# SEA LAMPREY CONTROL IN THE GREAT LAKES 2017

## ANNUAL REPORT TO THE GREAT LAKES FISHERY COMMISSION


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**Cover:** Steelhead with Sea Lamprey at the Old Mill Dam, Humber River, Toronto, ON. Photo: Anne De Haas.

Construction crews working on the rehabilitation of Denny’s Dam, an important Sea Lamprey barrier on the Saugeen River, near Southampton, ON. The Great Lakes Fishery Commission is undertaking this project, which began during 2017, in collaboration with the Saugeen Ojibway Nation, Ontario Ministry of Natural Resources and Forestry, and Fisheries and Oceans Canada. Photo: Chris Freiburger, GLFC.

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## *EXECUTIVE SUMMARY*

*This report summarizes Sea Lamprey control operations conducted by the United States Fish and Wildlife Service and Fisheries and Oceans Canada in the Great Lakes during 2017, which were consistent with those prescribed in the Great Lakes Sea Lamprey Control Plan (2011) to achieve Sea Lamprey abundance and marking targets. Lampricide treatments were conducted on 93 tributaries and 10 lentic areas. Larval assessment crews surveyed 489 Great Lakes tributaries and 71 lentic areas to assess control effectiveness, plan future TFM treatments, and establish production capacity of streams. Assessment traps were operated in 29 tributaries across the Great Lakes to estimate the index of adult Sea Lamprey abundance in each Great Lake.*

*Indices of adult Sea Lamprey abundance were evaluated relative to fish-community objectives for each of the lakes. In Lake Superior, the index of adult abundance was estimated to be 48,636 (95% CI; 36,197 –61,074), which was higher than the index target of 9,664. In Lake Michigan, the index of adult abundance was estimated to be 15,881 (95% CI; 13,168 – 18,593), which was less than the index target of 24,874. In Lake Huron, the index of adult abundance was estimated to be 36,269 (95% CI; 31,928 – 40,609), which was higher than the index target of 24,113. In Lake Erie, the index of adult abundance was estimated to be 14,743 (95% CI; 8,750 – 20,736), which was higher than the index target of 3,039. In Lake Ontario, the index of adult abundance was estimated to be 12,536 (95% CI; 9,828 – 15,244), which was higher than the index target of 11,368.*

## INTRODUCTION

The Sea Lamprey (*Petromyzon marinus*) is a destructive, invasive species in the Great Lakes that contributed to the collapse of Lake Trout (*Salvelinus namaycush*) and other native species in the mid-20$^{th}$ century and continues to impede efforts to restore and rehabilitate the fish-community. Sea Lamprey subsist on the blood and body fluids of large-bodied fish. It is estimated that about 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 Sea Lamprey that reaches adulthood. The Sea Lamprey Control Program (SLCP) is administered by the Great Lakes Fishery Commission (Commission) and implemented by two control agents: Fisheries and Oceans Canada (Department) and the United States Fish and Wildlife Service (Service). The 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.

As part of *A Joint Strategic Plan for Management of Great Lakes Fisheries*, the lake committees developed fish-community objectives for each of the Great Lakes. The fish-community objectives include goals for the SLCP that, if achieved, should establish and maintain self-sustaining stocks of Lake Trout and other salmonines by minimizing Sea Lamprey impacts on these stocks. The lake committees have agreed to Sea Lamprey abundance indices and Lake Trout marking targets for each of the lakes. This report outlines the program conducted by the control agents and the Commission in 2017 to meet these targets.

## FISH-COMMUNITY OBJECTIVES

Each lake committee has identified qualitative goals for Sea Lamprey control which are published in their fish-community objectives. During 2004, the lake committees agreed to explicit Sea Lamprey suppression targets designed to meet their fish-community objectives. In lakes Superior, Michigan and Erie, the targets were developed from a five-year period when marking rates resulted in a tolerable annual rate of Lake Trout mortality. A target of adult Sea Lamprey abundance was calculated for these lakes from the average index of abundance over a five-year period when marking rates were closest to 5 A1-3 marks per 100 Lake Trout >532 mm. Similarly, a target was developed for Lake Ontario from the estimated average abundance over a five-year period when marking rates were closest to 2 A1 marks per 100 Lake Trout >431 mm. In Lake Huron, the abundance target and range was calculated as 25% of the estimated average during the five-year period prior to the completion of the fish-community objectives (1989–1993).

The annual performance of the SLCP is evaluated by contrasting lake-specific adult Sea Lamprey index estimates and Lake Trout marking rates with prescribed targets. Adult Sea Lamprey abundance indices are estimated by the Service and Department by summing mark-recapture estimates from a sub-set of streams that were selected based on a consistent trapping history and significant Sea Lamprey spawning runs. The index approach was first used during 2015, replacing regression model estimates of lake-wide abundance that were derived from multiple variables. Lake Trout marking rates are assessed and collected by member agencies that comprise the lake committees and their technical committees.

**Lake Superior**

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

- *Suppress Sea Lampreys to population levels that cause only insignificant mortality on adult Lake Trout.*

The adult index target for Lake Superior of 9,664 Sea Lamprey was calculated from the average abundance estimated for the 5-year period, 1994-1998, when marking rates were closest to 5 marks per 100 Lake Trout >532 mm (5.2 A1-3 marks per 100 fish >532mm). During 2017, the index of adult abundance in Lake Superior was estimated to be 48,636 (95% CI; 36,197-61,074), which is greater than the index target. The Sea Lamprey marking rate on Lake Trout is currently at 6.2 A1-A3 marks per 100 Lake Trout >532mm, which is greater than the target of 5 marks per 100 fish.

**Lake Michigan**

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

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

Sea Lamprey control has the most direct effect on achieving objectives for Lake Trout and other salmonines:

- *Establish self-sustaining Lake Trout populations.*

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

The adult index target for Lake Michigan of 24,874 Sea Lamprey was calculated from the average abundance estimated for the 5-year period, 1995-1999, when marking rates were closest to 5 marks per 100 Lake Trout >532 mm (8.9 A1-3 marks per 100 fish >532mm), and multiplied by 5/8.9. During 2017, the index of adult abundance in Lake Michigan was estimated to be 15,881 (95% CI; 13,168-18,593), which was less than the index target. The Sea Lamprey marking rate on Lake Trout is currently at 4.5 A1-A3 marks per 100 Lake Trout >532mm which is lower than the target of 5 marks per 100 fish.

**Lake Huron**

The Lake Huron Committee established the following specific goals for Sea Lamprey control in Lake Huron:

- *Reduce Sea Lamprey abundance to allow the achievement of other fish-community objectives.*
- *Obtain a 75% reduction in parasitic-phase Sea Lampreys by the year 2000 and a 90% reduction by the year 2010 from present levels.*

This Sea Lamprey objective supports the other fish-community objectives, specifically the salmonine objective:

- *Establish a diverse salmonine community that can sustain an annual harvest of 2.4 million kg, with Lake Trout the dominant species and anadromous (stream-spawning) species also having a prominent place.*

The adult index target for Lake Huron of 24,113 Sea Lamprey was calculated as 25% of the average abundance estimated during the 5 year period prior to the publication of the fish community objectives (1989-1993). Unlike the other Great Lakes, this explicit target was not based on observed marking rates that resulted in a tolerable annual Lake Trout mortality rate. During 2017, the index of adult abundance in Lake Huron was estimated to be 36,269 (95% CI: 31,928-40,609) which is higher than the index target. The Sea Lamprey marking rate on Lake Trout is currently 3.0 A1-A3 marks per 100 Lake Trout >532 mm. This is less than the target of 5 marks per 100 fish, and the lowest making rate in the time series (1984-2017).

**Lake Erie**

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 salmonines; restore a self-sustaining population of Lake Trout to historical levels of abundance.*

The Lake Trout management plan for rehabilitation of self-sustaining stocks in the eastern basin of Lake Erie prescribed a maximum annual mortality of less than 40% to permit the establishment and maintenance of suitable stocks of spawning adults. Mortality was to be controlled through management of fishery exploitation and continued suppression of Sea Lamprey.

The adult index target for Lake Erie of 3,039 Sea Lamprey was calculated from the average abundance 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 2017, the index of adult abundance in Lake Erie was estimated to be 14,743 (95% CI; 8,750-20,736), which was greater than the index target. The Sea Lamprey marking rate on Lake Trout is currently 16.7 A1-A3 marks per 100 Lake Trout >532mm which is greater than the target of 5 marks per 100 fish.

## Lake Ontario

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

- *Suppression of Sea Lamprey populations to early-1990s levels.*

The Lake Ontario Committee recognized that continued control of Sea Lamprey is necessary for Lake Trout rehabilitation and stated a specific objective for Sea Lamprey:

- *Control Sea Lampreys so that fresh wounding rates (A1) of Lake Trout larger than 431 mm is less than 2 marks/100 fish*

This objective is intended to maintain the annual Lake Trout survival rate of 60% or greater to support a target spawning stock of 0.5 to 1.0 million adults of multiple year classes. Along with Sea Lamprey control, angler and commercial exploitation will also be controlled so that annual harvest does not exceed 120,000 fish in the near term.

The target for Lake Ontario Sea Lamprey abundance is calculated using A1 marks exclusively, which have been more consistently recorded on Lake Ontario. The target marking rate of less than 2 A1 marks per 100 Lake Trout was explicitly identified as producing tolerable mortality in the Lake Trout rehabilitation plan.

The adult index target for Lake Ontario of 11,368 Sea Lamprey was calculated from the average abundance estimated for the 5-year period, 1993-1997, when marking rates were closest to 2 marks per 100 Lake Trout >431 mm (1.6 A1 marks per fish >431 mm). During 2017, the index of adult abundance in Lake Ontario was estimated to be 12,536 (95% CI; 9,828 – 15,244), which is greater than the index target. The Sea Lamprey marking rate on Lake Trout is currently less than 0.1 A1 marks per 100 Lake Trout >431mm, and the lowest marking rate in the time series (1982-2017).

## LAMPRICIDE CONTROL

Tributaries harboring larval Sea Lamprey are treated periodically with lampricides to eliminate or reduce larval populations before they recruit to the lake as feeding juveniles. During stream treatments, Service and Department control units administer and analyze several lampricide formulations including TFM or TFM mixed with Bayluscide (70% wettable powder or 20% emulsifiable concentrate). Specialized equipment and techniques are employed to maintain lampricide concentrations at levels that eliminate approximately 93% of resident Sea Lamprey larvae while minimizing risk to non-target organisms. To control larval populations that inhabit lentic areas and interconnecting waterways, field crews apply a bottom-release formulation of lampricide, Bayluscide 3.2% granular (gB), which is 75% effective on average.

Reporting to the Sea Lamprey Control Board (SLCB), the Lampricide Control Task Force (LCTF) was established by the Commission during December 1995 and charged to improve the efficiency of lampricide control, maximize Sea Lamprey killed in stream and lentic treatments (while minimizing lampricide use, costs, and impacts on aquatic ecosystems), and define lampricide control options for near and long-term stream selection and target setting. The task force's progress on SLCB charges during 2017 is presented in the LCTF section of this report.

During 2017, lampricide treatments were conducted on 93 tributaries and 10 lentic areas of the Great Lakes (Table 1). Historical control efforts compared to 2017 control efforts are presented in Figure 1.

**Table 1.** Summary of lampricide applications in tributaries of the Great Lakes in 2017.

| Lake | Number of Streams | Number of Lentic Areas | Discharge ($m^3/s$) | Distance Treated (km) | TFM (kg) [1,2] | Bayluscide (kg) [1,3] |
|---|---|---|---|---|---|---|
| Superior | 23 | 5 | 63 | 416 | 9,269 | 192 |
| Michigan | 42 | 3 | 231 | 1,533 | 46,352 | 245 |
| Huron | 16 | 2 | 58 | 466 | 10,209 | 1,701 |
| Erie | 4 | 0 | 44 | 201 | 6,700 | 0 |
| Ontario | 8 | 0 | 51 | 198 | 5,444 | 6 |
| **Total** | **93** | **10** | **447** | **2,814** | **77,974** | **2,144** |

[1]Lampricide quantities are reported in kg of active ingredient.
[2]Includes solid formulation of TFM.
[3]Includes 3.2% granular Bayluscide applied to lentic areas.

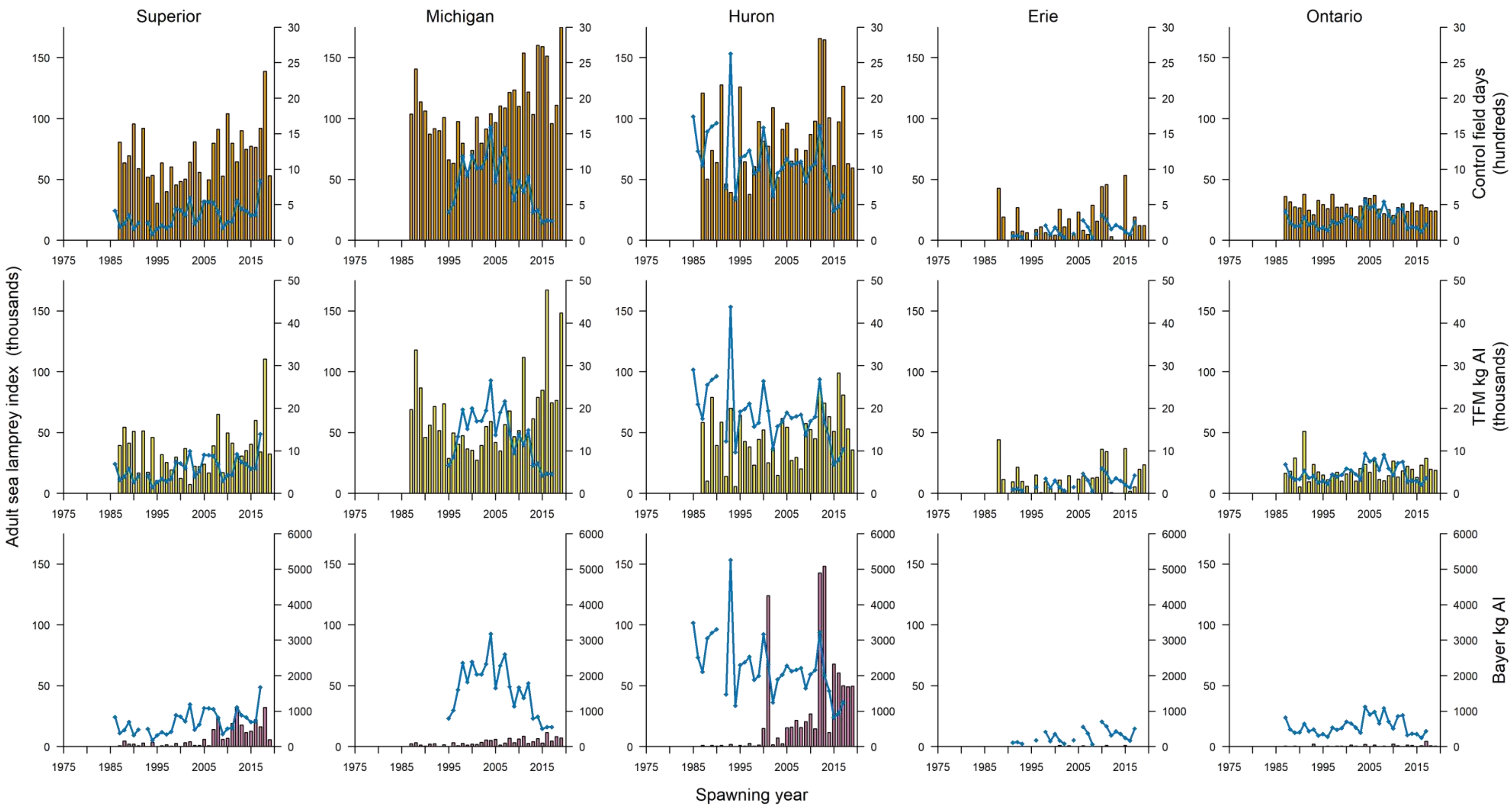


**Figure 1.** Row 1: Number of control field days (orange bars). Row 2: TFM used (kg active ingredient, yellow bars). Row 3: Bayluscide used (kg active ingredient, purple bars). All rows: Index of adult Sea Lamprey is shown with blue lines. All metrics plotted against the Sea Lamprey spawning year. Control metrics are offset by 2 years, e.g., control applied during 2006 is plotted on the 2008 spawning year - the year the treatment effect would first be observed in the adult Sea Lamprey population.

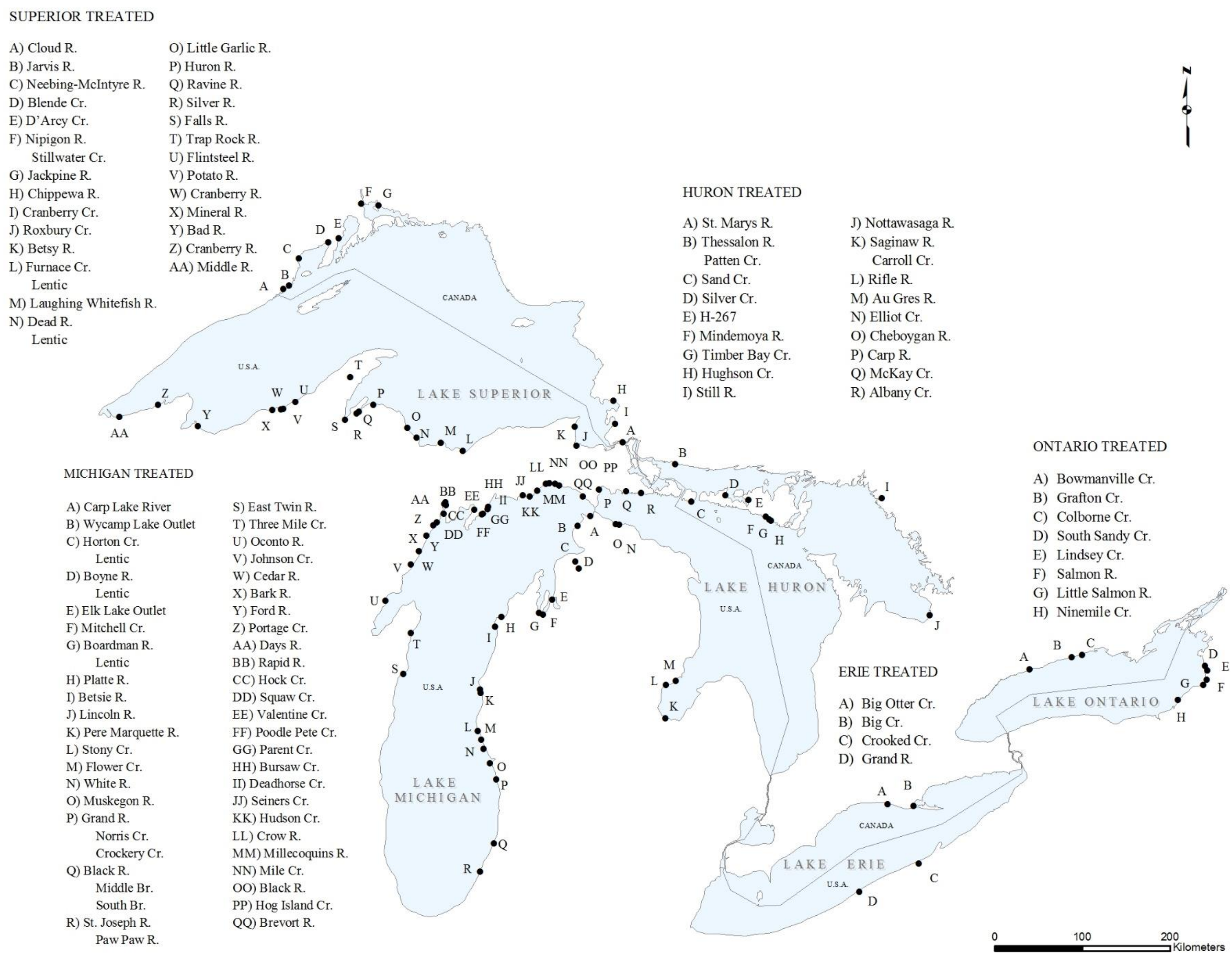


**Figure 2.** Location of tributaries treated with lampricide in 2017.

## Lake Superior

Lake Superior has 1,566 tributaries (833 Canada, 733 U.S.). One hundred sixty-five tributaries (58 Canada, 107 U.S.) have historical records of larval Sea Lamprey production. Of these, 119 tributaries (43 Canada, 76 U.S.) have been treated with lampricides at least once during 2008-2017. Fifty-one tributaries (17 Canada, 34 U.S.) are treated every 4-6 years. Details on lampricide applications to Lake Superior tributaries and lentic areas during 2017 are found in Table 1 and Figure 1.

- Lampricide treatments were completed in 23 tributaries (6 Canada, 17 U.S.) and in 5 lentic areas (3 Canada, 2 U.S.).

- The lentic areas of the Jackpine River and D'Arcy Creek were treated for the first time.

- A lentic area of the Chippewa River was treated due to the presence of large Sea Lamprey larvae.

- The Jarvis River was treated for the first time. Fish community assessment surveys were completed pre- and post-treatment. Non-target surveys following lampricide application covered 3.3% of the treated area; 1 Common White Sucker was collected during this effort.

- Larval distribution in the Neebing River was further upstream than previous treatments.

- The Flintsteel River was treated for the first time and high densities of Sea Lamprey larvae were observed.

- Treatment of the mainstream Bad River, including the White River (Bad River tributary), was postponed from September due to high stream discharge and treated in late October.

- The Middle, Silver, and Falls rivers were treated under unusually high discharge conditions.

**Table 2.** Details on the application of lampricides to tributaries and lentic areas of Lake Superior during 2017 (letter in parentheses corresponds to location of stream in Figure 2).

| Tributary | Date | Discharge ($m^3/s$) | Distance Treated (km) | Liquid TFM (kg)[1] | Solid TFM (kg)[1] | Wettable Powder Bayluscide (kg)[1] | Emulsifiable Concentrate Bayluscide (kg)[1] | Granular Bayluscide (kg)[1] |
|---|---|---|---|---|---|---|---|---|
| **Canada** | | | | | | | | |
| Cloud R. (A) | May-27 | 4.1 | 32.1 | 1602.5 | 1.5 | --- | --- | 0.4 |
| Jarvis R. (B) | Jun-06 | 0.5 | 0.3 | 170.5 | --- | --- | --- | --- |
| Neebing-McIntyre (C) | Jun-05 | 1.3 | 0.9 | 237.5 | --- | --- | --- | --- |
| Blende Cr (D) | Jun-27 | 0.2 | 5.6 | 46.9 | --- | --- | --- | --- |
| D'Arcy Cr (E) | Jun-20 | --- | --- | --- | --- | --- | --- | 13.5 |
| Nipigon R (F) | | | | | | | | |
| Stillwater Cr | Jun-18 | 0.3 | 1.2 | 34.2 | 0.2 | --- | --- | 0.1 |
| Jackpine R (G) | Jun-18 | --- | --- | --- | --- | --- | --- | 13.5 |
| Chippewa R (H) | Aug-2 | --- | --- | --- | --- | --- | --- | 39.8 |
| Cranberry Cr (I) | May-10 | 0.5 | 7.4 | 25.7 | 0.8 | --- | --- | --- |
| **Total (Canada)** | | **6.9** | **47.5** | **2117.3** | **2.5** | **0.0** | **0.0** | **67.3** |
| | | | | | | | | |
| **United States** | | | | | | | | |
| Roxbury Cr. (J) | Jul-19 | 0.2 | 4.2 | 26.1 | --- | --- | --- | --- |
| Betsy R. (K) | Jul-21 | 2.2 | 23.2 | 238.7 | 0.2 | --- | --- | 0.0[2] |
| Furnace Cr. (L) | May-23 | 0.7 | 0.8 | 62.8 | --- | --- | --- | --- |
| Lentic | Jul-3 | --- | --- | --- | --- | --- | --- | 72.3 |
| Laughing Whitefish R. (M) | Jul-6 | 1.0 | 10.5 | 164.5 | 0.6 | --- | --- | --- |
| Dead R. (N) | | | | | | | | |
| Lentic | Jul-6 | --- | --- | --- | --- | --- | --- | 52.7 |
| Little Garlic R. (O) | May-23 | 0.9 | 7.7 | 90.6 | 2.7 | --- | --- | --- |
| Huron R. (P) | Aug-29 | 3.7 | 11.6 | 243.9 | 1.3 | --- | --- | --- |
| Ravine R. (Q) | Aug-24 | 0.8 | 12.1 | 51.1 | 0.4 | --- | --- | --- |
| Silver R. (R) | Aug-28 | 3.1 | 5.6 | 272.4 | 2.1 | --- | --- | --- |
| Falls R. (S) | Aug-23 | 2.7 | 0.5 | 359.0 | --- | --- | --- | --- |
| Trap Rock R. (T) | Jul-28 | 1.2 | 13.8 | 212.8 | 2.5 | --- | --- | --- |
| Flintsteel R. (U) | Sep-9 | 0.7 | 16.9 | 116.9 | --- | --- | --- | --- |
| Potato R. (V) | Sep-9 | 0.1 | 31.1 | 98.8 | 1.3 | --- | --- | --- |
| Cranberry R. (W) | Sep-10 | 0.1 | 27.5 | 70.8 | 0.4 | --- | --- | --- |
| Mineral R. (X) | Sep-7 | 1.4 | 9.3 | 201.6 | 0.6 | --- | --- | --- |
| Bad R. (Y) | Oct-20 | 30.9 | 174.7 | 4078.3 | 5.4 | --- | --- | --- |

**Table 2**. *continued*

| Tributary | Date | Discharge ($m^3/s$) | Distance Treated (km) | Liquid TFM (kg)[1] | Solid TFM (kg)[1] | Wettable Powder Bayluscide (kg)[1] | Emulsifiable Concentrate Bayluscide (kg)[1] | Granular Bayluscide (kg)[1] |
|---|---|---|---|---|---|---|---|---|
| Cranberry R. (Z) | Jun-29 | 1.3 | 10.5 | 144.7 | 1.3 | --- | --- | --- |
| Middle R. (AA) | Jun-29 | 5.1 | 8.2 | 348.6 | --- | --- | --- | --- |
| **Total (United States)** | | **56.1** | **368.2** | **6781.6** | **367.4** | **0.0** | **0.0** | **125.0** |
| | | | | | | | | |
| **Total for Lake** | | **63.0** | **415.7** | **8898.9** | **369.9** | **0.0** | **0.0** | **192.3** |

1. Lampricide quantities are reported in kg of active ingredient.
2. Lampricide quantities reported are < 0.05 kg of active ingredient.

## Lake Michigan

Lake Michigan has 511 tributaries. One hundred twenty-eight tributaries have historical records of larval Sea Lamprey production, and of these, 92 tributaries have been treated with lampricides at least once during 2008-2017. Twenty-nine tributaries are treated every 3-5 years. Details on lampricide applications to Lake Michigan tributaries and lentic areas during 2017 are found in Table 1 and Figure 1.

- Lampricide applications were conducted in 42 streams and 3 lentic areas (Table 1). Of these, 30 streams and three lentic areas were included as a targeted treatment effort to reduce sea lamprey recruitment from large producers to Lake Michigan.

- Seiners Creek was added to the treatment schedule after large Sea Lamprey larvae were detected in the system during 2017 evaluation surveys. This was the first time the stream was treated since 1984.

- The upper Days River was added to the treatment schedule after large Sea Lamprey larvae were detected upstream from the barrier.

- The following streams were treated under unusually high stream discharge: Hog Island Creek, Black, Millecoquins, Days, Ford, Cedar, Bark, Oconto, and East Twin rivers.

- To conserve lampricide under high discharge conditions, treatments of the East Twin and upper Cedar rivers were supplemented with Bayluscide for the first time.

- The South Branch Black River (Van Buren County) was treated for the first time.

- Hock Creek was treated for the first time since 1984.

- Treatment of the Muskegon River was scheduled for mid-September in coordination with the Michigan Department of Natural Resources (MIDNR) and Little River Band of Ottawa Indians (LRBOI).

- A significant rain event caused the Oconto River treatment, originally scheduled for late April, to be rescheduled to late October. Likewise, the Ford River treatment was postponed until early June from its originally scheduled time in mid-May.

**Table 3.** Details on the application of lampricides to tributaries and lentic areas of Lake Michigan during 2017 (letter in parentheses corresponds to location of stream in Figure 2).

| Tributary | Date | Discharge ($m^3/s$) | Distance Treated (km) | Liquid TFM (kg)[1] | Solid TFM (kg)[1] | Wettable Powder Bayluscide (kg)[1] | Emulsifiable Concentrate Bayluscide (kg)[1] | Granular Bayluscide (kg)[1] |
|---|---|---|---|---|---|---|---|---|
| Carp Lake R. (A) | July-07 | 0.5 | 0.5 | 100.3 | --- | --- | --- | --- |
| Wycamp Lake O. (B) | July-18 | 0.3 | 2.3 | 95.2 | --- | --- | --- | --- |
| Horton Cr. (C) | June-29 | 0.8 | 1.1 | 111.4 | --- | --- | --- | --- |
| Lentic | July-01 | --- | --- | --- | --- | --- | --- | 2.5 |
| Boyne R. (D) | June-30 | 3.5 | 6.4 | 580.9 | 15.8 | 7.2 | --- | --- |
| Lentic | July-02 | --- | --- | --- | --- | --- | --- | 13.4 |
| Elk Lake O. (E) | July-01 | 1.4 | 0.5 | 300.4 | --- | --- | --- | --- |
| Mitchell Cr. (F) | July-13 | 0.2 | 5.8 | 112.0 | --- | --- | --- | --- |
| Boardman R. (G) | | | | | | | | |
| Lentic | June-28 | --- | --- | --- | --- | --- | --- | 12.1 |
| Platte R. (H) | June-01 | 12.5 | 24.2 | 3576.9 | 8.7 | --- | --- | --- |
| Betsie R. (I) | June-06 | 8.2 | 20.5 | 1222.1 | 6.6 | --- | 13.2 | --- |
| Lincoln R. (J) | July-15 | 1.7 | 32.7 | 514.3 | 3.9 | --- | --- | --- |
| Pere Marquette R. (K) | July-19 | 21.4 | 263.4 | 5088.6 | 2.9 | --- | 22.1 | --- |
| Stony Cr. (L) | July-14 | 1.7 | 11.6 | 361.9 | --- | --- | --- | --- |
| Flower Cr. (M) | July-18 | 0.6 | 11.8 | 131.1 | --- | --- | --- | --- |
| White R. (N) | Aug-25 | 12.5 | 121.4 | 2707.6 | 4.3 | --- | --- | --- |
| Muskegon R. (O) | Sept-08 | 44.6 | 165.8 | 8320.3 | 32.8 | --- | 89.4 | --- |
| Grand R. (P) | | | | | | | | |
| Norris Cr. | June-16 | 1.6 | 9.7 | 201.3 | 2.1 | --- | --- | --- |
| Crockery Cr. | June-17 | 6.5 | 48.9 | 1241.2 | 0.8 | --- | --- | --- |
| Black R. (Van Buren) (Q) | | | | | | | | |
| Middle Br. | May-19 | 2.8 | 30.9 | 449.2 | 1.7 | --- | --- | --- |
| South Br. | May-22 | 4.1 | 38.6 | 1107.4 | 1.5 | --- | --- | --- |
| St. Joseph R. (R) | | | | | | | | |
| Paw Paw R. | Sept-20 | 7.9 | 179.0 | 2403.2 | 1.9 | --- | --- | --- |
| East Twin R. (S) | Apr-25 | 3.5 | 8.5 | 811.9 | 1.3 | --- | 4.7 | --- |
| Three Mile Cr. (T) | Apr-21 | 0.6 | 4.8 | 103.0 | 1.9 | --- | --- | --- |
| Oconto R. (U) | Oct-10 | 25.5 | 26.9 | 3719.0 | 1.5 | --- | 32.6 | --- |
| Johnson Cr. (V) | Apr-21 | 0.5 | 0.5 | 61.3 | 2.1 | --- | --- | --- |
| Cedar R. (W) | Jun-2 | 17.0 | 43.3 | 2762.7 | 1.7 | 24.9 | --- | --- |
| Bark R. (X) | May-22 | 4.5 | 24.8 | 916.7 | 1.7 | --- | --- | --- |
| Ford R. (Y) | Jun-3 | 15.9 | 198.0 | 4065.0 | 5.6 | 11.2 | 7.9 | --- |
| Portage Cr. (Z) | May-21 | 1.6 | 3.7 | 175.3 | --- | --- | --- | --- |

**Table 3.** *continued*

| Tributary | Date | Discharge ($m^3/s$) | Distance Treated (km) | Liquid TFM (kg)[1] | Solid TFM (kg)[1] | Wettable Powder Bayluscide (kg)[1] | Emulsifiable Concentrate Bayluscide (kg)[1] | Granular Bayluscide (kg)[1] |
|---|---|---|---|---|---|---|---|---|
| Days R. (AA) | Aug-21 | 1.6 | 22.9 | 664.2 | 0.8 | --- | --- | 0.0[2] |
| Rapid R. (BB) | May-7 | 5.0 | 58.9 | 925.4 | 1.3 | --- | --- | --- |
| Hock Cr. (CC) | May-4 | 0.5 | 0.8 | 48.2 | --- | --- | --- | --- |
| Squaw Cr. (DD) | Aug-19 | 0.3 | 4.2 | 51.6 | --- | --- | --- | 0.1 |
| Valentine Cr. (EE) | Aug-14 | 0.1 | 7.2 | 23.9 | --- | --- | --- | 0.0[2] |
| Poodle Pete Cr. (FF) | Aug-13 | 0.1 | 0.6 | 8.6 | --- | --- | --- | --- |
| Parent Cr. (GG) | Aug-13 | 0.1 | 2.7 | 31.4 | --- | --- | --- | 0.0[2] |
| Bursaw Cr. (HH) | Aug-11 | 0.3 | 5.5 | 46.3 | --- | --- | --- | --- |
| Deadhorse Cr. (II) | May-19 | 0.1 | 2.7 | 29.9 | --- | --- | --- | --- |
| Seiners Cr. (JJ) | Aug-22 | 0.1 | 1.9 | 11.3 | 0.8 | --- | --- | 0.1 |
| Hudson Cr. (KK) | Aug-19 | 0.1 | 3.2 | 12.5 | --- | --- | --- | 0.1 |
| Crow R. (LL) | Aug-20 | 1.5 | 7.2 | 382.8 | --- | --- | --- | 0.0[2] |
| Millecoquins R. (MM) | Jul-14 | 12.0 | 65.5 | 1743.3 | 2.9 | --- | 3.6 | --- |
| Mile Cr. (NN) | May-25 | 0.2 | 2.3 | 18.7 | --- | --- | --- | --- |
| Black R. (OO) | Jun-16 | 3.5 | 25.8 | 453.7 | 2.3 | --- | --- | --- |
| Hog Island Cr. (PP) | Jun-17 | 0.6 | 8.4 | 89.9 | 0.2 | --- | --- | --- |
| Brevort R. (QQ) | Jun-25 | 2.7 | 27.2 | 463.0 | --- | --- | --- | --- |
| **Total for Lake** | | **230.7** | **1532.6** | **46244.9** | **107.1** | **43.3** | **173.5** | **28.4** |

[1] Lampricide quantities are reported in kg of active ingredient.
[2] Lampricide quantities reported are < 0.05 kg of active ingredient.

## Lake Huron

Lake Huron has 1,761 tributaries (1,334 Canada, 427 U.S.). One hundred twenty-seven tributaries (59 Canada, 68 U.S.) have historical records of larval Sea Lamprey production. Of these, 84 tributaries (38 Canada, 47 U.S.) have been treated with lampricide at least once during 2008-2017. Forty-five tributaries (22 Canada, 24 U.S.) are treated every 3-5 years. Details on lampricide applications to Lake Huron tributaries and lentic areas during 2017 are found in Table 1 and Figure 1.

- Lampricide applications were completed in 16 tributaries (9 Canada, 7 U.S.), 1 lentic area (0 Canada, 1 U.S.) and 346 ha of the St. Marys River (see Table 1). Two St. Marys River plots were re-ranked based on a 75% reduction during the first treatment and were re-treated to remove residual Sea Lamprey larvae.

- Sand Creek, on Cockburn Island, was treated during 2017 due to the presence of residual Sea Lamprey larvae.

- Treatments of the Garden and Mississagi rivers were deferred to 2018.

- The Still River was treated for the first time in 21 years and many Sea Lamprey were observed during treatment.

- Silver Creek was re-treated in 2017 due to the presence of residual Sea Lamprey from the 2016 treatment.

- Myers Creek (Cheboygan River) was treated for the first time since 1999.

**Table 4.** Details on the application of lampricides to tributaries and lentic areas of Lake Huron during 2017 (letter in parentheses corresponds to location of stream in Figure 2).

| Tributary | Date | Discharge ($m^3/s$) | Distance Treated (km) | Liquid TFM (kg)[1] | Solid TFM (kg)[1] | Wettable Powder Bayluscide (kg)[1] | Emulsifiable Concentrate Bayluscide (kg)[1] | Granular Bayluscide (kg)[1] |
|---|---|---|---|---|---|---|---|---|
| **Canada** | | | | | | | | |
| St. Marys R. (A) | Jul-12 | --- | --- | --- | --- | --- | --- | 1638.7 |
| Thessalon R. (B) | Jul-11 | 12.9 | 30.3 | 751.2 | --- | --- | --- | 0.1 |
| Patten Cr | May-16 | 0.4 | 5.0 | 34.6 | --- | --- | --- | --- |
| unnamed Cr. (C) | Apr-29 | 0.2 | 4.7 | 90.3 | --- | --- | --- | 0.3 |
| Silver Cr. (D) | May-2 | 1.5 | 5.1 | 336.7 | --- | --- | --- | --- |
| Sand Cr. (E) | Oct-18 | 0.5 | 4.6 | 158.0 | 0.2 | --- | --- | 0.1 |
| Mindemoya R. (F) | May-4 | 2.1 | 7.3 | 468.4 | --- | --- | --- | 0.1 |
| Timber Bay Cr. (G) | Apr-27 | 0.3 | 3.2 | 68.4 | 0.9 | --- | --- | --- |
| Hughson Cr. (H) | Apr-26 | 0.7 | 3.9 | 117.2 | --- | --- | --- | 0.1 |
| Still R. (I) | Jul-22 | 1.9 | 6.4 | 56.4 | --- | --- | --- | --- |
| Nottawasaga R. (J) | May-31 | 11.7 | 44.0 | 2092.1 | 4.8 | --- | 24.4 | 0.7 |
| **Total (Canada)** | | **32.3** | **114.4** | **4174.2** | **5.9** | **0.0** | **24.4** | **1640.1** |
| | | | | | | | | |
| **United States** | | | | | | | | |
| Saginaw R (K) | | | | | | | | |
| Carroll Cr. | May-17 | 0.9 | 7.6 | 223.9 | --- | --- | --- | --- |
| Rifle R. (L) | Aug-10 | 9.1 | 161.2 | 1936.9 | 14.4 | --- | --- | --- |
| AuGres R. (M) | May-06 | 7.8 | 77.3 | 2091.7 | 4.6 | --- | --- | --- |
| Elliot Cr. (N) | Jul-16 | 0.2 | 4.2 | 57.6 | --- | --- | --- | --- |
| Cheboygan R. (O) | | | | | | | | |
| Myers Cr. | Jul-17 | 0.1 | 1.3 | 19.2 | --- | --- | --- | --- |
| Carp R. (P) | Jun-19 | 7.6 | 90.6 | 1553.9 | --- | --- | --- | 0.1 |
| McKay Cr. (Q) | Jun-28 | 0.4 | 9.0 | 126.9 | --- | --- | --- | --- |
| Albany Cr. (R) | | | | | | | | |
| Lentic | Aug-2 | --- | --- | --- | --- | --- | --- | 36.7 |
| **Total (United States)** | | **26.1** | **351.2** | **6010.1** | **19.0** | **0.0** | **0.0** | **36.8** |
| | | | | | | | | |
| **Total for Lake** | | **58.4** | **465.6** | **10184.3** | **24.9** | **0.0** | **24.4** | **1676.9** |

[1]Lampricide quantities are reported in kg of active ingredient.

## Lake Erie

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, 17 tributaries (7 Canada, 10 U.S.) have been treated with lampricides at least once during 2008-2017. Nine tributaries (3 Canada, 6 U.S.) are treated every 3-5 years. Details on lampricide applications to Lake Erie tributaries and lentic areas during 2017 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 2008-2017.

- Lampricide treatments were completed in 4 tributaries (2 Canada, 2 U.S.).

- Big Creek was treated from the Sea Lamprey barrier for the first time since its construction in 1996, an indication that it had effectively blocked adult Sea Lamprey since the previous treatment in 2013. Improved efficacy is likely attributable to earlier elevation of the seasonally-operated crest, and improvements in the reliability of the inflatable crest technology.

- The Grand River (Ohio) was successfully treated after being deferred in 2016.

**Table 5.** Details on the application of lampricides to tributaries and lentic areas of Lake Erie during 2017 (letter in parentheses corresponds to location of stream in Figure 2).

| Tributary | Date | Discharge ($m^3/s$) | Distance Treated (km) | Liquid TFM (kg)[1] | Solid TFM (kg)[1] | Wettable Powder Bayluscide (kg)[1] | Emulsifiable Concentrate Bayluscide (kg)[1] | Granular Bayluscide (kg)[1] |
|---|---|---|---|---|---|---|---|---|
| **Canada** | | | | | | | | |
| Big Otter Cr. (A) | Jun-03 | 5.2 | 97.9 | 1957.4 | 5.8 | --- | --- | 0.3 |
| Big Cr. (B) | Jun-06 | 7.8 | 48.0 | 2560.7 | 2.7 | --- | --- | --- |
| **Total (Canada)** | | **13.0** | **145.9** | **4518.1** | **8.5** | **---** | **---** | **0.3** |
| | | | | | | | | |
| **United States** | | | | | | | | |
| Crooked Cr. (C) | Apr-23 | 0.2 | 2.2 | 35.3 | --- | --- | --- | --- |
| Grand R. (D) | Apr-24 | 31.2 | 52.5 | 2137.6 | --- | --- | --- | --- |
| **Total (United States)** | | **31.4** | **54.7** | **2172.9** | **---** | **---** | **---** | **---** |
| | | | | | | | | |
| **Total for Lake** | | **44.4** | **200.6** | **6691.0** | **8.5** | **0** | **0** | **0.3** |

[1]Lampricide quantities are reported in kg of active ingredient.

## Lake Ontario

Lake Ontario has 659 tributaries (405 Canada, 254 U.S.). Sixty-six tributaries (31 Canada, 35 U.S.) have historical records of larval Sea Lamprey production, and of these, 36 tributaries (18 Canada, 18 U.S.) have been treated with lampricides at least once during 2008-2017. Twenty-eight tributaries (14 Canada, 14 U.S.) are treated on a regular 3-5 year cycle. Details on lampricide applications to Lake Ontario tributaries and lentic areas during 2017 are found in Table 1 and Figure 1.

- Lampricide applications were conducted in 8 streams (3 Canada, 5 U.S.).
- Bowmanville Creek was treated upstream of the Goodyear Dam for the first time. Fish community assessment and benthic surveys were completed pre- and post-treatment. Non-target mortality was negligible.
- High lake levels caused issues with treatment effectiveness on all 8 tributaries treated in 2017.

**Table 6.** Details on the application of lampricides to tributaries of Lake Ontario during 2017 (letter in parentheses corresponds to location of stream in Figure 2).

| Tributary | Date | Discharge ($m^3/s$) | Distance Treated (km) | Liquid TFM (kg)[1] | Solid TFM (kg)[1] | Wettable Powder Bayluscide (kg)[1] | Emulsifiable Concentrate Bayluscide (kg)[1] | Granular Bayluscide (kg)[1] |
|---|---|---|---|---|---|---|---|---|
| **<u>Canada</u>** | | | | | | | | |
| Bowmanville Cr. (A) | May-27 | 4.1 | 32.1 | 1602.5 | 1.5 | --- | --- | 0.4 |
| Grafton Cr. (B) | Jun-06 | 0.5 | 0.3 | 170.5 | --- | --- | --- | --- |
| Colborne Cr. (C) | Jun-05 | 1.3 | 0.9 | 237.5 | --- | --- | --- | --- |
| **Total (Canada)** | | **5.9** | **33.3** | **2010.5** | **1.5** | **0.0** | **0.0** | **0.4** |
| | | | | | | | | |
| **<u>United States</u>** | | | | | | | | |
| South Sandy Cr. (D) | Jun-01 | 6.2 | 14.8 | 449.2 | --- | --- | 5.1 | 0.1 |
| Lindsey Cr. (E) | Apr-24 | 1.3 | 26.1 | 221.6 | 0.9 | --- | --- | 0.2 |
| Salmon R. (F) | Apr-21 | 27.7 | 56.6 | 1976.7 | 6.0 | --- | --- | 0.2 |
| Little Salmon R. (G) | Apr-30 | 9.1 | 41.6 | 591.6 | 1.5 | --- | --- | 0.2 |
| Nine Mile Cr. (H) | May-29 | 1.2 | 25.4 | 182.4 | 2.0 | --- | --- | 0.2 |
| **Total (United States)** | | **45.4** | **164.5** | **3421.5** | **10.4** | **---** | **5.1** | **0.8** |
| | | | | | | | | |
| **Total for Lake** | | **51.3** | **197.8** | **5432.0** | **11.9** | **0.0** | **5.1** | **1.2** |

[1]Lampricide quantities are reported in kg of active ingredient.

## ALTERNATIVE CONTROL

The Service and Department continue to coordinate with the Commission and other partners to research and develop alternatives to lampricides to provide a broader spectrum of tactics to control Sea Lamprey. During 2017, barriers were the only operational alternative control method. Juvenile trapping and nest destruction were explored as potential alternative methods. Other methods that are currently being investigated include the use of attractants (e.g. pheromones), repellents (e.g. alarm cues), and new trap designs.

### Barriers

The Sea Lamprey barrier program priorities are:

1) Operate and maintain existing Sea Lamprey barriers that were built or modified by the SLCP.
2) Ensure Sea Lamprey migration is blocked at important non-SLCP barrier sites.
3) Construct new structures in streams where they
    a. provide control where other options are impossible, excessively expensive, or ineffective;
    b. provide a cost-effective alternative to lampricide control;
    c. improve cost-effective control in conjunction with attractant and repellent based control, trapping, and lampricide treatments; and
    d. are compatible with a system's watershed plan.

Reporting to the SLCB, the Barrier Task Force (BTF) was established by the Commission during April 1991 to coordinate efforts of the Service, Department, and U.S. Army Corps of Engineers (USACE) on the construction, operation, and maintenance of Sea Lamprey barriers. The task force's progress on SLCB charges during 2017 is presented in the BTF section of this report.

The Commission has invested in 73 barriers in the Great Lakes basin (Figure 3). Of these, 48 were purpose-built as Sea Lamprey barriers and 25 were constructed for other purposes but have been modified to block Sea Lamprey migrations.

Data gathered during field visits to assess the status of other dams and structures were recorded in the SLCP's Barrier Inventory and Project Selection System (BIPSS) database and may be used to: 1) select barrier projects; 2) monitor inspection frequency; 3) schedule upstream larval assessments; 4) assess the effects of barrier removal or modifications on Sea Lamprey populations; or 5) identify structures that are important in controlling Sea Lamprey.

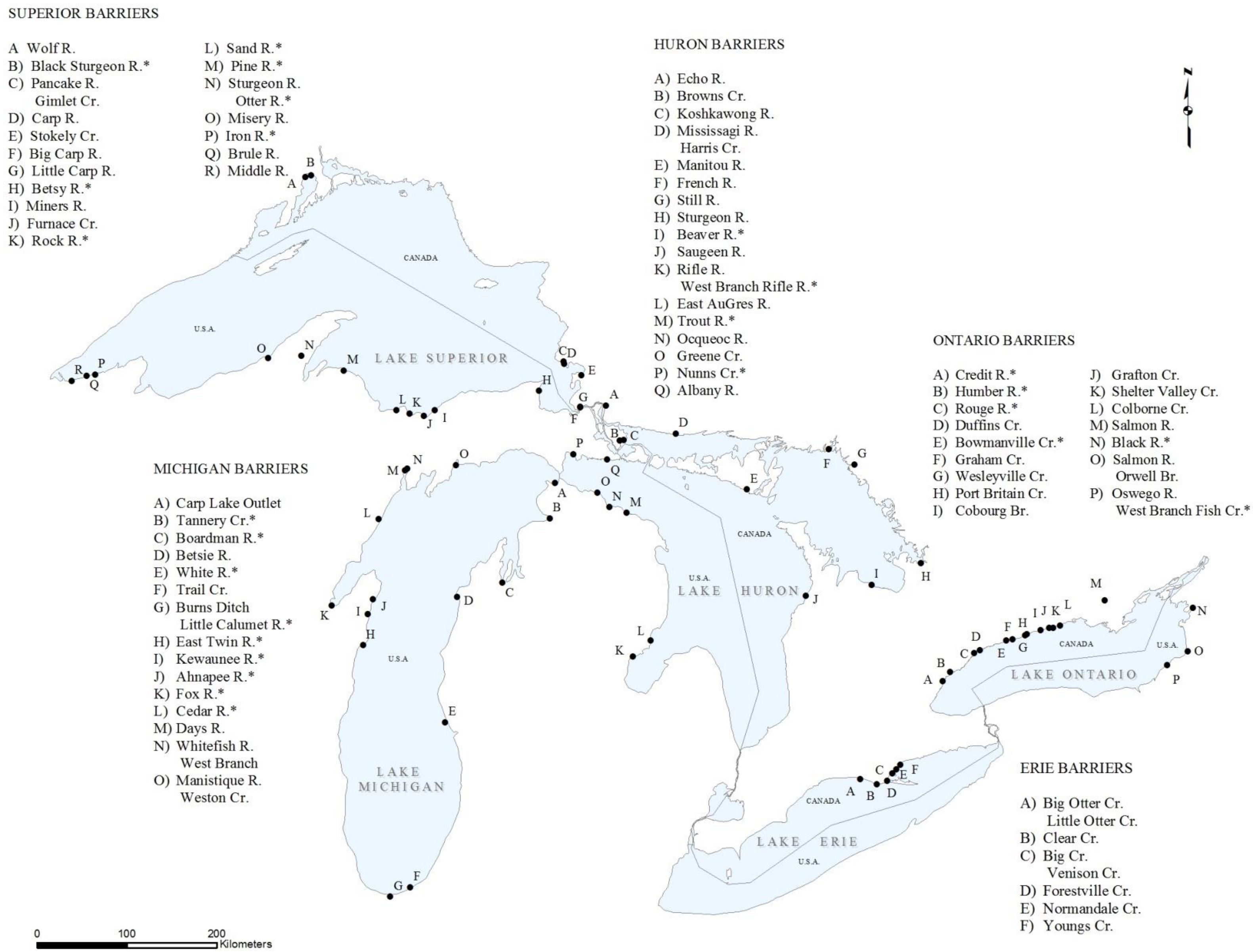


**Figure 3.** Locations of tributaries with Sea Lamprey barriers. Structures that have been modified or constructed by others that prevent the upstream migration of Sea Lamprey are indicated by an asterisk.

## Lake Superior

The Commission has invested in 18 barriers on Lake Superior (Figure 3). Of these, 11 were purpose-built as Sea Lamprey barriers and 7 were constructed for other purposes but have been modified to block Sea Lamprey migrations.

*Barrier Inventory and Project Selection System (BIPSS)*

- Field crews visited one structure on a tributary to Lake Superior to assess Sea Lamprey blocking potential and to improve the information in the BIPSS database.

*Operation and Maintenance*

- Routine maintenance, spring start-up, and safety inspections were performed on 17 barriers (6 Canada, 11 U.S.).

- Repairs or improvements were conducted on one Canadian barrier.

    - Stokely Creek – Sediment upstream of the barrier was impeding flow, posing a risk that the stream would bypass the barrier. The accumulated sediment was flushed out to the original riverbed profile in October 2017.

- Forty-two fish community assessment surveys were conducted in the Black Sturgeon watershed upstream of the Black Sturgeon Dam (Camp 43) to the Camp 1 Site at the outlet of Eskwanonwatin Lake to evaluate the fish community within this reach. In addition to electrofishing surveys, 3 lakes (Black Mountain, Shillabeer, and Driftsone) were also sampled using trap nets.

*Ensure Blockage to Sea Lamprey Migration*

- Black Sturgeon River – The Ontario Ministry of Natural Resources and Forestry (OMNRF) initiated an Environmental Assessment (EA) during 2012 of a proposal to decommission the Camp 43 dam and construct a new Sea Lamprey barrier 50 km upstream. A draft Environmental Study Report was released for public and management agency comment in March 2017. Preparation of the final report is in progress.

- Middle River – Larval and habitat surveys were conducted upstream from the Sea Lamprey barrier during July 2017 to determine the production potential for Sea Lamprey upstream of the dam.

- Partner agencies were consulted to ensure blockage at barriers at 16 sites in 9 streamsduring 2017 (Table 7).

**Table 7.** Status of concurrence requests for barrier removals, replacements, or fish passage projects in Lake Superior tributaries during 2017.

| Mainstream | Tributary | Lead Agency | Project | SLCP Position | Comments |
|---|---|---|---|---|---|
| Chocolay R. | Big Cr. | MCCD[1] | Karen Road culvert 32 Ne | Proposed | Ineffective Barrier |
| Chocolay R. | Big Cr. | MCCD[1] | Karen Road culvert 32 Sc | Proposed | Ineffective Barrier |
| Compeau Cr. | | SWP[2] | Compeau Cr. Road culvert | Concur | Ineffective Barrier |
| Huron R. | Chinks Cr. | SWP[2] | Culvert 213 | Concur | Upstream of First Blocker |
| Huron R. | Chinks Cr. | SWP[2] | Culvert 217 | Concur | Upstream of First Blocker |
| Sturgeon R. | Gristmill Cr. | SWP[2] | Gristmill Road culvert | Concur | Upstream of First Blocker |
| Sturgeon R. | Sidnaw Cr. | SWP[2] | Markey Lake Road culvert | Concur | Upstream of First Blocker |
| Eagle R. | Central Cr. | SWP[2] | Gratiot Lake Road culvert | Concur | Upstream of First Blocker |
| Bad R. | City Cr. | ACLWCD[3] | Snowmobile Trail culvert | Concur | Upstream of First Blocker |
| Bad R. | Porcupine Cr. | USFS[4] | Porcupine Cr. culvert | Concur | Upstream of First Blocker |
| Bad R. | Gehrman Cr. | SRWA[5] | Gehrman Cr. culvert | Concur | Upstream of First Blocker |
| Bad R. | Jader Cr. | BCLWCD[6] | Jader Cr. culvert #243 | Concur | Upstream of First Blocker |
| Bad R. | Jader Cr. | BCLWCD[6] | Jader Cr. culvert #244 | Concur | Upstream of First Blocker |
| Sioux R. | Little Sioux R. | BCLWCD[6] | Little Sioux culvert | Concur | Ineffective Barrier |
| Brule R. | Nebagamon Cr. | WIDNR[7] | Nebagamon Cr. Railroad culvert | Concur | Upstream of First Blocker |
| French R. | | SWP[2] | French R. Headwaters Dam | Concur | Upstream of First Blocker |

[1]Marquette County Conservation District
[2]Superior Watershed Partnership
[3]Ashland County Land & Water Conservation Department
[4]U.S. Forest Service
[5]Superior Rivers Watershed Association
[6]Bayfield County Land and Water Conservation Department
[7]Wisconsin Department of Natural Resources

*New Construction*

- Bad River – The USACE is the lead agency administering a project to construct a Sea Lamprey barrier in the Bad River under the Great Lakes Fishery Ecosystem Restoration (GLFER) program. The USACE completed the feasibility study to site a new barrier and trap downstream from the Potato River junction (the location supported by the Bad River Tribe). The study indicated that the topography at this location would require a structure much larger than anticipated to block Sea Lamprey and would result in potential backwater effects. Personnel from the Service, the Natural Resources Department of the Bad River Band of Lake Superior Chippewa Indians (NRD), and the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) met to discuss alternate locations. The NRD is supportive of investigating the feasibility of barrier construction on the smaller high production tributaries to the Bad River. Permission to survey potential barrier locations in the Marengo River was requested during 2016.

- Ontonagon River – The Service is working with the U.S. Forest Service to investigate construction of an adjustable-crest, seasonal barrier several miles downstream of the Lower Dam on the East Branch Ontonagon River, which would be removed as part of the project. Site visits were conducted during fall 2017 and water surface elevation loggers were installed at one of the locations.

## Lake Michigan

The Commission has invested in 15 barriers on Lake Michigan (Figure 3). Of these, seven were purpose-built as Sea Lamprey control barriers and eight were constructed for other purposes, but have been modified to block Sea Lamprey migrations.

*Barrier Inventory and Project Selection System (BIPSS)*

- Field crews visited 99 structures on tributaries to Lake Michigan to assess Sea Lamprey blocking potential and to improve the information in the BIPSS database.

*Operation and Maintenance*

- Routine maintenance, spring start-up, and safety inspections were performed on 25 barriers.

*Ensure Blockage to Sea Lamprey Migration*

- Boardman River – Removal of the Boardman Dam and construction of the Cass Road Bridge took place during 2017. Removal of Sabin Dam will occur during 2018 contingent upon Union Street Dam continuing to perform as a blocking structure to Sea Lamprey. Larval and habitat surveys were conducted above the Union Street Dam during July 2017 to determine the production potential for Sea Lamprey in areas upstream of the dam.

- Grand River – The City of Grand Rapids along with several citizens groups are proposing removing the 6th Street Dam on the Grand River to provide for more varied use of the downtown rapids area. The current plan calls for removal of the existing structure and the creation of an artificial rapids complex that can be used by kayakers and fishermen. A new inflatable crest structure that will theoretically act as a velocity barrier under high flows is proposed approximately one mile upstream of the 6th Street Dam. Project partners met at the USACE Engineer Research and Development Center in April 2017 to discuss design and operational criteria for the new structure. The Service and Department are engaged in the review of the proposed structure and will maintain a presence at various levels of project coordination.

- Kalamazoo River – Larval and habitat surveys were conducted above the Calkins Bridge Dam during July 2017 to determine the production potential for Sea Lamprey in areas upstream of the dam.

- Barrier removals/modification –Partner agencies were consulted to ensure blockage at barriers at 20 sites in 6 streams (Table 8).

**Table 8.** Status of concurrence requests for barrier removals, replacements, or fish passage projects in Lake Michigan tributaries during 2017.

| Mainstream | Tributary | Lead Agency | Project | SLCP Position | Comments |
|---|---|---|---|---|---|
| Menominee R. | Iron R. | SWP[1] | Wild R.s Road culvert | Concur | Ineffective barrier |
| Peshtigo R. | Otter Cr. | TU[2] | Otter Cr. culvert | Concur | Ineffective barrier |
| Peshtigo R. | Armstrong Cr. | TU[2] | US-8 culvert | Concur | Ineffective barrier |
| Peshtigo R. | Shabadock Cr. | TU[2] | Goodman Park Road culvert | Concur | Ineffective barrier |
| Peshtigo R. | Spencer Cr. | TU[2] | Flanner Lane culvert | Concur | Ineffective barrier |
| Peshtigo R. | Halley Cr. | TU[2] | Valley Lake Road culvert | Concur | Ineffective barrier |
| Peshtigo R. | Middle Peshtigo R. | TU[2] | Forest Service Road 2337 culvert | Concur | Ineffective barrier |
| Peshtigo R. | Chickadee Cr. | TU[2] | Forest Service Road 2337 culvert #2 | Concur | Ineffective barrier |
| Peshtigo R. | Trib. to Chickadee Cr. | TU[2] | North Fork Road culvert | Concur | Ineffective barrier |
| Peshtigo R. | Trib. to Caldron Falls | TU[2] | Caldron Falls Trib. culvert | Concur | Ineffective barrier |
| Peshtigo R. | Trib. to Hay Cr. | TU[2] | Forest Service Road 3877 culvert | Concur | Ineffective barrier |
| Milwaukee R. | | MMSD[3] | Estabrook Dam | Concur | Ineffective barrier |
| Milwaukee R. | Buser Cr. | OC[4] | Buser Cr. Project | Concur | Upstream of blocking barrier |
| Milwaukee R. | Little Menominee R. | OC[4] | Mequon culverts | Concur | Ineffective barrier |
| Big Sucker Cr. | | MIDNR[5] | O'neal Lake Dam | Concur | Modification |
| Stover Cr. | | TMWC[6] | Stover Cr. Dam | Pending | First barrier |
| Boardman R. | | CRA[7] | Sabin Dam | Concur | Upstream of blocking barrier |

[1]Superior Watershed Partnership
[2]Trout Unlimited
[3]Milwaukee Metropolitan Sewerage District
[4]Ozaukee County
[5]Michigan Department of Natural Resources
[6]Tip of the Mitt Watershed Council
[7]Conservation Resource Alliance

*New Construction*

- Manistique River – The USACE is the lead agency administering a project to construct a Sea Lamprey barrier to replace a deteriorated structure in the Manistique River. Project partners include the Commission, Service, MIDNR, City of Manistique, and Manistique Papers, Inc. The existing Manistique Paper Inc. Dam was identified as the most feasible site for a new barrier. The USACE is completing additional design work in order to reduce upstream inundation as part of the Michigan Department of Environmental Quality (MIDEQ) permit requirements. Once the new design elements have been identified, the Environmental Assessment (EA) and Takings Analysis can be updated and the Detailed Project Report can be reviewed internally prior to the opening of the public review period. During October 2107, the Service contracted the removal of several hundred cubic yards of wooden debris from the dam crest.

- Little Manistee River – The USACE is the lead agency on a project to replace the current dam at the MIDNR egg taking facility on the Little Manistee River. The current barrier height is insufficient to prevent Sea Lamprey from migrating upstream. The Preliminary Restoration Plan is complete for the barrier and trap project at or near the current weir location. The project would include improvements to the weir structure and construction of permanent traps. The MIDNR is working with the Service to develop new operational procedures to reduce the length of time stop logs must be removed in the fall/winter to clean sand deposited above the barrier. The State has also acquired funding to upgrade the structure, combining these two projects would save considerable dollars in mobilization and dewatering costs.

**Lake Huron**

The Commission has invested in 17 barriers on Lake Huron (Figure 2). Of these, 13 were purpose built as Sea Lamprey barriers and 4 were constructed for other purposes, but have been modified to block Sea Lamprey migrations.

*Barrier Inventory and Project Selection System (BIPSS)*

- Field crews visited 12 structures on tributaries to Lake Huron to assess Sea Lamprey blocking potential and to improve the information in the BIPSS database.

*Operation and Maintenance*

- Routine maintenance, spring start-up, and safety inspections were performed on 11 barriers (5 Canada, 6 U.S.).

- Repairs or improvements were conducted on one Canadian barrier:

    - Echo River – Replacement of the existing Sea Lamprey trap to improve function and safety is underway at the Echo River barrier. Construction is expected to be completed by September 30, 2018.

- The electrical field of the combination low-head/electrical barrier in the Ocqueoc River was active from March 25 until August 27. The barrier was electrified for most of March and April when water levels inundated the low-head barrier.

- Fish community assessment surveys were conducted in the upper Nottawasaga watershed. This work was conducted as a monitoring component of the Nicolston Dam Rehabilitation Project.

*Ensure Blockage to Sea Lamprey Migration*

- Cheboygan River – Plans to block adult Sea Lamprey at the Cheboygan lock and dam complex and to eradicate lampreys from the upper river included:

    - Control and research agents continued discussion with the USACE and the Michigan Department of Natural Resources (MIDNR) regarding alternatives for preventing Sea Lamprey passage at the Cheboygan River lock. The MIDNR is pursuing a refurbishment of the aging structure and the federal partners are interested in making the lock "lamprey proof" using Great Lakes Fishery and Ecosystem Restoration (GLFER) funding through the USACE.

    - A total of 3,680 sterilized male Sea Lamprey were released upstream of the Cheboygan Dam during 2017 as part of a research project being conducted by the U.S. Geological Survey testing an eradication hypothesis using the Sterile Male Release Technique.

    - Fyke nets were deployed in the Pigeon, Sturgeon, and Maple rivers during 2017. Two unmarked lamprey were captured in the Pigeon, one in the Sturgeon, and zero in the Maple. Fin clipped sterile males were also released in these rivers: 1,425 in the Pigeon, 1,425 in the Sturgeon, and 830 in the Maple. Fyke nets recaptured sterile males at the following rates in these rivers: 29% in the Pigeon, 28% in the Sturgeon, and 60% in the Maple. Results are consistent with previous netting efforts between 2013-2016 suggesting the abundance of adult sea lamprey in the streams is very low (less than

50). Some of the sterile males in the Pigeon River were recaptured in a trap integrated with resistance weir panels (n=25), but nets were generally more efficient. A modified trap and resistance weir panel will be installed during 2018. The sterile male evaluation study is expected to take place during 2017-2020.

- Saugeen River – The Saugeen Ojibway Nation (SON) and Commission entered into an agreement to rehabilitate Denny's Dam to maintain its Sea Lamprey control function. Reconstruction began during 2017 and will be completed in 2018. The Department is providing funding for this project under the Canadian Federal Infrastructure Initiative.

- Nottawasaga River – Reconstruction of Nicolston Dam began during 2017 under the Canadian Federal Infrastructure Initiative. The work, including rehabilitation of the auxiliary and main spillways, abutments, and headwalls, will be completed in 2018.

- Partner agencies were consulted to ensure blockage at barriers for 24 sites in 8 streams during 2017 (Table 9).

**Table 9.** Status of concurrence requests for barrier removals, replacements, or fish passage projects in Lake Huron tributaries during 2017.

| Mainstream | Tributary | Lead Agency | Project | SLCP Position | Comments |
|---|---|---|---|---|---|
| Cheboygan R. | Milligan Cr. | HP[1] | Waveland Rd. culvert | Concur | Ineffective barrier |
| Cheboygan R. | Minnehaha Cr. | TOMWC[2] | Pickerel Lake Rd. culvert | Concur | Ineffective barrier |
| Cheboygan R. | Minnehaha Cr. | TOMWC[2] | Maxwell Rd. culvert | Concur | Ineffective barrier |
| Cheboygan R. | Little Rainy R. | HP[1] | 3 Mile Hwy culvert | Concur | Ineffective barrier |
| Cheboygan R. | Milligan Cr. | HP[1] | Brady Rd. culvert | Concur | Ineffective barrier |
| Cheboygan R. | Van Cr. | CRA[3] | Reed Rd. culvert | Concur | Ineffective barrier |
| Lone Pine Cr. | | HP[1] | Mulligan Cr. Rd. culvert | Concur | Ineffective barrier |
| Mulligan Cr. | | HP[1] | Pine Tree Trail culvert | Concur | Ineffective barrier |
| Mulligan Cr. | | HP[1] | Sandpiper Lane culvert | Concur | Upstream of blocking barrier |
| Grace Cr. | Grace Cr. | HP[1] | Grace Harbor Rd. culvert | Concur | Ineffective barrier |
| Au Sable R. | Wilbur Cr. | HP[1] | Brodie Rd. culvert | Concur | Ineffective barrier |
| Au Sable R. | Middle Branch Big Cr. | HP[1] | Pickerel Lake Rd. culvert | Concur | Ineffective barrier |
| Au Sable R. | Beaver Cr. | HP[1] | Cherry Cr. Rd. culvert | Concur | Ineffective barrier |
| Au Sable R. | South Branch Au Sable R. | HP[1] | Rollways Rd. culvert | Concur | Ineffective barrier |
| East Au Gres R. | Smith Cr. | HP[1] | Webb Rd. culvert | Concur | Upstream of blocking barrier |
| East Au Gres R. | Smith Cr. | HP[1] | Esmond Rd. culvert | Concur | Upstream of blocking barrier |
| East Au Gres R. | Graham Cr. | HP[1] | Curtis Rd. culvert | Concur | Upstream of blocking barrier |
| East Au Gres R. | Vaughn Cr. | HP[1] | Curtis Rd. culverts | Concur | Upstream of blocking barrier |
| East Au Gres R. | Vaughn Cr. | HP[1] | Esmond Rd. culverts | Concur | Upstream of blocking barrier |
| Rifle R. | Houghton Cr. | HP[1] | Heath Rd. culvert | Proposed | Ineffective barrier |
| Rifle R. | Houghton Cr. | HP[1] | Beechwood Rd. culvert | Proposed | Ineffective barrier |
| Rifle R. | Vaughn Cr. | HP[1] | Heath Rd. culvert | Proposed | Ineffective barrier |
| Saginaw R. | Flint R. | GCPRC[4] | Fabri Dam | Concur | Ineffective barrier |
| Saginaw R. | Flint R. | GCPRC[4] | Hamilton Dam | Concur | Ineffective barrier |

[1]Huron Pines
[2]Tip of the Mitt Watershed Council
[3]Conservation Resource Alliance
[4]Genesee County Parks and Recreation Commission

*New Construction*

- Pine River (Nottawasaga River tributary) – An engineering consultant was contracted to provide detailed design, specifications, and construction drawings for a Sea Lamprey barrier being proposed within the boundaries of Canadian Forces Base Borden, near Angus, Ontario. The design phase will be completed in 2018, however; there are no immediate plans for construction.

*Experimental barriers*

- A next generation low voltage electrical fish barrier was deployed seasonally (March –August) near the mouth of Black Mallard Creek (near Hammond Bay, MI) during 2016 and 2017 to block adult Sea Lamprey and eliminate the need for the next scheduled treatment during 2019. Although no adult Sea Lamprey were captured or observed above the barrier during 2016 and 2017, assessment crews from the Service found sea lamprey larvae in the river from the 2015, 2016, and 2017 year classes. The electrical barrier with modified design will be tested again during 2018, but the stream will likely require lampricide treatment on a normal schedule.

**Lake Erie**

The Commission has invested in seven purpose-built Sea Lamprey barriers on Lake Erie (Figure 3).

*Barrier Inventory and Project Selection System (BIPSS)*

- Field crews visited one structure on a Lake Erie tributary to assess Sea Lamprey blocking potential and to improve the information in the BIPSS database.

*Operation and Maintenance*

- 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 Otter Creek – Plans to rehabilitate the Black Bridge Dam as a Sea Lamprey barrier were abandoned. The engineering consultant completed rehabilitation plans and specifications, and provided a Class A construction estimate of $1,446,680. This was more than twice the preliminary estimate, and the cost-benefit of rehabilitating the dam relative to ongoing, periodic lampricide treatment of the upstream larval infestation is unfavourable.

    - Big Creek – Based on a site visit, Obermeyer Hydro Incorporated submitted a proposal for upgrading the existing components of the inflatable crest barrier, including replacement of the computer control system and sensors. The Department has reviewed the proposal and returned it with minor revisions. Upgrades will be implemented following the 2018 Sea Lamprey spawning migration.

    - Little Otter Creek – The Department is replacing the barrier-integrated trap to improve its function and safety. Construction will be completed following the 2018 Sea Lamprey spawning migration.

*Ensure Blockage to Sea Lamprey Migration*

- Cattaraugus Creek – The USACE, along with project partners Erie County and New York State Department of Environmental Conservation (NYSDEC) have approved the selected plan for the Springville Dam Ecosystem Restoration Project. The Project Partnership Agreement (PPA) was completed in July 2017 and upon receipt of non-federal funding from NYSDEC, the study team will move forward with the engineering and design phase. The selected plan will lower a portion of the existing spillway but the structure will still 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 15-foot wide rock riffle ramp with seasonal trapping and sorting operations is also included in the design. Construction is targeted for 2021 following the Sea Lamprey spawning run.

- Partner agencies were consulted to ensure blockage at barriers for three sites in two streams (Table 10).

**Table 10.** Status of concurrence requests for barrier removals, replacements, or fish passage projects in Lake Erie tributaries during 2017.

| Mainstream | Tributary | Lead Agency | Project | SLCP Position | Comments |
|---|---|---|---|---|---|
| Euclid Cr. | | CCBH[1] | East 185th Street Spillway | Pending | First barrier |
| Silver Cr. | Walnut Cr. | CCSWCD[2] | Tupper Cr. Culvert | Concur | Negative system |
| Silver Cr. | | CCSWCD[2] | Smiths Mills Dam | Concur | Negative system |

[1]Cuyahoga County Board of Health
[2]Chautauqua County Soil and Water Conservation District

*New Construction*

- Grand River – The USACE is the lead agency administering a project to construct a Sea Lamprey barrier to replace the deteriorated structure in the Grand River. Project partners include the Commission, Service, Ohio Department of Natural Resources (OHDNR), and Ashtabula County. The USACE has selected an onsite rebuild as the preferred alternative and barrier design is under review. Design considerations for the barrier include an 18-inch drop between crest height and tail water elevations and tail water velocities capable of preventing Sea Lamprey passage during high water events. Construction is targeted for completion by the end of 2019.

## Lake Ontario

The Commission has invested in 16 barriers on Lake Ontario (Figure 3). Of these, 10 were purpose-built as Sea Lamprey barriers and 6 were constructed for other purposes, but have been modified to block Sea Lamprey migrations.

*Barrier Inventory and Project Selection System (BIPSS)*

- Field crews visited one structure on a tributary to Lake Ontario to assess Sea Lamprey blocking potential and to improve the information in the BIPSS database.

*Operation and Maintenance*

- Routine maintenance, spring start-up, and safety inspections were performed on 12 barriers (9 Canada, 3 U.S.).

- Fish community assessments were conducted on Cobourg, Colborne, Grafton, Graham, Port Britain, Shelter Valley, and Wesleyville creeks to evaluate any changes that may be associated with the existence of purpose-built Sea Lamprey Barriers.

*Ensure Blockage to Sea Lamprey Migration*

- Bowmanville Creek – A fishway at the Goodyear Dam was reconstructed in 2014. Since then, there has been escapement of adult Sea Lamprey in successive years, leading to upstream establishment of a larval population. Potential Sea Lamprey escapement routes, including a water intake on the east side of the dam, are being investigated, from which remediation plans will be developed.

- Partner agencies were Consulted to ensure blockage conducted with for one site during 2017 (Table 11).

**Table 11.** Status of concurrence requests for barrier removals, replacements, or fish passage projects in Lake Ontario tributaries during 2017.

| Mainstream | Tributary | Lead Agency | Project | SLCP Position | Comments |
|---|---|---|---|---|---|
| Oswego R. | Breakneck Cr. | TU[1] | Bishop Corners Rd. culvert | Concur | Limited upstream potential |

[1]Trout Unlimited

*New Construction*

- Rouge River – Plans to conduct a Sea Lamprey barrier feasibility study are on hold pending transfer of land from Toronto Regional Conservation Authority to Parks Canada, as part of the initiative to establish an Urban National Park on the Rouge River.

## Juvenile Trapping

- No trapping for out-migrating Sea Lamprey juveniles was conducted in 2017.

## Sterile Male Release Technique

The Sterile Male Release Technique (SMRT) was discontinued as an alternative control method in the St. Marys River in 2012 after being implemented during 1997-2011. Monitoring of embryo viability (proportion of embryos that were alive at the time of stage 12 of development) continues to provide insight into the effectiveness of SMRT.

- In 2017, the mean embryo viability from 35 nests was 58%. The mean post-SMRT (2012-2017) embryo viability (65%) was significantly higher ($p=0.00036$) than the mean embryo viability (32%) when SMRT was applied (1993-2011; Figure 4).

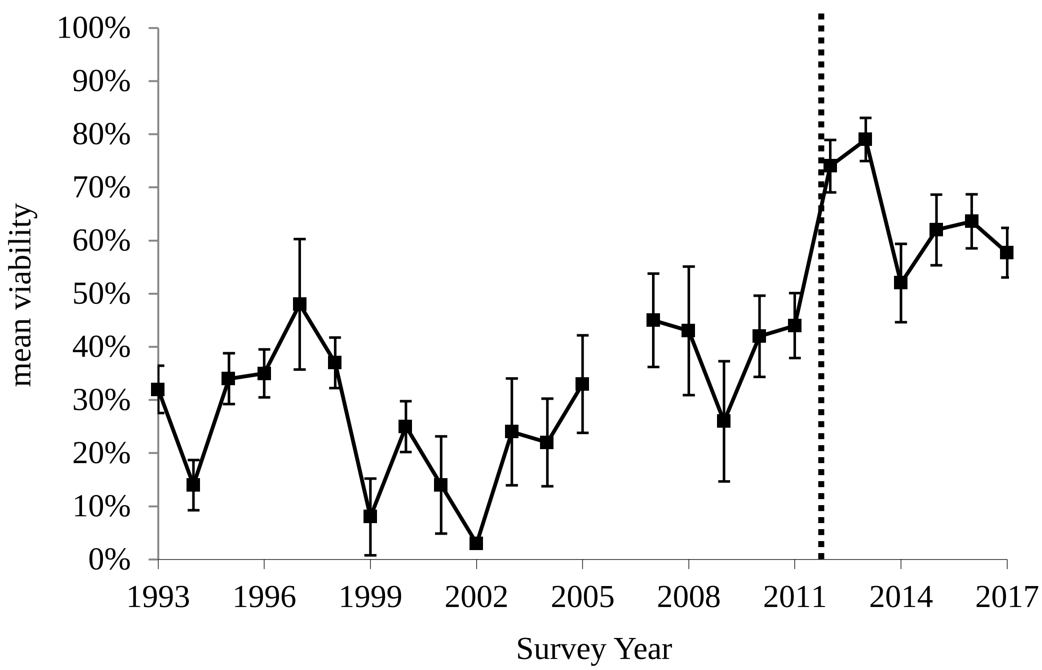


**Figure 4.** Mean annual embryo viability in the St. Marys River rapids during and after application of the sterile-male release technique (SMRT). The error bars represent SEs (not calculated for 2002 because only one sample was obtained). The vertical dashed line shows when SMRT application was discontinued after 2011.

**ASSESSMENT**

The SLCP has three assessment components and include the following:

1. Larval assessment determines the abundance and distribution of Sea Lamprey larvae in streams and lentic areas. These data are used to predict where larvae greater than 100 mm total length will most likely be found by the end of the growing season during the year of sampling. These predictions are used to prioritize lampricide treatments for the following year.

2. Juvenile assessment evaluates the lake-specific rate of Lake Trout marking inflicted by Sea Lamprey. These time series data are used in conjunction with adult assessment data to assess the effectiveness of the SLCP for each lake. In addition, several indices of relative abundance of feeding juveniles are used in some lakes to monitor Sea Lamprey populations over time.

3. Adult assessment annually estimates an index of adult Sea Lamprey abundance in each lake. Because this life stage is comprised of individuals that have either survived or avoided exposure to lampricides, the time series of adult abundance indices is the primary metric used to evaluate the effectiveness of the SLCP.

Reporting to the SLCB, the Larval Assessment Task Force (LATF) and the Trapping Task Force (TTF) were established by the Commission in 2012. The LATF is responsible for ranking streams and lentic areas for Sea Lamprey control options and evaluating the success of lampricide treatments through assessment of residual larvae. The TTF is responsible for optimizing trapping techniques for assessing adult Sea Lamprey populations and removing adults and juveniles. Task Force progress on SLCB charges during 2017 are presented in the LATF and TTF sections of this report.

## Larval Assessment

Tributaries considered for lampricide treatment during 2018 were assessed during 2017 to define the distribution and estimate the abundance and size structure of larval Sea Lamprey populations. Assessments were conducted with backpack electrofishers in waters <0.8 m deep, while waters ≥0.8 m in depth were surveyed with gB or by deep-water electrofishing (DWEF). Additional surveys are used to define the distribution of Sea Lamprey within a stream, detect new populations, evaluate lampricide treatments, and to establish the sites for lampricide application.

### Lake Superior

- Larval assessments were conducted on 160 tributaries (73 Canada, 87 U.S.) and 35 lentic areas (18 Canada, 17 U.S.). The status of larval Sea Lamprey populations in historically infested Lake Superior tributaries and lentic areas is listed in Tables 12 and 13.

- Surveys to estimate larval abundance were conducted in 36 tributaries (19 Canada, 17 U.S.) and in lentic areas offshore of 13 tributaries (9 Canada, 4 U.S.).

- Surveys to detect the presence of new larval Sea Lamprey populations were conducted in 46 tributaries (32 Canada, 14 U.S.). No new populations were discovered during 2017.

- Post-treatment assessments were conducted in 39 tributaries (19 Canada, 20 U.S.) and 10 lentic areas (7 Canada, 3 U.S.) to determine the effectiveness of lampricide treatments conducted during 2016 and 2017. The Cranberry River (Ontonagon Co.), Whitman Creek (Goulais River tributary), Batchawana River, Michipicoten River, and the lentic areas of Ankodosh Creek (Chippewa Co.) and Black River (Gogebic Co.), are scheduled for treatment in 2018 based on the presence of residual Sea Lamprey.

- Surveys to evaluate barrier effectiveness were conducted in 4 tributaries (1 Canada, 3 U.S.). All barriers remain effective in limiting sea lamprey infestations.

- Biological collections for research or training purposes were conducted in two U.S. tributaries. A total of 576 Sea Lamprey larvae were collected for research purposes from Harlow Creek and Middle River.

- Larval assessment surveys were conducted in non-wadable lentic and lotic areas using 104.53 kg active ingredient of gB (38.36 kg Canada, 66.17 kg U.S.; Table 14).

**Table 12.** Status of larval Sea Lamprey in Lake Superior tributaries with a history of Sea Lamprey production and estimates of abundance from tributaries surveyed during 2017.

| Tributary | Last Treated | Last Surveyed | Status of Larval Lamprey Population (surveys since last treatment) | | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
|---|---|---|---|---|---|---|---|
| | | | Residuals Present | Recruitment Evident | | | |
| **Canada** | | | | | | | |
| East Davignon Cr. | May-72 | Jul-15 | --- | No | --- | --- | Unknown |
| West Davignon Cr. | Jun-14 | Sep-17 | No | No | --- | --- | Unknown |
| Little Carp R. | May-16 | May-17 | --- | --- | --- | --- | Unknown |
| Big Carp R. | Sep-07 | May-17 | --- | No | --- | --- | Unknown |
| Cranberry Cr. | May-17 | Oct-17 | No | No | --- | --- | Unknown |
| Goulais R. | Oct-16 | Aug-17 | Yes | Yes | --- | --- | 2020[1] |
| Boston’s Cr. | Never | Jun-17 | --- | No | --- | --- | Unknown |
| Horseshoe Cr. | Never | Aug-15 | --- | No | --- | --- | Unknown |
| Havilland Cr. | Jul-13 | Jul-16 | No | No | --- | --- | Unknown |
| Stokely Cr. | Jun-08 | Jun-16 | --- | No | --- | --- | Unknown |
| Tier Cr. | Never | Jul-16 | --- | No | --- | --- | Unknown |
| Harmony R. | Jun-14 | Jun-16 | No | No | --- | --- | Unknown |
| Sawmill Cr. | Jul-11 | Aug-17 | --- | Yes | 303 | 227 | ***2018*** |
| Jones Landing Cr. | Never | Jul-17 | --- | No | --- | --- | Unknown |
| Tiny Cr. | Never | Sep-15 | --- | No | --- | --- | Unknown |
| Chippewa R. | Jun-16 | Aug-17 | No | Yes | --- | --- | 2020 |
| Unger Cr. | Jul-10 | Jul-16 | --- | No | --- | --- | Unknown |
| Batchawana R. | Jun-16 | Aug-17 | Yes | Yes | 98,666 | 4,979 | ***2018*** |
| Digby Cr. | Jun-13 | Jul-17 | No | Yes | 13 | 13 | Unknown |
| Carp R. | Jun-16 | Sep-16 | No | No | --- | --- | 2020[1] |
| Pancake R. | Jul-16 | Sep-16 | Yes | --- | --- | --- | 2020[1] |
| Westman Cr. | Jun-16 | Sep-16 | No | No | --- | --- | Unknown |
| Agawa R. | Jun-16 | Jul-16 | Yes | No | --- | --- | 2020 |
| Sand R. | Sep-71 | Aug-17 | --- | Yes | --- | --- | Unknown |
| Baldhead R. | Never | Jul-17 | --- | No | --- | --- | Unknown |
| Gargantua R. | Aug-13 | Jul-15 | No | Yes | --- | --- | ***2018***[1] |
| Old Woman R. | Jul-12 | Jul-17 | Yes | Yes | 34,799 | 3,796 | ***2018*** |
| Michipicoten R. | Aug-16 | Jul-17 | Yes | Yes | 64,904 | 4,476 | 2020[1] |
| Dog R. | Aug-63 | Jul-17 | --- | Yes | --- | --- | Unknown |
| White R. | Jul-16 | Jul-17 | --- | --- | --- | --- | 2021 |
| Pic R. | Jul-13 | Jul-16 | No | No | --- | --- | 2019[1] |
| Nama Cr. | Aug-14 | Jul-11 | --- | --- | | | 2019[1] |
| Little Pic R. | Jul-16 | Jul-17 | No | --- | --- | --- | Unknown |
| Prairie R. | Jul-94 | Jul-16 | --- | No | --- | --- | Unknown |
| Steel R. | Jul-16 | Aug-16 | No | --- | --- | --- | 2020[1] |
| Pays Plat R. | Jul-15 | Aug-17 | No | Yes | --- | --- | 2019[1] |
| Little Pays Plat Cr. | Jul-15 | Aug-17 | No | Yes | --- | --- | 2020 |
| Gravel R. | Aug-16 | Aug-16 | No | --- | --- | --- | 2020[1] |
| Little Gravel R. | Jul-13 | Aug-16 | Yes | Yes | 43,646 | 1,570 | ***2018*** |
| Little Cypress | Aug-14 | Aug-17 | No | Yes | --- | --- | Unknown |
| Cypress R. | Jul-15 | Aug-17 | Yes | Yes | 18,668 | 363 | ***2018*** |
| Jackpine R. | Never | Aug-16 | --- | Yes | --- | --- | Unknown |
| Jackfish R. | Oct-16 | Aug-17 | Yes | No | --- | --- | 2021[1] |
| Nipigon R. | | | | | | | |
| Upper Nipigon R. | Aug-16 | Aug-17 | No | No | --- | --- | 2021[1] |
| Lower Nipigon R. | Aug-06 | Aug-17 | --- | Yes | --- | --- | Unknown |

**Table 12**. *continued*.

| Tributary | Last Treated | Last Surveyed | Status of Larval Lamprey Population (surveys since last treatment) Residuals Present | Recruitment Evident | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
|---|---|---|---|---|---|---|---|
| Cash Cr. | Oct-15 | Aug-16 | Yes | Yes | --- | --- | 2021 |
| Polly Cr. | Jul-87 | Aug-17 | --- | Yes | 528 | 528 | ***2018*** |
| Stillwater Cr. | Jun-17 | Aug-16 | --- | --- | --- | --- | 2021[1] |
| Big Trout Cr. | Jul-15 | Aug-17 | Yes | Yes | 24,239 | 1,405 | ***2018*** |
| Otter Cove Cr. | Aug-71 | Jun-12 | --- | No | --- | --- | Unknown |
| Black Sturgeon R. | Aug-16 | Aug-17 | --- | --- | --- | --- | 2021 |
| Big Squaw Cr. | Jun-72 | Aug-14 | --- | No | --- | --- | Unknown |
| Wolf R. | Jul-15 | Aug-17 | Yes | Yes | 29,156 | 6,368 | ***2018*** |
| Coldwater Cr. | Jul-12 | Aug-17 | --- | Yes | 51,957 | 21,822 | ***2018*** |
| Pearl R. | Jul-15 | Aug-17 | No | Yes | --- | --- | 2020 |
| D’Arcy Cr. | Jul-10 | Aug-16 | --- | Yes | --- | --- | Unknown |
| Blende Cr. | Jun-17 | Aug-17 | Yes | No | --- | --- | Unknown |
| MacKenzie R. | Aug-16 | Aug-17 | No | Yes | --- | --- | Unknown |
| Wild Goose Cr. | Never | Aug-17 | --- | Yes | 1,983 | 839 | ***2018*** |
| Neebing-McIntyre FW | Jun-17 | Aug-17 | No | Yes | --- | --- | 2021 |
| Kaministiquia R. | Sep-16 | Aug-17 | Yes | No | --- | --- | 2019[1] |
| Corbett Cr. | Jul-16 | Aug-15 | --- | --- | --- | --- | 2019[1] |
| Whitefish R. | Aug-16 | Aug-17 | No | No | --- | --- | 2019[1] |
| Oliver Cr. | Jul-16 | Aug-17 | No | No | --- | --- | 2019[1] |
| Jarvis R. | Jun-17 | Aug-17 | No | No | --- | --- | Unknown |
| Cloud R. | Jun-17 | Aug-17 | No | Yes | --- | --- | 2021 |
| Pine R. | Jul-73 | Aug-16 | --- | Yes | 3,215 | 1,415 | ***2018*** |
| Pigeon R. | Aug-16 | Aug-17 | Yes | Yes | 25,065 | 3,581 | ***2018*** |
| **United States** | | | | | | | |
| Waiska R. | Never | Jul-14 | --- | No | --- | --- | Unknown |
| West Branch | Jun-16 | Jun-16 | --- | --- | --- | --- | Unknown |
| Sec 11SW Cr. | Never | Jun-17 | --- | Yes | --- | --- | Unknown |
| Pendills Cr. | Jul-12 | Sep-16 | --- | Yes | --- | --- | Unknown |
| Grants Cr. | Aug-15 | Jul-17 | No | No | --- | --- | Unknown |
| Halfaday Cr. | Jul-12 | Aug-17 | --- | Yes | --- | --- | Unknown |
| Naomikong Cr. | Jul-63 | Jun-17 | --- | Yes | 1,520 | 1,216 | ***2018*** |
| Ankodosh Cr. | Aug-15 | Jul-17 | Yes | Yes | --- | --- | Unknown |
| Roxbury Cr. | Jul-17 | Sep-17 | No | --- | --- | --- | Unknown |
| Galloway Cr. | Aug-15 | Jul-17 | Yes | Yes | --- | --- | Unknown |
| Tahquamenon R. | Oct-15 | Sep-16 | Yes | Yes | --- | --- | 2019[1] |
| Betsy R. | Jul-17 | Sep-17 | No | --- | --- | --- | Unknown |
| Three Mile Cr. | Jun-62 | Aug-17 | --- | Yes | 1,345 | 931 | ***2018*** |
| Little Two Hearted R. | Aug-16 | Jul-17 | No | --- | --- | --- | Unknown |
| Two Hearted R. | Aug-16 | May-17 | Yes | --- | --- | --- | 2020[1] |
| Dead Sucker R. | Aug-13 | Sep-16 | No | No | --- | --- | Unknown |
| Sucker R. | Jul-14 | Sep-17 | Yes | Yes | --- | --- | ***2018[1]*** |
| Chipmunk Cr. | Oct-61 | Jun-15 | --- | No | --- | --- | Unknown |
| Carpenter Cr. | Aug-15 | May-17 | No | No | --- | --- | Unknown |
| Sable Cr. | Sep-89 | Sep-16 | --- | Yes | --- | --- | Unknown |
| Hurricane R. | Never | Jun-15 | --- | No | --- | --- | Unknown |
| Sullivans Cr. | Jul-15 | May-17 | No | Yes | --- | --- | Unknown |
| Seven Mile Cr. | Jul-67 | Sep-17 | --- | Yes | 19,414 | 213 | ***2018*** |

**Table 12**. *continued*.

| Tributary | Last Treated | Last Surveyed | Status of Larval Lamprey Population (surveys since last treatment) Residuals Present | Recruitment Evident | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
|---|---|---|---|---|---|---|---|
| Beaver Lake Cr. | | | | | | | |
| Beaver Lake Outlet | Never | Aug-17 | --- | Yes | 646 | 0 | ***2018*** |
| Lowney Cr. | Aug-15 | Aug-17 | Yes | Yes | 6,585 | 459 | ***2018*** |
| Little Beaver Cr. | Sep-87 | Aug-17 | --- | Yes | 218 | 0 | ***2018*** |
| Mosquito R. | Jun-73 | Jul-14 | --- | No | --- | --- | Unknown |
| Miners R. | | | | | | | |
| Barrier downstream | Jul-16 | Sep-16 | No | Yes | --- | --- | 2020[1] |
| Barrier upstream | Jul-13 | Jul-15 | No | No | --- | --- | Unknown |
| Munising Falls Cr. | Sep-64 | Sep-17 | --- | No | --- | --- | Unknown |
| Anna R. | Jul-13 | Sep-17 | Yes | Yes | 1,413 | 0 | Unknown |
| Tourist Park Cr. | Never | Jul-16 | --- | Yes | --- | --- | Unknown |
| Furnace Cr. | | | | | | | |
| Lower | Jul-17 | Oct-16 | --- | --- | --- | --- | Unknown |
| Upper | Sep-10 | Oct-16 | --- | No | --- | --- | Unknown |
| Five Mile Cr. | Jul-16 | Oct-16 | No | --- | --- | --- | Unknown |
| Au Train R. | | | | | --- | --- | |
| Lower | Sep-16 | Sep-17 | No | No | --- | --- | Unknown |
| Upper | Sep-16 | Jul-17 | Yes | --- | --- | --- | Unknown |
| Rock R. | Jul-02 | Jun-14 | --- | No | --- | --- | Unknown |
| Deer Lake Cr. | Aug-70 | Sep-17 | --- | No | --- | --- | Unknown |
| Laughing Whitefish R. | Jul-17 | Sep-17 | Yes | --- | --- | --- | Unknown |
| Sand R. | | | | | --- | --- | |
| Below Dam | Jul-15 | Apr-17 | No | Yes | --- | --- | Unknown |
| Above Dam | Jul-15 | Aug-17 | Yes | No | --- | --- | Unknown |
| Chocolay R. | Jul-16 | Oct-16 | No | --- | --- | --- | 2020[1] |
| Carp R. | Jul-16 | Aug-17 | Yes | Yes | 51,876 | 1,166 | ***2018*** |
| Compeau Cr. | Never | Jun-16 | --- | Yes | --- | --- | Unknown |
| Dead R. | Aug-14 | Jul-17 | Yes | Yes | --- | --- | Unknown |
| Harlow Cr. | Jul-15 | Aug-17 | Yes | Yes | 38,944 | 2.076 | ***2018*** |
| Little Garlic R. | May-17 | Sep-17 | No | Yes | --- | --- | 2021[1] |
| Garlic R. | Jun-15 | Sep-17 | Yes | Yes | --- | --- | ***2018[1]*** |
| Iron R. | Jun-16 | Oct-16 | No | Yes | --- | --- | 2020[1] |
| Salmon Trout R. (Marquette Co.) | Jul-16 | Oct-16 | No | Yes | --- | --- | 2020[1] |
| Pine R. | Jun-15 | Sep-17 | Yes | Yes | 1,795 | 897 | ***2018*** |
| Huron R. | Aug-17 | Jun-17 | --- | --- | --- | --- | Unknown |
| Ravine R. | Aug-17 | Oct-17 | Yes | --- | --- | --- | ***2018[1]*** |
| Slate R. | Sep-13 | Jun-17 | Yes | Yes | --- | --- | Unknown |
| Silver R. | Aug-17 | Jun-17 | --- | --- | --- | --- | ***2018[1]*** |
| Falls R. | Aug-17 | Sep-17 | No | --- | --- | --- | ***2018[1]*** |
| Six Mile Cr. | May-63 | Sep-17 | --- | Yes | 1,352 | 811 | ***2018*** |
| Little Carp R. | May-16 | Aug-16 | No | No | --- | --- | Unknown |
| Kelsey Cr. | Never | Aug-16 | --- | Yes | --- | --- | Unknown |
| Sturgeon R. | Sep-15 | Oct-17 | Yes | Yes | --- | --- | ***2018[1]*** |
| Pilgrim R. | Aug-62 | Jun-17 | --- | Yes | --- | --- | Unknown |
| Trap Rock R. | Jul-17 | Aug-17 | No | --- | --- | --- | Unknown |
| McCallum Cr. | Aug-63 | May-15 | --- | No | --- | --- | Unknown |
| Traverse R. | May-16 | Sep-16 | No | Yes | --- | --- | 2019[1] |

**Table 12**. *continued*.

| Tributary | Last Treated | Last Surveyed | Status of Larval Lamprey Population (surveys since last treatment) Residuals Present | Recruitment Evident | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
|---|---|---|---|---|---|---|---|
| Little Gratiot R. | Jun-16 | Aug-17 | No | No | --- | --- | Unknown |
| Eliza Cr. | Aug-15 | Aug-16 | Yes | No | --- | --- | Unknown |
| Gratiot R. | Jul-15 | Aug-17 | Yes | Yes | 208 | 0 | ***2018***[1] |
| Smiths Cr. | May-64 | Aug-17 | --- | No | --- | --- | Unknown |
| Boston-Lily Cr. | Jun-16 | Aug-16 | Yes | Yes | --- | --- | Unknown |
| Schlotz Cr. | Jul-16 | Sep-16 | No | --- | --- | --- | Unknown |
| Salmon Trout R. (Houghton Co.) | Jun-16 | Sep-16 | No | --- | --- | --- | Unknown |
| Mud Lake Outlet | Oct-73 | Aug-17 | --- | Yes | 8,371 | 4,185 | ***2018*** |
| Graveraet R. | Aug-15 | Aug-17 | Yes | Yes | 1,696 | 0 | ***2018***[1] |
| Elm R. | Aug-16 | May-17 | No | --- | --- | --- | Unknown |
| Misery R. | | | | | --- | --- | Unknown |
| Barrier downstream | Jul-15 | May-17 | Yes | Yes | --- | --- | ***2018***[1] |
| Barrier upstream | Aug-00 | Jul-16 | --- | No | --- | --- | Unknown |
| East Sleeping R. | Jun-16 | Sep-16 | No | Yes | --- | --- | 2019[1] |
| West Sleeping R. | Jun-16 | Sep-16 | Yes | Yes | --- | --- | Unknown |
| Firesteel R. | Jul-16 | Jun-17 | Yes | --- | --- | --- | 2020[1] |
| Flintsteel R. | Sep-17 | Oct-17 | No | --- | --- | --- | Unknown |
| Ontonagon R. | Oct-16 | Jul-17 | Yes | --- | --- | --- | 2020[1] |
| Potato R. | Sep-17 | Oct-17 | No | --- | --- | --- | 2021[1] |
| Floodwood R. | Never | Jul-14 | --- | No | --- | --- | Unknown |
| Cranberry R. (Ontonagon Co.) | Sep-17 | Oct-17 | Yes | --- | 2,151 | 1,075 | ***2018*** |
| Mineral R. | Sep-17 | Jun-17 | --- | --- | --- | --- | Unknown |
| Big Iron R. | Never | Jun-17 | --- | Yes | --- | --- | Unknown |
| Little Iron R. | Sep-75 | Jun-17 | --- | Yes | --- | --- | Unknown |
| Union R. | May-64 | Jun-17 | --- | No | --- | --- | Unknown |
| Black R. | Jun-16 | Jul-17 | Yes | --- | --- | --- | ***2018***[1] |
| Montreal R. | Jul-75 | Aug-13 | --- | Yes | --- | --- | Unknown |
| Washington Cr. | Jun-80 | Jul-12 | -- | No | --- | --- | Unknown |
| Bad R. | Sep-17 | Jul-17 | --- | --- | --- | --- | 2020[1] |
| Marengo River | May-16 | Sep-16 | No | No | --- | --- | 2020[1] |
| Fish Cr. (Eileen Twp) | Jun-15 | Jun-17 | No | Yes | --- | --- | Unknown |
| Sioux R. | Sep-14 | Jun-17 | No | No | --- | --- | Unknown |
| Pikes Cr. | May-16 | Aug-16 | No | No | --- | --- | Unknown |
| Red Cliff Cr. | Jun-15 | Aug-17 | No | Yes | 3,980 | 948 | ***2018*** |
| Raspberry R. | May-16 | Sep-16 | No | No | --- | --- | Unknown |
| Sand R. | Jul-16 | Sep-16 | No | --- | --- | --- | Unknown |
| Cranberry R. (Bayfield Co.) | Jun-17 | Jun-17 | --- | --- | --- | --- | Unknown |
| Iron R. | | | | | | | |
| Barrier downstream | Aug-16 | Jul-17 | Yes | --- | --- | --- | Unknown |
| Barrier upstream | Oct-64 | Aug-16 | --- | No | --- | --- | Unknown |
| Reefer Cr. | Oct-64 | Sep-16 | --- | Yes | --- | --- | Unknown |
| Fish Cr. (Orienta Twp) | Oct-64 | Sep-16 | --- | No | --- | --- | Unknown |
| Brule R. | | | | | --- | --- | Unknown |
| Barrier downstream | Jun-15 | Jul-17 | Yes | Yes | --- | --- | ***2018***[1] |
| Barrier upstream | Jun-86 | Jul-16 | --- | No | --- | --- | Unknown |

**Table 12**. *continued*.

| Tributary | Last Treated | Last Surveyed | Status of Larval Lamprey Population (surveys since last treatment) Residuals Present | Recruitment Evident | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
|---|---|---|---|---|---|---|---|
| Poplar R. | Jun-15 | Jul-17 | Yes | Yes | 28,022 | 4,611 | ***2018*** |
| Middle R. | | | | | --- | --- | Unknown |
| Barrier downstream | Jun-17 | Aug-17 | No | --- | --- | --- | Unknown |
| Barrier upstream | Jun-02 | Jul-17 | --- | No | --- | --- | Unknown |
| Amnicon R. | Jun-15 | Jul-17 | Yes | Yes | --- | --- | ***2018***[1] |
| Nemadji R. | Oct-14 | Aug-17 | Yes | Yes | 11,417 | 4,302 | ***2018*** |
| St. Louis R. | Sep-87 | Aug-17 | --- | Yes | --- | --- | Unknown |
| Sucker R. (St. Louis Co.) | Never | Aug-17 | --- | No | --- | --- | Unknown |
| Gooseberry R. | Aug-76 | Aug-17 | --- | No | --- | --- | Unknown |
| Splitrock R. | Aug-76 | Aug-17 | --- | No | --- | --- | Unknown |
| Poplar R. | Jul-77 | Aug-17 | --- | Yes | 228 | 46 | ***2018*** |
| Arrowhead R. | Jun-09 | Aug_16 | --- | Yes | --- | --- | Unknown |

[1] Stream being treated based on stream-specific knowledge of sea lamprey recruitment and growth.

**Table 13.** Status of larval Sea Lamprey in historically infested lentic areas of Lake Superior during 2017.

| Tributary | Lentic Area | Last Surveyed | Last Survey Showing Infestation | Last Treated |
|---|---|---|---|---|
| **Canada** | | | | |
| Goulais R. | Goulais Bay | Sep-16 | Jul-15 | Oct-16 |
| Havilland Cr. | Havilland Bay | Jul-17 | Jul-14 | Jun-15 |
| Stokely Cr. | Havilland Bay | Jul-17 | Jul-09 | Aug-11 |
| Harmony R. | Batchawana Bay | Aug-17 | Aug-17 | Aug-14 |
| Chippewa R. | Batchawana Bay | Aug-17 | Aug-17 | Oct-17 |
| Batchawana R. | Batchawana Bay | Jul-17 | Jul-17 | Jun-16[1] |
| Carp R. | Batchawana Bay | Sep-16 | Sep-16 | Aug-07 |
| Pancake R. | Pancake Bay | Jun-14 | Jun-14 | Never |
| Agawa R. | Agawa Bay | Jul-14 | Jul-14 | Aug-10 |
| Michipicoten R. (Lower) | Marina Area | Jul-15 | Aug-12 | Aug-16 |
| Pays Plat R. | Pays Plat Bay | Aug-17 | Aug-17 | Never |
| Gravel R. | Mountain Bay | Aug-17 | Aug-17 | Aug-16[1] |
| Little Gravel R. | Mountain Bay | Aug-17 | Aug-17 | Aug-16 |
| Little Cypress R. | Cypress Bay | Aug-15 | Aug-15 | Aug-16 |
| Cypress R. | Cypress Bay | Aug-16 | Aug-16 | Aug-15 |
| Jackpine R. | Nipigon Bay | Aug-16 | Aug-16 | Jun-17 |
| Jackfish R. | Nipigon Bay | Aug-14 | Aug-05 | Never |
| Nipigon R. | | | | |
| Poly Cr. | Poly Lake | Aug-17 | Jul-90 | Jul-87 |
| Cash Cr. | Lake Helen | Aug-17 | Aug-15 | Sep-16 |
| Nipigon R. | Lake Helen | Aug-15 | Aug-15 | Aug-16 |
| Nipigon R (Lower). | Nipigon Bay | Aug-17 | Aug-17 | Aug-16[1] |
| Stillwater Cr. | Nipigon Bay | Aug-17 | Aug-17 | Aug-13[1] |
| Big Trout Cr. | Nipigon Bay | Aug-14 | Aug-14 | Oct-11 |
| Black Sturgeon R. | Black Bay | Aug-11 | Jul-04 | Never |
| Wolf R. | Black Bay | Aug-16 | Aug-16 | Aug-15 |
| D'Arcy Cr. | Black Bay | Aug-17 | Aug-16 | Jun-17 |
| MacKenzie R. | MacKenzie Bay | Aug-17 | Aug-16 | Aug-16 |
| Current R. | Thunder Bay | Aug-17 | Aug-17 | Aug-14[1] |
| Neebing-McIntyre Floodway | Thunder Bay | Aug-14 | Jul-90 | Never |
| Kaministiquia R. (Lower) | Thunder Bay | Aug-17 | Aug-17 | Aug-16 |
| Pigeon R. | Pigeon Bay | Aug-15 | Aug-15 | Aug-10[2] |
| **United States** | | | | |
| Pendills Cr. | Tahquamenon Bay | Jul-17 | Jul-12 | Never[2] |
| Grants Cr. | Tahquamenon Bay | Jul-17 | Jul-17 | Never[1] |
| Halfaday Cr. | Tahquamenon Bay | Jul-12 | Jul-12 | Never[2] |
| Ankodosh Cr. | Tahquamenon Bay | Jul-17 | Jul-17 | Sep-16[1] |
| Roxbury Cr | Tahquamenon Bay | Aug-15 | Aug-15 | Never[2] |
| Galloway Cr. | Tahquamenon Bay | Jun-13 | Jul-88 | Never |
| Sucker R. | Grand Marais Harbor | Sep-09 | Aug-90 | Never |
| Carpenter Cr. | West Bay | Sep-16 | Sep-16 | Aug-15 |
| Beaver Lake Cr. | Beaver Lake | Aug-17 | Aug-17 | Never[2] |
| | Little Beaver Lake | Aug-17 | Aug-17 | Never[2] |
| Anna R. | Munising Bay | Jun-17 | Jun-17 | Aug-11 |
| Miners R. | Miners Lake | Sep-13 | Sep-13 | Jun-11 |
| Furnace Cr. | Furnace Bay | Jun-17 | Jun-17 | Jul-17 |

**Table 13.** *continued.*

| Tributary | Lentic Area | Last Surveyed | Last Survey Showing Infestation | Last Treated |
|---|---|---|---|---|
| Pendills Cr. | Tahquamenon Bay | Jul-17 | Jul-12 | Never[2] |
| | Furnace Lake – Offshore Hanson Cr. | Jul-17 | Aug-09 | Never[2] |
| Furnace Cr. | Furnace Lake – Offshore Gongeau Cr. | Jul-17 | Aug-09 | Never[2] |
| Five Mile Cr. | Offshore mouth | Jul-16 | Jul-16 | Never[2] |
| Carp R. | Offshore mouth | Jun-17 | Jun-17 | Jun-15 |
| Dead R. | Presque Isle Harbor | Jun-17 | Jun-17 | Jul-17 |
| Harlow Cr. | Harlow Lake – | | | |
| | Offshore Bismark Cr. | Jul-14 | Jul-14 | Never[2] |
| | Offshore Outlet | Jun-17 | Jun-12 | Never |
| Little Garlic R. | Offshore mouth | Jun-17 | Aug-11 | Jul-12 |
| Garlic R. | Offshore mouth | Jul-12 | Sep-05 | Never[2] |
| | Saux Head Lake | Jul-17 | Jul-17 | Jun-15 |
| Ravine R. | Huron Bay | Sep-17 | Sep-17 | Sep-15 |
| Slate R. | Huron Bay | Jul-16 | Jul-16 | Sep-15 |
| Silver R. | Huron Bay | Sep-17 | Sep-17 | Aug-16 |
| Falls R. | Huron Bay | Sep-17 | Sep-17 | Sep-15[1] |
| Trap Rock R. | Torch Lake | Jun-16 | Jun-16 | Sep-15 |
| Eliza Cr. | Eagle Harbor | Jun-16 | Jun-16 | Never[2] |
| Mineral R. | Offshore mouth | Sep-11 | Sep-11 | Never[2] |
| Black R. | Black River Harbor | Jul-17 | Jul-17 | Jun-16[1] |
| Fish Cr. (Eileen Twp.) | Chequamegon Bay | Aug-15 | Aug-06 | Never[2] |
| Red Cliff Cr. | Buffalo Bay | Aug-11 | Aug-03 | Never |
| Sand R. (Bayfield Twp.) | Sand Bay | Aug-15 | Aug-15 | Aug-10[2] |
| Amnicon R. | Superior Bay | Aug-15 | Aug-12 | Never |

[1] Scheduled for treatment during 2018
[2] Low-density larval population monitored with 3.2% granular Bayluscide surveys

**Table 14.** Details on application of granular Bayluscide to tributaries and lentic areas of Lake Superior for larval assessment purposes during 2017.

| Tributary | Bayluscide (kg)[1] | Area Surveyed (ha) |
|---|---|---|
| **Canada** | | |
| Haviland Cr. | 0.84 | 0.15 |
| Stokely Cr. | 0.84 | 0.15 |
| Harmony R. | 0.84 | 0.15 |
| Chippewa R. | 1.68 | 0.3 |
| Batchawana R. | 2.52 | 0.45 |
| Carp R. | 1.68 | 0.3 |
| Agawa R. | 1.68 | 0.3 |
| Sand R. | 0.56 | 0.1 |
| Michipicoten R. | 1.12 | 0.2 |
| Dog R. (lotic) | 0.56 | 0.1 |
| White R. (lotic) | 1.68 | 0.3 |
| Little Pic R. (lotic) | 1.68 | 0.3 |
| Gravel R. (Lentic) | 1.96 | 0.35 |
| L. Gravel R. (Lentic) | 0.56 | 0.1 |
| Jackfish R. (Lotic) | 0.84 | 0.15 |
| Nipigon R. (Lentic and Lotic) | 6.44 | 1.15 |
| Black Sturgeon R. (Lotic) | 0.84 | 0.15 |
| Pearl R. (Lotic) | 0.84 | 0.15 |
| D'Arcy Cr. (Lentic) | 0.84 | 0.15 |
| MacKenzie R. (Lentic) | 1.68 | 0.3 |
| Current R. | 2.24 | 0.4 |
| Kaministiquia R. | 5.6 | 1 |
| Pigeon R. | 0.84 | 0.15 |
| **Total (Canada)** | **38.36** | **6.85** |
| | | |
| **United States** | | |
| Pendills Creek (Lentic) | 2.32 | 0.41 |
| Grants Creek (Lentic) | 2.32 | 0.41 |
| Ankodosh Creek (Lentic) | 2.32 | 0.41 |
| Tahquamenon River (Lentic) | 3.48 | 0.62 |
| Beaver Lake Creek (Lentic) | 4.06 | 0.73 |
| Anna River (Lentic) | 2.32 | 0.41 |
| Furnace Creek (Lentic) | 4.94 | 0.88 |
| AuTrain River (Lotic) | 2.34 | 0.42 |
| Carp River (Lentic) | 2.32 | 0.41 |
| Dead River (Lotic and Lentic) | 5.81 | 1.04 |
| Harlow Creek (Lentic) | 1.16 | 0.21 |
| Little Garlic River (Lentic) | 1.74 | 0.31 |
| Garlic River (Lentic) | 1.74 | 0.31 |
| Ravine River (Lentic) | 2.32 | 0.41 |
| Silver River (Lentic) | 3.48 | 0.62 |
| Falls River (Lentic) | 2.32 | 0.41 |
| Pilgrim River (Lotic) | 1.74 | 0.31 |
| Flintsteel River (Lotic) | 1.16 | 0.21 |
| Ontonagon River (Lotic) | 1.02 | 0.18 |
| Black River (Lotic and Lentic) | 3.48 | 0.62 |
| Iron River (Bayfield Co.) (Lotic) | 1.74 | 0.31 |

**Table 14.** *continued*

| Tributary | Bayluscide (kg)[1] | Area Surveyed (ha) |
|---|---|---|
| Nemadji River (Lotic) | 1.89 | 0.34 |
| St. Louis River (Lotic) | 6.97 | 1.18 |
| Arrowhead River (Lotic) | 3.18 | 0.57 |
| **Total (United States)** | **66.17** | **11.73** |
| | | |
| **Total for Lake** | **104.53** | **18.58** |

[1]Lampricide quantities are reported in kg active ingredient

## Lake Michigan

- Larval assessments were conducted on 90 tributaries and 14 lentic areas. The status of larval Sea Lamprey populations in historically infested Lake Michigan tributaries and lentic areas is presented in Tables 15 and 16.

- Surveys to estimate larval Sea Lamprey abundance were conducted in five tributaries.

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

- Post-treatment assessments were conducted in 29 tributaries and 1 lentic area to determine the effectiveness of lampricide treatments during 2016 and 2017. Deadhorse Creek is scheduled for treatment in 2018 based on the presence of residual Sea Lamprey.

- Surveys were conducted in eight tributaries to Lake Michigan to evaluate sea lamprey barrier effectiveness. Significant numbers of large Sea Lamprey larvae were collected in barrier surveys in the Days River. This additional infested area above the barrier was added to the 2017 treatment schedule.

- Larval assessment surveys were conducted in 15 non-wadable lentic and lotic areas using 30.87 kg active ingredient of gB (Table 17).

**Table 15.** Status of larval Sea Lamprey in Lake Michigan tributaries with a history of Sea Lamprey production and estimates of abundance from tributaries surveyed during 2017.

| Tributary | Last Treated | Last Surveyed | Status of Larval Lamprey Population (surveys since last treatment) Residuals Present | Recruitment Evident | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
|---|---|---|---|---|---|---|---|
| Brevort R. | | | | | | | |
| Upper | Jun-17 | Sep-17 | No | No | --- | --- | Unknown |
| Lower | Jun-17 | Sep-17 | No | No | --- | --- | Unknown |
| Paquin Cr. | Oct-87 | May-15 | No | Yes | --- | --- | Unknown |
| Davenport Cr. | Sep-13 | Jun-16 | No | No | --- | --- | Unknown |
| Hog Island Cr. | Jun-17 | Aug-17 | No | Yes | --- | --- | 2021[1] |
| Sucker R. | Jun-61 | Sep-17 | No | Yes | --- | --- | Unknown |
| Black R. | Jun-17 | Aug-17 | No | No | --- | --- | Unknown |
| Mattix Cr. | Aug-15 | Jun-16 | No | --- | --- | --- | Unknown |
| Mile Cr. | May-17 | May-17 | --- | --- | --- | --- | Unknown |
| Millecoquins R. | Jun-17 | Aug-17 | No | Yes | --- | --- | 2020[1] |
| Rock R. | Sep-13 | Jun-16 | Yes | Yes | --- | --- | Unknown |
| Crow R. | Aug-17 | May-17 | --- | --- | --- | --- | Unknown |
| Cataract R. | Sep-13 | Jun-16 | Yes | Yes | --- | --- | Unknown |
| Pt. Patterson Cr. | Jul-13 | Aug-16 | No | No | --- | --- | Unknown |
| Hudson Cr. | Aug-17 | Aug-16 | --- | --- | --- | --- | Unknown |
| Swan Cr. | Jul-13 | May-17 | No | No | --- | --- | Unknown |
| Seiners Cr. | Aug-17 | Jul-17 | --- | --- | --- | --- | Unknown |
| Milakokia R. | Oct-16 | May-17 | No | --- | --- | --- | Unknown |
| Bulldog Cr. | Jun-13 | Jul-16 | Yes | Yes | --- | --- | Unknown |
| Gulliver Lake Outlet | Sep-13 | Aug-16 | No | Yes | --- | --- | Unknown |
| Marblehead Cr. | May-16 | Jul-16 | No | --- | --- | --- | Unknown |
| Manistique R. | Sep-16 | Sep-17 | Yes | No | --- | --- | Unknown |
| Southtown Cr. | Jul-13 | Jul-17 | No | No | --- | --- | Unknown |
| Thompson Cr. | Never | Aug-16 | --- | Yes | --- | --- | Unknown |
| Johnson Cr. | Jun-13 | May-17 | No | No | --- | --- | Unknown |
| Deadhorse Cr. | May-17 | Aug-17 | Yes | Yes | 239 | 80 | ***2018*** |
| Gierke Cr. | Never | Jul-16 | --- | Yes | --- | --- | Unknown |
| Bursaw Cr. | Aug-17 | Jul-17 | --- | --- | --- | --- | Unknown |
| Parent Cr. | Aug-17 | Jul-16 | --- | --- | --- | --- | Unknown |
| Poodle Pete Cr. | Aug-17 | Jul-16 | --- | --- | --- | --- | Unknown |
| Valentine Cr. | Aug-17 | Jun-17 | --- | --- | --- | --- | Unknown |
| Little Fishdam R. | May-01 | Jun-16 | --- | No | --- | --- | Unknown |
| Big Fishdam R. | Aug-16 | Jul-17 | No | --- | --- | --- | Unknown |
| Sturgeon R. | Aug-15 | Aug-17 | No | Yes | --- | --- | 2019[1] |
| Ogontz R. | Jun-16 | May-17 | Yes | Yes | --- | --- | 2020[1] |
| Squaw Cr. | Aug-17 | Apr-17 | --- | --- | --- | --- | Unknown |
| Hock Cr. | May-17 | Aug-17 | No | No | --- | --- | Unknown |
| Whitefish R. | May-16 | Sep-17 | Yes | Yes | --- | --- | 2019[1] |
| Bills Creek | May-16 | Aug-17 | Yes | Yes | 13,676 | 318 | ***2018*** |
| Rapid R. | May-17 | Aug-17 | Yes | Yes | --- | --- | 2021[1] |
| Tacoosh R. | Oct-14 | Aug-17 | No | No | --- | --- | Unknown |
| Days R. | | | | | | | |
| Barrier downstream | Aug-17 | Aug-17 | --- | --- | --- | --- | ***2018*** |
| Barrier upstream | Aug-17 | Aug-17 | --- | --- | --- | --- | Unknown |

**Table 15**. *continued.*

| Tributary | Last Treated | Last Surveyed | Status of Larval Lamprey Population (surveys since last treatment) Residuals Present | Recruitment Evident | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
|---|---|---|---|---|---|---|---|
| Escanaba R. | Never | Jun-15 | --- | --- | --- | --- | Unknown |
| Portage Cr. | May-17 | Aug-17 | Yes | No | --- | --- | Unknown |
| Ford R. | May-17 | Sep-17 | No | Yes | --- | --- | 2020[1] |
| Sunnybrook Cr. | May-71 | May-16 | --- | No | --- | --- | Unknown |
| Bark R. | May-17 | Aug-17 | No | No | --- | --- | Unknown |
| Cedar R. | Jun-17 | Aug-17 | No | Yes | --- | --- | 2020[1] |
| Sugar Cr. | May-08 | Aug-17 | --- | Yes | --- | --- | Unknown |
| Arthur Bay Cr. | Jun-10 | Sep-17 | --- | Yes | --- | --- | Unknown |
| Rochereau Cr. | Apr-63 | Aug-17 | --- | No | --- | --- | Unknown |
| Johnson Cr. | Apr-17 | Aug-17 | No | No | --- | --- | Unknown |
| Bailey Cr. | Apr-15 | Aug-17 | Yes | Yes | --- | --- | Unknown |
| Beattie Cr. | Apr-15 | May-17 | No | Yes | --- | --- | Unknown |
| Springer Cr. | Apr-13 | Aug-17 | No | Yes | --- | --- | Unknown |
| Menominee R. | Jul-16 | Jun-17 | Yes | --- | --- | --- | Unknown |
| Little R. | Aug-77 | Aug-17 | --- | No | --- | --- | Unknown |
| Peshtigo R. | Oct-15 | Aug-17 | No | Yes | --- | --- | 2019[1] |
| Oconto R. | Oct-17 | Aug-17 | --- | --- | --- | --- | Unknown |
| Pensaukee R. | Nov-77 | Aug-17 | --- | No | --- | --- | Unknown |
| Suamico R. | Never | Aug-17 | --- | No | --- | --- | Unknown |
| Ephraim Cr. | Apr-63 | Jun-15 | --- | No | --- | --- | Unknown |
| Hibbards Cr. | May-07 | Sep-16 | --- | Yes | --- | --- | Unknown |
| Whitefish Bay Cr. | May-16 | Jul-17 | No | No | --- | --- | Unknown |
| Shivering Sands Cr. | Apr-12 | Sep-16 | Yes | No | --- | --- | Unknown |
| Lilly Bay Cr. | Apr-63 | May-14 | --- | No | --- | --- | Unknown |
| Bear Cr. | May-75 | Jul-15 | --- | No | --- | --- | Unknown |
| Door Co. 23 Cr. | May-07 | Sep-16 | --- | Yes | --- | --- | Unknown |
| Silver Creek | Never | Sep-16 | --- | Yes | --- | --- | Unknown |
| Ahnapee R. | Apr-64 | Sep-15 | --- | No | --- | --- | Unknown |
| Three Mile Cr. | Apr-17 | Jul-17 | No | --- | --- | --- | Unknown |
| Kewaunee R. | | | | | | | |
| Barrier downstream | May-75 | Jul-17 | --- | Yes | --- | --- | Unknown |
| Barrier upstream | May-75 | Jul-17 | --- | Yes | --- | --- | Unknown |
| Casco Cr. | May-14 | Jul-17 | Yes | No | --- | --- | Unknown |
| Scarboro Cr. | May-75 | Jul-17 | --- | Yes | --- | --- | Unknown |
| East Twin R. | Apr-17 | Jul-17 | No | --- | --- | --- | Unknown |
| Fischer Cr. | May-87 | Jul-15 | --- | No | --- | --- | Unknown |
| French Farm Cr. | Never | Jun-17 | --- | --- | --- | --- | Unknown |
| Carp Lake Outlet | Jun-17 | Sept-17 | No | --- | --- | --- | Unknown |
| Big Stone Cr. | Sep-13 | Aug-16 | No | --- | --- | --- | Unknown |
| Big Sucker R. | Sept-13 | Aug-16 | No | --- | --- | --- | Unknown |
| Wycamp Lake Outlet | Jul-17 | Sep-17 | No | --- | --- | --- | Unknown |
| Bear R. | Never | Aug-16 | --- | No | --- | --- | Unknown |
| Horton Cr. | Jun-17 | Sep-17 | Yes | Yes | --- | --- | Unknown |
| Boyne R. | Jun-17 | Sep-17 | Yes | Yes | --- | --- | 2021[1] |
| Porter Cr. | Sep-13 | Jul-17 | No | No | --- | --- | Unknown |
| Jordan R. | Aug-15 | Oct-17 | Yes | Yes | 106,700 | 1,887 | ***2018*** |
| Monroe Cr. | Aug-13 | Aug-16 | No | No | --- | --- | Unknown |

**Table 15**. *continued.*

| | | | Status of Larval Lamprey Population (surveys since last treatment) | | | | |
|---|---|---|---|---|---|---|---|
| Tributary | Last Treated | Last Surveyed | Residuals Present | Recruitment Evident | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
| Loeb Cr. | Aug-13 | Jun-17 | No | No | --- | --- | Unknown |
| McGeach Cr. | Oct-99 | May-15 | --- | --- | --- | --- | Unknown |
| Elk Lake Outlet | Jun-17 | Sep-17 | No | --- | --- | --- | Unknown |
| Yuba Cr. | May-06 | Jun-14 | --- | --- | --- | --- | Unknown |
| Acme Cr. | Aug-63 | May-15 | --- | --- | --- | --- | Unknown |
| Mitchell Cr. | Jul-17 | Jun-17 | --- | --- | --- | --- | Unknown |
| Boardman R. (lower) | Aug-15 | Sep-16 | No | No | --- | --- | Unknown |
| Boardman R. (mid.) | Aug-15 | Jun-16 | No | No | --- | --- | Unknown |
| Hospital Creek | Aug-15 | Jun-17 | Yes | Yes | 230 | 230 | ***2018*** |
| Leo Cr. | Never | Sep-16 | --- | No | --- | --- | Unknown |
| Leland River | Never | Jul-17 | --- | No | --- | --- | Unknown |
| Good Harbor Cr. | Jul-10 | Sep-16 | --- | No | --- | --- | Unknown |
| Crystal R. | Nov-11 | Jul-17 | --- | No | --- | --- | Unknown |
| Platte R. (upper) | Jun-17 | May-17 | --- | --- | --- | --- | 2020[1] |
| Platte R. (middle) | Jun-17 | Sep-16 | --- | --- | --- | --- | 2020[1] |
| Platte R. (lower) | Jun-17 | Sep-17 | Yes | Yes | --- | --- | 2020[1] |
| Betsie R. | Jun-17 | Sep-17 | Yes | Yes | --- | --- | 2020[1] |
| Bowen Cr. | Jun-09 | Jul-15 | --- | --- | --- | --- | Unknown |
| Big Manistee R. | Aug-16 | Oct-16 | Yes | --- | --- | --- | 2019[1] |
| Bear Cr. | Aug-16 | Oct-16 | Yes | --- | --- | --- | 2019[1] |
| L. Manistee R. | Jul-15 | Aug-16 | No | Yes | --- | --- | ***2018*** |
| Gurney Cr. | Jun-16 | Jul-17 | No | No | --- | --- | Unknown |
| Cooper Cr. | Jul-08 | Jul-15 | --- | No | --- | --- | Unknown |
| Lincoln R. | Jul-17 | May-17 | --- | --- | --- | --- | 2021[1] |
| Pere Marquette R. | Jul-17 | Jul-17 | --- | --- | --- | --- | 2020[1] |
| Bass Lake Outlet | Aug-78 | Jul-15 | --- | --- | --- | --- | Unknown |
| Pentwater R. (N. Br.) | Jul-16 | Aug-17 | Yes | Yes | --- | --- | 2019[1] |
| South Branch | Never | Aug-17 | --- | No | --- | --- | Unknown |
| Lambricks Cr. | Sep-84 | Aug-17 | --- | No | --- | --- | Unknown |
| Stony Cr. | Jul-17 | May-17 | --- | --- | --- | --- | Unknown |
| Flower Cr. | Jul-17 | May-17 | --- | --- | --- | --- | Unknown |
| White R. | Aug-17 | May-17 | --- | --- | --- | --- | 2020[1] |
| Duck Cr. | Jul-84 | May-15 | --- | No | --- | --- | Unknown |
| Muskegon R. | Sep-17 | May-17 | --- | --- | --- | --- | 2020[1] |
| Brooks Cr. | Sep-17 | May-17 | --- | --- | --- | --- | 2020[1] |
| Cedar Cr. | Sep-17 | May-17 | --- | --- | --- | --- | 2020[1] |
| Bridgeton Cr. | Sep-17 | May-17 | --- | --- | --- | --- | 2020[1] |
| Minnie Cr. | Sep-17 | May-17 | --- | --- | --- | --- | 2020[1] |
| Bigelow Cr. | Sep-17 | May-17 | --- | --- | --- | --- | 2020[1] |
| Big Bear Cr. | Aug-70 | May-15 | --- | No | --- | --- | Unknown |
| Mosquito Cr. | Sep-68 | Aug-14 | --- | No | --- | --- | Unknown |
| Black Cr. | Aug-08 | Sep-16 | --- | No | --- | --- | Unknown |
| Grand R. | Never | Jul-12 | --- | No | --- | --- | Unknown |
| Norris Cr. | Jun-17 | Sep-16 | --- | --- | --- | --- | Unknown |
| Lowell Cr | Sep-65 | Jun-13 | --- | No | --- | --- | |
| Buck Cr. | Sep-65 | Oct-15 | --- | No | --- | --- | |
| Rush Cr. | Sep-65 | Oct-15 | --- | No | --- | --- | |

**Table 15**. *continued.*

| Tributary | Last Treated | Last Surveyed | Status of Larval Lamprey Population (surveys since last treatment) Residuals Present | Recruitment Evident | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
|---|---|---|---|---|---|---|---|
| Loeb Cr. | Aug-13 | Jun-17 | No | No | --- | --- | Unknown |
| Sand Cr. | Jun-07 | Sep-16 | --- | No | --- | --- | Unknown |
| Crockery Cr. | Jun-17 | May-17 | --- | --- | --- | --- | 2020[1] |
| Bass R. | Aug-04 | Sep-16 | --- | No | --- | --- | Unknown |
| Rogue R. | Sep-09 | Aug-16 | --- | No | --- | --- | Unknown |
| Pigeon R. | Oct-64 | Jun-16 | --- | No | --- | --- | Unknown |
| Pine Cr. | Oct-64 | Jun-16 | --- | No | --- | --- | Unknown |
| Gibson Cr. | Jul-84 | Jun-16 | --- | No | --- | --- | Unknown |
| Kalamazoo R. | Oct-65 | Jul-12 | --- | No | --- | --- | Unknown |
| Bear Cr. | Jul-14 | May-17 | Yes | Yes | --- | --- | Unknown |
| Sand Cr. | Sep-10 | May-17 | --- | Yes | --- | --- | Unknown |
| Mann Cr. | Jul-16 | May-17 | No | No | --- | --- | Unknown |
| Rabbit R. | Sep-15 | May-17 | No | No | --- | --- | Unknown |
| Swan Cr. | Jul-13 | May-17 | No | No | --- | --- | Unknown |
| Allegan 3 Cr. | Sep-65 | Jun-16 | --- | No | --- | --- | Unknown |
| Allegan 4 Cr. | Oct-78 | May-15 | --- | Yes | --- | --- | Unknown |
| Allegan 5 Cr. | Jul-14 | Jun-16 | No | No | --- | --- | Unknown |
| Black R. | | | | | | | |
| North Branch | Jun-77 | May-15 | --- | No | --- | --- | Unknown |
| Middle Branch | May-17 | Oct-17 | Yes | Yes | --- | --- | Unknown |
| South Branch | May-17 | Oct-17 | No | No | --- | --- | Unknown |
| Brandywine Cr. | Aug-85 | Sep-14 | --- | No | --- | --- | Unknown |
| Rogers Cr. | May-98 | Jun-16 | --- | Yes | --- | --- | ***2018*** |
| St. Joseph R. | Never | Jul-10 | --- | No | --- | --- | Unknown |
| Lemon Cr. | Oct-65 | Sep-11 | --- | No | --- | --- | Unknown |
| Pipestone Cr. | May-14 | Oct-14 | No | No | --- | --- | Unknown |
| Meadow Dr. | Oct-65 | Sep-11 | --- | No | --- | --- | Unknown |
| Hickory Cr. | Jul-15 | Aug-15 | No | --- | --- | --- | Unknown |
| Paw Paw R. | Sep-17 | Jul-17 | --- | --- | --- | --- | Unknown |
| Blue Cr. | Sep-15 | Jul-17 | No | No | --- | --- | Unknown |
| Mill Cr. | Sep-17 | Jul-17 | --- | --- | --- | --- | Unknown |
| Brandywine Cr. | Sep-17 | Jul-17 | --- | --- | --- | --- | Unknown |
| Brush Cr. | Sep-15 | Jul-17 | No | No | --- | --- | Unknown |
| Hayden Cr. | Sep-15 | Jul-17 | No | No | --- | --- | Unknown |
| Campbell Cr. | Sep-17 | Jul-17 | --- | --- | --- | --- | Unknown |
| Galien R. (N. Br.) | Jun-16 | Jul-17 | No | No | --- | --- | 2020[1] |
| E. Br. & Dowling Cr. | Oct-10 | May-16 | --- | No | --- | --- | 2020[1] |
| S. Br. & Galina Cr. | Jun-16 | Jul-17 | No | No | --- | --- | 2020[1] |
| Spring Cr. | Jun-16 | Jul-17 | No | No | --- | --- | 2020[1] |
| S. Br. Spring Cr. | Jun-16 | Jul-17 | No | No | --- | --- | 2020[1] |
| State Cr. | Apr-14 | May-16 | No | No | --- | --- | Unknown |
| Trail Cr. | Apr-14 | Sep-17 | No | No | --- | --- | Unknown |
| Donns Cr. | May-66 | Sep-17 | --- | No | --- | --- | Unknown |
| Burns Ditch | Jun-15 | Sep-17 | Yes | Yes | 2,038 | 1,630 | ***2018*** |

[1] Stream being treated based on stream-specific **knowledge of sea lamprey recruitment and growth.**

**Table 16.** Status of larval Sea Lamprey in historically infested lentic areas of Lake Michigan during 2017.

| Tributary | Lentic Area | Last Surveyed | Last Survey Showing Infestation | Last Treated |
|---|---|---|---|---|
| Brevort R. | Brevort Lake (Silver Cr. – Offshore) | Jun-16 | Jul-08 | Never[2] |
| | Brevort Lake (L. Brevort R. – Offshore) | Jun-16 | Aug-74 | Never |
| Paquin Cr. | Paquin Cr. (Offshore) | Jul-08 | Jul-08 | Never[2] |
| Hog Island Cr. | Hog Island Cr. (Offshore) | Jun-16 | Sep-12 | Jun-07[2] |
| Black R. | Black R. (Offshore) | Aug-15 | Aug-11 | Jun-76[2] |
| Mile Cr. | Mile Cr. (Offshore) | Jun-08 | Jun-08 | Aug-68[2] |
| Millecoquins R. | Millecoquins Lake (Cold Cr. – Offshore) | Jun-16 | Sep-10 | Never[2] |
| Milakokia R. | Seul Choix Bay | Jun-14 | Aug-80 | Never |
| Manistique R. | Manistique R. (Offshore) | Jul-17 | Jul-17 | Sep-16 |
| Deadhorse Cr. | Deadhorse Cr. (Offshore) | Jul-11 | Oct-64 | Never |
| Bursaw Cr. | Bursaw Cr. (Offshore) | Jul-11 | Jul-11 | Never[2] |
| Valentine Cr. | Big Bay De Noc (Offshore) | Sep-11 | Aug-94 | Never |
| Ogontz R. | Big Bay De Noc (Offshore) | Aug-17 | Jul-15 | Sep-14 |
| Whitefish R. | Little Bay De Noc | Jun-13 | Jul-11 | Jun-83[2] |
| Rapid R. | Little Bay De Noc | Jul-16 | Jul-16 | May-15 |
| Days R. | Little Bay De Noc | Aug-17 | Aug-13 | Aug-14 |
| Escanaba R. | Little Bay De Noc | Jun-15 | Jul-06 | Never[2] |
| Portage Cr. | Portage Bay | Aug-17 | Aug-82 | Never |
| Ford R. | Green Bay | Aug-17 | Jul-16 | Oct-14 |
| Sunny Br. | Green Bay | Sep-82 | Aug-81 | Never |
| Bark R. | Green Bay | Jul-16 | Sep-98 | Never |
| Cedar R. | Green Bay | Jul-16 | Jul-16 | May-10 |
| Beattie Cr. | Green Bay | Jul-08 | Jul-85 | Never |
| Menominee R. | Green Bay | Aug-17 | Sep-15 | Jul-16[2] |
| Peshtigo R. | Green Bay | Sep-15 | Aug-14 | Never |
| Bear R. | Little Traverse Bay | Aug-16 | Jun-08 | May-07 |
| Horton Cr. | Horton Bay (Lake Charlevoix) | Jul-16 | Jul-16 | Jul-17 |
| Boyne R. | Boyne Harbor (Lake Charlevoix) | Jun-14 | Jun-14 | Jul-17 |
| Porter Cr. | Lake Charlevoix | Jun-14 | Jun-14 | Sep-13 |
| Jordan R. | Lake Charlevoix | Jun-14 | Jun-14 | Aug-15[1] |
| Monroe Cr. | Lake Charlevoix | Aug-16 | Jun-13 | Aug-13 |
| Mitchell Cr. | Grand Traverse Bay (East Arm) | May-04 | May-04 | Never |
| Boardman R. | Grand Traverse Bay (West Arm) | Jun-16 | Jun-16 | Jun-17 |
| Leland R. | Leland R. (Offshore) | Jun-17 | Jun-13 | Never |
| Platte R. | Loon Lake | Sep-17 | Sep-17 | Never |
| | Platte Lake | Sep-16 | Jul-03 | Never |
| Betsie R. | Betsie Lake | Sep-16 | Aug-83 | Never |
| Big Manistee R. | Manistee Lake (Big Manistee - Offshore) | Jul-15 | Jul-08 | Never |
| | Manistee Lake (Little Manistee – Offshore) | Jul-15 | Jul-08 | Jul-08 |

[1] Scheduled for treatment during 2018
[2] Low-density larval population monitored with 3.2% granular Bayluscide surveys.

**Table 17.** Details on application of granular Bayluscide to tributaries and lentic areas of Lake Michigan for larval assessment purposes during 2017.

| Tributary | Bayluscide (kg)[1] | Area Surveyed (ha) |
|---|---|---|
| Manistique River (Lentic) | 5.81 | 1.04 |
| Manistique River (Lotic) | 3.48 | 0.62 |
| Fishdam River (Lentic) | 1.74 | 0.31 |
| Ogontz River (Lentic) | 2.32 | 0.41 |
| Tacoosh River (Lenic) | 2.32 | 0.41 |
| Days River (Lentic) | 2.32 | 0.41 |
| Ford River (Lentic) | 2.32 | 0.41 |
| Portage River (Lentic) | 0.58 | 0.10 |
| Menominee River (Lentic) | 2.32 | 0.41 |
| Peshtigo River (Lotic) | 2.32 | 0.41 |
| Whitefish Bay Creek (Lentic) | 0.58 | 0.10 |
| Loeb Creek (Lentic) | 0.28 | 0.05 |
| Elk Lake Outlet (Lentic) | 1.40 | 0.25 |
| Leland River (Lentic) | 0.84 | 0.15 |
| Crystal River (Lentic) | 0.84 | 0.15 |
| Platte River (Lotic) | 1.40 | 0.25 |
| **Total for Lake** | **30.87** | **5.48** |

[1] Lampricide quantities are reported in kg of active ingredient.

## Lake Huron

- Larval assessments were conducted on 113 tributaries (57 Canada, 56 U.S.) and 20 lentic areas (14 Canada, 6 U.S.). The status of larval Sea Lamprey populations in historically infested Lake Huron tributaries and lentic areas are presented in Tables 18 and 19.

- Surveys to estimate larval Sea Lamprey abundance were conducted in 22 tributaries (12 Canada, 10 U.S.) and 6 lentic areas (5 Canada; 1 U.S.).

- Surveys to detect the presence of new larval Sea Lamprey populations were conducted in 30 tributaries (16 Canada; 14 U.S.). No new infestations were identified.

- Post-treatment assessments were conducted in 26 tributaries (13 Canada; 13 U.S.) and in 1 lentic area (0 Canada; 1 U.S.) to determine the effectiveness of lampricide treatments during 2016 and 2017. The Carp River and McKay Creek are scheduled for treatment during 2018 based on the presence of residual Sea Lamprey.

- Surveys to evaluate barrier effectiveness in 7 tributaries (2 Canada; 5 U.S.) revealed no evidence of escapement.

- Monitoring of larval Sea Lamprey in the St. Marys River continued during 2017. With the use of deepwater electrofishers, 921 geo-referenced sites were sampled. Surveys were conducted according to a stratified, systematic sampling design. The larval Sea Lamprey population in the St. Marys River was estimated to be 2,320,000 (95% CI; 1,300,000 – 3,300,000).

- Larval assessments were conducted in non-wadable lentic and lotic areas using 42.83 kg active ingredient of gB (28.0 kg Canada; 14.83 U.S.; Table 20).

**Table 18.** Status of larval Sea Lamprey in Lake Huron tributaries with a history of Sea Lamprey production and estimates of abundance from tributaries surveyed during 2017.

| Tributary | Last Treated | Last Surveyed | Status of Larval Lamprey Population (surveys since last treatment) Residuals Present | Recruitment Evident | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
|---|---|---|---|---|---|---|---|
| **Canada** | | | | | | | |
| St. Marys R. | Jul-16 | Aug-16 | --- | --- | 2,300,000 | ? | ***2018*** |
| Whitefish Ch. | May-16 | Sep-15 | --- | --- | --- | --- | 2020 |
| Root R. | May-16 | Oct-17 | Yes | Yes | --- | --- | ***2018***[1] |
| Garden R. | Jul-14 | Aug-15 | Yes | Yes | 1,162,720 | 148,490 | ***2018*** |
| Driving Cr. | May-15 | May-15 | --- | --- | --- | --- | ***2018*** |
| Echo R. | | | | | | | |
| Main | Jul-11 | Jun-17 | --- | No | --- | --- | Unknown |
| Bar & Iron Cr. | Jun-15 | Sep-17 | Yes | Yes | 32,781 | 9,548 | ***2018*** |
| Bar R. | Oct-11 | Sep-17 | --- | No | --- | --- | Unknown |
| Sucker Cr. | Apr-12 | Sep-17 | --- | No | 7,166 | 4,637 | ***2018*** |
| Two Tree R. | May-15 | Oct-17 | No | No | --- | --- | Unknown |
| Richardson Cr. | Sep-16 | Jun-17 | No | No | --- | --- | 2021 |
| Watson Cr. | May-15 | Sep-17 | Yes | Yes | --- | --- | ***2018*** |
| Gordon Cr. | Sep-11 | Sep-17 | --- | Yes | | | ***2018*** |
| Browns Cr. | May-16 | Sep-16 | Yes | No | --- | --- | Unknown |
| Koshkawong R. | May-15 | Jul-17 | No | No | --- | --- | ***2018***[1] |
| No Name (H-65) | Jun-13 | Sep-17 | No | No | --- | --- | |
| No Name (H-68) | Sep-75 | Sep-17 | --- | Yes | --- | --- | 2019 |
| MacBeth Cr. | Jun-67 | Aug-16 | --- | Yes | --- | --- | Unknown |
| Thessalon R. | | | | | | | |
| Upper | Aug-11 | Sep-17 | --- | Yes | --- | --- | ***2018***[1] |
| Patten Lake Cr. | Jul-17 | Sep-16 | --- | --- | | | 2021 |
| Lower | Jul-17 | Sep-17 | No | No | --- | --- | 2021 |
| Livingstone Cr. | Jun-13 | May-17 | No | No | --- | --- | Unknown |
| Mississagi R. | Aug-13 | Aug-16 | No | Yes | --- | --- | ***2018*** |
| Harris/Bolton Cr. | Jul-12 | Aug-16 | --- | Yes | --- | --- | ***2018*** |
| Blind R. | May-84 | Jun-16 | --- | No | --- | --- | Unknown |
| Lauzon R. | Jun-15 | May-17 | No | Yes | --- | --- | 2019 |
| Spragge Cr. | Oct-95 | Jun-15 | --- | No | --- | --- | Unknown |
| No Name (H-114) | Jun-15 | Jun-15 | No | No | --- | --- | 2019 |
| Marcellus Cr. | Jun-13 | May-17 | No | No | --- | --- | Unknown |
| Serpent R. | | | | | | | |
| Main | Jun-16 | Aug-16 | No | --- | --- | --- | 2020 |
| Grassy Cr. | Jun-16 | Aug-16 | Yes | No | --- | --- | 2019[1] |
| Spanish R. | | | | | | | |
| Main | Sep-15 | Jun-17 | No | No | --- | --- | 2020 |
| LaCloche Cr. | Jun-14 | Sep-17 | No | Yes | --- | --- | ***2018***[1] |
| Birch Cr. | Jun-14 | Jun-17 | Yes | Yes | --- | --- | ***2018***[1] |
| Aux Sables R. | Sep-15 | Jun-17 | No | No | --- | --- | 2020 |
| Kagawong R. | Aug-67 | Jun-15 | --- | No | --- | --- | Unknown |
| Unnamed (H-267) | Apr-17 | Sep-17 | No | No | --- | --- | 2021 |
| Silver Cr. | May-17 | Sep-17 | No | Yes | --- | --- | 2021 |
| Sand Cr. | Oct-17 | Jun-17 | --- | --- | --- | --- | 2022 |
| Mindemoya R. | May-17 | Sep-17 | No | No | --- | --- | 2021 |

**Table 18.** *continued.*

| Tributary | Last Treated | Last Surveyed | Status of Larval Lamprey Population (surveys since last treatment) Residuals Present | Recruitment Evident | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
|---|---|---|---|---|---|---|---|
| Timber Bay Cr. | Apr-17 | Sep-17 | No | Yes | --- | --- | 2021 |
| Hughson Cr. | Apr-17 | Sep-17 | No | Yes | --- | --- | 2021 |
| Manitou R. | Aug-13 | Sep-17 | Yes | Yes | 1,364 | 818 | ***2018*** |
| Blue Jay Cr. | Sep-15 | Sep-17 | Yes | Yes | --- | --- | ***2018***[1] |
| Kaboni Cr. | Oct-78 | Jun-15 | --- | No | --- | --- | Unknown |
| Chikanishing R. | Jun-03 | May-17 | --- | Yes | 4,089 | 363 | ***2018*** |
| French R. System | | | | | | | |
| O.V. Channel | Jun-12 | Jun-17 | --- | No | --- | --- | Unknown |
| Wanapitei R. | Jun-11 | Jun-17 | --- | No | --- | --- | Unknown |
| Key R. (Nesbit Cr.) | Sep-72 | May-15 | --- | No | --- | --- | Unknown |
| Still R. | Jul-17 | Sep-17 | No | No | --- | --- | Unknown |
| Magnetawan R. | Jul-15 | Sep-17 | No | Yes | --- | --- | ***2018***[1] |
| Naiscoot R. | May-16 | Aug-17 | No | Yes | --- | --- | ***2018***[1] |
| Shebeshekong R. | Never | Aug-17 | --- | Yes | 282 | 282 | ***2018*** |
| Boyne R. | Jun-16 | Aug-17 | No | No | --- | --- | 2020[1] |
| Musquash R. | Aug-13 | Jun-17 | No | Yes | --- | --- | Unknown |
| Simcoe/Severn System | Never | Aug-17 | --- | Yes | 750 | 200 | ***2018*** |
| Sturgeon R. | Apr-12 | May-17 | No | No | --- | --- | Unknown |
| Hog Cr. | Sep-78 | Aug-17 | --- | No | --- | --- | Unknown |
| Lafontaine Cr. | Jun-68 | May-14 | --- | No | --- | --- | Unknown |
| Nottawasaga R. | | | | | | | |
| Main | Jun-17 | Aug-17 | Yes | Yes | --- | --- | 2021 |
| Boyne R. | Jun-17 | Aug-17 | No | No | --- | --- | 2021 |
| Bear Cr. | Jun-13 | May-16 | No | No | --- | --- | Unknown |
| Pine R. | May-16 | Aug-17 | Yes | Yes | --- | --- | ***2018***[1] |
| Marl Cr. | Apr-13 | May-16 | No | No | --- | --- | Unknown |
| Pretty R. | May-72 | May-15 | --- | No | --- | --- | Unknown |
| Silver Cr. | Sep-82 | May-15 | --- | No | --- | --- | Unknown |
| Bighead R. | Aug-15 | May-17 | Yes | Yes | --- | --- | ***2018***[1] |
| Bothwells Cr. | Jun-79 | May-15 | --- | No | --- | --- | Unknown |
| Sydenham R. | Jun-72 | May-15 | --- | No | --- | --- | Unknown |
| Sauble R. | Jun-04 | Jun-16 | --- | Yes | --- | --- | Unknown |
| Saugeen R. | Jun-71 | May-17 | --- | No | --- | --- | Unknown |
| Bayfield R. | Jun-70 | May-17 | --- | No | --- | --- | Unknown |
| **United States** | | | | | | | |
| Mission Cr. | Never | May-16 | --- | No | --- | --- | Unknown |
| Frenchette Cr. | Never | May-16 | --- | No | --- | --- | Unknown |
| Ermatinger Cr. | Never | May-16 | --- | No | --- | --- | Unknown |
| Charlotte R. | Oct-11 | Jun-17 | --- | No | --- | --- | Unknown |
| Little Munuscong R. | Jul-16 | May-17 | No | No | --- | --- | Unknown |
| Big Munuscong R. | Jun-99 | May-16 | --- | No | --- | --- | Unknown |
| Taylor Cr. | Jul-15 | May-17 | No | No | --- | --- | Unknown |
| Gogomain River | Jul-16 | Sep-16 | No | --- | --- | --- | Unknown |
| Carlton Cr. | Jul-15 | Jun-17 | Yes | No | 345 | 345 | ***2018*** |
| Canoe Lake Outlet | May-70 | Apr-13 | --- | No | --- | --- | Unknown |
| Caribou Cr. | Jun-11 | Sep-17 | --- | Yes | 3,451 | 690 | ***2018*** |

**Table 18.** *continued*

| Tributary | Last Treated | Last Surveyed | Status of Larval Lamprey Population (surveys since last treatment) | | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
|---|---|---|---|---|---|---|---|
| | | | Residuals Present | Recruitment Evident | | | |
| Bear Lake Outlet | Sep-16 | Jun-17 | Yes | No | --- | --- | Unknown |
| Carr Cr. | Jun-13 | Sep-16 | Yes | No | --- | --- | Unknown |
| Joe Straw Cr. | Jun-13 | Jun-17 | No | No | --- | --- | Unknown |
| Saddle Cr. | Never | Sep-16 | --- | No | --- | --- | Unknown |
| Huron Point Cr. | Jun-13 | Aug-17 | Yes | Yes | 826 | 38 | ***2018*** |
| Albany Cr. | | | | | | | |
| Barrier downstream | Jul-15 | Sep-17 | Yes | Yes | 1,320 | 330 | ***2018*** |
| Barrier upstream | Sep-01 | Aug-15 | --- | No | --- | --- | Unknown |
| Trout Cr. | Jul-15 | Jun-17 | No | Yes | --- | --- | Unknown |
| Beavertail Cr. | May-11 | Aug-17 | --- | Yes | 39,334 | 29,874 | ***2018*** |
| Prentiss Cr. | May-11 | Aug-17 | --- | Yes | 4,525 | 1,131 | ***2018*** |
| McKay Cr. | Jun-17 | Sep-17 | Yes | Yes | --- | --- | ***2018***[1] |
| Flowers Cr. | Jun-13 | Jun-16 | No | No | --- | --- | Unknown |
| Ceville Cr. | Jul-16 | May-17 | No | --- | --- | --- | Unknown |
| Hessel Cr. | Jul-15 | Jun-17 | No | Yes | --- | --- | Unknown |
| Steeles Cr. | Sep-16 | May-17 | No | --- | --- | --- | Unknown |
| Nunns Cr. | | | | | | | |
| Barrier downstream | Jul-16 | Sep-16 | No | --- | --- | --- | Unknown |
| Barrier upstream | Jul-16 | Sep-16 | No | --- | --- | --- | Unknown |
| Pine R. | Jun-15 | May-17 | Yes | Yes | --- | --- | ***2018***[1] |
| McCloud Cr. | Jul-15 | May-17 | No | Yes | --- | --- | Unknown |
| Carp R. | Jun-17 | Sep-17 | Yes | Yes | --- | --- | ***2018***[1] |
| Martineau Cr. | Jul-16 | May-17 | Yes | --- | --- | --- | Unknown |
| Hoban Cr. | Jun-12 | May-17 | --- | No | --- | --- | Unknown |
| 266-20 Cr. | Aug-76 | Jul-15 | --- | No | --- | --- | Unknown |
| Beaugrand Cr. | Jun-16 | Jun-17 | No | No | --- | --- | Unknown |
| Little Black R. | May-67 | May-14 | --- | No | --- | --- | Unknown |
| Cheboygan R. | Oct-83 | Jun-17 | --- | Yes | --- | --- | Unknown |
| Laperell Cr. | May-00 | Jun-17 | --- | No | --- | --- | Unknown |
| Meyers Cr. | Jul-17 | Sep-17 | --- | --- | --- | --- | Unknown |
| Maple R. | Aug-16 | Sept-17 | Yes | No | --- | --- | 2019[1] |
| Pigeon R. | Sep-16 | Sep-17 | Yes | Yes | --- | --- | 2019[1] |
| Little Pigeon R. | Aug-12 | Jun-17 | --- | No | --- | --- | Unknown |
| Sturgeon R. | Aug-16 | Sep-17 | Yes | Yes | --- | --- | 2019[1] |
| Elliot Cr. | Jul-17 | Sep-17 | Yes | --- | --- | --- | 2021[1] |
| Greene Cr. | | | | | | | |
| Barrier downstream | Jul-12 | Aug-16 | --- | No | --- | --- | Unknown |
| Barrier upstream | Jun-07 | Aug-16 | --- | No | --- | --- | Unknown |
| Grass Cr. | May-78 | Aug-16 | --- | No | --- | --- | Unknown |
| Mulligan Cr. | Jun-16 | Aug-16 | No | --- | --- | --- | Unknown |
| Grace Cr. | Jun-13 | Sep-17 | No | Yes | 341 | 341 | ***2018*** |
| Black Mallard Cr. | May-15 | Sep-17 | Yes | Yes | --- | --- | ***2018***[1] |
| Seventeen Cr. | Jul-12 | Aug-16 | --- | No | --- | --- | Unknown |
| Ocqueoc R. | | | | | | | |
| Barrier downstream | Jul-16 | Sep-17 | No | Yes | --- | --- | 2020[1] |
| Barrier upstream | Oct-14 | Sep-17 | No | Yes | 41,425 | 29,918 | ***2018*** |

**Table 18.** *continued.*

| Tributary | Last Treated | Last Surveyed | Status of Larval Lamprey Population (surveys since last treatment) Residuals Present | Recruitment Evident | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
|---|---|---|---|---|---|---|---|
| Johnny Cr. | Sep-70 | Aug-16 | --- | No | --- | --- | Unknown |
| Schmidt Cr. | | | | | | | |
| Lower | Jun-13 | Jun-17 | --- | Yes | --- | --- | ***2018[1]*** |
| Upper | May-08 | Jun-17 | --- | No | --- | --- | Unknown |
| Nagels Cr. | Never | Jun-15 | --- | No | --- | --- | Unknown |
| Trout R. | | | | | | | |
| Barrier downstream | Jul-16 | Sept-17 | Yes | Yes | --- | --- | 2019 |
| Barrier upstream | Oct-07 | Jul-17 | --- | No | --- | --- | Unknown |
| Swan R. | Jun-10 | Jul-17 | --- | No | --- | --- | Unknown |
| Grand Lake Outlet | Never | Jun-17 | --- | No | --- | --- | Unknown |
| Middle Lake Outlet | Jun-67 | Aug-14 | --- | No | --- | --- | Unknown |
| Long Lake Outlet | Jun-16 | Jul-17 | No | No | --- | --- | 2020 |
| Squaw Cr. | Jun-13 | Jun-16 | No | No | --- | --- | Unknown |
| Devils R. | Oct-14 | Jul-17 | No | No | --- | --- | Unknown |
| Black R. | Aug-15 | Jul-17 | Yes | Yes | --- | --- | ***2018[1]*** |
| Mill Cr. | Never | Jun-15 | --- | No | --- | --- | Unknown |
| Au Sable R. | Jul-15 | Jul-17 | Yes | Yes | --- | --- | ***2018[1]*** |
| Pine R. | May-87 | Jun-16 | --- | No | --- | --- | Unknown |
| Tawas Lake Outlet | Jun-15 | May-17 | No | No | --- | --- | Unknown |
| Cold Cr. | Jul-13 | May-17 | No | Yes | --- | --- | ***2018[1]*** |
| Sims Cr. | Jul-09 | May-17 | --- | No | --- | --- | Unknown |
| Grays Cr. | Sep-05 | Jun-14 | --- | No | --- | --- | Unknown |
| Silver Cr. | Jun-15 | Sep-17 | Yes | Yes | 33,071 | 4,134 | ***2018*** |
| East AuGres R. | Jun-16 | Sep-17 | No | Yes | --- | --- | ***2018[1]*** |
| AuGres R. | May-17 | Aug-17 | No | No | --- | --- | ***2018[1]*** |
| Rifle R. | Aug-17 | Jun-17 | --- | --- | --- | --- | ***2018[1]*** |
| Saginaw R. | | | | | | | |
| Shiawassee R. | May-15 | Sep-17 | Yes | Yes | 62,670 | 15,667 | ***2018*** |
| Cass R. | May-15 | Aug-17 | Yes | Yes | --- | --- | ***2018[1]*** |
| Flint River | Never | Sep-17 | --- | No | --- | --- | Unknown |
| Armstrong Cr. | May-15 | Sep-17 | No | No | --- | --- | Unknown |
| Tittabawassee R. | Never | Sep-17 | --- | Yes | 242,728 | 41,719 | ***2018*** |
| Chippewa R. | May-16 | Aug-17 | Yes | Yes | --- | --- | ***2018[1]*** |
| Pine R. | May-16 | Aug-17 | No | Yes | --- | --- | ***2018[1]*** |
| Carroll Cr. | May-17 | Aug-17 | No | No | --- | --- | 2020 |
| Big Salt R. | May-15 | Aug-17 | No | Yes | 38,962 | 19,643 | ***2018*** |
| Rock Falls Cr. | Never | Jul-14 | --- | No | --- | --- | Unknown |
| Sucker Cr. | Never | May-17 | --- | No | --- | --- | Unknown |
| Cherry Cr. | Never | Aug-12 | --- | No | --- | --- | Unknown |
| Mill Cr. | May-85 | Sep-13 | --- | No | --- | --- | Unknown |

[1] Stream being treated based on stream-specific knowledge of recruitment and growth.

**Table 19.** Status of larval Sea Lamprey in historically infested lentic areas of Lake Huron during 2017.

| Tributary | Lentic Area | Last Surveyed | Last Survey Showing Infestation | Last Treated |
|---|---|---|---|---|
| **Canada** | | | | |
| Echo River | Echo Lake | Sep-17 | Sep-17 | Jun-15 |
| | Solar Lake | Jul-06 | May-90 | Jul-87 |
| | Stuart Lake | May-90 | May-90 | Jul-80 |
| Sucker Cr. | Desjardins Bay | Sep-16 | Jun-13 | Jul-84 |
| Two Tree R. | North Channel | Aug-81 | Aug-81 | Never |
| Gordon Cr. | Tenby Bay | Aug-13 | Aug-91 | Jul-84 |
| Brown’s Cr. | Tenby Bay | Aug-13 | Aug-91 | Aug-87 |
| Koshkawong R. | North Channel | Jul-17 | Aug-91 | Never |
| Unnamed (H-68) | North Channel | Apr-12 | May-95 | Never |
| Mississagi R. | North Channel | Aug-16 | Aug-16 | Jul-16 |
| Lauzon R. | North Channel | Jun-17 | Jun-16 | Jun-15 |
| Unnamed (H-114) | North Channel | Jun-16 | Sep-14 | Jun-15 |
| Kagawong R. | Mudge Bay | Aug-16 | Aug-16 | Aug-87 |
| Mindemoya R. | Providence Bay | May-12 | Jul-88 | Jul-81 |
| Manitou R. | Michael's Bay | Sep-17 | Sep-17 | Oct-12 |
| Blue Jay Cr. | Michael's Bay | Sep-17 | Sep-17 | Oct-12 |
| Still R. | Byng Inlet | Sep-17 | Aug-16 | Jun-12 |
| Boyne R. | Georgian Bay | Aug-17 | May-16 | Never |
| Severn R. | Georgian Bay | Aug-17 | Aug-17 | Never |
| Sturgeon R. | Sturgeon Bay | May-14 | June-99 | Never |
| Bighead R. | Georgian Bay | Aug-17 | Aug-17 | Never |
| | | | | |
| **United States** | | | | |
| Caribou Cr. | Caribou Cr. (Offshore) | Jul-17 | Jul-17 | Jun-10[1] |
| Albany Cr. | Albany Bay (Offshore) | Jul-16 | Jul-16 | Aug-17 |
| Trout Cr. | Trout Cr. (Offshore) | Jul-14 | Jul-11 | Never[2] |
| McKay Cr. | McKay Bay | Jul-11 | Jul-11 | May-75[2] |
| Flowers Cr. | Flowers Bay | Jun-12 | Jul-80 | Never |
| Nunns Cr. | St. Martin Bay | Aug-14 | Aug-87 | Never |
| Pine R. | St. Martin Bay | Jul-17 | Jul-17 | Sep-16 |
| McCloud Cr. | St. Martin Bay | Aug-15 | Aug-15 | Never |
| Carp R. | St. Martin Bay | Jun-16 | Jun-16 | Jul-14[1] |
| Martineau Cr. | Horseshoe Bay | Aug-15 | Sep-14 | Never[2] |
| Cheboygan R. | Straits of Mackinac | Sep-15 | Aug-93 | Never |
| Sturgeon R. | Burt Lake | Jun-17 | Jun-17 | Aug-16 |
| Elliot Cr. | Duncan Bay | Aug-16 | Jul-12 | Never |
| Mulligan Cr. | Mulligan Cr. (Offshore) | Aug-16 | Aug-16 | Never |
| Black Mallard R. | Black Mallard Lake | Jul-12 | Jun-10 | Never |
| Hammond Bay Cr. | Hammond Bay | Sep-17 | Sep-17 | Never |
| Ocqueoc R. | Hammond Bay | Sep-12 | Sep-86 | Never |
| Devils R. | Thunder Bay | Jun-09 | Aug-76 | Never |
| Au Sable R. | Au Sable R. (Offshore) | Aug-17 | Sep-14 | Aug-15 |
| East Au Gres R. | East Au Gres R. | Aug-15 | Jun-86 | Never |

[1] Low-density larval population monitored with Bayluscide 3.2% Granular Sea Lamprey Larvicide surveys.

**Table 20.** Details on application of granular Bayluscide to tributaries and lentic areas of Lake Huron for larval assessment purposes during 2017.

| Tributary | Bayluscide (kg)[1] | Area Surveyed (ha) |
|---|---|---|
| **Canada** | | |
| Echo R. | 0.84 | 0.15 |
| Bar R. | 0.56 | 0.1 |
| Koshkawong R. | 0.84 | 0.15 |
| Thessalon R. | 1.4 | 0.25 |
| Lauzon R. | 0.28 | 0.05 |
| Marcellus Cr. | 0.28 | 0.05 |
| Serpent R. | 0.56 | 0.1 |
| Spanish R. | 2.8 | 0.5 |
| Whitefish R. | 0.84 | 0.15 |
| Blue Jay Cr. | 2.24 | 0.4 |
| French R. | 2.24 | 0.4 |
| Key R. | 2.24 | 0.4 |
| Magnetawan R. | 1.96 | 0.35 |
| Shebeshekong R. | 0.84 | 0.15 |
| Seguin R. | 0.56 | 0.1 |
| Boyne R. | 1.4 | 0.25 |
| Squirrel Cr. | 0.28 | 0.05 |
| Moon R. | 1.12 | 0.2 |
| Musquash R. | 1.12 | 0.2 |
| Simcoe/Severn Waterway | 1.68 | 0.3 |
| Nottawasaga R. | 1.12 | 0.2 |
| Bighead R. | 1.68 | 0.3 |
| Saugeen R. | 1.12 | 0.2 |
| **Total (Canada)** | **28.0** | **5.0** |
| | | |
| **United States** | | |
| Charlotte River | 1.51 | 0.27 |
| Caribou Creek | 2.32 | 0.41 |
| Pine River | 2.32 | .41 |
| Cheboygan R. | 3.36 | 0.60 |
| HBBS Cr. | 1.68 | 0.30 |
| Black River | 0.84 | 0.15 |
| Ausable River | 1.12 | 0.20 |
| Saginaw R. | 1.68 | 0.30 |
| **Total (United States)** | **14.83** | **2.64** |
| | | |
| **Total for Lake** | **42.83** | **7.64** |

[1]Lampricide quantities are reported in kg active ingredient

## Lake Erie

The control agents continue to delineate the distribution and abundance of the larval Sea Lamprey population in the St. Clair River, a potential source of parasitic juveniles in Lake Erie. Results of these efforts form the basis for further actions and strategies for Sea Lamprey control in this important interconnecting waterway.

- Larval assessments were conducted on 64 tributaries (27 Canada, 37 U.S.) and offshore of 2 U.S. tributaries. The status of larval Sea Lamprey in historically infested Lake Erie tributaries and lentic areas is presented in Tables 21 and 22.

- Surveys to detect new larval populations were conducted in 42 tributaries (18 Canada, 24 U.S.). A new Sea Lamprey population was discovered in the Huron River in Huron and Erie Counties, Ohio. The Huron River is scheduled for treatment in 2018.

- Post-treatment assessments were conducted in 4 tributaries (2 Canada, 2 U.S.) to determine the effectiveness of lampricide treatments conducted during 2016 and 2017. Surveys indicated that all treatments were highly effective, precluding the need for re-treatment.

- Surveys to evaluate barrier effectiveness were conducted in 2 tributaries (1 Canada, 1 U.S.). All barriers assessed were effective in continuing to block Sea Lamprey.

- A total of 2.6 ha of the St. Clair River were surveyed with gB, including the upper river and the three main delta channels. Forty-nine Sea Lamprey larvae were captured throughout the river with no additional areas of high density detected.

- Larval assessments were conducted in non-wadable lentic and lotic areas using 21.00 kg active ingredient of gB (8.96 Canada, 12.04 U.S.; Table 23).

**Table 21.** Status of larval Sea Lamprey in Lake Erie tributaries with a history of Sea Lamprey production, and estimates of abundance from tributaries surveyed during 2017 using a quantitative method.

| Tributary | Last Treated | Last Surveyed | Status of Larval Lamprey Population (surveys since last treatment) Residuals Present | Recruitment Evident | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
|---|---|---|---|---|---|---|---|
| **Canada** | | | | | | | |
| East Cr. | Jun-87 | May-17 | --- | No | --- | --- | Unknown |
| Catfish Cr. | Apr-16 | Jun-16 | No | --- | --- | --- | Unknown |
| Bradley Cr. | Apr-16 | Jun-16 | No | --- | --- | --- | Unknown |
| Silver Cr. | Oct-09 | Jun-17 | --- | Yes | --- | --- | ***2018*** |
| Big Otter Cr. | Jun-17 | Sept-17 | No | No | --- | --- | 2020 |
| South Otter Cr. | Aug-10 | May-17 | --- | No | --- | --- | Unknown |
| Clear Cr. | May-91 | May-16 | --- | No | --- | --- | Unknown |
| Big Cr. | Jun-17 | Sept-17 | No | No | --- | --- | 2020 |
| Forestville Cr. | Aug-13 | Apr-16 | No | No | --- | --- | Unknown |
| Normandale Cr. | Jun-87 | Apr-16 | --- | No | --- | --- | Unknown |
| Fishers Cr. | Jun-87 | May-17 | --- | No | --- | --- | Unknown |
| Young's Cr. | Aug-13 | May-17 | No | No | --- | --- | Unknown |
| **United States** | | | | | | | |
| Buffalo R. | Never | Aug-17 | --- | No | --- | --- | Unknown |
| Buffalo Cr. | Jun-13 | Jul-17 | No | No | --- | --- | Unknown |
| Cayuga Cr. | Never | Jul-17 | --- | No | --- | --- | Unknown |
| Cazenovia Cr. | Sept-13 | Jul-17 | No | No | --- | --- | Unknown |
| Big Sister Cr. | Apr-15 | Jul-16 | Yes | No | --- | --- | Unknown |
| Delaware Cr. | Jun-13 | Jul-17 | No | No | --- | --- | Unknown |
| Cattaraugus Cr. | May-16 | Jul-17 | Yes | Yes | 3,279 | 1,249 | 2019 |
| Halfway Br. | Oct-86 | Jul-16 | --- | No | --- | --- | Unknown |
| Canadaway Cr. | May-16 | Jul-17 | No | No | --- | --- | Unknown |
| Chautauqua Cr. | Never | Aug-16 | --- | No | --- | --- | Unknown |
| Crooked Cr. | Apr-17 | Jun-17 | No | --- | --- | --- | Unknown |
| Raccoon Cr. | May-15 | Sep-17 | No | No | --- | --- | Unknown |
| Conneaut Cr. | May-15 | Sep-17 | Yes | Yes | --- | --- | ***2018*** |
| Wheeler Cr. | Never | Aug-15 | --- | No | --- | --- | Unknown |
| Grand R. | Apr-17 | Jun-17 | No | --- | --- | --- | Unknown |
| Chagrin R. | Never | Jun-17 | --- | No | --- | --- | Unknown |
| **St. Clair River/Lake St. Clair Tributaries** | | | | | | | |
| St. Clair R. | Never | Jun-17 | --- | Yes | --- | --- | Unknown |
| Black R. | Never | Jun-17 | --- | No | --- | --- | Unknown |
| Mill Cr. | Never | Jun-17 | --- | No | --- | --- | Unknown |
| Pine R. | Apr-88 | Sep-17 | --- | No | --- | --- | Unknown |
| Belle R. | Never | Jun-17 | --- | No | --- | --- | Unknown |
| Clinton R. | Never | Sep-17 | --- | Yes | --- | --- | Unknown |
| Paint Cr. | May-15 | Sep-17 | No | No | --- | --- | Unknown |
| Thames R. | Never | May-16 | --- | No | --- | --- | Unknown |
| Komoka Cr. | Aug-15 | May-16 | Yes | No | --- | --- | Unknown |

**Table 22.** Status of larval Sea Lamprey in historically infested lentic areas of Lake Erie during 2017.

| Tributary | Lentic Area | Last Surveyed | Last Survey Showing Infestation | Last Treated |
|---|---|---|---|---|
| **United States** | | | | |
| Cattaraugus Cr. | Sunset Bay | Jul-17 | Aug-12 | Never[1] |
| Conneaut Cr. | Conneaut Harbor | Jul-16 | Jul-06 | Never[1] |
| Grand R. | Fairport Harbor | Aug-15 | Jun-87 | Never[1] |

[1] Low-density larval population monitored with 3.2% granular Bayluscide surveys.

**Table 23.** Details on application of granular Bayluscide to tributaries and lentic and lotic areas of Lake Erie for larval assessment purposes during 2017.

| Tributary | Bayluscide (kg)[1] | Area Surveyed (ha) |
|---|---|---|
| **Canada** | | |
| St. Clair R. | 8.96 | 1.6 |
| **Total (Canada)** | **8.96** | **1.6** |
| | | |
| **United States** | | |
| St. Clair R. | 5.60 | 1.00 |
| Buffalo R. (lotic) | 1.12 | 0.20 |
| Cattaraugus Cr. (lotic) | 1.68 | 0.30 |
| Cattaraugus Cr. (lentic) | 0.56 | 0.10 |
| Huron R. (lotic) | 1.12 | 0.20 |
| Sandusky R. (lentic) | 0.84 | 0.15 |
| Muddy Cr. (lentic) | 0.56 | 0.10 |
| Toussaint R. (lotic) | 0.56 | 0.10 |
| **Total (United States)** | **12.04** | **2.15** |
| | | |
| **Total for Lake** | **23.81** | **3.75** |

[1] Lampricide quantities are reported in kg of active ingredient.

## Lake Ontario

- Larval assessments were conducted on 62 tributaries (35 Canada, 27 U.S.). The status of larval Sea Lamprey in historically infested Lake Ontario tributaries and lentic areas is presented in Tables 24 and 25.

- Surveys to estimate larval Sea Lamprey abundance were conducted in 10 tributaries (3 Canada, 7 U.S.).

- Surveys to detect the presence of new larval Sea Lamprey populations were conducted in 16 tributaries (13 Canada, 3 U.S.). No new populations were detected.

- Post-treatment assessments were conducted in 9 tributaries (4 Canada, 5 U.S.) to determine the effectiveness of lampricide treatments conducted during 2016 and 2017. Surveys on New York's Salmon River and Lindsey Creek detected many residuals, resulting in the scheduling of both systems for treatment during 2018.

- Surveys to evaluate barrier effectiveness were conducted in 10 tributaries (7 Canada, 3 U.S.). All barriers assessed continue to be effective in blocking Sea Lamprey.

- Larval assessment surveys were conducted in non-wadable lentic and lotic areas using 20.24 kg active ingredient of gB (10.42 Canada; 9.82 U.S; Table 26).

- Surveys performed on Lake Ontario's Credit River in 2017 indicate larval Sea Lamprey growth that may justify a 2- year treatment cycle. The Credit River has ranked again for treatment in 2018.

**Table 24.** Status of larval Sea Lamprey in Lake Ontario tributaries with a history of Sea Lamprey production and estimates of abundance from tributaries surveyed during 2017 using a quantitative method.

| | | | Status of Larval Lamprey Population (surveys since last treatment) | | | | |
|---|---|---|---|---|---|---|---|
| Tributary | Last Treated | Last Surveyed | Residuals Present | Recruitment Evident | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
| **Canada** | | | | | | | |
| Niagara R. | Never | Jun-17 | --- | No | --- | --- | Unknown |
| Ancaster Cr. | May-03 | Jun-17 | --- | No | --- | --- | Unknown |
| Grindstone Cr. | Never | Jun-16 | --- | No | --- | --- | Unknown |
| Bronte Cr. | Apr-16 | Jun-16 | No | --- | --- | --- | 2019[1] |
| Sixteen Mile Cr. | Jun-82 | Aug-16 | --- | No | --- | --- | Unknown |
| Credit R. | Jun-16 | Sept-17 | No | Yes | 262,957 | 124,982 | ***2018*** |
| Humber R. | Never | Jun-17 | --- | No | --- | --- | Unknown |
| Rouge R. | Jun-11 | Jul-17 | --- | No | --- | --- | Unknown |
| Little Rouge. R. | Jun-15 | Jul-17 | No | No | --- | --- | Unknown |
| Petticoat Cr. | Sep-04 | Jun-16 | --- | Yes | --- | --- | Unknown |
| Duffins Cr. | Jun-15 | Jul-17 | No | Yes | --- | --- | ***2018[1]*** |
| Carruthers Cr. | Sep-76 | Jul-16 | --- | No | --- | --- | Unknown |
| Lynde Cr. | Jun-15 | Jul-17 | No | Yes | --- | --- | 2019[1] |
| Oshawa Cr. | Jun-15 | Jul-17 | Yes | Yes | --- | --- | ***2018[1]*** |
| Farewell Cr. | Jun-15 | Jul-17 | No | No | --- | --- | Unknown |
| Bowmanville Cr. | May-17 | Jun-17 | Yes | No | --- | --- | 2020[1] |
| Wilmot Cr. | Jun-15 | Jul-17 | No | Yes | --- | --- | ***2018[1]*** |
| Graham Cr. | May-96 | Jul-17 | --- | No | --- | --- | Unknown |
| Wesleyville Cr. | Oct-02 | Jul-17 | --- | No | --- | --- | Unknown |
| Port Britain Cr. | Apr-16 | Jun-16 | No | --- | --- | --- | 2019 |
| Gage Cr. | May-71 | Jun-16 | --- | No | --- | --- | Unknown |
| Cobourg Br. | Oct-96 | Jun-17 | --- | No | --- | --- | Unknown |
| Covert Cr. | Apr-16 | Jun-16 | Yes | --- | --- | --- | Unknown |
| Grafton Cr. | Jun-17 | Ju1-17 | No | --- | --- | --- | Unknown |
| Shelter Valley Cr. | Apr-16 | Jun-16 | No | --- | --- | --- | Unknown |
| Colborne Cr. | Jun-17 | Jul-17 | No | --- | --- | --- | Unknown |
| Salem Cr. | Jun-15 | Jul-17 | No | Yes | --- | --- | ***2018[1]*** |
| Proctor Cr. | Jun-15 | Jul-17 | No | Yes | 403 | 403 | ***2018*** |
| Smithfield Cr. | Sep-86 | Jul-17 | --- | No | --- | --- | Unknown |
| Trent R. (Canal System) | Sep-11 | Jul-17 | --- | No | --- | --- | Unknown |
| Mayhew Cr. | Jun-15 | Jul-17 | No | No | --- | --- | Unknown |
| Moira R. | Jun-15 | Jul-17 | Yes | No | --- | --- | Unknown |
| Salmon R. | Jun-16 | Jul-17 | No | --- | --- | --- | Unknown |
| Napanee R. | Never | Jul-17 | --- | No | --- | --- | Unknown |
| **United States** | | | | | | | |
| Black R. | Aug-15 | Aug-17 | Yes | Yes | --- | --- | ***2018[1]*** |
| Stony Cr. | Sep-82 | Aug-17 | --- | No | --- | --- | Unknown |
| Sandy Cr. | Never | Jul-16 | --- | No | --- | --- | Unknown |
| South Sandy Cr. | Jun-17 | Aug-17 | No | Yes | --- | --- | 2020[1] |

**Table 24.** *Continued*

| Tributary | Last Treated | Last Surveyed | Status of Larval Lamprey Population (surveys since last treatment) Residuals Present | Recruitment Evident | Estimate of Overall Larval Population | Abundance Estimate of Larvae >100mm | Expected Year of Next Treatment |
|---|---|---|---|---|---|---|---|
| Skinner Cr. | Apr-05 | Aug-17 | --- | No | --- | --- | Unknown |
| Lindsey Cr. | Apr-17 | Aug-17 | Yes | Yes | 21,197 | 6,204 | ***2018*** |
| Blind Cr. | May-76 | Jul-16 | --- | No | --- | --- | Unknown |
| Little Sandy Cr. | May-16 | Aug-17 | Yes | Yes | --- | --- | Unknown |
| Deer Cr. | Apr-04 | Jul-16 | --- | No | --- | --- | Unknown |
| Salmon R. | May-17 | Aug-17 | Yes | Yes | 143,981 | 40,927 | ***2018*** |
| Orwell Brook | May-17 | Aug-17 | No | No | --- | --- | Unknown |
| Trout Brook | May-17 | Aug-17 | Yes | Yes | --- | --- | ***2018*** |
| Altmar Cr. | May-17 | Aug-17 | No | No | --- | --- | ***2018*** |
| Grindstone Cr. | Apr-16 | Aug-17 | Yes | No | --- | --- | 2019[1] |
| Snake Cr. | Apr-15 | Aug-17 | No | Yes | --- | --- | ***2018[1]*** |
| Sage Cr. | May-78 | Jul-16 | --- | No | --- | --- | Unknown |
| Little Salmon R. | Jun-14 | Aug-17 | Yes | Yes | --- | --- | 2020[1] |
| Butterfly Cr. | May-72 | Jul-16 | --- | No | --- | --- | Unknown |
| Catfish Cr. | Apr-15 | Aug-17 | Yes | Yes | --- | --- | ***2018[1]*** |
| Oswego R. | | | | | | | |
| Black Cr. | May-81 | Aug-17 | --- | No | --- | --- | Unknown |
| Big Bay Cr. | Sep-93 | Aug-15 | --- | No | --- | --- | Unknown |
| Scriba Cr. | Jun-10 | Apr-14 | --- | No | --- | --- | Unknown |
| Fish Cr. | May-16 | Jul-16 | No | No | --- | --- | 2019[1] |
| Carpenter Br. | May-94 | Jul-16 | --- | No | --- | --- | Unknown |
| Putnam Br./ Coldsprings Cr. | May-96 | Aug-16 | --- | No | --- | --- | Unknown |
| Hall Br. | Never | Aug-15 | --- | No | --- | --- | Unknown |
| Crane Br. | Never | Aug-16 | --- | No | --- | --- | Unknown |
| Skaneateles Cr. | Never | Aug-16 | --- | No | --- | --- | Unknown |
| Owasco Outlet | Oct-15 | Jul-16 | Yes | Yes | --- | --- | Unknown |
| Rice Cr. | May-72 | Aug-15 | --- | No | --- | --- | Unknown |
| Eight Mile Cr. | Apr-15 | Aug-17 | Yes | Yes | 6,900 | 1,479 | ***2018*** |
| Nine Mile Cr. | May-17 | Aug-17 | No | No | --- | --- | Unknown |
| Sterling Cr. | May-15 | Aug-17 | Yes | Yes | --- | --- | ***2018[1]*** |
| Blind Sodus Cr. | May-78 | Aug-16 | --- | No | --- | --- | Unknown |
| Red Cr. | Apr-15 | Aug-17 | No | Yes | 10,771 | 9,574 | ***2018*** |
| Wolcott Cr. | May-79 | Aug-17 | --- | No | --- | --- | Unknown |
| Sodus Cr. | Apr-15 | Aug-17 | No | No | --- | --- | Unknown |
| Forest Lawn Cr. | Never | Aug-17 | --- | Yes | 69 | 41 | Unknown |
| Irondequoit Cr. | Never | Aug-17 | --- | No | --- | --- | Unknown |
| Larkin Cr. | Never | Aug-15 | --- | No | --- | --- | Unknown |
| Northrup Cr. | Never | Aug-15 | --- | No | --- | --- | Unknown |
| Salmon Cr. | Apr-05 | Aug-17 | --- | Yes | --- | --- | Unknown |
| Sandy Cr. | Apr-14 | Aug-17 | No | No | --- | --- | Unknown |
| Oak Orchard Cr. | | | | | | | |
| Marsh Cr. | Apr-14 | Aug-17 | No | No | --- | --- | Unknown |
| Johnson Cr. | Apr-10 | Aug-16 | --- | No | --- | --- | Unknown |
| Third Cr. | May-72 | Aug-17 | --- | No | --- | --- | Unknown |
| First Cr. | May-95 | Aug-16 | --- | No | --- | --- | Unknown |

[1]Stream is being treated based on stream-specific knowledge of sea lamprey recruitment and growth .

**Table 25.** Status of larval Sea Lamprey in historically infested lentic areas of Lake Ontario during 2017.

| Tributary | Lentic Area | Last Surveyed | Last Survey Showing Infestation | Last Treated |
|---|---|---|---|---|
| **Canada** | | | | |
| Duffins Cr. | Duffins Cr. - lentic | Aug-15 | Aug-12 | Never[1] |
| Oshawa Cr. | Oshawa Cr. - lentic | Jul-13 | Oct–81 | Never[1] |
| Wilmot Cr. | Wilmot Cr. - lentic | Aug-11 | Aug-11 | Never[1] |
| | | | | |
| **United States** | | | | |
| Black R. | Black River Bay | Aug-17 | Aug-17 | Aug-15 |

[1] Low-density larval population monitored with 3.2% granular Bayluscide surveys.

**Table 26.** Details on application of granular Bayluscide to tributaries and lentic areas of Lake Ontario for larval assessment purposes during 2017.

| Tributary | Bayluscide (kg)[1] | Area Surveyed (ha) |
|---|---|---|
| **Canada** | | |
| Niagara R. (lotic) | 4.42 | 0.79 |
| Trent R. (lotic) | 1.68 | 0.30 |
| Moira R. (lotic) | 1.12 | 0.20 |
| Salmon R. (lotic) | 1.68 | 0.30 |
| Napanee R. (lotic) | 0.92 | 0.17 |
| **Total (Canada)** | **9.82** | **1.76** |
| | | |
| **United States** | | |
| Niagara R. (lotic) | 3.36 | 0.6 |
| Black R. (lentic) | 0.56 | 0.10 |
| Black R. (lotic) | 1.12 | 0.20 |
| Little Sandy Cr. (lotic) | 1.12 | 0.20 |
| Genesee R. (lotic) | 2.24 | 0.40 |
| Oak Orchard Cr. | | |
| Marsh Cr. (lotic) | 2.02 | 0.36 |
| **Total (United States)** | **10.42** | **1.86** |
| | | |
| **Total for Lake** | **20.24** | **3.62** |

[1] Lampricide quantities are reported in kg of active ingredient.

## Juvenile Assessment

The juvenile life stage is assessed through the interpretation of marking rates by feeding juvenile Sea Lamprey on Lake Trout. Used in conjunction with adult Sea Lamprey abundance to annually evaluate the performance of the SLCP, marking rates on Lake Trout are contrasted against the targets set for each lake. Marking rates on Lake Trout are estimated from fisheries assessments conducted by state, provincial, tribal, and federal fishery management agencies associated with each lake, and are updated when the data become available. These data provide a metric of the mortality inflicted on Lake Trout on a lake-wide basis. The Commission contracts with the Service's Green Bay Fish and Wildlife Conservation Office (GBFWCO) to calculate marking statistics and Lake Trout abundance estimates to assess the damage caused by Sea Lamprey.

### Lake Superior

- Lake Trout marking data for Lake Superior are provided by the MIDNR, Minnesota Department of Natural Resources, WDNR, GLIFWC, Chippewa-Ottawa Resource Authority (CORA), Keweenaw Bay Indian Community, Grand Portage Band of Lake Superior Chippewa Indians, and the OMNRF, and analyzed by the Service's GBFWCO.

- Based on standardized spring assessment data, the marking rate during 2017 was 6.2 A1-A3 marks per 100 Lake Trout >532mm (Figure 5) which is greater than the target of 5 marks per 100 fish.

- The MIDNR provided data on the frequency of juvenile Sea Lamprey attached to fishes caught by sport charter fishers.

    - A total of 42 juvenile Sea Lampreys were collected from 8 management districts: 42 were attached to Lake Trout and 0 were attached to Chinook Salmon. Attachment rates during 2017 were 0.90 per 100 Lake Trout (n=4,647) and 0.00 per 100 Chinook Salmon (n=44), which was lower for the attachment rate on Lake Trout and Chinook Salmon during 2016 (1.13 and 5.66, respectively).

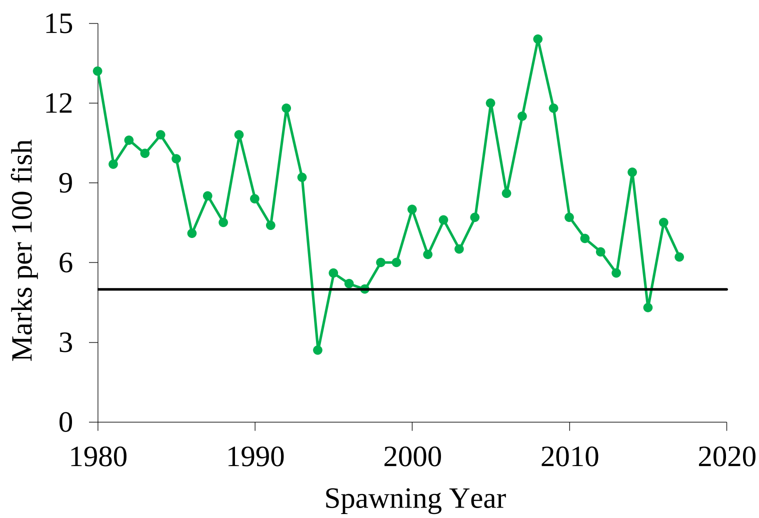


**Figure 5.** Average number of A1-A3 marks per 100 Lake Trout >532 mm caught during April-June assessments in Lake Superior 1980 – 2017. The horizontal line represents the target of 5 A1-A3 marks per 100 Lake Trout.

## Lake Michigan

- Lake Trout marking data for Lake Michigan are provided by MIDNR, WDNR, Illinois Department of Natural Resources, Indiana Department of Natural Resources, CORA, Service, and United States Geological Survey (USGS), and analyzed by the Service's GBFWCO.

- Based on standardized fall assessment data, the marking rate during 2017 was 4.5 A1-A3 marks per 100 Lake Trout >532mm which is lower than the target of 5 marks per 100 fish (Figure 6).

- The MIDNR and WDNR provided data on the frequency of juvenile Sea Lamprey attached to fish caught by sport charter fishers.

    - A total of 331 juvenile Sea Lampreys were collected from 14 management districts: 92 were attached to Lake Trout and 239 were attached to Chinook Salmon. Attachment rates during 2017 were 0.18 per 100 Lake Trout (n=52,167) and 0.46 per 100 Chinook Salmon (n=51,708), which were higher than the attachment rates on Lake Trout and Chinook Salmon during 2016 (0.17 and 0.36, respectively).

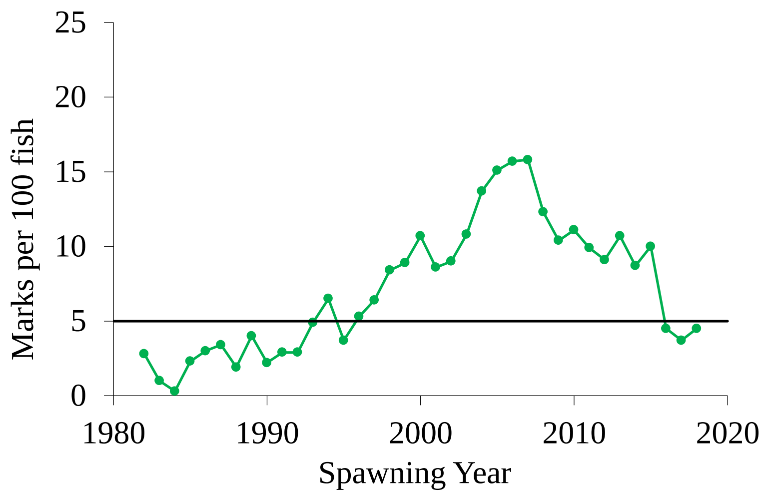


**Figure 6.** Average number of A1-A3 marks per 100 Lake Trout >532 mm from standardized fall assessments in Lake Michigan 1982 – 2017. The horizontal line represents the target of 5 A1-A3 marks per 100 Lake Trout. The spawning year is used rather than the survey year (shifted by one year) to provide a comparison with the adult index.

## Lake Huron

- Lake Trout marking data for Lake Huron are provided by the MDNR, CORA, U.S. Geological Survey (USGS), and OMNRF. The data was analyzed by the Service's GBFWCO.

- Based on standardized spring assessment data, the marking rate during 2016 was 3.9 A1-A3 marks per 100 Lake Trout >532 mm, which is less than the target of 5 per 100 Lake Trout for the second consecutive year (Figure 7).

- Marking rates on Lake Whitefish and Ciscoes have been increasing and may be important initial hosts for juvenile Sea Lamprey.

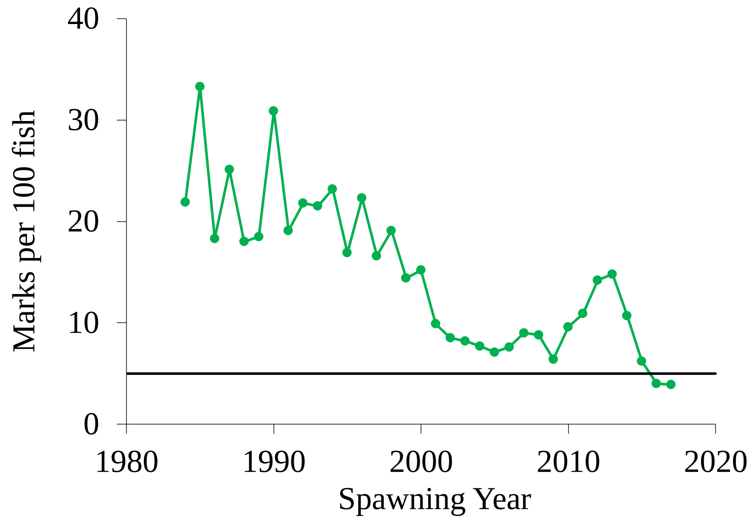


**Figure 7.** Average number of A1-A3 marks per 100 Lake Trout >532 mm caught in U.S. waters during spring assessments in Lake Huron 1984-2017. The horizontal line represents the target of 5 A1-A3 marks per 100 Lake Trout.

- Canadian commercial fisheries in northern Lake Huron continued to provide parasitic juvenile Sea Lamprey in 2017, along with associated catch information including date, location, and host species. The total number of Sea Lamprey captured each year, along with effort data provided by the OMNRF, is used as an index of juvenile Sea Lamprey abundance in northern Lake Huron (Figure 8).

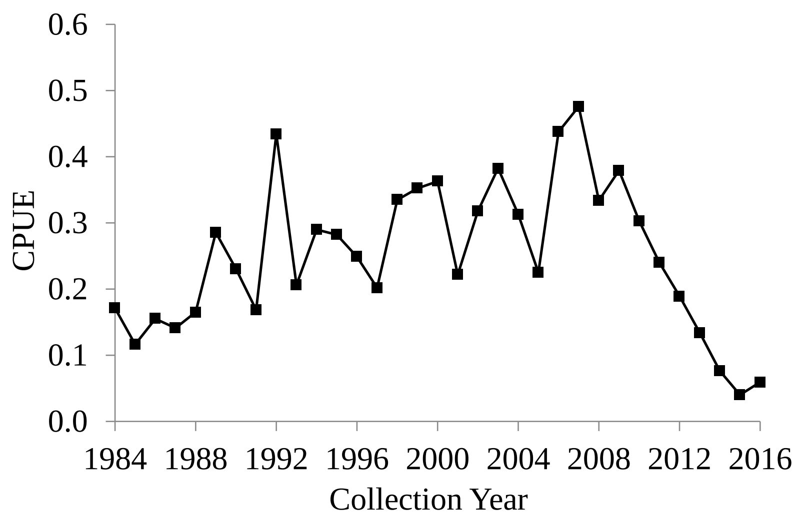


**Figure 8.** Northern Lake Huron commercial fisheries index showing CPUE (number of parasitic juvenile Sea Lamprey per km of gillnet per night) for 1984-2016.

- Since 1998, standardized trapping for out-migrating juveniles has been conducted in the St. Marys River as an index of Sea Lamprey production in this system. Eleven floating fyke nets are deployed each October and November in the Munuscong, Sailor's Encampment, and Middle Neebish channels. In 2017, fyke nets were fished for a total of 489 net days, capturing 55 out-migrating juveniles (0.11 juveniles per net day. CPUE has increased each year for the last 6 years (Figure 9).

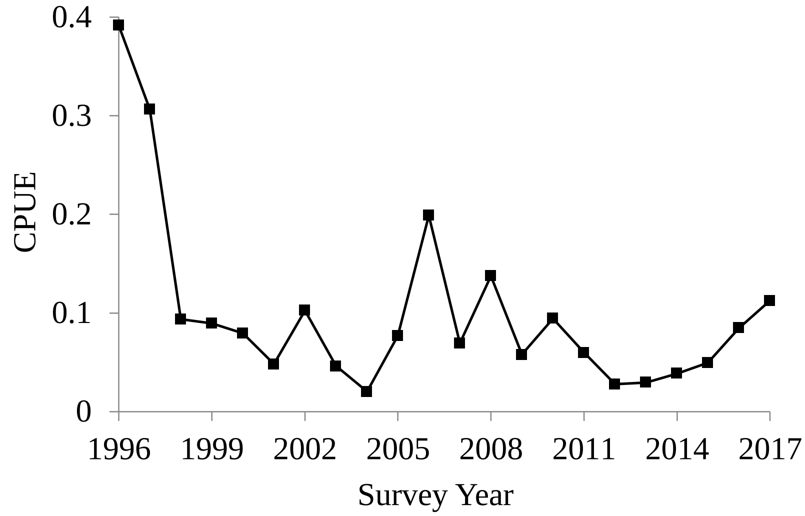


**Figure 9.** CPUE (number of out-migrating juvenile Sea Lamprey per net day) of fall fyke netting in the St. Marys River during 1996-2017.

- The MIDNR provided data on the frequency of juvenile Sea Lamprey attached to fishes caught by sport charter fishers.
    - A total of 129 juvenile Sea Lampreys were collected from 6 management districts: 93 were attached to Lake Trout and 36 were attached to Chinook Salmon. Attachment rates during 2017 were 1.03 per 100 Lake Trout (n=9,019) and 5.85 per 100 Chinook Salmon (n=615), which were higher than the attachment rates on Lake Trout and Chinook Salmon during 2016 (0.81and 0.81, respectively).

**Lake Erie**

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

- Based on standardized fall assessment data, the marking rate during 2017 was 16.7 A1-A3 marks per 100 Lake Trout >532 mm. The marking rate has been greater than the target for the last 15 years (Figure 10).

- In cooperation with Walpole Island First Nation, the Commission and partners completed the third year of an annual index for out-migrating juvenile Sea Lamprey in the St. Clair River (SCR). Ten floating fyke nets were deployed on November 15, 2017. Due to complications surrounding U.S. Coast Guard aids to navigation and ice flow, the nets were retrieved on December 29. Over the collection period, 98 juvenile Sea Lamprey were captured.

- No data are collected in Lake Erie to determine the frequency of feeding juvenile Sea Lamprey attached to fish caught by sport charter fishers.

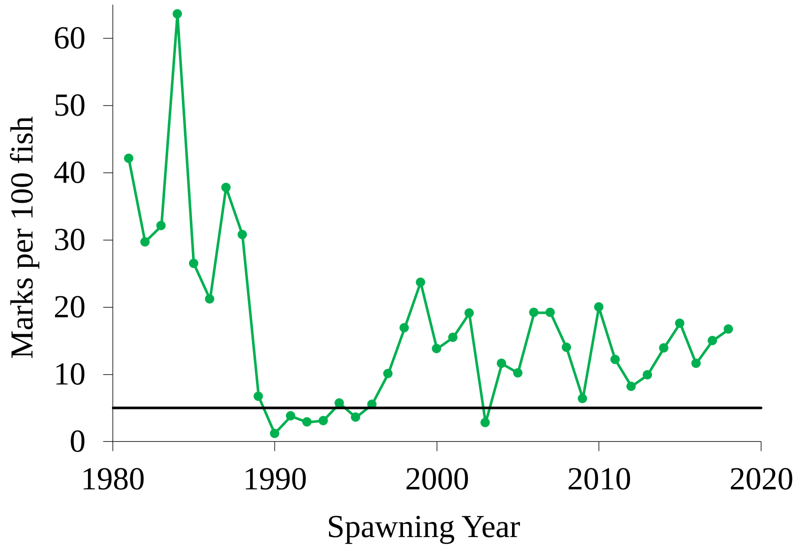


**Figure 10.** Average number of A1-A3 marks per 100 Lake Trout >532 mm from standardized fall assessments. The horizontal line represents the target of 5 A1-A3 marks per 100 Lake Trout 1985-2017. The spawning year is used rather than the survey year (shifted by one year) to provide a comparison with the adult index.

**Lake Ontario**

- Lake Trout marking data for Lake Ontario are provided by the USGS, OMNRF, and the NYSDEC. The data is analyzed by the Service's GBFWCO.

- Based on standardized fall assessment data, the marking rate during 2017 was 0.005 A1 marks per 100 Lake Trout >431 mm which is less than the target of 2 A1 marks per 100 Lake Trout target (Figure 11), and the lowest in the time series.

- The NYSDEC provided data on the frequency of juvenile Sea Lamprey attached to fish caught by sport charter fishers during April 15 – September 30, 2017.

    - An estimated 2,380 juvenile Sea Lampreys were observed by anglers. Sea Lampreys were attached to Chinook Salmon (51.02%), Rainbow Trout (8.16%), Brown Trout (35.71%), and Lake Trout (2.04%). Attachment rates were 1.02 per 100 trout and salmon in the west region, 1.92 in the west central region, 1.79 in the east central region, and 1.44 in the east region. In comparison to 2016, attachment rates were less in the west region (1.34) and greater in the west central, east central and east regions (0.31, 1.69 and 0.61 respectively).

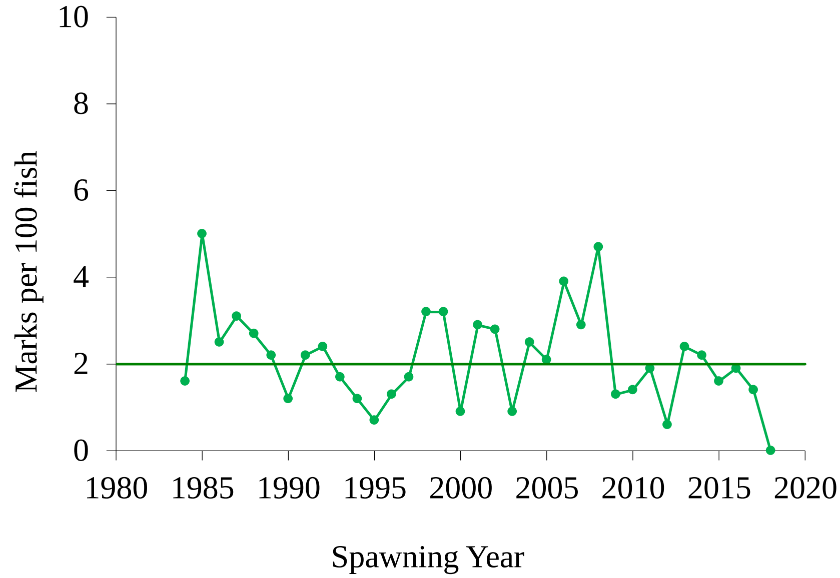


**Figure 11.** Number of A1 marks per 100 Lake Trout >431 mm from standardized fall assessments in Lake Ontario 1983-2017. The horizontal line represents the target of 2 A1 marks per 100 Lake Trout.

## Adult Assessment

An annual index of adult Sea Lamprey abundance is derived by summing individual population estimates from traps operated in a specific suite of streams (index streams) during spring and early summer. Mark-recapture estimates are attempted in each index stream; however, in the absence of an estimate due to an insufficient number of marked or recaptured Sea Lamprey, abundance is estimated using the annual pattern of adult abundance observed in all streams and years, and adjusted to the stream-specific average abundance estimate in the time series. The index targets are estimated as the mean of indices during a period within each lake when marking rate was considered acceptable, or the percentage of the mean that would be deemed acceptable (see Fish Community Objectives section for more detail).

### Lake Superior

- A total of 8,387 Sea Lamprey were captured in 10 tributaries, 7 of which are index locations. Adult population estimates based on mark-recapture were obtained for each index location (Table 27, Figure 22).
- The index of adult Sea Lamprey abundance was 48,636 (95% CI; 36,197 – 61,074), which was higher than the target of 9,664 (Figure 12-13).
- Adult Sea Lamprey migrations were monitored in the Middle, Bad, Misery, and Silver rivers through cooperative agreements with the GLIFWC and in the Brule River with the WDNR.
- The access road to the Bad River trap site was repaired prior to the start of the 2017 trapping season. Service staff worked with the Natural Resources Department and GLIFWC to make the necessary improvements.
- The configuration of the Brule River fishway downstream from the trap was modified to enhance trapping of Sea Lamprey and facilitate improved fish passage. The fish ladder was operated as a vertical slot fishway

instead of a pool and weir fishway up to the lamprey trap jumping pool. This change allowed for easier passage up to the lamprey trap for both fish and lampreys. In addition, two sorting weirs were placed within two rungs of the lower fish ladder to test their ability to sort lampreys from finfish. The system was monitored using underwater cameras and trap catch observations of marked fishes.

- Service staff are evaluating if the accuracy and precision of mark-recapture abundance estimates differ when using weekly batch marks or unique individual marks as part of a 2-year Technical Assistance Program study on the Brule and Middle rivers.

**Table 27.** Information collected regarding adult Sea Lamprey captured in assessment traps or nets in tributaries of Lake Superior during 2017 (letter in parentheses corresponds to streams in Figure 22).

| Tributary | Number Caught | Adult Estimate | Trap Efficiency (%) | Number Sampled [1] | Percent Males[2] | Mean Length (mm) Males | Mean Length (mm) Females | Mean Weight (g) Males | Mean Weight (g) Females |
|---|---|---|---|---|---|---|---|---|---|
| **Canada** | | | | | | | | | |
| Neebing R. (A) | 468 | 1,893 | 25 | 58 | 52 | 474 | 440 | 259 | 205 |
| Big Carp R. [3] (B) | 15 | --- | --- | 10 | 70 | 454 | 488 | 277 | 264 |
| **Total or Mean (Canada)** | **483** | --- | --- | **68** | **54** | **471** | **445** | **263** | **211** |
| **United States** | | | | | | | | | |
| Tahquamenon R. (C) | 2,374 | 10,549 | 23 | 101 | 72 | 470 | 464 | 237 | 240 |
| Betsy R. (D) | 591 | 3,778 | 16 | 54 | 69 | 468 | 453 | 246 | 230 |
| Rock R. (E) | 401 | 994 | 40 | 81 | 60 | 465 | 456 | 234 | 232 |
| Silver R.[3] (F) | 2 | --- | --- | --- | --- | --- | --- | --- | --- |
| Misery R. [3] (G) | 24 | --- | --- | 2 | 50 | 590 | 447 | 309 | 238 |
| Bad R. (H) | 731 | 5,878 | 12 | 12 | 33 | 433 | 466 | 171 | 272 |
| Brule R. (I) | 3,309 | 21,024 | 16 | 59 | 64 | 468 | 465 | 233 | 246 |
| Middle R. (J) | 481 | 4,519 | 11 | 14 | 57 | 500 | 485 | 277 | 283 |
| **Total or Mean (U.S.)** | **7,913** | --- | --- | **323** | **65** | **469** | **462** | **238** | **242** |
| **Total or Mean (for lake)** | **8,396** | --- | --- | **391** | **63** | **470** | **458** | **242** | **235** |

[1] The number of Sea Lamprey used to determine percent males, mean length, and mean weight.
[2] Gender was determined using external characteristics.
[3] Not an index location.

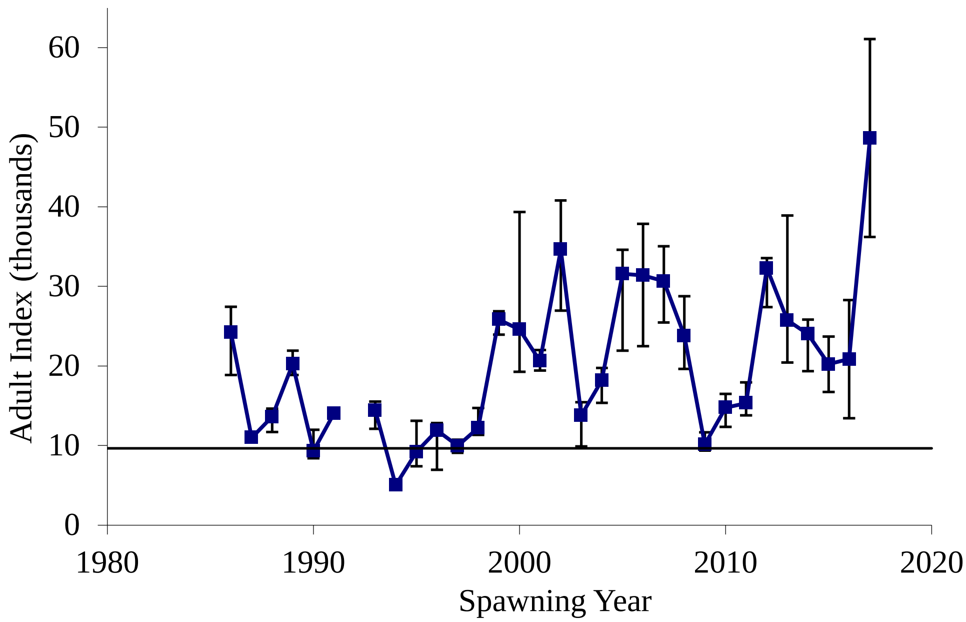


**Figure 12.** Index estimates with 95% confidence interval (vertical bars) of adult Sea Lamprey. The adult index in 2017 was 48,636 (95% confidence interval 36,197-61,074). The point estimate was greater than the target of 9,664 (black horizontal line). The index target was estimated as the mean of indices during a period with acceptable marking rates (1994-1998).

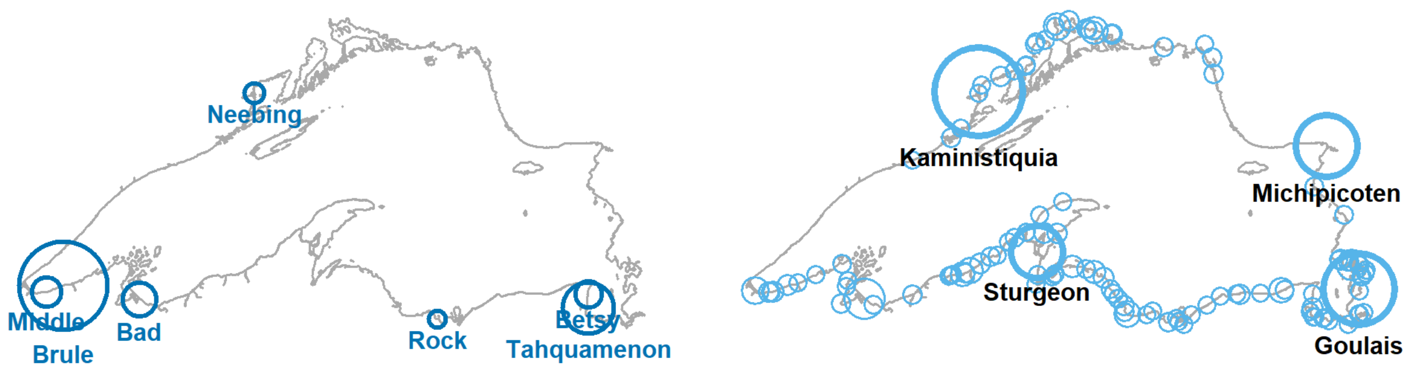


**Figure 13.** LEFT: Estimated index of adult Sea Lamprey during the spring spawning migration, 2017. Circle size corresponds to estimated number of adults from mark-recapture studies (blue) and model predictions (orange). All index streams are identified. RIGHT: Maximum estimated number of larval Sea Lamprey in each stream surveyed during 1995-2012. Tributaries composing over half of the lake-wide larval population estimate are identified (Kaministiquia 6,600,000; Goulais 5,000,000; Michipicoten 4,100,000; Sturgeon 3,300,000).

## Lake Michigan

- A total of 7,506 Sea Lamprey were captured at eight locations in eight tributaries, six of which are index locations. Adult population estimates based on mark-recapture were obtained for each index location locations (Table 28, Figure 22).

- The index of adult Sea Lamprey abundance was 15,881 (95% CI; 13,168 – 18,593), which was less than the target of 24,874 (Figures 14-15).

- Adult Sea Lamprey migrations were monitored in the Boardman and Betsie rivers through a cooperative agreement with the Grand Traverse Band of Ottawa and Chippewa Indians.

**Table 28.** Information collected regarding adult Sea Lamprey captured in assessment traps or nets in tributaries of Lake Michigan during 2017 (letter in parentheses corresponds to stream in Figure 22).

| Tributary | Number Caught | Adult Estimate | Trap Efficiency (%) | Number Sampled[1] | Percent Males[2] | Mean Length (mm) Males | Mean Length (mm) Females | Mean Weight (g) Males | Mean Weight (g) Females |
|---|---|---|---|---|---|---|---|---|---|
| Carp Lake Outlet (A) | 1,119 | 1,293 | 87 | 109 | 56 | 487 | 480 | 252 | 254 |
| Boardman R. [3] (B) | 144 | 415 | 35 | 42 | 40 | 497 | 485 | 265 | 263 |
| Betsie R. (C) | 576 | 984 | 59 | 80 | 65 | 505 | 505 | 271 | 286 |
| Big Manistee R. (D) | 332 | 2,972 | 11 | 25 | 60 | 490 | 519 | 276 | 305 |
| St. Joseph R. (E) | 575 | 1,921 | 30 | 49 | 45 | 484 | 506 | 246 | 280 |
| Trail Cr. [3] (F) | 64 | --- | --- | --- | --- | --- | --- | --- | --- |
| Peshtigo R. (G) | 1,606 | 2,159 | 74 | 99 | 42 | 505 | 510 | 266 | 267 |
| Manistique R. (H) | 3,090 | 6,549 | 47 | 120 | 53 | 507 | 511 | 283 | 306 |
| **Total or Mean** | **7,506** | **---** | **---** | **524** | **52** | **499** | **501** | **267** | **278** |

[1] The number of Sea Lamprey used to determine percent males, mean length, and mean weight.
[2] Gender was determined by using external characteristics.
[3] Not an index location.

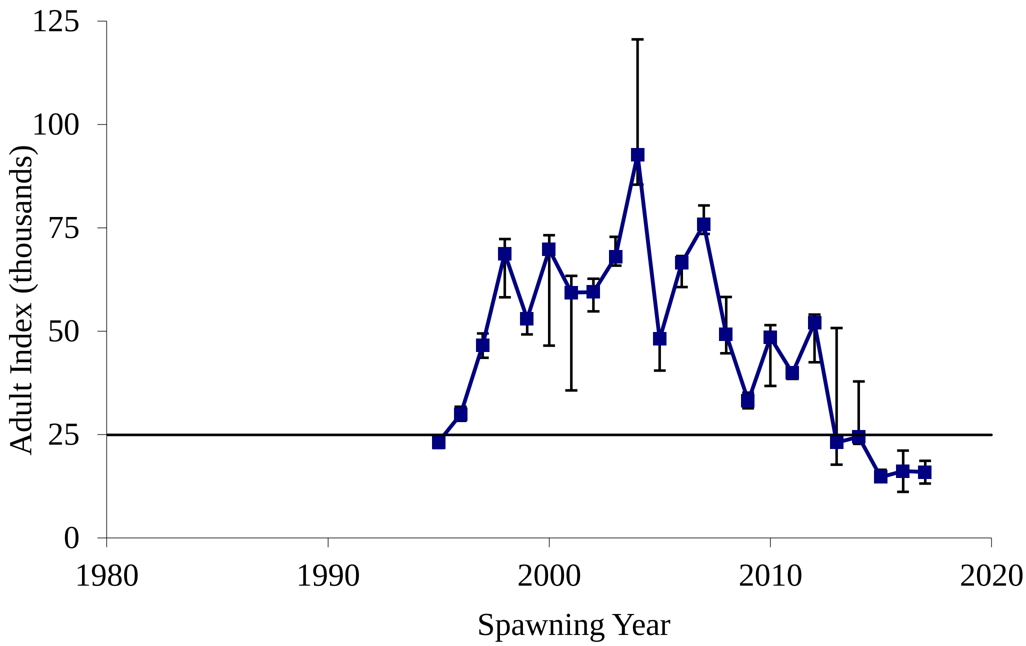


**Figure 14.** Index estimates with 95% confidence intervals (vertical bars) of adult Sea Lamprey. The adult index in 2016 was 16,125 with 95% confidence interval (11,112-21,138). The point estimate met the target of 24,874 (green horizontal line). The index target was estimated as 5/8.9 times the mean of indices (1995-1999).

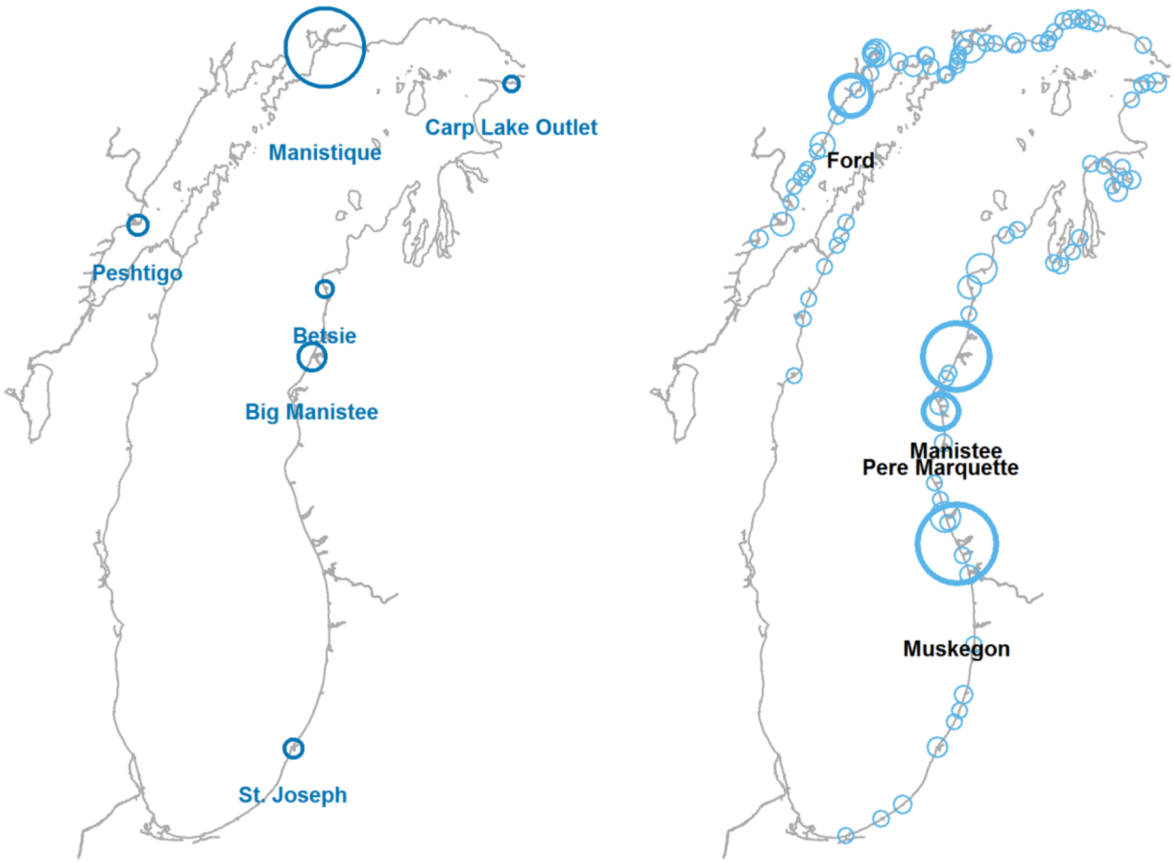


**Figure 15.** LEFT: Estimated index of adult Sea Lamprey during the spring spawning migration, 2017. Circle size corresponds to estimated number of adults from mark-recapture studies (blue) and model predictions (orange). All index streams are identified. RIGHT: Maximum estimated number of larval Sea Lamprey in each stream surveyed during 1995-2012. Tributaries composing over half of the lake-wide larval population estimate are identified (Muskegon 4,500,000; Manistee 3,600,000; Ford 1,800,000; Pere Marquette 1,400,000).

**Lake Huron**

- A total of 22,215 Sea Lamprey were trapped in six tributaries, all of which are index locations. Adult population estimates based on mark-recapture were obtained from all six tributaries (Table 29, Figure 22).

- The index of adult Sea Lamprey abundance was 36,269 (95% CI; 31,928 – 40,609), which is higher than the index target of 24,113 (Figure 16-17).

- A total of 2,861 adult Sea Lamprey were captured in traps operated in the St. Marys River at the Clergue Generating Station in Canada, and the USACE and Cloverland Electric plants and compensating gates in the U.S. The estimated population in the river was 7,803 adult Sea Lamprey and trapping efficiency was 37%.

- The USACE continued planning for trap improvement projects at the St. Marys, Au Sable, and East Au Gres rivers using GLFER program funding.

- The SLCP assisted Michigan State University with EPA-funded Sea Lamprey alarm substance field trials on the Ocqueoc River. The team tested whether the natural Sea Lamprey alarm cue (a repellent) may be combined with the partial pheromone 3kPZS (an attractant) in a push-pull configuration to guide migrants into a trap in a free-flowing river channel (i.e., a trap not associated with a barrier). The work will continue in 2018.

- The SLCP assisted University of Guelph researchers with a project aimed at understanding adult Sea Lamprey behavior near traps on the St. Marys River. Two hypotheses are being tested to explain why many Sea Lamprey that encounter traps do not enter them. Entrance rates may be influenced by: a) the local hydrodynamic conditions at the traps when Sea Lamprey encounter them, or b) differences in behavior among individual Sea Lamprey. Researchers are first screening Sea Lamprey for "behavioral type," tagging and releasing them, monitoring their behavior near traps with PIT tagging equipment, and measuring water flows.

- The SLCP assisted USGS researchers in Hammond Bay, Michigan with the first year of a study to test the sterile male release technique in the upper Cheboygan River tributaries (Pigeon, Sturgeon and Maple). The overall goal is to delay or eliminate the need to treat these tributaries with lampricides. In May and June 2017, over 2,500 male sea lamprey captured in traps were sterilized and released into these three tributaries. Similar numbers will be sterilized and released in 2018 and 2019, and the larval assessment will occur in 2019 to determine if treatment is required in 2020.

**Table 29.** Information collected regarding adult Sea Lamprey captured in assessment traps or nets in tributaries of Lake Huron during 2017 (letter in parentheses corresponds to stream in Figure 22).

| Tributary | Number Caught | Adult Estimate | Trap Efficiency (%) | Number Sampled[1] | Percent Males[2] | Mean Length (mm) Males | Mean Length (mm) Females | Mean Weight (g) Males | Mean Weight (g) Females |
|---|---|---|---|---|---|---|---|---|---|
| **Canada** | | | | | | | | | |
| St. Marys R. (A) | 2,861 | 7,803 | 37 | 57 | 65 | 493 | 493 | 263 | 275 |
| Echo R. (B) | 3,035 | 7,213 | 42 | 85 | 65 | 499 | 491 | 261 | 261 |
| Thessalon R. (C) | | | | | | | | | |
| Bridgeland Cr. | 1,668 | 2,042 | 82 | --- | --- | --- | --- | --- | --- |
| **Total or Mean (Canada)** | **7,564** | --- | --- | **142** | **65** | **496** | **492** | **262** | **267** |
| **United States** | | | | | | | | | |
| East Au Gres R. (D) | 424 | 1,542 | 27 | 30 | 60 | 497 | 460 | 261 | 223 |
| Ocqueoc R. (E) | 1,782 | 2,539 | 70 | 114 | 51 | 476 | 479 | 240 | 241 |
| Cheboygan R. (F) | 12,445 | 15,130 | 82 | 633 | 54 | 490 | 495 | 242 | 258 |
| St. Marys R. (A) | See Canada | 30 | 60 | 495 | 497 | 300 | 279 | | |
| **Total or Mean (U.S.)** | **14,651** | --- | --- | **810** | **54** | **488** | **491** | **245** | **255** |
| **Total or Mean (for Lake)** | **22,215** | --- | --- | **952** | **56** | **490** | **491** | **248** | **256** |

[1] The number of Sea Lamprey used to determine percent males, mean length, and mean weight.
[2] Gender was determined using external characteristics.

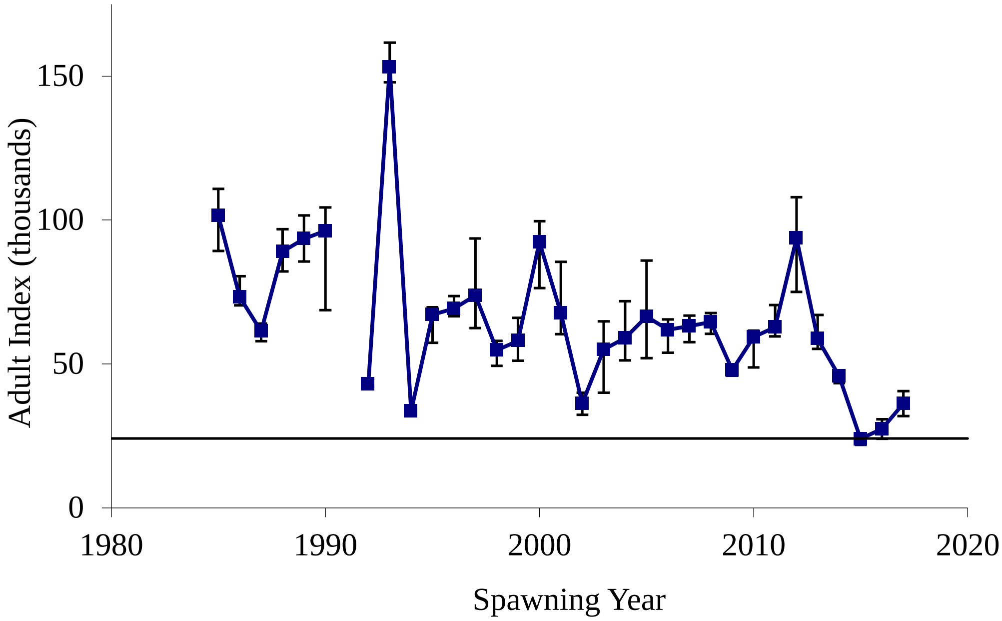


**Figure 16.** Index estimates with 95% confidence intervals (vertical bars) of adult Sea Lamprey. The adult index in 2017 was 36,269 (95% confidence interval 31,928-40,609). The point estimate was greater than the target of 24,113 (black horizontal line). The index target was estimated as 0.25 times the mean of indices between 1989 and 1993.

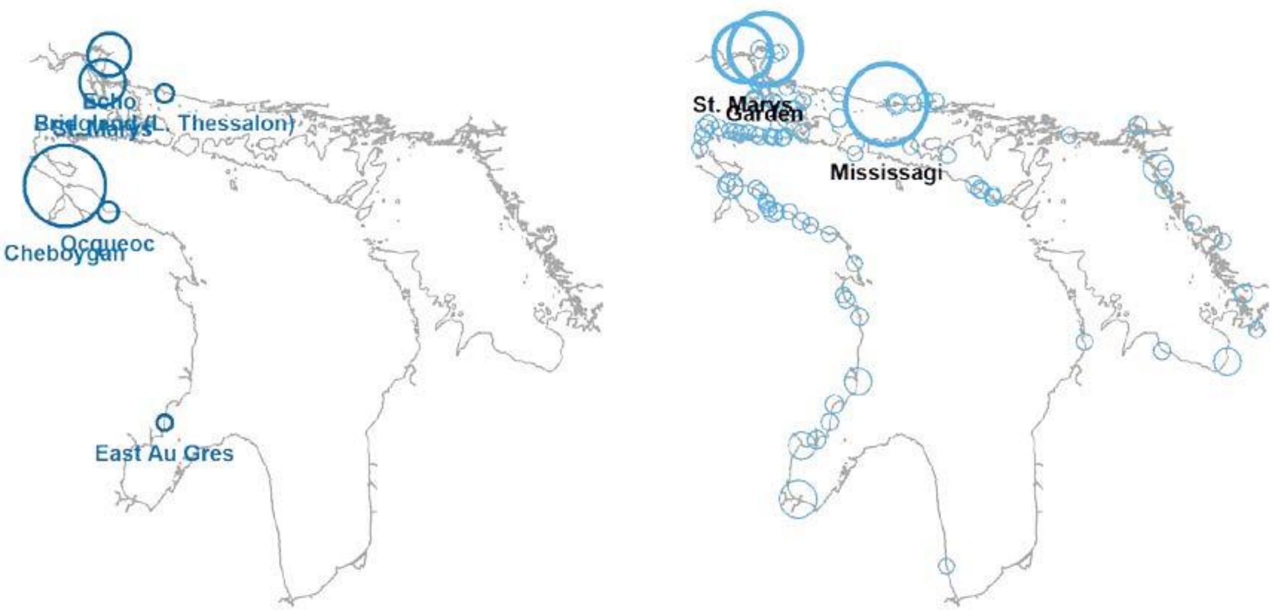


**Figure 17.** LEFT: Estimated index of adult Sea Lampreys during the spring spawning migration, 2017. Circle size corresponds to estimated number of adults from mark-recapture studies (blue) and model predictions (orange). All index streams are identified. RIGHT: Maximum estimated number of larval Sea Lampreys in each stream surveyed during 1995-2012. Tributaries composing over half of the lake-wide larval population estimate are identified (Mississagi 8,100,000; Garden 7,000,000; St. Marys 5,200,000).

## Lake Erie

- A total of 3,827 Sea Lamprey were trapped in 5 tributaries during 2017, all of which are index locations. Adult population estimates based on mark-recapture were obtained from each index location (Table 30, Figure 22).

- The index of adult Sea Lamprey abundance was 14,743 (95% CI; 8,750 – 20,736), which was higher than the target of 3,039 (Figure 18-19).

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

**Table 30**. Information collected regarding Sea Lamprey adults captured in assessment traps or nets in tributaries of Lake Erie during 2017 (letter in parentheses corresponds to stream in Figure 22).

| Tributary | Number Caught | Adult Estimate | Trap Efficiency (%) | Number Sampled[1] | Percent Males[2] | Mean Length (mm) Males | Mean Length (mm) Females | Mean Weight (g) Males | Mean Weight (g) Females |
|---|---|---|---|---|---|---|---|---|---|
| **Canada** | | | | | | | | | |
| Big Otter Cr. (A) | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Little Otter Cr. | 164 | 2,069 | 8 | 12 | 58 | 506 | 506 | 247 | 249 |
| Big Cr. (B) | 1,825 | 3,218 | 57 | --- | --- | --- | --- | --- | --- |
| Young's Cr. (C) | 126 | 221 | 57 | --- | --- | --- | --- | --- | --- |
| **Total or Mean (Canada)** | **2,115** | **---** | **---** | **12** | **58** | **506** | **506** | **247** | **249** |
| **United States** | | | | | | | | | |
| Cattaraugus Cr. (D) | 1,079 | 5,901 | 18 | 16 | 94 | 518 | 554 | 284 | 394 |
| Grand R. (E) | 633 | 3,334 | 19 | 9 | 44 | 495 | 472 | 284 | 281 |
| **Total or Mean (U.S.)** | **1,712** | **---** | **---** | **25** | **76** | **513** | **486** | **284** | **300** |
| **Total or Mean (for Lake)** | **3,827** | **---** | **---** | **37** | **70** | **511** | **495** | **274** | **277** |

[1]The number of Sea Lamprey used to determine percent males, mean length, and mean weight.
[2]Gender was determined using external characteristics.

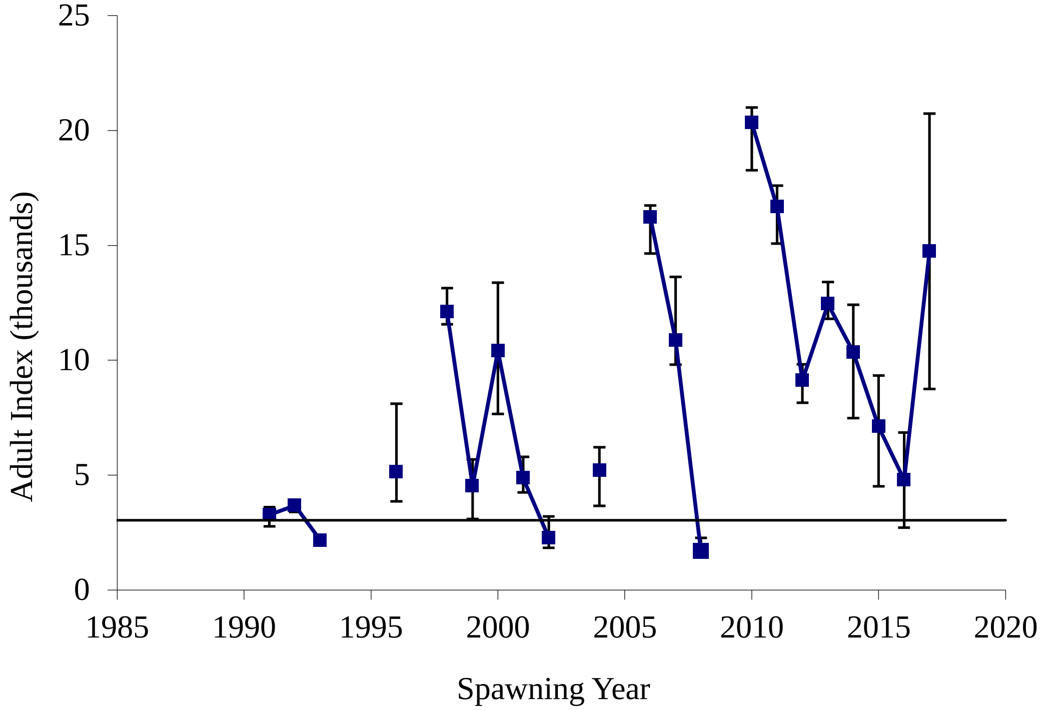


**Figure 18.** Index estimates with 95% confidence intervals (vertical bars) of adult Sea Lamprey. The adult index in 2017 was 14,743 with 95% confidence interval (8,750 – 20,736). The point estimate was above the target of 3,039 (horizontal line). The index target was estimated as the mean of indices during a period with acceptable marking rates (1991-1995).

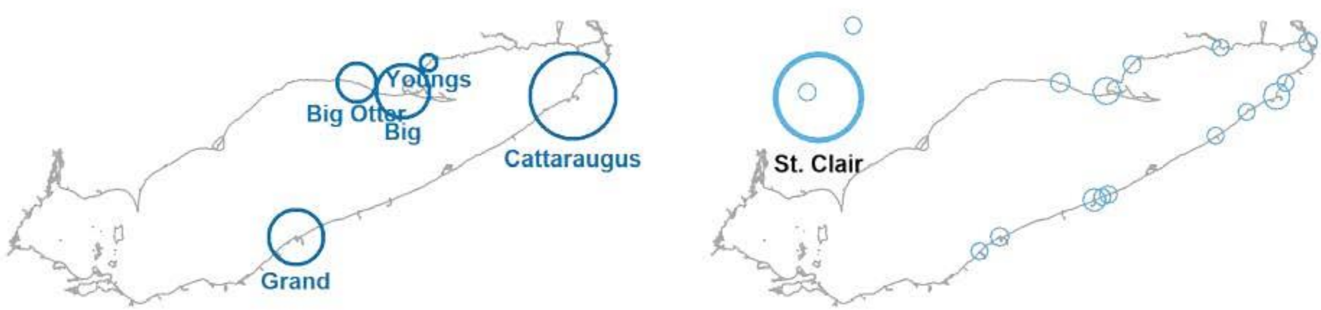


**Figure 19.** LEFT: Estimated index of adult Sea Lamprey during the spring spawning migration, 2017. Circle size corresponds to estimated number of adults from mark-recapture studies (blue) and model predictions (orange). All index streams are identified. RIGHT: Maximum estimated number of larval Sea Lamprey in each stream surveyed during 1995-2012. Tributaries composing over half of the lake-wide larval population estimate are identified (St. Clair 920,000).

## Lake Ontario

- A total of 5,755 Sea Lamprey were trapped in 8 tributaries, 5 of which are index locations. Adult population estimates based on mark-recapture were obtained from each index location (Table 31, Figure 22).

- The index of adult Sea Lamprey abundance was 12,536 (95% CI; 9,828 – 15,244), which is higher than the target of 11,368 (Figures 20-21).

**Table 31.** Information collected regarding Sea Lamprey adults captured in assessment traps or nets in tributaries of Lake Ontario during 2017 (letter in parentheses corresponds to stream in Figure 22).

| Tributary | Number Caught | Adult Estimate | Trap Efficiency (%) | Number Sampled[1] | Percent Males[2] | Mean Length (mm) Males | Mean Length (mm) Females | Mean Weight (g) Males | Mean Weight (g) Females |
|---|---|---|---|---|---|---|---|---|---|
| **Canada** | | | | | | | | | |
| Humber R. (A) | 3,282 | 6,992 | 47 | 122 | 56 | 509 | 500 | 296 | 287 |
| Duffins Cr. (B) | 365 | 1,035 | 35 | 18 | 56 | 528 | 508 | 319 | 285 |
| Bowmanville Cr. (C) | 755 | 1,461 | 52 | 84 | 57 | 505 | 515 | 281 | 304 |
| Cobourg Cr.[3] (D) | 227 | 347 | 66 | 132 | 49 | 491 | 486 | 248 | 248 |
| Salmon R.[3] (E) | 2 | --- | --- | --- | --- | --- | --- | --- | --- |
| **Total or Mean (Canada)** | **4,631** | --- | --- | **356** | **54** | **503** | **498** | **277** | **275** |
| **United States** | | | | | | | | | |
| Black R. (F) | 206 | 1,157 | 18 | 14 | 79 | 501 | 550 | 290 | 336 |
| Salmon R.(G) | | | | | | | | | |
| Orwell Br.[3] | 520 | 2,062 | 25 | 48 | 69 | 516 | 512 | 299 | 290 |
| Sterling Cr. (H) | 398 | 1,891 | 21 | 42 | 62 | 507 | 498 | 295 | 289 |
| **Total or Mean (U.S.)** | **1,124** | --- | --- | **104** | **67** | **510** | **508** | **296** | **292** |
| **Total or Mean (for lake)** | **5,755** | --- | --- | **460** | **57** | **505** | **500** | **282** | **278** |

[1] The number of Sea Lamprey used to determine percent males, mean length, and mean weight.
[2] Gender was determined using external characteristics.
[3] Not an index location.

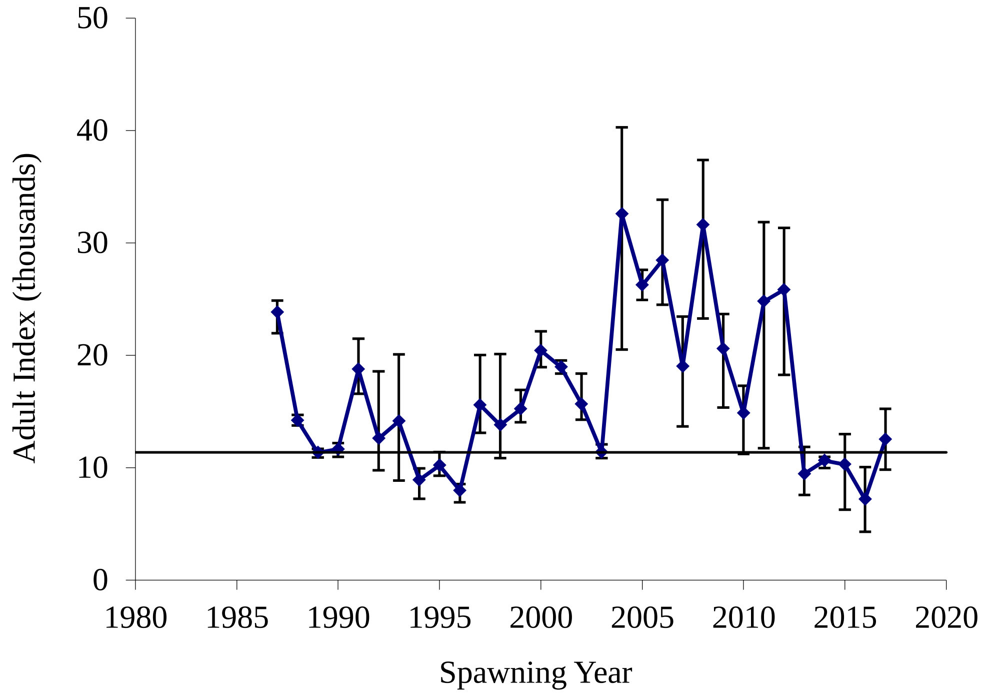


**Figure 20.** Index estimates with 95% confidence intervals (vertical bars) of adult Sea Lamprey. The adult index in 2017 was 12,536 (95% confidence interval 9,828-15,244). The point estimate did not meet the target of 11,368 (black horizontal line). The index target was estimated as the mean of indices during a period with acceptable marking rates (1993-1997).

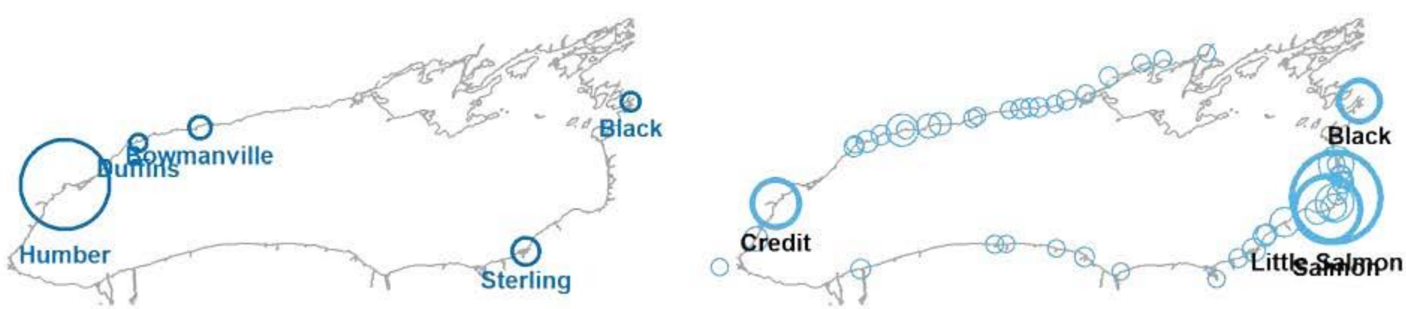


**Figure 21.** LEFT: Estimated index of adult Sea Lamprey during the spring spawning migration, 2017. Circle size corresponds to estimated number of adults from mark-recapture studies (blue) and model predictions (orange). All index streams are identified. RIGHT: Maximum estimated number of larval Sea Lamprey in each stream surveyed during 1995-2012. Tributaries composing over half of the lake-wide larval population estimate are identified (Salmon 1,400,000; Little Salmon 970,000; Credit 590,000; Black 470,000).

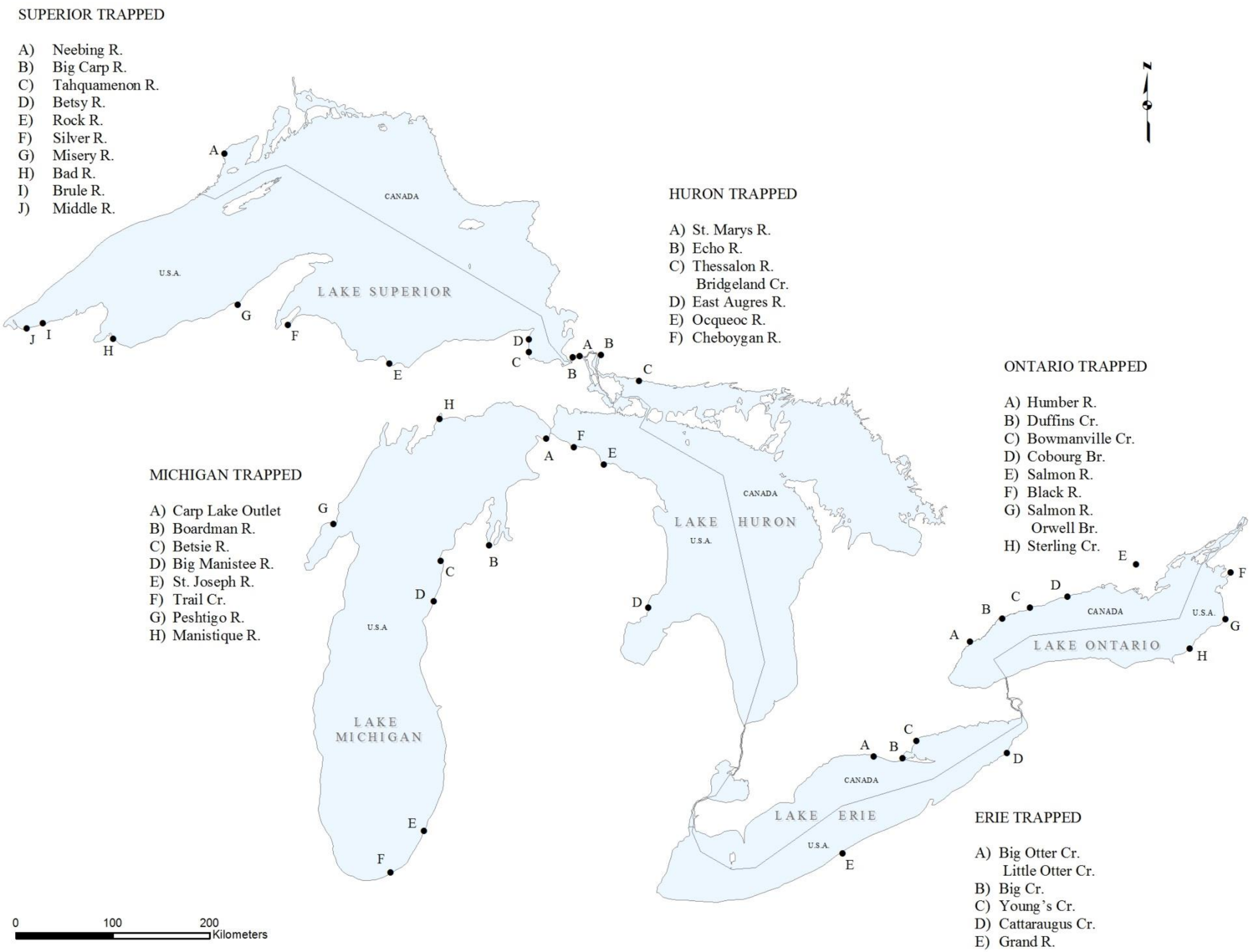


**Figure 4.** Locations of tributaries where assessment traps were operated during 2017.

## RISK MANAGEMENT

Risk management addresses environmental and non-target issues related to the implementation of the SLCP in the United States. This involves coordination with many federal, state, and tribal agencies, and working with others to minimize risk to non-target organisms.

### Species at Risk Act

The goal of the Species at Risk Act (SARA) is to protect endangered or threatened organisms and their habitats. Conducting activities that are prohibited under Sections 32, 33, and 58(1) of SARA require approval from the Department. SARA permits are sought where lampricide applications overlap with the known occurrence and critical habitat of federally listed threatened and endangered species. Permits are issued by the Department under section 73 of SARA annually.

### Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires all U.S. federal agencies consult with the Service's Ecological Services (ES) to ensure that actions that are federally funded, authorized, permitted or otherwise carried out will not jeopardize the continued existence of any federally listed (endangered, threatened and candidate) species or adversely modify designated critical habitat.

*Annual Reviews*

Endangered species reviews are conducted annually with ES to discuss proposed lampricide applications, assess the potential risk of these applications to federally listed species, and develop procedures to protect and avoid disturbance for each listed species.

During 2017, the following ES offices reviewed the effect of scheduled lampricide applications on endangered species within their jurisdiction. Concurrence with proposed conservation measures and determinations of "no effect" or "not likely to adversely affect" was received by:

- Ohio Ecological Services Field Office
- East Lansing Ecological Services Field Office (ELFO)
- New York Field Office
- Twin Cities Ecological Services Field Office
- Pennsylvania Department of Conservation and Natural Resources

*Programmatic Review*

Because of the broad scope of the SLCP, consultation under Section 7 of the ESA involves several states, many listed species and hundreds of streams. In an effort to streamline the consultation process and to add predictability for project planning, an informal, draft, SLCP-wide (programmatic) Section 7 Review was prepared in coordination with the East Lansing Field Office and submitted to the Midwest Region ES Program for consideration during 2007. The programmatic review evaluates all SLCP activities, identifies potential impacts to protected species and critical habitats, and specifies conservation measures to eliminate or minimize disturbance. No further action has been taken on the SLCP programmatic Section 7 review due to limited staffing within the ES Program.

## **State-Listed Species**

*Annual Reviews*

Reviews are annually conducted with state agencies to fulfill regulatory permit requirements, assess the potential risk to state listed (endangered, threatened and special concern) species, and develop procedures that protect and avoid disturbance for each listed species.

During 2017, the following state regulatory offices reviewed endangered species within their jurisdiction and issued permits to conduct lampricide applications:

- Michigan Department of Natural Resources
- Minnesota Department of Natural Resources
- Ohio Department of Environmental Protection
- New York Department of Environmental Protection
- Pennsylvania Department of Environmental Protection
- Wisconsin Department of Natural Resources

## **Studies**

*Granular Bayluscide Study*

Tests were conducted streamside within a bioassay trailer in flow through aquaria to determine the toxicity and sub-lethal effects of niclosamide, following granular Baylucide applications, to the Eastern pondmussel (*Ligumia nasuta*) and larval Sea Lampreys on the Middle Channel of the St. Clair River (Michigan).

*Piping Plover Risk Assessment*

A study was conducted during 2016 on the Manistee River to determine the concentration of TFM and niclosamide (Mixture) in burrowing mayfly larvae (HEX: *Hexagenia limbata*), water and sediment during and after treatment. The concentration in HEX was used to calculate the daily dietary exposure (DDE) of Piping Plover (PIPL) adults and chicks. The DDE, compared to the No Observable Adverse Effects Level (NOAEL) for PIPL estimated from avian toxicity studies, indicated that the Mixture would not pose a risk to PIPL adults and chicks. Therefore, streams with nesting PIPL can be treated with the Mixture at any time during the field season. A biological assessment summarizing this work and the effects determination was submitted to the East Lansing Field Office.

*Lake Sturgeon Collection on the Muskegon River*

Risk Management participated in the partner-led effort to collect young-of-the-year lake sturgeon (LAS: *Acipenser fulvescens*) before, during, and after treatment of the Muskegon River (Lake Michigan). A total of 28 live LAS were collected (26 pre-; 1 during; 1 post-treatment) and held in fresh Muskegon River water. The fish were measured and weighed, fin-clipped for genetic sampling, PIT-tagged, and returned to the capture site in the river following the treatment. One LAS died prior to release.

## Field Protocols

Field protocols are developed annually for field personnel so they can help protect and avoid disturbance to federal and state listed species located near scheduled SLCP activities. The protocols provides information on each species, their known locations and detailed conservation measures to be followed:

- *Protocol to protect and avoid disturbance to federal- and state-listed endangered, threatened, candidate, proposed, or special concern species and critical or proposed critical habitats in or near Great Lakes streams scheduled for lampricide treatments in the United States during 2017.*

- *Protocol to protect and avoid disturbance to federal- and state-listed endangered, threatened, candidate, proposed, or special concern species and critical or proposed critical habitats in or near Great Lakes streams scheduled for granular Bayluscide assessments in the United States during 2017*.

A total of 86 federal and state listed species and the de-listed bald eagle (*Haliaeetus leucocephalus*) were identified in the 2017 protocols. Mortality of two Northern Brook Lampreys (*Ichthyomyzon fossor*), state listed in Ohio, occurred in the Grand River.

## National Environmental Policy Act

Title I and Section 102 of the National Environmental Policy Act (NEPA) requires U.S. federal agencies to incorporate environmental considerations in their planning and decision making, which includes the details of the environmental impact of, and alternatives to, major federal actions significantly affecting the environment. During 2017, NEPA was required for cooperative agreements for the following actions:

Trapping for adult Sea Lamprey on the following streams:

- Betsie River (Lake Michigan)
- Boardman River (Lake Michigan)
- Cattaraugus Creek (Lake Erie)
- Clear Creek (Lake Erie)
- Bad River (Lake Superior)

## Federal Insecticide, Fungicide and Rodenticide Act

One report were prepared to comply with the U.S. EPA June 16, 1998 ruling of Section 6(a)(2) of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). This section of the FIFRA requires pesticide registrants to report unreasonable adverse effects of their products to the EPA. The Service is the registrant for lampricides and must report unreasonable adverse effects on humans, domestic animals, fish, wildlife, plants, other non-target organisms, water and damage to property. Incident reports are required with the observed mortality of a single federally-listed endangered, threatened or candidate species, and with observed mortalities of greater than 50 non-schooling or 1,000 schooling fish of any non-target species or taxa during a lampricide application (Table 32).

**Table 32.** Summary of 6(a)(2) reports submitted for incidents of non-target mortality during TFM treatment during 2017.

| Lake | Stream | Mortality | Freq. | Comments |
|---|---|---|---|---|
| Erie | Grand River | Madtom stonecat (*Noturus flavus*) | 464 | Species sensitive to TFM |
| | | Blackside darter (*Percina maculata*) | 117 | |
| | | Spotfin shiner (*Cyprinella spiloptera*) | 131 | |
| | | Bluntnose minnow (*Pimephales notatus*) | 354 | |
| | | Stripped/Common shiner (*Luxilus cornutus*) | 427 | Additionally, a tubing malfunction at the Harpersfield Dam AP resulted in a greater non-target mortality |
| | | Creek chub (*Semotilus atromaculatus*) | 112 | |
| | | Fantail darter (*Etheostoma flabellare*) | 65 | |
| | | Stoneroller minnow (*Campostoma anomalum*) | 186 | |
| | | Greenside darter (*Etheostoma blennioides*) | 64 | |
| | | Logperch (*Percina caprodes*) | 63 | |
| | | Rainbow darter (*Eteostoma caeruleum*) | 93 | |
| | | Twolined salamander (*Eurycea bislineata*) | 218 | |

## TASK FORCE REPORTS

The Commission has four task forces (Lampricide Control, Barrier, Larval Assessment and Trapping). The task forces include agents with expertise in specific program areas, researchers and academics, outside experts, Lake Committee representatives, Commission staff, and other experts as needed. The task forces report to the SLCB, which established their terms of reference and works with them to recommend program direction and funding to the Commission.

The following sections report the purpose, membership, and progress on objectives charged to each task force by the SLCB.

### Lampricide Control Task Force

**Purpose**

Maximize the number of Sea Lamprey killed in individual streams and lentic areas while minimizing costs and impacts on aquatic ecosystems.

**2017 Membership**

Lori Criger (Chair), Cheryl Kaye, Chris Gagnon, Tim Sullivan, Jenna Tews (Service); Brian Stephens, Bruce Morrison, Shawn Robertson, Fraser Neave (Department); Jean Adams (USGS/GLFC); Steve Lantz, Mike Boogaard, Terry Hubert, Karen Slaght (USGS); Michael Wilkie (Wilfred Laurier University); Dale Burkett, Mike Siefkes, Chris Freiburger (Commission Secretariat).

**Progress towards goals described in the GLFC Vision:**

**Goal 1: Suppress Sea Lamprey populations to target levels.**

**Strategy 1:** Implement lampricide treatment strategies to suppress Sea Lamprey populations to target levels in each Great Lake.

**2017 Outcomes:**

1. Where applicable, strategies were employed to reduce the number of sea lamprey that survive treatment and increase the effectiveness of individual stream treatments. Backwaters and isolated areas in target streams that did not otherwise receive lethal doses of lampricide were treated in conjunction with the main application to prevent survival and/or escapement in these refugia areas. Lampricide concentrations were targeted to be greater than 10% above theoretical values due to some uncertainty with the predictive chart levels. With the exception of outside agency (i.e. state, provincial, hydro generation) or endangered species constraints, streams were scheduled for treatment in the optimal time of year to ensure favorable discharge.
2. Personnel within the program were deployed to the control units in order treat more streams in the spring (when conditions are generally optimal) and to augment treatment effort on complex, labor intensive systems later in the season. Where practical, the Department conducted lampricide treatments in the US that were geographically closer to its headquarters to reduce travel time.
3. Crews from both Service and Department worked together to complete the St. Marys River granular Bayluscide treatment plots.

4. The Garden and Mississagi rivers (Lake Huron) were deferred due to lack of concurrence from First Nations, and Rogers Creek (Lake Michigan) was deferred due to unfavorable environmental conditions. However, treatments to Seiners Creek and upper Days River (Lake Michigan) and Sand Creek (Lake Huron) were added to the treatment schedule based on larval assessments conducted during the 2017 field season. In addition, two plots in the St. Marys River were retreated after post-treatment surveys revealed high densities of larvae.

**2018 Objectives:**

1. Treat all streams listed on the 2018 treatment rank list.
2. Review past treatment results and larval assessment data to direct implementation of applicable treatment strategies to achieve improved efficacy for streams ranked for treatment in 2018.
3. Deploy additional personnel from within the program to treat more streams in the spring to take advantage of seasonal susceptibility, optimal stream discharge and water chemistries as well as to augment treatment effort on complex, labor intensive systems scheduled later in the season.
4. Develop an optimized schedule jointly between the agents to realize efficiencies in travel and effectively utilize Department staff conducting or assisting with treatments in Michigan.
5. To increase treatment effectiveness on St. Marys River granular Bayluscide applications, both spray boats will be utilized to ensure treatments are completed before aquatic vegetation becomes problematic.
6. Support and provide input into research that investigates sea lamprey sensitivity and non-target effects of other aquatic organisms to lampricides which may lead to new control strategies and minimize effects on non-target species.

**Strategy 3:** Measure the effectiveness of lampricide application and account for its variation among streams.

**2017 Outcomes:**

1. Lampricide analysis and water chemistry data from treatments in 2017 were/are to be reviewed to identify potential areas that did not receive theoretical lethal TFM concentrations during stream treatments. Information is provided to larval assessment to help guide treatment evaluation survey effort and if required, may result in re-treatment.

**2018 Objectives:**

1. Review past treatment history and larval assessment information for streams ranked for treatment in 2018 to identify impediments to effectiveness and develop strategies to increase efficacy
2. At the direction of the SLCB, work with other task forces to plan work that will measure effectiveness of lampricide applications.
3. Assist UMESC in field studies in support of the development of a more effective TFM bar and a new formulation of liquid niclosamide.

**Goal 2:** Increase the effectiveness and efficiency of Sea Lamprey control to maximize reductions in Sea Lamprey populations in each Great Lake.

**Strategy 4:** Implement integrated strategies for Sea Lamprey control for each lake and evaluate their effectiveness.

**2017 Outcomes:**

1. Implemented the large-scale treatment strategy targeting large producers in the Lake Michigan basin.
2. Assistance to the LATF to develop possible control strategies in the Huron-Erie Corridor as directed by SLCB is ongoing.

**2018 Objectives:**

1. Optimize stream treatment schedules to facilitate the implementation of the next the large-scale treatment strategy which targets Lake Huron in 2018.
2. Assist in the development of recommendations and implement tactics from the lampricide control review to increase effectiveness of treatments.

## <u>Barrier Task Force</u>

**Purpose**

The task force was established during April 1991 to coordinate efforts of the Department, the Service, and the USACE on the construction, operation, and maintenance of Sea Lamprey barriers.

**2017 Membership**

Pete Hrodey (Chair), Kevin Mann, Jessica Barber, Cheryl Kaye, and Rob Elliott (Service); Tonia Van Kempen, Bhuwani Paudel, and Tom Pratt (Department); Steve Fischer and Carl Platz (USACE); Gary Whelan (MIDNR); David Gonder (OMNR); Nicholas Johnson and Dan Zielinski (USGS); Rob McLaughlin (University of Guelph); Dale Burkett, Michael Siefkes, and Chris Freiburger (Commission Secretariat).

**Progress towards goals described in the GLFC Vision:**

**Goal 1: Suppress Sea Lamprey populations to target levels.**

**Strategy 5:** Construct and maintain a network of barriers to limit Sea Lamprey access to spawning habitats.

**2017 Outcomes:**

1. Planning continued on 14 barrier construction projects to prevent Sea Lampreys from accessing spawning habitat.
2. Routine maintenance at all purpose-built Sea Lamprey barriers was completed to ensure adult Sea Lamprey do not have access to spawning habitat.

3. Inspection of approximately 200 existing barriers in the Great Lakes was conducted to assess whether structures would prevent upstream migration and to identify repairs necessary to minimize the number of parasitic lampreys originating from untreated sources.
4. Review of fifty-seven fish passage projects was initiated or completed to determine the effect of fish passage and dam or culvert removals to Sea Lamprey control operations.
5. Completed electrofishing surveys and habitat assessments conducted upstream of barriers of concern in the Boardman, Credit, Kalamazoo, Middle, and Thunder Bay rivers to quantify potential infestation risk; barrier inspections were also completed to verify historical information and at locations not currently represented in the barrier database.

**2018 Objectives:**

1. Initiate construction of the Manistique River (Lake Michigan) Sea Lamprey barrier.
2. Complete final design and construction planning for the Grand River (Lake Erie) Sea Lamprey barrier in Harpersfield, OH. Plan for construction in FY19 to ensure that Sea Lampreys remain blocked at the Harpersfield Dam.
3. Initiate rebuild of Denny's Dam on the Saugeen River (Lake Huron), to ensure that Sea Lampreys remain blocked at Denny's Dam.
4. Members remain engaged in the process to reach a decision point regarding the Black Sturgeon River (Lake Superior) Camp 43 dam.
5. Members remain engaged in the analysis and review of options at the 6th Street Dam on the Grand River (Lake Michigan) to assess risk of adult Sea Lampreys migrating upstream of the proposed structure that will create a whitewater rapids area in downtown Grand Rapids, MI.
6. Continue working on priority GLFER barrier projects with the USACE: Bad (Lake Superior) and Little Manistee rivers (Lake Michigan) to limit Sea Lamprey access to spawning habitat.
7. Investigate repair, rebuild, or removal alternatives to restore the blocking function of the Sea Lamprey barrier on Duffin's Creek (Lake Ontario).
8. Investigate use of existing surrogate species data and geographic information systems (GIS) data to predict infestation risk upstream of blocking barriers.
9. Deliver barrier program of operation and maintenance to limit Sea Lamprey access to spawning habitat.

**Goal 2: Increase the effectiveness and efficiency of Sea Lamprey control to further reduce Sea Lamprey populations in each Great Lake.**

**Strategy 4:** Implement integrated Sea Lamprey control strategies for each lake and evaluate their effectiveness.

**2017 Outcomes:**

1. Participated in laboratory experiments to identify alarm cue compounds and to determine the effect of sea lamprey alarm cue on native species. Work to identify the chemical nature of the alarm cue is ongoing and preliminary results indicate that the magnitude of the response to Sea Lamprey alarm cue in other species seems to be related to how close phylogenetically the species is to Sea Lamprey.
2. The Cheboygan Working Group (CWG) investigated wounding and adult capture reports from the upper Cheboygan River system and confirmed presence of a small adult Sea Lamprey population through monitoring of fyke nets. Three unmarked adult lampreys were captured during 2017 in the upper Cheboygan. Approximately 3,700 sterilized male Sea Lampreys were also released into Sturgeon, Pigeon, and Maple rivers. Nest surveys were conducted and no viable eggs were observed. Further larval assessment surveys are planned for this fall.

3. Participated in a field experiment in the Black Mallard River to test an electrical barrier by Neptun as a seasonal barrier to block a natural Sea Lamprey run with the goal of eliminating the need for lampricide treatment. There was a failure of the electrical system for 70 hours, during May 2017. Approximately 50 sterile males were released to compensate for potential for escapement. No adult Sea Lamprey were captured upstream of the barrier, but one site was positive for young-of-year larvae. Further larval assessment work is needed to confirm the extent of possible infestation.
4. Participated in a field experiment in the Ocqueoc River to evaluate the use of the repellent in trap-and-pass fishways in the Great Lakes (to selectively remove sea lamprey from passing fishes). When alarm cue was added to the open fishway channel, no Sea Lamprey passed through it and more attempted to climb the eel ladder-style trap.

**2018 Objectives:**

1. Remain involved in barrier research regarding use of chemo-sensory techniques to block or guide Sea Lampreys to increase capture of adult Sea Lamprey at barrier/trap complexes.
2. Participate in research trials to further test alarm cue response and its utility in a push-pull scenario to direct lampreys toward a successful barrier/trap complex or effective treatment location.
3. Submit proposal to field test a combination of alternative strategies (pheromone, alarm cue, NEMO, etc.) to block Sea Lamprey from accessing spawning habitat.
4. Participate in technical assistance proposal evaluations of NEMO as a seasonal barrier to block a natural sea lamprey run in the Black Mallard River over three years with the goal of eliminating the need for lampricide treatment.
5. The Cheboygan Work Group (CWG) will continue to assess the upper Cheboygan River population during 2018 to confirm that adult populations upstream of the Cheboygan Lock and Dam complex are small. The CWG developed a proposal (to Sea Lamprey Research Board) to apply SMRT in the upper river in 2017-2019 following the 2016 lampricide treatment.

## Larval Assessment Task Force

The task force was established in 2012 and combined some objectives from the Assessment Task Force and the Larval Assessment Work Group.

### Purpose

Rank streams and lentic areas for Sea Lamprey control options and evaluate success of lampricide treatments through assessment of residual larvae.

### 2017 Membership

Fraser Neave (Chair), Mike Steeves and Kevin Tallon (Department); Lori Criger, Bob Frank and Aaron Jubar, (Service); Jean Adams and Chris Holbrook (USGS); Travis Brenden (Quantitative Fisheries Center, MSU); Dale Burkett, Chris Freiburger, and Mike Siefkes (Commission Secretariat).

**Progress towards goals described in the GLFC Vision:**

**Goal 1: Suppress Sea Lamprey populations to target levels.**

**Strategy 2:** Conduct detection and distribution surveys to identify all sources of larval Sea Lamprey.

**2017 Outcomes:**

1. Distribution surveys were conducted during 2017 in tributaries scheduled for treatment in 2017 and 2018.
2. In Lake Superior surveys, an increased distribution was found in the South Branch of the Betsy River. This increased the 2017 treatment by approximately seven miles. Trask Creek, a tributary to the Brule River (Wisconsin) was found to be newly infested. This will add seven miles to the 2018 treatment. Evaluation surveys conducted on the St. Louis River (Minnesota/Wisconsin) recovered only two larvae out of twenty $500m^2$ granular Bayluscide plots, indicating there is likely minimal Sea Lamprey reproduction in that system. In Lake Huron larval assessment, two year classes were found above the Ocqueoc River. A new producer was identified in Lake Erie: the Huron River (east of Sandusky, Ohio) is the first documentation of Sea Lamprey recruitment in the western basin of the lake other than the Huron Erie Corridor. In Lake Michigan, a newly extended infestation into Brandywine Creek (a tributary to Paw Paw River) will add seven miles to the treatment. A low density Sea Lamprey population was discovered in Usshers Creek, a tributary to the upper Niagara River.

**2018 Objectives:**

1. Conduct detection surveys as required. When new infestations are found, rank for treatment as size structure dictates.
2. Conduct distribution surveys for 2019 treatments.

**Strategy 3:** Measure the effectiveness of lampricide application and account for its variation among streams.

**2017 Outcomes:**

1. Post-treatment assessments were conducted on streams treated during 2016 and early 2017. Streams with large larvae were re-ranked for treatment.
2. Six streams were treated for the second time since 2015 based on residual Sea Lampreys found in treatment evaluation surveys. The streams which were treated in 2017 included: Mindemoya River and Timber Bay Creek (Lake Huron), Betsy River and Furnace and Roxbury creeks (Lake Superior), and Crooked Creek (Lake Erie).

**2018 Objectives:**

1. Continue to conduct post-treatment assessments on all treated streams and rank streams where large residual Sea Lamprey are recovered.

**Goal 2: Increase the effectiveness and efficiency of Sea Lamprey control to further reduce Sea Lamprey populations in each Great Lake.**

**Strategy 3:** Improve existing and develop new rapid assessment methods to determine the distribution and relative abundance of larval Sea Lamprey populations.

**2017 Outcomes:**

1. Larval habitat identification and quantification training for full-time staff was held within each agent office in 2017.
2. Electronic field data collection has now been fully implemented in the Marquette and Ludington offices.
3. The LATF is continuing to research the potential incorporation of environmental DNA detection into its assessment approach. A study designed to test the feasibility of Biomeme field equipment was conducted in the fall. Results are pending.
4. The Marquette office developed a new boat-mounted submersible electro-fisher unit for use in establishing distributions of lentic populations and habitat assessment.

**2018 Objectives:**

1. Conduct an all-office "train-the-trainers" larval habitat classification session in early spring 2018.
2. Continue to edit larval assessment protocols and operating procedures as necessary.
3. Continue implementation of electronic field data collection by US agents and work out any outstanding issues.
4. Re-convene the Larval Assessment Working Group to address items as decided by the LATF.

**Strategy 4:** Implement integrated Sea Lamprey control strategies for each lake and evaluate their effectiveness.

**2017 Outcomes:**

1. Year two of the 2016-2018 Targeted Effort treatment strategy was implemented. This basin-wide approach focused on Lake Michigan tributaries in 2017, and will target Lake Huron in 2018. Distribution surveys were conducted in preparation for the Lake Huron effort in 2018.
2. Six options for the next (2019-2021) targeted treatment strategy were created by the LATF and LCTF and discussed at the September 2017 joint meeting.
3. A report on the effectiveness of the 2012/2013 targeted treatments was completed, and a document outlining the expectations of the 2016-2018 strategy was drafted.

**2018 Objectives:**

1. Refine the Lake Superior Targeted Treatment Strategy stream list for 2019, based on 2018 larval assessment survey data.
2. Begin to assemble a preliminary stream list for the Lake Michigan Targeted Treatment Strategy for 2020.
3. Continue work on a report detailing the results of the Targeted Treatment effort from 2014-2015.

## Trapping Task Force

### Purpose

Coordinate optimization of trapping techniques for assessing adult Sea Lamprey populations and removing adult and transforming Sea Lampreys from spawning and feeding populations.

### 2017 Membership

Gale Bravener (Chair) and Mike Steeves (Department), Jessica Barber, Peter Hrodey, Greg Klingler (Service), Jean Adams, Scott Miehls, Jane Rivera, Alex Haro (USGS); Weiming Li, Michael Wagner (Michigan State University), Heather Dawson (University of Michigan), Rob McLaughlin (University of Guelph), Michael Siefkes, Dale Burkett, Chris Freiburger (Commission Secretariat).

### Progress towards goals described in the GLFC Vision:

### Goal 1: Suppress sea lamprey populations to target levels.

**Strategy 4:** Quantify the relationship between the abundance of adult Sea Lampreys, Lake Trout abundance, and marking rates on Lake Trout.

**2017 Outcomes:**

1. A total of 29 index streams were trapped throughout the Great Lakes in 2017, and mark recapture population estimates were obtained from all 29. Adult indices for each lake were generated.
2. As a result of recent research by McLaughlin et al, the program is transitioning to using the pooled Petersen estimator for mark-recapture data in 2018.

**2018 Objectives:**

1. Operate and maintain 37 trap sites throughout the Great Lakes. These include the 29 index streams, for which populations will be estimated using mark-recapture, and another 8 non-index streams.
2. Continue monitoring results from recent and ongoing research projects, and be prepared to implement effective new technologies and methods into the Sea Lamprey control program when they become available.

**Strategy 6:** Deploy trapping methods to increase capture of adult and recently metamorphosed Sea Lampreys.

**2017 Outcomes:**

1. Collection via screw traps, fyke nets, or electrofishing were considered in several tributaries with potential for juveniles in 2017. Most of these were subsequently treated, could not be collected on due to high water, or were deemed to have very few juveniles.
2. Monitored several recent and ongoing research projects aimed at improving the capture efficiency of adults and out-migrating juveniles for control purposes. No new methods to increase capture of adults or transformers were deployed in 2017.

3. Recent work by Dawson and Jones using the SlaMSE model suggests that trapping adults as a control method has the most potential in streams that are regularly treated and have low adult densities, but reductions in parasitic Sea Lamprey in the lake will only be made if traps cost < $5,000 each on average and trap efficiency is >50% on average.

**2018 Objectives:**

1. Continue trapping juveniles for control in newly discovered or deferred streams to decrease escapement to the lakes.
2. Continue monitoring results from recent and ongoing research projects, and be prepared to implement new technologies and methods into SLCP.
3. Continue to develop a trapping for control framework, evaluating when and where trapping for control is likely to be successful and cost-effective.

**Goal 2: Increase the effectiveness and efficiency of sea lamprey control to maximize reductions in sea lamprey populations in each Great Lake.**

**Strategy 1:** Increase the capture of Sea Lampreys by developing cost-effective trapping methods including those based on release of pheromones.

**2017 Outcomes:**

1. The Li lab has identified several new pheromone compounds over the past couple of years, some of which were tested for biological activity in 2017. However, no pheromone combinations tested were as effective at attracting or retaining ovulating females as washings from spermiated males.
2. The Li lab has also made significant progress identifying and testing pheromone antagonists. Antagonists are showing promise not only for migration but mate finding and nest building. At the right concentration, tri-sulfated PZS is very effecting at repelling ovulating females from spermiated male washings.
3. Nick Johnson and collaborators completed year 1 of 2 of a management-scale field trial using 3kPZS to bait traps. This is a follow-up to the management scale field trials of 2009-2011. The objective is to determine the concentration of 3kPZS required to maximize increases in trap exploitation rate.

**2018 Objectives:**

1. Continue to identify the structure and function of Sea Lamprey pheromone components, and attempt to unequivocally confirm the pheromone function of at least one novel compound.
2. Future directions for pheromone antagonist work include 1) determining an effective formula of antagonists, 2) determining the efficacy in halting reproduction in natural spawning populations, and 3) determining the mechanism of interaction with pheromone receptors.
3. Continue to monitor results from the optimizing 3kPZS application research project, and implications for trapping for control efforts.

**Strategy 2:** Evaluate a repellent-based method to deter Sea Lamprey from spawning areas.

**2017 Outcomes:**

1. Work to isolate and identify the chemical structure of the Sea Lamprey alarm cue (Wagner Lab and Nair Lab, MSU) continued. New extraction methods were tested. Bio-assays were conducted and the aqueous ethanolic type of extract showed the most repellent activity. Further partitioning of the extract into water-soluble and lipophilic components showed that the activity was concentrated only in water-soluble fraction. The water-soluble fraction was further separated into nine distinct sub-fractions. Compounds from the most reactive fractions will be isolated and chemically characterized as the project continues.

**2018 Objectives:**

1. Continue work to isolate and identify the chemical structure of the Sea Lamprey alarm cue (Wagner Lab and Nair Lab, MSU).
2. Michael Wagner's lab (at MSU) and collaborators will begin new research on siting traps in open water river systems, using telemetry, bathymetry and push-pull with repellants and attractants.

**Strategy 4:** Implement integrated strategies for sea lamprey control for each lake and evaluate their effectiveness.

**2017 Outcomes:**

1. Worked with LATF to identify and target streams for trapping juveniles for control.
2. Evaluated the effects of integrated control strategies that have been implemented (e.g. large-scale treatment strategies) by developing adult Sea Lamprey abundance estimates and wounding rates on Lake Trout.

**2018 Objectives:**

1. Continue to work with LATF to identify and target streams for trapping out-migrating juveniles for control.
2. Continue to evaluate the effect of integrated control strategies that have been implemented by developing adult Sea Lamprey abundance estimates.

## EDUCATION AND OUTREACH

The GLFC, with considerable help from partners, advisors, agents, and others, conducts a comprehensive education and outreach program. As part of efforts to inform the public about the Commission's programs, the health of the Great Lakes, and the importance of the fisheries to the region, the following shows and events were attended in 2017:

**2017 Shows and Events:**

- Ultimate Fishing Show, Detroit Michigan—January 12-15 (USFWS-LBS)
- Greater Niagara Fishing and Outdoor Expo., Niagara Falls, NY—January 20-22 (USFWS-LBS)
- Chicagoland Fishing Travel & Outdoor Expo, Schaumburg, IL—January 26-29 (USFWS-LBS)
- Duluth Boat and Sport Show, Duluth, MN—February 15-19 (USFWS-MBS)
- Spring Fishing & Boat Show, Mississauga, ON—February 17-20 (DFO-SLCC)
- Ottawa Boat & Sportsmen's Show, Ottawa, ON—February 23-26 (DFO-SLCC)
- Northeast Wisconsin Sport Fishin' Show, Oshkosh, WI—March 3-5 (USFWS-MBS)
- Bay Mills CC Seminar – Earth Day event series, Brimley, MI—March 20 (HBBS)
- Ohio Charter Captain's Conference, Huron, OH—March 4 (GLFC)
- Ultimate Sport Show, Grand Rapids, MI—March 16-19 (USFWS-LBS)
- Spring into Science Event, Cranbrook Inst. of Science, Bloomfield Hills, MI—April 3-7 (GLFC)
- Earth Day Event at Chrysler Technical Center, Auburn Hills, MI—April 19 (GLFC)
- Cheboygan Earth Week Plus Expo, Cheboygan, MI—April 22 (HBBS)
- Rouge River Water Festival, Dearborn, MI—May 4 (GLFC)
- Clinton River Water Festival, Oakland University, Rochester, MI—May 19 (GLFC)
- Port Clinton Walleye Festival, Port Clinton, OH—May 25-29 (GLFC)
- Michigan Out of Doors Summer Camp, Chelsea Michigan—all summer (GLFC/MUCC)
- Blue Water Sturgeon Festival, Port Huron, MI—June 2-3 (GLFC)
- Washtenaw Elementary Science Olympiad, Ann Arbor, MI—June 3 (HBBS)
- MDNR Cheboygan Youth Fishing Contest, Cheboygan, MI—June 10 (HBBS)
- Detroit River Fish 4 Kids, Detroit, MI—June 11 (GLFC)
- Hooked for Life Kids Fishing Clinic and Derby, Alpena, MI—June 17 (HBBS)
- Rogers City 4-H camp, Millersburg, MI—June 28 (HBBS)
- MDNR Academy of Natural Resources Teacher Workshop Roscommon, MI—June 17 (HBBS)
- P.H. Hoeft State Park, Rogers City, MI—August 1 (HBBS)
- Owen Sound Salmon Spectacular, Owen Sound, ON –August 26 – September 4 (GLFC/DFO-SLCC)
- Great Lakes and Natural Resources 4-H camp, Presque Isle, MI—August 31 (HBBS)
- Rogers City Fishing Tournament, Rogers City, MI—August 17 (HBBS)
- Great Outdoor Youth Jamboree, Lake Hudson, MI—September 13 (GLFC)
- Rouge River Water Festival, Cranbrook Institute of Science—September 13, 15 (GLFC)
- Cranbrook Institute of Science Halloween Event—September 20-22 (GLFC/Cranbrook)
- Invasive Species Centre, Parliamentary Event, Toronto, ON—November 15 (GLFC/ISC)

A special thanks to the following advisors, agents, and friends who participated in, or who have committed to, events in 2017: Don Arcuri, Gale Bravener, Kevin Butterfield, Chris Eilers, John Ewalt, Matt Faust, Thom Gulash, Al House, Bob Kahl, Jerome Keen, Aaron Jubar, Dave Keffer, Jason Krebill, Paul Kyostia, Matt Lipps, Mike Matta, Dan McGarry, Commissioner Jim McKane, Ken Merckel, Jen Nalbone, Judy Ogden, Dale Ollila, Chuck Pistis, Alan Rowlinson, Michael Ryan, Barry Scotland, Titus Seilheimer, Barry Shier, Chris Sierzputowski, Brian Stephens, Tim Sullivan, Jenna Tews, Danny Tanner.

# PERMANENT EMPLOYEES OF THE SEA LAMPREY CONTROL PROGRAM

## FISHERIES AND OCEANS CANADA

### Sea Lamprey Control Centre – Sault Ste. Marie, Ontario Canada

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Bruce Morrison: Supervisor
Shawn Robertson: Supervisor
Alan Rowlinson: Assistant Supervisor
Barry Scotland: Assistant Supervisor
Tonia Van Kempen: Environmental Supervisor

**Lampricide Application Coordinators:**
Peter Grey: Supervisor
Jamie Storozuk: Supervisor

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Melissa Landry
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Jamie Smith
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**Barriers:**
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Joe Hodgson: Barrier Engineering Technician

**Section Head, Assessment:** Mike Steeves

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Kevin Tallon: Larval Supervisor (Lower Lakes)

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## UNITED STATES FISH AND WILDLIFE SERVICE

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(CS) Career Seasonal


Great Lakes Fishery Commission Commissioner Tracey Mill (left) presents Paul Sullivan with the 2017 Vernon C. Applegate Award for Outstanding Contributions to Sea Lamprey Control. The award was presented to Mr. Sullivan on June 7, 2017, during the Great Lakes Fishery Commission's annual meeting, held in Duluth, Minnesota. Photo: Ted Lawrence, GLFC.


After having dedicated 29 years of her professional career to the USFWS Sea Lamprey Control Program, Kasia Mullett has hung up her waders to seek new adventures with USFWS Ecological Services in Hawaii. Kasia began her career with the Sea Lamprey Control Program as a Biological Science Aid and held numerous leadership positions with the Program, culminating as the Field Supervisor of the Marquette and Ludington Biological stations. She was passionate about the resource, but will be most remembered for her passion to develop and lead others. Good luck, Kasia! Photo: Chuck Krueger.