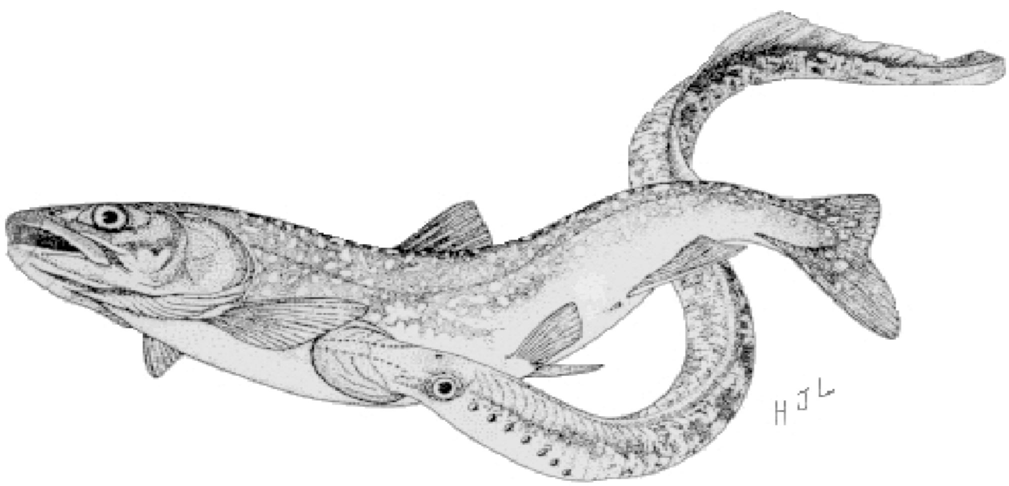
INTEGRATED MANAGEMENT OF SEA LAMPREYS IN THE GREAT LAKES 2010

ANNUAL REPORT TO THE GREAT LAKES FISHERY COMMISSION



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EXECUTIVE SUMMARY

This report summarizes activities in the integrated management of sea lampreys conducted by the Canadian Department of Fisheries and Oceans (Department) and the United States Fish and Wildlife Service (Service) in the Great Lakes during 2010. Lampricide treatments were conducted on 107 tributaries and 21 lentic areas. Larval assessment crews surveyed 440 Great Lakes tributaries and 45 lentic areas to assess control effectiveness, plan future TFM treatments, and establish production capacity of streams. Assessment traps were operated in 68 tributaries across the Great Lakes to estimate the spawning-phase population in each Great Lake.

We evaluate spawning-phase sea lamprey populations relative to fish community objectives for each of the lakes. In Lake Superior, sea lamprey abundance (36,414) was within target levels of 37,000 ± 19,000 for the third consecutive year. In Lake Michigan, sea lamprey abundance (89,278) was greater than target levels of 57,000 ± 13,000. In Lake Huron, sea lamprey abundance (139,676) has increased from the 2009 abundance estimate and remains greater than target levels of 73,000 ± 20,000. In Lake Erie, sea lamprey abundance (22,179) was less than the previous year and greater than the target levels of 3,000 ± 1,000. In Lake Ontario, spawning abundance was estimated to be 30,996, which was within target levels of 31,000 ± 4,000.

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 Management Program (SLMP) is administered by the Great Lakes Fishery Commission (Commission) and implemented by two control agents: the Canadian Department of Fisheries and Oceans (Department) and the United States Fish and Wildlife Service (Service). The SLMP 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 the *Strategic Plan for Great Lakes Fishery Management,* the lake committees developed fish-community objectives for each of the Great Lakes. The fish-community objectives include goals for the SLMP 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 2010 to meet these targets.

FISH-COMMUNITY OBJECTIVES

Each lake committee has published qualitative goals for sea lamprey management 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 five-year period when marking rates resulted in a tolerable annual rate of mortality on lake trout. A target and range of sea lamprey abundance was calculated for these lakes from the estimated abundance over a five-year period when marking rates were closest to 5 A1-3 marks per 100 lake trout >533 mm. Similarly, a target and range were developed for Lake Ontario from the estimated abundance of sea lampreys over a five-year period when marking rates were closest to 2 A1 marks per 100 lake trout >431 mm. In Lake Huron, the sea lamprey abundance target and range were calculated as 25% of the estimated average lake-wide population during the five-year period prior to the completion of the fish community objectives (1989–1993).

The performance of the SLMP is evaluated annually by contrasting spawning-phase sea lamprey abundance with the lake trout marking rate against these targets. The lake-wide abundance is estimated by the control agents using a combination of mark-recapture and trapping efficiency estimates of spawning-phase migrants in streams with traps, and regression model-predicted estimates in streams without traps. Lake trout marking rates are assessed and collected by the member agencies that comprise the lake committees and their technical committees.

The sea lamprey abundance targets presented here for lakes Superior, Michigan, Erie and Ontario have changed from what was included in previous reports. For each of these lakes, a five-year time period was selected during which wounding was at or near the target of 5 wounds per 100 lake trout (2 wounds per 100 lake trout for Lake Ontario). The spawning-phase abundance targets were then defined as the averages of the spawning-phase estimates for that five-year time period. Since the model for estimating spawning-phase abundance is annually updated using all available data, the spawning-phase estimates for previous years can change, which in turn, causes the spawning-phase targets to change. Because the Lake Huron Committee set a fixed number for the spawning-phase target, the target for Lake Huron does not change.

Lake Superior

The Lake Superior Committee established the following goal for sea lamprey management in Lake Superior:

Suppress sea lampreys to population levels that cause only insignificant mortality on adult lake trout.

The target and range of sea lamprey abundance for Lake Superior were calculated from the average abundance of sea lampreys estimated for the five-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.

Spawning-phase sea lamprey abundance in Lake Superior was estimated to be 36,414 (95% CI: 30,439 - 49,992), and was within the target range for the third consecutive year during 2010. The lake trout marking rate currently exceeds the target of 5 marks per 100 fish and has trended upward since 1994.

Lake-wide estimates of spawning-phase sea lamprey 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 has been increased and all significant sources have been treated.

Lake Michigan

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

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

Sea lamprey management 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 sea lamprey abundance for Lake Michigan were calculated from the average abundance of sea lampreys estimated for the five-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.

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 170,307 during 2007. Abundance declined markedly in 2008 and again in 2009, but increased slightly during 2010. During 2010, sea lamprey abundance was estimated to be 89,278 (82,928 – 97,130, 95% confidence interval), which is greater than the target range. Marking rates have trended upward and have exceeded target levels since 1995.

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 be 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 and 2009. 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 management 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 sea lamprey abundance target and range for Lake Huron were calculated as 25% of the estimated average lake-wide population during the five-year period prior to the publication of the fish-community objectives (1989–1993). The target using these data was 73,000 ± 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 2010, the spawning-phase sea lamprey population was estimated at 139,676 (95% CI: 123,296 – 165,035), which exceeds the suppression target and is slightly greater than in 2009, but represents a significant decrease from 2008. Sea lamprey abundance in Lake Huron has been greater than target levels throughout the last 20 years. Since 2001, the population estimates have been significantly lower than estimates during the previous 10 years.

High sea lamprey abundance in Lake Huron during the 1980s and 1990s was attributed to production from the St. Marys River, the large connecting channel with Lake Superior. The population of larval sea lampreys in the river was estimated at 5.2 million during the mid-1990s and was considered large enough to be producing the majority of parasitic-phase sea lampreys in the lake. The large discharge and complexity of the St. Marys River precludes traditional treatment applications. During 1997, an innovative control strategy was implemented on the river that integrated spot treatments with 3.2% granular Bayluscide (GB), a bottom-release formulation of lampricide, with the sterile-male-release technique (SMRT) and the operation of spawning-phase traps. During 1998-2001, approximately 850 ha of larval habitat was treated, and along with SMRT and trapping, have contributed to a decline in larval sea lamprey abundance in the river and to reduced spawning-phase abundance and lake trout marking rates in Lake Huron. To further reduce parasitic-phase sea lamprey abundance in Lake Huron, in 2010, the Commission implemented a large-scale treatment strategy that included GB treatment in the St. Marys River, and treatments of all streams currently containing larval sea lampreys tributary to the North Channel and St. Marys River. Trapping of spawning-phase sea lampreys and release of sterilized males also continued during 2010 as part of the St. Marys River integrated control program.

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 management 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 sea lamprey abundance for Lake Erie were calculated from the average abundance estimated for the five-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 2010, spawning-phase sea lamprey abundance in Lake Erie was estimated to be 22,179 (95% CI: 18,722 – 27,823). This level of abundance exceeds pre-control estimates and is greater than the target range of 3,000 ± 1,000. Marking rates on lake trout remain greater than target.

The initial round of stream treatments during 1986 and continued control efforts during the following eight years resulted in an annual sea lamprey population within the target range. During the late 1990s, sea lamprey abundance recovered to pre-treatment 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. Spawning-phase 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 to the North Shore of Lake Erie) and the stream was treated in 2009 and 2010. The full impact of this strategy should be evident in 2011 and 2012.

Lake Ontario

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

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

The Lake Ontario Committee revised its lake tout rehabilitation plan in 1983. The plan recognized that continued control of sea lampreys is necessary for lake trout rehabilitation and included a specific objective for sea lampreys:

Controlling 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 management, angler and commercial exploitation will also be controlled so that annual harvest does not exceed 120,000 fish in the near term.

The target for Lake Ontario sea lamprey abundance was first calculated using the same marking statistics as the other lakes (A1-3 marks). The target and range were revised during 2006, 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 fish was explicitly identified as producing tolerable mortality in the lake trout rehabilitation plan. The sea lamprey target and range were calculated from the average abundance during the five-year period, 1993-1997, when marking rates were closest to 2 marks per 100 fish (1.6 A1 marks per 100 lake trout >431mm). The calculated target abundance in Lake Ontario was 31,000 ± 4,000 sea lampreys.

Sea lamprey abundance in Lake Ontario during 2010 was estimated to be 30,996 (95% CI: 27,650 – 34,818), and is within target. Marking rates on lake trout were less than target for the second consecutive year in 2010.

LAMPRICIDE CONTROL

Tributaries harboring sea lamprey larvae are periodically treated with lampricides to eliminate or reduce larval populations before they recruit to the lake as parasitic-phase lampreys. Treatment units 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 approximately 95% of the sea lamprey larvae, while minimizing the risk to nontarget organisms. In this section, we identify lampricide applications conducted in 2010 (Figure 1, Table 1), history of lampricide treatments in each of the Great Lakes, and highlights of the 2010 treatments.

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 2010 is presented in the LCTF section of this report (p 83).

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.

Table 1. Summary of lampricide applications in tributaries of the Great Lakes, 2010.

Lake	Number of Streams	Number of Lentic	Discharge (m^3/s)	TFM (kg) [1]	Bayluscide (kg) [1,2]	Distance Treated (km)
Superior	24	17	93.5	8,300.6	1,085.0	500.1
Michigan	26	2	49.4	13,346.4	92.1	854.3
Huron	45	2	192.5	24,431.0	5,160.8	1,009.3
Erie	1	---	0.4	168.6	0.1	34.3
Ontario	11	---	42.0	5,276.6	0.0	257.3
Total	**107**	**21**	**377.8**	**51,523.2**	**6,338.0**	**2,655.3**

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

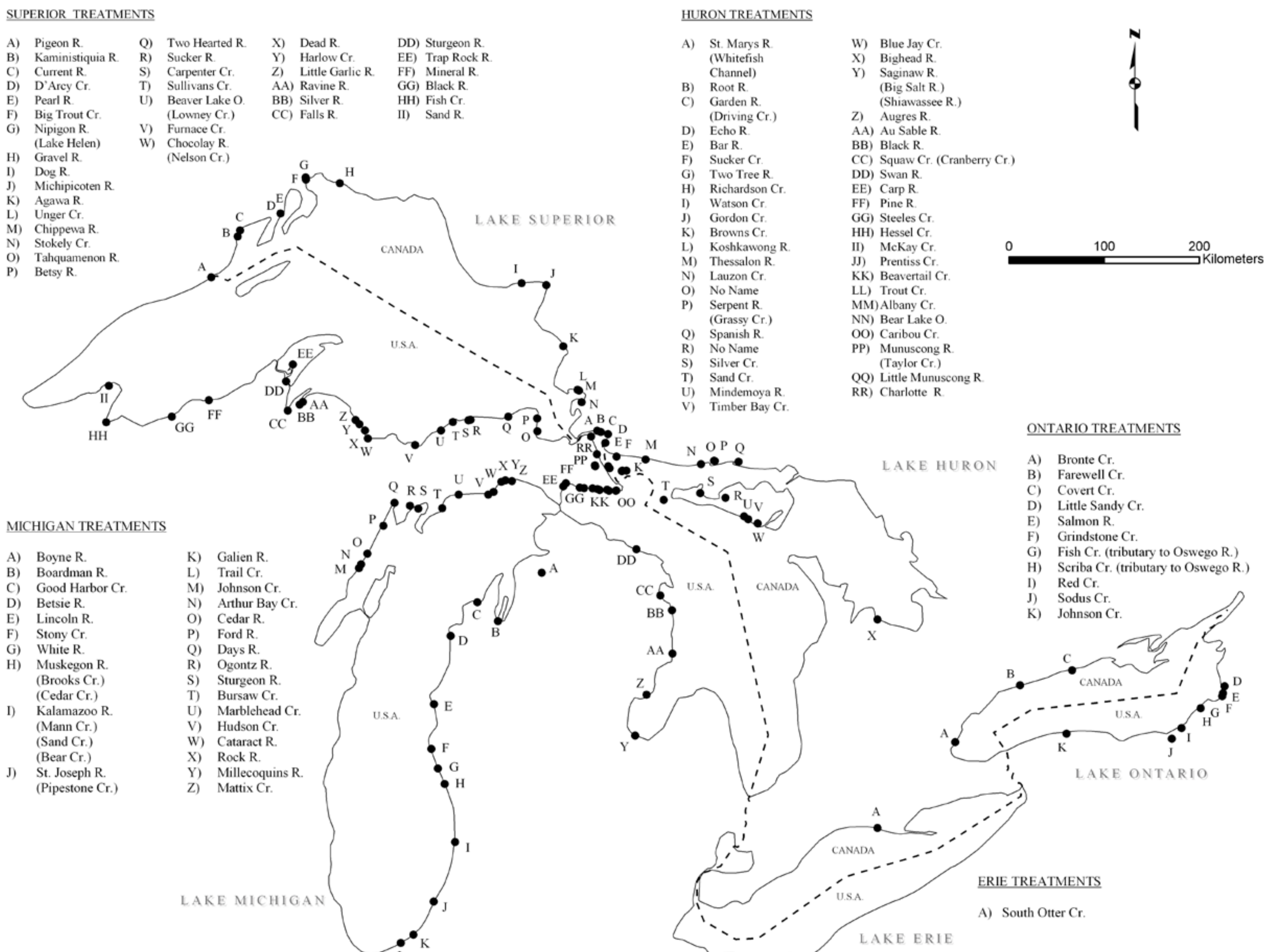

Figure 1. Location of tributaries treated with lampricide in 2010.

Lake Superior

Lake Superior has 1,566 tributaries (833 Canada, 733 U.S.). One hundred fifty-six tributaries (57 Canada, 99 U.S.) have historical records of larval sea lamprey production. Of these, 98 tributaries (38 Canada, 60 U.S.) have been treated with lampricides at least once during 2001-2010. Fifty-nine tributaries (18 Canada, 41 U.S.) are treated on a regular cycle. Table 2 provides details on the application of lampricides to Lake Superior tributaries and lentic areas treated during 2010.

- Lampricide treatments were completed in 24 tributaries (6 Canada, 18 U.S.) and in 17 lentic areas (9 Canada, 8 U.S.).

- Lentic areas of Pigeon, Current, Dog and Michipicoten rivers (Canada) and the Trap Rock River and Carpenter Creek (U.S.) were treated with GB for the first time in 2010.

- Two tributaries to the Kaministiquia River, Oliver and Slate creeks were not treated in 2010 due to insufficient discharge. Both have been scheduled for treatment in 2011.

- Corbett Creek, a tributary to the Kaministiquia River, was treated for the first time since 1973. Very high densities of sea lamprey larvae were noted during the treatment, however, low water levels and large beaver impoundments resulted in sub-lethal concentrations of lampricide in a significant portion of the stream. Post-treatment assessment surveys confirmed the presence of high numbers of residual lampreys. A second treatment was scheduled for later in the year, but due to time constraints only the area of highest noted densities was retreated. This stream has been rescheduled for treatment in 2011.

- Unger and D'Arcy creeks were treated for the first time in 2010.

- Big Trout Creek was re-treated in 2010, as it was only partially treated in 2009 due to low discharge and numerous impoundments.

- Pearl River was treated in 2010 after being deferred due to low discharge in 2009.

- Agawa River and Sheppard Creek (a tributary to the Goulais River system) were not treated during 2010 due to time constraints. Both streams have been rescheduled for treatment in 2011.

- Nelson Creek, a tributary to the Chocolay River, was treated for the second consecutive year due to very low discharge during the 2009 treatment and presence of residual lampreys.

- During the annual treatment of the Ravine River, rain caused a decline in pH resulting in some non-target mortality of white suckers (*Catostomos commersonii*), longnose dace (*Rhinichthys cataractae)*, mottled sculpin (*Cottus bairdii*), coho salmon (*Oncorhynchus kisutch*) and stonecats (*Noturus flavus*).

- The first treatment of the Mineral River was successfully completed during 2010. The stream was added to the treatment schedule after surveys in early June revealed the presence of at least three year classes of larval sea lampreys.

- The Black River was treated with TFM for the first time since 1981. A 15-hour TFM block was applied to the stream, and GB was applied in the harbor to counteract strong seiche action near the river mouth. High densities of very large larval sea lampreys were observed during the treatment.

- Fish Creek was selected as one of two streams for an ongoing study examining dissipation of TFM in bottom sediments in the estuary of streams undergoing lampricide treatments. The study was conducted by personnel from the USGS Upper Midwest Environmental Sciences Center (UMESC).

- Studies evaluating lampricide toxicity to lake sturgeon and stonecats were conducted by the Service and UMESC during the lampricide treatment of the Two Hearted River.

Table 2. Details on the application of lampricides to tributaries and lentic areas of Lake Superior during 2010 (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)	Aug 17	---	---	88.6[3]	---
Kaministiquia R. lentic (B)	Aug 8	---	---	29.8[3]	---
Kaministiquia R.	Jul 14	29.3	3,178.0	30.2	103.0
Current R. (C)	Aug 9	---	---	46.5[3]	---
D'Arcy Cr. (D)	Jul 11	0.1	20.4	0.0	2.3
Pearl R. (E)	Jul 11	0.3	59.4	0.0	3.7
Big Trout Cr. (F)	Jul 7	0.6	135.2	0.0	23.7
Nipigon R. (G)					
Lake Helen	Aug 7	---	---	47.2[3]	---
Gravel R. (H)	Aug 5	---	---	212.1[3]	---
Dog R. (I)	Jun 15	---	---	1.5[3]	---
Michipicoten R. (J)	Aug 19	---	---	46.5[3]	---
Agawa R. (K)	Aug 20	---	---	31.2[3]	---
Unger Cr. (L)	Jul 13	0.1	0.5	0.0	0.2
Chippewa R. (M)	Jul 14	3.9	261.7	0.0	4.2
Stokely Cr. (N)	Aug 29	---	---	109.0[3]	---
Total (Canada)		**34.3**	**3,655.2**	**642.6**	**137.1**
United States					
Tahquamenon R. (O)	Oct 16	14.2	871.6	11.2	38.0
Betsy R. (P)	Oct 29	3.4	189.3	0.0	16.1
Two Hearted R. (Q)	Aug 6	5.0	569.5	0.0	95.0
Sucker R. (R)	Sep 18	2.8	311.4	0.0	43.5
Carpenter Cr. (S)	Aug 11	---	---	55.9[3]	---
Sullivans Cr. (T)	Sep 17	0.1	13.5	0.0	2.3
Beaver Lake O. (U)					
Lowney Cr.	Sep 8	0.2	55.0	0.0	2.6
Furnace Cr. (V)	Sep 2	1.0	104.2	46.5[3]	6.1
Chocolay R. (W)					
Nelson Cr.	Sep 22	0.4	57.2	0.0	9.7
Dead R. (X)	Aug 17	2.8	250.4	93.6[3]	1.6
Harlow Cr. (Y)	Sep 30	0.7	67.9	0.0	6.4
Little Garlic R. (Z)	Oct 4	0.3	20.7	0.0	9.5
Ravine R. (AA)	Sep 16	0.3	82.1	47.2[3]	9.7
Silver R. (BB)	Sep 20	1.0	90.8	0.0	7.7
Falls R. (CC)	Sep 19	1.4	142.3	103.1[3]	0.5
Sturgeon R. (DD)	Oct 4	19.8	1,030.2	11.1	83.7
Trap Rock R. (EE)	Aug 8	---	---	24.7[3]	---
Mineral R. (FF)	Oct 1	0.4	67.0	0.0	11.3
Black R. (GG)	Jul 9	3.1	369.4	7.7[3]	1.6
Fish Cr. (HH)	Jul 13	2.3	352.9	0.0	17.7
Sand R. (II)	Aug 4	---	---	41.4[3]	---
Total (United States)		**59.2**	**4,645.4**	**442.4**	**363.0**
Total for lake		**93.5**	**8,300.6**	**1,085.0**	**500.1**

[1] Lampricide quantities are reported in kg of active ingredient.
[2] Includes a total of 102.5 TFM bars (21.3 kg active ingredient) applied in 10 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-three tributaries have historical records of larval sea lamprey production, and of these, 79 tributaries have been treated with lampricides at least once during 2001-2010. Thirty-nine tributaries are treated on a regular cycle. Table 3 provides details on the application of lampricides to tributaries treated during 2010.

- Lampricide treatments were completed in 26 tributaries and 2 lentic areas. Lentic applications on the Boyne and Cedar rivers were conducted in conjunction with the TFM treatment of the streams.

- The upper Boardman River had not been treated since 1987, but was added to the schedule and treated after several year classes of sea lamprey larvae were discovered.

- The White River was treated from the dam in White Cloud, including 28 miles of river between the White Cloud and Hesperia dams. Repairs were made to the Hesperia Dam in 2010 to improve its ability to block sea lampreys.

- Treatment of Trail Creek was compromised when Willow Creek, a major tributary, unexpectedly tripled in flow during the application. The increase was likely due to a landowner cleaning a three foot diameter standpipe that controls the level of a small lake. However, post-treatment surveys collected no larval sea lampreys, so Trail Creek was not scheduled for treatment in 2011.

- Stony Creek was treated for the first time since 1987. Arthur Bay Creek and Johnson Creek were treated for the first time since 1970 and 1963, respectively. Numerous large larval sea lampreys were collected in Arthur Bay Creek, however, only a few larval sea lampreys were observed in Johnson and Stony creeks.

- The Cedar River was selected as one of two locations for the final phase of an ongoing study examining distribution of TFM in a stream undergoing lampricide treatment. Personnel from the UMESC conducted this study.

- A significant rain event dramatically increased stream discharge during treatment of the Cedar River. Despite the challenge of achieving minimum lethal concentrations with rising water levels, the increased discharge improved treatment conditions by alleviating the radical pH shifts that often occur during low water treatments on this river.

- The Ford River was treated in two simultaneous segments and required additional lampricide application sites due to extremely low discharge. The combination of low water and high temperatures resulted in water chemistries that increased minimum lethal concentrations throughout the stream compared to the 2008 treatment.

- Studies evaluating lampricide toxicity to lake sturgeon were conducted by the Service and the UMESC during the lampricide treatments of the Millecoquins and Sturgeon rivers.

- The first treatment of Mattix Creek was successfully completed.

Table 3. Details on the application of lampricides to tributaries and lentic areas of Lake Michigan during 2010 (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)
Boyne R. (A)	May 26	2.2	642.6	17.4[3]	6.4
Boardman R. (B)	Oct 5	6.1	942.6	10.4	3.5
Good Harbor Cr. (C)	Jul 9	0.3	59.8	0.0	1.4
Betsie R. (D)	Jul 10	5.7	1,407.1	0.0	15.0
Lincoln R. (E)	Aug 6	1.1	433.4	0.0	50.1
Stony Cr. (F)	Jun 17	1.4	408.4	0.0	15.1
White R. (G)	Jul 14	11.6	3,301.0	0.4[3]	153.0
Muskegon R. (H)					
Brooks Cr.	Aug 21	0.7	250.8	0.0	23.0
Cedar Cr.	Aug 23	0.7	140.5	0.0	18.4
Kalamazoo R. (I)					
Mann Cr.	Aug 31	0.2	26.9	0.0	1.9
Sand Cr.	Sep 8	0.1	20.2	0.0	1.8
Bear Cr.	Sep 9	0.3	75.0	0.0	4.2
St. Joseph R. (J)					
Pipestone Cr.	Sep 1	0.6	173.8	0.0	15.8
Galien R. (K)	Oct 18	0.5	220.6	0.0	18.8
Trail Cr. (L)	Sep 30	1.0	245.9	0.0	25.8
Johnson Cr. (M)	May 17	0.1	6.5	0.0	0.5
Arthur Bay Cr. (N)	May 30	0.1	1.5	0.0	0.6
Cedar R. (O)	May 27	6.4	1,675.7	63.9[3]	119.1
Ford R. (P)	May 13	2.8	1,691.1	0.0	206.1
Days R. (Q)	Oct 18	0.7	130.8	0.0	6.9
Ogontz R. (R)	Oct 16	0.4	37.7	0.0	18.5
Sturgeon R. (S)	Sep 3	2.1	548.8	0.0	112.7
Bursaw Cr. (T)	Aug 20	0.2	51.2	0.0	4.8
Marblehead Cr. (U)	Aug 21	0.2	87.4	0.0	3.7
Hudson Cr. (V)	Aug 24	0.1	6.7	0.0	3.2
Cataract R. (W)	Aug 20	0.3	65.9	0.0	3.7
Rock R. (X)	Aug 24	0.3	66.7	0.0	4.2
Millecoquins R. (Y)	Aug 22	3.1	621.7	0.0	14.5
Mattix Cr. (Z)	Aug 20	0.1	6.1	0.0	1.6
Total for Lake		**49.4**	**13,346.4**	**92.1**	**854.3**

[1]Lampricide quantities are reported in kg of active ingredient.
[2]Includes a total of 466.5 TFM bars (97.3 kg active ingredient) applied in 16 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 eighteen tributaries (57 Canada, 61 U.S.) have historical records of larval sea lamprey production. Of these, 73 tributaries (35 Canada, 38 U.S.) have been treated with lampricide at least once during 2001-2010. Forty-seven tributaries (22 Canada, 25 U.S.) are treated on a regular cycle. Table 4 provides details on the application of lampricides to tributaries and lentic areas treated during 2010.

- Lampricide treatments were completed in 44 tributaries (24 Canada, 20 U.S.), the St. Marys River, and 2 lentic areas in the U.S.

- This was the first year of a large-scale treatment strategy in the North Channel of Lake Huron. Forty sea lamprey producing tributaries and lentic areas were treated (23 Canada, 16 U.S. and the St. Marys River) to suppress the number of spawning-phase sea lampreys in Lake Huron. With the exception of the streams that have already been treated for two consecutive years, all streams are scheduled to be re-treated in 2011 to eliminate larvae that may have survived 2010 treatments. The Pine and Little Munuscong rivers and Trout Creek (U.S.) along with Two Tree and Root rivers and Watsons Creek (Canada) were treated for the second consecutive year in 2010.

- As part of the North Channel large-scale treatment strategy, the Charlotte River and Bear Lake Outlet were treated for the first time since 1977 and 1981, respectively. Treatment of the Charlotte River was completed at very low discharge, which resulted in extended flow times and the need for numerous boost applications to reach minimum lethal concentration throughout the stream.

- The treatment of 874.6 ha (266.7 Canada, 607.8 U.S.) of larval habitat in the St. Marys River with GB was made possible through the deployment of a second new spray boat by the Service in 2010. These state-of-the-art craft use technology adapted from agricultural applications and are equipped with real-time navigation and a delivery system that mixes GB with water before delivering it under high pressure to boom-mounted spray nozzles. Application rates are more than double those of conventional rotary spreaders and are automatically adjusted according to boat position and speed. The Chippewa-Ottawa Resource Authority assisted in the treatment of the St. Marys River by providing temporary storage for 42,865 kg of GB in preparation for delivery to the U.S. and Canadian spray boats.

- The St. Marys River Whitefish Channel was treated with TFM for the first time in 2010.

- Treatment of the main Garden River was postponed when road washouts, caused by late spring floods, limited access. The treatment was rescheduled for early fall, however, excessive discharge caused by heavy rains resulted in deferral to 2011.

- The Spanish River system was treated in its entirety in 2010; the main river was deferred from treatment in 2009 due to excessive discharge.

- Treatments of the Mississagi, Wanapitei, and Magnetawan rivers were deferred due to lower than normal discharge caused by early spring run-off and lack of rain. These streams have been scheduled for treatment in 2011.

- Treatment of Marl Creek was deferred for the second consecutive year due to extreme flow variations caused by a large scale irrigation system operating within the stream. The treatment was scheduled for April 2010, prior to the anticipated start-up of irrigation; however, the pumps were activated even earlier because of early spring run-off and a lack of precipitation. Treatment of Marl Creek is scheduled for April 2011.

- A large number of residual larvae were collected in the mouth area of stream H-114 during post treatment assessment surveys. The treatment was ineffective due to very low flows and seiche caused by heavy winds. This area of concern was re-treated with GB later in the year.

- The Shiawassee River was treated when discharge was higher than normal and diel pH cycling presented a challenge. Treatment timing had to be coordinated around the five-day Curwood Festival in Owosso, Michigan and to accommodate a Michigan Department of Natural Resources aquatic sampling protocol.

- Suppression of pH was observed during treatments of the Big Salt River and its tributary, Bluff Creek. Some non-target mortality of white suckers (*Catostomos commersonii*), rainbow darters (*Etheostoma caeruleum*), common shiners (*Luxilus cornutus*), and creek chubs (*Semotilus atromaculatus*) occurred in the lower reach of Bluff Creek.

- The Carp River was selected as one of two study streams for ongoing research examining distribution of TFM in a stream undergoing lampricide treatment. A 15-hour TFM bank was applied to accommodate the study that was conducted by personnel from the UMESC.

- Despite relatively high stream discharge during the Carp River lampricide treatment, beaver activity in Taylor and Ozark creeks delayed flow times and required additional lampricide applications at remote and poorly accessible sites.

- Treatment of the Pine River was hindered by beaver activity in several tributaries including Trout Brook, Biscuit Creek, and the North Branch upstream of the junction with Sullivan Creek, which made it difficult to maintain minimum lethal concentrations of lampricide.

Table 4. Details on the application of lampricides to tributaries and lentic areas of Lake Huron during 2010 (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)	May 13	---	---	1,493.7[3]	---
Whitefish Channel	Sep 23	0.2	23.0	0.0	0.7
Root R. (B)	Jun 22	1.2	177.4	0.0	51.7
Garden R. (C)					
Driving Cr.	Jul 22	0.3	44.5	0.0	10.3
Echo River (D)	Jul 7	0.8	46.2	0.0	2.6
Bar R. (E)	Jul 8	2.8	141.7	0.0	20.7
Sucker Cr. (F)	May 11	0.1	29.1	0.0	1.0
Two Tree R. (G)	May 12	0.3	56.7	0.0	10.5
Richardson Cr. (H)	May 19	1.6	68.2	0.0	4.7
Watson Cr. (I)	May 13	0.1	4.5	0.0	1.5
Gordon Cr. (J)	May 13	0.1	2.3	0.0	1.5
Browns Cr. (K)	Sep 2	0.2	13.3	0.0	3.7
Koshkawong R. (L)	May 11	0.3	43.9	0.0	1.5
Thessalon R. (M)					
Upper	May 17	2.2	148.3	0.0	40.5
Lower	Jun 28	6.7	529.3	0.0	32.7
Lauzon Cr. (N)	Jun 8	0.4	11.1	0.0	0.9
No Name (H-114) (O)	Jun 9	0.1	0.4	0.3[3]	0.4
Serpent R. (P)					
Grassy Cr.	Aug 25	0.2	7.6	0.0	3.5
Spanish R. (Q)	Oct 5	83.3	3,643.9	41.5[3]	90.6
No Name (H-267) (R)	Jun 23	0.1	17.8	0.0	2.6
Silver Cr. (S)	Jun 24	0.7	113.2	0.0	3.0
Sand Cr. (T)	Oct 18	0.1	46.0	0.0	4.2
Mindemoya R. (U)	Jun 29	1.6	203.8	0.0	8.5
Timber Bay Cr. (V)	Jun 26	0.6	124.3	0.0	3.8
Blue Jay Cr. (W)	Jun 28	2.0	319.6	0.0	9.1
Bighead R. (X)	Jun 8	3.1	1,536.6	0.0	64.3
Total (Canada)		**109.1**	**7,352.8**	**1,535.5**	**374.5**
United States					
Saginaw R. (Y)					
Big Salt R.	May 3	3.5	1,404.8	0.0	62.6
Shiawassee R.	Jun 6	14.9	4,987.2	12.0	87.7
AuGres R. (Z)	May 14	4.1	1,320.4	0.0	106.3
Au Sable R. (AA)	Jun 28	40.4	5,859.7	64.3[3]	15.5
Black R. (BB)	Jun 29	0.1	81.6	0.0	10.5
Squaw Cr. (Cranberry Cr.) (CC)	Jun 23	0.3	51.8	0.0	1.8
Swan R. (DD)	Jun 25	2.8	507.1	0.0	8.7
Carp R. (EE)	Jun 10	5.9	1,048.4	0.0	98.2
Carp R. lentic only	Jun 10	---	---	91.4[3]	---
Pine R. (FF)	Jun 16	8.8	1,214.6	0.0	169.1
Steeles Cr. (GG)	May 1	0.1	15.9	0.0	1.3

Table 4. *continued*

Tributary	Date	Discharge (m^3/s)	TFM (kg)[1,2]	Bayluscide (kg)[1,3]	Distance Treated (km)
Hessel Cr. (HH)	Apr 30	0.1	10.1	0.0	0.6
McKay Cr. (II)	May 3	0.1	52.8	0.0	8.9
Prentiss Cr. (JJ)	May 2	0.1	52.1	0.0	4.8
Beavertail Cr. (KK)	Apr 30	0.4	76.5	0.0	7.1
Trout Cr. (LL)	Oct 14	0.1	11.6	0.0	1.6
Albany Cr. (MM)	May 4	0.1	36.8	0.0	1.0
Bear Lake O. (NN)	Apr 29	0.1	3.6	0.0	0.5
Caribou Cr. (OO)	May 1	0.1	4.3	0.0	1.0
Caribou Cr. lentic only	Jun 13	---	---	53.7[3]	---
Munuscong R. (PP)					
Taylor Cr.	Oct 18	0.4	144.8	0.0	12.1
Little Munuscong R. (QQ)	Oct 16	0.7	116.3	0.0	11.3
Charlotte R. (RR)	Oct 15	0.3	77.8	0.0	24.2
St. Marys R. (A)	May 13			3,403.9[3]	
Total (United States)		**83.4**	**17,078.2**	**3,625.3**	**634.8**
Total for lake		**192.5**	**24,431.0**	**5,160.8**	**1,009.3**

[1] Lampricide quantities are reported in kg of active ingredient.
[2] Includes a total of 493.1 TFM bars (102.9 kg active ingredient) applied in 20 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-two tributaries (11 Canada, 11 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 2001-2010. Eight tributaries (2 Canada, 6 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 (1 Canada, 1 U.S.), none of which have required treatment during 2001-2010. Table 5 provides details on the application of lampricides to tributaries treated during 2010.

- South Otter Creek was treated in 2010 completing the second year of the whole lake large-scale treatment strategy designed to suppress and maintain abundance at or below the lake-wide target of 3,000 spawning-phase sea lampreys. No sea lamprey larvae were collected or observed during the treatment.

Table 5. Details on the application of lampricides to tributaries of Lake Erie during 2010 (letter in parentheses corresponds to location of stream in Figure 1).

Tributary	Date	Discharge (m^3/s)	TFM[1] (kg)	Bayluscide[1] (kg)	Distance Treated (km)
<u>Canada</u>					
South Otter Cr. (A)	Aug 20	0.4	168.6	0.1	34.3
Total (Canada)		**0.4**	**168.6**	**0.1**	**34.3**
<u>United States</u>					
Total (United States)		**0**	**0**	**0**	**0**
Total (for lake)		**0.4**	**168.6**	**0.1**	**34.3**

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

Lake Ontario

Lake Ontario has 659 tributaries (405 Canada, 254 U.S.). Sixty-six tributaries (31 Canada, 35 U.S.) have historical records of larval sea lamprey production, and of these, 41 tributaries (20 Canada, 21 U.S.) have been treated with lampricides at least once during 2001-2010. Twenty-nine tributaries (13 Canada, 16 U.S.) are treated on a regular cycle. Table 6 provides details on the application of lampricides to tributaries treated during 2010.

- Treatments were completed in 11 tributaries (3 Canada, 8 U.S.).

- Johnson Creek (Orleans and Niagara counties) was treated for the first time in 2010. Non-target mortality of brown bullheads (*Ameiurus nebulosus*), white suckers (*Catostomus commersonii*) and round gobies (*Neogobius melanostomus*) was noted due to suppression of the stream pH cycle.

- Orwell Brook was treated for the fourth consecutive year to address residual populations in numerous beaver impoundments. The stream is being treated annually, pending construction of a sea lamprey barrier.

- The treatments of Sodus and Scriba creeks were postponed until later in the year due to reports of spawning walleye in these rivers.

Table 6. Details on the application of lampricides to tributaries of Lake Ontario during 2010 (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)
<u>Canada</u>					
Bronte Cr. (A)	Apr 26	2.6	1,072.7	0.0	37.9
Farwell Cr. (B)	Jul 28	0.7	132.3	0.0	6.3
Covert Cr. (C)	Jul 29	0.1	25.9	0.0	3.3
Total (Canada)		**3.4**	**1,230.9**	**0.0**	**47.5**
<u>United States</u>					
Little Sandy Cr. (D)	Jun 4	0.5	68.7	0.0	8.7
Salmon R. (E)	Apr 19	24.6	1,610.7	0.0	58.4
Grindstone Cr. (F)	Apr 21	1.0	197.7	0.0	45.5
Oswego R.					
Fish Cr. (G)	May 30	9.5	1,322.4	0.0	63.6
Scriba Cr. (H)	Jun 2	0.5	40.3	0.0	0.8
Red Cr. (I)	Apr 15	0.7	243.7	0.0	11.1
Sodus Cr. (J)	May 30	0.1	27.3	0.0	2.2
Johnson Cr. (K)	Apr 15	1.7	534.9	0.0	19.5
Total (United States)		**38.6**	**4,045.7**	**0.0**	**209.8**
Total (for Lake)		**42.0**	**5,276.6**	**0.0**	**257.3**

[1] Lampricide quantities are reported in kg of active ingredient.
[2] Includes a total of 43 TFM bars (8.9 kg active ingredient) applied in 4 streams.

ALTERNATIVE CONTROL

The Commission continues to research and develop alternatives to lampricide treatments to provide a broader spectrum of tactics to control sea lamprey populations. Current alternative control methods include trapping of spawning-phase sea lampreys, release of sterilized males to suppress reproductive success, and operation and construction of low-head barriers to block spawning migrations. New applications of alternative control including sterile-female release, the use of lamprey pheromones, and trapping technologies are currently being investigated.

Sterile-Male-Release Technique

During 2010, spawning-phase sea lampreys were captured from 23 tributaries throughout the Great Lakes for use in SMRT (Figure 2). These males were transported to the sterilization facility at the U.S. Geological Survey Hammond Bay Biological Station, sterilized with the chemosterilant bisazir, marked with a fin clip and released into the St. Marys River. Laboratory and field studies have demonstrated that treated male sea lampreys are sterile and sexually competitive (produce mating pheromones and exhibit typical spawning behaviors). Furthermore, studies show that in areas where sterile males are released, the number of eggs hatching in nests is reduced. Table 7 provides a summary of the SMRT program activities in 2010.

The Reproduction Reduction Task Force (RRTF) was formed in 2003 and coordinates the optimization of pheromone, sterile-male-release and trapping for control strategies in an integrated program of sea lamprey control. A report outlining the progress of this task force is presented in the RRTF section of this report (p 89).

- A total of 21,844 spawning-phase male sea lampreys were delivered to the sterilization facility from trapping operations in Lakes Superior (741), Michigan (6,395), Huron (13,378), and Ontario (1,330).

- A total of 19,392 sterilized male sea lampreys were released in the St. Marys River from mid-May to mid-July. The estimated resident population of spawning-phase sea lampreys in the St. Marys River was 25,234. Assessment traps removed 7,644 sea lampreys, an estimated reduction in reproduction of 28% through trapping. The ratio of sterile to resident male sea lampreys remaining in the St. Marys River was estimated at 1.7:1 (19,392 sterile:11,348 estimated resident after trapping).

- The theoretical reduction from trapping and enhanced sterile-male-release was estimated at 74% during 2010. The theoretical reduction in reproduction from trapping and the enhanced SMRT averaged 85% between 1997-2010. Prior to the enhanced program, from 1991-1996, the theoretical reduction in reproduction averaged 58%.

- The release of sterile males combined with the removal of sea lampreys by traps reduced the theoretical number of effective fertile females in the St. Marys River from 9,398 to 2,498 during 2010.

- In the St. Marys River rapids, 1 unsterilized male sea lamprey was observed spawning and eggs were collected from 20 nests. Approximately 4,750 eggs were assessed to determine the mean percent egg viability. Average egg viability in nests was 41.7%, and ranged from 0% to 96%. Average egg viability weighted by nests per year from 1997-2010 was 31.5%.

- A four-year field study of the sterile-female-release technique concluded in 2010. The primary objective of the study, conducted in the Trout River (Rogers City, Michigan), was to determine if release of sterilized female sea lampreys could delay or prevent lampricide treatment. In 2010, a total of 4,985 sterilized female sea lampreys were released in the Trout River from May 19-May 31. Observations of 747 sterile females, nine untreated females, and 72 untreated males were made during the spawning migration. Type of activity was recorded as resting, nest building, or actively spawning. In 2010, a total of 116 nests were located and 94 nests were sampled to assess the percentage of viable eggs found in nests. The average percent egg viability for all nests combined (n=88) was 10.2% (range 0% - 100%). Egg viability in nests where only sterile female lampreys were observed (n=52) averaged 7.6% (range 0%-44.9%). A completion report for the four year study will be submitted in 2011.

Table 7. Theoretical effects of trapping and sterile male release, and theoretical suppression of reproduction in the estimated population of sea lampreys in the St. Marys River during 1991-2010.

Year	Population estimate	Percent males	Percent removed by traps	Sterile males released	Estimated ratio sterile:normal males	Theoretical percent reduction in reproduction[1]	Theoretical reproducing females[2]
1991	35,582	53	42	7,516	0.7:1	65	5,805
1992	19,508	58	39	4,508	0.7:1	63	3,029
1993	45,620	56	22	4,832	0.2:1	38	12,534
1994	10,624	57	53	2,667	1:1	76	1,091
1995	19,608	55	44	4,238	0.7:1	67	2,873
1996	22,255	63	20	3,650	0.3:1	39	4,922
Refocused efforts entirely on the St. Marys River							
1997	8,162	56	30	17,181	5.4:1	89	402
1998	20,235	57	35	16,743	2.2:1	80	1,771
1999	19,860	60	53	26,285	4.7:1	92	638
2000	38,829	64	48	43,184	3.3:1	88	1,670
2001	25,311	63	45	31,459	3.6:1	88	1,113
2002	13,619	63	59	22,684	6.4:1	94	289
2003	27,011	66	33	27,963	2.3:1	80	1,860
2004	19,864	70	27	26,472	2.6:1	80	1,203
2005	18,790	64	45	30,581	4.6:1	90	673
2006	24,836	65	41	25,879	3:1:1	84	1,389
2007	22,808	65	25	32,152	2.9:1	81	1,559
2008	17,513	64	41	22,072	3.3:1	86	875
2009	13,424	62	42	19,212	3.8:1	87	643
2010	25,234	63	28	19,392	1.7:1	74	2,498

[1] $\left[f = 1 - \left(\frac{1-t}{s:n+1} \right) \right]$ Where f is the theoretical reduction in reproduction from sterile males and trapping, t is the proportion of animals trapped and $s{:}n$ is the ratio of sterile to normal males

[2]Theoretical reproducing females = the theoretical reduction in reproduction (f) x female population estimate.

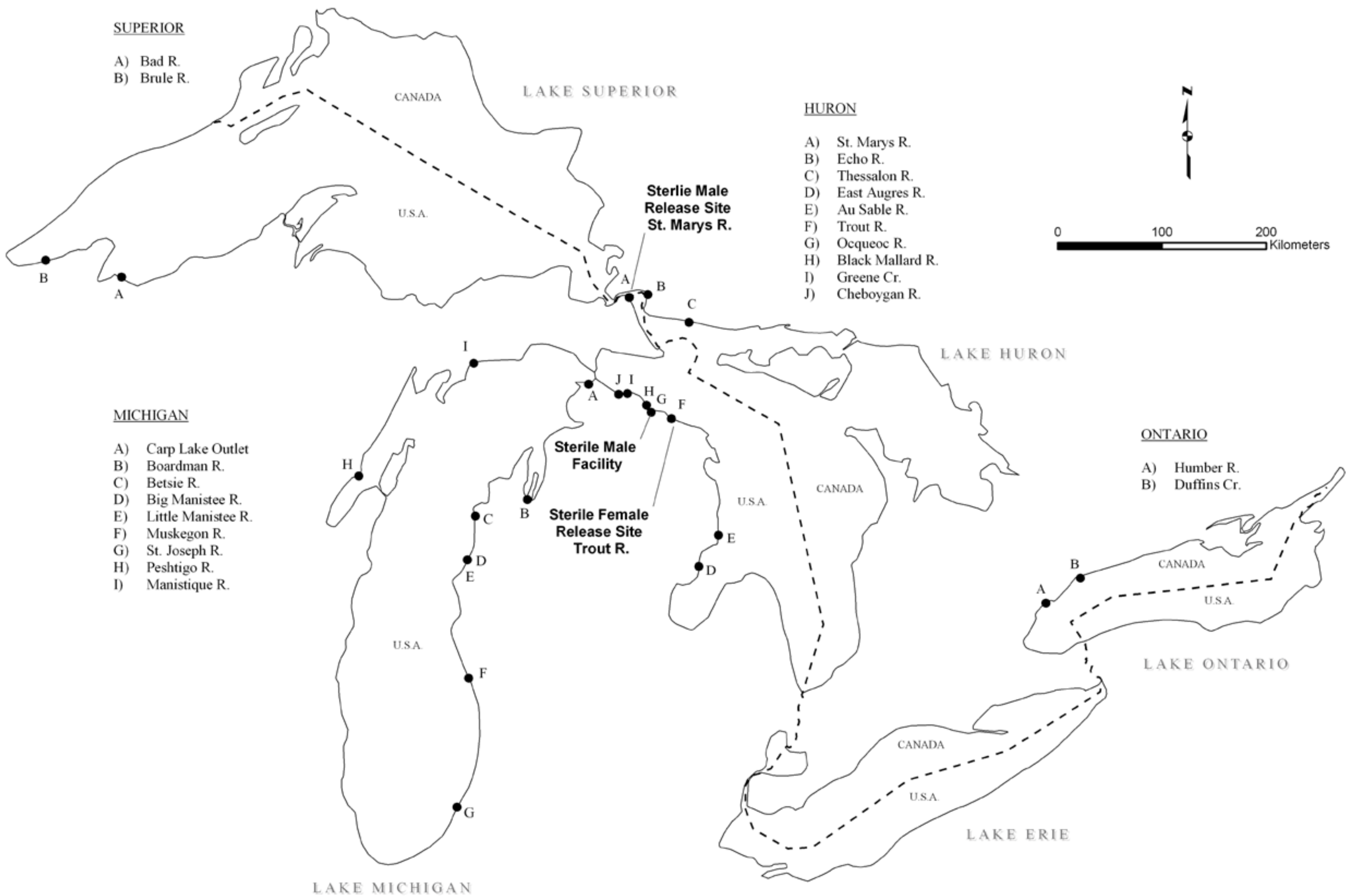

Figure 2. Locations of trapped tributaries that contributed spawning-phase sea lamprey for sterilization during 2010, release sites, and the sterilization facility.

Barriers

The *Strategic Vision of the Great Lakes Fishery Commission for the First Decade of the New Millennium* contains a milestone which states that 50% of sea lamprey suppression and a 20% reduction in TFM use will be accomplished through alternative control technologies, including barriers. The sea lamprey barrier program priorities are:

1) Operate and maintain existing sea lamprey barriers.
2) Ensure sea lamprey migration is blocked at important barrier sites.
3) Construct 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 pheromone-based control methods, trapping, the sterile male program, and lampricide treatments; and
   d. are compatible with a systems 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, which were revised during 2008, is presented in the BTF section of this report (p 93).

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 SLMP's Barrier Inventory and Project Selection System (BIPSS). During 2010, sites were inspected that were either previously inaccessible or where additional information was needed. In addition, field crews re-visited streams where, historically, no sea lamprey larvae have been found and inspected at least one more barrier upstream from the first sea lamprey barrier encountered in the system. This will allow the program to respond effectively to future barrier removal proposals on those systems. The initial inventory is nearly complete, and in the future, barrier sites will be monitored on a rotating schedule.

Lake Superior

Operation and Maintenance

- There are 15 sea lamprey barriers on Lake Superior (Figure 3). Eleven of these were purpose-built by the Commission to block sea lamprey spawning migrations and four were modifications to existing structures or barriers constructed by others that ensure sea lampreys remain blocked at those sites.

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

- Repairs or improvements were conducted on three barriers (1 Canada, 2 U.S.):

- Betsy River - Modifications were made to the stop logs on each side of the spillway and rip rap below the dam was repositioned to improve flows through and around portable assessment traps.

- Miners River - Rip rap was repositioned below the barrier to improve flows through and around portable assessment traps.

- Big Carp River - New rip-rap was installed to stabilize the downstream side of the barrier and fishway.

Ensure Blockage to Sea Lamprey Migration

- 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^2 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 (OMNR) report. During 2010, the Fisheries Management Zone 9 Advisory Council (Council) continued to evaluate two options to improve walleye passage at the Black Sturgeon (Camp 43) Dam, namely to: 1) construct a new sea lamprey barrier at the former Camp 1 site (67 km upstream of the mouth) and decommission the existing dam, or 2) refurbish the existing dam and retrofit trap and sort fish passage. The Council concluded that both options should be put forward for public consultation under a formal provincial EA process, with the former as the preferred option and the latter as an alternate option. This recommendation has been advanced as part of a Recommendations and Rationale document for consideration by OMNR Senior Management. Continued dialogue regarding the next steps is anticipated between OMNR and the Commission, the Department, First Nations, and state and federal agencies with responsibility for managing fish stocks in Lake Superior.

- During 2010, field crews visited 172 sites on tributaries to Lake Superior to assess the sea lamprey blocking potential of barriers, and to add to and improve the information in BIPSS.

- Consultations to ensure blockage at barriers were conducted with partner agencies on one U.S. tributary (Table 8).

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

Mainstream	Tributary	Lead Agency	Project	SLMP[1] Position	Comments
Poplar River		WIDNR[2]	Poplar Dam	Do not concur	Infested up to dam

[1] Sea Lamprey Management Program
[2] Wisconsin Department of Natural Resources

Assessment of Candidate Streams

- Flow monitoring and fish community assessment surveys of barrier candidate streams were conducted on one Canadian tributary.

    - Whitefish River (tributary to the Kaministiquia River) - Level loggers were reset at the potential barrier site approximately 1 km upstream from the river mouth. Cross sections of the proposed barrier site were measured. Fish surveys were conducted in the watershed during 2010. These surveys are a continuation of a multiple year assessment study designed to determine the fish community in the Whitefish River watershed. The cumulative results of these surveys have identified 38 fish species in the watershed. No provincially or federally listed species at risk have been observed during the course of recent sampling. Historically, however, the Department has documented *Ichthyomyzon* sp. in the Whitefish River.

Lake Michigan

Operation and Maintenance

- There are nine sea lamprey barriers on Lake Michigan (Figure 3). Four of these were purpose-built by the Commission to block sea lamprey spawning migrations and five were modifications to existing structures or barriers constructed by others that ensure sea lampreys remain blocked at those sites.

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

- The Pere Marquette River electrical barrier was discontinued in 2010 and the site has been decommissioned.

Ensure Blockage to Sea Lamprey Migration

- During 2010, field crews visited 461 potential barrier sites on tributaries to Lake Michigan to assess the sea lamprey blocking potential of barriers, and to add to and improve the information in BIPSS.

- White River - Repairs were made to the Hesperia Dam through a cooperative agreement with the Village of Hesperia Department of Public Works. The dam was partially dewatered and inspected for possible paths of escapement. Repairs to the dam included a resurface of the spillway, stop log channel repair, installation of new stop logs, and sealing of large cracks and voids.

- Boardman River - Union Street Dam in downtown Traverse City has historically served as a lamprey barrier, but several year classes of larval sea lampreys were discovered upstream of the barrier during 2010. Investigation is ongoing to identify the escapement route. A current plan to remove three upstream dams from the Boardman River hinges on retaining Union Street Dam as a sea lamprey barrier.

- Consultations to ensure blockage at barriers were conducted with partner agencies on nine tributaries (Table 9).

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

Mainstream	Tributary	Lead Agency	Project	SLMP[1] Position	Comments
Sheboygan River		WIDNR[2]	River Bend Dam	Decision pending	More information requested
Sheboygan River		WIDNR[2]	Walderhaus Dam	Decision pending	More information requested
St Joseph River		MDNR[3]	Erosion control structure	Concur	Not a lamprey barrier
St. Joseph River	Mill Creek	MDNR[3]	Mill Creek Dam	Concur	Not a lamprey barrier
St. Joseph River	Paw Paw River	MDNR[3]	Watervliet Dam	Concur	Not a lamprey barrier
Black River		MDNR[3]	Breedsville Dam	Concur	Not a lamprey barrier
Grand River		MDNR[3]	Lyons Dam	Concur	Not a lamprey barrier, Weber Dam upstream
Bear River		MDNR[3]	Mitchell Dam	Do not concur	Evaluate lowering crest height
Sauk Creek		City of Port Washington	Sauk Weir	Concur	Not a lamprey barrier

[1]Sea Lamprey Management Program
[2]Wisconsin Department of Natural Resources.
[3]Michigan Department of Natural Resources.

New Construction

- Manistique River - The U.S. Army Corps of Engineers is the lead agency administering a project to construct a sea lamprey barrier to replace a deteriorated structure in the Manistique River. The existing Manistique Paper, Inc. dam was identified as the most feasible site for a new barrier. Hydrology and hydraulic analysis indicated that additional real estate easements will be necessary. Construction is scheduled for early 2012.

- Days River - Stanley Consultants completed topographic surveys and was provided tailwater stage height data collected below the existing sea lamprey barrier. This information will be used to complete a hydrology and hydraulic analysis of the barrier site. The analysis will determine the crest height necessary to block spawning-phase migrations of sea lampreys.

- Trail Creek - Construction was planned for 2010. Due to delays in real estate negotiations construction is now scheduled for 2011.

Lake Huron

Operation and Maintenance

- There are 17 sea lamprey barriers on Lake Huron (Figure 3). Thirteen of these were purpose-built by the Commission to block sea lamprey spawning migrations and four were modifications to existing structures or barriers constructed by others that ensure sea lampreys remain blocked at those sites.

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

- Repairs or improvements were conducted on one Canadian barrier:

    - Koshkawong Creek - Repairs completed to barrier access route on private landowner’s property.

- The electrical field of the combination low-head/electrical barrier in the Ocqueoc River operated continuously between April 21- April 27, May 9-May 19, and June 12-June 21. A new computer and software were installed at the weir by Smith Root prior to the start of the season. Problems with calibrating the new software to the tailwater elevation sensor led to manual operation of the electrical field during most of the season.

Ensure Blockage to Sea Lamprey Migration

- Saugeen River - Denny’s Dam currently ranks third on the OMNR dam rehabilitation project list, and although the Commission has committed approximately $800,000 to the project over two years, lack of provincial funding is projected to delay the start of reconstruction until 2013. In the meantime, OMNR plans to address an area of scour under the north toe of the spillway and lower the level of the head pond to mitigate the risk that ice load will destabilize the structure.

- During 2010, field crews visited 166 potential barrier sites on tributaries to Lake Huron to assess the sea lamprey blocking potential of barriers, and to add to and improve the information in BIPSS.

- Consultations to ensure blockage at barriers were conducted with partner agencies on seven U.S. tributaries (Table 10).

Table 10. Status of concurrence requests for barrier removals, replacements, or fish passage projects in Lake Huron tributaries.

Mainstream	Tributary	Lead Agency	Project	SLMP[1] Position	Comments
Saginaw River	Tittabawassee River	East Lansing ES[2]	Dow Dam	Mitigate	Improve trapping
Saginaw River	Flint River	Shiawassee NWR[3]	Hamilton Dam	Concur	Low chance of infestation
Saginaw River	Flint River	Shiawassee NWR[3]	Utah Dam	Concur	Low chance of infestation
Saginaw River	Flint River	Shiawassee NWR[3]	Fabri Dam	Concur	Low chance of infestation
Saginaw River	Cass River	Shiawassee NWR[3]	Vassar Dam	Decision pending	Not a lamprey barrier
Saginaw River	Cass River	Shiawassee NWR[3]	Caro (Fox) Dam	Decision pending	Fish passage modification
Au Sable River	Van Etten Creek	MDNR[4]	Van Etten Dam	Decision pending	Fish passage modification

[1] Sea Lamprey Management Program
[2] U.S. Fish and Wildlife Service, Ecological Services (East Lansing).
[3] U.S. Fish and Wildlife Service, National Wildlife Refuge (Shiawassee).
[4] Michigan Department of Natural Resources.

New Construction

- Construction projects were initiated, ongoing, or completed on one Canadian tributary.
    - Still River - The construction and clean-up of a new two km-long road into the barrier site is complete. Fencing along the road, required to protect the landowner's thoroughbred horses from vehicular traffic, was completed in May 2010. The contract to re-construct the barrier was tendered and awarded in August. Construction commenced in September. Project completion is expected in early 2011 prior to the sea lamprey spawning run.

Assessment of Candidate streams

- Fish community assessment surveys of barrier candidate streams were conducted on one Canadian tributary.
    - Bighead River - Fish surveys were conducted in the watershed during 2010. These surveys are a continuation of a multiple year assessment study designed to determine the fish community in the Bighead River. The cumulative results of these surveys have identified 40 fish species in the watershed. Round goby have

been observed in the lower stem of the main river. No provincially or federally listed species at risk have been observed during the course of recent sampling. Historically, the Department has documented northern brook lamprey in the Bighead River.

Lake Erie

Operation and Maintenance

- There are seven sea lamprey barriers on Lake Erie (Figure 3) that were purpose-built by the Commission to block sea lamprey spawning migrations.

- Routine maintenance, spring start-up, and safety inspections were performed on six Canadian barriers, but did not include the Normandale Creek barrier, which was reconstructed in 2010.

- Repairs or improvements were conducted on two barriers in Canada:

    - Big Creek - A new air hoist was installed to lift the sea lamprey trap and a hole under the east section of wall was repaired. To prevent water seepage around the east abutment and to ensure blockage during periods of high flows, the existing wall was raised 0.6 m.

    - Little Otter Creek - At the landowner's request, the Department installed a fence to deter trespassing at the site.

Ensure Blockage to Sea Lamprey Migration

- During 2010, field crews visited 12 potential barrier sites on tributaries to Lake Erie to assess the sea lamprey blocking potential of barriers, and to add to and improve the information in BIPSS.

- Consultations to ensure blockage at barriers were conducted with partner agencies on two tributaries (1 U.S., 1 Canada; Table 11).

Table 11. Status of concurrence requests for barrier removals, replacements, or fish passage projects in Lake Erie tributaries.

Mainstream	Tributary	Lead Agency	Project	SLMP[1] Position	Comments
Four Mile Creek		PFBC[2]	Lawrence Park Golf Club Dam	Concur	Seasonal requirements
Lynn River		DFO-FHM[3]	Misner Dam in Port Dover	Concur	Low chance of infestation

[1]Sea Lamprey Management Program
[2]Pennsylvania Fish and Boat Commission
[3]Department of Fisheries and Oceans – Fish Habitat Management

New Construction

- Construction projects were initiated, ongoing, or completed on one Canadian tributary.

    - Normandale Creek - The Department completed reconstruction of this barrier in late August, 2010, which had been destroyed by a 2008 flood.

Lake Ontario

Operation and Maintenance

- There are 15 sea lamprey barriers on Lake Ontario (Figure 3). Nine of these were purpose-built by the Commission to block sea lamprey spawning migrations and six were modifications to existing structures or barriers constructed by others that ensure sea lampreys remain blocked at those sites.

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

Ensure Blockage to Sea Lamprey Migration

- Duffins Creek - A Commission-sponsored PIT tagging study was conducted by the Department's Great Lakes Laboratory for Aquatic Science (GLLFAS) in 2010 to identify pathways of escapement at the sea lamprey barrier. Sea lampreys were recorded passing over the face of the dam during high water events.

- Credit River - A Commission-sponsored PIT tagging study was conducted by the GLLFAS in 2010 to identify pathways of escapement at the Kraft Dam in Streetsville, Ontario. This dam was repaired in 2004 to block sea lampreys. No lampreys were recorded breaching the dam or fishway, however, the antennae signal was lost on two separate occasions due to high water velocity and debris loading. A continuation of the study is tentatively planned for 2011.

- During 2010, field crews visited 297 potential barrier sites on tributaries to Lake Ontario to assess the sea lamprey blocking potential of barriers, and to add to and improve the information in BIPSS.

New Construction

- A construction project was ongoing on one Canadian tributary.

    - Orwell Brook - The final design has been completed. Unforeseen delays with the environmental permitting process have postponed this project. Construction is expected for 2011.

Assessment of Candidate Streams

- Fish community assessment surveys were conducted on one Canadian tributary.

- Rouge River - The Toronto Regional Conservation Authority (TRCA) will soon complete a draft Fisheries Management Plan (FMP) to complement the 2007 Rouge River Watershed Management Plan, which identified the evaluation of "*the installation or maintenance of barriers to partition species or to exclude invasive species"* as a priority for the watershed. The FMP will recommend a sea lamprey barrier feasibility study. TRCA has provided a floodplain map for the proposed site and fisheries data from the upper portion of the watershed. The Department has augmented these data with fish community assessment surveys from the lower parts of the watershed completed in September 2009 and May 2010. A total of 39 species have been identified by these fish community assessment surveys. Department surveys have identified four additional species: the American eel (*Anguilla rostrata*), round goby (*Neogobius melanostomus*), guppy (*Poecilia reticulata*), and blackchin shiner (*Notropis heterodon*).

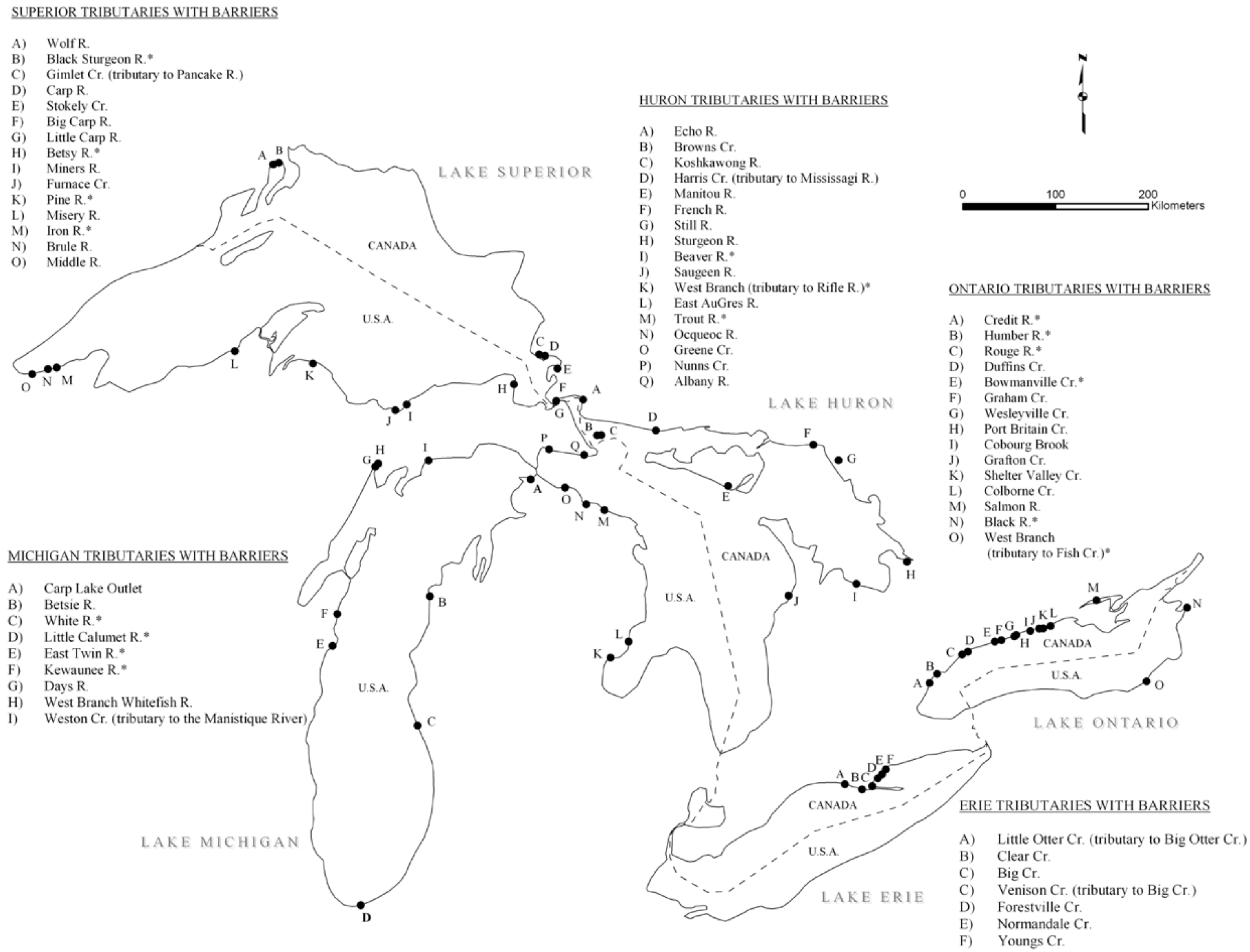

Figure 3. Locations of tributaries with sea lamprey barriers. Structures that have been modified or constructed by others that prevent the upstream migration of sea lampreys are indicated by an asterisk.

ASSESSMENT

The SLMP has two assessment components that target the larval and spawning phases of sea lampreys:

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

2. The spawning-phase component annually assesses the stock size of spawning-phase lampreys in each of the lakes. Because this life-phase is comprised of individuals that have evaded control efforts, the time series of spawning-phase abundance is used to evaluate the success of the SLMP.

The Assessment Task Force (ATF) was established by the Commission during 1996 to rank streams and lentic areas for sea lamprey control options and to optimize long-term measures of success of the sea lamprey control program. The task force's report on the charges during 2010 is presented in the ATF section of this report (p 86).

Larval Assessment

Tributaries considered for lampricide treatment during 2011 were assessed during 2010 to estimate the density and size structure of larval sea lamprey populations. Assessments were conducted with backpack electrofishers in waters <0.8m deep. Waters ≥0.8m 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 sea lamprey larvae in each infested area was estimated by multiplying the mean density of larvae ≥100mm (number per m^2) by an estimated area of suitable habitat (m^2). Infested areas were ranked for treatment during 2011 based on a cost per kill of larval sea lampreys ≥100mm, as estimated using this index of abundance and average treatment costs. Additional surveys are used to define the distribution of sea lampreys within a stream, detect new populations, evaluate lampricide treatments, and to establish the sites for lampricide application. Lentic areas <2.0 hectares are monitored for relative abundance and spatial distribution of larvae.

Lake Superior

- Larval assessment surveys were conducted on a total of 136 tributaries (46 Canada, 90 U.S.) and offshore of 24 tributaries (11 Canada, 13 U.S.). The status of larval sea lamprey populations in historically infested Lake Superior tributaries and lentic areas is presented in Tables 12 and 13.

- Surveys to estimate abundance of larval sea lampreys were conducted in 32 tributaries (11 Canada, 21 U.S.) and offshore of 13 tributaries (7 Canada, 6 U.S.).

- Surveys to detect the presence of new larval sea lamprey populations were conducted in 36 tributaries (13 Canada, 23 U.S.). New infestations were discovered in the Mineral and Big Iron rivers and Tourist Park Creek (U.S.).

- Post-treatment assessments were conducted in 27 tributaries and lentic areas (13 Canada, 14 U.S.) to determine the effectiveness of lampricide treatments conducted during 2009 and 2010.

- Surveys to evaluate barrier effectiveness were conducted in four tributaries (3 Canada, 1 U.S.).

- Biological collections for researchers or training purposes were conducted in nine tributaries (5 Canada, 4 U.S.).

- RoxAnn© sonar was used to map a total of 1,312 hectares of lentic substrate off the mouths of Big Trout Cr. (111 ha), Nipigon R. (Cash Creek; 52 ha), Gravel/Little Gravel R. (113 ha), St. Louis R. (556 ha), and Slate/Silver/Ravine R. (345 ha).

Table 12. Status of larval sea lampreys in Lake Superior tributaries with a history of sea lamprey production and estimates of abundance from tributaries surveyed during 2010.

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	May-07	No	No	---	---	Unknown
West Davignon Cr.	Jun-04	Jul-10	No	Yes	2,274	2,274	***2011***
Little Carp R.	May-08	Jun-10	No	Yes	---	---	2012
Big Carp R.	Sep-07	Jul-10	No	No	---	---	Unknown
Cranberry Cr.	Jun-04	Jul-10	No	Yes	19,586	4,197	***2011***[2]
Goulais R.	Jun-09	May-10	Yes	Yes	---	---	2012[1]
Bostons Cr.	Never	Jun-09	---	No	---	---	Unknown
Horseshoe Cr.	Never	Jul-05	---	No	---	---	Unknown
Haviland Cr.	Never	Jul-10	---	Yes	---	---	Unknown
Stokely Cr.	Jun-08	Jun-10	No	Yes	---	---	Unknown
Tier Cr.	Never	Jul-09	---	No	---	---	Unknown
Harmony R.	Jun-09	Jul-09	No	Yes	---	---	2014
Sawmill Cr.	Jun-68	Jul-09	No	Yes	608	608	***2011***
Jones Landing Cr.	Never	Jun-08	---	No	---	---	Unknown
Tiny Cr.	Never	Jul-09	---	No	---	---	Unknown
Chippewa R.	Jul-10	Sep-09	---	---	---	---	2016
Unger Cr.	Jul-10	Sep-09	---	---	---	---	Unknown
Batchawana R.	Sep-07	Oct-08	Yes	Yes	---	---	***2011***[1]
Digby Cr.	Oct-10	Oct-10	---	---	---	---	Unknown
Carp R.	Jun-09	Jul-09	No	No	---	---	2013[1]
Pancake R.	Jun-08	Jul-09	Yes	Yes	---	---	2012[1]
Westman Cr.	Never	Aug-07	---	No	---	---	Unknown
Agawa R.	Oct-08	Aug-09	---	Yes	---	---	***2011***[2]
Sand R.	Sep-71	Jun-09	No	Yes	---	---	Unknown
Baldhead R.	Never	Jun-09	---	No	---	---	Unknown
Gargantua R.	Jul-09	Aug-09	No	No	---	---	2013[1]
Michipicoten R.	Aug-08	Aug-09	Yes	Yes	---	---	2013[1]
Dog R.	Jun-10	Jun-10	---	---	---	---	Unknown
White R.	Aug-05	Sep-09	---	Yes	---	---	***2011***[1]
Pic R.	Jul-06	Aug-10	---	Yes	---	---	2012[1]
Little Pic R.	Sep-94	Aug-10	No	Yes	26,081	17,930	***2011***
Prairie R.	Jul-94	Jun-09	No	No	---	---	Unknown
Steel R.	Jul-08	Aug-10	No	Yes	---	---	2012
Pays Plat R.	Jul-07	Jul-08	No	Yes	---	---	2012[1]
Little Pays Plat Cr.	Jul-07	Jul-07	No	Yes	---	---	2012
Gravel R.	Jul-08	Sep-09	Yes	Yes	---	---	2012[1]
Little Gravel R.	Jul-08	Aug-09	No	Yes	---	---	2013[1]
Cypress R.	Jul-09	Aug-09	Yes	No	---	---	Unknown
Jackpine R.	Never	Jun-09	No	No	---	---	Unknown
Jackfish R.	Jul-08	Aug-08	Yes	No	---	---	2012[1]

Table 12. *continued.*

Tributary	Last Treated	Last Surveyed	Status of Larval Lamprey Population (surveys since last treatment) Residuals Present	Recruitment Evident	Estimate of Overall Larval Population	Abundance Estimate of Larvae >100mm	Expected Year of Next Treatment
Nipigon R.							
Upper Nipigon R.	Aug-09	Jun-10	Yes	Yes	---	---	2014[1]
Lower Nipigon R.	Aug-06	Aug-10	No	Yes	24,371	6,665	***2011***
Cash Cr.	Jul-09	Jun-10	Yes	No	---	---	2013
Polly Cr.	Jul-87	Aug-09	No	No	---	---	Unknown
Stillwater Cr.	Jul-09	Jun-10	Yes	Yes	---	---	2013[1]
Big Trout Cr.	Jul-10	Aug-10	No	No	---	---	2014
Otter Cove Cr.	Aug-71	Jul-02	No	No	---	---	Unknown
Black Sturgeon R.	Aug-05	Aug-10	No	Yes	---	---	***2011***[1]
Big Squaw Cr.	Jun-72	Jun-09	No	No	---	---	Unknown
Wolf R.	Jul-07	Jun-10	No	Yes	---	---	***2011***[1]
Coldwater Cr.	Jul-07	Aug-10	No	Yes	---	---	2012
Pearl R.	Jul-10	Aug-10	Yes	---	---	---	2014
Blende Cr.	Aug-64	Aug-10	No	No	---	---	Unknown
MacKenzie R.	Jul-08	Aug-10	No	Yes	---	---	2012
Neebing-McIntyre Floodway							
McIntyre R.	Jul-07	Aug-09	No	Yes	---	---	2013
Neebing R.	Jul-08	Aug-09	No	Yes	---	---	2013
Kaministikwia R.	Jul-10	Sep-10	Yes	Yes	---	---	2014
Cloud R.	Jul-08	Sep-10	No	Yes	---	---	2012
Pine R.	Jul-73	Aug-09	---	Yes	---	---	Unknown
Pigeon R.	Jul-07	Aug-09	No	Yes	---	---	2012
United States							
Waiska R.	Jul-07	Aug-09	No	No	---	---	Unknown
Pendills Cr.	Sep-88	Aug-09	---	Yes	---	---	Unknown
Grants Cr.	Jun-08	Jul-10	No	Yes	---	---	Unknown
Naomikong Cr.	Jul-63	Jul-10	---	No	---	---	Unknown
Ankodosh Cr.	Jun-08	Jul-10	No	Yes	---	---	Unknown
Roxbury Cr.	Jun-08	Jul-10	No	Yes	891	274	Unknown
Galloway Cr.	Jul-07	Jul-10	No	Yes	---	---	Unknown
Tahquamenon R.	Oct-10	Sep-10	---	---	---	---	Unknown
Betsy R.	Oct-10	Aug-09	---	---	---	---	Unknown
Three Mile Cr.	Jun-62	Jul-08	---	No	---	---	Unknown
Little Two Hearted R.	Jun-08	Sep-08	No	No	---	---	2012
Two Hearted R.	Aug-10	Jul-10	---	---	---	---	Unknown
Dead Sucker R.	Jul-75	Sep-09	---	No	---	---	Unknown
Sucker R. (Alger Co.)	Sep-10	Jul-10	---	---	---	---	Unknown
Chipmunk Cr.	Sep-62	Jul-10	---	No	---	---	Unknown
Carpenter Cr.	Aug-05	Sep-10	Yes	Yes	0	0	Unknown
Sable Cr.	Sep-89	Sep-10	---	Yes	---	---	Unknown
Hurricane R.	Never	Sep-10	---	Yes	---	---	Unknown
Sullivans Cr.	Sep-10	Jul-10	---	---	---	---	Unknown
Seven Mile Cr.	Jul-67	Sep-09	---	No	---	---	Unknown

Table 12. *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			
Beaver Lake Cr.							
Lowney Cr.	Sep-10	Aug-09	---	---	---	---	Unknown
Mosquito R.	Jun-73	Aug-08	---	No	---	---	Unknown
Miners R.							
Barrier downstream	Sep-09	Oct-09	No	No	---	---	2013
Barrier upstream	Sep-09	Oct-09	No	No	---	---	Unknown
Munising Falls Cr.	Sep-64	Jun-09	---	Yes	---	---	Unknown
Anna R.	Sep-65	Jul-09	---	Yes	---	---	Unknown
Tourist Park Cr.	Never	Jul-10	---	---	---	---	Unknown
Furnace Cr.	Sep-10	Sep-10	---	---	---	---	Unknown
Five Mile Cr.	Jul-07	Jun-10	No	Yes	2,191	88	Unknown
Au Train R.							
Upper	Jul-08	Sep-10	Yes	Yes	24,259	14,335	***2011***
Buck Bay Cr.	Jul-08	Sep-10	No	Yes	---	---	***2011***
Lower	Aug-97	Sep-10	---	Yes	32,394	8,936	***2011***
Rock R.	Jul-02	May-09	---	No	---	---	Unknown
Deer Lake Cr.	Aug-70	May-09	---	No	---	---	Unknown
Laughing Whitefish R.	Aug-09	Jun-10	Yes	No	2,042	2,042	***2011***
Sand R.	Jul-85	Oct-09	---	Yes	---	---	Unknown
Chocolay R.	Jul-09	May-10	Yes	Yes	---	---	2012
Carp R.	Sep-09	May-10	Yes	Yes	---	---	2013
Dead R.	Aug-10	Jul-09	---	---	---	---	Unknown
Harlow Cr.	Sep-10	Oct-09	---	---	---	---	Unknown
Little Garlic R.	Oct-10	Jun-10	---	---	---	---	Unknown
Garlic R.	Jul-09	May-10	Yes	---	61,456	61,456	***2011***
Iron R.	Sep-09	Jul-10	No	No	---	---	Unknown
Salmon Trout R. (Marquette Co.)	Sep-09	Oct-09	No	No	---	---	2013
Pine R.	Jul-04	Sep-10	Yes	Yes	63,702	10,617	***2011***
Huron R.	Oct-09	Jul-10	Yes	---	1,791	972	2013
Ravine R.	Sep-10	Jul-10	---	---	---	---	***2011***[1]
Slate R.	Aug-09	Oct-09	No	No	---	---	*2013*
Silver R.	Sep-10	Jul-10	---	---	---	---	***2011***[1]
Falls R.	Aug-09	Oct-09	No	No	---	---	***2011***[1]
Six Mile Cr.	May-63	Aug-09	---	Yes	---	---	Unknown
Sturgeon R.	Oct-10	Jul-10	---	---	---	---	Unknown
Pilgrim R.	Aug-62	Jun-09	---	No	---	---	Unknown
Trap Rock R.	May-09	Aug-10	Yes	Yes	22,139	3,406	***2011***
McCallum Cr.	Aug-63	Jul-10	---	No	---	---	Unknown
Traverse R.	May-09	Jul-10	No	Yes	9,710	639	*2013*
Little Gratiot R.	Aug-72	Jun-08	---	No	---	---	Unknown
Eliza Cr.	Jul-07	Sep-10	Yes	Yes	862	172	***2011***
Gratiot R.	Jun-06	Sep-10	No	Yes	25,663	3,963	***2011***
Smiths Cr.	May-64	Jun-07	---	No	---	---	Unknown

Table 12. *continued.*

Tributary	Last Treated	Last Surveyed	Status of Larval Lamprey Population (surveys since last treatment) Residuals Present	Recruitment Evident	Estimate of Overall Larval Population	Abundance Estimate of Larvae >100mm	Expected Year of Next Treatment
Boston-Lily Cr.	Aug-62	Jun-07	---	No	---	---	Unknown
Salmon Trout R. (Houghton Co.)	Jul-08	Jul-10	No	Yes	4,706	0	Unknown
Mud Lake Outlet	Oct-73	Jul-10	---	No	---	---	Unknown
Graveraet R.	Aug-63	Aug-09	---	No	---	---	Unknown
Elm R.	Jul-07	Aug-09	No	No	---	---	Unknown
Misery R.							
Barrier downstream	Aug-07	Sep-10	No	Yes	---	---	***2011***[1]
Barrier upstream	Sep-00	Aug-09	---	No	---	---	Unknown
East Sleeping R.	Jul-08	Sep-10	No	Yes	---	---	***2011***[1]
West Sleeping R.	Aug-09	Aug-10	No	No	---	---	2013
Firesteel R.	Jul-08	Aug-10	Yes	Yes	---	---	***2011***[1]
Ontonagon R.	Oct-08	Aug-09	Yes	Yes	---	---	2012
Potato R.	Jun-08	Sep-10	No	Yes	---	---	***2011***[1]
Floodwood R.	Never	Aug-10	---	No	---	---	Unknown
Cranberry R.	Jun-08	Aug-10	Yes	Yes	---	---	***2011***[1]
Mineral R.	Oct-10	Jul-10	---	Yes	---	---	Unknown
Little Iron R.	Sep-75	Jul-08	---	No	---	---	Unknown
Union R.	May-64	Aug-09	---	No	---	---	Unknown
Black R.	Jul-10	Sep-09	---	---	---	---	Unknown
Montreal R.	Jul-75	Aug-07	---	No	---	---	Unknown
Washington Cr.	Jun-80	Aug-09	---	No	---	---	Unknown
Bad R.	Oct-08	Oct-09	Yes	Yes	---	---	***2011***
Fish Cr. (Eileen Twp.)	Jul-10	Jun-10	---	---	---	---	Unknown
Sioux R.	Never	Sep-09	---	Yes	---	---	Unknown
Red Cliff Cr.	Sep-07	Oct-10	No	Yes	19,449	1,165	***2011***
Raspberry R.	Jun-63	Aug-08	---	No	---	---	Unknown
Sand R.	Aug-07	Oct-10	Yes	Yes	78,084	6,516	***2011***
Cranberry R.	Never	Oct-10	---	Yes	2,855	816	2012
Iron R.							
Barrier downstream	Aug-07	Jun-10	No	Yes	---	---	Unknown
Barrier upstream	Oct-64	Aug-08	---	No	---	---	Unknown
Reefer Cr.	Oct-64	Aug-08	---	No	---	---	Unknown
Fish Cr. (Orienta Twp.)	Oct-64	Aug-08	---	No	---	---	Unknown
Brule R.	Jul-09	Oct-09	No	Yes	---	---	2012
Poplar R.	May-08	Oct-10	No	Yes	241,026	154,741	***2011***
Middle R.							
Barrier downstream	May-08	Sep-10	Yes	Yes	1,396	237	2012
Amnicon R.	Oct-09	Sep-10	---	Yes	1,052	1,052	2012
Nemadji R.	Jun-09	Oct-10	Yes	Yes	52,320	0	2012
St. Louis R.	Sep-87	Sep-07	---	Yes	---	---	Unknown
Sucker R. (St. Louis Co.)	Never	Jun-10	---	No	---	---	Unknown
Gooseberry R.	Aug-76	Jun-10	---	Yes	---	---	Unknown
Splitrock R.	Aug-76	Jun-10	---	No	---	---	Unknown

Table 12. *continued.*

Tributary	Last Treated	Last Surveyed	Status of Larval Lamprey Population (surveys since last treatment) Residuals Present	Recruitment Evident	Estimate of Overall Larval Population	Abundance Estimate of Larvae >100mm	Expected Year of Next Treatment
Poplar R.	Jul-77	Jun-10	---	Yes	---	---	Unknown
Arrowhead R.	Jun-09	Jun-10	No	Yes	---	---	2013

[1] Stream being treated based on expert judgement
[2] Stream deferred for treatment from 2010

Table 13. Status of larval sea lampreys in historically infested lentic areas of Lake Superior during 2010.

Tributary	Lentic Area	Last Surveyed	Last Survey Showing Infestation	Last Treated
Canada				
Goulais R.	Goulais Bay	Jul-08	Jul-08	Aug-85
Haviland Cr.	Haviland Bay	Jul-10	Jul-10	Never[1]
Stokely Cr.	Haviland Bay	Jul-09	---	Aug-10
Harmony R.	Batchawana Bay	Jul-09	Jul-09	Aug-87
Chippewa R.	Batchawana Bay	Jul-10	Jul-10	Jul-09[1]
Batchawana R.	Batchawana Bay	Aug-10	Aug-10	Oct-07
Carp R.	Batchawana Bay	Jul-10	Jul-10	Aug-07
Agawa R.	Agawa Bay	Aug-09	---	Aug-10
Pays Plat R.	Pays Plat Bay	Sep-07	---	Never
Gravel R.	Mountain Bay	Sep-10	Sep-10	Aug-10
Little Gravel R.	Mountain Bay	Aug-08	---	Aug-10
Little Cypress R.	Cypress Bay	Aug-78	Aug-78	Never
Cypress R.	Cypress Bay	Sep-10	Sep-10	Jul-09[1]
Jackfish R.	Nipigon Bay	Jul-07	Aug-05	Never
Nipigon R.	Lake Helen	Aug-10	---	Aug-10
	Cash Cr. Lentic	Jun-10	Jun-10	Aug-10
	Stillwater Cr. Lentic	Jun-10	Jun-10	Oct-09
	Nipigon Bay	Jun-10	Jun-10	Aug-05[1]
	Polly Lake	Aug-05	Jul-90	Jul-87
Big Trout Cr.	Nipigon Bay	Jun-10	Jun-10	Oct-09[1]
Black Sturgeon R.	Black Bay	Aug-09	Jul-04	Never
Wolf R.	Black Bay	Aug-09	Aug-09	Never
MacKenzie R.	MacKenzie Bay	Aug-10	Aug-10	Jul-08[1]
Current R.	Thunder Bay	Aug-10	---	Aug-10
Neebing-McIntyre Floodway	Thunder Bay	Aug-05	---	Never
Kaministiquia R. (lower)	Thunder Bay	Jun-10	Jun-10	Aug-10[1]
Pigeon R.	Pigeon Bay	Sep-10	Jul-07	Aug-10
United States				
Grants Cr.	Tahquamenon Bay	Sep-05	Never	Never
Ankodosh Cr.	Tahquamenon Bay	Jul-10	Jul-10	Never[2]
Roxbury Cr.	Tahquamenon Bay	Jul-10	Jul-10	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-09	Sep-09	Aug-10
Beaver Lake Cr.	Beaver Lake	Sep-10	Sep-10	Never[2]
Anna R.	Munising Bay	Jul-10	Jul-10	Never[1]
Miners R.	Miners Lake	Sep-10	Sep-10	Sep-09[1]
Furnace Cr.	Furnace Bay	Aug-09	Aug-09	Aug-10
	Furnace Lake – Offshore Hanson Cr.	Aug-09	Aug-09	Never[2]
	Furnace Lake – Offshore Gongeau Cr.	Aug-09	Aug-09	Never[2]
Dead R.	Presque Isle Harbor	Sep-08	Sep-08	Aug-10
Harlow Cr.	Harlow Lake – Offshore Bismark Cr.	Jul-09	Jul-09	Never[2]

Table 13. *continued.*

Tributary	Lentic Area	Last Surveyed	Last Survey Showing Infestation	Last Treated
Little Garlic R.	Little Garlic R.	Jul-10	Jul-10	Never[1]
Garlic R.	Garlic R. offshore mouth	Sep-05	Sep-05	Never[2]
	Saux Head Lake	Jul-10	Jul-10	Never[2]
Ravine R.	Huron Bay	Jul-06	Jul-06	Aug-10[1]
Slate R.	Huron Bay	Jul-10	Jul-10	Never[2]
Silver R.	Huron Bay	Jul-10	Jul-10	Never[1]
Falls R.	Huron Bay	Jul-08	Jul-08	Aug-10[1]
Trap Rock R.	Torch Lake	Aug-09	Aug-09	Aug-10
Eliza Cr.	Eagle Harbor	Jul-03	Sep-78	Never
Black R.	Black River Harbor	Jul-10	Jul-10	May-06
Fish Cr. (Eileen Twp.)	Chequamegon Bay	Jun-10	Aug-06	Never[2]
Red Cliff Cr.	Buffalo Bay	Jul-05	Jun-97	Never
Sand R. (Bayfield Twp.)	Sand Bay	Sep-09	Sep-09	Aug-10
Amnicon R.	Superior Bay	Sep-09	Sep-09	Never

[1] Scheduled for treatment during 2011
[2] Low-density larval population monitored with Bayluscide 3.2% Sea Lamprey Larvicide surveys

Lake Michigan

- Larval assessment surveys were conducted on a total of 129 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 14 and 15.

- Surveys to estimate the abundance of larval sea lampreys were conducted in 36 tributaries and offshore of 2 tributaries.

- Surveys to detect the presence of new larval sea lamprey populations were conducted in 48 tributaries. A new population was discovered in French Farm Creek.

- Post-treatment assessments were conducted in 28 tributaries and 2 lentic areas to determine the effectiveness of lampricide treatments during 2009 and 2010.

- Surveys to evaluate barrier effectiveness were conducted in five tributaries. Several year classes of larval sea lampreys were present upstream of Union Street Dam on the Boardman River, between Sabin Dam and Boardman Lake and this area was subsequently treated with lampricide.

- Surveys to collect larval lampreys for pheromone extraction were conducted in three tributaries.

Table 14. Status of larval sea lampreys in Lake Michigan tributaries with a history of sea lamprey production and estimates of abundance from tributaries surveyed during 2010.

Tributary	Last Treated	Last Surveyed	Status of Larval Lamprey Population (surveys since last treatment) Residuals Present	Recruitment Evident	Estimate of Overall Larval Population	Abundance Estimate of Larvae >100mm	Expected Year of Next Treatment
Brevort R.							
Lower	Oct-06	Jun-09	No	No	---	---	Unknown
Little Brevort R.	Sep-08	May-10	Yes	No	391	0	***2011***
Silver Cr.	Sep-08	May-10	Yes	Yes	2,870	1,435	***2011***
Paquin Cr.	Oct-87	Jun-09	---	No	---	---	Unknown
Davenport Cr.	Aug-63	Aug-10	---	No	---	---	Unknown
Hog Island Cr.	Jun-09	Aug-09	No	No	---	---	2012
Sucker R.	Jun-61	Aug-09	---	No	---	---	Unknown
Black R.	Jun-09	Oct-09	Yes	Yes	---	---	2012
Mattix Cr.	Aug-10	Oct-10	Yes	---	---	---	Unknown
Mile Cr.	Sep-72	Aug-09	---	Yes	27	0	Unknown
Millecoquins R.							
Lower	Aug-10	Oct-10	No	---	---	---	Unknown
Upper	Jun-07	Aug-10	No	Yes	---	---	***2011***[1]
McAlpine Cr.	Jun-07	Aug-10	No	Yes	---	---	***2011***[1]
Furlong Cr.	Jun-07	Aug-10	Yes	Yes	---	---	***2011***[1]
Cold Cr.	Jul-09	Sep-09	No	No	---	---	2012
Rock R.	Aug-10	Oct-10	Yes	---	3,061	1,347	Unknown
Crow R.	Jun-09	Oct-09	No	No	---	---	2012
Cataract R.	Aug-10	Oct-10	No	No	---	---	Unknown
Pt. Patterson Cr.	Sep-83	Aug-10	---	Yes	1,597	266	2012
Hudson Cr.	Aug-10	Oct-10	No	---	---	---	Unknown
Swan Cr.	Jul-92	May-10	No	No	---	---	Unknown
Seiners Cr.	May-84	May-10	No	No	---	---	Unknown
Milakokia R.	Oct-07	Aug-10	Yes	Yes	64,090	7,477	***2011***
Huntspur Cr.	Sep-08	May-10	Yes	No	211	0	***2011***
Bulldog Cr.	Jul-08	Aug-10	No	No	0	0	Unknown
Gulliver Lake Outlet	Oct-07	Sep-10	No	Yes	246	0	Unknown
Marblehead Cr.	Aug-10	Oct-10	Yes	---	---	---	Unknown
Manistique R.							
Barrier upstream	Sep-09	May-10	Yes	---	32,504	5,010	2012
Barrier downstream	Sep-09	Aug-08	---	---	---	---	2012
Estuary	Sep-09	Jul-09	---	---	---	---	2012
Southtown Cr.	Jun-77	May-10	---	Yes	443	332	Unknown
Thompson Cr.	Never	May-10	---	Yes	---	---	Unknown
Johnson Cr.	Aug-81	Sep-10	---	Yes	167	22	2012
Deadhorse Cr.	Jun-09	May-10	Yes	---	254	254	2012
Gierke Cr.	Never	May-10	---	No	---	---	Unknown
Bursaw Cr.	Aug-10	Oct-10	No	---	---	---	Unknown
Parent Cr.	Jun-91	May-10	---	Yes	147	73	Unknown
Poodle Pete Cr.	Aug-01	Oct-10	No	Yes	628	34	2012
Valentine Cr.	Jul-08	Oct-10	Yes	Yes	5,317	591	2012
Little Fishdam R.	May-01	Sep-09	No	No	---	---	Unknown

Table 14. *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
Big Fishdam R.	Aug-08	Oct-10	Yes	Yes	22,139	3,406	***2011***
Sturgeon R.	Sep-10	Sep-10	---	---	---	---	2013
Tacoosh R.	May-07	Oct-10	No	No	---	---	2013
Days R.							
Barrier downstream	Oct-10	May-10	---	---	---	---	***2011***[1]
Barrier upstream	Apr-09	Aug-10	Yes	No	---	---	Unknown
Portage Cr.	Oct-09	May-10	No	---	---	---	2013
Ford R.	May-10	May-10	---	---	---	---	Unknown
Sunnybrook Cr.	May-71	Jul-09	---	No	---	---	Unknown
Bark R.	May-07	Oct-10	Yes	Yes	61,349	24,540	***2011***
Cedar R.	May-10	Aug-09	---	---	---	---	2013[1]
Sugar Cr.	May-08	Jul-10	No	No	---	---	Unknown
Arthur Bay Cr.	Jun-10	Aug-10	Yes	---	---	---	Unknown
Rochereau Cr.	Apr-63	Aug-10	---	No	---	---	Unknown
Johnson Cr.	May-10	Oct-10	No	No	---	---	Unknown
Bailey Cr.	May-09	Jul-09	Yes	No	---	---	2012
Beattie Cr.	Apr-09	Jul-09	Yes	Yes	---	---	2012
Springer Cr.	May-08	Oct-10	Yes	No	---	---	2013
Menominee R.	Jun-07	Aug-10	No	Yes	---	---	2012
Little R.	Aug-87	Aug-08	---	No	---	---	Unknown
Peshtigo R.	Oct-09	Oct-10	Yes	No	56,489	33,893	***2011***
Oconto R.	May-09	Jun-09	No	No	---	---	2012
Pensaukee R.	Nov-77	Jun-09	---	No	---	---	Unknown
Suamico R.	Never	Jun-09	---	No	---	---	Unknown
Ephraim Cr.	Apr-63	May-07	---	No	---	---	Unknown
Hibbards Cr.	May-07	Aug-10	No	No	---	---	Unknown
Whitefish Bay Cr.	May-87	Jun-09	---	No	---	---	Unknown
Lilly Bay Cr.	Apr-63	May-07	---	No	---	---	Unknown
Bear Cr.	May-75	May-07	---	No	---	---	Unknown
Door Co. 23 Cr.	May-07	Oct-09	No	No	---	---	Unknown
Ahnapee R.	Apr-64	Aug-08	---	No	---	---	Unknown
Three Mile Cr.	Sep-08	Jun-09	No	No	---	---	2012
Kewaunee R.							
Barrier downstream	May-75	Aug-08	---	No	---	---	Unknown
Barrier upstream	May-75	Aug-08	---	Yes	---	---	Unknown
Casco Cr.	May-07	Jun-09	No	No	---	---	Unknown
Scarboro Cr.	May-75	Aug-08	---	No	---	---	Unknown
East Twin R.	Oct-08	Jun-09	No	No	---	---	2012
Fischer Cr.	May-87	Aug-08	---	No	---	---	Unknown
French Farm Cr.	Never	Jun-10	---	Yes	---	---	Unknown
Carp Lake R.	Apr-09	May-09	Yes	---	---	---	Unknown
Big Stone Cr.	Oct-07	Sep-10	No	Yes	1,240	0	Unknown
Big Sucker R.	Oct-07	Aug-10	No	Yes	8,270	0	Unknown
Wycamp Lake Outlet	May-08	Sep-10	No	Yes	7,686	372	2012
Bear River	Never	May-09	---	No	---	---	Unknown

Table 14. *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
Horton Cr.	Oct-09	Sep-10	Yes	No	---	---	2012
Boyne R.	May-10	Sep-10	Yes	No	---	---	Unknown
Porter Cr.	Oct-09	Sep-10	Yes	No	---	---	2012
Jordan R.	Sep-07	Sep-09	Yes	Yes	NA	NA	***2011***[1]
Monroe Cr.	Sep-07	Sep-10	No	Yes	---	---	Unknown
Loeb Cr.	Oct-08	Sep-10	Yes	No	223	223	2012
McGeach Cr.	Oct-99	Jun-08	No	No	---	---	Unknown
Elk Lake Outlet	Sep-04	Oct-10	No	Yes	735	294	***2011***[2]
Yuba Cr.	May-06	Jun-09	No	No	---	---	Unknown
Acme Cr.	Aug-63	Jun-09	---	No	---	---	Unknown
Mitchell Cr.	Oct-08	Oct-08	No	---	---	---	2012
Boardman R.	Oct-10	Oct-10	Yes	---	12,219	3,620	***2011***
Leo Cr.	Never	Sep-10	---	No	---	---	Unknown
Good Harbor Cr.	Jul-10	Oct-10	No	No	---	---	Unknown
Crystal R.	Oct-72	Sep-10	---	Yes	36,225	3,105	***2011***
Platte R. (upper)	Jun-09	Jul-09	No	---	---	---	2012
Platte R. (middle)	Aug-07	Sep-10	No	Yes	14,779	462	2012
Platte R. (lower)	Aug-07	Sep-10	No	Yes	3,994	1,997	2012
Betsie R.	Jul-10	Oct-10	Yes	No	---	---	2014
Bowen Cr.	Jun-09	Oct-09	No	---	---	---	2012
Big Manistee R.	Aug-09	Oct-09	Yes	---	---	---	2012
Bear Cr.	Aug-09	Oct-09	No	---	---	---	2012
L. Manistee R.	Jul-08	Sep-10	Yes	Yes	150,419	34,698	***2011***
Gurney Cr.	Aug-09	Oct-09	No	---	---	---	Unknown
Cooper Cr.	Jul-08	Sep-08	No	---	---	---	Unknown
Lincoln R.	Aug-10	Oct-10	No	No	---	---	2014
Pere Marquette R.	Jul-09	Oct-09	No	---	---	---	2012
Bass Lake Outlet	Aug-78	Jul-09	---	No	---	---	Unknown
Pentwater R. (N. Br.)	Jun-07	Oct-09	No	Yes	NA	NA	***2011***[1]
South Branch	Never	Oct-09	---	No	---	---	Unknown
Lambricks Cr.	Sep-84	Oct-09	---	No	---	---	Unknown
Stony Cr.	Jun-10	Aug-10	No	No	---	---	Unknown
Flower Cr.	Sep-81	Sep-10	---	Yes	2,903	1,452	***2011***
White R.							
Barrier downstream	Jul-10	Oct-10	Yes	No	---	---	Unknown
Barrier upstream	Jul-10	Oct-10	Yes	No	---	---	Unknown
White R. (N. Br.)	Jul-10	Oct-10	Yes	No	---	---	Unknown
Duck Cr.	Jul-84	Jun-09	---	No	---	---	Unknown
Muskegon R.	Aug-08	Sep-10	Yes	Yes	1,078,044	153,330	***2011***
Brooks Cr.	Aug-10	Sep-10	No	No	---	---	Unknown
Cedar Cr.	Aug-10	Sep-10	No	No	---	---	Unknown
Bridgeton Cr.	Aug-08	Sep-10	No	No	---	---	***2011***
Minnie Cr.	Aug-08	Sep-10	No	Yes	---	---	***2011***
Bigelow Cr.	Aug-08	Sep-10	No	Yes	---	---	***2011***
Big Bear Cr.	Aug-70	Jun-06	---	No	---	---	Unknown

Table 14. *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
Mosquito Cr.	Sep-68	Sep-10	---	No	---	---	Unknown
Black Cr.	Aug-08	Aug-08	No	---	---	---	Unknown
Grand R.	Never	Jul-07	---	No	---	---	Unknown
Norris Cr.	Aug-08	Oct-08	No	---	---	---	2012
Lowell Cr	Sep-65	Aug-05	---	No	---	---	Unknown
Buck Cr.	Sep-65	Oct-08	---	No	---	---	Unknown
Rush Cr.	Sep-65	Oct-08	---	No	---	---	Unknown
Sand Cr.	Jun-07	Jul-10	---	No	---	---	Unknown
Crockery Cr.	Sep-09	Oct-10	No	No	---	---	Unknown
Bass R.	Aug-04	Oct-10	---	No	---	---	Unknown
Rogue R.	Sep-09	Sep-09	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.	Never	Jul-07	---	Yes	---	---	Unknown
Bear Cr.	Sep-10	Oct-10	---	Yes	---	---	Unknown
Sand Cr.	Sep-10	Oct-10	Yes	No	---	---	Unknown
Mann Cr.	Aug-10	Sep-10	No	No	---	---	Unknown
Rabbit R.	Aug-08	Sep-10	No	No	---	---	Unknown
Swan Cr.	Jul-77	Sep-09	No	No	0	0	Unknown
Allegan 3 Cr.	Sep-65	Jun-10	---	No	---	---	Unknown
Allegan 4 Cr.	Oct-78	Jul-09	---	No	---	---	Unknown
Allegan 5 Cr.	Never	Jun-10	---	No	---	---	Unknown
Black R.	Oct-07	Oct-10	---	Yes	35,247	14,099	***2011***
Brandywine Cr.	Oct-85	Jun-09	---	No	---	---	Unknown
Rogers Cr.	May-98	Jun-09	---	No	---	---	Unknown
St. Joseph R.	Never	Jul-10	---	No	---	---	Unknown
Lemon Cr.	Oct-65	Sep-07	---	No	---	---	Unknown
Pipestone Cr.	Sep-10	Sep-10	No	No	---	---	Unknown
Meadow Dr.	Oct-65	Sep-07	---	No	---	---	Unknown
Hickory Cr.	Oct-65	Sep-07	No	Yes	---	---	Unknown
Paw Paw R.	May-09	Jul-09	No	---	---	---	2012
Blue Cr.	May-01	Jul-09	---	Yes	---	---	Unknown
Mill Cr.	May-09	Jul-09	No	No	---	---	2012
Brandywine Cr.	May-05	Oct-08	No	Yes	---	---	Unknown
Brush Cr.	May-09	Jul-09	No	No	---	---	2012
Galien R. (N. Br.)	Oct-10	Oct-10	Yes	No	---	---	2013
E. Br. & Dowling Cr.	Oct-10	Oct-10	No	No	---	---	2013
S. Br. & Galina Cr.	Jun-09	Sep-09	No	No	---	---	2012
Spring Cr.	Jun-09	Sep-09	No	No	---	---	2012
S. Br. Spring Cr.	Jun-09	Sep-09	No	No	---	---	2012
State Cr.	May-86	Aug-10	---	No	---	---	Unknown
Trail Cr.	Oct-10	Oct-10	No	No	---	---	Unknown
Donns Cr.	May-66	Sep-09	---	No	---	---	Unknown

Table 14. *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			
Burns Ditch	Jul-99	Aug-10	---	No	---	---	Unknown

[1] Stream being treated based on expert judgment
[2] Stream being treated based on geographic efficiency

Table 15. Status of larval sea lampreys in historically infested lentic areas of Lake Michigan during 2010.

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)	Aug-09	Aug-09	Jun-07
Black R.	Black R. (Offshore)	Jun-08	Jun-08	Never[1]
Mile Cr.	Mile Cr. (Offshore)	Jun-08	Jun-08	Never[1]
Millecoquins	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-09	Jul-09	Aug-08
Bursaw Cr.	Bursaw Cr. (Offshore)	Jul-86	Jul-76	Never
Ogontz R.	Ogontz R. (Offshore)	Aug-07	Aug-07	Never[1]
Whitefish R.	Big Bay De Noc	Jul-07	Jul-07	Never
Rapid R.	Little Bay De Noc	Jul-10	Jul-10	Never[1]
Days R.	Little Bay De Noc	Aug-08	Aug-08	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	Aug-08	Aug-08	Never[1]
Cedar R.	Green Bay	Aug-10	Jul-09	May-10
Beattie Cr.	Green Bay	Jul-08	Jul-85	Never
Menominee R.	Green Bay	Aug-10	Sep-06	Never[1]
Carp Lake R.	Cecil Bay	Sep-09	Sep-09	Never[1]
Bear R.	Little Traverse Bay	Sep-10	Jun-08	May-07
Horton Cr.	Horton Bay (Lake Charlevoix)	Sep-10	Sep-10	Oct-09
Boyne R.	Boyne Harbor (Lake Charlevoix)	Sep-10	Sep-10	May-10
Porter Cr.	Lake Charlevoix	Sep-10	Sep-10	Never[1]
Jordan R.	Lake Charlevoix	Sep-10	Sep-10	May-07
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)	Jul-08	May-04	Never[1]
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	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 assessment surveys were conducted on a total of 109 tributaries (58 Canada, 51 U.S.) and offshore of 8 U.S. tributaries. The status of larval sea lamprey populations in historically infested Lake Huron tributaries and lentic areas are presented in Tables 16 and 17.

- Surveys to estimate abundance of larval sea lampreys were conducted in 19 tributaries (4 Canada, 15 U.S.) and offshore of 2 tributaries (1 Canada, 1 U.S.).

- Surveys to detect the presence of new larval sea lamprey populations were conducted in 53 tributaries (31 Canada, 22 U.S). A new larval population was discovered in Marcellus Creek (H-115).

- Post-treatment assessments were conducted in 29 tributaries (11 Canada, 18 U.S.) to determine the effectiveness of lampricide treatments during 2009 and 2010.

- Surveys to evaluate barrier effectiveness were conducted in eight tributaries (1 Canada, 7 U.S.).

- Monitoring of larval sea lampreys in the St. Marys River continued during 2010. Approximately 850 geo-referenced sites were sampled using deepwater electrofishers. Surveys were conducted according to a stratified, systematic sampling design. The larval sea lamprey population in the St. Marys River was estimated to be 0.6 million (95% confidence limits 0.2-1.0 million). This is the lowest population estimate in the St. Marys River on record.

- Data were compiled for the Wilberg et al. Commission-funded research project exploring the use of historical data to inform the selection of lampricide plots on the St. Marys River.

Table 16. Status of larval sea lampreys in Lake Huron tributaries with a history of sea lamprey production and estimates of abundance from tributaries surveyed during 2010.

Tributary	Last Treated	Last Surveyed	Status of Larval Lamprey Population (surveys since last treatment) Residuals Present	Recruitment Evident	Estimate of Overall Larval Population	Abundance Estimate of Larvae >100mm	Expected Year of Next Treatment
Canada							
St. Marys R.	Sep-10	Aug-10	Yes	Yes	600,000	---	***2011***[1]
Root R.							
Main	Aug-10	Aug-10	Yes	No	---	---	2013
West Root	Jun-10	Aug-10	Yes	No	---	---	2013
Garden R.							
Main	Jul-09	Jul-10	Yes	Yes	---	---	***2011***[1]
Maud/Driving	Jul-10	Jul-10	No	No			2013
Echo R.							
Upper	Oct-99	Sep-09	No	No	---	---	Unknown
Lower	Jul-10	Sep-09	---	---	---	---	***2011***[1]
Bar & Iron Cr.	Oct-08	Jun-10	Yes	Yes	---	---	***2011***
Bar R.	Sep-10	Jul-10	---	---	---	---	***2011***[1]
Sucker Cr.	May-10	Jul-10	No	No	---	---	Unknown
Two Tree R.	May-10	Aug-10	No	No	---	---	Unknown
Richardson Cr.	May-10	May-10	Yes	Yes	---	---	***2011***[1]
Watson Cr.	May-10	May-10	---	Yes	---	---	2014
Gordon Cr.	May-10	Sep-08	---	---	---	---	***2011***[1]
Browns Cr.	Sep-10	May-10	---	---	---	---	***2011***[1]
Koshkawong R.	May-10	Sep-09	---	---	---	---	Unknown
No Name (H-65)	Aug-75	Jun-08	No	Yes	---	---	Unknown
No Name (H-68)	Sep-75	Jul-08	No	Yes	---	---	Unknown
MacBeth Cr.	Jun-67	Aug-05	No	No	---	---	Unknown
Thessalon R.							
Upper	May-10	May-10	---	---	---	---	***2011***[1]
Lower	Jun-10	Sep-08	---	---	---	---	2013
Livingstone Cr.	Jun-00	Jul-10	No	Yes	---	---	2015
Mississagi R.							
Main	Aug-08	Oct-08	No	No	---	---	***2011***[1]
Pickerel Cr.	Jun-08	Jul-10	No	No	---	---	***2011***[1]
Blind R.	May-84	Jun-07	No	No	---	---	Unknown
Lauzon R.	Jun-10	Jul-10	No	No	---	---	***2011***[1]
Spragge Cr.	Oct-95	May-09	No	No	---	---	Unknown
No Name (H-114)	Jun-10	Jul-10	Yes	Yes	---	---	***2011***[1]
Marcellus Cr.	Never	Jul-10	---	---	---	---	Unknown
Serpent R.							
Main	Jun-08	Jun-07	---	---	---	---	***2011***[1]
Grassy Cr.	Aug-10	Apr-10	---	---	---	---	***2011***[1]
Spanish R.	Oct-10	Oct-08	---	---	---	---	***2011***[1]
Aux Sables R.	Oct-10	Oct-07	---	---	---	---	***2011***[1]
Kagawong R.	Aug-67	May-09	No	No	---	---	Unknown
Unnamed (H-267)	Jun-10	Jul-10	No	No	---	---	***2011***[1]
Silver Cr.	Jun-10	Jul-10	No	No	---	---	***2011***[1]

Table 16. *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
Sand Cr.	Oct-10	Oct-10	---	---	---	---	***2011***[1]
Mindemoya R.	Jun-10	Jul-10	Yes	---	---	---	***2011***[1]
Timber Bay Cr.	Jun-10	Jul-10	No	---	---	---	***2011***[1]
Manitou R.	Oct-07	Aug-10	No	Yes	---	---	2012
Blue Jay Cr.	Jun-10	Jul-10	No	No	---	---	***2011***[1]
Kaboni Cr.	Oct-78	May-09	No	No	---	---	Unknown
Chikanishing R.	Jun-03	Apr-09	No	No	---	---	Unknown
French R. System							
O.V. Channel	Jun-06	Jul-09	No	No	---	---	Unknown
Wanapitei R.	Jul-05	Jun-08	No	Yes	---	---	***2011***
Key R. (Nesbit Cr.)	Sep-72	Jul-09	No	No	---	---	Unknown
Still R.	Jun-96	Jun-10	No	Yes	---	---	Unknown
Magnetawan R.	Jun-06	Jul-09	No	Yes	---	---	***2011***
Naiscoot R.	Jun-08	Jun-08	No	---	---	---	2012
Shebeshekong R.	Never	Jul-09	---	Yes	---	---	Unknown
Boyne R.	Jun-08	Oct-08	No	Yes	---	---	2012
Musquash R.	Sep-05	Jul-09	No	No	---	---	Unknown
McDonald Cr.	Never	Jul-09	---	No	---	---	Unknown
Simcoe/Severn	Never	Jul-09	---	Yes	---	---	Unknown
Coldwater R.	Never	Sep-09	---	No	---	---	Unknown
Sturgeon R.	Jun-07	Sep-09	No	Yes	---	---	***2011***[2]
Hog Cr.	Sep-78	Sep-07	No	No	---	---	Unknown
Lafontaine Cr.	Jun-68	May-07	No	No	---	---	Unknown
Nottawasaga R.							
Main	May-02	Oct-08	No	No	---	---	Unknown
Boyne Cr.	May-02	Oct-08	No	No	---	---	Unknown
Bear Cr.	Jun-09	Oct-09	Yes	Yes	---	---	2013
Pine R.	Jun-09	Sep-09	Yes	Yes	---	---	2013
Marl Cr.	Never	Jul-09	---	Yes	---	---	***2011***
Pretty R.	May-72	Jun-06	No	No	---	---	Unknown
Silver Cr.	Sep-82	Jul-09	No	No	---	---	Unknown
Bighead R.	Jun-10	May-10	---	---	---	---	2013
Bothwells Cr.	Jun-79	May-10	No	No	---	---	Unknown
Sydenham R.	Jun-72	May-04	No	No	---	---	Unknown
Sauble R.	Jun-04	May-09	No	No	---	---	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-09	---	No	---	---	Unknown
Frenchette Cr.	Never	Sep-08	---	No	---	---	Unknown
Ermatinger Cr.	Never	Sep-08	---	No	---	---	Unknown
Charlotte R.	Oct-10	Jun-10	---	---	---	---	***2011***[1]
Little Munuscong R.	Oct-10	Jul-10	---	---	---	---	Unknown
Big Munuscong R.	Jun-99	Jun-10	---	No	---	---	Unknown

Table 16. *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
Taylor Cr.	Oct-10	Jul-10	---	---	---	---	***2011***[1]
Carlton Cr.	Sep-01	Sep-10	---	Yes	31,621	6,510	***2011***
Canoe Lake Outlet	May-70	May-10	---	No	---	---	Unknown
Caribou Cr.	May-10	Aug-10	---	---	---	---	***2011***[1]
Bear Lake Outlet	Apr-10	Aug-10	Yes	---	241	804	***2011***[1]
Carr Cr.	May-78	May-10	---	Yes	---	---	Unknown
Joe Straw Cr.	May-75	May-09	---	No	---	---	Unknown
Huron Point Cr.	Never	May-09	---	Yes	---	---	Unknown
Saddle Cr.	Never	May-10	---	No	---	---	Unknown
Albany Cr.							
Barrier downstream	May-10	Aug-10	Yes	Yes	---	---	***2011***[1]
Barrier upstream	Jul-07	Sep-10	No	No	---	---	Unknown
Boiling Springs Cr.	Never	Apr-10	---	No	---	---	Unknown
Trout Cr.	Oct-10	Jul-10	---	---	---	---	Unknown
Beavertail Cr.	May-10	Sep-10	---	---	---	---	***2011***[1]
Prentiss Cr.	May-10	Aug-10	No	No	---	---	***2011***[1]
McKay Cr.	May-10	Oct-10	Yes	No	---	---	***2011***[1]
Susan Cr.	Never	Apr-10	---	No	---	---	Unknown
Flowers Cr.	Sep-83	Sep-08	---	No	---	---	Unknown
Ceville Cr.	Sep-05	Oct-09	No	No	---	---	Unknown
Hessel Cr.	Apr-10	Aug-10	Yes	No	---	---	***2011***[1]
Law Cr.	Never	Oct-10	---	No	---	---	Unknown
Steeles Cr.	May-10	Sep-10	No	No	---	---	***2011***[1]
Nunns Cr.	Sep-01	May-09	---	No	---	---	Unknown
Pine R.	Jun-10	Oct-10	Yes	Yes	---	---	2013
McCloud Cr.	Oct-72	May-09	---	Yes	---	---	Unknown
Carp R.	Jun-10	Oct-10	Yes	Yes	---	---	***2011***[1]
Martineau Cr.	May-07	Sep-10	No	Yes	215	1,938	***2011***[1]
Rabbits Back Cr.	Never	May-10	---	No	---	---	Unknown
Rogers Cr.	Never	May-10	---	No	---	---	Unknown
Sec. 7 Cr.	Never	May-10	---	No	---	---	Unknown
266-20 Cr.	Aug-76	Jun-09	No	No	---	---	Unknown
Beaugrand Cr.	Never	May-07	---	No	---	---	Unknown
Little Black R.	May-67	Jun-09	No	No	---	---	Unknown
Cheboygan R.	Oct-83	Aug-10	---	Yes	---	---	Unknown
Mullett Cr.	Never	Jun-10	---	No	---	---	Unknown
Laperell Cr.	May-00	Jun-10	No	No	---	---	Unknown
Meyers Cr.	Sep-99	Jun-10	No	No	---	---	Unknown
Maple R.	Jul-07	Sep-10	No	Yes	NA	NA	***2011***[2]
Pigeon R.	Jul-07	Oct-10	No	Yes	NA	NA	***2011***[2]
Little Pigeon R.	Aug-98	Jun-10	No	Yes	NA	NA	***2011***[3]
Sturgeon R.	Jul-08	Sep-10	No	Yes	179,686	12,307	***2011***
Little Sturgeon R.	Never	Sep-10	---	No	---	---	Unknown
Elliot Cr.	Oct-08	Sep-10	No	Yes	13,742	211	2012

Table 16. *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
Greene Cr.							
Barrier downstream	Jun-07	Sep-10	No	Yes	NA	NA	***2011***[3]
Barrier upstream	Jun-07	Sep-10	No	No	---	---	Unknown
Grass Cr.	May-78	May-07	No	No	---	---	Unknown
Mulligan Cr.	Apr-09	Sep-10	No	Yes	NA	NA	***2011***[2]
Grace Cr.	May-09	Jun-09	Yes	No	---	---	2012
Black Mallard Cr.							
Lower	May-08	Aug-10	No	Yes	18,858	969	***2011***
Upper	May-09	Sep-10	Yes	Yes	26,402	1,985	***2011***
Seventeen Cr.	May-67	May-07	No	No	---	---	Unknown
Ocqueoc R.							
Barrier downstream	Oct-08	Aug-10	No	Yes	---	---	2012
Barrier upstream	Aug-09	Sep-10	Yes	No	---	---	Unknown
Johnny Cr.	Sep-70	Jun-07	No	No	---	---	Unknown
Schmidt Cr.	May-08	Oct-10	No	Yes	2,703	238	2012
Trout R.	Oct-07	Aug-10	No	Yes	9,566	1,895	***2011***
Swan R.	Jun-10	Aug-10	No	No	---	---	Unknown
Grand Lake Outlet	Never	Aug-10	---	No	---	---	Unknown
Middle Lake Outlet	Jun-67	Aug-10	No	No	---	---	Unknown
Long Lake Outlet	May-08	Aug-10	No	Yes	35,654	222	2012
Squaw Cr.	Jun-10	Jun-10	Yes	No	---	---	Unknown
Devils R.	May-08	Aug-10	No	Yes	9,339	6,537	***2011***
Black R.	Jun-07	Sep-10	No	Yes	NA	NA	***2011***[2]
Butternut Cr.	Jun-10	Aug-10	Yes	No	---	---	***2011***[2]
Au Sable R.	Jun-10	Aug-10	Yes	No	---	---	2013
Pine R.	May-87	Jun-09	---	No	---	---	Unknown
Tawas Lake Outlet	Jul-09	Aug-09	No	No	---	---	2013
Cold Cr.	Jul-09	Aug-09	No	No	---	---	2013
Sims Cr.	Jul-09	Aug-09	No	No	---	---	2013
Grays Cr.	Sep-05	Jun-10	No	No	---	---	Unknown
Silver Cr.	Jul-09	Aug-09	Yes	Yes	---	---	2013
East Au Gres R.	Jul-09	Oct-09	Yes	Yes	---	---	2012
Au Gres R.	May-10	Aug-10	Yes	No	---	---	2013
Rifle R.	Sep-08	Oct-10	No	Yes	1,262,041	184,310	***2011***
Saginaw R.							
Cass R.	Jun-08	Aug-10	No	Yes	---	---	Unknown
Juniata Cr.	Jun-08	Aug-10	No	Yes	---	---	Unknown
Scott Drain	Jun-08	Aug-10	No	No	146	146	2012
Goodings Cr.	Jun-08	Aug-10	No	Yes	5,660	472	2012
Tittabawasse R.	Never	Sep-08	---	No	---	---	Unknown
Chippewa R.	Jun-09	Jul-09	No	No	---	---	2013
Coldwater R.	Jun-09	Jul-09	No	No	---	---	2013
Pine R.	Jun-08	Aug-10	Yes	Yes	11,984	7,989	2012
Little Salt Cr.	May-02	Sep-08	No	No	---	---	Unknown

Table 16. *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			
Big Salt Cr.	Jun-09	Sep-08	---	---	---	---	2013
North Br.	Never	Sep-08	---	No	---	---	Unknown
Carroll Cr.	May-07	Aug-10	No	Yes	NA	NA	2012
Big Salt R.	May-10	Aug-10	No	No	---	---	Unknown
Bluff Cr.	May-10	Aug-10	No	No	---	---	Unknown
Shiawassee R.	Jun-10	Aug-10	No	No	---	---	2013
Rock Falls Cr.	Never	Jun-07	---	No	---	---	Unknown
Sucker Cr.	Never	Jun-07	---	No	---	---	Unknown
Cherry Cr.	Never	Jun-07	---	No	---	---	Unknown
Mill Cr.	May-85	Aug-09	---	No	---	---	Unknown

[1] Stream being treated based on North Channel scenario
[2] Stream being treated based on expert judgment
[3] Stream being treated based on geographic efficiency

Table 17. Status of larval sea lampreys in historically infested lentic areas of Lake Huron during 2010.

Tributary	Lentic Area	Last Surveyed	Last Survey Showing Infestation	Last Treated
Canada				
Echo River	Solar Lake	Jul-06	Sep-93	Jul-87
	Stuart Lake	May-90	May-90	Jul-80
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
No Name Cr.	North Channel	Sep-71	Sep-71	Never
Mississagi R.	North Channel	Aug-90	Aug-90	Jul-81
Lauzon R.	North Channel	Jul-10	Jul-10	Aug-08
Kagawong R.	Mudge Bay	Jul-90	Jul-90	Aug-87
Mindemoya R.	Providence Bay	Jun-08	Jul-88	Jul-81
Manitou R.	Michael's Bay	Jul-10	Jul-10	Aug-87
Blue Jay Cr.	Michael's Bay	Jul-10	Jul-10	Aug-87
Still R.	Bying Inlet	Jun-10	Jun-10	Aug-81
United States				
Caribou Cr.	Caribou Cr. (Offshore)	Aug-09	Aug-10	Jun-10
Albany Cr.	Albany Bay (Offshore)	Aug-09	Aug-05	Never
Trout Cr.	Trout Cr. (Offshore)	Aug-09	Aug-09	Never[1]
Beavertail Cr.	Beavertail Bay	Aug-07	Aug-07	Never[1]
McKay Cr.	McKay Bay	Jun-09	Jun-09	Jul-07
Flowers Cr.	Flowers Bay	Jul-81	Jul-80	Never
Nunns Cr.	St. Martin Bay	Jun-09	Aug-87	Never
Pine R.	St. Martin Bay	Jun-09	Jun-09	Never[1]
McCloud Cr.	St. Martin Bay	Jul-10	Jul-10	Never
Carp R.	St. Martin Bay	Sep-10	Oct-09	Jun-10
Martineau Cr.	Horseshoe Bay	Sep-10	Sep-10	Never[1]
Cheboygan R.	Straits of Mackinac	Sep-03	Aug-93	Never
	Burt Lake (Sturgeon R.)	Aug-08	Aug-98	Never
Elliot Cr.	Duncan Bay	Jun-09	Aug-86	Never
Black Mallard R.	Black Mallard Lake	Jun-10	Jun-10	Never
Hammond Bay Cr.	Hammond Bay	Sep-10	Sep-10	Never[1]
Mulligan Cr.	Mulligan Cr. (offshore)	Jun-09	Jun-09	Never[1]
Ocqueoc R.	Hammond Bay	Jun-09	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 Bayluscide 3.2% Granular Sea Lamprey Larvicide surveys.

Lake Erie

- Larval assessment surveys were conducted on a total of 56 tributaries (16 Canada, 40 U.S.) and offshore of 4 U.S. tributaries. The status of larval sea lampreys in historically infested Lake Erie tributaries and lentic areas is presented in Tables 18 and 19, respectively.

- Surveys to detect new larval populations were conducted in 34 Lake Erie tributaries (29 U.S., 5 Canada) and no new populations were discovered.

- Post-treatment assessments were conducted in 10 (5 Canada, 5 U.S.) tributaries to determine the effectiveness of lampricide treatments conducted in 2009 and 2010. Residual sea lamprey larvae were found only in Conneaut (two larvae) and Cattaraugus (one larva) creeks. Neither of these streams ranked for treatment in 2011.

- Larval sea lamprey recruitment was detected in two U.S. streams, Conneaut and Cattaraugus creeks.

- Statoliths were removed from larvae collected during the 2009 treatment of South Otter Creek to estimate their age and determine the most likely timing of recruitment and metamorphosis. Poor quality of the statoliths precluded aging the majority of these larvae and the results were inconclusive.

Table 18. Status of larval sea lampreys in Lake Erie tributaries with a history of sea lamprey production, and estimates of abundance from tributaries surveyed during 2010.

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	Aug-10	No	No	---	---	Unknown
Silver Cr.	Oct-09	Aug-10	No	No	---	---	Unknown
Big Otter Cr.	Sept-09	Aug-10	No	No	---	---	Unknown
South Otter Cr.	Aug-10	Aug-10	No	No	---	---	Unknown
Clear Cr.	May-91	Sep-09	No	No	---	---	Unknown
Big Cr.	Sept-09	Aug-10	No	No	---	---	Unknown
Forestville Cr.	May-89	Aug-10	No	No	---	---	Unknown
Normandale Cr.	Jun-87	Aug-10	No	No	---	---	Unknown
Fishers Cr.	Jun-87	Aug-10	No	No	---	---	Unknown
Young's Cr.	Sept-09	Aug-10	No	No	---	---	Unknown
United States							
Buffalo R.	Never	Jul-10	---	No	---	---	Unknown
Delaware Cr.	Sep-05	Jun-10	No	No	---	---	Unknown
Cattaraugus Cr.	Oct-09	Aug-10	Yes	Yes	---	---	2013
Halfway Br.	Oct-86	Jun-10	---	No	---	---	Unknown
Canadaway Cr.	Oct-86	Jun-08	---	No	---	---	Unknown
Crooked Cr.	Oct-09	Jul-10	No	---	---	---	Unknown
Raccoon Cr.	Oct-09	Jul-10	No	---	---	---	Unknown
Conneaut Cr.	Oct-09	Aug-10	Yes	Yes	870	870	2013
Wheeler Cr.	Never	May-08	---	No	---	---	Unknown
Grand R.	Oct-09	Jul-10	No	---	---	---	Unknown
Chagrin R.	Never	May-08	---	Yes	---	---	Unknown
St. Clair River/Lake St. Clair Tributaries							
Black R.	Never	Jul-10	---	No	---	---	Unknown
Mill Cr.	Never	Jul-10	---	No	---	---	Unknown
Pine R.	Apr-88	Oct-08	---	---	---	---	Unknown
Belle R.	Never	Oct-08	---	---	---	---	Unknown
Clinton R.	Never	Jul-09	---	---	---	---	Unknown
St. Clair R.	Never	Aug-09	---	Yes	---	---	Unknown
Thames R.	Never	Aug-10	---	No	---	---	Unknown

[1] Stream being treated based on North Channel scenario
[2] Stream being treated based on expert judgment
[3] Stream being treated based on geographic efficiency

Table 19. Status of larval sea lampreys in historically infested lentic areas of Lake Erie during 2010.

Tributary	Lentic Area	Last Surveyed	Last Survey Showing Infestation	Last Treated
United States				
Cattaraugus Cr.	Sunset Bay	Aug-10	Jul-09	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 granular Bayluscide surveys.

Lake Ontario

- Larval assessment surveys were conducted on a total of 44 tributaries (19 Canada, 25 U.S.). The status of larval sea lampreys in historically infested Lake Ontario tributaries and lentic areas is presented in Tables 20 and 21, respectively.

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

- Surveys to detect the presence of new larval sea lamprey populations were conducted in seven tributaries (3 Canada, 4 U.S.). No new populations were detected.

- Post-treatment assessments were conducted in nine tributaries (4 Canada, 5 U.S.) to determine the effectiveness of lampricide treatments conducted during 2009 and 2010.

- GB surveys in the Black River Bay (New York) detected a low density population. Further assessment is planned for 2011 to determine if treatment of this area is warranted.

Table 20. Status of larval sea lampreys in Lake Ontario tributaries with a history of sea lamprey production and estimates of abundance from tributaries surveyed during 2010.

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							
Welland R.	Never	Jul-06	---	No	---	---	Unknown
Niagara R.	Never	Jul-10	---	Yes	---	---	Unknown
Ancaster Cr.	May-03	Jul-09	No	No	---	---	Unknown
Grindstone Cr.	Never	Jul-09	---	No	---	---	Unknown
Bronte Cr.	Apr-10	Jun-10	Yes	Yes	---	---	2013
Sixteen Mile Cr.	Jun-82	Jul-09	No	No	---	---	Unknown
Credit R.	May-08	Aug-10	Yes	Yes	604,596	368,831	***2011***
Rouge R.	Oct-07	Aug-10	No	Yes	31,496	23,280	***2011***
Petticoat Cr.	Sep-04	Aug-08	No	No	---	---	Unknown
Duffins Cr.	May-09	Aug-10	No	Yes	---	---	2012
Carruthers Cr.	Sep-76	April-09	No	No	---	---	Unknown
Lynde Cr.	May-09	Aug-09	No	Yes	---	---	2012
Oshawa Cr.	May-09	Aug-09	No	Yes	---	---	2012
Farewell Cr.	Jul-10	Aug-10	Yes	No	---	---	2013
Bowmanville Cr.	May-08	Aug-10	No	Yes	---	---	***2011***[1]
Wilmot Cr.	May-09	Aug-09	No	No	---	---	2012
Graham Cr.	May-96	May-10	No	No	---	---	Unknown
Wesleyville Cr.	Oct-02	May-10	No	No	---	---	Unknown
Port Britain Cr.	Oct-07	Aug-10	No	Yes	1,059	92	2012
Gage Cr.	May-71	Aug-09	No	No	---	---	Unknown
Cobourg Br.	Oct-96	Aug-10	No	Yes	57	19	2012
Covert Cr.	Jul-10	Aug-10	No	No	---	---	2013
Grafton Cr.	Oct-07	May-10	No	Yes	---	---	Unknown
Shelter Valley Cr.	Sep-03	Aug-09	No	Yes	---	---	Unknown
Colborne Cr.	May-09	Aug-09	No	No	---	---	Unknown
Salem Cr.	Apr-09	May-09	Yes	--	---	---	2012
Proctor Cr.	May-09	Aug-09	No	Yes	---	---	2012
Smithfield Cr.	Sep-86	May-09	No	No	---	---	Unknown
Trent R. (Canal System)	Sep-06	May-10	No	Yes	9,450	4,489	***2011***
Mayhew Cr.	April-09	May-09	No	--	---	---	2012
Moira R.	Sep-09	May-10	Yes	Yes	5,227	3,267	***2011***
Salmon R.	Jun-00	May-10	No	Yes	1,158	926	Unknown
Napanee R.	Never	May-09	---	Yes	---	---	Unknown
United States							
Black R.	Sept-08	Sept-08	Yes	No	---	---	2012
Stony Cr.	Sep-82	Jul-08	No	No	---	---	Unknown
Sandy Cr.	Never	Apr-10	---	No	---	---	Unknown
South Sandy Cr.	Apr-08	Oct-10	Yes	Yes	---	---	***2011***[1]
Skinner Cr.	Apr-05	Jul-09	No	No	---	---	Unknown
Lindsey Cr.	Apr-08	Sep-10	Yes	Yes	---	---	***2011***[1]
Blind Cr.	May-76	Jul-10	No	No	---	---	Unknown
Little Sandy Cr.	Jun-10	Jul-10	Yes	Yes	---	---	2013

Table 20. *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
Deer Cr.	Apr-04	Apr-10	No	No	---	---	Unknown
Salmon R.	May-10	Jul-10	Yes	Yes	34,004	7,804	***2011***
Grindstone Cr.	Apr-10	Jul-10	Yes	Yes	---	---	2013
Snake Cr.	Apr-08	Apr-10	No	Yes	---	---	***2011***[1]
Sage Cr.	May-78	Apr-10	No	No	---	---	Unknown
Little Salmon R.	Apr-09	Jul-09	Yes	Yes	---	---	2012
Butterfly Cr.	May-72	Jul-08	No	No	---	---	Unknown
Catfish Cr.	Apr-09	Sep-10	No	No	---	---	2012
Oswego R.							
Black Cr.	May-81	Aug-07	No	No	---	---	Unknown
Big Bay Cr.	Sep-93	April-09	No	No	---	---	Unknown
Scriba Cr.	Jun-10	Sep-09	---	---	---	---	Unknown
Fish Cr.	Jun-10	Apr-10	---	---	---	---	2013
Carpenter Br.	May-94	April-09	No	No	---	---	Unknown
Putnam Br.							
Coldsprings Cr.	May-96	Oct-10	No	No	---	---	Unknown
Hall Br.	Never	Oct-10	---	No	---	---	Unknown
Crane Br.	Never	Jul-06	---	No	---	---	Unknown
Skaneateles Cr.	Never	Oct-10	---	No	---	---	Unknown
Rice Cr.	May-72	Apr-10	No	No	---	---	Unknown
Eight Mile Cr.	Apr-07	Apr-10	No	No	---	---	Unknown
Nine Mile Cr.	Jun-05	Sep-10	No	Yes	46,068	10,911	***2011***
Sterling Cr.	April-09	Sep-09	No	Yes	---	---	2012
Blind Sodus Cr.	May-78	April-09	No	No	---	---	Unknown
Red Cr.	Apr-10	Apr-10	No	Yes	---	---	2013
Wolcott Cr.	May-79	Jul-08	No	No	---	---	Unknown
Sodus Cr.	May-10	Sep-09	No	Yes	---	---	2013
Forest Lawn Cr.	Never	Sep-09	---	Yes	---	---	Unknown
Irondequoit Cr.	Never	April-09	---	No	---	---	Unknown
Larkin Cr.	Never	Jul-09	---	No	---	---	Unknown
Northrup Cr.	Never	Apr-08	---	No	---	---	Unknown
Salmon Cr.	Apr-05	Sep-10	No	Yes	319	319	Unknown
Sandy Cr.	Apr-09	Sep-10	No	Yes	---	---	2012
Oak Orchard Cr.							
Marsh Cr.	May-08	Sep-10	No	Yes	---	---	2012
Johnson Cr.	Apr-10	Sep-09	---	Yes	---	---	Unknown
Third Cr.	May-72	Oct-06	No	No	---	---	Unknown
First Cr.	May-95	Apr-08	No	No	---	---	Unknown

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

Table 21. Status of larval sea lampreys in historically infested lentic areas of Lake Ontario during 2010.

Tributary	Lentic Area	Last Surveyed	Last Survey Showing Infestation	Last Treated
Canada				
Duffins Cr.	Duffins Cr. - lentic	May-06	May-06	Never[1]
Oshawa Cr.	Oshawa Cr. - lentic	Oct–81	Oct–81	Never[1]
Wilmot Cr.	Wilmot Cr. - lentic	Oct–81	Oct-81	Never[1]
United States				
Black River	Black River Bay	Oct-10	Jul-10	Never[1]

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

Spawning-Phase Assessment

The long-term effectiveness of the SLMP has been measured by the annual estimation of the lake-wide populations of spawning-phase sea lampreys. Traps and nets are operated to capture migrating spawning-phase sea lampreys during the spring and early summer. Abundance is estimated using a combination of mark recapture and trap efficiency estimates of spawning-phase migrants in streams with traps, and regression model predicted estimates in streams without traps.

Lake Superior

- A total of 3,801 sea lampreys were trapped in 22 tributaries during 2010 (Table 22, Figure 4).

- The estimated population of spawning-phase sea lampreys during 2010 was 36,414 (95% CI; 30,439-49,992) and was within the fish-community objective target range of 37,000±19,000 for the third consecutive year (Figure 5).

- Spawning-phase sea lamprey migrations were monitored in the Amnicon, Poplar, Middle, Bad, Firesteel, Misery, and Silver rivers through cooperative agreements with the Great Lakes Indian Fish and Wildlife Commission, in Red Cliff Creek with the Red Cliff Band of Lake Superior Chippewas, in the Brule River with the Wisconsin Department of Natural Resources, and in the Miners River with the National Park Service, Pictured Rocks National Lakeshore.

- A total of 741 spawning-phase male sea lampreys were delivered to the sterilization facility from trapping operations on the Bad (310) and Brule (431) rivers.

- A three-year field-scale management experiment using the mating pheromone to enhance trap captures was conducted in 20 Great Lakes tributaries, including the Tahquamenon, Betsy, Miners, Rock, Misery, and Carp rivers and Stokely Creek on Lake Superior.

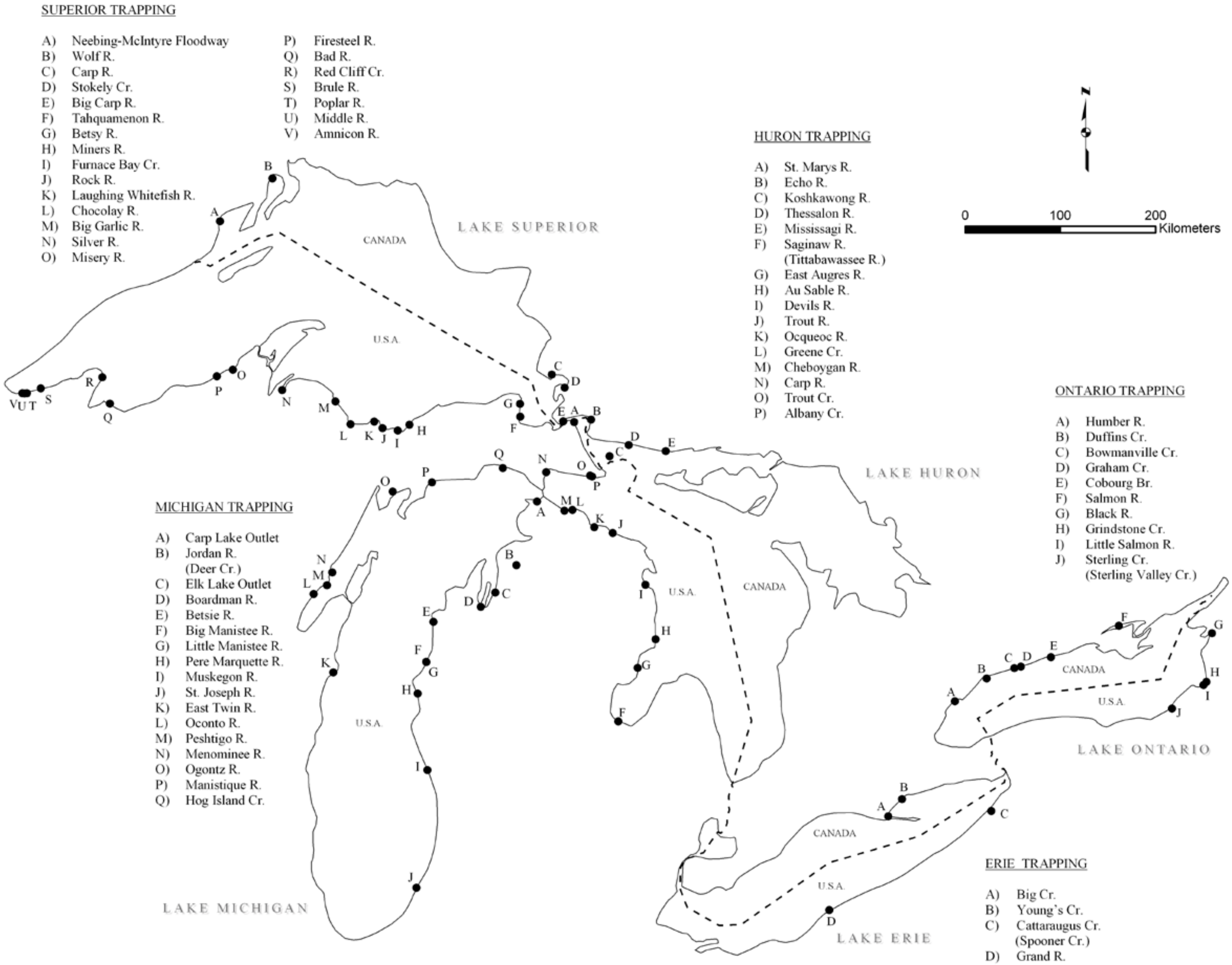

Figure 4. Locations of tributaries where assessment traps were operated during 2010.

Table 22. Stream name, number caught, spawner 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 2010 (letter in parentheses corresponds to location of stream in Figure 4).

Tributary	Number Caught	Spawner Estimate	Trap Efficiency	Number Sampled[1]	Percent Males[2]	Mean Length (mm)		Mean Weight (g)	
						Males	Females	Males	Females
Canada									
Neebing-McIntyre Floodway(A)									
- Neebing R.	36	---	---	---	---	---	---	---	---
Wolf R. (B)	28	---	---	---	---	---	---	---	---
Carp R. (C)	23	---	---	22	73	---	---	---	---
Stokely Cr. (D)	11	---	---	11	64	---	---	---	---
Big Carp R. (E)	41	63	65	35	69	---	---	---	---
Total or Mean (Canada)	**139**	**---**	**---**	**68**	**69**	**---**	**---**	**---**	**---**
United States									
Tahquamenon R. (F)	786	2,501	31	124	81	458	444	206	192
Betsy R. (G)	185	498	37	49	51	438	431	196	200
Miners R. (H)	77	149	52	27	74	367	357	220	249
Furnace Bay Cr. (I)	18	64	28	1	100	410	---	171	---
Rock R. (J)	151	303	50	67	61	422	416	182	171
Laughing Whitefish R. (K)	0	---	---	---	---	---	---	---	---
Chocolay R.(L)	3	---	---	---	---	---	---	---	---
Big Garlic R. (M)	3	---	---	---	---	---	---	---	---
Silver R. (N)	30	98	31	1	100	421	---	196	---
Misery R. (O)	52	141	37	12	83	428	435	166	121
Firesteel R. (P)	31	98	32	2	50	490	380	238	143
Bad R. (Q)	964	7,905	12	18	28	425	434	172	184
Red Cliff Cr. (R)	29	---	---	26	69	448	460	188	208
Brule R. (S)	592	1,216	49	36	56	437	432	201	216
Poplar R. (T)	8	---	---	---	---	---	---	---	---
Middle R. (U)	664	2,024	33	40	40	447	424	218	195
Amnicon R. (V)	69	---	---	---	---	---	---	---	---
Total or Mean (U.S.)	**3,662**	**---**	**---**	**403**	**64**	**438**	**427**	**199**	**195**
Total or Mean (for lake)	**3,801**	**---**	**---**	**471**	**65**	**438**	**427**	**199**	**195**

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

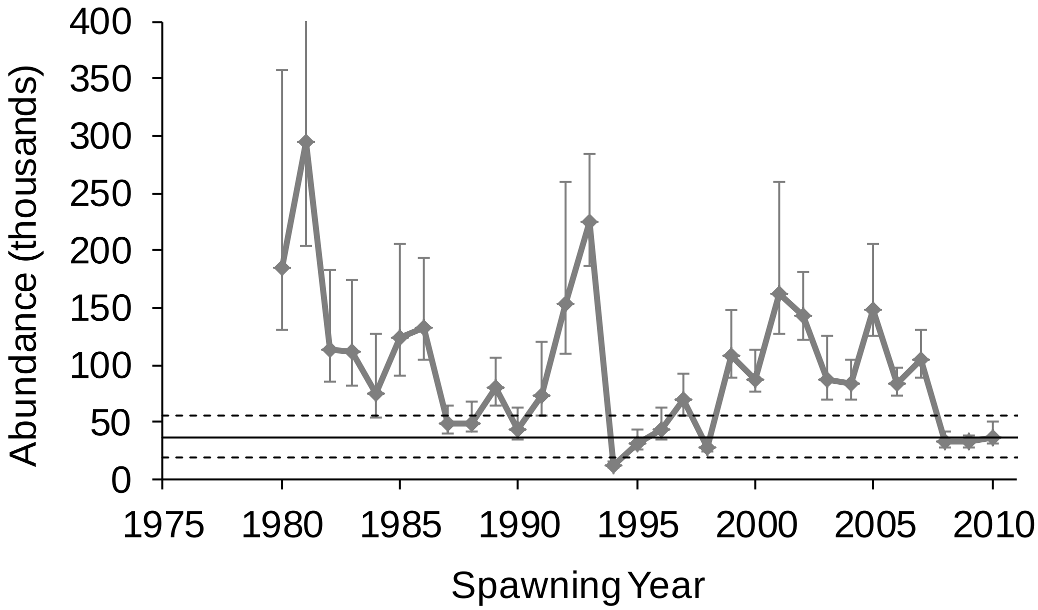

Figure 5. Annual lake-wide population estimates of spawning-phase sea lampreys in Lake Superior, 1980 – 2010 with 95% confidence intervals (vertical error bars). Target level is indicated by the solid horizontal line with 95% confidence intervals (horizontal dashed lines).

Lake Michigan

- A total of 19,427 sea lampreys were trapped at 17 sites in 16 tributaries during 2010 (Table 23, Figure 4).

- The estimated population of spawning-phase sea lampreys during 2010 was 89,278 (95% CI; 82,928 – 97,130), which was greater than the fish-community objective target of 57,000±13,000 (Figure 6).

- Spawning-phase 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 total of 6,395 spawning-phase male sea lampreys were delivered to the sterilization facility from trapping operations on the Manistique (3,350), Peshtigo (572), Carp Lake Outlet (114), Boardman (111), Betsie (317), Manistee (154), Muskegon (82), and St. Joseph (116) rivers. The total includes 1,579 lampreys that were grouped for transport from a combination of Lake Michigan tributaries.

- A three-year field-scale management experiment using the mating pheromone to enhance trap captures was conducted in 20 Great Lakes tributaries, including the Carp Lake Outlet and Betsie and Manistee rivers on Lake Michigan.

Table 23. Stream name, number caught, spawner estimate, trap efficiency, number sampled, percent males, and biological characteristics of spawning-phase sea lampreys captured in assessment traps or nets in tributaries of Lake Michigan during 2010 (letter in parentheses corresponds to location of stream in Figure 4).

Tributary	Number Caught	Spawner Estimate	Trap Efficiency	Number Sampled[1]	Percent Males[2]	Mean Length (mm)		Mean Weight (g)	
						Males	Females	Males	Females
Carp Lake Outlet (A)	269	334	80	47	51	478	470	216	224
Jordan R. (B)	---	---	---	---	---	---	---	---	---
Deer Cr.	109	451	24	21	33	478	493	265	285
Elk Lake Outlet (C)	43	242	18	4	25	450	431	162	200
Boardman R. (D)	460	877	52	32	41	463	466	217	219
Betsie R. (E)	1,471	2,898	51	179	59	491	492	250	255
Big Manistee R. (F)	416	2,032	20	5	20	515	519	278	301
Little Manistee R. (G)	63	88	72	12	17	506	477	278	267
Pere Marquette R. (H)	0								
Muskegon R. (I)	268	1,276	21	13	62	488	505	237	287
St. Joseph R. (J)	822	2,066	40	51	35	473	470	256	295
East Twin R. (K)	31	45	69	1	100	425	---	221	---
Oconto R. (L)	19	---	---	2	0	---	496	---	260
Peshtigo R. (M)	3,922	5,053	78	457	54	505	503	269	277
Menominee R. (N)	532	1,952	27	32	59	494	493	252	255
Ogontz R. (O)	0	---	---	---	---	---	---	---	---
Manistique R. (P)	10,968	36,147	30	314	54	500	504	255	276
Hog Island Cr. (Q)	34	---	---	1	100	503	---	310	---
Total or Mean	**19,427**	**---**	**---**	**1,171**	**53**	**497**	**496**	**257**	**270**

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

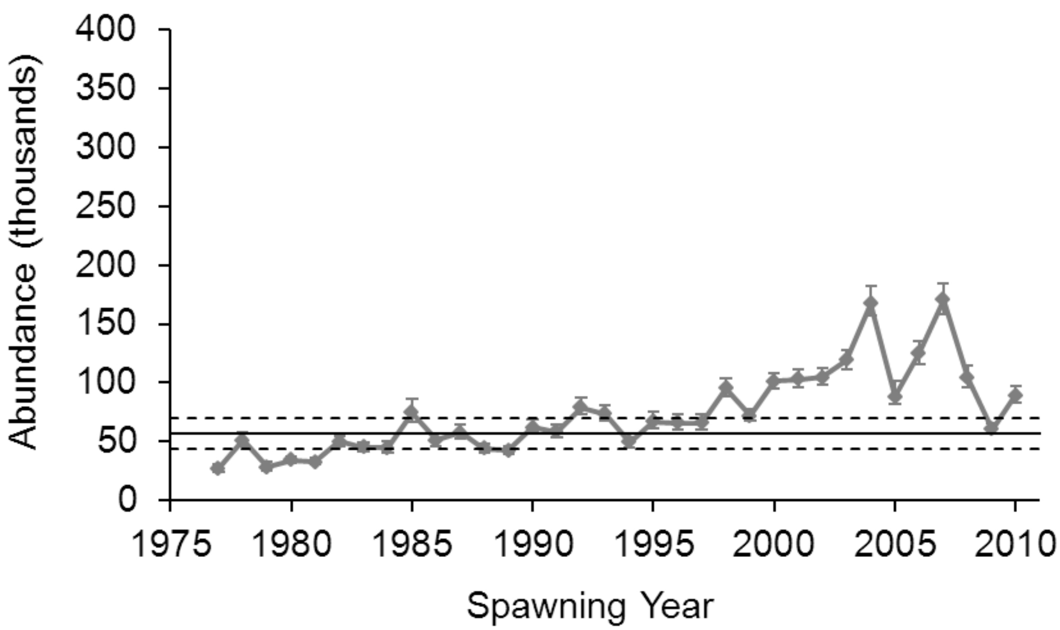

Figure 6. Annual lake-wide population estimates of spawning-phase sea lampreys in Lake Michigan during 1977-2010 with 95% confidence intervals (vertical error bars). Target level is indicated by the solid horizontal line with 95% confidence intervals (horizontal dashed lines).

Lake Huron

- A total of 27,274 sea lampreys were trapped at 17 sites in 16 tributaries during 2010 (Table 24, Figure 4).

- The estimated population of spawning-phase sea lampreys during 2010 was 139,676 (95% CI; 123,296 – 165,035), which was greater than the fish-community objective target of 73,000±20,000 (Figure 7).

- A total of 7,644 spawning-phase sea lampreys were captured in traps operated in the St. Marys River at the Clergue Generating Station (formerly known as Great Lakes Power) in Canada and the U.S. Army Corps of Engineers and Cloverland Electric (formerly known as Edison Sault Electric) in the U.S. The estimated population in the river was 25,234 sea lampreys and trapping efficiency was 30%.

- A total of 13,378 spawning-phase male sea lampreys were delivered to the sterilization facility from trapping operations (Figure 2) on the Lake Huron tributaries Au Sable (778), Cheboygan (5,856), East AuGres (135), Echo (324) Thessalon (1,085), Trout (4), Ocqueoc (984), and St. Marys (4,207) rivers and Greene Cr. (2). The total includes three lampreys that were grouped for transport from a combination of Lake Huron tributaries.

- A three-year field-scale management experiment using the mating pheromone to enhance trap captures was conducted in 20 Great Lakes tributaries, including the St. Marys, East AuGres, Echo, Thessalon, and Little Thessalon rivers on Lake Huron.

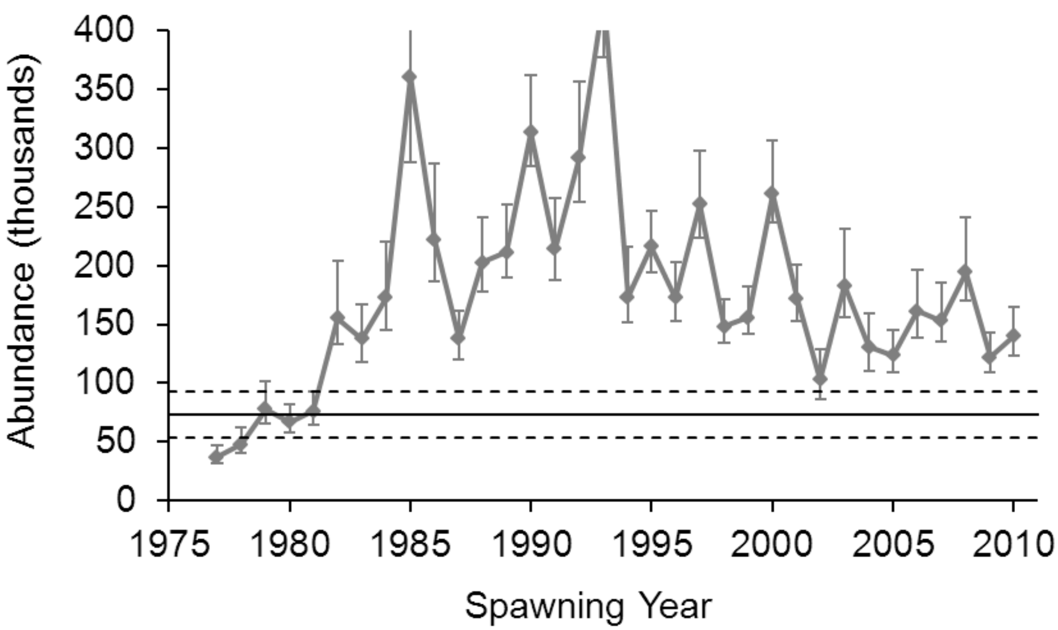

Figure 7. Annual lake-wide population estimates of spawning-phase sea lampreys in Lake Huron during 1977-2010 with 95% confidence intervals (vertical error bars). Target level is indicated by the solid horizontal line with 95% confidence intervals (horizontal dashed lines).

Table 24. Stream name, number caught, spawner 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 2010 (letter in parentheses corresponds to location of stream in Figure 4).

Tributary	Number Caught	Spawner 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)	4,226	25,234	30	4,148	61	---	---	---	---
Echo R. (B)	554	4,908	11	391	65	---	---	---	---
Koshkawong R. (C)	0	---	---	---	---	---	---	---	---
Thessalon R. (D)									
Little Thessalon R.	2,411	3,462	70	2,129	53	---	---	---	---
Main at Rydal Bank	13	---	---	12	50	---	---	---	---
Mississagi R (E)	2	---	---	2	100	---	---	---	---
Total or Mean (Canada)	**7,206**	**---**	**---**	**6,682**	**58**	**---**	**---**	**---**	**---**
United States									
Tittabawassee R. (F)	1	---	---	---	---	---	---	---	---
East Au Gres R. (G)	319	1,589	20	6	67	463	430	217	189
Au Sable R. (H)	1,957	5,907	33	103	73	471	446	250	219
Devils R. (I)	11	---	---	1	100	509	---	264	---
Trout R. (J)	5	---	---	1	0	---	430	---	182
Ocqueoc R. (K)	2,178	3,763	58	198	43	457	459	200	209
Greene Cr. (L)	7	---	---	1	100	453	---	197	---
Cheboygan R. (M)	11,191	20,491	55	529	62	476	475	220	226
Carp R. (N)	826	5,129	16	54	62	---	---	---	---
Trout Cr. (O)	1	---	---	---	---	---	---	---	---
Albany Cr. (P)	154	419	37	28	57	464	456	200	202
St. Marys R. (A)	3,418	See Canada	See Canada	67	75	481	479	237	231
Total or Mean (U.S.)	**20,068**	**---**	**---**	**988**	**60**	**430**	**427**	**179**	**178**
Total or Mean (for lake)	**27,274**	**---**	**---**	**7,670**	**59**	**475**	**472**	**221**	**223**

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

Lake Erie

- A total of 3,929 spawning-phase sea lampreys were trapped at 5 sites in 4 tributaries during 2010 (Table 25, Figure 4).

- The estimated population of spawning-phase sea lampreys during 2010 was 22,179 (95% CI; 18,722-27,823), which was significantly greater than the fish-community objective target range of 3,000±1,000 (Figure 8). Mark-recapture estimates were available for only two primary tributaries and one secondary tributary and the regression model was used to estimate the lake-wide spawning-phase population.

- All spawning-phase sea lampreys captured in Canadian traps were scanned for coded wire tags in 2010 and no tags were detected, providing no evidence that any sea lampreys tagged during a multi-year study in Lake Huron tributaries migrated to Lake Erie.

Table 25. Stream name, number caught, spawner 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 2010 (letter in parentheses corresponds to location of stream in Figure 4).

Tributary	Number Caught	Spawner Estimate	Trap Efficiency	Number Sampled[1]	Percent Males[2]	Mean Length (mm) Males	Mean Length (mm) Females	Mean Weight (g) Males	Mean Weight (g) Females
Canada									
Big Cr. (A)	3,366	9,543	35	1,814	62	---	---	---	---
Young's Cr. (B)	323	447	72	157	56	---	---	---	---
Total or Mean (Canada)	**3,689**	**---**	**---**	**1,971**	**61**	**---**	**---**	**---**	**---**
United States									
Cattaraugus Cr. (C)	73	---	---	---	---	---	---	---	---
Spooner Cr.	139	1,337	10	11	73	471	449	275	246
Grand R. (D)	28	---	---	---	---	---	---	---	---
Total or Mean (U.S.)	**240**	**---**	**---**	**11**	**73**	**471**	**449**	**275**	**246**
Total or Mean (for lake)	**3,929**	**---**	**---**	**1,982**	**61**	**482**	**485**	**274**	**274**

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

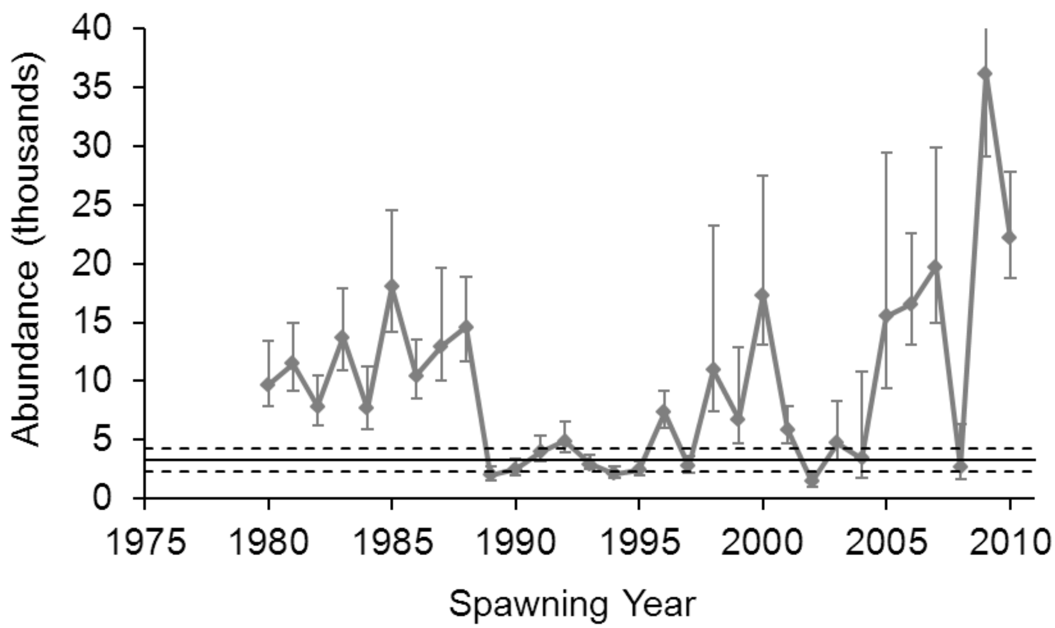

Figure 8. Annual lake-wide population estimates of spawning-phase sea lampreys in Lake Erie during 1980-2010 with 95% confidence intervals (vertical error bars). Target level is indicated by the solid horizontal line with 95% confidence intervals (horizontal dashed lines).

Lake Ontario

- A total of 5,256 spawning-phase sea lampreys were trapped at 11 sites on 10 tributaries during 2010 (Table 26, Figure 4).
- The estimated population of spawning-phase sea lampreys during 2010 was 30,996 (95% CI; 27,650-34,818), which was within the fish-community objective target of 31,000±4,000 (Figure 9).
- 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 total of 1,330 spawning-phase male sea lampreys were delivered to the sterilization facility from trapping operations on Duffins Creek (255) and Humber River (1,075).
- A three-year field-scale management experiment using the mating pheromone to enhance trap captures was conducted in 20 Great Lakes tributaries, including the Humber River and Duffins, Bowmanville, Graham, and Cobourg creeks on Lake Ontario.

Table 26. Stream name, number caught, spawner estimate, trap efficiency, number sampled, percent males, and biological characteristics of spawning-phase sea lampreys captured in assessment traps or nets in tributaries of Lake Ontario during 2010 (letter in parentheses corresponds to location of stream in Figure 4).

Tributary	Number Caught	Spawner 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)	2,680	3,520	76	132	46	493	485	263	247
Duffins Cr. (B)	995	1,760	57	71	45	481	489	242	253
Bowmanville Cr. (C)	94	441	21	32	53	493	495	265	290
Graham Cr. (D)	196	282	70	64	41	514	486	278	247
Cobourg Cr. (E)	211	278	76	60	53	493	495	265	290
Salmon R. (F)	17	---	---	8	75	485	410	226	166
Total or Mean (Canada)	**4,193**	**---**	**---**	**367**	**47**	**494**	**487**	**261**	**257**
United States									
Black R. (G)	753	7,901	10	35	57	484	472	267	279
Grindstone Cr. (H)	0	---	---	---	---	---	---	---	---
Little Salmon R. (I)	35	---	---	---	---	---	---	---	---
Sterling Cr. (J)	252	1,242	18	36	47	495	497	290	291
Sterling Valley Cr.	23	---	---	---	---	---	---	---	---
Total or Mean (U.S.)	**1,063**	**---**	**---**	**71**	**52**	**489**	**486**	**277**	**285**
Total or Mean (for lake)	**5,256**	**---**	**---**	**438**	**48**	**492**	**485**	**263**	**257**

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

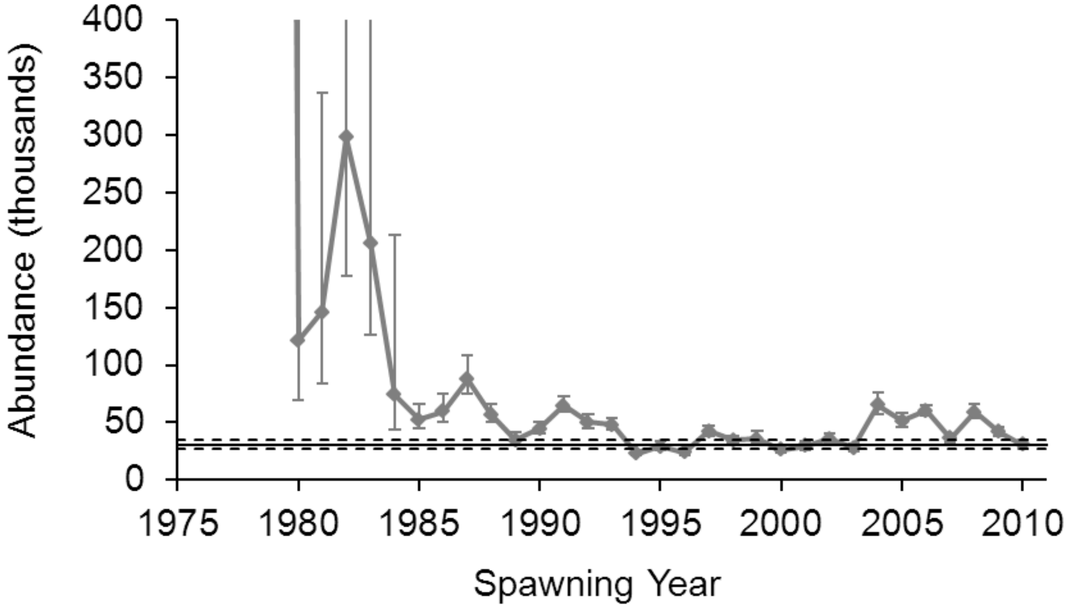

Figure 9. Annual lake-wide population estimates of spawning-phase sea lampreys in Lake Ontario during 1977-2010 with 95% confidence intervals (vertical error bars). Target level is indicated by the solid horizontal line with 95% confidence intervals (horizontal dashed lines).

Parasitic Phase

Lake Superior

- The number of A1-3 wounds per 100 lake trout >533mm from standardized spring assessments have not been analyzed for 2008-2010. The wounding rate in Lake Superior has been greater than the target of 5 per 100 lake trout for at least the last 10 years.

- The Michigan Department of Natural Resources (MDNR) provided data on the frequency of parasitic-phase sea lampreys attached to fish caught by charter boats during 2010.

    - 27 parasitic-phase sea lampreys attached to lake trout were collected from 4 management districts.

    - Parasitic-phase sea lampreys were attached at a rate of 0.9 per 100 lake trout (n = 2,990).

Lake Michigan

- The number of A1-3 wounds per 100 lake trout >533mm from standardized fall assessments have not been analyzed for 2008-2010. The wounding rate in Lake Michigan has been greater than the target of 5 per 100 lake trout for at least the last 10 years.

- The MDNR and the Wisconsin Department of Natural Resources (WDNR) provided data on the frequency of parasitic-phase sea lampreys attached to fish caught by sport charter boats during 2010.

    - A total of 1,212 parasitic-phase sea lampreys were collected from 14 management districts; 218 were attached to lake trout and 994 were attached to Chinook salmon.

    - Parasitic-phase sea lampreys were attached at a rate of 1.07 per 100 lake trout (n = 20,350) and 0.69 per 100 Chinook salmon (n = 143,194).

Lake Huron

- The number of A1-3 wounds per 100 lake trout >533mm from standardized spring assessments have not been analyzed for 2010. The wounding rate in Lake Huron has been greater than the target of 5 per 100 lake trout for at least the last 10 years.

- The MDNR provided data on the frequency of parasitic-phase sea lampreys attached to fishes caught by sport charter fishers during 2010.

    - 97 parasitic-phase sea lampreys were collected from 6 management districts; 68 were attached to lake trout and 29 were attached to Chinook salmon.

    - Parasitic-phase sea lampreys were attached at a rate of 1.57 per 100 lake trout (n = 4,332) and 4.5 per 100 Chinook salmon (n = 645).

Lake Erie

- The number of A1-3 wounds per 100 lake trout >533mm from standardized fall assessments was 12.8 and above the target of 5 per 100 lake trout during 2010. The wounding rate in Lake Erie has been greater than the target for 9 of the last 10 years.

- No data are collected in Lake Erie to determine the frequency of parasitic-phase sea lampreys attached to fish caught by sport charter boats.

Lake Ontario

- The number of A1 wounds per 100 lake trout >431mm from standardized fall assessments has not been analyzed for 2010. The wounding rate in Lake Ontario has been greater than the target during for 6 of the last 10 years.

- The New York Department of Environmental Conservation provided data on the frequency of parasitic-phase sea lampreys attached to fish caught by sport charter boats during 2010.

    - 2,599 parasitic-phase sea lampreys were sampled; the percent composition of salmonine host species to which lampreys were attached was coho salmon (3%), Chinook salmon (52%), rainbow trout (14%), atlantic salmon (3%), brown trout (27%), and lake trout (1%).

- Parasitic-phase sea lampreys were attached at a rate of 1.31 per 100 trout and salmon in the west region, 1.53 in the west central region, 1.55 in the east central region, and 2.41 in the east region.

RISK MANAGEMENT

Risk management addresses environmental and non-target issues related to the implementation of the SLMP 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.

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 habitats.

Annual Reviews

Endangered species reviews are annually conducted 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 2010, 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:

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

Programmatic Review

Because of the broad scope of the SLMP, consultation under Section 7 of the ESA involves several states, many listed species, and hundreds of streams. In an effort to streamline the consultation process and to add predictability for project planning, an informal, draft, SLMP-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 SLMP 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 SLMP programmatic review due to limited availability of staffing within the ES Program.

State-Listed Species

Annual Reviews

Reviews are annually conducted 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 2010, the following state regulatory offices reviewed endangered species within their jurisdiction and issued permits to conduct lampricide applications:

- Indiana Department of Environmental Quality
- Michigan Department of Natural Resources and Environment
- Minnesota Department of Natural Resources
- New York Department of Environmental Conservation
- Ohio Environmental Protection Agency
- Wisconsin Department of Natural Resources
- Pennsylvania Fish and Boat Commission

Species or Stream-specific Investigations

- Lake sturgeon – The lake sturgeon is state listed as endangered in Illinois, Indiana, Ohio, and Pennsylvania, threatened in Michigan and New York, and of special concern in Minnesota and Wisconsin. In Canadian waters of the Great Lakes, the lake sturgeon is provincially listed as threatened.

    - During 2010 the SLMP treated two state-designated sturgeon streams (Sturgeon and Cedar rivers). The Sturgeon River was treated after August 1 to minimize the potential effect on age-0 lake sturgeon. The Cedar River was treated during May because it is the optimal time to treat the stream and there currently is no natural recruitment of lake sturgeon in the system. No lake sturgeon mortality was observed during non-target assessments conducted after the treatments.

    - Cage and bioassay studies were conducted in three streams (Two Hearted, Millecoquins and Sturgeon rivers) to evaluate the toxicity of TFM to age-0 (<100mm) lake sturgeon in year one of a two-year study.

- Stonecat – The stonecat is a fish that is sometimes vulnerable to lampricide treatments and is a species of concern to the Ohio EPA. A cage study was conducted on the Two Hearted River to evaluate the toxicity of TFM to the fish during the stream treatment. A project report will be completed during 2011.

- Mudpuppy – The mudpuppy (*Necturus maculosus*) is a species sensitive to TFM and is a species of concern to the Ohio EPA. A cage study was conducted on the Sturgeon River (Delta County) to evaluate the toxicity of TFM to young-of-year mudpuppies. A project report will be completed during 2011.

Field Protocols

Both federal and state listed species are considered in protocols that are annually developed by the risk assessment unit for field staff. The protocols detail conservation measures to be followed where sea lamprey management activities are scheduled. During 2010, 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 2010.*

- *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 2010*.

The protocols provided field personnel with a list of protected federal and state listed species, their known locations, and measures to avoid and protect. No mortality or disturbance was observed during 2010 for the 38 federal and state listed species and the de-listed bald eagle *(Haliaeetus leucocephalus)* identified in the protocols.

National Environmental Policy Act

Title I and section 102 of the National Environmental Policy Act (NEPA) requires U.S. federal agencies to incorporate environmental considerations in their planning and decision making, which includes the details of the environmental impact of, and alternatives to, major federal actions significantly affecting the environment. During 2010, NEPA compliance was required for one proposed project:

Trap Projects

- Cattaraugus Creek – A NEPA compliance checklist and categorical exclusion questionnaire were completed for the permanent sea lamprey trap on Cattaraugus Creek (Erie County). The trap is proposed to be constructed at the downstream opening of the west-side tailrace of the Scoby Power Plant and Dam (Springville Dam). It was determined that the construction of the permanent sea lamprey trap would not have significant environmental impacts.

Federal Insecticide, Fungicide, and Rodenticide Act

Reports were prepared to comply with the U.S. EPA June 16, 1998 ruling of Section 6(a)(2) of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). This section of the FIFRA requires pesticide registrants to report unreasonable adverse effects of their products to the EPA. The Service is the registrant for lampricides and must report unreasonable adverse effects on humans, domestic animals, fish, wildlife, plants, other non-target organisms, water, and damage to property. Incident reports are required with the observed mortality of a single federally listed endangered, threatened, or candidate species and with observed mortalities of more than 50 individuals of any non-target species or taxa during a lampricide application (Table 27).

Table 27. Summary of 6(a)(2) incidents on non-target organisms during 2010.

Lake	Tributary	Mortality	Freq	Comments
Champlain	Little AuSable R.	Brown bullhead (*Ameiurus nebulosus*)	72	pH did not rise to levels observed during pre-treatment testing.
Ontario	Johnson Cr.	Brown bullhead (*Ameiurus nebulosus*)	5000	Unexpected drop in pH.
		White sucker (*Catostomus commersonii*)	250	
		Round goby (*Neogobius melanostomus*)	100	
Huron	Saginaw R. (Bluff Cr.)	White sucker (*Catostomus commersonnii*)	122	Unexpected drop in pH.
		Rainbow darter (*Etheostoma caeruleum*)	142	
		Common shiner (*Luxilus cornutus*)	167	
		Creek chub (*Semotilus atromaculatus*)	138	
Superior	Ravine R.	White sucker (*Catostomus commersonnii*)	159	Unexpected drop in pH.
		Longnose dace (*Rhinichthys cataractae*)	213	
		Mottled sculpin (*Cottus bairdii*)	152	
		Coho salmon (*Oncorhynchus kisutch*)	78	
		Stonecat (*Noturus flavus*)	50	

TASK FORCE REPORTS

Task forces were established to provide expertise, guidance and coordination for the four key program areas of lampricide control, assessment, reproduction reduction, and barriers. 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 Commission's Sea Lamprey Integration Committee which establishes 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 Sea Lamprey Integration Committee.

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.

2010 Membership:
Brian Stephens (Chair – appointed April 2010), Paul Sullivan (Past Chair), Barry Scotland, (Department); Dorance Brege, Mike Fodale, Alex Gonzalez, Cheryl Kaye, Ellie Koon, Shawn Nowicki, Tim Sullivan, Jeff Slade (Service); Jean Adams, Mike Boogaard, Terry Hubert (USGS); Gord McDonald, (U of G); Dale Burkett, Mike Siefkes, (Commission).

Task Force Meetings were held February 11 and September 13-14, 2010.

Progress:

1. ***Annually submit a lampricide treatment plan designed to reduce sea lamprey abundance to target wounding level.*** Lake-specific plans to suppress sea lampreys to target are in progress. A revised schedule will have the final draft presented to the SLIC in April, 2011 and to the Commission at the Annual Meeting in June, 2011.

2. ***Evaluate and prioritize options to optimize kill of sea lampreys and use of TFM.*** Measures to enhance treatment efficacy have now been applied to most regularly treated tributaries since this tactic was first introduced in 2006. These measures, which include increasing the duration of primary lampricide applications, increasing concentrations, and elevating the use of secondary applications to reduce escapement during treatment, have now been integrated as standard practises for treating these streams.

3. ***Annually select streams and lentic areas for lampricide control from the ESTR ranked list.*** This process resulted in the selection and treatment of 106 streams and 22 lentic areas. With the initiation of the first year of the Lake Huron - North Channel large-scale treatment strategy in 2010, 35 tributaries were scheduled for lampricide application and 874.6 ha of larval habitat in the St. Marys River were treated with granular Bayluscide.

In FY 2011, a total of 111 Great Lakes streams and 24 lentic areas are slated for treatment. This includes treatment of 30 Lake Huron streams and 799.7 ha in the St. Marys River for the second year of the large-scale treatment strategy.

4. ***Develop annual border-blind treatment schedule that maximizes efficiency.*** Based on the streams selected for treatment in a given year, the control agents continue to develop and implement treatment schedules that maximize efficiency with regard to the delivery of the program. In 2011, a joint Service-Department treatment of the St. Marys River is planned, and the Department will assist the Service in treating the Rifle River and will conduct treatments of 4 streams in Michigan.

5. ***Evaluate the effects on the environment of all proposed treatment options.*** The sea lamprey control agents have designated staff to review federal, provincial, and state listed species and identify any potential conflicts with the lampricide control program. LCTF Meeting Agendas routinely include discussion of issues related to non-target impacts of treatments.

   The final draft of the Biological Assessment (BA) concerning lampricide treatment impacts on Piping Plover was completed and USFWS-Ecological Services (ES) are to observe adults and chicks during treatment of the Milakokia River (July, 2011) to support the BA determination of "Not likely to adversely affect".

   In situ cage studies were conducted in 2010 to assess lampricide toxicity to stonecats and juvenile mudpuppies. A draft completion report was completed and has been sent out for review.

   Toxicity testing on snuffbox mussels (glochidia and juveniles) and logperch (primary host fish) are scheduled for 2011.

6. ***Annually refine estimates of staff effort, lampricide amount and total costs for inclusion in the ESTR model.*** In 2010, treatment supervisors at each of the field stations refined these estimates to aid in development of the 2011 Stream Treatment Ranking List.

7. ***Annually update Standard Operating Procedures.*** A sub-group of the LCTF met in December 2010 to update SOPs. Revisions will be incorporated into field manuals prior to the commencement of the 2011 field season.

8. ***Annually develop estimates of costs for effort and lampricide for upcoming fiscal year.*** The LCTF developed a budget for FY2011, which was submitted to PIWG and is pending approval by the Commission. Lampricide purchases and effort were proposed to deliver the FY2011 control program, including the Lake Huron - North Channel large-scale treatment strategy.

9. ***Assist in the development and refinement of the lampricide control research theme paper.*** The lampricide control white paper was published in 2007 (available on Commission website). Recently completed projects include a lampricide distribution study (January 2011) and modes of lampricide toxicity in larval lampreys and non-target fishes (December 2010).

10. ***Working with internal and external researchers, develop proposals and participate in field research of studies consistent with the lampricide control research theme paper.*** Collaborative research was conducted between the Department, the Service and USGS on a Technical Assistance Project which investigated *in situ* determination of age-0 lake sturgeon mortality from exposure to TFM. The second year of this 2 year project is scheduled for completion in December 2011.

11. ***Annually review research proposals for relevance to the lampricide control research theme paper.*** The LCTF reviews research pre-proposals and proposals relevant to lampricide control during its winter meeting.

Assessment Task Force

Purpose

The purpose of the ATF is to rank streams and lentic areas for sea lamprey control options, and to optimize the evaluation of the success of the sea lamprey control program.

2010 Membership

Mike Steeves (Chair), Rod McDonald, Fraser Neave, Paul Sullivan, Brian Stephens, Andrew Treble (Department); Jessica Barber, Michael Fodale, Jeffrey Slade (Service); Jean Adams, Roger Bergstedt, Nicholas Johnson (USGS); Shawn Sitar (MDNR); Michael Jones (Michigan State University); Dale Burkett, Mike Siefkes (Commission).

The task force met during February and September 2010. The larval assessment workgroup met in January 2010. The ATF continues to work closely with all of the other Sea Lamprey Integration Committee task forces.

Progress:

1. ***Rank streams and lentic areas for lampricide control.*** In cooperation with the Secretariat and an Integrated Management of Sea Lamprey contractor, the ATF used larval sea lamprey abundance indices and treatment costs generated by the Empirical Stream Treatment Ranking model (ESTR) to prioritize for treatment all streams expected to contain pre-metamorphic larval sea lampreys in 2011. Included in this ranking were the St. Marys River and lentic areas off the mouths of producing streams in lakes Superior, Huron, and Michigan. Streams and lentic areas In the North Channel that contribute parasitic-phase sea lampreys to Lake Huron were treated in 2010. This includes 866ha of substrate in the St. Marys River, and all streams from the Spanish River, Ontario, in the east to the Carp River, Michigan, in the west. These same treatments will be effected again in 2011.

2. ***Rank streams for selection for sea lamprey barriers.*** ATF continues to work with the Barrier Task Force and the Commission on the prioritization of streams for construction of lamprey barriers. Larval production estimates, quantity of habitat, and treatment effectiveness are being incorporated into the process.

3. ***Refine and implement recommendations of the larval assessment review of 2002.*** The Task Force continues to implement recommendations of the review panel. Activities in 2010 included ranking streams for treatment using “expert judgment” and examining the ability to detect low-density larval sea lamprey populations using backpack electrofishers.

4. ***Refine parameters of the ESTR model for sea lamprey population biology and habitat, effort and costs, and control effectiveness.*** Model refinement is an ongoing process. In 2008 the model was adapted to provide indices of larval sea lamprey abundance as well as estimates of metamorphosed sea lamprey production. The indices of larval abundance were used to prioritize streams for lampricide application in 2011.

5. ***Optimize assessments of abundance of sea lampreys to derive the best long-term measure(s) of sea lamprey control success.*** There is an effort among the control agents, lake technical committees, and the Sea Lamprey Integration Committee to incorporate information on initial and terminal host abundance, wounding rates, and geographic location to improve our understanding of the effects of sea lamprey management at both the stream and lake level. This will enable the control agents to better direct control efforts and optimize control activities.

6. ***Refine and implement recommendations of the adult assessment review of 1997.*** Following the recommendations of the adult assessment review panel:

    A. Annual estimates of lake-wide spawner abundance are made for each lake.
    B. Rationalization of which streams to trap is on-going using a value-added approach that includes input from the BTF and RRTF.
    C. Increased assessments of the size of spawning runs in more large rivers as well as spawning runs in Georgian Bay tributaries continue to be worked on by the ATF, BTF, and RRTF.
    D. Refugia traps were evaluated as an alternate trapping methodology to determine if they could be used to capture sufficient lampreys to provide Petersen abundance estimates and to evaluate the catchability assumption of the current mark-recapture model. Evaluation of these devices and assumptions will continue in 2011.

7. ***Develop annual border-blind schedules that maximize efficiency.*** Cross-border larval assessment schedules are the norm for work on lakes Erie and Ontario. Cost efficiencies continue to be realized as the Canadian agent completes all larval assessment work on the St. Marys River. The extensive lampricide application in 2010 was completed by crews from both agents. Cost-benefit analyses are being completed on other aspects of the assessment programs in an attempt to improve efficiencies through cross-border cooperation. For example, a fixed treatment cycle is being investigated for some portion of the sea lamprey producing tributaries throughout the Great Lakes.

8. ***Update standard operating protocols (SOP), as required.*** Larval and adult assessment SOPs are reviewed annually and updated from time to time as changes are made.

9. ***Develop estimates of costs for larval and adult assessment programs.*** Assessment cost estimates are developed annually for submission to the Program Integration Working Group prior to its fall budget meeting.

10. ***Assist in the development of research proposals and participate in field research studies consistent with the assessment research theme paper.*** Members of the ATF are often part of the team of investigators on research pre-proposals, and are involved in the coordination and completion of research projects in the field, including the supply of live sea lamprey life stages to support research. In 2010, the ATF assisted with the following new or ongoing projects:

Johnson, N. (Initiated by Swink, W.)	Determine the contribution of transformers from lentic areas to sea lamprey populations in lakes Huron and Michigan.	2007
Neave, F.	An investigation of a potential morphotype trigger in two Ichthyomyzon species.	2007
McLaughlin, R.	Movement pathways and behavior of sea lamprey around traps in the St. Marys River	2008
Wilberg, M.	Improving sea lamprey control through use of historical data to inform selection of sites for lampricide treatment.	2009
McLaughlin, R.	A decision analysis of management options for the Black Sturgeon Dam, Lake Superior.	2010

11. *Review research proposals and prioritize task force research needs that are consistent with the assessment research theme paper.* The assessment theme paper has been published in the Journal of Great Lakes Research. The task force continues to review the theme paper for relevancy to current and future needs, and up-to-date versions are published online at www.glfc.org. The ATF uses the theme paper as a benchmark to evaluate pre-proposals submitted to the Commission's Sea Lamprey Research Board. This evaluation is then passed on to the Sea Lamprey Research Board for consideration during their deliberation process.

<u>Reproduction Reduction Task Force</u>

The task force was established in 2003 and combined the former sterile-male-release technique task force and the pheromone and trapping task force.

Purpose

Coordinate and optimize the pheromone, sterile-male release, and trapping strategies in an integrated program of sea lamprey control.

2010 Membership

Michael Twohey (Chair-Spring), Lisa Walter (Chair-Fall), and Jessica Barber (Service); Rod McDonald and Mike Steeves (Department); Jane Rivera, Roger Bergstedt and Nick Johnson (USGS); Weiming Li and Michael Wagner, (Michigan State University); Rob McLaughlin and Gordon McDonald, (University of Guelph); Neal Godby (MDNR) Ellen Marsden, (University of Vermont); Michael Siefkes and Dale Burkett (Commission).

Progress

1. ***Identify application strategies and solicit field evaluations of the most promising strategies.*** Field trials testing the utility of 3kPZS in enhancing trap captures at traditional barrier integrated traps were implemented in 10 U.S. streams in 2009 and expanded in 2010 to include an additional 10 streams in Canada. Further, early application of pheromones in two Lake Superior tributaries tested the effect of drawing more lampreys into streams, and spermiated males were used to bait one St. Marys River trap to determine its effect on captures. Preliminary raceway tests examining the potential utility of repellents in an integrated program were conducted. Lampreys showed a strong negative response to the application of necromones in laboratory studies; proposals were funded for further work during 2011.

   Evaluation of the sterilization program:
   - The task force drafted a study designed to evaluate the effectiveness of SMRT in smaller systems outside of the St. Marys River. The task force also began collaborating with the Quantitative Fisheries Center (QFC) on an updated St. Marys River Decision Analysis and a workshop on the topic was held.
   - A research project to evaluate genetic damage in treated lampreys for quality assurance continued.
   - A field trial examining the use of sterilized females as an alternative control technique continued. This was the final year of sterilized female release and a completion report will be submitted during 2011.

   Planning, evaluation, and implementation of trapping strategies:
   - A Great Lakes Restoration Initiative (GLRI) proposal in cooperation with power producers in the St. Marys River was pursued to advance alternative controls, manipulate flows in the major power canals and at the compensating gates to evaluate new trapping opportunities, facilitate diver efforts to remove lampreys, access nests for sampling, and evaluate lamprey behavior near traps. The work is planned for 2011.

- A permanent trap was constructed in the Manistee River.
- Rotary screw traps were used in 2 streams and fyke nets were used in 11 streams to capture downstream migrating juvenile sea lampreys during 2010. Downstream trapping continues to be a useful technique for agents to mitigate the effects of deferred treatments.

2. ***Evaluate the role of trapping as an alternate control technique.*** Assessment of larval populations in the St. Marys River, simulation modeling by Jones et al., and economic effects investigated in Jones' decision analysis project all indicate that trapping is an integral element of the integrated control strategy in the St. Marys River, and that the strategy is effectively reducing production of larvae.

   Trapping in the St. Marys River:
   - Refinements in the newly built South Attractant Water Trap at the Brookfield hydro plant resulted in a noticeable increase in trapping efficiency; efficiency was 12% in 2009 and increased to 30% in 2010.
   - Behavior near traps was observed with video and hydro acoustic technology.
   - Discussions with a board of the International Joint Commission (IJC) continued; flow manipulations that would allow for better evaluation of trapping techniques and lamprey movement and behavior near traps have been suggested as part of the IJC's revised water allocation plan.
   - Acoustic telemetry studies investigating lamprey movements and behavior continued in the St. Marys River. The studies provided insight on the percentage of lampreys that might be escaping to tributaries of the St. Marys River and migration behavior of spawning-phase sea lampreys. Acoustic telemetry studies will continue during 2011, and intentions are to build a multi-state mark-recapture model and 3-dimensional movement tracks and to identify areas of opportunity for increased trapping effort.
   - Plans were formulated for use of DIDSON sonar to evaluate lamprey behavior near traps in 2011.

   Research to advance the technology of trapping and to understand lamprey behaviors:
   - Evaluation of a large fishwheel was attempted on the Mississagi River during 2010. Historically low water levels precluded installation, but much was learned by the agents in regards to construction and operation.

3. ***Evaluate results of laboratory and field research and revise application strategies accordingly.*** Results of field studies since 2007 suggest new hypotheses on how sea lamprey pheromones work. Migratory responses in sea lampreys to pheromones may occur in two distinct phases: 1) settlement at river mouths in response to PADS/PSDS/PS at the end of the lake to river transition; and 2) use of 3kPZS in stream selection during the river portion of the migration. A cooperative field study (Johnson et al.) tests the use 3kPZS in a large suite of streams to manipulate migratory behavior and improve the efficacy of traps associated with barriers. Further, the Li lab is continuing to evaluate additional pheromone components. Methods to analyze 3kPZS in stream water have been developed. The Wagner lab is evaluating spawner behavior in response to a pheromone plume, formulation and use of a slow-release polymer, and extraction and identification of a putrefaction-derived sea lamprey repellent.

The task force continued efforts to review application of the SMRT in collaboration with the QFC. Dr. Brian Irwin has begun updating the decision analysis to better understand appropriate targets for sterile males and suppression in the St. Marys River. A workshop focused on model updates and improvements was held with the agents. The task force developed an alternative application and evaluation proposal for the SMRT to begin in smaller streams in 2012.

4. ***Mediate a collaborative link between control agencies and research institutions to use the best available resources and facilitate the transition from laboratory to field.*** Pheromone field experiments continued with investigators from MSU, USGS and both control agents. The control agent's expertise in trapping has been integral to the field studies. Good Laboratory Practices training has been provided by the UMESC and they continue to coordinate registration issues. Extraction of larval (migratory) pheromone continues at Hammond Bay with support from both control agents. This approach is providing a strong interdisciplinary team and building critical expertise for future implementation of a pheromone control strategy.

   The task force is collaborating with agents and internal and external researchers to advance strategies for suppression of reproduction. Agents, PERM scientists, and outside experts are collaborating on movement studies and understanding of lamprey behavior near traps. The task force continues to monitor studies of population dynamics that are integral to success of alternative controls. The Hammond Bay Biological Station is continuing to provide support for SMRT related field activities. Several members of the task force are members of the Sea Lamprey Research Board.

5. ***Identify chemical-biochemical registration requirements, coordinate registration research, and facilitate the registration process with appropriate agency personnel.*** All permits for planned field applications were acquired. Appropriate records of field evaluations are being kept. UMESC is working with pheromone researchers to address the need for EUP's for various mixtures of pheromone components. A plan for joint registration of 3kPZS under NAFTA is in progress.

6. ***Develop annual border-blind schedules that maximize efficiency.*** The U.S. and Canadian agents have been working on both sides of the border to facilitate effective trapping, processing, and transport of sea lampreys. The task force used effective protocols for screening and moving sea lampreys from the lower to upper Great Lakes using facilities on both sides of the border.

7. ***Update annual standard operating protocols (SOP).*** Field operations continue to be conducted under updated protocols. Standard operating procedures for critical sterilization activities are annually updated and incorporated into a manual of standard operating procedures. The task force developed procedures and schedules for trap operation on the St. Marys River and procedures are detailed in the agents' annual work plans. Pheromone field trials are conducted under peer reviewed study plans.

8. ***Develop annual estimates of costs for effort for upcoming fiscal year.*** Budgets were proposed for trapping, sterilization, and pheromone development. The task force continued to develop costs and timelines for strategic development and implementation of pheromone strategies.

9. ***Assist internal and external researchers to develop proposals and participate in field research consistent with pheromone, sterility, and trapping for control research theme papers.*** Task force members were involved in development of research priorities, served as investigators on some studies, and supported these studies in many ways. The task force worked to identify new strategies to target lampreys that elude traps. Recent research is bringing new understanding to the challenge of capturing high proportions of lampreys, working in difficult environments such as large rivers, and understanding the effect of trapping as a management technique. Projects just completed or underway address issues of inter-stream movements of sea lampreys, pathways of migratory sea lampreys in large rivers, movement pathways and behavior near traps in the St. Marys River, improving effectiveness of portable traps, and behavior and swim performance of sea lampreys. New applications of technology are being planned to improve trapping efficiencies and DIDSON cameras and acoustic telemetry technology is intended to advance understanding of sea lamprey behavior. Further work will be coordinated with the QFC to analyze critical uncertainties associated with alternative controls, particularly the SMRT, and use updated models to forecast the consequences of a variety of management scenarios.

   Task force members were engaged in development of research proposals for SMRT, pheromones, and population dynamics. The task force continued to refine a research strategy to support implementation of a pheromone control technique. Control agents, internal research and external research collaborated on pheromone field trials. A cooperative field study (Li lab, Wagner lab, control agents), formulated with task force members will continue in 2011 to test the utility of using 3kPZS at barrier integrated traps to manipulate migratory behavior and improve efficacy of traps associated with barriers. Efficacy of sterilization, Q/A, and potential for sterile female release continued to be investigated with help from agents, internal research, and external research.

10. ***Review pheromone, sterility, and trapping for control research proposals for relevance to pheromone, sterility, and trapping for control research theme papers.*** Pre-proposals were circulated to task force members and comments were carried to the Sea Lamprey Research Board by the chair and other task force members who attend the research meeting. Research priorities are up to date.

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.

2010 Membership

Jessica Barber (Chair), Kasia Mullett, Cheryl Kaye, Rob Elliott (Service); Paul Sullivan, Tonia VanKempen, Tom Pratt, and Kelly Withers (Department); Jim Galloway (USACOE); Sharon Hanshue (MDNR); Steve Bobrowicz (OMNR); Nick Johnson (USGS); Rob McLaughlin (University of Guelph); and Dale Burkett, Mike Siefkes (Commission).

Progress

1. ***Coordinate operation, maintenance and construction of sea lamprey barriers.***
   Operation and maintenance **-** During 2010, 9 barriers were operated (Canada – Big Carp and Little Carp rivers, Big and Wesleyville creeks and Cobourg Brook; U.S. – Ocqueoc River and Albany, Furnace and Greene creeks). The barriers operated each year are those barriers that have adjustable components that need to be set/removed/adjusted at the beginning/end of the sea lamprey migration periods or that have permanent traps or fishways associated with them that require regular servicing.
   Routine maintenance, spring pre-migration or safety inspections were conducted in 46 streams (26 Canada, 20 U.S.) The results of inspections led to immediate minor repairs or engineered inspections and remediation plans for major repairs. During 2010, 7 structures, sites, or access routes were repaired (Canada – Big Carp River and Koshkawong, Big, and Little Otter creeks; U.S. – Betsy, Miners, and White rivers). Water level loggers were set and downloaded for performance monitoring and planning purposes in 17 U.S. streams.
   Construction – During 2010, construction was completed in one stream (Canada – Normandale Creek). Barrier planning continued on five streams (Canada – Still River and Orwell Brook; U.S. – Manistique and Marengo rivers and Trail Creek). Feasibility investigations or fish assessments were initiated or continued for barrier projects in five streams (Canada – Whitefish, Bighead, and Rouge rivers; U.S. – Days and Grand rivers).

2. ***Ensure that structures important to sea lamprey management block adult sea lampreys.***
   During 2010, agent staff consulted and provided mitigation recommendations on fish passage or dam/perched culvert removal projects for the Poplar, Sheboygan, St. Joseph (Mill Creek and Paw Paw River), Black, Grand, Bear, Saginaw (Tittabawassee, Flint, and Cass rivers), Au Sable, and Lynn rivers and Sauk and Four Mile creeks. Several alternatives were investigated to block sea lamprey migrations at the Days River. Department coordination to ensure sea lampreys remain blocked at existing structures continued regarding the Black Sturgeon River Dam and Denny’s Dam in the Saugeen River.

3. ***Develop and annually update a GIS database of structures that block adult sea lampreys*.**
   The Service has completed the inventory of over 4,000 barrier structures on Great Lakes tributaries. The Department assessment crews inspect barrier structures while conducting

larval surveys and all removals must go through the Department Fish Management Office. Any further work on the database has been deferred in lieu of higher priority items until the Service and Department fill vacancies in the barrier program (Service – barrier planning biologist; Department – barrier coordinator).

4. ***Develop and annually update standard operating protocols*.** Several of the protocols in the Barrier Life Cycle and Operational Protocols document are in need of revision. A schedule to complete these revisions will be developed during 2011.

5. ***Develop annual border-blind schedules and budget*.** A five year plan (2011-2015) was developed for barrier projects. The list included a rebuild or new construction of barriers in the Still, Manistique, Grand, Saugeen, and Black Sturgeon rivers, Trail Creek, and Orwell Brook. Planning, feasibility studies or fish assessments are being conducted in Marengo, Whitefish, Days, Root, Pine, Bighead, and Rouge rivers, and Big Otter Creek.

6. ***Review barrier research proposals for relevance to barrier and trapping research theme paper.*** The task force continued to work with researchers via the task force and to develop proposals consistent with identified needs and the barrier research theme paper. Research proposal summaries were reviewed, ranked by priority and submitted to the Great Lakes Fishery Commission Secretariat and Research Priorities Workgroup.

7. ***Collaborate with researchers to develop proposals and execute field research consistent with the barrier and trapping research theme paper.*** Passing non-jumping fish while effectively blocking sea lamprey migration continues to be an important research need of the task force. Using the Black Sturgeon River dam removal proposal as a case study, researchers and task force representatives are involved in addressing this concern. A research project is underway to address spawning-phase sea lamprey movement in the St. Marys River and will be important in understanding lamprey movements and the implications for barriers.

OUTREACH

The Service and Department are involved in outreach activities to inform the public of the benefits and operations of the SLMP. These efforts educate the public about sea lampreys and the devastating effect they have on Great Lakes fishes. The main tool used during outreach events is a large display with graphics, a computer interface, and an aquarium that houses live larval and spawning-phase sea lampreys for visitors to experience the sea lamprey first-hand. During 2010, this display was in attendance at nine large capacity events (Table 28).

Table 28. Dates and locations of public outreach performed by agents of the sea lamprey control program in 2010.

Date	Location	Venue	Lead Agency
January 7^{th} – 10^{th}	Detroit, MI	Ultimate Fishing Show	USFWS
January 15^{th} – 24^{th}	Cleveland, OH	Cleveland Boat & Waterfront Lifestyle Expo	DFO
February 17^{th} – 21^{st}	Duluth, MN	Duluth Boat, Sport and Travel Show	USFWS
February 27^{th} - 28^{th}	Valparaiso, IN	Spring Fever Outdoor Show	GLFC
March 5^{th} - 7^{th}	Green Bay, WI	Northeast Wisconsin Sport Fishing Show	USFWS
March 17^{th} – 21^{st}	Toronto, ON	Toronto Sportsmen's Show	DFO
July 14^{th} – 16^{th}	Las Vegas, NV	ICAST	USFWS
August 16^{th} – 22^{nd}	Escanaba, MI	UP State Fair	USFWS
August 24^{th} – 29^{th}	Chicago, IL	Tallships Chicago	USFWS

PERMANENT EMPLOYEES OF THE SEA LAMPREY CONTROL PROGRAM

DEPARTMENT OF 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: Control Supervisor
- Barry Scotland: Assistant Control Supervisor
- Tonia Van Kempen: Environmental Supervisor

Lampricide Control Technicians:

Charlie Boudreau	Chris Sierzputowski
Peter Grey	Jamie Smith
Adam Loubert	Randy Stewart
Jerome Keen	Jamie Storozuk
Mike MacKenna	John Tibbles
Shawn Robertson	Sarah Woods

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

Section Head, Assessment: Mike Steeves

Assessment Biologists:
- Rod McDonald: Adult Supervisor
- Andrew Treble: Larval Supervisor (Upper Lakes)
- Fraser Neave: Larval Supervisor (Lower Lakes)

Assessment Technicians:

Gale Bravener	Sean Nickle
Paul Kyostia	Andrea Phippen
Sarah Larden	Jeff Rantamaki
Michael McAulay	Kevin Tallon
Richard Middaugh	Thomas Voigt
Sean Morrison	

Barriers:
- Joe Hodgson: Barrier Technician
- Barrier Coordinator: Vacant

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

UNITED STATE FISH AND WILDLIFE SERVICE

Robert Adair, Sea Lamprey Management Program Manager and Field Supervisor

Ludington Biological Station – Ludington Michigan
Jeff Slade, Station Supervisor

Lampricide Control Fish Biologists:
- Timothy Sullivan, Treatment Supervisor
- Ellie Koon, Treatment Supervisor
- Rebecca Gannon
- Matt Lipps
- Jenna Tews

Lampricide Control Lead Physical Science Technician:
- Michael Calloway

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

Lampricide Control Biological Science Technicians:

Margie Shaffer (CS)	Brian Bartos (CS)
Bobbie Halchishak (CS)	Gena Long (CS)
Tim Falconer (CS)	Dan McGarry (CS)

Larval Assessment Fish Biologists:
- Alex Gonzalez, Larval Assessment Supervisor
- Dave Keffer
- Aaron Jubar

Larval Assessment Biological Science Technicians:
- Lois Mishler
- Jason Krebill
- John Stegmeier (CS)
- Gary Haiss (CS)
- Timothy Granger (CS)
- Eric Kopperud (CS)

Maintenance Worker: Vacant

Administrative Support:
- Joe Tyron
- Danya Sanders

Marquette Biological Station – Marquette Michigan
Katherine Mullett, Station Supervisor

Administrative Support:
Tracy Demeny, Adminstrative Officer
Michael LeMay
Casey Piton
Barbara Poirier
Alana Kiple (CS)

Information Technology Support:
Larry Carmack, Supervisor
Deborah Larson

Larval Unit Supervisor: Michael Fodale

Lampricide Control Fish Biologists:
Dorance Brege, Treatment Supervisor
Shawn Nowicki, Treatment Supervisor
Lori Criger
Kathy Hahka

Lampricide Control Lead Physical Science Technician:
Robert Wootke

Lampricide Control Physical Science Technicians:
Jamie Criger
Michael St.Ours
Kelley Stanley

Lampricide Control Biological Science Technicians:

Susan Becker (CS)	Janet McConnell (CS)
James Criger (CS)	Justin Oster (CS)
Thomas Elliott (CS)	Daniel Suhonen (CS)
Jesse Haavisto(CS)	Patrick Wick (CS)
Stephen Healy (CS)	

Larval Assessment Fish Biologists:
Joseph Genovese, Larval Assessment Supervisor
Jacob Cunha
Lynn Kanieski

Larval Assessment Biological Science Technicians:

Kyle Krysiak	Chris Gagnon (CS)
Mary Wilson	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
Gregg Baldwin, Biological Science Technician

Maintenance Worker:
Vacant

Adult Unit Supervisor : Michael Twohey

Fish Biologists:
Jessica Barber, Adult Assessment /Barrier Supervisor
Lisa Walter, Sterile-Male-Release Supervisor
Pete Hrodey
Gregory Klingler
Matthew Symbal

Biological Science Technicians:

Daniel Kochanski	Bruce Eldridge (CS)
Nikolas Rewald	John Ewalt (CS)
Dennis Smith	Michael Greiner (CS)
Deborah Winkler	Kevin Letson (CS)
Jason VanEffen	Sara Ruiter (CS)
Chad Andresen (CS)	