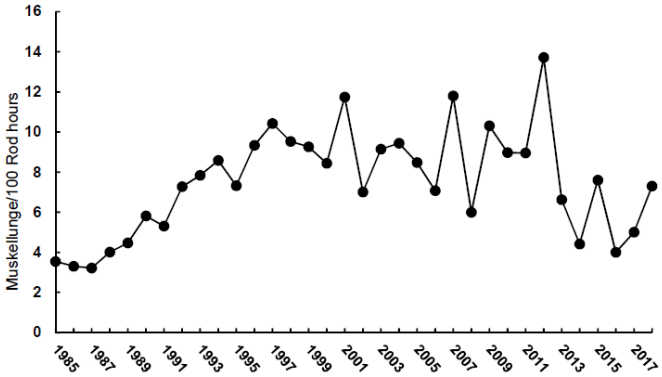


Fig 11 Lake St. Clair Muskellunge catch rate from Angler Diary Program, 1986-2018.

Muskellunge catch rates derived from the Sport Fishery Diary Program on Lake St. Clair improved through the late 1980's and early 1990's, but were more variable in the 2000's. In 2018, the catch rate again showed a small increase from the previous year (**Fig 11).** The observed Muskellunge catch rates for 2018 continues a pattern of increased variability in catch rates over the past 17 years. Efforts are in place in 2019 to increase the number of Muskie anglers in the Angler Diary program.

Lake St. Clair continued to dominate the statewide Master Angler entries for Muskellunge in 2018 with 33 of the 58 total entries (57%). The previous four years have shown an increasing trend in the number of Master Angler entries from Lake St. Clair **(Fig 12).** There has been a general decline in entries since the peak in 2001. We suspect this is largely a reflection of waning interest in submitting Master Angler entries for Muskellunge less than 50 inches in length, which has become a local benchmark for "trophy" status for Muskellunge from the St. Clair-Detroit River System. By all accounts, the Muskellunge population continues to provide excellent fishing opportunities.

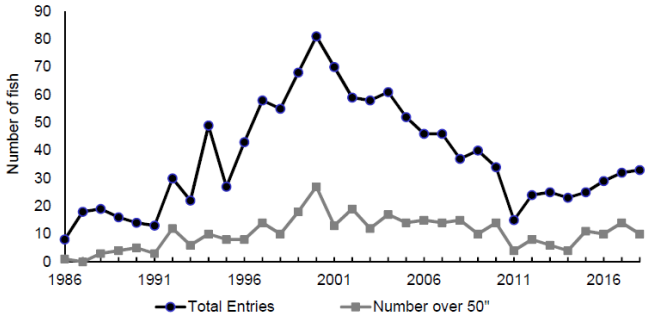


Fig 12 Lake St. Clair Muskellunge entered in the Michigan DNR Master Angler Program,1986- 2018.

Only one Muskellunge was captured during our 2018 Anchor Bay trap net survey, continuing a trend of decreased gear effectiveness observed in Anchor Bay since 2010. We believe this decline in catch is correlated with increased water clarity. The increased water clarity makes trap nets easier to see, and likely increases the ability of Muskellunge to avoid the gear.

In 2018 we tagged 10 Muskellunge with acoustic tags. Nine of these fish were captured by angler partners, before being tagged by DNR fisheries personnel (the 10th fish was caught in the trap net survey). Since 2016, 30 Muskellunge have been tagged in the American waters of Lake St. Clair nd the Detroit River, with an additional 59 fish tagged by our Canadian counterparts in the Canadian waters of Lake St. Clair. These acoustic tags have an expected battery life of 7+ years and can be detected by stationary listening stations located throughout the Great Lakes as part of the Great Lakes Acoustic Telemetry Observation System (GLATOS; https://glatos.glos.us/). Since 2016, more than a half million detections of these tagged fish have been logged, revealing substantial movements and use of Lake St. Clair, the Detroit River and Lake Erie.

A total of four age 0 Muskellunge were captured during our fall nearshore electrofishing survey, for a catch rate of 0.1 fish/10-min shocking. This value was down from 0.31 fish/10-min shocking in 2017, but up from 0.03 fish/10-min shocking in 2016. Over time this annual Muskellunge recruitment index will provide valuable information about the success of Muskellunge spawning, as well as the spatial distribution of age-0 Muskellunge within Michigan waters of Lake St. Clair.

We captured a total of 114 Northern Pike during our spring trap net survey in Anchor Bay. Valid age estimates were obtained for 105 individuals. Similar to last year, the majority of the catch was comprised of the 2014 (36% of total catch) and 2013 (25% of the total catch) year classes. Across all individuals captured the average length was 28.5 inches and average weight was 4.96 lbs.

Lake Sturgeon

A total of 151 Lake Sturgeon were collected during assessment surveys on Lake St. Clair and the St. Clair River in 2018. Captured Lake Sturgeon averaged 42.1 inches in total length, with a range from 22.0 inches to 71.2 inches. A total of 122 Lake Sturgeon were caught in the St. Clair River during the annual setline survey in June, while 29 fish were caught with trawls in Lake St. Clair during August. The length frequency for setline and trawl captured Lake Sturgeon in 2018 illustrates the higher proportion of large individuals in the trawl catch in the lake **(Fig 13**). We suspect this reflects a difference in the actual size structure of the Lake Sturgeon present in the lake during the summer, rather than a product of differences in size bias between the two survey gear types. Survey setlines were modified in 2002 to include small hooks, providing a less biased sample of the Lake Sturgeon population. In addition to sampling Lake Sturgeon, each setline is also set with two minnow traps, one attached to each end. These traps target Northern Madtom, a small catfish species endangered in the State of Michigan and Province of Ontario. Each trap is baited with earthworms, which experimentation in past years has suggested as being the preferred bait. A total of 94 Northern Madtoms were sampled in 2018. Northern Madtoms have very specific habitat and water quality requirements, making them a sensitive indicator of environmental quality. The high catch rate suggests high quality habitat conditions exist in the St. Clair River at this time.

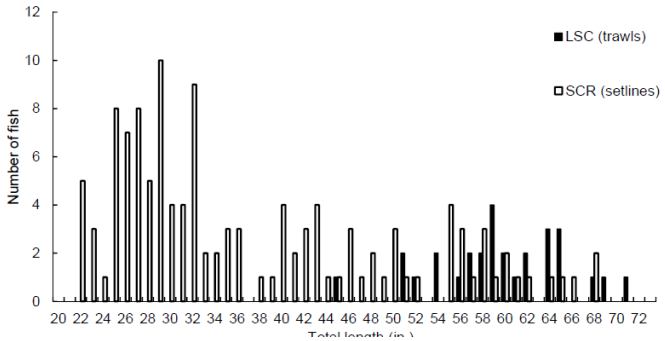


Fig 13 Length frequency distribution for Lake Sturgeon caught in 2018 with survey setlinesin the St. Clair River, and bottom trawls in Lake St. Clair.

A total of 3,340 Lake Sturgeon have been tagged and released in the St. Clair River and Lake St. Clair since 1996. To date, 825 tagged Lake Sturgeon have been recaptured with survey gear or reported by fishermen. A total of 514 tagged sturgeon have been recovered with survey setlines. One was recovered in a survey trap net in Anchor Bay, one in a survey gill net, while 15 have been recaptured in assessment trawls on Lake St. Clair. Sport anglers have reported 260 recoveries, most from the North Channel of the St. Clair River. Twenty-six recoveries have been reported from the Ontario commercial trap net fishery in southern Lake Huron, approximately 70 km (43.5 mi) from the tag site. Seven recoveries have been made on Lake Sturgeon that were found dead from boat strikes or unknown causes.

Forage fish community

Recent declines of shiner species in our spring and fall trawling continued. We captured 27 Spottail Shiners per hectare trawled, down from 55 per hectare last year and well below the long term mean. Johnny Darter (27 per ha trawled) and Rainbow Smelt (106 per ha trawled) were the most common forage sized fish captured during spring trawls.

During our fall trawl survey Spottail Shiner (79 per hectare trawled) and Trout-Perch (31 per hectare trawled) were the most common forage species captured.

Brook Silversides were the most frequently captured (37.4 per ten-minute sample period) forage sized fish during our fall nearshore electrofishing survey, though this value was down slightly from 2017 (41.7 per ten-minute sample period). Other key forage species captured included Emerald Shiners (5.3 fish per ten-minute sample period), Spottail Shiners (5.8 fish per ten minute sample period), and Mimic Shiners (8.4 fish per ten-minute sample period). While still a new survey, the nearshore electrofishing survey provides important additional insight into the lakes forage fish community, which can in time be compared to our traditional trawl surveys to provide a more complete picture of the status and trends of Lake St. Clair forage species and their potential availability to sportfish.

Commercial Fishery Summary

No state regulated commercial fishery exists in the Michigan waters of the St. Clair River or Lake St. Clair. ✧

Fisheries Research/Monitoring; Lake Erie Biological Station, 2018 (USGS)

Executive Summary

A comprehensive understanding of fish populations and their interactions is the cornerstone of modern fishery management and the basis for Fish Community Goals and Objectives for Lake Erie. This report is responsive to U.S. Geological Survey (USGS) obligations via Memorandum of Understanding (MOU) with the Great Lakes Council of Lake Committees (CLC) to provide scientific information in support of fishery management. Goals for the USGS Great Lakes Deepwater Fish Assessment and Ecological Studies in 2018 were to monitor long-term changes in the fish community and population dynamics of key fishes of interest to management agencies. Specific to Lake Erie, expectations of this agreement were sustained investigations of native percids, forage (prey) fish populations, and Lake Trout.

Our 2018 deepwater program operations began in April and concluded in December, and utilized trawl, gillnet, hydroacoustic, lower trophic sampling, and telemetry methods. This work resulted in 51 bottom trawls covering 40 ha of lake-bottom and catching 33,156 fish totaling 1,682 kg during 3 separate trawl surveys in the western and central basins of Lake Erie. Gillnet assessments for cold water species in the western and eastern basins of Lake Erie consisted of 7.2 km of gill nets, which caught an additional 213 fish, 105 of which were native coldwater species: Lake Trout, Burbot, and Lake Whitefish. USGS hydroacoustic surveys produced 179 km of transects, and lower trophic sampling provided data from zooplankton samples (n=27), benthic grabs (n=18), and water quality profiles (n=27) to populate a database maintained by the Ontario Ministry of Natural Resources and Forestry (OMNRF), Ohio Division of Natural Resources (OD NR), Michigan Division of Natural Resources (MIDNR), Pennsylvania Fish and Boat Commission (PFBC), and New York State Department of Environmental Conservation (NYSD EC). USGS also assisted CLC member agencies with deployment and maintenance of the Great Lakes Acoustic Telemetry Observation System (GLATOS) throughout all three Lake Erie sub-basins, supporting multiple coordinated telemetry investigations.

Lake Trout investigations included annual gill net surveys and more recent acoustic telemetry of spawning migration and habitat use in coordination with OMNRF, NYSDEC, and PFBC. Results from Lake Trout investigations were reported in the Coldwater Task Group annual report to the Great Lakes Fishery Commission (GLFC) and the CLC **(http://www.glfc.org/lake-erie-committee.php)**. Likewise, interagency forage fish assessments conducted with hydroacoustics were summarized and reported in the Forage Task Group annual report **(http://www.glfc.org/lake-erie-committee.php).** Additionally, at the request of the Lake Erie Committee (LEC) in 2016, we worked with ODNR and OMNRF to develop a bottom trawl survey in the central basin that addressed current uncertainties in the Yellow Perch stock assessment. The USGS contribution to this effort has been incorporated in the OMNRF database, which included exploratory bottom trawls and acoustic habitat mapping in 2018, summarized in the Yellow Perch Task Group annual report **(http://www.glfc.org/lake-erie-committee.php).**

This report presents biomass-based summaries of fish communities in western Lake Erie derived from USGS bottom trawl surveys conducted from 2013 to 2018 during June and September. The survey design provided temporal and spatial coverage that did not exist in Lake Erie Biological Station Annual Report 2018 the interagency trawl database, and thus complemented the August ODNR-OMNR effort to reinforce stock assessments with more robust data. Analyses herein evaluated trends in: total biomass, abundance of dominant predator and forage species, non-native species composition, biodiversity and community structure. Data from this effort can be explored interactively online (**https:/ jlebs.shinyapps.iojwestern-basin/),** and are accessible for download **(https://doi.org/10.5066/P9ZOSBKZ)**. Annual survey data are added to these sources as the data become available.

Trends in Biomass and Community Composition

Total biomass in trawl catches declined by approximately 85 % from 310 kg/ha in 2013 to 46 kg/ha in 2018. This decline was not attributed to any single taxon, but was observed across the assemblage and functional groups, including predators (percids and moronids), forage fishes (Emerald Shiners, Gizzard Shad, and Rainbow Smelt), and large benthic species (Freshwater Drum, Quillback, Common Carp, and Channel Catfish).

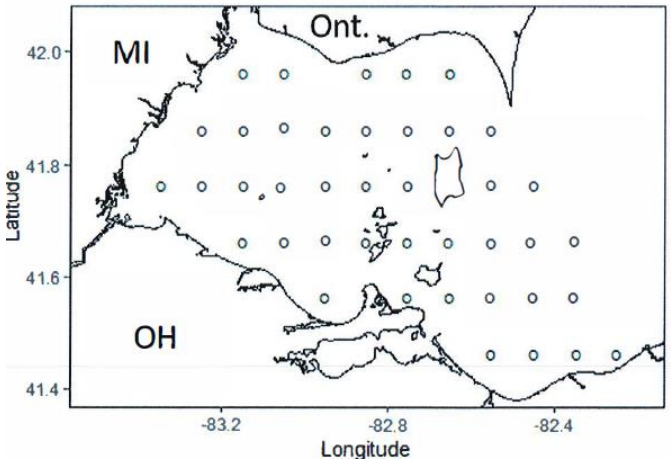


Fig 1 Target bottom trawl locations sampled by USGS Lake Erie Biological Station

Forage biomass averaged 2.4 kg/ha in 2018 during autumn sampling. Catches of Emerald Shiner peaked at 51.5 kg/ha in spring 2013 and were <0.1 kgjha in autumn 2018 **(Fig 2).** During 2013-2018, Rainbow Smelt catches were low and varied from <0.01 kg/ha to 5 kg/ha **(Fig 2).** Similarly, Gizzard Shad were also low and variable, but typically higher in autumn than spring historically, reflecting the occurrence of young-of-year fish **(Fig 2**).

The biomass proportion of catch of non-native species was generally less than 0.25, averaging 0.16 (s.d.= 0.06) over the six years. The dominant non-native species either declined or showed little evidence of trends. White Perch averaged 13.35 kgfha (s.d. = 30.01) across the series, with catch rates of 3.61 kg/ha in autumn of 2018 **(Fig 1**). Common Carp represented the second most abundant non-native species by biomass, and varied from 0.2 to 17 kg/ha (mean= 5.1 kg/ha, s.d. = 5.6; **Fig 1**) during 2013-2018. After relatively large mean catches of Alewife in 2013 (0.69 kg/ha and 7.69 kg/ha in spring and autumn, respectively) very few (<0.01 kg/ha) to none were captured from 2014-2018 **(Fig 2**). Other non-native species (Round Go by, Goldfish, Sea Lamprey) were captured in low abundances (<0.1 kg/ha) during annual surveys.

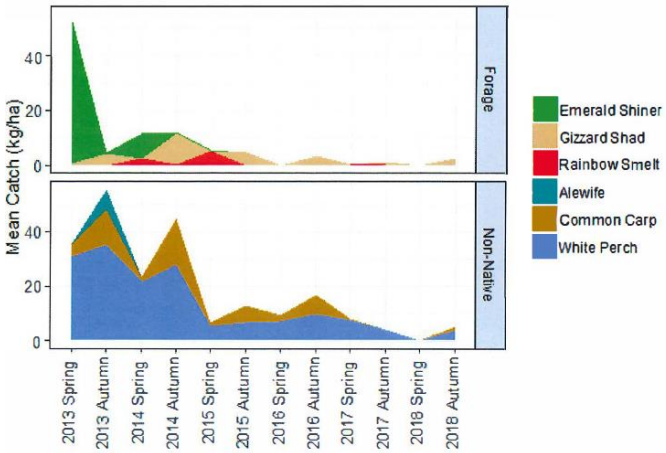


Fig 2 Stacked area plots of catch of primary forage (upper panel) and non-native (lower panel) fishes from trawls in western Lake Erie. Rainbow Smelt belong to both categories but are only plotted in the upper panel to conform with Lake Erie task group conventions. Also, note that Round Goby, Sea Lamprey, and Goldfish are non-native species that were not plotted due to very low abundances in trawls.

Despite the decrease in total biomass, biodiversity of trawl catches was variable and ranged from 0.35 to 2.01. Diversity tended to be higher in autumn than spring, except in 2017 when the opposite pattern was due to the presence of one additional species (Lake Whitefish) in spring catches.

Similar to the numerically-based Shannon Diversity estimates of fish community structure, species biomass composition varied little across the series. While large benthic species (Freshwater Drum, Common Carp, Quillback, and Channel Catfish) were not numerically dominant, they accounted for 50% or more of the total catch biomass during nearly every sampling season (Figure 3; numerical versus biomass summaries can be explored here: **https://lebs.shinyapps.io /western-basin**/).

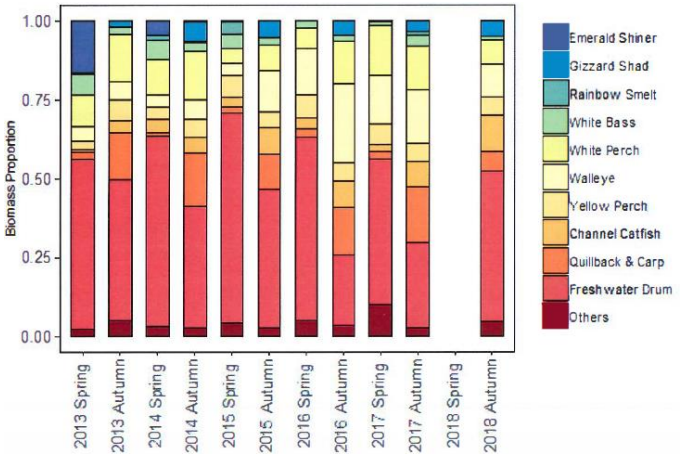


Fig 3 Biomass proportion of fish in bottom trawls in western Lake Erie.

Freshwater Drum dominated the biomass proportion with percentages as high as 70% in spring 2015 **(Fig 3).** Although it has remained the dominant single species by biomass (except in autumn 2016), Freshwater Drum biomass fluctuated from 25% to 53% since autumn 2016 (**Fig 3).** By comparison, the proportions of other large benthic species, such as Channel Catfish, Common Carp and Quill back, have remained relatively constant across the series **(Fig 3).** Other non-forage species that dominated the biomass composition of the catch were percids (Walleye and Yellow Perch) and moronids (White Perch and White Bass). Both moronid species and Yellow Perch biomass proportions were relatively constant across the series, but Walleye (adults and juveniles) increased from an average of 5.08% (s.d. = 1.16) prior to 2015 to 14.22% (s.d. = 6.4) of the catch biomass in recent years **(Fig 3**). The proportion of Gizzard Shad to the overall catch has remained stable over the 6-year survey (5-10%), while contributions from other forage species (Emerald Shiner and Rainbow Smelt) declined across the series to below 5%.

Trends in Percids

Age-0 Yellow Perch catch rates in 2018 increased (229.44 fish/ha) compared with the previous 3 years **(Fig 4).** A larger peak in catch rates was observed for age-0 Yellow Perch in 2014, and although we expected a corresponding peak in age-l catch rates one year later, the data did not exhibit such a pattern **(Fig 4).** By comparison for Walleye, a lagged year-class signal was evident in age-0 and age-l catch rate peaks corresponding to the 2015 year-class (age-0 = 69.67 fish/ha; **Fig 4).** Further an increase in Walleye age-0 catch rates from 2013 to 2014 was also reflected by an increase in age-l catch rates from 2014 to 2015 (not shown). Increased catches of age-0 Walleye in 2018 may be a precursor to increased catches of age-1 Walleye in 2019; however, cross-

validations of Walleye year class variability from this survey will depend upon additional years of data.

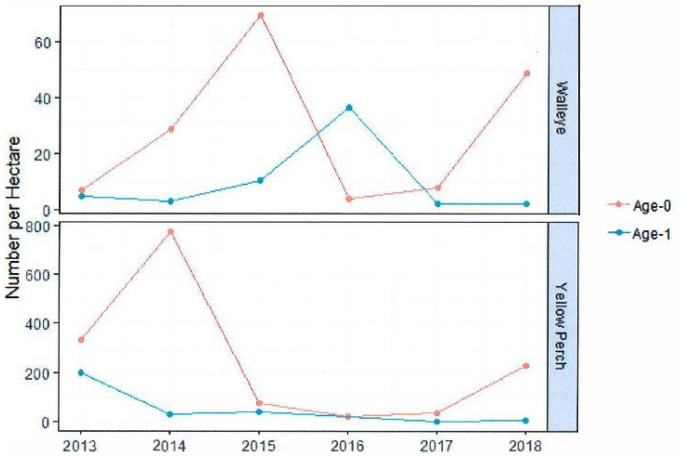


Fig 4 Number per hectare of age-0 and age-l Walleye (upper panel) and YellowPerch (lower panel) in bottom trawls from western Lake Erie during autumn.

Summary

Although biomass of bottom trawl catches from western Lake Erie has declined dramatically over the past six years, cycles of fish population abundance are often longer than six years in the Laurentian Great Lakes. Thus, trends from a six-year data series should be interpreted cautiously. This survey provided new perspectives not immediately available from existing monitoring efforts to support goals of natural resource management efforts to establish a mesotrophic ecosystem with a harmonic cool-water species assemblage of forage fish and percids. Notably, other Lake Erie surveys have underemphasized the importance of Freshwater Drum because they tend to report numerical instead of biomass-based measures of relative abundance. The potential for Freshwater Drum to impact invasive dreissenid mussels has only been evaluated superficially, but due to its dominance in the fish community, this species has potential to contribute substantially to the remineralization of phosphorous in Lake Erie through the consumption of mussels.

Data presented herein, along with other surveys, highlight the need to better understand mechanisms driving forage fish abundance. Adult Walleye and Yellow Perch have historically relied on Gizzard Shad and Emerald Shiner as primary forage. Particularly for Walleye, which have experienced strong year classes in 2015 and 2018, the low abundance of forage in western Lake Erie may result in reduced growth and early emigration. Diet investigations that incorporate ontogenetic changes in spatial distribution may be needed to better inform potential management actions that would ensure sustainable fisheries in Lake Erie. Such efforts will require surveys like the one presented in this report. ✧

Sea Lamprey Control in Lake Erie 2018 (USFWS)

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 Fish Community Goals and Objectives for Lake Erie does not include a specific Sea Lamprey objective, however it does acknowledge that effective Sea Lamprey control is needed to support the fish community objectives for Lake Erie, especially those related to Lake Trout restoration:

● Eastern basin – provide sustainable harvests of Walleye, Smallmouth Bass, Yellow Perch, Whitefish, Rainbow Smelt, Lake Trout, Rainbow Trout, and other salmonids; restore a self-sustaining population of Lake Trout to historical levels of abundance.

● The adult index target for Lake Erie of 4,435 Sea Lampreys was calculated from the average index estimated for the 5-year period, 1991-1995, when marking rates were closest to 5 marks per 100 Lake Trout >532 mm (4.4 A1-3 marks per 100 fish >532 mm). During 2018, the index of adult abundance in Lake Erie was estimated to be 4,149 (95% CI; 3,027 – 5,270), which was less than the index target.

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

Lampricide Control

Lake Erie has 842 tributaries (525 Canada, 317 U.S.). Thirty tributaries (11 Canada, 19 U.S.) have historical records of larval Sea Lamprey production. Of these, 18 tributaries (7 Canada, 11 U.S.) have been treated with lampricides at least once during 2009-2018. Eight tributaries (2 Canada, 6 U.S.) are treated every 3-5 years. Details on lampricide applications to Lake Erie tributaries and lentic areas during

2018 are found in Table 1 and Figure 1. In addition, larval production has been documented in the St. Clair River, three of its U.S. tributaries, and two tributaries to Lake St. Clair (one Canada, one U.S.), one of which required treatment during 2009-2018.

● Lampricide treatments were completed in 3 tributaries (1 Canada, 2 U.S.).

● Silver Creek (Canada) and Conneaut Creek (U.S.) were successfully treated. Silver Creek was treated from a point further upstream than in previous treatments.

● The Huron River was treated for the first time in 2018.

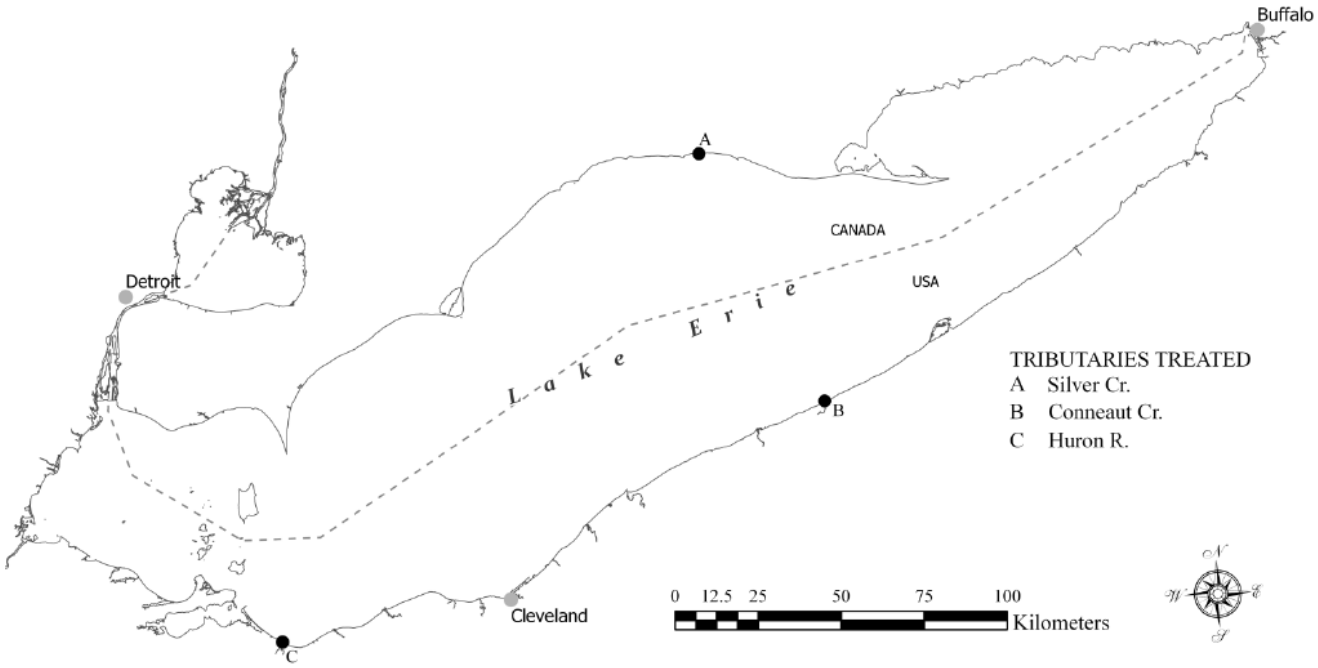


Fig 1. Location of Lake Erie tributaries treated with lampricides during 2018.

Alternative Control

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

● Routine maintenance, spring start-up, and safety inspections were performed on 11 barriers (7 Canada, 4 U.S.).

● Repairs or improvements were conducted on three Canadian barriers:

● Big Creek –The trap on Big Creek was refitted with lighter trap inserts and the land surrounding the barrier on Venison Creek, a tributary to Big Creek, was stabilized to prevent passage. Obermeyer Hydro Incorporated has been contracted to refit the inflatable crest barrier and replace the control system scheduled for completion during 2019.

● Little Otter Creek – The barrier-integrated trap was replaced to improve function and safety.

● Fish community assessment surveys were conducted on Big (Venison) (10), Big Otter (Little Otter) (11), Clear (10), and Forestville (4) creeks to monitor the condition of fish communities in streams where purpose built Sea Lamprey barriers are present.

● Cattaraugus Creek – The U.S. Army Corps of Engineers (USACE), along with project partners Erie County and New York Department of Environmental Conservation (NYDEC) have approved the selected plan for the Springville Dam Ecosystem Restoration Project. The Project Partnership Agreement (PPA) was signed in August 2017 between USACE, NYDEC, and Erie County, and the study team has moved forward with the engineering and design phase of this project. The selected plan will decrease the existing spillway height from 38 to 13.5 feet to serve as a Sea Lamprey barrier. Requests from the National Historic Registry will be fulfilled by preserving a portion of the original spillway on both banks to show the original structure. A Denil fishway with a seasonal trap and sort operation is also included in the design. Construction is targeted for 2021 following the Sea Lamprey spawning run.

● Consultation to ensure blockage at barriers was conducted with partner agencies for 5 sites in 5 streams during 2018.

New Construction

● Grand River – The USACE is the lead agency administering a project at the Harpersfield Dam to construct a Sea Lamprey barrier to replace the deteriorated structure in the Grand River. Project partners include the Commission, Service, Ohio DNR, and Ashtabula County. Design of the barrier allows for an 18-inch drop between crest height and tailwater elevations along with velocities capable of preventing Sea Lamprey passage during flooding events. Construction of the dam has begun and will be completed during 2019.

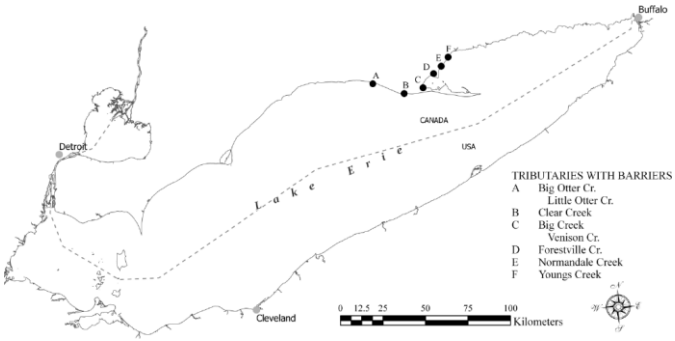


Fig 2. Location of Lake Erie tributaries with Sea Lamprey barriers

Larval Assessment

● Larval assessments were conducted on 67 tributaries (20 Canada, 47 U.S.) and offshore of 2 U.S. tributaries.

● Surveys to detect the presence of new larval populations were conducted in 37 tributaries (7 Canada, 30 U.S.). No new Sea Lamprey infestations were discovered.

● Post-treatment assessments were conducted in 3 tributaries (1 Canada, 2 U.S.) to determine the effectiveness of lampricide treatments conducted during 2017 and 2018.

● Surveys to evaluate barrier effectiveness were conducted in 5 tributaries (2 Canada, 3 U.S.). All barriers were found to be effective in limiting Sea Lamprey infestations.

● A total of 2.5 ha of the St. Clair River were surveyed with gB, including the upper river and the three main delta channels. Eighty-two Sea Lamprey larvae were captured throughout the river. Larval assessments were conducted in non-wadable lentic and lotic areas including the St. Clair River, using 17.36 kg active ingredient of 3.2% gB (6.16 Canada, 11.2 U.S).

Juvenile Assessment

● Lake Trout marking data for Lake Erie are provided by the NYSDEC, the Pennsylvania Fish and Boat Commission, USGS, and OMNRF, and analyzed by the Service's GBFWCO.

● The number of A1-A3 marks on Lake Trout from fall assessments during 2018 was submitted in February 2019 and have yet to be analyzed.

● Based on standardized fall assessment data, the marking rate during 2017 was 16.7 A1-A3 marks per 100 Lake Trout >532 mm (Figure 3). The marking rate has been greater than the target for the last 15 years.

● In cooperation with Walpole Island First Nation, the Commission and partners completed the fourth year of an annual index for out-migrating juvenile Sea Lampreys in the St. Clair River. Eight floating fyke nets were deployed on November 14, 2018. Due to United States Coast Guard (USCG) concerns surrounding proper function of aids to navigation and ice flow, the nets were retrieved on December 15. Over the collection period, 20 juvenile Sea Lampreys were captured. Despite attempts to standardize annual sampling effort, net numbers, location, and duration of collection have varied depending on conditions in the river.

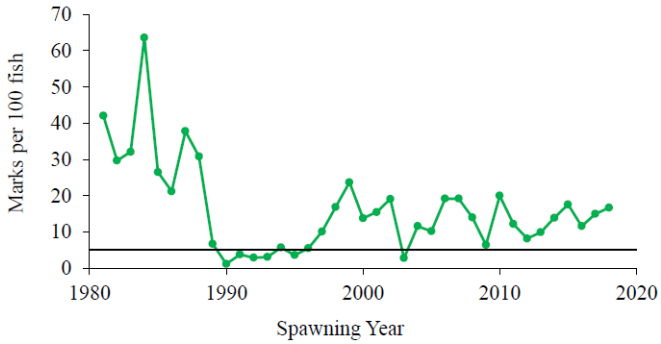


Fig 3. Average number of A1-A3 marks per 100 Lake Trout >532 mm from standardized fall assessments in Lake Erie. The horizontal line represents the target of 5 A1-A3 marks per 100 Lake Trout.

Adult Assessment

● A total of 913 Sea Lampreys were trapped in 5 tributaries during 2018, all of which are index locations. Adult population estimates based on mark-recapture were obtained from 3 of the 5 index locations; the Cattaraugus Creek and Grand River were estimated using the relative annual pattern of abundance.

● The index of adult Sea Lamprey abundance was 4,149 (95% CI; 3,027 – 5,270), which was less than the target of 4,435. The index target was estimated as the mean of indices during a period with acceptable marking rates (1991-1995).

● The adult Sea Lamprey migration in Cattaraugus Creek was monitored through a cooperative agreement with the Seneca Nation of Indians.

✧

End