SEA LAMPREY CONTROL IN THE GREAT LAKES 2012

ANNUAL REPORT TO
THE GREAT LAKES FISHERY COMMISSION

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GLFC Annual Meeting
Montreal, Quebec
May 29-30, 2013

Photo by Michael Siefkes, GLFC

Pete Hrodey (U.S. Fish and Wildlife Service) checking nets in the St. Clair River for out-migrating juvenile sea lampreys. On the cover: One of 18 out-migrating juvenile sea lampreys that were captured in nets operated at three locations in the St. Clair and Detroit Rivers between November 27 and December 14, 2012.

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EXECUTIVE SUMMARY

This report summarizes sea lamprey control activities conducted by Fisheries and Oceans Canada (Department) and the United States Fish and Wildlife Service (Service) in the Great Lakes during 2012. These activities are consistent with the actions identified in the Great Lakes Sea Lamprey Control Plan to achieve sea lamprey abundance and marking targets that was adopted by the Great Lakes Fishery Commission in 2011. Lampricide treatments were conducted on 100 tributaries and 15 lentic areas. Larval assessment crews surveyed 674 Great Lakes tributaries and 54 lentic areas to assess control effectiveness, plan future TFM treatments, and establish production capacity of streams. Assessment traps were operated in 72 tributaries across the Great Lakes to estimate the adult sea lamprey populations in each Great Lake.

Adult sea lamprey populations were evaluated relative to fish-community objectives for each of the lakes. In Lake Superior, adult abundance (71,846, 95% CI: 56,880-99,941) was greater than the target level of 37,000 ± 19,000 after being within the target range during the previous four years. In Lake Michigan, abundance (87,887, 95% CI: 82,325-95,028) was greater than the target level of 58,000 ± 13,000 for the third consecutive year. In Lake Huron, abundance (275,006, 95% CI: 236,999-332,782) showed a significant increase compared to the previous three years and remains greater than target level of 76,000 ± 20,000. In Lake Erie, abundance (17,211, 95% CI: 13,444-23,949) decreased for the third consecutive year but remains greater than the target level of 3,000 ± 1,000. In Lake Ontario, abundance (57,270, 95% CI: 51,290-63,314) was greater than the target level of 31,000 ± 4,000 after being within the target range for the previous two years.

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-20th century and continues to affect efforts to restore and rehabilitate the fish-community. Sea lampreys attach to large bodied fish and extract blood and body fluids. It is estimated that about half of sea lamprey attacks result in the death of their prey and an estimated 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 and lake trout marking targets for each of the lakes. This report outlines the program conducted by the control agents and the Commission in 2012 to meet these targets.

FISH-COMMUNITY OBJECTIVES

Each lake committee has published qualitative goals for sea lamprey control in their fish-community objective documents. 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 5-year period when marking rates resulted in a tolerable annual rate of mortality on lake trout. A target and range of adult sea lamprey abundance was calculated for these lakes from the estimated average abundance over a 5-year period when marking rates were closest to 5 A1-3 marks per 100 lake trout >533 mm. Similarly, a target and range was developed for Lake Ontario from the estimated average abundance over a 5-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 5-year period prior to the completion of the fish-community objectives (1989–1993).

The performance of the SLCP is evaluated annually by contrasting adult sea lamprey abundance with the lake trout marking rate against these targets. Lake-wide adult abundance is estimated by the Service and Department using a combination of mark-recapture and trapping efficiency estimates of adults in streams with traps, and regression model-predicted estimates in streams without traps. Since the model for estimating adult abundance is updated annually using all available data, the adult estimates for previous years can change, which in turn, can cause the adult targets to change. Lake trout marking rates are assessed and collected by the 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 target and range of adult sea lamprey abundance for Lake Superior was calculated from the estimated average abundance for the 5-year period, 1994-1998, when marking rates were closest to 5 marks per 100 fish (5.2 A1-3 marks per 100 lake trout >533mm). The calculated target abundance in Lake Superior is 37,000 ± 19,000 sea lampreys**.**

During 2012, adult sea lamprey abundance in Lake Superior was estimated to be 71,846 (95% CI; 56,880-99,941). Abundance estimates were within the fish-community target range during the previous four years (2008-2011) before increasing during 2012. The sea lamprey marking rate on lake trout is currently at 6 A1-A3 marks per 100 lake trout >533mm, which is greater than the target of 5 marks per 100 fish.

Lake-wide adult abundance estimates exceeded the Lake Superior target during 1999-2007. The control agents responded by surveying all known and potential sources of sea lampreys during 2004-2006. Treatment effort increased and all significant sources were treated bringing abundance within target range during 2008-2011 before increasing during 2012.

Lake Michigan

The Lake Michigan Committee established the following goal for sea lamprey control in Lake Michigan:

- *Suppress the sea lamprey to allow the achievement of other fish-community objectives.*

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 target and range of adult sea lamprey abundance for Lake Michigan was calculated from the estimated average abundance for the 5-year period, 1988-1992, when marking rates were closest to 5 marks per 100 fish (4.7 A1-3 marks per 100 lake trout >533mm). The calculated target abundance in Lake Michigan was 57,000 ± 13,000 sea lampreys.

During 2012, adult sea lamprey abundance in Lake Michigan was estimated to be 87,887 (95% CI; 82,325-95,028), which was greater than the target range. Populations were less than or within the target range prior to the 2000 spawning year, but had shown a significant trend upward to a peak abundance of 168,791 during 2007. Abundance declined markedly in 2008 and again in 2009, increased slightly during 2010, declined in 2011, and increased in 2012. The sea lamprey marking rate on lake trout is currently at 13 A1-A3 marks per 100 lake trout >533mm. The marking rate has been greater than the target of 5 marks per 100 fish for at least the previous 10 years.

The trend of increasing sea lamprey abundance between 2000 and 2007 led the Commission to increase assessment and treatment effort in Lake Michigan. The causes of the increase in sea lamprey abundance may have been due to reduced lampricide control effort, increased production of sea lampreys upstream of deteriorated barriers, and increased survival of juvenile lampreys due to changes in the fish-community. However, all known and likely sources of sea lampreys have been surveyed and control efforts have targeted all potential sources of sea lampreys in the lake.

Beginning in 2001, treatment effort increased with special emphasis on increasing suppression in Lake Michigan. The Manistique River was treated in 2003, 2004, 2007, 2009 and 2012. Treatments of smaller streams that were located near other streams scheduled for treatment (geographic efficiencies) increased the number of streams that were treated each year. Beginning in 2005, the states and tribes of Michigan and Wisconsin agreed to relax previous restrictions on TFM concentrations in select lake sturgeon (*Acipenser fulvescens*) streams to maximize treatment effectiveness. Treatments of streams where lake sturgeon reproduction exists were scheduled later during the year, when larval lake sturgeon exceed 100mm in length and may be less vulnerable.

Lake Huron

The Lake Huron Committee established the following specific goal 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 sea lamprey abundance target and range for Lake Huron were calculated as 25% of the estimated average abundance during the 5-year period prior to the publication of the fish-community objectives (1989-1993). The target using these data was 76,000 ± 20,000 sea lampreys in Lake Huron. 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 2012, adult sea lamprey abundance in Lake Huron was estimated to be 275,006 (95% CI; 236,999-332,782) and was greater than the fish-community objective target range. The sea lamprey marking rate on lake trout is currently 11 A1-A3 marks per 100 lake trout >533 mm. The marking rate has been greater than the target of 5 marks per 100 fish since 1983.

Despite efforts to reduce juvenile sea lamprey abundance in Lake Huron through the implementation of a large-scale treatment strategy involving consecutive treatments of all infested streams tributary to the North Channel and the St. Marys River, including granular Bayluscide treatment of St. Marys River plots, the estimate of adult abundance significantly increased from 2011 to 2012. By contrast, the 2012 post-treatment larval population estimate of 360,000 for the St. Marys River was the lowest ever recorded during the 1997-2012 time frame (range 360,000-3,100,000) that this data has been collected. The source(s) of increased adult sea lamprey abundance has not been determined, but it has been hypothesized that recent increases in abundance of intermediate hosts (ciscos) may have resulted in increased survival of juvenile sea lampreys. Also, abundance estimates based on the large trap catches of adults in the Cheboygan, Ocqueoc, and St. Marys rivers and a model-predicted estimate in the Mississagi River accounted for more than half of the Lake Huron population estimate (see Adult Assessment section).

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 lampreys.

The target and range of adult sea lamprey abundance for Lake Erie were calculated from the estimated average abundance for the 5-year period, 1991-1995, when marking rates were closest to 5 marks per 100 fish (4.4 A1-3 marks per 100 lake trout >533mm). The calculated target abundance in Lake Erie was 3,000 ± 1,000 sea lampreys.

During 2012, adult sea lamprey abundance in Lake Erie was estimated to be 17,211 (95% CI: 13,444 – 23,949). For the fourth consecutive year, this level of abundance is significantly greater than the target range. The sea lamprey marking rate on lake trout is currently 10 A1-A3 marks per 100 lake trout >533mm. The marking rate has been greater than the target for the previous 10 years and increased during 2012 after a two-year decline.

The initial round of stream treatments during 1986 and continued control efforts during the following eight years resulted in an annual adult sea lamprey population within the target range. During the late 1990s, adult abundance recovered to pre-control levels, which was probably due to deferral of some treatments, failure to treat all sea lamprey-infested areas in some streams, and lower treatment efficacy resulting from measures designed to reduce lampricide use and protect non-target organisms. Beginning in 1999, the Commission responded to burgeoning sea lamprey abundance with the application of concerted control effort to the major sea lamprey producing streams in Lake Erie, resulting in suppression to target levels for four years. Adult sea lamprey abundance rebounded during the period from 2005 to 2007, once again exceeding pre-control levels. In response to the observed increases, a whole-lake treatment strategy was implemented and all known infested tributaries to Lake Erie were treated in two consecutive years, beginning in 2008. During 2009, a new infestation was found in South Otter Creek (tributary on the north shore of Lake Erie) and the stream was treated in 2009 and 2010. Despite increased lampricide control, adult sea lamprey abundance has been near pre-control levels since 2009. Increased efforts to identify the source(s) of these animals suggest that they may be recruiting from the Huron-Erie Corridor (HEC), which was not considered a significant source when the whole-lake treatment strategy was implemented. Increased assessment to evaluate the contribution of juveniles from the HEC was initiated in 2012 and will be enhanced in 2013.

Lake Ontario

The Lake Ontario Committee established the following goal for sea lamprey control in Lake Ontario:

- *Suppression of sea lamprey populations to early 1990's levels.*

The Lake Ontario Committee recognized that continued control of sea lampreys is necessary for lake trout rehabilitation and specified a specific objective for sea lampreys:

- *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 at 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 adult sea lamprey abundance was first calculated using the same marking statistics as the other lakes (A1-A3 marks). During 2006, the target and range were revised using A1 marks exclusively, which have been more consistently recorded on Lake Ontario. Also, the target marking rate of less than 2 A1 marks per 100 lake trout >431mm was explicitly identified as producing tolerable mortality in the lake trout rehabilitation plan. The target and range of adult sea lamprey abundance for Lake Ontario was calculated from the estimated average abundance for the 5-year period, 1993-1997, when marking rates were closest to 2 marks per 100 fish (1.6 A1 marks per fish >431 mm). The calculated target adult abundance in Lake Ontario is 31,000 ± 4,000 sea lampreys.

During 2012, adult sea lamprey abundance was estimated to be 57,270 (95% CI: 51,290-63,314), which was greater than the target range after being within the range for the previous 2 years. The sea lamprey marking rate on lake trout is currently 2 A1 marks per 100 lake trout >431mm. The marking rate has been less than target during the last 4 years.

LAMPRICIDE CONTROL

Tributaries harboring larval sea lampreys are treated periodically with lampricides to eliminate or reduce larval populations before they recruit to the lake as feeding juveniles. Service and Department treatment staff administer and analyze TFM, or TFM/niclosamide mixtures (TFM augmented with Bayluscide 70% wettable powder or 20% emulsifiable concentrate) during stream treatments, and apply 3.2% granular Bayluscide (GB) to control populations inhabiting lentic areas. Specialized equipment and techniques are employed to provide concentrations of lampricides that eliminate about 95% of the sea lamprey larvae while minimizing the risk to non-target organisms.

The Lampricide Control Task Force (LCTF) was established by the Commission during December 1995 with charges to improve the efficiency of lampricide control, maximize sea lampreys 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 report on the charges during 2012 is presented in the LCTF section of this report.

Since 2006, the control agents have employed strategies to maximize treatment efficacy, while continuing to protect non-target organisms. These strategies include: targeting lampricide concentrations at greater than minimum lethal concentrations (MLC) in all treated stream reaches; extending the duration of lampricide treatment blocks by one or two hours; conducting secondary lampricide applications to treat backwaters, springs, and small feeder streams that offer refuge to larvae from the primary treatment; and scheduling treatments during periods when favorable flow conditions are likely to exist.

During 2012, lampricide treatments were conducted on 100 tributaries and 15 lentic areas of the Great Lakes (Table 1).

Table 1. Summary of lampricide applications in tributaries of the Great Lakes, 2012.

Lake	Number of Streams	Number of Lentic	Discharge (m^3/s)	TFM (kg) [1]	Bayluscide (kg) [1,2]	Distance Treated (km)
Superior	28	8	100.7	10,050.9	395.2	658.9
Michigan	25	4	107.0	22,531.3	224.3	1,455.0
Huron	33	3	89.3	18,030.3	395.9	577.9
Erie	0	0	0.0	0.0	0.0	0.0
Ontario	14	0	37.9	5,644.2	33.9	239.1
Total	**100**	**15**	**334.9**	**56,256.7**	**1,049.3**	**2,930.9**

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

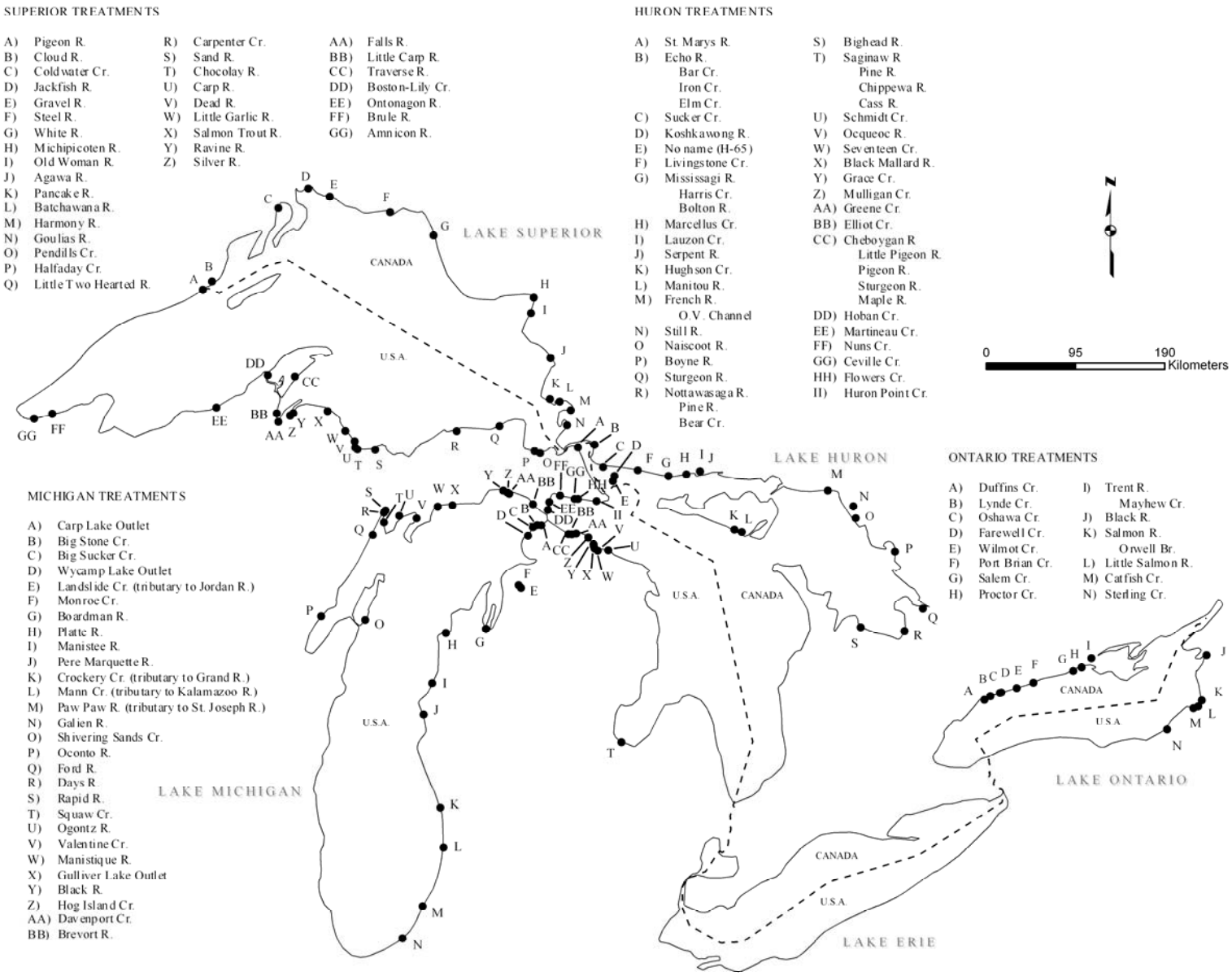

Figure 1. Location of tributaries treated with lampricide in 2012.

Lake Superior

Lake Superior has 1,566 tributaries (833 Canada, 733 U.S.). One hundred sixty-one tributaries (58 Canada, 103 U.S.) have historical records of larval sea lamprey production. Of these, 106 tributaries (42 Canada, 64 U.S.) have been treated with lampricides at least once during 2003-2012. Fifty-three tributaries (18 Canada, 35 U.S.) are treated on a regular cycle. Table 2 and Figure 1 provide details on the application of lampricides to Lake Superior tributaries and lentic areas during 2012.

- Lampricide treatments were completed in 28 tributaries (11 Canada, 17 U.S.) and in 8 lentic areas (3 Canada, 5 U.S.).

- The Little Carp River was discovered as a new sea lamprey producing stream during 2011 and was treated for the first time during 2012. Due to low water conditions, only the lower portion of the stream was treated in September. The entire infested area was treated during early October.

- The Carp, Amnicon and Brule rivers were treated with the addition of Bayluscide for the first time.

- Boston-Lily Creek was treated for the first time since 1962.

- Halfaday Creek was discovered as a new sea lamprey producing stream during 2011 and was treated as a geographical efficiency during 2012.

- The Sand River was treated for the first time since 1985. The distribution of larvae was further upstream than previously recorded due to the abandonment of James Jeske Flooding Dam. Approximately four miles of the newly colonized area was difficult to treat due to low or no water flow. Several treatment attempts were made during low flows, but successful treatment only occurred after water reached normal levels.

- The Old Woman River was treated for the first time and multiple year classes were observed.

- Larval assessments determined that the sea lamprey distribution on Coldwater Creek had expanded upstream and an additional 9.8 km of this tributary required treatment. The stream was treated in numerous sections due to the presence of many beaver impoundments and low stream discharge.

- Treatment of the Agawa River was completed after deferral in 2010 and 2011 due to low discharge.

- Treatments scheduled for Pic River, McKenzie River, Neebing-McIntyre Floodway and Corbett Creek (Kaministiquia River) were not completed due to insufficient discharge. All four streams have been rescheduled for treatment during 2013.

Table 2. Details on the application of lampricides to tributaries and lentic areas of Lake Superior during 2012 (letter in parentheses corresponds to location of stream in Figure 1).

Tributary	Date	Discharge (m^3/s)	TFM (kg)[1,2]	Bayluscide (kg)[1,3]	Distance Treated (km)
Canada					
Pigeon R. (A)	Jul 29	10.2	509.0	6.5	4.9
Cloud R.(B)	Jul 27	0.1	18.0	0.0	7.5
Coldwater Cr. (C)	Jul 22	0.9	377.6	0.0	20.2
Jackfish R. (D)	Jul 19	2.1	377.2	0.1[3]	10.9
Gravel R. (E)	Jul 19	3.8	295.8	4.1[3]	14.0
Steel R. (F)	Jul 17	11.7	775.6	10.2	10.4
White R. (G)	Jul 23	25.4	2,519.2	25.0	5.3
Michipicoten R. estuary (H)	Aug 9	---	---	26.9[3]	---
Old Woman R. (I)	Jul 13	1.7	96.2	0.0	15.5
Agawa R. (J)	Jul 7	4.0	232.1	0.1[3]	12.3
Pancake R. (K)	Jun 26	1.5	73.5	0.1[3]	8.4
Batchawana R. lentic (L)	Aug 29	---	---	102.3[3]	---
Harmony R. lentic (M)	Aug 16	---	---	27.6[3]	---
Goulais R. (N)	Sep 27	6.7	656.2	0.1[3]	120.3
Total (Canada)		**68.1**	**5,930.4**	**203.0**	**229.7**
United States					
Pendills Cr. (O)	Jul 25	0.4	36.7	0.0	1.6
Halfaday Cr. (P)	Jul 24	0.4	49.6	0.0	2.6
Little Two Hearted R. (Q)	Jul 20	0.4	58.5	0.0	20.9
Carpenter Cr. lentic (R)	Sep 26	---	---	10.3[3]	---
Sand R. (S)	Jul 21	0.1	21.7	0.0	10.0
Chocolay R. (T)	Jul 6	3.5	424.6	1.9	51.5
Carp R. (U)	Jul 10	1.9	196.6	2.1	6.9
Dead R. (V)	Jul 18	3.0	181.6	2.0	2.1
Dead R. lentic	Jul 5	---	---	53.9[3]	---
Little Garlic R. lentic (W)	Jul 6	---	---	6.1[3]	---
Salmon Trout R. (X)	Jul 19	0.8	135.2	0.0	12.9
Ravine R. (Y)	Aug 31	0.1	9.3	0.0	9.8
Ravine R. lentic	Jun 27	---	---	24.5[3]	---
Silver R. (Z)	Sep 3	0.2	42.7	0.0	5.6
Falls R. (AA)	Aug 30	1.1	145.2	0.0	0.5
Falls R. lentic	Jun 26	---	---	85.1[3]	---
Little Carp R. (BB)	Sep 5	0.1	9.5	0.0	6.8
Traverse R. (CC)	Jun 22	0.3	62.9	0.0	19.8
Boston-Lily Cr. (DD)	Jun 22	0.3	32.2	0.0	2.9
Ontonagon R. (EE)	Sep 27	10.5	2,025.0	0.0	244.7
Brule R. (FF)	Jun 11	6.1	518.6	4.0	12.9
Amnicon R. (GG)	Jun 8	3.4	170.6	2.1	17.7
Total (United States)		**32.6**	**4,120.5**	**192.2**	**429.2**
Total for Lake		**100.7**	**10,050.9**	**395.2**	**658.9**

[1] Lampricide quantities are reported in kg of active ingredient.
[2] Includes a total of 165 TFM bars (34.3 kg active ingredient) applied in 14 streams.
[3] Includes 3.2% granular Bayluscide applied in spot treatments or to lentic areas.

Lake Michigan

Lake Michigan has 511 tributaries. One hundred twenty-six tributaries have historical records of larval sea lamprey production, and of these, 83 tributaries have been treated with lampricides at least once during 2003-2012. Thirty-six tributaries are treated on a regular cycle. Table 3 and Figure 1 provide details on the application of lampricides to Lake Michigan tributaries and lentic areas during 2012.

- Lampricide treatments were completed in 25 tributaries and 4 lentic areas.

- Lentic areas offshore of the Rapid and Ford rivers were treated with GB for the first time.

- This was the first year of an expanded large-scale treatment strategy in northern Lake Michigan. Six sea lamprey producing tributaries were treated as part of this effort: Brevort River, Carp Lake and Wycamp Lake outlets, and Davenport, Big Stone and Big Sucker creeks.

- Upstream distribution of sea lampreys in Kelly Brook (tributary to Oconto River) nearly doubled the amount of stream that required treatment compared to distribution during 1987. Large larval sea lampreys were observed in the newly treated area.

- A larval population was detected in Shivering Sands Creek during 2011 and was treated for the first time during 2012.

- Approximately 512 km (318 mi) of the Manistique River were treated by a combined crew of personnel from the Department and Service. The North Branch Stutts Creek and the Fox and Driggs rivers were treated independently prior to the main treatment. The distribution of larval sea lampreys in the system was further upstream than previously recorded. High densities of larvae were observed in the upper reaches, particularly in the North Branch of Stutts Creek and the upper Fox River. Water levels were extremely low during treatment of the mainstream. Significant effort was put forth to conduct secondary treatments in the oxbows and backwaters.

- The Manistee River was treated by a combined crew of personnel from the Department and Service. Secondary treatments of the oxbows and backwaters associated with the mainstream treatment were completed. This treatment was observed by staff from the National Institute of Safety and Occupational Health (NIOSH) who conducted a health hazard evaluation during lampricide application. A treatment plan was developed and executed for the first time on Section 25/36 tributary.

- Major tributaries to the Paw Paw River were treated in conjunction with the mainstream treatment for the first time.

- Big Sucker and Crockery creeks were successfully treated during record low discharges.

- The Middle Branch of the Platte River was treated independently of the upper and lower sections during a tour by the Service's Directorate.

- Following treatment in 2012, larval assessment surveys detected significant numbers of larval sea lampreys surviving in the Big Manistee River and this river is scheduled to be re-treated during 2013.

Table 3. Details on the application of lampricides to tributaries and lentic areas of Lake Michigan during 2012 (letter in parentheses corresponds to location of stream in Figure 1).

Tributary	Date	Discharge (m^3/s)	TFM (kg)[1,2]	Bayluscide (kg)[1,3]	Distance Treated (km)
Carp Lake Outlet (A)	Jul 9	0.3	72.1	0.0	0.5
Big Stone Cr. (B)	Sep 27	0.1	5.9	0.0	1.6
Big Sucker Cr. (C)	Aug 31	0.1	33.3	0.0	3.5
Wycamp Lake Outlet (D)	Sep 1	0.1	18.4	0.0	2.3
Jordan R. (E)					
Landslide Cr.	Aug 10	0.6	183.5	0.0	1.4
Monroe Cr. (F)	Sep 27	0.1	40.5	0.0	1.6
Boardman R. lentic (G)	Jun 20	---	---	33.1[3]	---
Platte R. (H)	Jun 21	11.6	2,910.0	5.5	21.3
Manistee R. (I)	Aug 18	42.5	7,254.3	78.2[3]	109.5
Pere Marquette R. (J)	Aug 3	11.9	2,991.7	22.2	209.3
Grand R. (K)					
Crockery Cr.	Jul 21	0.4	209.8	0.0	58.8
Kalamazoo R. (L)					
Mann Cr.	Oct 9	0.1	14.0	0.0	3.5
St. Joseph R. (M)					
Paw Paw R.	Jun 9	7.9	2,633.7	0.0	188.7
Galien R. (N)	Oct 12	0.8	535.0	0.0	40.9
Shivering Sands Cr. (O)	Apr 27	0.1	35.3	0.0	0.8
Oconto R. (P)	Apr 28	12.7	1,833.9	8.8	101.4
Ford R. lentic (Q)	Jun 24	---	---	20.8[3]	---
Days R. (R)	Aug 15	0.1	45.3	0.0	6.9
Rapid R. (S)	May 11	0.8	267.6	0.0	112.7
Rapid R. lentic	Jun 22	---	---	35.2[3]	---
Squaw Cr. (T)	May 14	0.7	56.4	0.0	4.3
Ogontz R. lentic (U)	Jun 23	---	---	8.6[3]	---
Valentine Cr. (V)	May 11	0.2	16.3	0.0	7.2
Manistique R. (W)	Aug 30	14.2	2,902.4	11.7	512.0
Gulliver Lake Outlet (X)	May 10	0.1	3.4	0.0	2.3
Black R. (Y)	May 24	0.4	113.3	0.0	24.2
Hog Island Cr. (Z)	Jun 24	0.6	62.1	0.0	6.3
Davenport Cr. (AA)	May 30	0.4	61.9	0.0	1.6
Brevort R. (BB)	May 23	0.2	231.2	0.0	32.4
Total for Lake		**107.0**	**22,531.3**	**224.3**	**1,455.0**

[1]Lampricide quantities are reported in kg of active ingredient.
[2]Includes a total of 323.5 TFM bars (67.4 kg active ingredient) applied in 13 streams.
[3]Includes 3.2% granular Bayluscide applied in spot treatments or to lentic areas.

Lake Huron

Lake Huron has 1,761 tributaries (1,334 Canada, 427 U.S.). One hundred twenty tributaries (58 Canada, 62 U.S.) have historical records of larval sea lamprey production. Of these, 82 tributaries (39 Canada, 43 U.S.) have been treated with lampricide at least once during 2003-2012. Forty-eight tributaries (22 Canada, 26 U.S.) are treated on a regular cycle. Table 4 and Figure 1 provide details on the application of lampricides to Lake Huron tributaries and lentic areas during 2012.

- Lampricide treatments were completed in 32 tributaries (16 Canada, 16 U.S.), the St. Marys River, and 3 lentic areas (3 Canada, 0 U.S.).

- This was year one of an expanded large-scale treatment strategy in northern Lake Huron. Twenty-nine tributaries and lentic areas (19 Canada, 9 U.S.) were treated as part of the effort.

- The treatment of 268 ha (138 Canada, 130 U.S.) of larval habitat in the St. Marys River with GB was made possible through the deployment of 2 spray boats. The Chippewa-Ottawa Resource Authority (CORA) assisted the effort by providing temporary storage for GB.

- Hoban Creek was a newly discovered sea lamprey producing stream in 2011 and was treated for the first time during 2012.

- The upper Chippewa River was treated for the first time using a combination of Bayluscide and TFM. An Environmental Protection Agency 6(a)2 adverse effects report was submitted due to non-target mortality of stonecats (*Noturus flavus*).

- Seventeen Creek (U.S.) was treated for the first time since 1967 and Marcellus and Hughson creeks (Canada) were treated for the first time as part of the expanded large-scale treatment strategy.

- An unusually dry summer led to record low discharges during the treatments of Carp Lake Outlet and Seventeen, Mulligan, Elliot, and Greene creeks.

- Goodings Creek (tributary to Cass River) was treated during record low discharge and in two separate sections to accommodate a study on the impact of TFM on the ellipse mussel (*Venustaconcha ellipsiformis*). No mortality to mussels was observed.

- The Sturgeon River was successfully treated from the furthest upstream larval distribution ever recorded.

- Significant rains dramatically increased discharge during treatment of the Cass River. Despite the challenge of rising water levels, the treatment was a success.

- Due to insufficient flows or time constraints, lampricide treatments of three tributaries in Canada were deferred, including the Wanapitei (French River), Magnetawan, and Musquash rivers. In addition, lampricide applications were completed on several tributaries to the

Mississagi and Nottawasaga only, although treatment plans included the main rivers. All deferred streams are scheduled for treatment in 2013.

Table 4. Details on the application of lampricides to tributaries and lentic areas of Lake Huron during 2012 (letter in parentheses corresponds to location of stream in Figure 1).

Tributary	Date	Discharge (m^3/s)	TFM (kg)[1,2]	Bayluscide (kg)[1,3]	Distance Treated (km)
Canada					
St Marys R. (A)	Jun 24	---	---	773.9[3]	---
Echo R. (B)					
Bar & Iron Cr.	Oct 12	0.41	61.2	0.0	13.4
Elm Cr.	Oct 17	0.32	50.5	0.0	3.3
Sucker Cr. (C)	Apr 17	0.10	20.6	0.0	1.0
Koshkawong R. (D)	Apr 17	0.36	48.1	0.0	1.5
No Name R. (H-65) (E)	Jun 7	0.06	12.3	0.0	0.9
Livingstone Cr. (F)	Jun7	0.04	3.1	0.0	1.5
Mississagi R. (G)					
Harris Cr. /Bolton R.	Jul 11	1.12	57.0	0.0	7.4
Marcellus Cr. (H)	Jun 7	0.01	0.3	0.0	0.4
Lauzon Cr. lentic (I)	Jun 20	---	---	29.8[3]	---
Serpent R. (J)	Jun 19	7.70	211.8	0.1[3]	7.6
Hughson Cr. (K)	Oct 30	0.43	79.2	0.0	2.5
Manitou R. (L)	Oct 29	0.83	191.8	0.0	0.7
Lentic	Oct 29	---	---	29.0[3]	---
French R. (M)					
O.V. Channel	Jun 22	0.12	28.2	0.0	1.4
Still R. lentic (N)	Jun 21	---	---	24.7[3]	---
Naiscoot R. (O)	Oct 26	9.53	304.8	0.5[3]	17.8
Boyne R. (P)	Apr 14	0.20	8.5	0.0	1.9
Sturgeon R. (Q)	Apr 12	1.10	295.5	0.0	1.9
Nottawasaga R. (R)					
Pine R. & Bear Cr.	May 31	3.20	1,081.2	0.0	56.1
Bighead R. (S)	Jun 21	1.51	572.4	0.0	65.9
Total (Canada)		**27.04**	**3,026.5**	**858.0**	**185.2**
United States					
Saginaw R. (T)					
Pine R.	Apr 29	7.1	1,812.1	21.5	53.8
Chippewa R.	May 12	21.5	5,632.7	9.6	119.1
Cass R.	May 25	19.8	3,888.9	0.0	53.0
Schmidt Cr. (U)	May 1	0.4	52.4	0.0	1.6
Ocqueoc R. (V)	Aug 2	1.6	459.2	0.0	5.6
Seventeen Cr. (W)	Jul 9	0.1	0.7	0.0	0.2
Black Mallard R. (X)	Apr 27	1.6	195.3	0.7[3]	13.0
Grace Cr. (Y)	Apr 30	0.1	8.6	0.0	3.2
Mulligan Cr. (Z)	Jul 10	0.1	3.4	0.1[3]	1.6

Tributary	Date	Discharge (m^3/s)	TFM (kg)[1,2]	Bayluscide (kg)[1,3]	Distance Treated (km)
Greene Cr. (AA)	Jul 8	0.1	4.8	0.0	0.3
Elliot Cr. (BB)	Jul 10	0.1	41.5	0.0	3.4
Cheboygan R. (CC)					
Little Pigeon R.	Sep 1	0.1	20.2	0.0	3.2
Pigeon R.	Sep 2	2.1	1,098.1	0.0	54.6
Sturgeon R.	Sep 29	5.1	1,157.6	11.9	56.8
Maple R.	Oct 1 20	1.5	472.5	0.0	12.2
Hoban Cr. (DD)	Jun 21	0.2	20.9	0.0	1.6
Martineau Cr. (EE)	Jun 22	0.2	51.8	0.0	4.3
Nuns Cr. (FF)	Jun 25	0.3	46.6	0.0	0.2
Ceville Cr. (GG)	Jun 26	0.1	14.9	0.0	3.2
Flowers Cr. (HH)	Jun 25	0.1	13.5	0.0	1.0
Huron Point Cr. (II)	Jun 26	0.1	8.1	0.0	0.8
St Marys R. (A)	Jun 21	---	---	726.5[3]	---
Total (United States)		**62.3**	**15,003.8**	**770.3**[3]	**392.7**
Total for Lake		**89.3**	**18,030.3**	**1,628.3**[3]	**577.9**

[1] Lampricide quantities are reported in kg of active ingredient.
[2] Includes a total of 76 TFM bars (15.8 kg active ingredient) applied in 12 streams.
[3] Includes 3.2% granular Bayluscide applied in spot treatments or to lentic areas.

Lake Erie

Lake Erie has 842 tributaries (525 Canada, 317 U.S.). Twenty-three tributaries (11 Canada, 12 U.S.) have historical records of larval sea lamprey production. Of these, 11 tributaries (5 Canada, 6 U.S.) have been treated with lampricides at least once during 2003-2012. Seven tributaries (two Canada, five U.S.) are treated on a regular cycle. 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.), none of which have been treated during 2003-2012.

- A whole lake large-scale treatment strategy consisting of back-to-back treatments of 10 tributaries (5 Canada, 5 U.S.) was completed during the period of 2008-2010. Treatment evaluation surveys indicated that all 10 tributaries were treated with very high efficacy, therefore, no Lake Erie streams were treated during 2012.

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, 40 tributaries (19 Canada, 21 U.S.) have been treated with lampricides at least once during 2003-2012. Twenty-seven tributaries (13 Canada, 14 U.S.) are treated on a regular cycle. Table 5 and Figure 1 provide details on the application of lampricides to Lake Ontario tributaries and lentic areas during 2012.

- Treatments were completed in 14 tributaries (9 Canada, 5 U.S.).

- Larval assessments determined that a dam that had acted as a *defacto* sea lamprey barrier on Farewell Creek since 1977 had been breached, resulting in an upstream expansion of the larval distibution. As a result, an additional 11.2 km required treatment.

- Orwell Brook was treated for the sixth consecutive year to address residual populations in numerous beaver impoundments. Construction of a sea lamprey barrier was completed in the fall of 2012 and the stream is scheduled to be re-treated in 2013 upstream of the barrier.

Table 5. Details on the application of lampricides to tributaries of Lake Ontario during 2012 (letter in parentheses corresponds to location of stream in Figure 1).

Tributary	Date	Discharge (m^3/s)	TFM (kg)[1,2]	Bayluscide (kg)[1]	Distance Treated (km)
Canada					
Duffins Cr. (A)	May 30	1.3	424.2	0.1[3]	42.8
Lynde Cr. (B)	May 25	0.4	174.1	0.0	36.3
Oshawa Cr. (C)	May 26	0.6	198.3	0.1[3]	23.4
Farewell Cr. (D)	Jun 2	0.6	150.4	0.1[3]	17.5
Wilmot Cr. (E)	May 28	0.9	327.7	0.0	19.1
Port Britain Cr. (F)	Apr 30	0.2	63.8	0.0	1.4
Salem Cr. (G)	Apr 28	0.2	46.9	0.0	2.2
Proctor Cr. (H)	Apr 27	0.3	88.9	0.0	5.9
Trent R. (I)					
Mayhew Cr.	Apr 25	0.8	202.7	0.0	2.5
Total (Canada)		**5.3**	**1,677.0**	**0.3**	**151.1**
United States					
Black R. (J)	Aug 27	21.6	2,565.4	33.4	9.3
Salmon R. (K)					
Orwell Br.	Apr 26	1.7	219.4	0.0	11.2
Little Salmon R. (L)	Apr 29	4.5	351.5	0.2[3]	38.8
Catfish Cr. (M)	Apr 27	1.7	163.8	0.0	1.2
Sterling Cr. (N)	May 2	3.1	667.1	0.0	27.5
Total (United States)		**32.6**	**3,967.2**	**33.6**	**88.0**
Total for Lake		**37.9**	**5,644.2**	**33.9**	**239.1**

[1] Lampricide quantities are reported in kg of active ingredient.
[2] Includes a total of 29 TFM bars (6.0 kg active ingredient) applied in 4 streams.
[3] Includes 3.2% granular Bayluscide applied in spot treatments or to lentic areas.

ALTERNATIVE CONTROL

The Commission and its partners continue to research and develop alternatives to lampricide treatments to provide a broader spectum of tactics to control sea lampreys. During 2012, barriers were the only operational alternative control method. Alternative control methods that are currently being investigated include the use of attractants (e.g. pheromones) and repellents (e.g. necromones), and new trapping designs.

Sterile-Male-Release Technique

The Commission made a decision to discontinue the Sterile-Male-Release Technique (SMRT) in 2012. The decision was based on research that suggested the technique was not effective in reducing recruitment due to the lack of males for sterilization; uncertainty in the stock recruitment relation; and concerns with the ability to evaluate its effectiveness in the river.

- The viability of eggs in the St. Marys River was assessed during 2012 as part of an ongoing effort to evaluate effects of sterile-male releases in the river. Egg samples were obtained from 33 nests in the St. Marys River rapids and the average egg viability in nests was 74%. Average egg viability during years 1997-2011 with sterilized males released into the river was 33% (range 4%-48%).

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.

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 (USACOE) on the construction, operation, and maintenance of sea lamprey barriers. The task force's report on the charges during 2012 is presented in the BTF section of this report.

Beginning in 2007, an intensive effort to inventory and ground truth the information contained in the National Inventory of Dams was conducted to assess the sea lamprey blocking potential of barriers located on U.S. tributaries to the Great Lakes. This information is recorded in the SLCP's Barrier Inventory and Project Selection System (BIPSS) and barrier sites are monitored on a rotating schedule. The data contained in BIPSS are used to select barrier projects, monitor the frequency of inspections and schedule upstream larval assessments. Further, the information can be used to assess the effects of barrier removal or modification requests on sea lamprey populations and identify structures that are important in controlling sea lampreys.

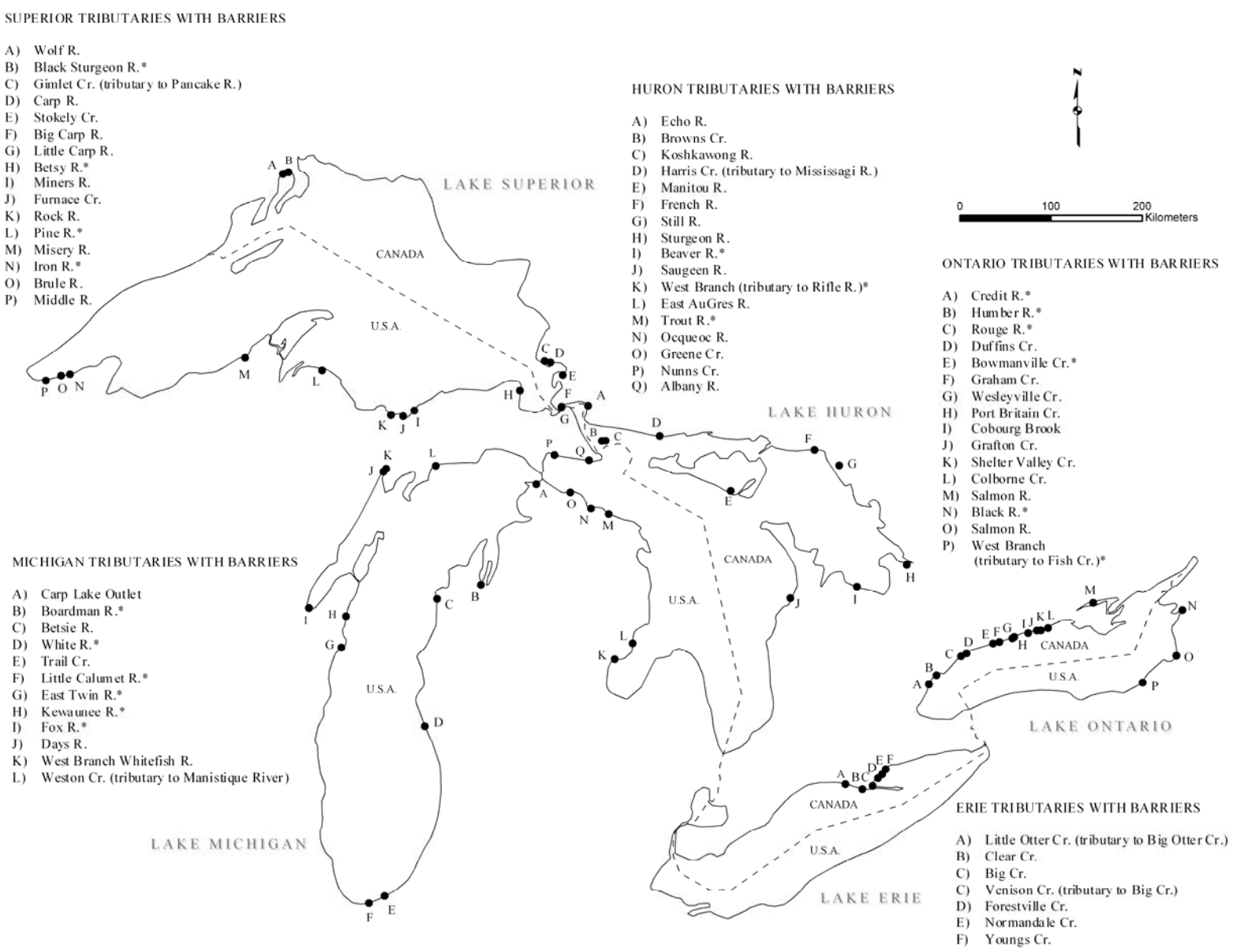

Figure 2. Locations of tributaries with sea lamprey barriers. Structures that have been modified or constructed by others that prevent the upstream migration of sea lampreys are indicated by an asterisk.

During 2012, there were 67 sea lamprey barriers in the Great Lakes basin that were operated and maintained by the SLCP. This includes the addition of the Boardman River on Lake Michigan where an existing structure was modified to ensure blockage, and a new barrier constructed on Orwell Creek, a tributary to the Salmon River (New York) on Lake Ontario (Figure 2).

Lake Superior

There are 16 SLCP barriers on Lake Superior (Figure 2). Of these, 12 were purpose-built by the Commission and 4 were built for other purposes but have been modified by the Commission to ensure sea lampreys remain blocked.

Barrier Inventory and Project Selection System

- Field crews visited 110 structures on tributaries to Lake Superior to assess their sea lamprey blocking potential and to improve the information in BIPSS.

Operation and Maintenance

- Routine maintenance, spring start-up, and safety inspections were performed on 12 barriers (6 Canada, 6 U.S.).

- Repairs or improvements were conducted on one Canadian barrier:

    - Big Carp River – The inflatable barrier control system malfunctioned as a result of unusually low temperatures in early April 2012. A heater was installed inside the control room to maintain a proper temperature and operations were restored.

Ensure Blockage to Sea Lamprey Migration

- Poplar River – The owners of the Poplar Dam applied to abandon the structure based on the results of a safety inspection. Drawdown activities were initiated during fall 2012. The current structure had been considered a barrier to migrating sea lampreys and the SLCP did not concur with removal or alteration of the dam.

- Sand River – Several year classes of sea lamprey were found upstream of the James Jeske Flooding Dam in 2011. The Service is working with the Michigan Department of Natural Resources to reinstate an effective barrier at this site.

- Black Sturgeon River – The Black Sturgeon Dam, located 17 km upstream of the mouth, serves a vital sea lamprey control function, protecting more than 2,500 km of watershed from larval sea lamprey infestation. However, it has been identified as an impediment to walleye rehabilitation in Black Bay in an Ontario Ministry of Natural Resources (Ministry) report. In December, 2012, the Ministry initiated a Class Environmental Assessment (Class EA) to evaluate the preferred option, as identified by the Fisheries Management Zone 9 Advisory Council, to construct a new sea lamprey barrier at the former Camp 1 site (67 km upstream of the mouth) and decommission the existing dam. The Black Sturgeon River Dam Class EA process is expected to conclude in 2014.

- Consultations to ensure blockage at barriers were completed with partner agencies at four sites in three tributaries (Table 6).

New Construction

- Bad River – The USACOE initiated the development of a Preliminary Restoration Plan (PRP) to review potential barrier sites on the Bad River under the Great Lakes Fishery and Ecosystem Restoration (GLFER) program. The PRP outlines a project's merit to seek approval for further federal expenditure. Once approved, barrier sites will be reviewed for suitability in collaboration with the Bad River Band of Lake Superior Chippewa Indians.

Assessment of Candidate Streams

- Whitefish River (tributary to the Kaministiquia River) – Flow monitoring was conducted during 2012. This river will likely be removed from consideration as a barrier candidate stream due to its highly variable discharge and Ministry concerns regarding fish passage. The final decision will be made following the analysis of water level data collected during 2013.

Table 6. Status of concurrence requests for barrier removals, replacements, or fish passage projects in Lake Superior tributaries.

Mainstream	Tributary	Lead Agency	Project	SLCP Position	Comments
Brickyard Cr.		USFWS[1]	Hwy 13 culvert	Concur	Ineffective barrier
Bad R.	Billy Cr.	BRWA[2]	Seaquist culvert	Concur	Ineffective barrier
Bad R.	Sec. 27 Trib.	BRWA[2]	Railroad culvert	Concur	Ineffective barrier
Saxine R.		USFWS[1]	Hwy 13 culvert	Concur	Ineffective barrier

[1]U.S. Fish and Wildlife Service, Fish and Wildlife Conservation Office (Ashland).
[2]Bad River Watershed Association.

Lake Michigan

There are 12 SLCP barriers on Lake Michigan (Figure 2). Of these, five were purpose-built by the Commission and seven were built for other purposes but have been modified by the Commission to ensure sea lampreys remain blocked.

Barrier Inventory and Project Selection System

- Field crews visited 147 structures on tributaries to Lake Michigan to assess their sea lamprey blocking potential and to improve the information in BIPSS.

Operation and Maintenance

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

- Pere Marquette River – Planning for decommissioning of the electrical barrier moved forward. Custer Township, Pere Marquette Watershed Council, Conservation Resource Alliance and Michigan Department of Natural Resources (MDNR) will partner with the Service and Commission to assist with financing, operation and maintenance to rehabilitate and improve the site.

- Trail Creek – Construction of the sea lamprey barrier was completed during January 2012. The barrier was operated with one stop-log in each of the two outer bays and no stop-log in the center bay to reduce the possibility of low velocity flooding around the barrier abutments. Trapping was conducted during the spawning run using a trap and transfer operation. Desired fish species were passed upstream and 140 sea lampreys were captured during March 29-May 30, 2012. In addition, the Indiana Department of Natural Resources (IDNR) used the facility to collect summer run steelhead for egg collection. The fishway remained closed when not being used as a trap and transfer facility or for fish collection.

Ensure Blockage to Sea Lamprey Migration

- Kewaunee River – Aluminum stop logs were installed at the Buzz Besadny Anadromous Fish Facility and low head dam complex to replace the lower section of screens in the bypass channel and improve blocking potential.

- White River – Electrofishing surveys revealed recruitment of the 2011 year class upstream of the Hesperia Dam despite extensive repairs to the stop log bays in 2010. During fall 2012, with the cooperation of the City of Hesperia Department of Public Works, stoplogs in four bays were replaced and sealed with hydraulic cement at the wood-concrete interface. An angle iron lip was installed on the face of the top stop log in each of the four bays.

- Boardman River – Surveys were conducted during 2012 to look for active sea lamprey nests and young-of-year larvae upstream of the Union Street Dam. No spawning activity was noted and no larvae were collected upstream of the dam. During July, Stanley Engineering inspected the Union Street Dam for possible routes of escapement using divers and underwater video equipment. Divers also assisted with removal and replacement of all stoplogs. A final inspection report is pending. The Service does not support removal of the upstream Sabin Dam until it is certain that the Union Street Dam is an effective sea lamprey barrier.

- Fox River – Inspection of the Rapide Croche Dam on the Fox River by the USACOE revealed significant deterioration of the steel mesh grating that lined the tainter gate aprons. The steel mesh grating prevented sea lampreys from attaching and migrating upstream of the dam when the gates were opened during periods of high flow. An Inter-Agency Agreement was developed with the USACOE to incorporate the mesh repairs into their scheduled repair work. Repairs and installation of new mesh grating were completed during summer 2012.

- Consultations to ensure blockage at barriers were completed with partner agencies for eight sites in five tributaries (Table 7) and one additional consultation was initiated.

New Construction

- Manistique River – The USACOE 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, MDNR, City of Manistique, and Manistique Papers, Inc. The new structure will be built adjacent to the old structure. The State of Michigan has agreed to take ownership of the barrier and attached retaining wall. Construction of the new barrier is planned for 2014.

Table 7. Status of concurrence requests for barrier removals, replacements, or fish passage projects in Lake Michigan tributaries.

Mainstream	Tributary	Lead Agency	Project	SLCP Position	Comments
Tannery Cr.		USFWS[1]	Wheelway culvert	Conditional	Incorporate sea lamprey barrier
Pere Marquette R.	Baker Cr.	USFWS[1]	56th St. culvert	Concur	Ineffective barrier
White R.	Cobmoosa Cr.	USFWS[1]	Buchanan culvert	Concur	Ineffective barrier
White R.	Cobmoosa Cr.	USFWS[1]	Fillmore culvert	Concur	Ineffective barrier
White R.	Carlton Cr.	USFWS[1]	Winston culvert	Concur	Ineffective barrier
Grand R.		GRWW[2]	6th Street Dam	Conditional	Incorporate sea lamprey barrier
Grand R.	Prairie Cr.	USFWS[1]	Prairie Creek Dam	Concur	Upstream of blocking barrier
St. Joseph R.	McCoy Cr.	USFWS[1]	Duck Pond Dam	Concur	Upstream of blocking barrier

[1]U.S. Fish and Wildlife Service, Fish and Wildlife Conservation Office (Green Bay).
[2]Grand Rapids Whitewater group (Grand Rapids, MI).

Lake Huron

There are 17 SLCP barriers on Lake Huron (Figure 2). Of these, 13 were purpose-built by the Commission and 4 were built for other purposes but have been modified by the Commission to ensure sea lampreys remain blocked.

Barrier Inventory and Project Selection System

- Field crews visited 85 structures on tributaries to Lake Huron to assess their sea lamprey blocking potential and to improve the information in BIPSS.

Operation and Maintenance

- Routine maintenance, spring start-up, and safety inspections were performed on 10 barriers (4 Canada, 6 U.S.).

- Repairs or improvements were conducted on one Canadian barrier:

- Still River – One stop log from each bay was removed to lower drop height in the barrier. A level logger was installed to monitor crest height and flow.

- The electrical field of the combination low-head/electrical barrier in the Ocqueoc River was activated from March 5-27, April 20-23, and June 2-4. The system was manually activated March 5-21 when the computer controlling its activation was being repaired.

Ensure Blockage to Sea Lamprey Migration

- Cheboygan River – Investigations were initiated to understand the ecology of sea lampreys in the Cheboygan River upstream from the lock. Interviews with anglers and fisheries professionals suggested there may be feeding juveniles in Burt and Mullett lakes. DIDSON imaging was used to observe sea lamprey movements at the downstream end of the lock. Lamprey movements are important to understand as methods to block the lock are considered. The USACOE completed a Preliminary Restoration Plan that reviewed options for blocking sea lampreys through the lock.

- Saugeen River – In June 2012, the Ministry began the tendering process for the Denny's Dam Reconstruction Project when the Saugeen Ojibway Nation (SON) expressed their dissatisfaction to the Provincial Minister of Natural Resources that they had not been consulted on the project. In response, the province postponed the project, pending full consultation with the SON. The consultation process is currently underway. The Ministry's senior project engineer indicated that the dam is not at imminent risk of failure; however, erosion will need to be addressed in the near term. The Commission has agreed to carry over its contribution to the project (50% of the construction costs estimated during 2012) through fiscal year 2013.

- Consultations to ensure blockage at barriers were completed with partner agencies for 21 sites in 5 tributaries (Table 8).

New Construction

- No new construction projects were initiated or underway.

Assessment of Candidate Streams

- Bighead River – A potential barrier site has been identified in the Town of Meaford. Field data collection for hydrological and hydraulic analysis is ongoing. Discussions with the Ministry, the Town of Meaford, Grey-Sauble Conservation Authority, and other stakeholders will be initiated in 2013.

- Pine River (Nottawasaga River) – A potential barrier site has been identified near a railway crossing in the Town of Angus. A data logger was installed in 2012 to collect flow information for hydraulic and hydrological analysis. Discussions with the Ministry, the Town of Angus, Nottawasaga Conservation Authority, and other stakeholders will be initiated in 2013.

Table 8. Status of concurrence requests for barrier removals, replacements, or fish passage projects in Lake Huron tributaries.

Mainstream	Tributary	Agency	Project	SLCP Position	Comments
Cheboygan R.	Black R.	USFWS[1]	Saunders Dam	Concur	Ineffective barrier
Cheboygan R.	Maple R.	USFWS[1]	Brutus culvert	Concur	Ineffective barrier
Cheboygan R.	Maple R.	USFWS[1]	Robinson culvert	Concur	Ineffective barrier
Cheboygan R.	Maple R.	USFWS[1]	Ely culvert	Concur	Ineffective barrier
Cheboygan R.	Sturgeon R.	USFWS[1]	Poquette culvert	Concur	Ineffective barrier
Cedar Cr.		USFWS[1]	Lake level structure	Do not concur	Infestation potential
Au Sable R.	East Br.	USFWS[1]	Hatchery Pond Dam	Concur	Upstream of blocking barrier
Au Sable R.	East Br. Big Cr.	USFWS[1]	Farrington culvert	Concur	Upstream of blocking barrier
Au Sable R.	East Br. Big Cr.	USFWS[1]	CR 489 culvert	Concur	Upstream of blocking barrier
Au Sable R.	Middle Br. Big Cr.	USFWS[1]	Cobb culvert	Concur	Upstream of blocking barrier
Au Sable R.	Wright Cr.	USFWS[1]	Farrington culvert	Concur	Upstream of blocking barrier
Au Sable R.	Trib to East Br. Big Cr..	USFWS[1]	Farrington culvert	Concur	Upstream of blocking barrier
Au Sable R.	Trib to Wright Cr.	USFWS[1]	Pine Haven culvert	Concur	Upstream of blocking barrier
Au Sable R.	Trib to Wright Cr.	USFWS[1]	Bruchi culvert	Concur	Upstream of blocking barrier
Au Sable R.	Trib to North Br.	USFWS[1]	Knox culvert	Concur	Upstream of blocking barrier
Rifle R.	Houghton Cr.	USFWS[1]	Flynn culvert	Concur	Ineffective barrier
Rifle R.	Cursten Cr.	GLFT[2]	Wildwood culvert	Concur	Ineffective barrier
Rifle R.	Prior Cr.	GLFT[2]	Campbell culvert	Concur	Ineffective barrier
Rifle R.	Wilkins Cr.	GLFT[2]	Campbell culvert	Concur	Ineffective barrier
Saginaw R.	Shiawassee R.	NWF[3]	Owosso Dam	Conditional	Shiatown Dam must remain in place
Saginaw R.	Cass R.	USFWS[4]	Vassar Dam	Concur	Ineffective barrier

[1]U.S. Fish and Wildlife Service, Fish and Wildlife Conservation Office (Alpena).
[2]Great Lakes Fishery Trust.
[3]National Wildlife Federation.
[4]U.S. Fish and Wildlife Service, National Wildlife Refuge (Shiawassee).

Lake Erie

There are seven SLCP barriers on Lake Erie (Figure 2) that were purpose-built by the Commission.

Barrier Inventory and Project Selection System

- Field crews visited four structures on tributaries to Lake Erie to assess their sea lamprey blocking potential and to improve the information in BIPSS.

Operation and Maintenance

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

- Repairs or improvements were conducted on one Canadian barrier:

    - Big Creek – The remote control system for the inflatable barrier malfunctioned in April 2012 causing the crest to be lowered and it had to be manually raised. Two sensors failed and were replaced, and remote and local computer automated operation was restored in December 2012. The barrier is ready to operate in spring 2013.

Ensure Blockage to Sea Lamprey Migration

- Water level data were collected at the Kirtland Country Club Dam on the East Branch of Chagrin River to monitor barrier effectiveness.

- Consultations to ensure blockage at barriers were completed with partner agencies for 15 sites in 8 tributaries (Table 9).

New Construction

- Grand River – The USACOE is the lead agency administering this project. The Harpersfield Dam currently blocks approximately 60 miles of suitable habitat for spawning and larval sea lampreys, but the condition of the dam is deteriorating. A ground penetrating radar survey of the Harpersfield Dam was conducted, indicating that the dam was hollow and in worse shape than originally thought. These new findings suggest that repair of the barrier is not a likely option. Remaining alternatives are no action or rebuild at the existing site.

Assessment of Candidate Streams

- Big Otter Creek – The removal of the Rock's Mill Dam in 2010 has resulted in the infestation of an additional 30 km including the main creek between Rock's Mill and Otterville, and two tributaries, Spittler and Plum creeks. A new barrier site has not yet been identified, but a less costly alternative may be the remediation of the Blackwater Dam located at a railway trestle in Tillsonburg, Ontario. A level logger has been installed immediately downstream of the trestle site to collect hydraulic and hydrologic information. Further investigation is planned for 2013.

Table 9. Status of concurrence requests for barrier removals, replacements, or fish passage projects in Lake Erie tributaries.

Mainstream	Tributary	Agency	Project	SLCP Position	Comments
Crooked Cr.		PFBC[1]	Springfield culvert	Do not concur	Infestation potential
Conneaut Cr.	East Br.	USACE[2]	Bessmer Dam	Do not concur	Infestation potential; project terminated
Ashtabula R.		Ashtabula County	Hadlock Ford	Do not concur	Infestation potential
Euclid Cr.		NOAA[3]	East 185th St spillway	Concur	Feasibility only
River Raisin		MIDNR[4]	Lowhead barrier (6)	Concur	Ineffective barrier
River Raisin		MIDNR[4]	Murciak Dam	Concur	Ineffective barrier
River Raisin		MIDNR[4]	Waterloo Dam	Do not concur	Infestation potential
Black R.		USFWS[5]	Fords Dam	Do not concur	Infestation potential
River Rouge		NOAA[3]	Fords Estate Dam	Concur	Feasibility only
Clinton R.	Lane Dr.	NOAA[3]	Aquatic Center Dam	Concur	Ineffective barrier

[1]Pennsylvania Fish and Boat Commission.
[2]U.S. Army Corps of Engineers.
[3]National Oceanic and Atmospheric Administration.
[4]Michigan Department of Natural Resources.
[5]U.S. Fish and Wildlife Service, Fish and Wildlife Conservation Office (Alpena).

Lake Ontario

There are 16 SLCP barriers on Lake Ontario (Figure 2). Of these, 10 were purpose-built by the Commission and 6 were built for other purposes but have been modified by the Commission to ensure sea lampreys remain blocked.

Barrier Inventory and Project Selection System

- No additional structures were visited on tributaries to Lake Ontario to assess sea lamprey blocking potential or add to the information in BIPSS.

Operation and Maintenance

- Routine maintenance, spring start-up, and safety inspections were performed on 11 Canadian barriers.

- Repairs or improvements were conducted on three Canadian barriers:

    - Humber River – Trap lid was replaced. Handrails around the working platform are being fabricated and will be installed in spring 2013 and removed in the summer 2013 to avoid damage from early spring flood debris and ice.

    - Graham Creek – The water intake in the trap was repaired and a Johnson screen was installed.

- Duffin's Creek – Some of the safety signs were replaced, the water intake was repaired and a Johnson screen was installed.

Ensure Blockage to Sea Lamprey Migration

- Duffins Creek – Escapement of sea lampreys has occurred consistently since 2001 and recent telemetry work indicates that the center section of the crest is too low. There are ongoing safety concerns that are exacerbated by the location of the barrier in a public park. Relocation of the barrier is not feasible and it serves as an important assessment trap site. The Department will investigate ways to improve safety, while restoring its sea lamprey control function.

- Credit River – A Commission-sponsored PIT tagging study was conducted by the Department's Great Lakes Laboratory for Fisheries and Aquatic Sciences staff in 2010 and 2012 to identify pathways of escapement at the Kraft Dam on the Credit River in Streetsville, Ontario, a barrier that was repaired in 2004 to block sea lampreys. Sea lamprey escapement was recorded over the crest of the dam and through the fishway, which is operated by the Credit River Anglers Association during the steelhead migration. Two recommendations were made to control sea lamprey escapement: 1) re-install the missing overhanging plate on the crest; and 2) modify operations at the fishway to prevent sea lamprey escapement. Replacement of a coarse mesh screen with a finer-mesh screen in the fishway is also recommended. Consultation with Kraft Canada, who owns the dam, the Ministry, and the Credit River Anglers Association is planned for 2013.

New Construction

- Orwell Brook – This project represented a collaboration between the Commission, New York Department of Environmental Conservation (NYSDEC), Service and Department, and was undertaken to eliminate the requirement for annual treatments, which have been conducted since 2007 to control residual larvae. All construction, including the barrier, adult sea lamprey trap, access road, gate and fencing was completed during 2012. The barrier's stop logs will be removed outside the period of sea lamprey migration to facilitate the passage of non-target migratory species. The trap will be monitored by Service personnel during 2013, and at least one additional lampricide treatment will be necessary to eliminate residual larvae upstream of the barrier. It is anticipated that future treatments will be conducted downstream of the barrier on a 3-year cycle.

Assessment of Candidate Streams

- No assessments were conducted.

ASSESSMENT

The SLCP has three assessment components that target the larval, juvenile and adult sea lamprey life stages. Terminology for life stages in this report have been standardized from previous years. *Out-migrating juveniles* replaced *metamorphosing-phase* and *transformers*, *feeding juvenile*s replaced *parasitic-phase*, and *adults* replaced *spawning-phase*. Assessment of the different life stages are described here:

1. The larval component assesses the relative abundance and distribution of larval sea lampreys in streams and lentic areas. These data are used to predict the streams and lentic areas most likely to contain larvae greater than 100 mm total length at the end of the growing season during the year of sampling. These predictions are used to establish the priorities for the lampricide treatment program the following year.

2. The juvenile component annually assesses the rates of lake trout marking inflicted by sea lamprey in each of the lakes. Time series data are used to assess the effectiveness of the SLCP for each lake. In addition, several indices of relative abundance of feeding juveniles are used to monitor sea lamprey populations over time.

3. The adult component annually assesses the stock size of adult lampreys in each lake. Because this life stage is comprised of individuals that have evaded or were not exposed to control efforts, the time series of adult abundance is used to evaluate the effectiveness of the SLCP.

The Assessment Task Force that was established by the Commission during 1996 was disbanded during 2012 along with the Reproduction Reduction Task Force. Two new task forces were formed in their place: the Larval Assessment Task Force (LATF) and the Trapping Task Force (TTF). 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 and the TTF is responsible for optimizing trapping techniques for assessing adult sea lamprey populations and removing adults and juveniles. The task force reports on their charges during 2012 are presented in the LATF and TTF sections of this report.

Larval Assessment

Tributaries considered for lampricide treatment during 2013 were assessed during 2012 to estimate the density and size structure of larval sea lamprey populations. Assessments were conducted with backpack electrofishers in waters <0.8 m deep. Waters ≥0.8 m in depth were surveyed with GB or deepwater electrofishers. Survey sites were randomly selected in each tributary, larval sea lamprey catches were adjusted for gear efficiency, and lamprey lengths were forecast to the estimated end of the growing season. The number of large larval sea lampreys in each infested area was estimated by multiplying the mean density of larvae ≥100 mm (number per m^2) by an estimated area of suitable habitat (m^2). Infested areas were ranked for treatment during 2013 based on a cost per kill of larval sea lampreys ≥100 mm, as estimated using this index of abundance and average treatment costs. However, in response to increased sea lamprey abundance in Lake Erie, any infested areas in that lake where surveys indicate the presence of larvae >100 mm are scheduled for treatment in 2013. Additional surveys in all tributaries of all lakes are used to define the distribution of sea lampreys within a stream, detect new populations,

evaluate lampricide treatments, and establish the sites for lampricide application. Lentic areas <2.0 ha are monitored for relative abundance and spatial distribution of larvae.

Lake Superior

- Larval assessments were conducted on a total of 222 tributaries (106 Canada, 116 U.S.) and offshore of 29 tributaries (9 Canada, 20 U.S.). The status of larval sea lamprey populations in historically infested Lake Superior tributaries and lentic areas is listed in Tables 10 and 11.

- Surveys to estimate larval abundance were conducted in 37 tributaries (12 Canada, 25 U.S.) and in lentic areas offshore of 10 tributaries (9 Canada, 1 U.S.).

- Surveys to detect the presence of new larval sea lamprey populations were conducted in 118 tributaries (66 Canada, 52 U.S.). New infestations were discovered in Government (Canada) and Compeau (U.S.) creeks.

- Post-treatment assessments were conducted in 25 tributaries (13 Canada, 12 U.S.) and 9 lentic areas (4 Canada, 5 U.S.) to determine the effectiveness of lampricide treatments conducted during 2011 and 2012.

- Surveys to evaluate barrier effectiveness were conducted in 29 tributaries (6 Canada, 23 U.S.). No breaches were detected.

- Biological collections for researchers or training purposes were conducted in six U.S. tributaries.

Table 10. Status of larval sea lampreys in Lake Superior tributaries with a history of sea lamprey production and estimates of abundance from tributaries surveyed during 2012.

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	Jun-11	---	No	---	---	Unknown
West Davignon Cr.	Jul-11	Sep-11	No	---	---	---	Unknown
Little Carp R.	May-08	Jul-12	No	Yes	---	---	Unknown
Big Carp R.	Sep-07	Sep-12	No	No	---	---	Unknown
Cranberry Cr.	May-11	Jul-11	No	No	---	---	Unknown
Goulais R.	Oct-12	Sep-12	No	No	---	---	2015
Boston's Cr.	Never	Jun-12	---	No	---	---	Unknown
Horseshoe Cr.	Never	Jun 11	---	No	---	---	Unknown
Havilland Cr.	Never	Jul-12	---	Yes	22,589	5,893	***2013***
Stokely Cr.	Jun-08	Aug.12	No	Yes	0	0	Unknown
Tier Cr.	Never	Jun-12	---	No	---	---	Unknown
Harmony R.	Jun-09	Aug-12	Yes	Yes	0	0	Unknown
Government Cr.	Never	Jun-12	---	---	---	---	Unknown
Sawmill Cr.	Jul-11	Jun-12	Yes	No	---	---	Unknown

Table 10. *Lake Superior 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
Jones Landing Cr.	Never	May-12	---	No	---	---	Unknown
Tiny Cr.	Never	Aug-12	---	Yes	---	---	Unknown
Chippewa R.	Jul-10	Sep-11	No	No	---	---	Unknown
Unger Cr.	Jul-10	Jul-12	Yes	No	---	---	Unknown
Batchawana R.	Aug-11	Aug-12	Yes	Yes	9,062	3,544	2015
Digby Cr.	Never	May-12	---	Yes	180	180	***2013***
Carp R.	Jun-09	Jul-12	No	No	---	---	Unknown
Pancake R.	Jun-12	Jul-12	No	No	---	---	2016
Westman Cr.	Never	Aug-12	---	No	---	---	Unknown
Agawa R.	Sept-12	Aug-12	No	No	---	---	Unknown
Sand R.	Sep-71	Jul-12	---	Yes	---	---	Unknown
Baldhead R.	Never	Jun-12	---	No	---	---	Unknown
Gargantua R.	Jul-09	Aug-09	No	Yes	---	---	***2013***
Old Woman R.	Jul-12	Aug-12	Yes	---	---	---	Unknown
Michipicoten R.	Aug-08	Aug-12	Yes	Yes	---	---	***2013***[1]
Dog R.	Jun-10	Aug-12	Yes	Yes	---	---	Unknown
White R.	Jul-12	Sep-09	---	---	---	---	Unknown
Pic R.	Jul-06	Jul-11	No	Yes	---	---	***2013***[1]
Little Pic R.	Aug-11	Aug-11	Yes	---	---	---	Unknown
Prairie R.	Jul-94	Aug-12	---	No	---	---	Unknown
Steel R.	Jul-12	Aug-12	Yes	No	---	---	Unknown
Pays Plat R.	Jul-11	Aug-12	Yes	Yes	37,907	903	2016[1]
Little Pays Plat Cr.	Jul-07	Aug-12	No	Yes	6,680	716	Unknown
Gravel R.	Jul-12	Aug-12	No	No	---	---	2016
Little Gravel R.	Jul-08	Aug-12	Yes	Yes	17,706	1,736	***2013***
Cypress R.	Jul-09	Jun-12	Yes	Yes	---	---	***2013***[1]
Jackpine R.	Never	Jun-09	---	No	---	---	Unknown
Jackfish R.	Jul-12	Aug-11	---	---	---	---	2016
Nipigon R.							
Upper Nipigon R.	Aug-09	Aug-12	Yes	Yes	478,961	9,361	2014
Lower Nipigon R.	Oct-11[3]	Jun-12	---	---	---	---	Unknown
Cash Cr.	Jul-09	Jun12	No	---	---	---	Unknown
Polly Cr.	Jul-87	Aug-09	No	No	---	---	Unknown
Stillwater Cr.	Jul-09	Aug-12	Yes	Yes	---	---	***2013***[1]
Big Trout Cr.	Jul-10	Jun-12	No	Yes	---	---	Unknown
Otter Cove Cr.	Aug-71	Jun-12	No	No	---	---	Unknown
Black Sturgeon R.	Aug-11	Aug-12	No	No	---	---	Unknown
Big Squaw Cr.	Jun-72	Jun-09	---	No	---	---	Unknown
Wolf R.	Jul-11	Aug-12	Yes	Yes	8,236	1,544	2015
Coldwater Cr.	Jul-12	Aug-12	Yes	No	---	---	Unknown
Pearl R.	Jul-10	Jun-12	Yes	Yes	---	---	Unknown
D'Arcy Cr.	Jul-10	Jun-12	No	---	---	---	Unknown
Blende Cr.	Aug-64	Aug-12	---	Yes	---	---	Unknown
MacKenzie R.	Jul-08	Aug-12	No	Yes	---	---	***2013***
Neebing-McIntyre FW	Jul-08	Aug-11	Yes	Yes	486,390	273,998	***2013***
Kaministiquia R.	Sep-10	Aug-12	Yes	Yes	375,252	150,000	***2013***

Table 10. *Lake Superior 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
Cloud R.	Jul-12	Aug-12	No	No	---	---	Unknown
Pine R.	Jul-73	Aug-11	---	Yes	---	---	Unknown
Pigeon R.	Jul-12	Aug-12	Yes	No	---	---	Unknown
United States							
Waiska R.	Jul-07	Sep-11	No	No	---	---	Unknown
Pendills Cr.	Jul-12	May-11	---	---	---	---	Unknown
Grants Cr.	Jum-08	Jul-12	No	Yes	868	133	2014
Halfaday Cr.	Jul-12	Jun-11	---	---	---	---	Unknown
Naomikong Cr.	Jul-63	Jul-10	---	No	---	---	Unknown
Ankodosh Cr.	Jun-08	Aug-12	No	Yes	1,686	0	Unknown
Roxbury Cr.	Jun-08	Aug-12	No	Yes	2,520	504	2014
Galloway Cr.	Jul-07	Jul-10	No	Yes	---	---	2014
Tahquamenon R.	Oct-10	Sep-11	---	Yes	---	---	2014
Betsy R.	Oct-10	Jun-11	---	No	---	---	Unknown
Three Mile Cr.	Jun-62	Jun-11	---	No	---	---	Unknown
Little Two Hearted R.	Jul-12	Sep-11	---	---	---	---	Unknown
Two Hearted R.	Aug-10	Sep-12	Yes	Yes	96,146	13,820	***2013***
Dead Sucker R.	Jul-75	Jul-12	---	Yes	4,361	4,361	***2013***
Sucker R. (Alger Co.)	Sep-10	Jun-11	Yes	---	---	---	Unknown
Chipmunk Cr.	Sep-62	Jul-10	---	No	---	---	Unknown
Carpenter Cr.	Aug-05	Sep-12	Yes	Yes	---	---	Unknown
Sable Cr.	Sep-89	Jun-12	---	Yes	---	---	Unknown
Hurricane R.	Never	Jun-12	---	Yes	---	---	Unknown
Sullivans Cr.	Sep-10	Aug-12	---	Yes	---	---	Unknown
Seven Mile Cr.	Jul-67	Aug-12	---	No	---	---	Unknown
Beaver Lake Cr.							
Lowney Cr.	Sep-10	May-12	Yes	Yes	---	---	Unknown
Mosquito R.	Jun-73	May-12	---	No	---	---	Unknown
Miners R.							
Barrier downstream	Sep-09	May-12	No	Yes	---	---	***2013***[1]
Barrier upstream	Sep-09	May-12	No	No	---	---	Unknown
Munising Falls Cr.	Sep-64	Jun-12	---	Yes	---	---	Unknown
Anna R.	Sep-65	Aug-12	---	Yes	28,858	3,435	***2013***
Tourist Park Cr.	Never	Jun-12	---	---	---	---	Unknown
Furnace Cr.	Sep-10	Sep-11	---	Yes	---	---	Unknown
Five Mile Cr.	Jul-07	Jun-12	No	Yes	5,266	1,835	***2013***
Au Train R.							
Upper	Jun-11	Aug-11	Yes	No	---	---	Unknown
Buck Bay Cr.	Jun-11	Aug-11	No	No	---	---	Unknown
Lower	Jun-11	Aug-11	---	No	---	---	Unknown
Rock R.	Jul-02	May-09	---	No	---	---	Unknown
Deer Lake Cr.	Aug-70	Jun-12	---	No	---	---	Unknown
Laughing Whitefish R.	Jun-11	Aug-11	No	No	---	---	Unknown
Sand R.	Jul-12	Aug-12	Yes	---	---	---	Unknown
Chocolay R.	Jul-12	Aug-12	Yes	Yes	---	---	2016

Table 10. *Lake Superior 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
Carp R.	Jul-12	Oct-11	Yes	Yes	46,827	468	2014
Dead R.	Jul-12	Jul-11	---	---	---	---	2016
Harlow Cr.	Jun-11	Aug-11	No	No	---	---	2015
Compeau Cr.	Never	Jun-12	No	No	---	---	Unknown
Little Garlic R.	Oct-10	Aug-12	---	Yes	43,880	1,972	2014
Garlic R.	Jun-11	Aug-11	Yes	Yes	18,712	65	2015
Iron R.	Sep-09	Jun-12	No	Yes	---	---	***2013***[1]
Salmon Trout R. (Marquette Co.)	Jul-12	Oct-12	Yes	Yes	---	---	*2016*
Pine R.	Jun-11	Oct-12	Yes	Yes	---	---	Unknown
Huron R.	Oct-09	Jun-12	Yes	Yes	---	---	***2013***[1]
Ravine R.	Sep-12	Oct-11	---	---	---	---	***2013***[1]
Slate R.	Aug-09	Oct-09	No	Yes	62	39	***2013***
Silver R.	Sep-12	Oct-11	---	---	---	---	***2013***[1]
Falls R.	Aug-12	Aug-11	---	---	---	---	***2013***[1]
Six Mile Cr.	May-63	Aug-11	---	---	---	---	Unknown
Little Carp R.	Oct-12	Aug-11	---	---	---	---	Unknown
Kelsey Cr.	Never	Aug-11	---	Yes	---	---	Unknown
Sturgeon R.	Oct-10	Aug-12	Yes	Yes	1,871,010	22,823	***2013***
Pilgrim R.	Aug-62	Jun-09	---	No	---	---	Unknown
Trap Rock R.	Jul-11	Oct-11	No	Yes	---	---	Unknown
McCallum Cr.	Aug-63	Jul-10	---	No	---	---	Unknown
Traverse R.	Jun-12	Aug-12	Yes	Yes	---	---	Unknown
Little Gratiot R.	Aug-72	May-12	---	No	---	---	Unknown
Eliza Cr.	Jul-11	May-12	---	Yes	---	---	Unknown
Gratiot R.	Jul-11	May-12	Yes	Yes	---	---	Unknown
Smiths Cr.	May-64	Jul-11	---	No	---	---	Unknown
Boston-Lily Cr.	Aug-62	Aug-12	No	No	---	---	Unknown
Salmon Trout R. (Houghton Co.)	Jul-08	Aug-12	No	Yes	57,786	2,799	***2013***
Mud Lake Outlet	Oct-73	Jul-10	---	No	---	---	Unknown
Graveraet R.	Aug-63	Aug-09	---	No	---	---	Unknown
Elm R.	Jul-07	May-12	No	No	---	---	Unknown
Misery R.							
Barrier downstream	Jul-11	Aug-12	No	Yes	4,877	0	2015
Barrier upstream	Sep-00	Jun-12	---	No	---	---	Unknown
East Sleeping R.	May-11	Aug-12	Yes	Yes	84,382	21,858	***2013***
West Sleeping R.	Aug-09	Aug-10	No	No	---	---	2014
Firesteel R.	Oct-11	Aug-10	Yes	---	---	---	2015
Ontonagon R.	Oct-12	Oct-11	---	---	---	---	2016
Potato R.	May-11	Sep-12	No	Yes	53,619	0	2014
Floodwood R.	Never	Aug-10	---	No	---	---	Unknown
Cranberry R.	May-11	Oct-11	Yes	Yes	---	---	2014
Mineral R.	Oct-10	Aug-11	No	No	---	---	Unknown
Big Iron R.	Never	Aug-12	No	Yes	173	0	Unknown
Little Iron R.	Sep-75	Jun-12	---	Yes	456	456	Unknown

Table 10. *Lake Superior 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
Union R.	May-64	Aug-09	---	No	---	---	Unknown
Black R.	Jul-10	Jul-11	No	---	---	---	Unknown
Montreal R.	Jul-75	Aug-07	---	No	---	---	Unknown
Washington Cr.	Jun-80	Jul-12	---	No	---	---	Unknown
Bad R.	Sep-11	Sep-12	Yes	Yes	---	---	2014
Fish Cr. (Eileen Twp)	Jul-10	Jul-11	---	Yes	---	---	Unknown
Sioux R.	Never	Jul-12	---	Yes	5,132	1,140	Unknown
Pikes Cr.	Never	Jul-12	---	Yes	---	---	Unknown
Red Cliff Cr.	Sep-11	Oct-11	No	---	---	---	Unknown
Raspberry R.	Jun-63	Jul-12	---	No	---	---	Unknown
Sand R.	Sep-11	Aug-12	Yes	---	769	769	Unknown
Cranberry R.	Never	Sep-12	---	Yes	2,358	0	***2013***
Iron R.							
Barrier downstream	Aug-07	Aug-12	No	Yes	19,554	---	***2013***
Barrier upstream	Oct-64	Aug-12	---	No	---	---	Unknown
Reefer Cr.	Oct-64	Jul-12	---	No	---	---	Unknown
Fish Cr. (Orienta Twp)	Oct-64	Jul-12	---	No	---	---	Unknown
Brule R.							
Barrier downstream	Jun-12	Sep-12	Yes	Yes	---	---	2015
Barrier upstream		Sep-12	---	No	---	---	Unknown
Poplar R.	Sep-11	Oct-11	No	---	---	---	2014
Middle R.							
Barrier downstream	May-08	Sep-12	Yes	Yes	43,585	14,645	***2013***
Amnicon R.	Jun-12	Sep-12	Yes	Yes	---	---	2016
Nemadji R.	Jun-09	Sep-12	Yes	Yes	898,284	598,388	***2013***
St. Louis R.	Sep-87	Sep-11	---	No	---	---	Unknown
Sucker R. (St. Louis Co.)	Never	Jun-10	---	No	---	---	Unknown
Gooseberry R.	Aug-76	Aug-12	---	Yes	---	---	Unknown
Splitrock R.	Aug-76	Jun-10	---	No	---	---	Unknown
Poplar R.	Jul-77	Aug-12	---	Yes	---	---	Unknown
Arrowhead R.	Jun-09	Aug-12	No	Yes	2,051	1,184	***2013***

[1] Stream being treated based on expert judgement
[2] Stream deferred for treatment from 2012

Table 11. Status of larval sea lampreys in historically infested lentic areas of Lake Superior during 2012.

Tributary	Lentic Area	Last Surveyed	Last Survey Showing Infestation	Last Treated
Canada				
Goulais R.	Goulais Bay	Jul-08	Jul-08	Aug-85
Havilland Cr.	Havilland Bay	Jul-10	Jul-10	Aug-11
Stokely Cr.	Havilland Bay	Jul-11	Jul-09	Aug-11
Harmony R.	Batchawana Bay	Sep-11	Sep-11	Aug-12
Chippewa R.	Batchawana Bay	Sep-11	Sep-11	Aug-11
Batchawana R.	Batchawana Bay	Jul-12	Sep-11	Aug-12
Carp R.	Batchawana Bay	Oct-12	Oct-12	Aug-07
Agawa R.	Agawa Bay	Aug-12	Aug-12	Aug-10
Michipicoten R.	Marina Area	Jul-11	Jul-11	Aug-10
Gravel R.	Mountain Bay	Aug-11	Aug-11	Jul-10
Little Gravel R.	Mountain Bay	Aug-08	Aug-08	Jul-10
Little Cypress R.	Cypress Bay	Aug-78	Aug-78	Never
Cypress R.	Cypress Bay	Jun-12	Sep-10	Oct-11
Jackpine R.	Nipigon Bay	Jul-02	Jul-89	Never
Jackfish R.	Nipigon Bay	Jul-07	Aug-05	Never
Nipigon R.	Helen Lake	Aug-12	Aug-12	Oct-11
Nipigon R.	Nipigon Bay	Jun-12	Jul-12	Aug-05
Nipigon R.	Polly Lake	Jun-12	Jul-90	Jul-87
Big Trout Cr.	Nipigon Bay	Jun-12	Jun-10	Oct-11
Black Sturgeon R.	Black Bay	Aug-11	Jul-04	Never
Wolf R.	Black Bay	Aug-09	Aug-09	Never
MacKenzie R.	MacKenzie Bay	Aug-12	Aug-12	Oct-11[1]
Current R.	Thunder Bay	Aug-10	Aug-09	Aug-10
Neebing-McIntyre Floodway	Thunder Bay	Aug-05	Jul-90	Never
Kaministiquia R. (lower)	Thunder Bay	Aug-11	Aug-11	Oct-11
Pigeon R.	Pigeon Bay	Sep-10	Sep-09	Aug-10
United States				
Pendills Cr.	Tahquamenon Bay	Jul-12	Jul-12	Never[2]
Grants Cr.	Tahquamenon Bay	Jul-12	Jul-12	Never[2]
Ankodosh Cr.	Tahquamenon Bay	Jul-12	Jul-12	Jul-11
Halfaday Cr.	Tahquamenon Bay	Jul-12	Jul-12	Never[2]
Roxbury Cr	Tahquamenon Bay	Jul-12	Jul-12	Never[2]
Dead Sucker R.	Offshore Dead Sucker R.	Sep-09	---	Never
Galloway Cr.	Tahquamenon Bay	Jul-10	Jul-88	Never
Sucker R.	Grand Marais Harbor	Sep-09	Aug-90	Never
Carpenter Cr.	West Bay	Sep-12	Sep-12	Sep-12
Beaver Lake Cr.	Beaver Lake	Sep-10	Sep-10	Never[2]
Anna R.	Munising Bay	Aug-12	Aug-12	Aug-11
Miners R.	Miners Lake	Jul-12	Jul-12	Jun-11
Furnace Cr.	Furnace Bay	Jul-11	Jul-11	Aug-10
	Furnace Lake – Outlet	Jun-12	Jun-12	Never[2]
	Furnace Lake – Offshore Hanson Cr.	Aug-09	Aug-09	Never[2]
	Furnace Lake – Offshore Gongeau Cr.	Aug-09	Aug-09	Never[2]

Table 11. *Lake Superior continued.*

Tributary	Lentic Area	Last Surveyed	Last Survey Showing Infestation	Last Treated
Five Mile Cr.	Offshore mouth	Aug-11	Aug-11	Never[2]
Carp R.	Offshore mouth	Aug-11	Aug-11	Never[2]
Dead R.	Presque Isle Harbor	Jul-11	Jul-11	Jul-12
Harlow Cr.	Harlow Lake – Offshore Bismark Cr.	Jul-12	Jul-12	Never[2]
Little Garlic R.	Little Garlic R.	Sep-11	Sep-11	Jul-12
Garlic R.	Garlic R. offshore mouth	Jul-12	Sep-05	Never[2]
	Saux Head Lake	Aug-11	Jul-10	Never[2]
Ravine R.	Huron Bay	Jul-06	Jul-06	Jun-12
Slate R.	Huron Bay	Jul-11	Jul-10	Never[2]
Silver R.	Huron Bay	Aug-12	Aug-12	Aug-11
Falls R.	Huron Bay	Jul-08	Jul-08	Jun-12
Trap Rock R.	Torch Lake	Aug-11	Aug-11	Aug-10[1]
Eliza Cr.	Eagle Harbor	Jul-03	Sep-78	Never
Mineral R.	Offshore mouth	Sep-11	Sep-11	Never[2]
Black R.	Black River Harbor	Jun-12	Jun-12	Aug-11
Fish Cr. (Eileen Twp.)	Chequamegon Bay	Jun-10	Aug-06	Never[2]
Red Cliff Cr.	Buffalo Bay	Aug-11	Jun-97	Never
Sand R. (Bayfield Twp.)	Sand Bay	Aug-11	Aug-11	Aug-10[2]
Amnicon R.	Superior Bay	Aug-12	Aug-12	Never

[1] Scheduled for treatment during 2013
[2]Low-density larval population monitored with 3.2% granular Bayluscide surveys

Lake Michigan

- Larval assessments were conducted on a total of 162 tributaries and offshore of 10 tributaries. The status of larval sea lamprey populations in historically infested Lake Michigan tributaries and lentic areas is presented in Tables 12 and 13.

- Surveys to estimate abundance of larval sea lampreys were conducted in 40 tributaries.

- Surveys to detect the presence of new larval sea lamprey populations were conducted in 60 tributaries. No new populations were discovered.

- Post-treatment assessments were conducted in 19 tributaries and 1 lentic area to determine the effectiveness of lampricide treatments during 2011 and 2012.

- Surveys to evaluate barrier effectiveness were conducted in 25 tributaries. Multiple year classes of larvae were found in Casco and Scarboro creeks, which are located upstream from the blocking structure in the Kewaunee River that has been and continues to be modified in an attempt to prevent upstream migration of sea lamprey.

- Surveys to collect larval sea lampreys for pheromone extraction and to support additional research were conducted in seven tributaries.

Table 12. Status of larval sea lampreys in Lake Michigan tributaries with a history of sea lamprey production and estimates of abundance from tributaries surveyed during 2012.

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			
Brevort R.							
Lower	May-12	Oct-11	---	---	---	---	***2013***[1]
Little Brevort R.	May-12	May-12	---	---	---	---	Unknown
Silver Cr.	May-12	May-12	---	---	---	---	Unknown
Paquin Cr.	Oct-87	Apr-12	---	No	---	---	Unknown
Davenport Cr.	May-12	Sep-12	No	No	---	---	***2013***[1]
Hog Island Cr.	Jun-12	Sep-12	No	No	---	---	***2013***[1]
Sucker R.	Jun-61	Sep-12	---	No	---	---	Unknown
Black R.	May-12	Sep-12	Yes	Yes	---	---	***2013***[1]
Mattix Cr.	Aug-10	Sep-12	Yes	Yes	2,087	102	***2013***[1]
Mile Cr.	Sep-72	Sep-12	---	Yes	119	48	***2013***[1]
Millecoquins R.							
Lower	Aug-10	Sep-12	No	No	0	0	***2013***[1]
Upper	May-07	Sep-12	No	Yes	4,011	669	***2013***[1]
McAlpine Cr.	May-11	Sep-12	Yes	Yes	3,794	361	***2013***[1]
Furlong Cr.	May-11	Sep-12	Yes	Yes	14,708	0	***2013***[1]
Cold Cr.	Jul-09	Sep-12	No	Yes	3,128	0	***2013***[1]
Rock R.	Aug-10	Apr-12	Yes	Yes	---	---	***2013***[1]
Crow R.	Jun-09	Sep-12	No	Yes	36,489	4,243	***2013***
Cataract R.	Aug-10	May-12	No	Yes	---	---	***2013***[1]
Pt. Patterson Cr.	Sep-83	Sep-12	---	Yes	5,158	38	***2013***[1]
Hudson Cr.	Aug-10	May-12	No	Yes	---	---	***2013***[1]
Swan Cr.	Jul-92	May-12	---	Yes	---	---	***2013***[1]
Seiners Cr.	May-84	May-12	---	No	---	---	Unknown
Milakokia R.	Jul-11	Sep-12	Yes	Yes	22,246	908	***2013***[1]
Bulldog Cr.	Jul-08	Aug-12	No	Yes	1,640	383	***2013***[1]
Gulliver Lake Outlet	May-12	Aug-12	Yes	No	---	---	***2013***[1]
Marblehead Cr.	Aug-10	Aug-12	Yes	Yes	11,672	486	***2013***[1]
Manistique R.							
Barrier upstream	Sep-12	Aug-12	---	---	---	---	Unknown
Barrier downstream	Sep-12	Aug-08	---	---	---	---	Unknown
Estuary	Sep-12	Jul-11	---	---	---	---	***2013***[1]
Southtown Cr.	Jun-77	Aug-12	---	Yes	363	363	***2013***[1]
Thompson Cr.	Never	May-12	---	Yes	228	228	Unknown
Johnson Cr.	Aug-81	Sep-12	---	Yes	30	30	***2013***[1]
Deadhorse Cr.	Jun-09	Sep-12	Yes	Yes	403	0	***2013***[1]
Gierke Cr.	Never	May-10	---	No	---	---	Unknown
Bursaw Cr.	Aug-10	May-12	No	No	---	---	***2013***[1]
Parent Cr.	Jun-91	Sep-12	---	Yes	175	0	***2013***[1]
Poodle Pete Cr.	Aug-01	Sep-12	---	Yes	1,462	133	***2013***[1]
Valentine Cr.	May-12	Jul-12	No	No	---	---	Unknown
Little Fishdam R.	May-01	Apr-12	---	No	---	---	Unknown
Big Fishdam R.	Sep-11	Apr-12	Yes	---	---	---	Unknown

Table 12. *Lake Michigan continued.*

Tributary	Last Treated	Last Surveyed	Status of Larval Lamprey Population (surveys since last treatment) Residuals Present	Status of Larval Lamprey Population (surveys since last treatment) Recruitment Evident	Estimate of Overall Larval Population	Abundance Estimate if Larvae >100mm	Expected Year of Next Treatment
Sturgeon R.	Sep-10	May-12	Yes	Yes	292,980	32,553	***2013***[2]
Eighteen Mile Cr.	Aug-11	May-12	Yes	---	---	---	***2013***[2]
Ogontz R.							
Mainstream	Oct-10	Sept-12	Yes	Yes	4,746	161	2014
W. Br. Ogontz R.	Sept-11	Sept-12	Yes	Yes	6,573	1,211	2014
N. Br. Ogontz R.	Oct-10	Sept-12	Yes	Yes	396	132	2014
Squaw Cr.	May-12	Jun-12	No	No	---	---	Unknown
Hock Cr.	May-81	Apr-12	---	Yes	999	999	Unknown
Whitefish R.	Jun-11	Oct-12	Yes	Yes	892,095	86,994	***2013***
Rapid R.	May-12	Jul-12	Yes	No	---	---	2015
Tacoosh R.	May-07	Jul-12	No	Yes	---	---	Unknown
Days R.							
Barrier downstream	Aug-12	Jul-12	---	---	---	---	***2013***
Barrier upstream	Oct-11	Jul-12	Yes	No	---	---	Unknown
Portage Cr.	Oct-09	Apr-12	Yes	Yes	1,164	727	Unknown
Ford R.	May-10	Aug-12	Yes	Yes	---	---	***2013***[2]
Sunnybrook Cr.	May-71	Jul-09	---	No	---	---	Unknown
Bark R.	Oct-11	Apr-12	No	No	---	---	Unknown
Cedar R.	May-10	Aug-12	Yes	Yes	---	---	***2013***[2]
Sugar Cr.	May-08	Aug-12	No	No	---	---	Unknown
Arthur Bay Cr.	Jun-10	Jun-11	Yes	---	---	---	Unknown
Rochereau Cr.	Apr-63	Aug-10	---	No	---	---	Unknown
Johnson Cr.	May-10	Aug-12	No	No	---	---	Unknown
Bailey Cr.	Apr-09	Aug-12	Yes	Yes	773	0	Unknown
Beattie Cr.	May-09	Aug-12	Yes	Yes	0	0	Unknown
Springer Cr.	May-08	Aug-12	Yes	Yes	1,199	999	***2013***[3]
Menominee R.	Jun-07	Aug-12	No	Yes	---	---	Unknown
Little R.	Aug-77	Jun-11	---	No	---	---	Unknown
Peshtigo R.	Oct-11	Jun-12	Yes	---	---	---	Unknown
Oconto R.	May-12	Jun-12	No	---	---	---	Unknown
Pensaukee R.	Nov-77	Jun-12	---	No	---	---	Unknown
Suamico R.	Never	Jun-12	---	No	---	---	Unknown
Ephraim Cr.	Apr-63	Jun-11	---	No	---	---	Unknown
Hibbards Cr.	May-07	May-12	No	No	---	---	Unknown
Whitefish Bay Cr.	May-87	May-12	---	Yes	---	---	Unknown
Shivering Sands Cr.	Apr-12	Jun-12	No	---	---	---	Unknown
Lilly Bay Cr.	Apr-63	Jun-11	---	No	---	---	Unknown
Bear Cr.	May-75	Jun-11	---	No	---	---	Unknown
Door Co. 23 Cr.	May-07	Oct-12	No	Yes	---	---	Unknown
Ahnapee R.	Apr-64	Jun-12	---	No	---	---	Unknown
Three Mile Cr.	Sep-08	Oct-12	Yes	Yes	3,641	575	Unknown
Kewaunee R.							
Barrier downstream	May-75	May-12	---	No	---	---	Unknown
Barrier upstream	May-75	May-12	---	Yes	---	---	Unknown

Table 12. *Lake Michigan continued.*

Tributary	Last Treated	Last Surveyed	Status of Larval Lamprey Population (surveys since last treatment) Residuals Present	Status of Larval Lamprey Population (surveys since last treatment) Recruitment Evident	Estimate of Overall Larval Population	Abundance Estimate if Larvae >100mm	Expected Year of Next Treatment
Casco Cr.	May-07	May-12	No	Yes	---	---	Unknown
Scarboro Cr.	May-75	May-12	---	Yes	---	---	Unknown
East Twin R.	Oct-08	May-12	No	Yes	---	---	Unknown
Fischer Cr.	May-87	May-12	---	No	---	---	Unknown
French Farm Cr.	Never	Jun-10	---	Yes	---	---	Unknown
Carp Lake Outlet	Jul-12	May-12	---	---	---	---	***2013***[1]
Big Stone Cr.	Sep-12	Aug-11	---	---	---	---	***2013***[1]
Big Sucker R.	Sug-12	Aug-11	---	---	---	---	***2013***[1]
Wycamp Lake Outlet	Aug-12	Aug-12	---	---	---	---	***2013***[1]
Bear R.	Never	Jun-12	---	No	---	---	Unknown
Horton Cr.	Oct-09	Jul-12	No	Yes	4,226	0	***2013***[1]
Boyne R.	May-10	Jul-12	No	Yes	47,127	7,313	***2013***
Porter Cr.	Oct-09	Jul-12	Yes	Yes	2,871	99	***2013***[3]
Jordan R.	Jul-11	Jun-12	Yes	Yes	---	---	2014
Monroe Cr.	Sep-12	Aug-11	---	---	---	---	***2013***[1]
Loeb Cr.	Oct-08	Sep-11	Yes	Yes	---	---	***2013***[1]
McGeach Cr.	Oct-99	Jun-12	---	No	---	---	Unknown
Elk Lake Outlet	Jul-11	Jun-12	No	No	---	---	Unknown
Yuba Cr.	May-06	Jun-12	---	No	---	---	Unknown
Acme Cr.	Aug-63	Jun-12	---	No	---	---	Unknown
Mitchell Cr.	Oct-08	Aug-12	No	Yes	1,491	0	***2013***[1]
Boardman R. (lower)	Jun-09	Aug-12	No	No	---	---	Unknown
Boardman R. (mid.)	Oct-11	Nov-12	No	No	---	---	Unknown
Hospital Creek	Jun-09	Aug-12	No	Yes	1,682	1,682	2014
Leo Cr.	Never	Sep-10	---	No	---	---	Unknown
Good Harbor Cr.	Jul-10	Sep-12	No	No	---	---	Unknown
Leland R.	Never	May-07	---	Yes	---	---	Unknown
Crystal R.	Nov-11	Jun-12	No	No	---	---	Unknown
Platte R. (upper)	Jun-12	Aug-12	Yes	No	15,701	7,851	2014
Platte R. (middle)	Aug-12	Oct-12	No	No	---	---	2014
Platte R. (lower)	Jun-12	Oct-12	Yes	No	---	---	2014
Betsie R.	Jul-10	Dec-12	Yes	Yes	282,264	7,561	***2013***[1]
Bowen Cr.	Jun-09	Aug-12	No	No	---	---	Unknown
Big Manistee R.	Aug-12	Oct-12	Yes	No	246,790	63,010	***2013***
Bear Cr.	Aug-12	Oct-12	Yes	No	21,717	15,202	***2013***
L. Manistee R.	Jul-11	Oct-12	No	Yes	67,580	0	2014
Gurney Cr.	Aug-09	Apr-12	No	No	---	---	Unknown
Cooper Cr.	Jul-08	Jun-11	No	No	---	---	Unknown
Lincoln R.	Aug-10	Oct-12	No	Yes	4,793	0	2014
Pere Marquette R.	Jul-12	Jun-12	---	---	---	---	2015
Bass Lake Outlet	Aug-78	Jul-09	---	No	---	---	Unknown
Pentwater R. (N. Br.)	Jun-11	Aug-12	Yes	Yes	157,945	21,318	***2013***
South Branch	Never	Oct-09	---	No	---	---	Unknown
Lambricks Cr.	Sep-84	Oct-09	---	No	---	---	Unknown

Table 12. *Lake Michigan continued.*

Tributary	Last Treated	Last Surveyed	Status of Larval Lamprey Population (surveys since last treatment) Residuals Present	Status of Larval Lamprey Population (surveys since last treatment) Recruitment Evident	Estimate of Overall Larval Population	Abundance Estimate if Larvae >100mm	Expected Year of Next Treatment
Stony Cr.	Jun-10	Sep-12	No	No	---	---	Unknown
Flower Cr.	Jun-11	Sep-10	---	---	---	---	Unknown
White R.	Jul-10	Sep-12	Yes	Yes	766,226	141,714	***2013***[2]
Duck Cr.	Jul-84	Sep-12	---	No	---	---	Unknown
Muskegon R.	Aug-11	Sep-12	Yes	Yes	261,000	14,500	2014
Brooks Cr.	Aug-10	Sep-12	No	Yes	---	---	2014
Cedar Cr.	Aug-10	Sep-12	No	Yes	---	---	2014
Bridgeton Cr.	Aug-11	Oct-11	No	No	---	---	2014
Minnie Cr.	Aug-11	Oct-11	No	No	---	---	2014
Bigelow Cr.	Aug-08	Oct-11	No	No	---	---	2014
Big Bear Cr.	Aug-70	Sep-12	---	No	---	---	Unknown
Mosquito Cr.	Sep-68	Sep-10	---	No	---	---	Unknown
Black Cr.	Aug-08	Oct-11	No	No	---	---	Unknown
Grand R.-	Never	Jul-12	---	No	---	---	Unknown
Norris Cr.	Aug-08	Sep-11	No	No	---	---	Unknown
Lowell Cr	Sep-65	Aug-05	---	No	---	---	Unknown
Buck Cr.	Sep-65	Jul-12	---	No	---	---	Unknown
Rush Cr.	Sep-65	Jul-12	---	No	---	---	Unknown
Sand Cr.	Jun-07	Sep-11	---	No	---	---	Unknown
Crockery Cr.	Jul-12	Sept-11	No	No	---	---	2015
Bass R.	Aug-04	Jul-12	---	No	---	---	Unknown
Rogue R.	Sep-09	Sep-11	No	No	---	---	Unknown
Pigeon R.	Oct-64	Oct-10	---	No	---	---	Unknown
Pine Cr.	Oct-64	Oct-10	---	No	---	---	Unknown
Gibson Cr.	Jul-84	Oct-10	---	No	---	---	Unknown
Kalamazoo R.	Oct-65	Jul-12	---	No	---	---	Unknown
Bear Cr.	Sep-10	Sep-12	No	Yes	4,673	610	2014
Sand Cr.	Sep-10	Jul-12	No	No	---	---	Unknown
Mann Cr.	Oct-12	Aug-12	---	---	---	---	2016
Rabbit R.	Aug-08	Aug-12	No	Yes	---	---	2014
Swan Cr.	Jul-77	Sep-12	No	Yes	35,000	15,909	***2013***
Allegan 3 Cr.	Sep-65	Jun-10	---	No	---	---	Unknown
Allegan 4 Cr.	Oct-78	Sep-12	---	No	---	---	Unknown
Allegan 5 Cr.	Never	Jun-10	---	No	---	---	Unknown
Black R.							
North Branch	Jun-77	Sep-11	---	No	---	---	Unknown
Middle Branch	Jun-11	Sep-11	No	No	---	---	2014
South Branch	Never	Aug-12	---	Yes	0	0	2014
Brandywine Cr.	Oct-85	Sep-12	---	No	---	---	Unknown
Rogers Cr.	May-98	Sep-12	---	Yes	164	0	Unknown
St. Joseph R.	Never	Jul-10	---	No	---	---	Unknown
Lemon Cr.	Oct-65	Sep-11	---	No	---	---	Unknown
Pipestone Cr.	Sep-10	Sep-12	No	Yes	---	---	2014

Table 12. *Lake Michigan continued.*

Tributary	Last Treated	Last Surveyed	Status of Larval Lamprey Population (surveys since last treatment) Residuals Present	Status of Larval Lamprey Population (surveys since last treatment) Recruitment Evident	Estimate of Overall Larval Population	Abundance Estimate if Larvae >100mm	Expected Year of Next Treatment
Meadow Dr.	Oct-65	Sep-11	---	No	---	---	Unknown
Hickory Cr.	Oct-65	Sep-11	---	Yes	---	---	Unknown
Paw Paw R.	Jun-12	Sep-12	No	No	15,652	9,391	2015
Blue Cr.	Jun-12	May-12	---	---	---	---	2015
Mill Cr.	Jun-12	Sep-12	No	No	---	---	2015
Brandywine Cr.	Jun-12	Sep-12	No	No	---	---	2015
Brush Cr.	Jun-12	Sep-12	Yes	Yes	---	---	2015
Hayden Cr.	Jun-12	Sep-11	---	---	---	---	2015
Campbell Cr.	Jun-12	Sep-12	No	No	---	---	2015
Galien R. (N. Br.)	Oct-10	Oct-11	Yes	No	---	---	2014
E. Br. & Dowling Cr.	Oct-10	Oct-10	No	No	---	---	2014
S. Br. & Galina Cr.	Oct-12	Oct-12	---	---	---	---	2015
Spring Cr.	Oct-12	Oct-12	---	---	---	---	2015
S. Br. Spring Cr.	Oct-12	Oct-12	---	---	---	---	2015
State Cr.	May-86	Aug-10	---	No	---	---	Unknown
Trail Cr. Barrier upstream	Oct-10	Sep-12	No	Yes	17,105	557	2014
Donns Cr.	May-66	Sep-12	---	No	---	---	Unknown
Burns Ditch	Jul-99	Sep-12	---	No	---	---	Unknown

[1] Stream being treated based on next large scale treatment
[2] Stream being treated based on expert judgement
[3] Stream being treated based on geographic efficiency

Table 13. Status of larval sea lampreys in historically infested lentic areas of Lake Michigan during 2012.

Tributary	Lentic Area	Last Surveyed	Last Survey Showing Infestation	Last Treated
Brevort R.	Brevort Lake (Silver Cr. – Offshore)	Jul-08	Jul-08	Never[1]
	Brevort Lake (L. Brevort R.. – Offshore)	Jul-08	Aug-74	Never
Paquin Cr.	Paquin Cr. (Offshore)	Jul-08	Jul-08	Never[1]
Hog Island Cr.	Hog Island Cr. (Offshore)	Sep-12	Sep-12	Jun-07[1]
Black R.	Black R. (Offshore)	Aug-11	Aug-11	Never[1]
Mile Cr.	Mile Cr. (Offshore)	Jun-08	Jun-08	Never[1]
Millecoquins R.	Millecoquins Lake (Cold Cr. – Offshore)	Sep-10	Sep-10	Never[1]
Cataract R.	Cataract R. (Offshore)	Aug-09	Aug-09	Never[1]
Milakokia R.	Seul Choix Bay	Sep-07	Aug-80	Never
Manistique R.	Manistique R. (Offshore)	Jul-11	Jul-11	Aug-08[1]
Bursaw Cr.	Bursaw Cr. (Offshore)	Jul-11	Jul-11	Never[1]
Ogontz R.	Ogontz R. (Offshore)	Jul-11	Jul-11	Jun-12
Whitefish R.	Big Bay De Noc	Jul-11	Jul-11	Never[1]
Rapid R.	Little Bay De Noc	Jul-10	Jul-10	Jun-12
Days R.	Little Bay De Noc	Aug-11	Aug-11	Never[1]
Escanaba R.	Little Bay De Noc	Aug-10	Jul-06	Never[1]
Portage Cr.	Portage Bay	Jul-84	Jul-77	Never
Ford R.	Green Bay	Jul-11	Jul-11	Jun-12
Cedar R.	Green Bay	Aug-10	Jul-09	May-10
Beattie Cr.	Green Bay	Jul-08	Jul-85	Never
Menominee R.	Green Bay	Aug-12	Aug-12	Never[1]
Carp Lake Outlet	Cecil Bay	Sep-09	Sep-09	Never[1]
Bear R.	Little Traverse Bay	Jun-12	Jun-08	May-07
Horton Cr.	Horton Bay (Lake Charlevoix)	Jul-12	Jul-12	Oct-09
Boyne R.	Boyne Harbor (Lake Charlevoix)	Jul-12	Jul-12	May-10
Porter Cr.	Lake Charlevoix	Jul-12	Sep-11	Never[1]
Jordan R.	Lake Charlevoix	Sep-10	Sep-10	Jul-11
Monroe Cr.	Lake Charlevoix	Jul-08	Jul-06	Never[1]
Mitchell Cr.	Grand Traverse Bay (East Arm)	May-04	May-04	Never[1]
Boardman R.	Grand Traverse Bay (West Arm)	Aug-12	Aug-12	Jun-12
Leland R.	Leland R. (Offshore)	Jun-09	Jun-09	Never[1]
Platte R.	Loon Lake	Sep-08	Sep-08	Never[1]
	Platte Lake	Sep-08	Jul-03	Never[1]
Betsie R.	Betsie Lake	May-08	Aug-83	Never[1]
Big Manistee R.	Manistee Lake (Big Manistee - Offshore)	Jul-08	Jul-08	Never[1]
	Manistee Lake (Little Manistee – Offshore)	Jul-08	Jul-08	Jul-08

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

Lake Huron

- Larval assessments were conducted on a total of 155 tributaries (90 Canada, 65 U.S.) and offshore of 12 tributaries (1 Canada, 11 U.S.). The status of larval sea lamprey populations in historically infested Lake Huron tributaries and lentic areas are presented in Tables 14 and 15.

- Surveys to estimate abundance of larval sea lampreys were conducted in 20 tributaries (2 Canada, 18 U.S.) and in lentic areas offshore of 3 tributaries (2 Canada, 1 U.S.).

- Surveys to detect the presence of new larval sea lamprey populations were conducted in 91 tributaries (57 Canada; 34 U.S) and offshore of 2 Canadian tributaries. No new populations were discovered.

- Post-treatment assessments were conducted in 32 tributaries (21 Canada, 11 U.S.) to determine the effectiveness of lampricide treatments during 2011 and 2012.

- Surveys to evaluate barrier effectiveness were conducted on 10 barriers in 9 tributaries (4 Canada, 5 U.S.). One sea lamprey larva was discovered upstream of Caro Dam on the Cass River (tributary to the Saginaw River). Additional surveys will be conducted upstream of the dam during 2013.

- Monitoring of larval sea lampreys in the St. Marys River continued during 2012. A total of 802 geo-referenced sites were sampled using deepwater electrofishing gear. Surveys were conducted according to a stratified, systematic sampling design. The larval sea lamprey population for the entire St. Marys River is estimated to be 360,000 (95% confidence limits 100,000-600,000), which is the lowest on record.

- Additional pre-treatment deep water electrofishing surveys were conducted in the St. Marys River in support of research.

Table 14. Status of larval sea lampreys in Lake Huron tributaries with a history of sea lamprey production and estimates of abundance from tributaries surveyed during 2012.

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							
St. Marys R.	Sep-10	Aug-10	Yes	Yes	360,000	---	***2013***
Whitefish Channel	Oct-11	Jul-12	---	---	---	---	Unknown
Root R.	Aug-10	Jul-12	Yes	Yes	---	---	2014
Garden R.	Jul-11	Jul-11	---	---	---	---	2014
Echo R.							
Upper	Oct-99	Oct-12	---	No	---	---	Unknown
Lower	Jul-11	Oct-12	No	No	---	---	Unknown
Bar & Iron Cr.	Oct-12	Aug-11	---	---		---	Unknown

Table 14. *Lake Huron 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			
Bar R.	Oct-11	Jul-12	---	---	---	---	Unknown
Sucker Cr.	Arp-12	Jun-12	No	Yes	---	---	Unknown
Two Tree R.	May-10	Jun-12	No	Yes	---	---	Unknown
Richardson Cr.	Aug-11	Jun-12	---	---	---	---	Unknown
Watson Cr.	Sep-10	Aug-12	No	No	0	0	2014
Gordon Cr.	Sep-11	Jun-12	---	---	---	---	Unknown
Browns Cr.	Sep-11	Jun-12	---	---	---	---	Unknown
Koshkawong R.	Apr-12	Jun-12	No	Yes	---	---	Unknown
Unnamed	Jun-12	Sep-11	---	---	---	---	***2013***[1]
Unnamed	Sep-75	Arp-12	---	Yes	---	---	Unknown
MacBeth Cr.	Jun-67	Jul-11	---	No	---	---	Unknown
Thessalon R.							
Upper	Aug-11	Aug-11	No	---	---	---	Unknown
Lower	Jul-10	Sep-12	Yes	Yes	---	---	2014
Livingstone Cr.	Jun-12	Sep-12	---	---	---	---	***2013***[1]
Mississagi R.	Jul-11	Sep-12	Yes	---	429,736	---	***2013***[1]
Blind R.	May-84	May-12	---	No	---	---	Unknown
Lauzon R.	Jun-11	Sep-12	No	Yes	---	---	Unknown
Spragge Cr.	Oct-95	May-12	---	No	---	---	Unknown
No Name	Jun-11	Sep-11	Yes	---	---	---	Unknown
Marcellus Cr.	Jun-12	Sep-12	---	---	---	---	***2013***[1]
Serpent R.							
Main	Jun-12	Sep-12	No	---	---	---	Unknown
Grassy Cr.	Jun-11	Sep-12	No	No	0	0	2014
Spanish R.	Sep-11	Sep-12	---	Yes	---	---	Unknown
Kagawong R.	Aug-67	May-12	---	No	---	---	Unknown
Unnamed	May-11	Sep-11	No	---	---	---	Unknown
Silver Cr.	May-11	Sep-11	---	---	---	---	Unknown
Sand Cr.	Oct-11	Jul-12	Yes	Yes	---	---	Unknown
Mindemoya R.	Jun-11	Sep-11	No	Yes	---	---	2015
Timber Bay Cr.	May-11	Sep-11	No	---	---	---	2015
Hughson Cr.	Oct-12	May-12	---	---	---	---	***2013***[1]
Manitou R.	Oct-12	Sep-11	---	---	---	---	***2013***[1]
Blue Jay Cr.	Jun-11	Sep-11	No	---	---	---	Unknown
Kaboni Cr.	Oct-78	May-09	---	No	---	---	Unknown
Chikanishing R.	Jun-03	May-12	No	No	---	---	Unknown
French R. System							
O.V. Channel	Jun-12	Jul-09	---	---	---	---	***2013***[1]
Wanapitei R.	Jun-11	Jun-08	No	Yes	1,929	---	***2013***[1]
Key R. (Nesbit Cr.)	Sep-72	May-12	---	No	---	---	Unknown
Still R.	Jun-96	Jun-10	---	Yes	---	---	Unknown
Magnetawan R.	Jun-11	May-12	No	Yes	---	---	2015
Naiscoot R.	Oct-12	Jun-11	---	---	---	---	***2013***[1]
Shebeshekong R.	Never	Jul-11	---	No	---	---	Unknown

Table 14. *Lake Huron 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
Boyne R.	Apr-12	Jun-11	---	---	---	---	***2013***[1]
Musquash R.	Sep-05	Jul-11	No	No	---	---	***2013***[1]
McDonald Cr.	Never	Jul-09	---	No	---	---	Unknown
Simcoe/Severn	Never	May-12	---	Yes	---	---	Unknown
Coldwater R.	Never	May-11	---	No	---	---	Unknown
Sturgeon R.	Apr-12	May-12	No	---	---	---	2016
Hog Cr.	Sep-78	May-11	---	No	---	---	Unknown
Lafontaine Cr.	Jun-68	May-11	---	No	---	---	Unknown
Nottawasaga R.							
Main	May-02	Jul-11	---	Yes	313,443	---	***2013***[1]
Bear Cr.	May-12	Arp-11	---	---	---	---	***2013***[1]
Pine R.	Jun-12	Jul-11	---	---	---	---	***2013***[1]
Pretty R.	May-72	Apr-11	---	No	---	---	Unknown
Silver Cr.	Sep-82	May-12	---	No	---	---	Unknown
Bighead R.	Jun-12	Jul-11	---	---	---	---	2015
Bothwells Cr.	Jun-79	May-12	---	No	---	---	Unknown
Sydenham R.	Jun-72	May-12	No	No	---	---	Unknown
Sauble R.	Jun-04	Jun-11	No	Yes	---	---	Unknown
Saugeen R.	Jun-71	May-10	No	No	---	---	Unknown
Bayfield R.	Jun-70	Jun-10	No	No	---	---	Unknown
United States							
Mission Cr.	Never	Jun-12	---	No	---	---	Unknown
Frenchette Cr.	Never	Jun-12	---	No	---	---	Unknown
Ermatinger Cr.	Never	Jun-12	---	No	---	---	Unknown
Charlotte R.	Oct-11	Jun-12	---	No	---	---	Unknown
Little Munuscong R.	Oct-10	May-12	---	Yes	---	---	Unknown
Big Munuscong R.	Jun-99	Jun-12	---	No	---	---	Unknown
Taylor Cr.	Oct-11	Jun-12	---	Yes	---	---	Unknown
Carlton Cr.	May-11	Sep-12	Yes	Yes	14,543	1,015	***2013***[1]
Canoe Lake Outlet	May-70	May-10	---	No	---	---	Unknown
Caribou Cr.	Jun-11	Jul-11	No	---	---	---	Unknown
Bear Lake Outlet	Jun-11	Jul-11	No	---	---	---	Unknown
Carr Cr.	May-78	Oct-12	---	Yes	---	---	***2013***[1]
Joe Straw Cr.	May-75	Oct-12	---	Yes	---	---	***2013***[1]
Huron Point Cr.	Jun-12	May-11	---	---	---	---	***2013***[1]
Saddle Cr.	Never	Oct-12	---	No	---	---	Unknown
Albany Cr.							
Barrier downstream	Apr-11	Jul-11	---	Yes	---	---	Unknown
Barrier upstream	Jul-07	Sep-10	No	No	---	---	Unknown
Boiling Springs Cr.	Never	Apr-10	---	No	---	---	Unknown
Trout Cr.	Oct-10	Apr-11	---	---	---	---	Unknown
Beavertail Cr.	May-11	Jul-11	No	---	---	---	Unknown
Prentiss Cr.	May-11	Jul-11	Yes	---	---	---	Unknown

Table 14. *Lake Huron 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
McKay Cr.	May-11	Jul-11	Yes	---	---	---	Unknown
Susan Cr.	Never	Apr-10	---	No	---	---	Unknown
Flowers Cr.	Jun-12	May-11	---	---	---	---	***2013***[1]
Ceville Cr.	Jun-12	Jul-11	---	---	---	---	***2013***[1]
Hessel Cr.	May-11	Jul-11	No	---	---	---	Unknown
Law Cr.	Never	Oct-10	---	No	---	---	Unknown
Steeles Cr.	May-11	Jul-11	No	Yes	---	---	Unknown
Nunns Cr.	Jun-12	Jul-11	---	---	---	---	***2013***[1]
Pine R.	Jun-10	Oct-10	Yes	Yes	193,126	1,655	2014
McCloud Cr.	Oct-72	May-11	---	No	---	---	Unknown
Carp R.	May-11	Oct-11	No	Yes	---	---	Unknown
Martineau Cr.	Jun-12	Oct-11	---	---	---	---	Unknown
Hoban Cr.	Jun-12	May-11	---	---	---	---	Unknown
Rogers Cr.	Never	May-10	---	No	---	---	Unknown
Sec. 7 Cr.	Never	May-10	---	No	---	---	Unknown
266-20 Cr.	Aug-76	Jul-12	---	No	---	---	Unknown
Beaugrand Cr.	Never	Jul-12	---	No	---	---	Unknown
Little Black R.	May-67	May-11	---	No	---	---	Unknown
Cheboygan R.	Oct-83	Jul-12	---	No	---	---	Unknown
Mullett Cr.	Never	Jun-10	---	No	---	---	Unknown
Laperell Cr.	May-00	Jul-11	---	No	---	---	Unknown
Meyers Cr.	Sep-99	Jul-11	---	No	---	---	Unknown
Maple R.	Sep-12	Jul-12	---	---	---	---	2015
Pigeon R.	Aug-12	Jul-12	---	---	---	---	2015
Little Pigeon R.	Aug-12	Jul-12	---	---	---	---	2015
Sturgeon R.	Sep-12	Sep-12	---	---	---	---	2015
Little Sturgeon R.	Never	Sep-10	---	No	---	---	Unknown
Elliot Cr.	Jul-12	Sep-12	No	Yes	---	---	***2013***[1]
Grass Cr.	May-78	Apr-11	---	No	---	---	Unknown
Greene Cr.							
Barrier downstream	Jul-12	Jul-11	---	---	---	---	Unknown
Barrier upstream	Jun-07	May-11	---	No	---	---	Unknown
Mulligan Cr.	Jul-12	Sep-12	Yes	Yes	1,538	0	Unknown
Grace Cr.	Apr-12	Sep-12	Yes	Yes	2,625	0	***2013***[1]
Black Mallard Cr.							
Lower	Apr-12	Sep-12	No	Yes	1,217	0	Unknown
Upper	Apr-12	Sep-12	Yes	Yes	1,964	0	Unknown
Seventeen Cr.	Jul-12	Jul-12	---	---	---	---	***2013***[1]
Ocqueoc R.							
Barrier downstream	Aug-12	Sep-12	Yes	No	824	275	***2013***[1]
Barrier upstream	Aug-09	May-12	No	No	---	---	Unknown
Johnny Cr.	Sep-70	May-11	---	---	---	---	Unknown
Schmidt Cr.							
Lower	May-12	Sep-12	Yes	Yes	2,342	0	***2013***[1]
Upper	May-08	May-11	---	---	---	---	Unknown

Table 14. *Lake Huron 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
Nagels Cr.	Never	Sep-12	---	No	---	---	Unknown
Trout R.							
Barrier downstream	May-11	Sep-12	No	Yes	7,708	---	***2013***[1]
Barrier upstream	Oct-07	May-11	---	---	---	---	Unknown
Swan R.	Jun-10	Sep-12	---	No	---	---	Unknown
Grand Lake Outlet	Never	Oct-11	---	No	---	---	Unknown
Middle Lake Outlet	Jun-67	Oct-11	---	No	---	---	Unknown
Long Lake Outlet	May-08	Sep-12	No	Yes	13,772	2,930	***2013***
Squaw Cr.	Jun-10	Oct-11	---	Yes	---	---	***2013***[1]
Devils R.	May-11	Sep-12	No	Yes	9,474	---	2014
Black R.	May-11	Sep-12	Yes	Yes	59,443	2,831	2014
Butternut Cr.	May-11	Sep-12	No	Yes	---	---	2014
Mill Cr.	Never	May-12	---	No	---	---	Unknown
Au Sable R.	Jun-10	Sep-12	No	Yes	537,142	---	2014
Pine R.	May-87	Sep-12	---	No	---	---	Unknown
Tawas Lake Outlet	Jul-09	Sep-12	No	Yes	---	---	***2013***
Cold Cr.	Jul-09	Sep-12	No	Yes	4,845	0	***2013***
Sims Cr.	Jul-09	Jul-11	---	No	---	---	Unknown
Grays Cr.	Sep-05	Jun-10	---	No	---	---	Unknown
Silver Cr.	Jul-09	Sep-12	No	Yes	93,412	9,174	***2013***
East Au Gres R.	Jul-09	Sep-12	No	Yes	33,178	4,104	***2013***[2]
Au Gres R.	May-10	Sep-12	No	Yes	347,326	0	2014
Rifle R.	Aug-11	Sep-12	Yes	Yes	427,370	8,219	2014
Saginaw R.							
Cass R.	May-12	Sep-12	No	No	---	---	2015
Juniata Cr.	May-12	Aug-12	No	No	---	---	2015
Scott Drain	Jun-08	Aug-11	No	No	---	---	2015
Goodings Cr.	May-12	Sep-12	No	Yes	---	---	2015
Tittabawassee R.	Never	Sep-08	---	No	---	---	Unknown
Chippewa R.	May-12	Sep-12	Yes	Yes	22,740	2,067	2014
Coldwater R.	May-12	Sep-12	No	No	---	---	2014
Pine R.	Apr-12	Sep-12	No	Yes	---	---	2014
Little Salt Cr.	May-02	Aug-11	---	No	---	---	Unknown
Big Salt Cr.	Jun-09	Aug-11	---	No	---	---	Unknown
North Br.	Never	Sep-11	---	No	---	---	Unknown
Carroll Cr.	May-07	Aug-11	---	No	---	---	2014
Big Salt R.	May-10	Sep-12	No	No	---	---	Unknown
Bluff Cr.	May-10	Sep-12	No	No	---	---	Unknown
Shiawassee R.	Jun-10	Sep-12	No	Yes	40,765	30,573	***2013***
Rock Falls Cr.	Never	Aug-12	---	No	---	---	Unknown
Elm Cr.	Never	Aug-12	---	No	---	---	Unknown
Cherry Cr.	Never	Aug-12	---	No	---	---	Unknown
Mill Cr.	May-85	Jun-12	---	Yes	215	215	Unknown

[1] Stream being treated based on large scale treatment
[2] Stream being treated based on geographic efficiency

Table 15. Status of larval sea lampreys in historically infested lentic areas of Lake Huron during 2012.

Tributary	Lentic Area	Last Surveyed	Last Survey Showing Infestation	Last Treated
Canada				
Echo R.	Solar Lake	Jul-06	Sep-93	Jul-87
	Stuart Lake	May-90	May-90	Jul-80
Sucker Cr.	Desjardins Bay	Jul-11	Jul-11	Jul-84
Two Tree R.	North Channel	Aug-81	Aug-81	Never
Gordons Cr.	North Channel	Aug-91	Aug-91	Jul-84
Browns Cr.	North Channel	Aug-91	Aug-91	Aug-87
Koshkawong R.	North Channel	Aug-91	Aug-91	Never
Unnamed Cr.	North Channel	Jun-00	May-95	Never
Mississagi R.	North Channel	Aug-90	Aug-90	Jul-81
Lauzon R.	North Channel	Sep-12	Jul-10	Jun-12
Unnamed	North Channel	Sep-11	Sep-11	Jul-10
Kagawong R.	Mudge Bay	May-11	Jul-90	Aug-87
Mindemoya R.	Providence Bay	May-12	Jul-88	Jul-81
Manitou R.	Michael's Bay	Jul-10	Jul-10	Oct-12
Blue Jay Cr.	Michael's Bay	Jul-10	Jul-10	Aug-87
Still R.	Bying Inlet	Jun-10	Jun-10	Jun-12
United States				
Caribou Cr.	Caribou Cr. (offshore)	Aug-09	Aug-10	Jun-10
Albany Cr.	Albany Bay (offshore)	Jul-11	Jul-11	Never[1]
Trout Cr.	Trout Cr. (offshore)	Jul-11	Jul-11	Never[1]
Beavertail Cr.	Beavertail Bay	Aug-07	Aug-07	Never[1]
McKay Cr.	McKay Bay	Jul-11	Jul-11	Jul-07[1]
Flowers Cr.	Flowers Bay	Jun-12	Jul-80	Never
Nunns Cr.	St. Martin Bay	Jun-09	Aug-87	Never
Pine R.	St. Martin Bay	Jun-12	Jun-12	Never[1]
McCloud Cr.	St. Martin Bay	Jul-10	Jul-10	Never
Carp R.	St. Martin Bay	Jun-12	Jun-12	Jun-10
Martineau Cr.	Horseshoe Bay	Sep-10	Sep-10	Never[1]
Cheboygan R.	Straits of Mackinac	Jul-12	Aug-93	Never
	Burt Lake (Sturgeon R.)	Aug-11	Aug-98	Never
Elliot Cr.	Duncan Bay	Jul-12	Jul-12	Never
Black Mallard R.	Black Mallard Lake	Jul-12	Jun-10	Never
Hammond Bay Cr.	Hammond Bay	Sep-12	Sep-12	Never
Mulligan Cr.	Mulligan Cr. (offshore)	Jul-12	Jul-12	Never[1]
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-09	Aug-09	Never[1]
East Au Gres R.	East Au Gres R.	May-07	Jun-86	Never

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

Lake Erie

- Larval assessments were conducted on a total of 86 tributaries (25 Canada, 61 U.S.) and offshore of 3 U.S. tributaries. The status of larval sea lampreys in historically infested Lake Erie tributaries and lentic areas is presented in Tables 16 and 17.

- Surveys to estimate abundance of larval sea lampreys were conducted in nine tributaries (two Canada, seven U.S.).

- Surveys to detect new larval populations were conducted in 47 tributaries (17 Canada, 30 U.S.). No new populations were discovered.

- Surveys to evaluate barrier effectiveness were conducted in seven tributaries (five Canada, two U.S.). Breaches were discovered in Big and Big Otter creeks. In Big Creek, sea lamprey larvae were found upstream of the Lehman Dam in North and South creeks while in Big Otter Creek, larvae were found upstream of dams on both Venison and Little Otter creeks.

- Due to high sea lamprey abundance estimates and marking in Lake Erie, 12 tributaries (4 Canada, 8 U.S.) infested with the 2010 year class are scheduled for treatment during 2013, including two streams (Young's and Catfish creeks) where larvae >100 mm were found, but an abundance estimate was not calculated.

- A total of 4.47 ha of the St. Clair River were surveyed with GB. Sampling guidelines called for annual sampling of index plots to monitor population trends in the river and detect new areas of infestation. Sea lampreys were captured in low densities throughout the upper and lower river, including the river delta near Lake St. Clair.

- A total of 0.9 ha of the lower Detroit River was sampled with GB. No sea lamprey larvae were detected.

Table 16. Status of larval sea lampreys in Lake Erie tributaries with a history of sea lamprey production, and estimates of abundance from tributaries surveyed during 2012.

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	Aug-10	No	No	---	---	Unknown
Catfish Cr.	Jun-87	Jul-12	No	Yes	---	---	***2013***
Silver Cr.	Oct-09	Aug-11	No	No	---	---	Unknown
Big Otter Cr.	Sep-09	Jul-12	No	Yes	23,111	9,905	***2013***
South Otter Cr.	Aug-10	Jul-12	No	No	---	---	Unknown
Clear Cr.	May-91	Jul-12	No	No	---	---	Unknown
Big Cr.	Sep-09	Jul-12	No	Yes	9,744	9,744	***2013***
Forestville Cr.	May-89	Aug-10	No	No	---	---	Unknown
Normandale Cr.	Jun-87	Jul-12	No	No	---	---	Unknown

Table 16. *Lake Erie 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			
Fishers Cr.	Jun-87	Aug-10	No	No	---	---	Unknown
Young's Cr.	Sep-09	Jul-12	No	Yes	---	---	***2013***
United States							
Buffalo R.	Never	Jul-12	---	Yes	9,906	8,105	***2013***
Delaware Cr.	Sep-05	Jul-12	---	Yes	1,267	533	***2013***
Cattaraugus Cr.	Oct-09	Aug-12	Yes	Yes	87,831	10,236	***2013***
Halfway Br.	Oct-86	Jun-10	---	---	---	---	Unknown
Canadaway Cr.	Oct-86	Jun-11	---	No	---	---	Unknown
Chautauqua Cr.	Never	Jul-12	---	Yes	---	---	Unknown
Crooked Cr.	Oct-09	Aug-12	No	Yes	7,478	1,519	***2013***
Raccoon Cr.	Oct-09	Aug-12	No	Yes	827	276	***2013***
Conneaut Cr.	Oct-09	Aug-12	Yes	Yes	69,916	29,654	***2013***
Wheeler Cr.	Never	Jul-11	---	No	---	---	Unknown
Grand R.	Oct-09	Aug-12	Yes	Yes	5,404	3,002	***2013***
Chagrin R.	Never	Sept-12	No	Yes	1,725	1,725	Unknown
St. Clair River/Lake St. Clair Tributaries							
Black R.	Never	Jun-12	---	No	---	---	Unknown
Mill Cr.	Never	Jun-12	---	No	---	---	Unknown
Pine R.	Apr-88	Jun-12	---	No	---	---	Unknown
Belle R.	Never	Jun-12	---	No	---	---	Unknown
Clinton R.	Never	Jun-12	---	Yes	---	---	Unknown
St. Clair R.	Never	May-12	---	Yes	---	---	Unknown
Thames R.	Never	Sept-12	---	No	---	---	Unknown
Detroit R.	Never	May-12	---	No	---	---	Unknown

Table 17. Status of larval sea lampreys in historically infested lentic areas of Lake Erie during 2012.

Tributary	Lentic Area	Last Surveyed	Last Survey Showing Infestation	Last Treated
United States				
Cattaraugus Cr.	Sunset Bay	Aug-12	Aug-12	Never[1]
Conneaut Cr.	Conneaut Harbor	Jul-10	Jul-06	Never[1]
Grand R.	Fairport Harbor	Jul-10	Jun-87	Never[1]

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

Lake Ontario

- Larval assessments were conducted on a total of 49 tributaries (24 Canada, 25 U.S.). The status of larval sea lampreys in historically infested Lake Ontario tributaries and lentic areas is presented in Tables 18 and 19.

- Surveys to estimate abundance of larval sea lampreys were conducted in nine tributaries (four Canada, five U.S.).

- Surveys to detect the presence of new larval sea lamprey populations were conducted in six Canadian tributaries. No new populations were detected.

- Post-treatment assessments were conducted in 12 tributaries (9 Canada, 3 U.S.) to determine the effectiveness of lampricide treatments conducted during 2011 and 2012.

- Surveys to evaluate barrier effectiveness were conducted in nine tributaries (six Canada, three U.S.). Sea lampreys were found upstream of the dam on Bronte Creek.

Table 18. Status of larval sea lampreys in Lake Ontario tributaries with a history of sea lamprey production and estimates of abundance from tributaries surveyed during 2012.

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							
Niagara R.	Never	Jul-10	---	Yes	---	---	Unknown
Ancaster Cr.	May-03	Sep-11	No	No	---	---	Unknown
Grindstone Cr.	Never	Sep-11	No	No	---	---	Unknown
Bronte Cr.	Apr-10	Jul-12	No	Yes	---	---	***2013***[1]
Sixteen Mile Cr.	Jun-82	Sep-11	No	No	---	---	Unknown
Credit R.	Jul-11	Jul-12	Yes	No	16,957	3,374	2015
Humber R.	Never	Jul-12	---	No	---	---	Unknown
Rouge R.	Jun-11	Jul-11	No	No	---	---	2014
Petticoat Cr.	Sep-04	Jul-11	No	No	---	---	Unknown
Duffins Cr.	May-12	Aug-12	No	Yes	---	---	2015
Carruthers Cr.	Sep-76	Apr-09	No	No	---	---	Unknown
Lynde Cr.	May-12	Aug-12	No	Yes	---	---	2015
Oshawa Cr.	May-12	Aug-12	No	Yes	---	---	2015
Farewell Cr.	Jun-12	Aug-12	No	No	---	---	2015
Bowmanville Cr.	May-11	Aug-12	No	Yes	4,478	488	2014
Wilmot Cr.	May-12	Aug-12	No	Yes	---	---	2015
Graham Cr.	May-96	May-10	No	No	---	---	Unknown
Wesleyville Cr.	Oct-02	Aug-12	No	No	---	---	Unknown
Port Britain Cr.	Apr-12	Aug-12	No	No	---	---	2015
Gage Cr.	May-71	Aug-09	No	No	---	---	Unknown
Cobourg Br.	Oct-96	Aug-11	No	Yes	---	---	Unknown
Covert Cr.	Jul-10	Aug-12	No	Yes	46,919	1,166	***2013***

Table 18. *Lake Ontario 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
Grafton Cr.	Oct-07	Aug-11	No	Yes	---	---	Unknown
Shelter Valley Cr.	Sep-03	Aug-11	No	No	---	---	Unknown
Colborne Cr.	May-09	Aug-11	No	No	---	---	Unknown
Salem Cr.	Apr-12	Aug-12	No	Yes	---	---	2015
Proctor Cr.	Apr-12	Aug-12	No	Yes	---	---	2015
Smithfield Cr.	Sep-86	Jun-12	No	No	---	---	Unknown
Trent R. (Canal System)	Sep-11	Jun-12	No	No	---	---	Unknown
Mayhew Cr.	Apr-12	Jun-12	No	---	---	---	2015
Moira R.	Jun-11	Jun-12	Yes	Yes	---	---	Unknown
Salmon R.	Jun-00	Jun-12	No	Yes	1,170	234	Unknown
Napanee R.	Never	May-11	---	No	---	---	Unknown
United States							
Black R.	Aug-12	May-11	No	Yes	---	---	2016
Stony Cr.	Sep-82	May-11	No	No	---	---	Unknown
Sandy Cr.	Never	Apr-12	---	No	---	---	Unknown
South Sandy Cr.	May-11	Aug-12	No	Yes	292,201	4,917	***2013***
Skinner Cr.	Apr-05	Jul-11	No	No	---	---	Unknown
Lindsey Cr.	May-11	Aug-12	Yes	Yes	38,435	8,219	***2013***
Blind Cr.	May-76	Jul-10	No	No	---	---	Unknown
Little Sandy Cr.	Jun-10	Aug-12	No	Yes	---	---	***2013***[1]
Deer Cr.	Apr-04	Apr-12	No	No	---	---	Unknown
Salmon R.	May-11	Aug-12	Yes	Yes	334,833	1,290	2014
Orwell Brook	Apr-12	Jul-12	Yes	Yes	---	---	***2013***[1]
Trout Brook	Apr-10	Apr-12	Yes	Yes	75,618	13,497	***2013***
Grindstone Cr.	Apr-10	Aug-12	Yes	Yes	---	---	***2013***[1]
Snake Cr.	May-11	Aug-12	No	No	---	---	2015
Sage Cr.	May-78	Apr-10	No	No	---	---	Unknown
Little Salmon R.	Apr-12	Jul-12	Yes	---	---	---	2015
Butterfly Cr.	May-72	Apr-12	No	No	---	---	Unknown
Catfish Cr.	Apr-12	Jul-11	---	---	---	---	2015
Oswego R.							
Black Cr.	May-81	Jun-11	No	No	---	---	Unknown
Big Bay Cr.	Sep-93	Apr-12	No	No	---	---	Unknown
Scriba Cr.	Jun-10	Apr-12	No	No	---	---	Unknown
Fish Cr.	Jun-10	Jul-12	No	Yes	---	---	***2013***[1]
Carpenter Br.	May-94	Apr-12	No	No	---	---	Unknown
Putnam Br./ Coldsprings Cr.	May-96	Oct-10	No	No	---	---	Unknown
Hall Br.	Never	Oct-10	---	No	---	---	Unknown
Crane Br.	Never	Apr-12	---	No	---	---	Unknown
Skaneateles Cr.	Never	Oct-10	---	No	---	---	Unknown
Rice Cr.	May-72	Apr-10	No	No	---	---	Unknown
Eight Mile Cr.	Apr-07	Apr-12	No	No	---	---	Unknown
Nine Mile Cr.	May-11	Jul-11	No	No	---	---	2014

Table 18. *Lake Ontario 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
Sterling Cr.	May-12	Aug-12	No	No	---	---	2015
Blind Sodus Cr.	May-78	Apr-09	No	No	---	---	Unknown
Red Cr.	Apr-10	Aug-12	No	No	---	---	2015
Wolcott Cr.	May-79	Apr-11	No	No	---	---	Unknown
Sodus Cr.	May-10	Aug-12	No	Yes	1,145	191	2014
Forest Lawn Cr.	Never	Jul-11	---	Yes	---	---	Unknown
Irondequoit Cr.	Never	Aug-12	---	No	---	---	Unknown
Larkin Cr.	Never	Aug-12	---	No	---	---	Unknown
Northrup Cr.	Never	Aug-12	---	No	---	---	Unknown
Salmon Cr.	Apr-05	Aug-12	No	Yes	---	---	Unknown
Sandy Cr.	Apr-09	Jul-11	No	Yes	---	---	Unknown
Oak Orchard Cr. Marsh Cr.	May-08	Aug-12	No	Yes	899	245	Unknown
Johnson Cr.	Apr-10	Jul-11	No	No	---	---	Unknown
Third Cr.	May-72	Oct-11	No	No	---	---	Unknown
First Cr.	May-95	Apr-11	No	No	---	---	Unknown

[1]Stream is being treated based on expert knowledge.

Table 19. Status of larval sea lampreys in historically infested lentic areas of Lake Ontario during 2012.

Tributary	Lentic Area	Last Surveyed	Last Survey Showing Infestation	Last Treated
Canada				
Duffins Cr.	Duffins Cr. - lentic	Aug-12	Aug-12	Never[1]
Oshawa Cr.	Oshawa Cr. - lentic	Oct–81	Oct–81	Never
Wilmot Cr.	Wilmot Cr. - lentic	Aug-11	Aug-11	Never[1]
United States				
Black R.	Black River Bay	Oct-10	Jul-10	Never[1]

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

Juvenile Assessment

The juvenile life stage is assessed through the interpretation of marking rates by feeding juvenile sea lampreys on lake trout. Terminology for life stages in this report have been standardized from previous years. *Out-migrating juveniles* replaced *metamorphosing-phase* and *transformers*, and *feeding juvenile*s replaced *parasitic-phase*. 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.

Beginning in 2007, the Commission contracted with the Service's Green Bay Fish and Wildlife Conservation Office (GBFWCO) to calculate marking statistics and lake trout abundance and to evaluate and describe the consistency of indices used to understand the damage caused by sea lampreys. In the fall of 2010, the Commission and GBFWCO began a process to create an updated database that consolidates the most recent fisheries data to create the metrics used to assess lamprey impacts across the lakes. Data from survey and commercial sampling has been submitted from over 25 organizations and work is underway to continue to standardize the multiple data-sets into cohesive lake-wide databases. Included in these submissions is information pertaining to marking on other species that has recently become an area of concern and will be evaluated in the future. The most recent results of this effort related to lake trout are presented in Figures 3-5 and Figures 8-9 and were calculated from un-weighted data for the whole lake (average number of marks calculated from all lake trout captured of a specific length range during a specific time period). The reason for the refresh of data sources was that calculation methods and the extent of data that were used to produce the previously used plots of marking rates were not consistent between the most recent graphs presented here and those presented in previous reports. Work continues to evaluate a number of ways to present the data, including weighting data based on characteristics of the individual lake units and possible separation of distinct regions within a lake, among other ideas. With this further analysis, it is hoped that a better understanding of lamprey impacts on the fish communities in the lakes and how they affect each other will be developed.

Standardized netting of out-migrating juveniles has been conducted in the St Marys River since 1998 as an index of relative abundance produced in this system. Additionally, netting of out-migrating juveniles was conducted in the HEC during 2011 and 2012 to assess production potential of that channel. Additional netting of out-migrating juveniles was conducted in two tributaries during 2012 to prevent their out-migration to the Great Lakes and to provide lampreys for research.

Lake Superior

- Lake trout marking data for Lake Superior are provided by the Department of Natural Resources from Michigan, Minnesota, and Wisconsin; Great Lakes Indian Fish and Wildlife Commission (GLIFWC); Chippewa-Ottawa Resource Authority; Keweenaw Bay Indian Community; Grand Portage Band of Lake Superior Chippewa Indians; and the Ministry; and are analyzed by the GBFWCO.

- Based on standardized spring assessment data, the marking rate during 2012 was 6 A1-A3 marks per 100 lake trout >533mm. The marking rate has been greater than the target of 5 marks per 100 fish for at least the last 10 years, but has declined for 4 consecutive years (Figure 3).

- The MDNR provided data on the frequency of juvenile sea lampreys attached to fish caught by charter boats during 2012:

    - A total of 63 juvenile sea lampreys attached to lake trout were collected from 4 of 8 management districts. Attachment rate during 2012 was 1.6 per 100 lake trout (n = 3,915), which was greater than attachment rates on lake trout during 2011 (0.96 per 100 lake trout) and 2010 (0.9 per 100 lake trout).

- Out-migrating juvenile sea lampreys (referred to as *transformers* in previous years) were trapped in the Little Carp River in the early spring and again in the fall prior to and during treatment. A combination of fyke nets, scap nets, and backpack electrofishers were used to capture 304 juveniles.

- Trapping for out-migrating juveniles was conducted in the Middle River during October and November. Four fyke nets were set in the mainstream and 24 sea lampreys were captured.

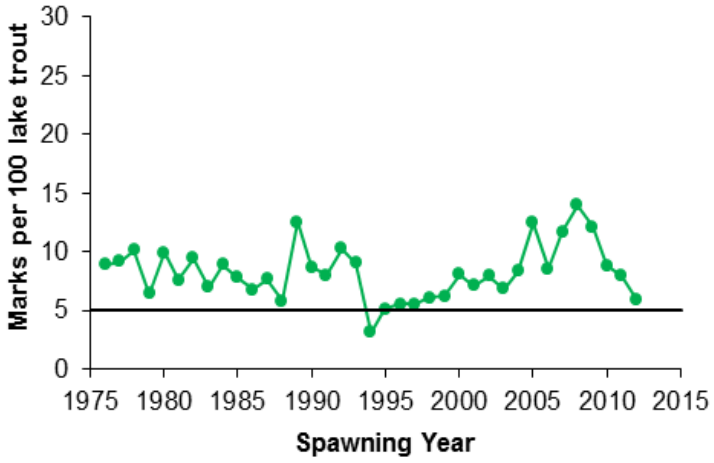

Figure 3. Average number of A1-A3 marks per 100 lake trout >533 mm caught during April-June assessments in Lake Superior, by sea lamprey spawning year (marking recorded in the spring is inflicted by the cohort of sea lampreys that spawned that year). Horizontal line represents the fish-community objective target of 5 A1-A3 marks per 100 fish.

Lake Michigan

- Lake trout marking data for Lake Michigan are provided by the MDNR, Wisconsin Department of Natural Resources (WDNR), Illinois Department of Natural Resources, IDNR, CORA, Service and U.S. Geological Survey (USGS), and are analyzed by the GBFWCO.

- Based on standardized fall assessment data, the marking rate during 2012 was 13 A1-A3 marks per 100 lake trout >533mm. The marking rate has been greater than the target of 5 per 100 fish for at least the previous 10 years, declined during 2006-2011, then increased during 2012 (Figure 4).

- The MDNR and WDNR provided data on the frequency of juvenile sea lampreys attached to fish caught by sport charter fishers during 2012.

    - A total of 1,581 juvenile sea lampreys were collected from 14 management districts; 213 were attached to lake trout and 1,368 were attached to Chinook salmon. Attachment rates during 2012 were 0.92 per 100 lake trout (n = 23,028) and 0.08 per 100 Chinook salmon (n = 201,012), which was similar to attachment rates on lake trout during 2011 (0.91 per 100 lake trout) but much less than attachment rates on Chinook salmon during 2011 (0.43 per 100 Chinook salmon).

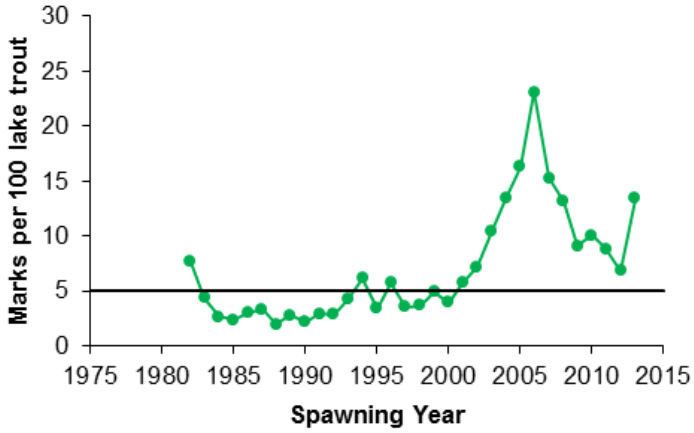

Figure 4. Average number of A1-A3 marks per 100 lake trout >533 mm from standardized fall assessments in Lake Michigan, by sea lamprey spawning year (marking recorded in the fall is inflicted by the cohort of sea lampreys that spawns the next spring). Horizontal line represents the fish-community objective target of 5 A1-A3 marks per 100 fish.

Lake Huron

- Lake trout marking data for Lake Huron are provided by the MDNR, CORA, USGS and the Ministry, and are analyzed by the GBFWCO.

- Based on standardized spring assessment data, the marking rate during 2012 was 11 A1-A3 marks per 100 lake trout >533mm. The marking rate has been greater than the target of 5 per 100 fish since 1983 (Figure 5).

- The MDNR provided data on the frequency of juvenile sea lampreys attached to fishes caught by sport charter fishers during 2012.

- A total of 119 juvenile sea lampreys were collected from 4 management districts: 46 were attached to lake trout and 73 were attached to Chinook salmon. Attachment rates during 2012 were 1.2 per 100 lake trout (n = 3,941) and 5.1 per 100 Chinook salmon (n = 1,424). This represents a decrease compared to lake trout attachment rates in 2011 (2.4) and is similar to attachment rates in 2010 and 2009 (1.57 and 1.3, respectively). The attachment rate on Chinook salmon is slightly less than attachment rates in 2011 (5.8) and slightly more than 2010 (4.5).

- Canadian commercial fisheries in northern Lake Huron continued to provide feeding juvenile sea lampreys along with associated catch information such as date, location and host species. These data are used as an index of the feeding juvenile population in this area:

  - A total of 838 feeding juveniles were collected from Lake Huron (Main Basin – 510, North Channel - 326, Georgian Bay - 2). This included 404 juveniles collected alive and used for research and public outreach. Although these total catches have not yet been standardized by effort, this represents the lowest annual total number of juveniles provided by cooperating fishermen in the last 20 years (Figure 6).

- Since 1998, standardized trapping for out-migrating juveniles has been conducted in the St Marys River as an index of relative abundance produced in this system. Approximately 11 floating fyke nets are deployed each fall in October and November in the Munuscong, Sailor's Encampment, and Middle Neebish channels. In 2012, fyke nets were operated for a total of 506 net days, resulting in the capture of 14 out-migrating juveniles, and a catch per unit effort (CPUE) of 0.03 (Figure 7).

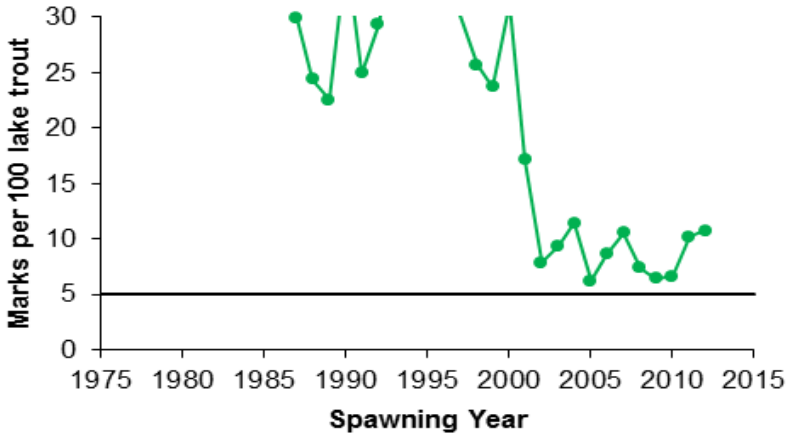

Figure 5. Average number of A1-A3 marks per 100 lake trout >533 mm caught during April-June assessments in Lake Huron, by sea lamprey spawning year (marking recorded in the spring is inflicted by the cohort of sea lampreys that spawned that year). Horizontal line represents the fish-community objective target of 5 A1-A3 marks per 100 fish.

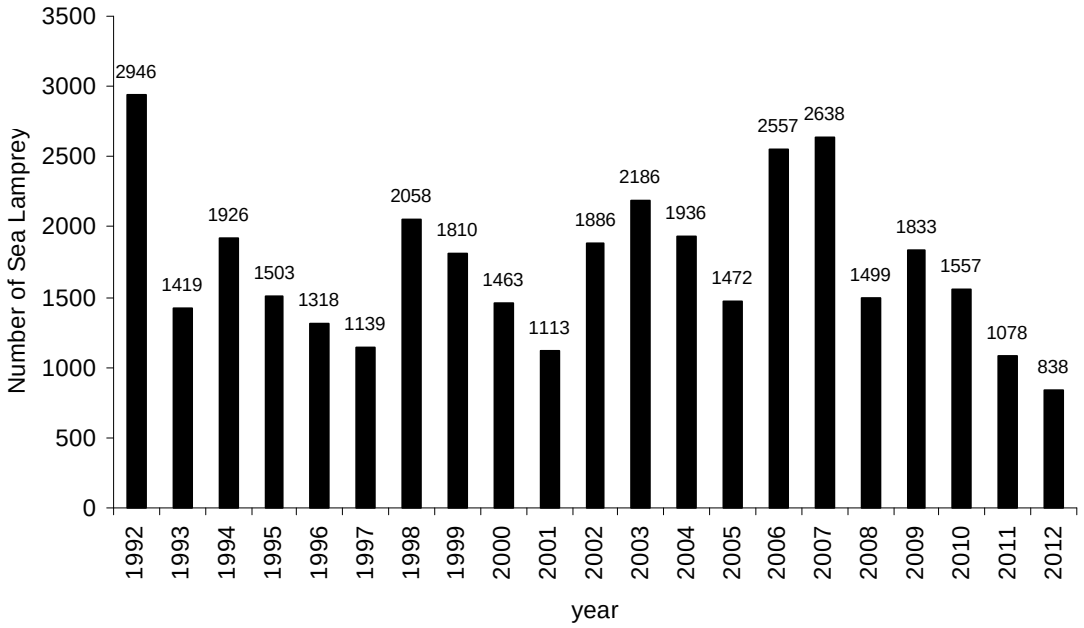

Figure 6. Number of feeding juvenile sea lampreys provided to the Department from commercial fishermen in the Manitoulin Island area (north channel and northern Lake Huron) including the preliminary total from 2012. Catches are not standardized by effort.

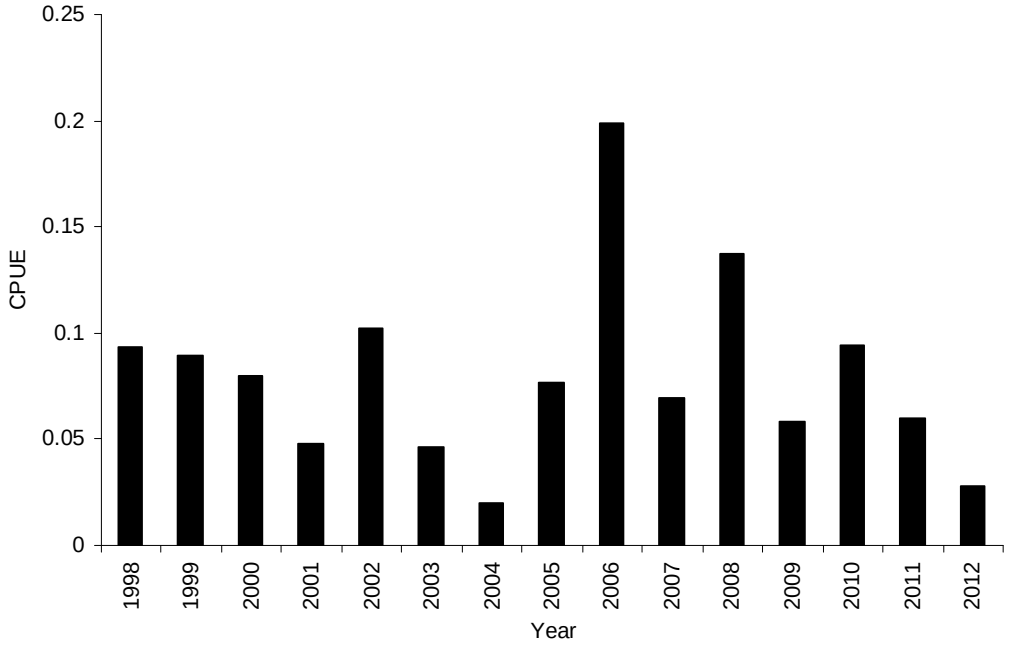

Figure 7. Catch per unit effort (number of out-migrating juvenile sea lampreys per net day) from fall fyke netting in the St. Marys River during 1998-2012.

Lake Erie

- Lake trout marking data for Lake Erie are provided by the NYSDEC, the Pennsylvania Fish and Boat Commission, USGS and the Ministry, and analyzed by the GBFWCO.

- Based on standardized fall assessment data, the marking rate during 2012 was 10 A1-A3 marks per 100 lake trout >533mm. The marking rate has been greater than the target for the last 10 years (Figure 8) and increased during 2012 after a two year decline in marking (2010-2011).

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

- A mark-recapture study was initiated to: 1) determine whether out-migrating juveniles released in the St. Clair River can migrate successfully through the HEC and be recaptured in Lake Erie as feeding juveniles or adults; and 2) compare recovery rates for juveniles released in the HEC and Lake Erie tributaries. Releases occurred in the St. Clair River (417), Big Creek (46), Big Otter (46), Cattaraugus Creek (44), Conneaut Creek (44), Crooked Creek (44), Grand River (67), Raccoon Creek (43), Silver Creek (44), South Otter Creek (44), and Youngs Creek (43). Recapture effort was conducted during fall fyke netting in the HEC and will occur again during spring 2014 when adults are vulnerable to assessment traps.

- Out-migrating juvenile sea lampreys were trapped at three locations within the HEC between November 27 and December 14. This work continued the efforts started in the lower Detroit River during 2011, but expanded to include areas further upstream (Belle Isle and the lower St. Clair River). A total of 31 floating fyke nets were deployed in U.S. waters. Nets were fished on a near continuous basis and checked every 48 hrs. Eighteen juvenile sea lampreys were collected during the nearly 9,900 hours of sampling effort. Capture of five juveniles downstream of the outlet of Lake St. Clair in the Detroit River suggests that migration through Lake St. Clair is possible. This finding indicates the need to re-examine the hypothesis that the HEC was not a significant contributor of feeding juvenile sea lampreys to Lake Erie.

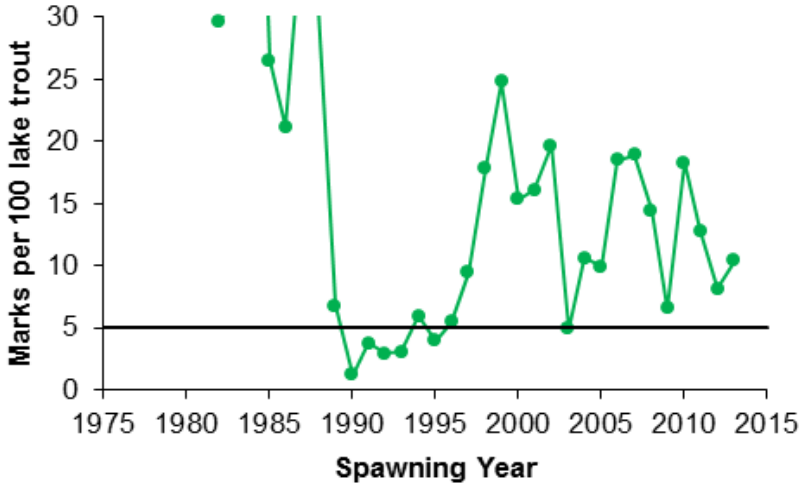

Figure 8. Average number of A1-A3 marks per 100 lake trout >533 mm from standardized fall assessments in Lake Erie, by sea lamprey spawning year (marking recorded in the fall is inflicted by the cohort of sea lampreys that spawns the next spring). Horizontal line represents the fish-community objective target of 5 A1-A3 marks per 100 fish.

Lake Ontario

- Lake trout marking data for Lake Ontario are provided by the NYSDEC, USGS, Ministry, and are analyzed by the GBFWCO.

- Based on standardized fall assessment data, the marking rate during 2012 was 2 A1 marks per 100 lake trout >431mm. The marking rate has been less than target during the last 4 years (Figure 3).

- The NYSDEC provided data on the frequency of juvenile sea lampreys attached to fish caught by sport charter fishers during 2012.

    - 3,441 juvenile sea lampreys were sampled; the percent composition of salmonine host species to which lampreys were attached was coho salmon (3%), Chinook salmon (60%), rainbow trout (9%), brown trout (22%), and lake trout (4%). Attachment rates during 2012 were 1.55 per 100 trout and salmon in the west region, 2.32 in the west central region, 2.05 in the east central region and 1.42 in the east region. In comparison to 2011 and 2010, attachment rates during 2012 were higher in the west region (1.24 in 2011 and 1.31 in 2010) and lower in the east region (4.08 in 2011 and 2.41 in 2010). In the west central region, the 2012 value was lower than it was in 2010 (2.56), but higher than 2009 (1.52). In the east central region, the 2012 value was lower than it was in 2010 (2.69), but higher than 2009 (1.54).

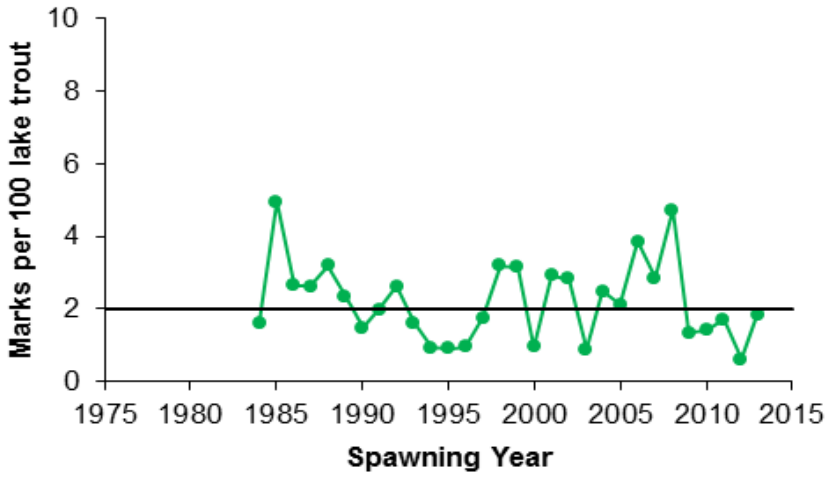

Figure 9. Number of A1 marks per 100 lake trout >431 mm from standardized fall assessments in Lake Ontario, by sea lamprey spawning year (marking recorded in the fall is inflicted by the cohort of sea lampreys that spawns the next spring). Horizontal line represents the fish-community objective target of 2 A1 marks per 100 fish.

Adult Assessment

The long-term effectiveness of the SLCP has been measured by the annual estimation of the lake-wide populations of adult sea lampreys. Terminology for life stages in this report have been standardized from previous years and the term *adult* has replaced *spawning-phase*. Traps and nets are operated to capture migrating adult sea lampreys during the spring and early summer. Abundance is estimated using a combination of mark-recapture and trapping efficiency estimates of adults in streams with traps, and regression model-predicted estimates in streams without traps.

Lake Superior

- A total of 5,135 sea lampreys were trapped on 23 tributaries (Table 20, Figure 15).

- The estimated population of adult sea lampreys was 71,846 (95% CI; 56,880-99,941) and was greater than the fish-community objective target range of 37,000 ± 19,000 (Figure 10). Large trap catches in the Chocolay, Bad and Brule rivers contributed to the increase in the lake-wide population estimate. Combined, these three streams accounted for more than a third of the lake-wide abundance estimate (29,116).

- Adult sea lamprey migrations were monitored in the Amnicon, Poplar, Middle, Bad, Firesteel, Misery, and Silver rivers through cooperative agreements with the GLIFWC, in Red Cliff Creek with the Red Cliff Band of Lake Superior Chippewa Indians, in the Brule River with the WDNR, and in the Miners River with the National Park Service, Pictured Rocks National Lakeshore.

- A three-year field-scale management experiment using the mating pheromone to enhance trap

captures was completed in 19 Great Lakes tributaries, including the Tahquamenon, Betsy, Miners, Rock, Misery, and Carp rivers, and Stokely Creek in Lake Superior. Results of this research are currently being analyzed.

Table 20. Stream name, number caught, adult sea lamprey estimate, trap efficiency, number sampled, percent males, and biological characteristics of adult sea lampreys captured in assessment traps or nets in tributaries of Lake Superior during 2012 (letter in parentheses corresponds to stream location in Figure 15).

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-McIntyre Floodway (A)									
- Neebing R.	290	1,248	23	--	--	---	---	---	---
Wolf R. (B)	0	0	0	0	0	---	---	---	---
Carp R. (C)	84	104	81	84	67	---	---	---	---
Stokely Cr. (D)	39	77	50			---	---	---	---
Big Carp R. (E)	14	14	100	13	54	---	---	---	---
Little Carp R (F)	1	---	---	---	---	---	---	---	---
Total or Mean (Canada)	**428**	**---**	**---**	**97**	**65**	**---**	**---**	**---**	**---**
United States									
Tahquamenon R. (G)	599	4,548	13	27	89	461	454	174	172
Betsy R. (H)	228	2,147	11	10	80	451	428	218	226
Miners R. (I)	58	142	41	17	29	444	434	196	177
Furnace Bay Cr. (J)	14	---	---	---	---	---	---	---	---
Rock R. (K)	285	537	53	123	50	432	424	188	177
Laughing Whitefish R. (L)	5	---	---	1	0	---	430	---	197
Chocolay R.(M)	467	6,992	7	12	75	446	463	187	195
Big Garlic R. (N)	1	---	---	---	---	---	---	---	---
Silver R. (O)	32	---	---	---	---	---	---	---	---
Misery R. (P)	19	---	---	1	100	480	---	186	---
Firesteel R. (Q)	15	---	---	4	50	410	470	182	156
Bad R. (R)	732	17,080	4	9	33	448	430	210	196
Red Cliff Cr. (S)	7	---	---	7	86	456	432	166	174
Brule R. (T)	1,683	5,044	33	59	71	443	428	125	161
Poplar R. (U)	1	---	---	---	---	---	---	---	---
Middle R. (V)	354	1,683	21	9	33	461	418	277	173
Amnicon R. (W)	207	---	---	1	100	503	---	212	---
Total or Mean (U.S.)	**4,707**	**---**	**---**	**280**	**59**	**441**	**430**	**177**	**175**
Total or Mean (for lake)	**5,135**	**---**	**---**	**377**	**61**	**441**	**430**	**177**	**176**

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

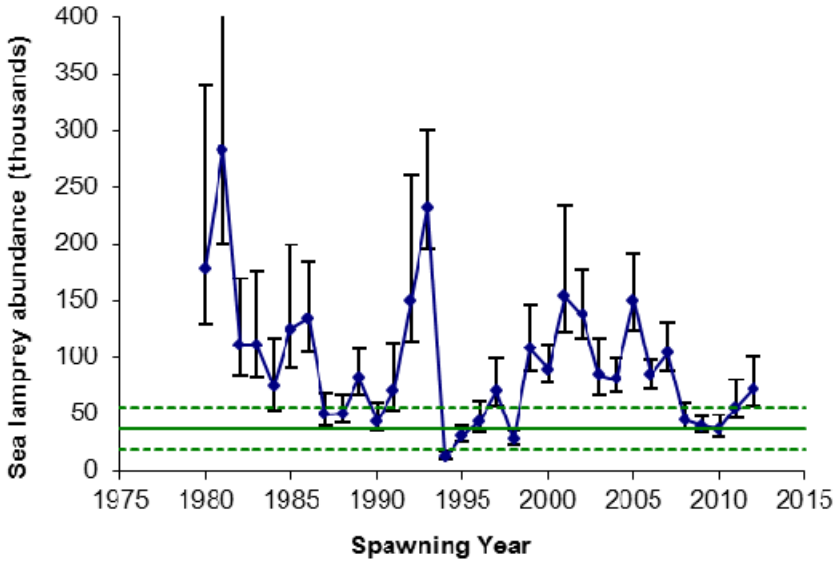

Figure 10. Annual lake-wide population estimates of adult sea lampreys in Lake Superior, 1980-2012 with 95% confidence intervals (vertical error bars). Target level is indicated by the solid horizontal line with 95% confidence intervals (dashed horizontal lines).

Lake Michigan

- A total of 20,958 sea lampreys were trapped at 18 sites on 17 tributaries (Table 21, Figure 15).

- The estimated population of adult sea lampreys was 87,887 (95% CI; 82,325-95,028) and was greater than the fish-community objective target range of 58,000 ± 13,000 (Figure 11). Noteworthy is the increase in the adult population estimate in the Manistique River that accounts for about 75% of the lake-wide population increase from 2011.

- 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.

- A three-year field-scale management experiment using the mating pheromone to enhance trap captures was completed in 19 Great Lakes tributaries, including the Carp Lake Outlet and Betsie and Manistee rivers on Lake Michigan. Results of this research are currently being analyzed.

Table 21. Stream name, number caught, adult sea lamprey estimate, trap efficiency, number sampled, percent males, and biological characteristics of adult sea lampreys captured in assessment traps or nets in tributaries of Lake Michigan during 2012 (letter in parentheses corresponds to stream location in Figure 15).

Tributary	Number Caught	Adult Estimate	Trap Efficiency	Number Sampled[1]	Percent Males[2]	Mean Length (mm)		Mean Weight (g)	
						Males	Females	Males	Females
Carp Lake Outlet (A)	1,201	2,362	51	269	57	473	467	222	227
Jordan R. (B)	---	---	---	---	---	---	---	---	---
Deer Cr.	122	869	14	12	42	477	503	245	276
Elk Lake Outlet (C)	95	276	34	24	71	488	465	249	226
Boardman R. (D)	515	1,001	51	199	51	467	470	226	241
Betsie R. (E)	1,186	2,895	41	188	57	485	482	244	254
Big Manistee R. (F)	904	5,410	17	67	79	498	497	272	276
Little Manistee R. (G)	56	120	47	15	47	491	492	270	250
Muskegon R. (H)	624	1,940	32	99	62	500	501	266	275
White R. (I)	100	341	29	12	58	418	502	228	223
St. Joseph R. (J)	399	954	42	90	50	498	497	253	271
Trail Cr. (K)	140	311	45	36	56	477	490	249	270
East Twin R. (L)	112	456	25	23	65	479	455	245	240
Oconto R. (M)	23	---	---	2	100	480	---	234	---
Peshtigo R. (N)	2,040	2,701	76	364	52	504	501	262	267
Menominee R. (O)	231	1,859	12	8	50	513	497	272	271
Ogontz R. (P)	0	---	---	---	---	---	---	---	---
Manistique R. (Q)	13,150	37,674	35	408	49	505	505	268	273
Hog Island Cr. (R)	60	---	---	---	---	---	---	---	---
Total or Mean	**20,958**	**---**	**---**	**1,816**	**54**	**490**	**490**	**251**	**258**

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

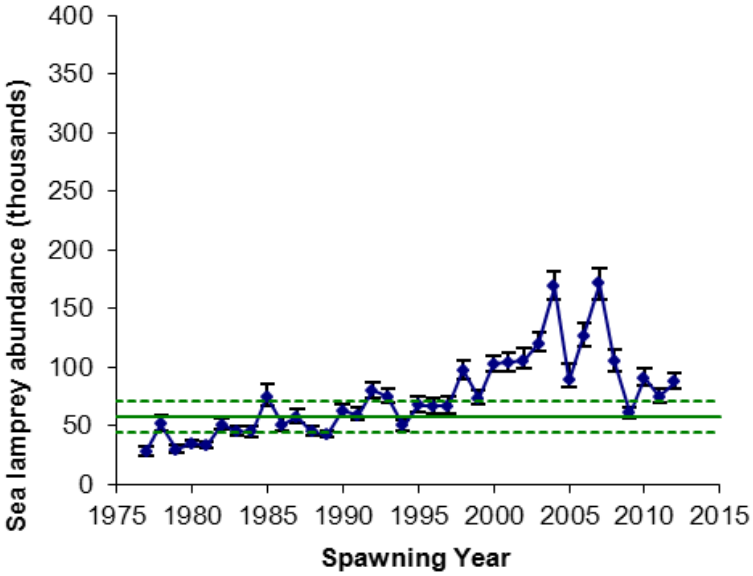

Figure 11. Annual lake-wide population estimates of adult sea lampreys in Lake Michigan, 1980-2012 with 95% confidence intervals (vertical error bars). Target level is indicated by the solid horizontal line with 95% confidence intervals (dashed horizontal lines).

Lake Huron

- A total of 45,646 sea lampreys were trapped at 17 sites in 16 tributaries (Table 22, Figure 15).

- The estimated population of adult sea lampreys was 275,006 (95% CI; 236,999-332,782) and was greater than the fish-community objective target range of 76,000 ± 20,000 (Figure 12). Large trap catches in the Cheboygan, Ocqueoc, and St. Marys rivers contributed to the increase in the lake-wide population estimate (combined population estimate from the three streams was 72,230). Nine lampreys were captured in the Mississagi River, but there was no recapture information to develop a stream population estimate. Therefore, a model estimate was used for the Mississagi River (population estimate of 79,000 compared to the mark recapture estimate in 2011 of 1,190). The model estimate for the Mississagi River of 79,000 is the largest single source of the Lake Huron increase for 2012 and demonstrates a concern with the accuracy of the model in large streams without consistent mark-recapture data. Combined, those four streams accounted for more than half of the Lake Huron population estimate.

- A total of 9,447 adult sea lampreys were captured in traps operated in the St. Marys River at the Clergue Generating Station in Canada, and the USACOE, Cloverland Electric plants and compensating gates in the U.S. The estimated population in the river was 21,386 sea lampreys and trapping efficiency was 44%.

- A field experiment to increase trap efficiency by manipulating flow at the compensating gates and Brookfield Renewable Power was conducted on the St. Marys River. Results are being reviewed and a final report is pending.

- A three-year field-scale management experiment using the mating pheromone to enhance trap captures was completed in 19 Great Lakes tributaries, including the East Au Gres, Echo, Thessalon, and Little Thessalon rivers in Lake Huron. Results of this research are currently being analyzed.

Table 22. Stream name, number caught, adult sea lamprey estimate, trap efficiency, number sampled, percent males, and biological characteristics of adult sea lampreys captured in assessment traps or nets in tributaries of Lake Huron during 2012 (letter in parentheses corresponds to stream location in Figure 15).

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)	9,447	21,386	44	5,970	63	---	---	---	---
Echo R. (B)	1,224	6,272	20	1,224	65	---	---	---	---
Koshkawong R. (C)	0	---	---	---	---	---	---	---	---
Thessalon R. (D)	5	---	---	5	80	---	---	---	---
Little Thessalon R.	3,671	5,276	70	3,670	60	---	---	---	---
Mississagi R. (E)	9	---	---	9	33	---	---	---	---
Total or Mean (Canada)	**14,356**	---	---	**10,878**	**62**	---	---	---	---
United States									
Tittabawassee R. (F)	94	---	---	---	---	---	---	---	---
East Au Gres R. (G)	685	9,971	7	8	75	534	533	2,440	266
Au Sable R. (H)	477	9,256	5	2	100	506	---	215	---
Devils R. (I)	10	---	---	3	67	461	440	226	216
Trout R. (J)	0	---	---	---	---	---	---	---	---
Ocqueoc R. (K)	11,609	26,006	45	458	55	465	468	226	230
Greene Cr. (L)	1	---	---	---	---	---	---	---	---
Cheboygan R. (M)	18,033	24,838	73	735	52	476	482	222	236
Carp R. (N)	33	---	---	---	---	---	---	---	---
Trout Cr. (O)	65	166	39	20	55	454	471	198	205
Albany Cr. (P)	283	906	31	40	48	473	448	224	189
St. Marys R. (A)	See Canada	See Canada	See Canada	87	67	494	479	240	232
Total or Mean (U.S.)	**31,290**	---	---	**1,353**	**54**	**473**	**476**	**237**	**232**
Total or Mean (for Lake)	**45,646**	---	---	**12,231**	**61**	**473**	**476**	**237**	**232**

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

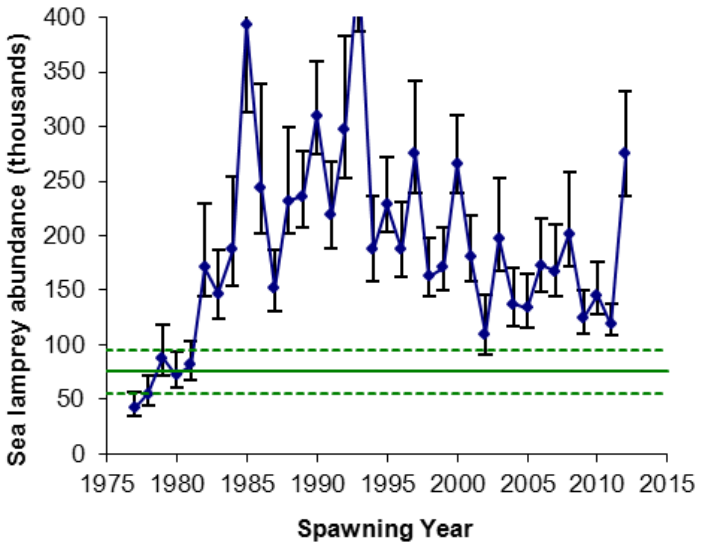

Figure 12. Annual lake-wide population estimates of adult sea lampreys in Lake Huron, 1980 – 2012 with 95% confidence intervals (vertical error bars). Target level is indicated by the solid horizontal line with 95% confidence intervals (dashed horizontal lines).

Lake Erie

- A total of 3,015 sea lampreys were trapped at 8 sites on 6 tributaries during 2012 (Table 23, Figure 15).

- The estimated population of adult sea lampreys was 17,211 (95% CI; 13,444-23,949) and was greater than the fish-community objective target range of 3,000 ± 1,000 (Figure 13).

- Construction of the Cattaraugus Creek sea lamprey trap at Scoby Hill Dam continued during late summer and fall. Operation will begin during spring 2013.

Table 23. Stream name, number caught, adult sea lamprey estimate, trap efficiency, number sampled, percent males, and biological characteristics of adult sea lampreys captured in assessment traps or nets in tributaries of Lake Erie during 2012 (letter in parentheses corresponds to stream location in Figure 15).

Tributary	Number Caught	Adult Estimate	Trap Efficiency	Number Sampled[1]	Percent Males[2]	Mean Length (mm)		Mean Weight (g)	
						Males	Females	Males	Females
Canada									
Big Cr. (A)	1,772	3,324	53	---	---	---	---	---	---
Young's Cr. (B)	197	395	50	---	---	---	---	---	---
Big Otter Cr. (C)	11	---	---	---	---	---	---	---	---
Little Otter Cr.	228	---	---	---	---	---	---	---	---
Total or Mean (Canada)	**2,208**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**
United States									
Cattaraugus Cr. (D)	217	1,541	14	1	100	467	---	288	---
Spooner Cr.	63	240	26	11	64	491	462	286	253
Grand R. (E)	513	---	---	---	---	---	---	---	---
Huron R. (F)	14	---	---	---	---	---	---	---	---
Total or Mean (U.S.)	**807**	**---**	**---**	**12**	**67**	**488**	**462**	**286**	**253**
Total or Mean (for lake)	**3,015**	**---**	**---**	**12**	**67**	**488**	**462**	**286**	**253**

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

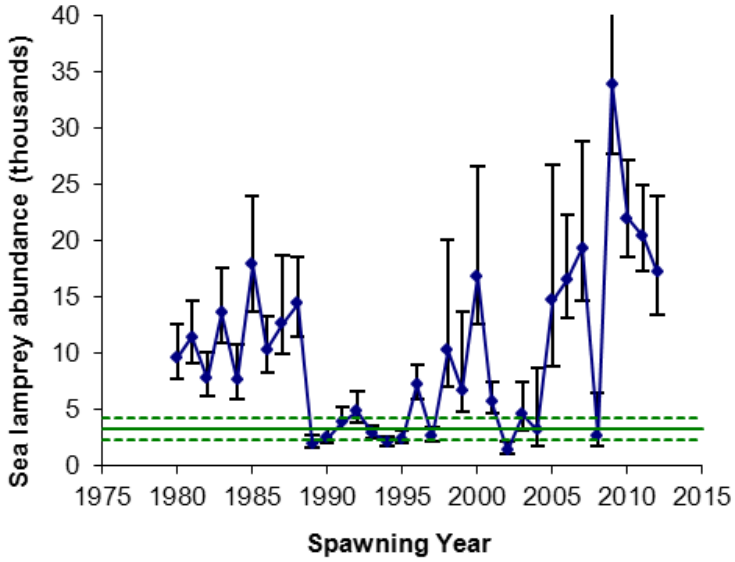

Figure 13. Annual lake-wide population estimates of adult sea lampreys in Lake Erie, 1980 – 2012 with 95% confidence intervals (vertical error bars). Target level is indicated by the solid horizontal line with 95% confidence intervals (dashed horizontal lines).

Lake Ontario

- A total of 7,835 sea lampreys were trapped at 11 sites on 10 tributaries (Table 24, Figure 15).

- The estimated population of adult sea lampreys was 57,270 (95% CI; 51,290-65,314) and was greater than the fish-community objective target range of 31,000 ± 4,000 (Figure 14).

- The Humber River and Duffins Creek traps were jointly operated through a partnership with the Toronto and Region Conservation Authority, the Cobourg Brook fishway and trap through a partnership with the Ganaraska River Conservation Authority, and the Salmon River trap through a partnership with the Mohawks of the Bay of Quinte.

- A three-year field-scale management experiment using the mating pheromone to enhance trap captures was completed in 19 Great Lakes tributaries, including the Humber River; Duffins, Bowmanville, and Graham creeks; and Cobourg Brook in Lake Ontario. Results of this research are currently being analyzed.

Table 24. Stream name, number caught, adult sea lamprey estimate, trap efficiency, number sampled, percent males, and biological characteristics of adult sea lampreys captured in assessment traps or nets in tributaries of Lake Ontario during 2012 (letter in parentheses corresponds to stream location in Figure 15).

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)	3,118	5,312	59	3,118	52	477	476	258	253
Duffins Cr. (B)	1,763	3,831	46	1,763	53	503	488	269	263
Bowmanville Cr. (C)	177	450	39	60	50	495	487	273	267
Graham Cr. (D)	140	399	35	43	44	500	495	260	260
Cobourg Cr. (E)	332	715	46	60	47	482	485	245	291
Salmon R. (F)	1	---	---	---	---	---	---	---	---
Total or Mean (Canada)	**5,531**	---	---	**5,044**	**52**	**487**	**481**	**262**	**257**
United States									
Black R. (G)	2,228	14,529	15	109	60	491	512	242	278
Grindstone Cr. (H)	160	---	---	1	100	528	---	289	---
Little Salmon R. (I)	36	---	---	---	---	---	---	---	---
Sterling Cr. (J)	36	---	---	---	---	---	---	---	---
Sterling Valley Cr.	5	---	---	---	---	---	---	---	---
Total or Mean (U.S.)	**2,465**	---	---	**110**	**60**	**491**	**512**	**242**	**278**
Total or Mean (for lake)	**7,996**	---	---	**5,154**	**52**	**487**	**482**	**261**	**258**

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

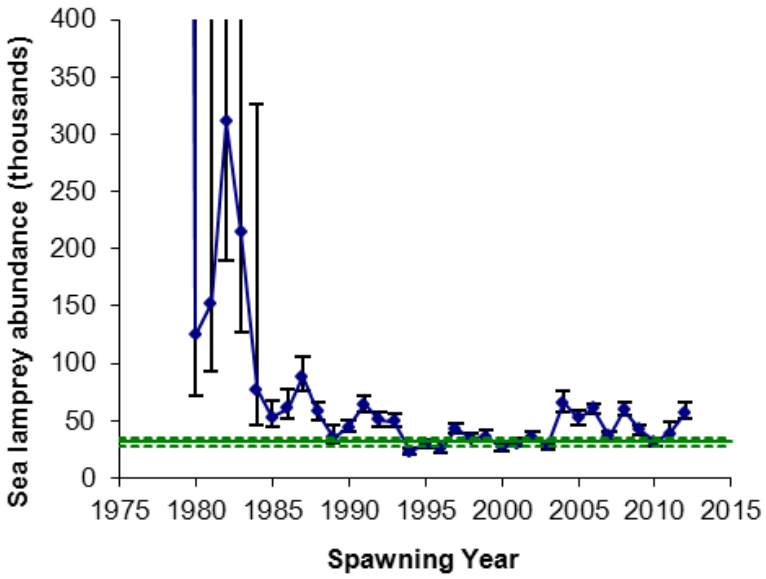

Figure 14. Annual lake-wide population estimates of adult sea lampreys in Lake Ontario, 1980 – 2012 with 95% confidence intervals (vertical error bars). Target level is indicated by the solid horizontal line with 95% confidence intervals (dashed horizontal lines).

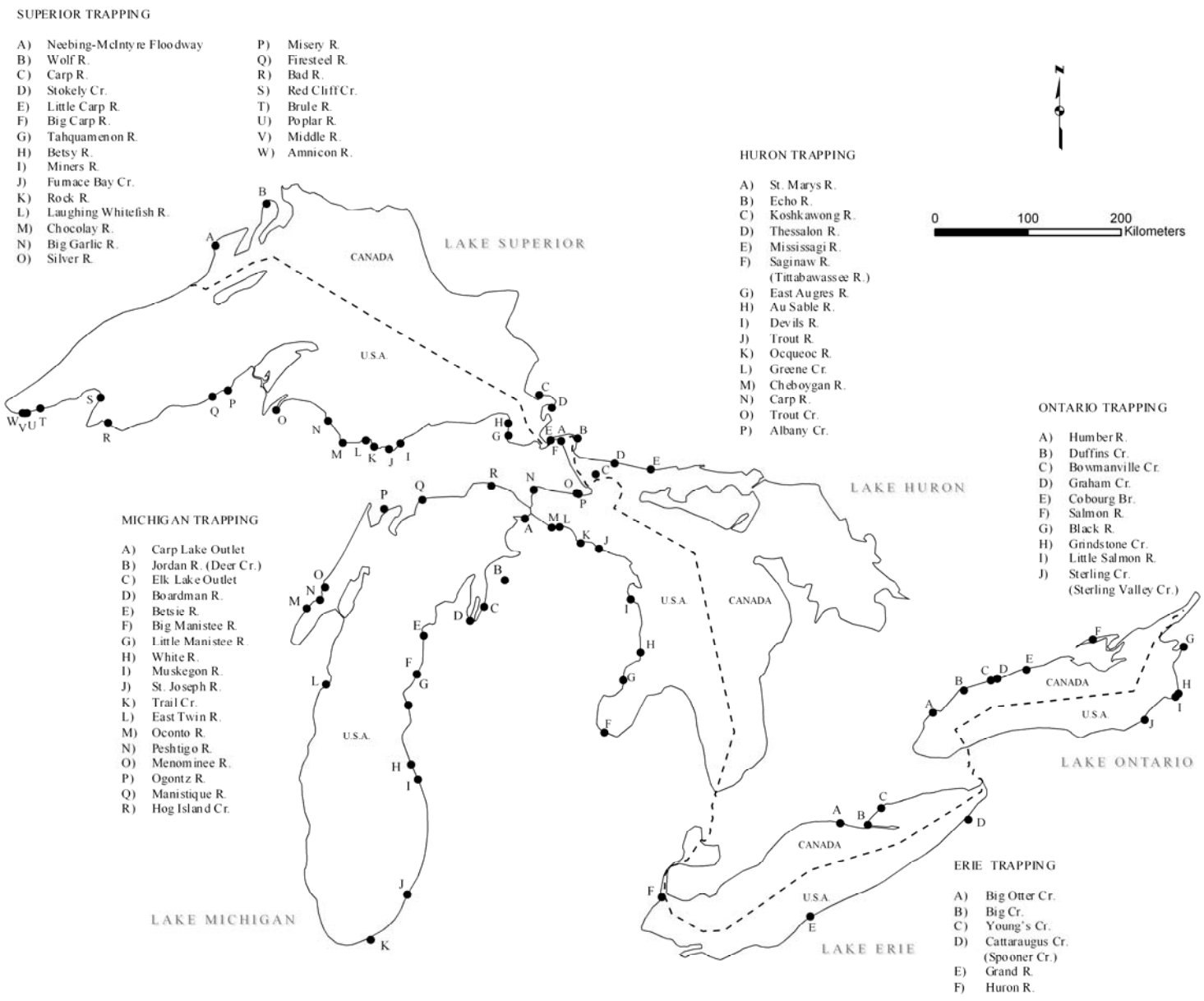

Figure 15. Locations of tributaries where assessment traps were operated during 2012.

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.

- No mortality or disturbance was observed during 2012 sea lamprey control operations for the 63 federal and state listed species and the de-listed bald eagle *(Haliaeetus leucocephalus)*.

Endangered Species Act

Section 7 of the Endangered Species Act (ESA) requires all U.S. federal agencies to 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 2012, 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:

- Columbus Ohio Field Office
- East Lansing Field Office
- Green Bay Field Office
- New York Field Office
- Twin Cities Field Office

Programmatic Review

Because of the broad scope of the SLCP, reviews and consultations under Section 7 of the ESA involves several states, many listed species, and hundreds of streams. In an effort to streamline the 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 review due to limited availability of staffing within the ES Program.

Species or Stream-specific Investigations

- Piping Plover - Piping plover (*Charadrius melodus*) adults and chicks were observed before, during and after the Platte River treatment (June 20 - 22). Two piping plover nesting pairs with three chicks each were observed at the mouth of the river. No unusual behavior was observed during or after the treatment and observations supported the 2009 biological assessment (BA) determination that TFM treatments are "not likely to adversely affect" piping plovers.

- Snuffbox Mussel - Bioassays were conducted to determine the acute toxicity of TFM to ellipse mussel (*Venustaconcha ellipsiformis*) glochidia and 1-week old juveniles. The ellipse mussel was used as a surrogate to the adult snuffbox mussel due to the 2012 listing of snuffbox as federally-endangered. Survival of ellipse glochidia averaged 97% (range 95-97) at 2.17 X the sea lamprey minimal lethal concentration (SLMLC) and control survival was 99%. Survival of one week old juvenile ellipse averaged 96% (range 89-100) at 1.79 X SLMLC and control survival was 100%. Results from ellipse tests (glochidia, juveniles and adults) were compared to tests conducted on snuffbox (glochidia and juveniles) to indicate how adult snuffbox would respond to TFM exposure. This information was used to draft the BA for the application of TFM in streams with extant snuffbox mussel populations.

- Adult ellipse mussels were observed *in situ* before, during, and after the TFM treatment of Goodings Creek (Cass River; Tuscola County, Michigan). A total of 51 mussels were located and identified. Position, foot extension, valve gape and movement were recorded every hour. The field observations supported the 2011 bioassay results of 100 percent adult ellipse survival at TFM concentration ratios up to 3.0 X SLMLC and were used to draft the BA for the application of TFM in streams with extant snuffbox mussel populations.

State-Listed Species

Annual Reviews

Reviews are conducted annually with state agencies to fulfill regulatory agency 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 2012, the MDNR reviewed endangered species within their jurisdiction and issued the permit to conduct lampricide applications.

Species or Stream-specific Investigations

- Stonecat - Year one of a two year study was initiated on the Chippewa River (Isabella County, Michigan) to determine the proportion of a stonecat (*Noturus flavus*) population that survives a TFM treatment. Stonecats electrofished from a riffle section of the river were marked and released prior to the treatment. Dead stonecats were collected during the treatment, but no marked fish were recaptured. Post treatment surveys occurred one week after the treatment and again during August. No marked fish were recaptured and newly captured fish were marked and released.

Field Protocols

Both federal and state listed species are considered in protocols developed annually for field staff. The protocols provided field personnel with a list of protected federal and state listed species, their known locations, and conservation measures to avoid and protect where sea lamprey control activities are scheduled. During 2012, the following protocols were implemented to protect and avoid disturbance to federal- and state-listed species:

- *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 2012.*

- *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 2012.*

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.

An Environmental Assessment (EA) of lampricide treatments under the SLCP was completed in 1976 at which time the Service determined that periodic treatment of sea lamprey producing tributaries with TFM and Bayer 73 was not a major federal action significantly affecting the quality of the human environment. Accordingly the preparation of an environmental impact statement covering lampricide treatment activities under the SLCP was not required.

The barrier program of the SLCP was covered under an EA prepared in 1979 and the Service determined that this activity was not a major federal action significantly affecting the quality of the human environment. Accordingly the preparation of an environmental impact statement covering barrier dams under the SLCP was not required.

In 1991 the U.S. Department of the Interior, Office of the Solicitor, reviewed available sources and determined that the SLCP remained in full compliance with NEPA. In 1998 the Service once again considered SLCP compliance with NEPA and determined that the 1979 EA covering the barrier dam program to provide sufficient coverage.

Federal Insecticide, Fungicide and Rodenticide Act

Reports were prepared to comply with the U.S. Environmental Protection Agency (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 25).

Table 25. Summary of 6(a)(2) incidents on non-target organisms during 2012.

Lake	Stream	Mortality	Freq	Comments
Champlain	Great Chazy R.[1]	Stonecat (*Noturus flavus*)	730	unexpected pH drop and incomplete mix
Huron	Chippewa R.[1]	Stonecat (*Noturus flavus*)	378	
Michigan	Rapid R.[2]	White Sucker *(Catostomus commersonii)* Johnny darter *(Etheostoma nigrum)*	450-500 55-65	wind direction change, fish trapped in shallow water with chemical

[1] TFM
[2] gB

TASK FORCE REPORTS

During its 2012 Annual Meeting the Commission restructured its Sea Lamprey Integration Committee (SLIC) and task forces. The SLIC was reformed into the Sea Lamprey Control Board (SLCB). The Lampricide Control and Barrier task forces remained intact. The Assessment and Reproduction Reduction task forces were disbanded and replaced with the two new task forces: the Larval Assessment Task Force and the Trapping Task Force. 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 as charged to each task force by the SLCB.

Lampricide Control Task Force

Purpose

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

2012 Membership

Brian Stephens (Chair – appointed April 2010), Barry Scotland, (Department); Dorance Brege, Lisa Walter, Cheryl Kaye, Ellie Koon, Shawn Nowicki, Tim Sullivan (Service); Jean Adams, Mike Boogaard, Terry Hubert, Karen Slaght (USGS); Michael Wilkie (Wilfred Laurier University); and Dale Burkett, Mike Steeves (Commission Secretariat).

The Task Force met February 9 and September 10-11, 2012.

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.

2012 Outcomes:

1. Lampricide applications were completed on most streams identified under the continuation of the large-scale treatment strategy in Lakes Huron and Michigan. Two streams were deferred due to insufficient discharge.
2. Treatment enhancement strategies (which include treating at greater than MLC, treating for longer durations, increasing secondary application effort and/or treating during optimal time periods) were conducted on streams scheduled for treatment in

2012. The success of these enhancements was evaluated based on post-treatment surveys.

3. Additional staff were deployed in the spring in order to treat more streams and to take advantage of seasonal susceptibility of sea lampreys and optimal stream discharges and water chemistries.
4. Streams listed under the 'Geographical Efficiencies' category were treated in order to realize savings in travel and to increase efficiencies in utilizing personnel.
5. Nets were utilized to capture larvae activated during treatment of a tributary to a larger untreated portion of the watershed.

2013 Objectives:

1. Year two of the continuing large-scale treatment strategy to be completed.
2. Treatment enhancement strategies are to be reviewed and revised for lampricide applications scheduled for 2013 and implemented where applicable.
3. Additional staff to be deployed to conduct spring treatments.
4. Streams identified as 'Geographical Efficiencies" to be treated in 2013.

Strategy 2: Measure the effectiveness of lampricide application and account for its variation among streams.

2012 Outcomes:

1. Lampricide analysis and water chemistry data were reviewed to identify potential areas that did not receive theoretical lethal TFM concentration during stream treatments.
2. Treatment evaluation surveys were reviewed to identify deficiencies in the treatment effectiveness.
3. Conducted on-stream observations during treatments to identify other potential sources of lamprey and communicated information to larval assessment crews to direct future survey work.

2013 Obectives:

1. Review treatment generated data and treatment evaluation survey information to refine treatment enhancement strategies for future treatments.
2. Conduct on-stream observations during treatment and identify areas that provide possible refuge for larval sea lamprey.
3. The use of Emulsifiable Concentrate (EC) will be increased with the goal of eliminating the requirement for Wettable Powder. EC is easier to use and results in improved analysis and regulation of niclosamide concentrations. A new delivery system is to be tested to eliminate issues that have occurred during high volume applications.

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

Strategy 5: Implement integrated strategies for sea lamprey control for each lake and evaluate their effectiveness.

2012 Outcomes:

1. The LCTF was involved in the development of the Lake-specific Sea Lamprey Control Plan. Lampricide control strategies identified in the plan (such as identifying treatment enhancement strategies, identifying and inventorying geographical features where treatment effectiveness can be increased, and using nets to capture and remove larvae activated during treatments) were performed during 2012.

2013 Objectives:

1. Continue, where possible, implementation of lampricide control strategies as described in the Lake-specific Sea Lamprey Control Plan for all the Great Lakes.
2. Where applicable, conduct lentic granular Bayluscide treatments during or immediately following TFM treatments on streams with known lentic populations.

Barrier Task Force

Purpose

The task force was established during April 1991 to coordinate efforts of the Department, the Service, and the USACOE on the construction, operation, and maintenance of sea lamprey barriers.

2012 Membership

Jessica Barber (Chair), Cheryl Kaye, Rob Elliott (Service); Brian Stephens, Tonia Van Kempen, Bhuwani Paudel, and Tom Pratt (Department); Jim Galloway and Carl Platz (USACOE); Randy Claramunt (MDNR); Melissa Rose (Ministry); Nicholas Johnson (USGS); Rob McLaughlin (University of Guelph); and Dale Burkett, Michael Siefkes (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.

2012 Outcomes:

1. Construction of the Orwell Brook (Lake Ontario) sea lamprey barrier was completed.
2. Repair work (steel mesh lining) at the Rapide Croche Lock, Fox River (Lake Michigan) was completed.
3. Inspection and stoplog replacement at the Union Street Dam, Boardman River (Lake Michigan) was completed to address escapement issues.

4. Stoplogs were repaired or replaced at the Hesperia Dam, White River (Lake Michigan).
5. Routine maintenance at purpose-built sea lamprey barriers was completed.
6. Inspection and assessment of the blocking potential of 350 barriers in the Great Lakes was conducted.

2013 Objectives:

1. Initiate construction of the Manistique River (Lake Michigan) sea lamprey barrier.
2. Initiate design and repair of the Grand River (Lake Erie) sea lamprey barrier.
3. Initiate rebuild of Denny's Dam, Saugeen River (Lake Huron), subject to successful consultation between the Ministry and Saugeen Ojibway Nation.
4. Continue working on priority GLFER projects with the USACOE:
   a. Lake Superior: Bad River (barrier).
   b. Lake Michigan: White River (barrier), Muskegon River (trap), Little Manistee River (barrier).
   c. Lake Huron: Cheboygan River (barrier), St. Marys River (trap), AuSable River (trap), Saginaw River (barrier).
5. Investigate options for modifying Sand River (Lake Superior) defacto barrier to prevent upstream migration.
6. Investigate repair, rebuild, or removal alternatives of the sea lamprey barrier on Duffin's Creek (Lake Ontario).
7. Deliver barrier program of operation and maintenance.
8. Periodically inspect existing, purpose built and modified barriers to ensure blockage to spawning habitat.

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

Strategy 5: Implement integrated strategies for sea lamprey control for each lake and evaluate their effectiveness.

2012 Outcomes:

1. Finalized structure and uploaded all U.S. barrier data to new barrier inventory database for use in scheduling barrier inspections, larval assessments, and responding to barrier removal requests.
2. Engaged partner agencies and user groups in the barrier consultation process and requested updated removal information.
3. Investigated marking and adult capture reports from the upper Cheboygan River (Lake Huron) system.
4. Reviewed research proposals for relevance to task force and program priorities.
5. Participated in analysis of options on the Black Sturgeon River (Lake Superior) and proposed remediation measures to alleviate pressure on east berm.
6. Participated in the Department of the Interior analysis and response document for the Grand River (Lake Michigan) Sixth Street Dam removal.

7. Participated in review of the NEMO electrical guidance/blocking system to assess its utilization in the barrier program.
8. Reviewed 30 barrier removal or modification proposals to determine effects to the Program.

2013 Objectives:

1. Combine DFO and Service data in the barrier database.
2. Continue work on barrier database that incorporates treatment and larval information to assist in scheduling work and prioritizing barrier repair projects.
3. BTF members and participants will remain involved in research regarding new trapping techniques, use of chemo-sensory techniques to increase capture of adult sea lampreys and recently metamorphosed juveniles.
4. Several BTF members and participants will remain involved in technical sub-groups to investigate management and engineering options on the Black Sturgeon River.
5. Engage partner agencies in barrier removal discussions and request notification of project proposals.
6. The Cheboygan River (Lake Huron) Working Group will develop a strategic plan to propose a practical control solution to sealing the lock.

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.

2012 Membership

Lisa Walter (Chair) and Alex Gonzalez, (Service); Fraser Neave and Brian Stephens, (Department); Jean Adams and Chris Holbrook, (USGS); Travis Brenden, (Quantitative Fisheries Center, Michigan State University); Mike Steeves and Dale Burkett (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 lampreys.

2012 Outcomes:

1. Detection surveys were conducted on 322 tributaries and two lentic areas during 2012; small infestations were discovered in two Lake Superior tributaries and are being monitored.

2. Distribution surveys were conducted on 128 streams during 2012 to define the geographic limits of sea lamprey infestation.
3. Granular Bayluscide surveys conducted on the St. Clair River during 2012 showed larval sea lamprey infestation in the north, middle and south channels of the delta (previously unknown). Detection surveys in the Detroit River were negative.

2013 Objectives:

1. Continue to plan and conduct assessments that investigate potential new infestations in streams and lentic areas and prepare streams for lampricide treatments in 2013 and 2014.
2. Develop and deploy a sampling plan that continues to monitor an index of larval sea lamprey abundance in the St. Clair River, but also expands our knowledge of sea lamprey distribution throughout the HEC.

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

2012 Outcomes:

1. Conducted post-treatment assessments to determine relative treatment effectiveness on 81 tributaries and 10 lentic areas that were treated during 2011 and 2012. Treatment effectiveness was not quantified, but tributaries with noticeable residual populations were ranked for retreatment during 2013.

2013 Objectives:

1. Continue to conduct post-treatment assessments on all treated river systems.
2. Work with other task forces to plan work that will measure the effectiveness of lampricide applications.
3. Complete the analysis of low-density survey data collected during 2010-2011 consecutive treatments. This analysis aims to determine the appropriate level of effort to expend when assessing low density larval sea lamprey populations, such as those remaining in a stream after treatment.

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.

2012 Outcomes:

1. Protocols detailing methods to conduct ranking surveys were updated and a workshop was held for full time staff at all stations to review procedures for habitat collection and electrofishing methodologies.

2. Evaluated whether treatment rotation for expert judgment streams should be accelerated due to the adjustment of ranking streams based on 100mm larvae by conducting ranking surveys on a suite of EJ streams due for treatment during 2014. No changes to treatment cycles were proposed.

2013 Objectives:

1. Investigate the potential for using non-traditional methods, such as eDNA, to investigate larval sea lamprey presence/absence.

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

2012 Outcomes:

1. Planned, re-directed effort, and implemented additional stream and lentic surveys to determine sources of elevated sea lamprey abundance in Lake Erie.
2. Planned for 2013 treatments in Lake Erie tributaries that showed recruitment as directed by the SLCB.
3. Provided data for and participated in discussions on the St. Marys River Decision Analysis, specifically the assessment model.

2013 Objectives:

1. Draft a final report on outcomes of the 2010-2011 North Channel large scale treatment strategy.
2. Implement increased sampling in the HEC that continues to monitor an index of larval sea lamprey abundance in the St. Clair River, but also expands our knowledge of larval sea lamprey infestation and delineates "hot spots" that could be treated with granular Bayluscide in the future.
3. Plan for distribution surveys on streams selected for treatment as part of the 2014-2015 Large-scale Treatment Strategy.

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.

2012 Membership

Gale Bravener (Chair) and Rod McDonald (Department), Jessica Barber (Service), Jean Adams, Scott Miehls, Jane Rivera, Alex Haro (USGS); Weiming Li and Michael Wagner, (Michigan State University); Rob McLaughlin (University of Guelph), Michael Siefkes, Dale Burkett (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.

2012 Outcomes:

1. Trap operation and maintenance for the purpose of estimating lake-wide adult sea lamprey abundance was conducted in 70 streams throughout the Great Lakes, including new traps on Trail Creek (Lake Michigan) and Big Otter Creek (Lake Erie).
2. The data used by the model to estimate lake-wide adult abundance was reviewed and updated. A list of assumptions related to how the model functions was compiled.
3. Up-to-date lake trout marking metrics for all lakes, including data for years that was previously missing were assembled and delivered by Ted Treska.
4. Collected data from commercial and charter fisheries as independent indices of feeding juvenile sea lamprey abundances in the Great Lakes. Investigated sea lamprey attachment rates on lake trout and Chinook salmon from the sport fisheries. Attachment rates on lake trout were correlated with fishery independent estimates of lake trout marking rates in the upper lakes, corroborating marking rate trends.
5. Interviews were conducted with Lake Erie commercial and charter fishers in Canada. Results suggest that they have observed an increase in sea lamprey abundance over the past few years, and that larger numbers of small lampreys are observed in the western basin.
6. Fyke net sampling for outmigrating juveniles in the St. Clair and Detroit rivers was conducted over a six week period in fall 2012. Eighteen juveniles were collected (12 in St. Clair and 6 in upper Detroit), demonstrating that the St. Clair River is producing juveniles, and transit through Lake St. Clair is possible.
7. Initiated a sea lamprey movement and survival study in the Huron-Erie Corridor (HEC) and Lake Erie. Outmigrating juvenile sea lampreys were tagged with coded wire tags and released in the St. Clair River. Recaptures of these tagged individuals as adults in traps will occur in 2014.

2013 Objectives:

1. Operate and maintain traps for the purpose of estimating lake-wide adult sea lamprey abundance at 71 streams throughout the Great Lakes, including the addition of Orwell Brook (Lake Ontario).
2. Continue to improve the current method of estimating lake-wide abundance estimates, while evaluating alternative methods to measure sea lamprey control success over time using adult abundance.
3. Assemble most recent lake trout marking data, gather the missing and most recent data to generate lake-wide lake trout abundance metrics, and work towards generating regional and/or management unit lake trout abundance and marking metrics.

4. Continue collecting data from commercial and charter fisheries, and obtain effort and harvest data for northern Lake Huron fisheries to develop a CPUE index of relative abundance for sea lamprey in this region.
5. Commercial and charter fishery sea lamprey collections from Lake Erie will be scanned for coded wire tags.
6. Pending available funding and results from pilot project work, a study using mark-recapture and acoustic telemetry in Lake Huron will begin in 2013. The goal is to test assumptions required for lake-wide juvenile sea lamprey mark and recapture abundance estimates, and will evaluate juvenile survival, stream selection by adults, and timing of stream entry by adults.

Strategy 6: Deploy trapping methods to increase capture of adult and recently metamorphosed sea lampreys.

2012 Outcomes:

1. Portable traps were operated at compensating gate 16 in the St. Marys River to capture sea lampreys ascending the rapids. Flow was re-allocated to gates 15 and 16 to provide attraction water, and 450 sea lampreys were captured; a substantial increase from the 112 captured in these traps during 2011.
2. Eel-ladder style traps were tested in Cheboygan, Ocqueoc and St. Marys rivers. All traps captured sea lampreys, but results varied by system. The catch in the Cheboygan was most impressive.
3. Field tests were conducted to test the ability of the low voltage electrical system (NEPTUN) to block sea lampreys or guide them toward traps. Results suggested that this system has promise, and should be tested in management scenarios.
4. The final year of both St. Marys River sea lamprey movement studies using acoustic telemetry were successfully completed in 2012. The three year large-scale study investigated the routes that sea lamprey chose as they migrated upstream throughout the entire river; whereas the two year fine-scale study investigated movement and behaviour in the vicinity of traps at the Clergue Generating Station.
5. A new trapping biologist position has been filled at Hammond Bay Biological Station. The biologist was fully engaged in research and field work in 2012.
6. Plans to test the ability of a fishwheel to catch adult sea lampreys in large rivers with no barrier continued. The fishwheel was acquired, assembled, and potential deployment sites were visited in 2012.
7. The potential for altering adult sea lamprey behaviour using a bioacoustic fence (light, sound and bubbles) was tested in a laboratory setting. Although it was not 100% effective at blocking sea lampreys, analysis is ongoing.
8. In late 2012, lab studies began to test the ability of NEPTUN and Smith-Root electrical systems to guide out-migrating juveniles swimming downstream.
9. Research to determine the diel and spatial distribution of out-migrating juvenile sea lampreys began in Lake Champlain study streams.
10. To mitigate the escapement of out-migrating juvenile to lakes, fyke nets and a screw trap were operated on the Little Carp River and the Chippewa River in spring 2012. Several hundred large larvae were collected in the Little Carp, and 22 out-migrating juveniles were captured in the Chippewa.

2013 Objectives:

1. Continue operating portable traps at compensating gate 16 in the St. Marys River to capture sea lampreys ascending the rapids that are no longer available to other traps.
2. Continue testing eel-ladder style traps and their potential application to the sea lamprey control program.
3. Test the ability of a portable version of the NEPTUN system (NEMO) to guide sea lampreys into traps in management scenarios beginning in 2014.
4. Test the ability of a fishwheel to capture sea lampreys and obtain a population estimate using mark-recapture methods in the Manistee River.
5. Continue to test the ability of NEPTUN and Smith-Root electrical systems to guide out-migrating juvenile sea lamprey swimming downstream.
6. Continue research to determine the diel and spatial distribution of out-migrating juvenile sea lampreys.
7. Continue capturing out-migrating juveniles to supplement control, where applicable.

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.

2012 Outcomes:

1. The third and final year of the 3kPZS management scale field trials in Canada were completed. Preliminary analyses suggest that results are highly variable by stream, and 3kPZS baiting results in an average increase of 11% in trapping efficiency.
2. Testing on pheromone emitters continued. Polyethylene glycol (PEG) impregnated with 3kPZS and placed in a PVC pipe to keep the surface area constant, were deployed in Cheboygan, Manistique, Muskegon rivers and Carp Lake Outlet. Overall, the trap baited with PEG had an increase catch of sea lamprey (mean: 31%, range: 6% - 57%).
3. Field trials were conducted to compare spermiating male washings (SMW) with 3kPZS. One of two traps received SMW and the other 3kPZS, both in the same concentration. Field trials were completed in the Ocqueoc and Miners rivers. Preliminary results demonstrate that approximately the same numbers of sea lampreys were captured in both traps.
4. The basic molecular mechanism for synthesizing 3kPZS has been solved. If the transporters responsible for transporting 3kPZS into the water can be confirmed, it may be possible to find a mechanism to stop males from releasing it.
5. Field tests of synthesized 3kPZS and DKPES showed that applying these two compounds in combination is better at attracting females to nests than either compound applied on its own. However, spermiating male washings are still more effective than 3kPZS + DKPES. The compound that makes females stay on the nest has not been found.

6. Migratory pheromone extraction and fractioning in 2012 resulted in the isolation of several compounds that may be behaviorally active.
7. Researchers are no longer required to have EUPs for the discovery-based research with pheromones from EPA. However, once we move things to management scale, we'll need permits for that sort of research.

2013 Objectives:

1. Finish processing and publishing data collected during 3kPZS management-scale field trials and present recommendation to SLCB in fall 2013.
2. Comparison of baiting traps with SMW and 3kPZS will continue in 2013, replicating trials conducted in 2012.
3. Further elucidation and testing of different combinations of mating pheromone compounds will be conducted in 2013.
4. Migratory pheromone compounds that appear to attract adult sea lamprey will be tested in the lab and field in 2013, and synthesis will be attempted.
5. Continue to develop a management strategy evaluation (MSE) model to evaluate the use of pheromone-baited trapping within a management framework.

Strategy 2: Evaluate a repellent-based method to deter sea lampreys from spawning areas.

2012 Outcomes:

1. The research for the project "Development of a Putrefaction-derived Repellent for the Sea Lamprey" was completed in 2012, with promising results. This was the first field test that clearly demonstrated the odors potential to fully block an area in a stream treated with a low dilution of the odor. The M.S. student working on the project (Jason Bals) graduated in December 2012.

2. A project funded by the US EPA Great Lakes Restoration Initiative to demonstrate the viability of using the sea lamprey alarm substance as a chemical barrier will be underway in 2013. Project funding received in November 2012.

2013 Objectives:

1. The completion report for the project "Development of a Putrefaction-derived Repellent for the Sea Lamprey" will be submitted in April 2013. Three additional manuscripts will be published in 2013 (one manuscript was published in 2012).
2. A research associate has been hired for the EPA-funded project "A Species-specific Chemical Barrier to Vastly Improve Sea Lamprey Control," equipment secured, and extractions are underway to initiate work in May 2013.
3. Submit a revised pre-proposal to the NSF Directorate of Environmental Biology (resubmission of a pre-proposal that was submitted in 2012 and positively received) to pursue external funding for fundamental behavioral research on the role of the alarm cue in sea lamprey decision-making.
4. Submit a revised pre-proposal to continue the line of research leading to the creation of a repellent to the GLFC.

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

2012 Outcomes:

1. With the termination of SMRT, the role of the Trapping Task Force in implementing integrated control strategies was somewhat reduced. However, members worked closely with larval assessment and lampricide control staff to identify and target streams for transformer trapping to mitigate escapement to lakes.
2. The Trapping Task Force played a large role in evaluating the effectiveness of integrated control strategies that have been implemented (e.g. large-scale treatment strategies). For example, members were involved in collecting data on adult populations to estimate lake-wide abundances and collecting data for measures of sea lamprey marking and host abundance.

2013 Objectives:

1. Work closely with larval assessment and lampricide control staff to identify and target streams for transformer trapping to mitigate escapement to lakes.
2. Continue to evaluate the effectiveness of integrated control strategies that have been implemented by collecting data on adult populations to estimate lake-wide abundances, and collecting data for measures of sea lamprey marking and host abundances.

OUTREACH

The Service and Department are involved in outreach activities to inform the public of the benefits and operations of the SLCP. These efforts educate the public about sea lampreys and the devastating effect they have on Great Lakes fishes. The primary tool used during outreach events is an interactive display with graphics and an aquarium that houses live larval and adult lampreys for visitors to experience the sea lampreys first-hand. During 2012, this display was in attendance at several large capacity events (Table 26).

Table 26. Dates and locations of public outreach performed by agents of the sea lamprey control program in 2012.

Date	Location	Venue	Lead Agency
January 12-16	Chicago, IL	Chicago Boat, Sports & RV Show	Service
January 13-22	Cleveland, OH	Mid-America Boat & Fishing Show	Service
February 15-19	Duluth, MN	Duluth Boat, Sport & Travel	Service
March 2-4	Green Bay, WI	NE Wisconsin Sport & Fishing Show	Service
March 14-18	Toronto, ON	Toronto Sportsmen's Show	Department
March 23-25	Marquette, MI	Superior Dome Boat & RV Show	Service
May 17-21	Ottawa, ON	National F&W Conservation Congress	Department
June 2	Niagara Falls, NY	Great Lakes Experience Festival	Service
July 13-14	Escanaba, MI	Escanaba Maritime Festival	Service
August 14	Traverse City, MI	Service Directorate Meeting	Service
August 13-19	Escanaba, MI	U. P. State Fair	Service

PERMANENT EMPLOYEES OF THE SEA LAMPREY CONTROL PROGRAM

FISHERIES AND OCEANS CANADA

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

Paul Sullivan, Division Manager

Section Head, Control: Brian Stephens

Lampricide Control Biologists:
- Vacant: Supervisor
- Vacant: Supervisor
- Barry Scotland: Assistant Supervisor
- Alan Rowlinson: Assistant Supervisor
- Tonia Van Kempen: Environmental Supervisor

Lampricide Application Coordinators:
- Peter Grey
- Jamie Storozuk

Lampricide Analysis Technicians:
- Jerome Keen
- Mike MacKenna
- Richard Middaugh
- Shawn Robertson

Lampricide Application Technicians:
- Charlie Boudreau
- Adam Loubert
- Paul Kyostia
- Sean Nickle
- Chris Sierzputowski
- Jamie Smith
- John Tibbles
- Sarah Woods

Barriers:
- Bhuwani Paudel: Barrier Engineering
- Joe Hodgson: Barrier Engineering Technician

Section Head, Assessment: Mike Steeves

Assessment Biologists:
- Gale Bravener: Adult Supervisor
- Vacant: Larval Supervisor (Upper Lakes)
- Fraser Neave: Larval Supervisor (Lower Lakes)

Assessment Technicians
- Ryan Booth
- Jennifer Hallett
- Sarah Larden
- Sean Morrison
- Andrea Phippem
- Jeff Rantamaki
- Kevin Tallon
- Thomas Voight

Administrative Support:
- Lisa Vine: Finance and Administrative Officer
- Christine Reid: Receptionist
- Melanie McCaig: Accounts Clerk

Maintenance:
- Brian Greene: Supervisor
- Chad Hill: Assistant

UNITED STATES FISH AND WILDLIFE SERVICE

Robert Adair, Program Manager

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Jeff Slade, Station Supervisor

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- Timothy Sullivan: Treatment Supervisor
- Ellie Koon: Treatment Supervisor
- Rebecca Neeley
- Matt Lipps
- Jenna Tews

Lampricide Control Lead Physical Science Technician:
- Vacant

Lampricicde Control Physical Science Technicians:
- Kevin Butterfield
- Jeffrey Sartor

Lampricide Control Biological Science Technicians:
- Margie Shaffer (CS)
- Bobbie Halchishak (CS)
- Tim Falconer (CS)
- John Ewalt (CS)
- Gena Long (CS)
- Dan McGarry (CS)

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- Dave Keffer
- Aaron Jubar

Larval Assessment Biological Science Technicians:
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- Jason Krebill
- John Stegmeier (CS)
- Gary Haiss (CS)
- Timothy Granger (CS)
- Vacant (CS)

Maintenance Worker:
- Michael Sell

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UNITED STATES FISH AND WILDLIFE SERVICE (CONTINUED)

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Lori Criger
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Robert Wootke

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James Criger (CS)	Justin Oster (CS)
Thomas Elliott (CS)	Daniel Suhonen (CS)
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Nikolas Rewald	Rachael Guth (CS)
Jarvis Applekamp (CS)	Robert Wollney (CS)
Michael Blohm (CS)	

Chemist:
Vacant

Risk Management:
Cheryl Kaye: Risk Management Supervisor
Mary Henson: Fish Biologist
Mary Wilson: Biological Science Technician

Maintenance Worker:
David Magno

Adult Unit Supervisor : Michael Twohey

Fish Biologists:
Jessica Barber: Adult Assessment /Barrier Supervisor
Pete Hrodey
Gregory Klingler

Biological Science Technicians:

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Dennis Smith	Bruce Eldridge (CS)
Jason VanEffen	Kevin Letson (CS)
Deborah Winkler	Sara Ruiter (CS)