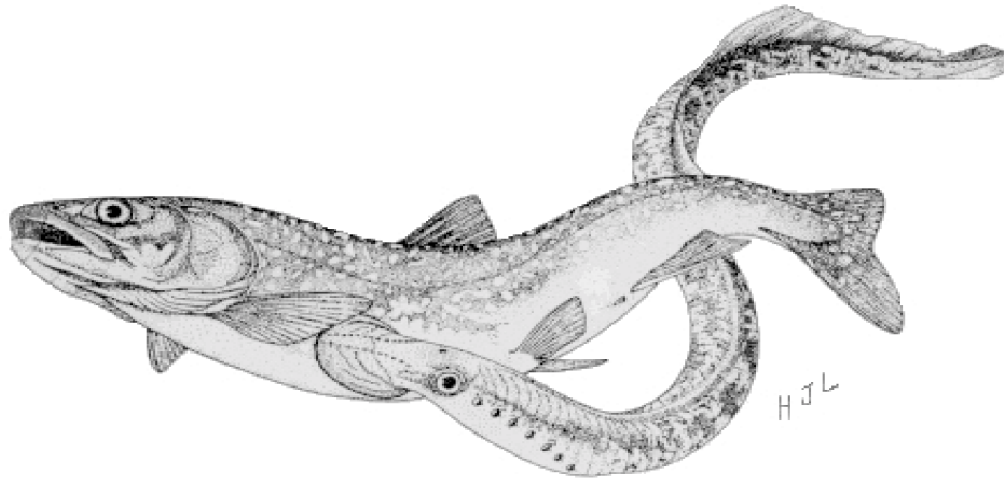


INTEGRATED MANAGEMENT OF SEA LAMPREYS IN LAKE ERIE 2002

Report to
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INTRODUCTION

Sea lamprey control is a critical fishery management action delivered to support the Fish Community Objectives developed by the Lake Committees as part of the Strategic Plan for Great Lakes Fishery Management. Objectives for acceptable levels of mortality that allow the establishment and maintenance of self-sustaining stocks of lake trout and other salmonids have been established on all of the lakes. In some cases, the lake committees have established specific targets for sea lamprey populations in the Fish Community Objectives or the lake trout rehabilitation plans. The current control program reflects actions by the U.S. Fish and Wildlife Service (Service) and Department of Fisheries and Oceans Canada (Department) as contract agents of the Great Lakes Fishery Commission (Commission) to meet these targets.

The Commission is working in partnership with the Lake Committees through their Lake Technical Committees to refine the current target statements and to develop common target formats for each of the lakes. The Commission and cooperators will consider the costs of control along with the benefits to define an optimum control program. The program must support the Fish Community Objectives, be ecologically and economically sound, and be socially acceptable. These targets for each lake will define the abundance of sea lampreys that can be tolerated and the economically viable level of control required to reach the desired suppression.

The cooperation of state, provincial, and tribal agencies continues to be critical to the success of all aspects of the control program. For example, in collaboration with the State of Michigan, the agents employed stream treatment methods that provided the best possible suppression of sea lampreys while protecting critical lake sturgeon populations.

This report presents the actions of the Service and Department in the integrated management of sea lampreys in Lake Erie during 2002. Also presented are actions to meet milestones of the Commission Vision and trends in sea lamprey abundance as related to Fish Community Objectives.

COMMISSION VISION

The Commission, in its "Strategic Vision for the First Decade of the New Millennium," identified milestones that included:

Accomplish at least 50% of sea lamprey suppression with alternative technologies while reducing TFM use by 20%.

The pesticide 3-trifluoromethyl-4-nitrophenol (TFM) has been used as a management tool to control larval sea lampreys in the Great Lakes since 1958. In the past decade, the Service and Department have reduced the dependency on TFM through the development and implementation of alternative controls, refinement of assessment procedures, and improvement of application techniques to more efficiently treat tributaries. The use of TFM has decreased 35% from an annual average of 55,169 kg active ingredient from 1986-1990 to an annual average of 35,687 kg active ingredient from 1998-2002.

FISH COMMUNITY OBJECTIVES

The Lake Erie Committee developed a draft “Guiding Principles for Determination of Fish Community Objectives” during 1999. The draft recognized sea lampreys as a pest species requiring control.

A specific management plan for sea lampreys in Lake Erie was developed prior to the implementation of stream treatments during 1986. The plan defined an experimental program of control to reduce sea lamprey populations to levels where wounding on lake trout would be less than 5%, assessment trap catches of lampreys would be less than 10% of pretreatment levels, and nest densities would be less than 2 nests per km of spawning habitat.

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 would be controlled through management of fishery exploitation and continued suppression of sea lampreys.

The fish community objective for sea lampreys was met during 2002, the first time since 1995. Indices indicate marking rates have decreased substantially, a distinct contrast to the recent period during 1996-2001 when wounding rates were consistently high.

During 1983-2002, the Service and Department annually have trapped spawning-phase sea lampreys in an average of 6 tributaries, and have estimated lake-wide abundance of spawning lampreys with multiple regression analysis of 6 interrelated variables (Fig. 3). Lampricide control began during 1986 and first showed effect in the spawner population during 1989. Estimated lake-wide abundance averaged 17,000 during 1980-1988, was reduced to an average of 4,000 during 1989-1994, and increased to over 8,000 during 1995-2001. Estimated spawning-phase abundance has declined during the past 2 years.

TRIBUTARY INFORMATION

- Lake Erie has 842 (317 United States, 525 Canada) tributaries.
- 21 (10 United States, 11 Canada) tributaries have historical records of production of sea lamprey larvae.
- 8 (5 United States, 3 Canada) tributaries have been treated with lampricide at least once during 1993-2002.
- Of these, 4 (2 United States, 2 Canada) tributaries are treated on a regular 3-5 year cycle.

LAMPRICIDE CONTROL

Lampricide treatments are systematically scheduled for tributaries harboring larval sea lampreys to eliminate or reduce the populations of larvae before they recruit to the lake as parasitic adults. Service and Department treatment units administer and monitor doses of the lampricide TFM, sometimes augmented with Bayluscide 70% Wettable Powder, to scheduled tributaries. Specialized equipment and techniques are employed to provide concentrations of lampricides that eliminate about 95% of the lamprey larvae and minimize the risk to nontarget organisms.

The following statements highlight the lampricide control program for Lake Erie during 2002. Table 1 provides details on the application of lampricides to tributaries treated during 2002 and Fig. 1 shows the locations of the tributaries.

- Treatment was successfully completed on 1 U.S. stream, Crooked Creek.
- Mortality of nontarget organisms was insignificant.

Table 1. Details on the application of lampricides to a tributary of Lake Erie, 2002.
(Number in parentheses corresponds to location of stream in Fig. 1.)

Stream	Date	Flow (m ³ /s)	TFM (kg) ¹	Bayluscide (kg) ¹	Distance Treated (km)
<u>United States</u>					
Crooked Cr. (1)	Oct 13	0.1	51.8	0	7.2
Total		0.1	51.8	0	7.2

¹Lampricide quantities are in kg of active ingredient.

TRIBUTARIES TRAPPED

- A. Big Cr.
- B. Youngs Cr.
- C. Cattaragus Cr. (Spooner Cr.)
- D. Grand R.

TRIBUTARY TREATED

- 1. Crooked Cr.

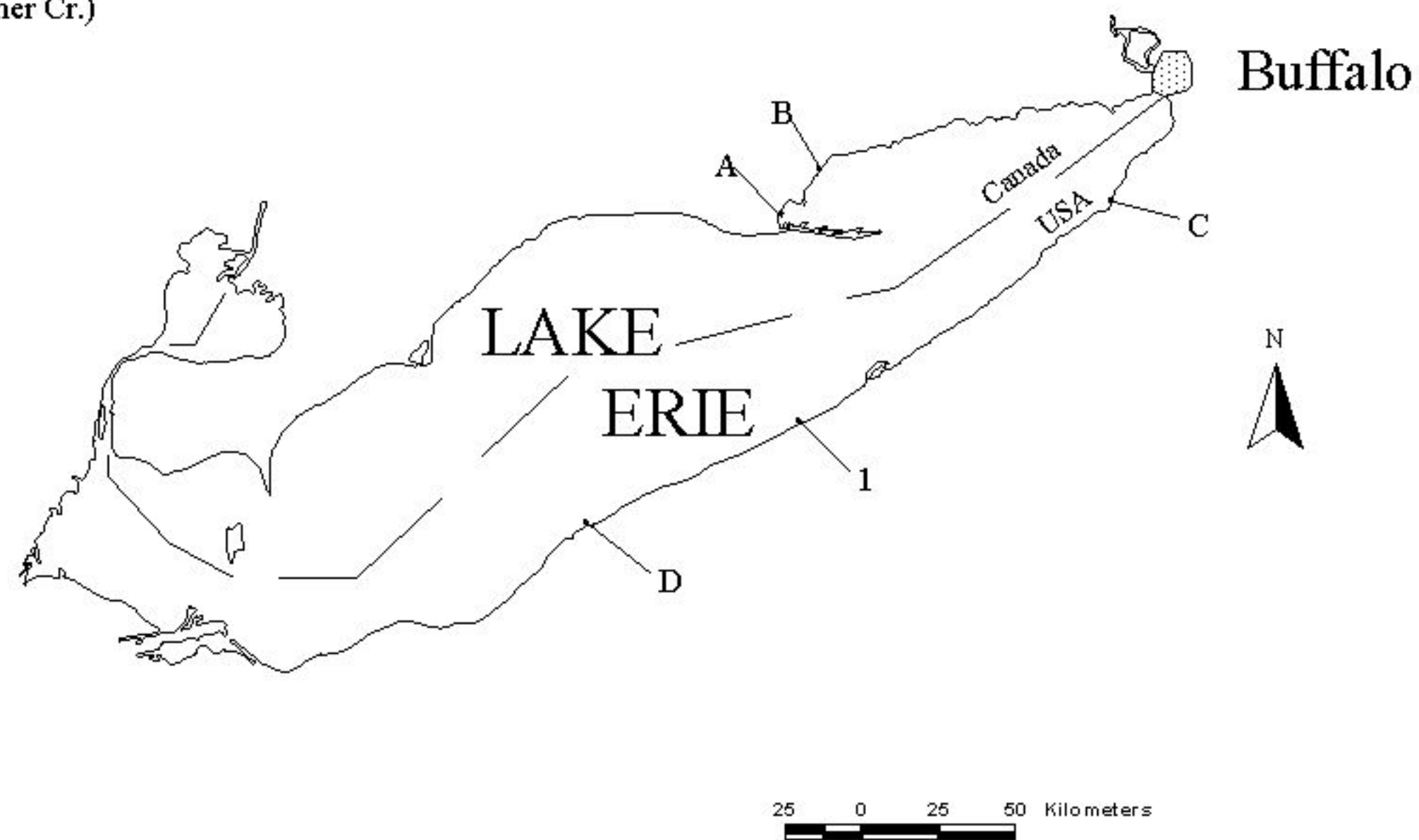


Fig. 1. Location of a Lake Erie tributary treated with lampricides (Numbers, Table 1) and tributaries where assessment traps were operated (Letters, Table 3) during 2002.

ALTERNATIVE CONTROL

Barriers

In its *Strategic Vision for the First Decade of the New Millennium*, the Commission committed to implementing an integrated control program relying on alternative control methods to achieve 50 percent of lamprey suppression. Barriers are currently the only proven alternative control method. Presently, there are 7 barriers on Lake Erie tributaries constructed solely to stop the migration of spawning-phase sea lampreys (Fig. 2).

The sea lamprey management program benefits substantially from a number of dams built and operated for other purposes. A Geographic Information System inventory of these “de-facto” barriers has been initiated. This will be a useful tool for identifying dams of value to sea lamprey management and for tracking a growing number of barrier mitigation proposals that have potentially serious consequences to the Great Lakes fishery. The inventory is complete or nearing completion for Ontario, Michigan, and Wisconsin.

- Youngs Creek - Deteriorated wooden stop logs were replaced with aluminum stop logs. The poor condition of the old stop logs may have allowed lamprey passage.
- Clear and Venison Creeks - Jump pools were reduced in size at the barriers to improve public safety.
- Conneaut Creek - The U.S. Army Corps of Engineers (ACE) Preliminary Restoration Plan for a proposed barrier is nearly complete. This project was submitted for further FY 2003 funding. Also, Conneaut Creek is a study stream in the evaluation of the Commission’s proposed barrier environmental criteria.
- Grand River (Ohio) - Ashtabula County Metroparks submitted a letter of request for ACE funding under the Water Resources Development Act Sec. 22 for an engineering study of Harpersfield Dam to evaluate structural integrity.
- Grand River (Ontario) – The plan to enhance the fishway at the Caledonia dam to allow passage of non-jumping fishes is on hold. The Department advised the Grand River Conservation Authority that proposed enhancements would allow passage of sea lampreys. Treatment of the Grand River upstream of the dam to eliminate resulting populations of lampreys would cost about \$1,000,000 every 4 years.

TRIBUTARIES WITH BARRIERS

1. Little Otter Cr.
2. Clear Cr.
3. Big Cr.
4. Venison Cr. (Big Cr.)
5. Forestville Cr.
6. Normandale Cr.
7. Youngs Cr.

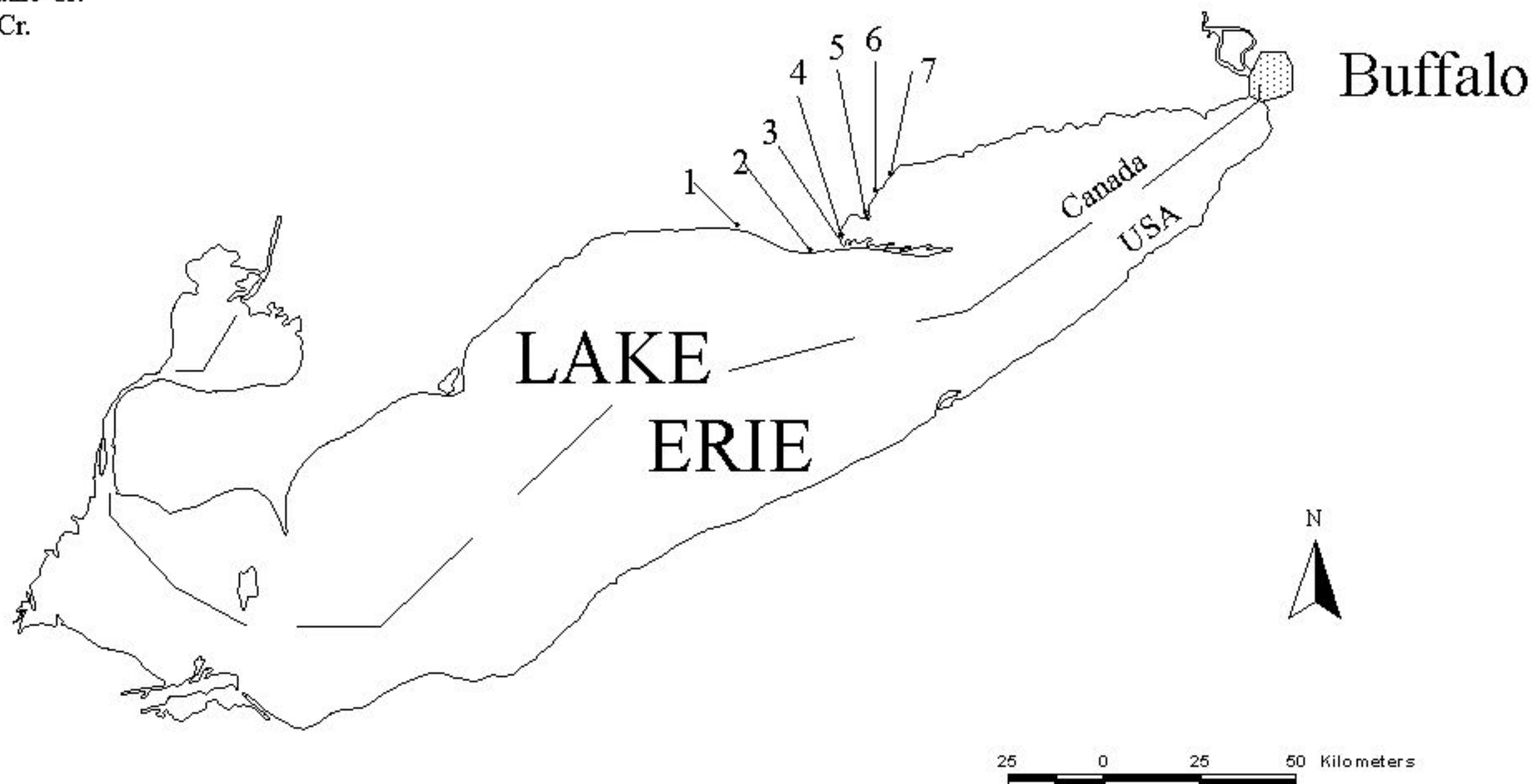


Fig. 2. Locations of Lake Erie tributaries with sea lamprey barriers.

ASSESSMENT

Larval

Tributaries to the Great Lakes are systematically assessed for abundance and distribution of sea lamprey larvae. Quantitative estimates of the number of metamorphosing sea lampreys that will leave individual tributaries the following year are used to prioritize streams for lampricide treatment. Qualitative sampling is used to define the distribution of sea lampreys within a stream and to establish the sites for lampricide application.

Tributaries considered for lampricide treatment during 2003 were assessed during 2002 to estimate larval density and amount of suitable larval habitat. Assessments were conducted with backpack electrofishers in waters <1m deep. Waters >1m in depth were surveyed with deepwater electrofishers or Bayluscide 3.2% Granular Sea Lamprey Larvicide. Survey plots were randomly selected in each tributary, catches of larvae were adjusted for gear efficiency, and lengths were standardized to the end of the growing season. Populations of larvae in each tributary were estimated by multiplying the mean density of larvae (number per m²) by an estimated area of suitable habitat (m²). The probable number of larvae that would metamorphose into parasitic sea lampreys during 2003 was developed from historical relations of the proportion of metamorphosed to larval sea lampreys collected during previous lampricide applications. After the data was processed, tributaries were ranked for treatment during 2003 based on an estimated cost per kill of metamorphosed sea lampreys.

- Assessments of larval populations were conducted in 16 tributaries (10 U.S., 6 Canada). The status of larval sea lamprey populations in tributaries treated during the last 10 years is presented in Table 2.
- Populations of larvae were estimated in 5 tributaries (4 U.S., 1 Canada; Table 2).
- A residual population was quantitatively assessed in Conneaut Creek, which was subsequently scheduled for treatment during 2003.

Table 2. Status of Lake Erie tributaries that have been treated for sea lamprey larvae during 1993-2002, and sea lamprey population estimates for tributaries surveyed during 2002.

Streams	Last Treated	Last Surveyed	Residuals Found	Oldest Reestablished Year Class	Estimate of 2002 Larval Population	2003 Metamorphosing Estimate	On 2003 Treatment Schedule
<u>United States</u>							
Buffalo R.	Never	2001	-	1999	-	-	No
Cattaraugus Cr.	May-01	2002	Yes	2001	328	0	No
Canadaway Cr. ¹	Oct-86	2002	-	1999	57	39	No
Crooked Cr. ²	Oct-02	2002	-	-	-	-	No
Raccoon Cr. ²	May-01	2000	-	-	-	-	No
Conneaut Cr.	May-00	2002	Yes	2000	17,291	4,376	Yes
Grand R.	May-99	2002	Yes	1999	6,526	2,581	Yes
<u>Canada</u>							
Silver Cr.	Never	2002	-	1998	-	-	No
Big Otter Cr.	May-01	2002	No	2001	-	-	No
Big Cr.	Jun-99	2002	No	1999	1,257	1,139	Yes
Young's Cr. ²	May-01	2001	No	None	-	-	No

¹Not treated during the past 10 years, but quantitative larval surveys were conducted during 2002.

²Not quantitatively assessed since last treatment.

Spawning-Phase

The long-term effectiveness of the control program has been measured by the annual estimation of the lake-wide abundance of spawning-phase sea lampreys. Traps and nets were used to capture migrating spawning-phase sea lampreys during the spring and early summer. Lake-wide abundance has been estimated since 1986 from a combination of mark-recapture estimates in streams with traps and model-predicted estimates in streams without traps.

- 314 sea lampreys were trapped in 4 tributaries during 2002 (Table 3, Fig. 1).
- The estimated population of spawning-phase sea lampreys for 2002 was 3,170 ($r^2 = 0.87$).
- No significant trend (Fig. 3) was detected from a linear regression of spawner abundance on year during post-treatment years, 1983-2002 ($p=0.063$). Estimates for the period were adjusted with a refined spawner discharge model and differ from those reported in previous years.

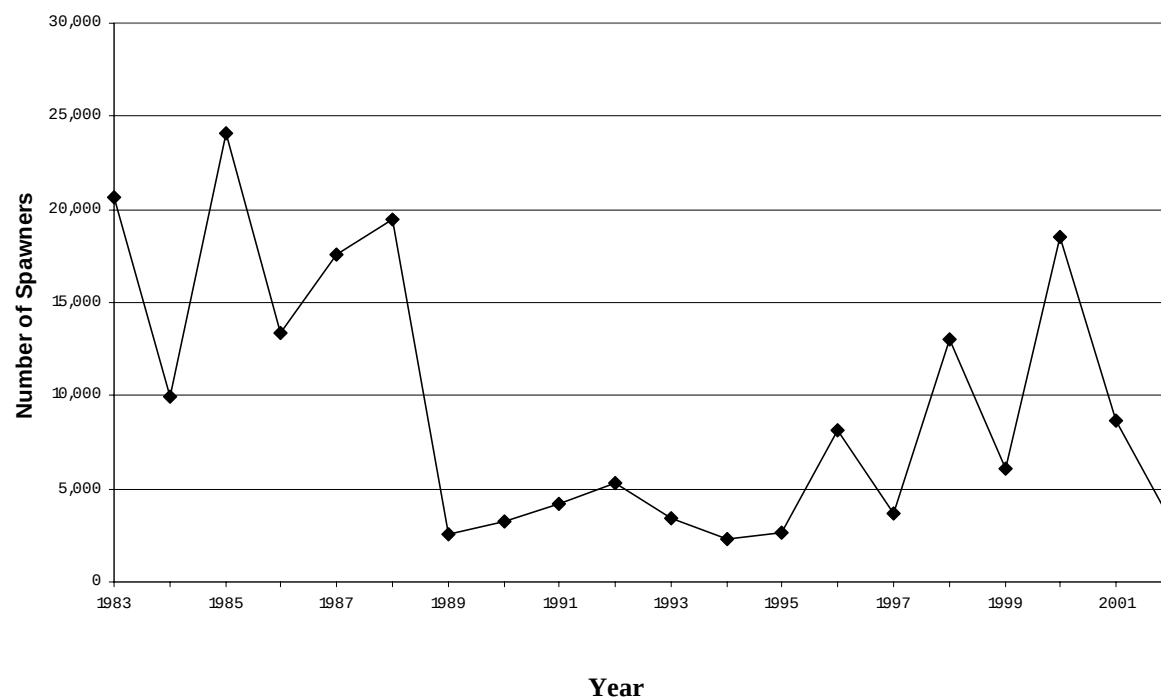


Fig. 3. Trendline of the linear regression of spawner abundance for Lake Erie, 1983-2002.

Table 3. Stream, number caught, spawner estimate, trap efficiency, number sampled, percent males, and biological characteristics of adult sea lampreys captured in assessment traps in tributaries of Lake Erie, 2002. (Letters in parentheses correspond to location of stream in Fig. 1.)

Stream	Number caught	Spawner estimate	Trap efficiency	Number sampled ¹	Percent males	<u>Mean Length (mm)</u>		<u>MeanWeight (g)</u>	
						Males	Females	Males	Females
<u>United States</u>									
Cattaraugus Cr. (C)	3	---	---	0	---	---	---	---	---
Spooner Cr. (C)	1	---	---	0	---	---	---	---	---
Grand R. (D)	118	547	22	13	---	513	509	283	302
Total or Mean (U.S.)	122			13	85	513	509	283	302
<u>Canada</u>									
Big Cr. (A)	187	378	49	0	---	---	---	---	---
Youngs Cr. (B)	5	---	---	0	---	---	---	---	---
Total or Mean (Canada)	192			0					
Total or Mean (for lake)	314			13	85	513	509	283	302

¹The number of sea lampreys from which all length and weight measurements were determined.