LAKE CHAMPLAIN FISH AND WILDLIFE MANAGEMENT COOPERATIVE

FISHERIES TECHNICAL COMMITTEE
ANNUAL REPORT
2007

Management of the fishery resources of Lake Champlain requires cooperation with several organizations. The activities of those organizations are coordinated via the Lake Champlain Fisheries Technical Committee which is part of the Lake Champlain Fish and Wildlife Management Cooperative. The Fisheries Technical Committee includes the US Fish and Wildlife Service (USFWS), the Vermont Department of Fish and Wildlife (VTDFW), the New York State Department of Environmental Conservation (NYSDEC), the University of Vermont, and the Vermont Cooperative Fish and Wildlife Research Unit. In addition, representatives from the Province of Quebec, Sea Grant, and other universities are frequently involved in Technical Committee activities.

In this annual report the activities discussed are not specific to a single agency; some aspects were conducted jointly with, or in some instances, independently by member agencies of the Technical Committee.

Management of sea lamprey in Lake Champlain

A. Objective:

- To achieve and maintain lamprey wounding rates at or below 25 (ideally 10) wounds per 100 lake trout, 15 (ideally 5) wounds per 100 landlocked Atlantic salmon, and two (ideally less than one) wounds per 100 walleye. These wounding rate objectives would be achieved within five years of full implementation of this study.

B. Summary of Activities:

Lampricide Control

- Lampricide treatments were successfully completed on three streams in New York (South Fork Ausable River, Boquet River, Beaver Brook) and one delta (Ausable River delta) during 2007. An additional river shared by Vermont and NY, the Poultney River, was also treated along with its Vermont tributary, the Hubbardton River. The South Fork of the Ausable River was treated in the spring because during the treatment of the Ausable River the previous fall, an effective concentration of TFM was not carried into the South Fork of the river (Table 1). A list of past and potential future treatments is presented in Appendix 1.

Table 1: Summary of lampricide applications in tributaries and deltas of Lake Champlain during 2007.

Stream or delta	Date treated	Flow (CFS)	TFM (lbs active ingredient)	Miles treated	Bayluscide (lbs active ingredient)	Acres treated
South Fork Ausable River	May 31	151	608.5	1.8	-	-
Ausable River delta	Sept 5	-	-	-	371.2	74
Beaver Brook	Sept 26-27	0.3	.2	2.0	-	-
Boquet River	Sept 19	70	1,141.8	2.6	-	-
Poultney River - Hubbardton River	Nov 8	182	1,601	10.6	-	-
	Nov 8	30	305	1.2	-	-
		Totals:	3,048	16.4	371.2	74

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Post-treatment larval assessment

- Post-treatment surveys to assess the TFM treatments were conducted on the South Fork Ausable, Boquet River and Beaver Brook. All surveys indicated the treatments were successful with larval population reductions of at least 95%.

- The Poultney River post-treatment assessment will be conducted in 2008 after river flows have dropped to suitable levels.

Trapping and Barriers

- Traps and pots were used to collect migratory-phase sea lamprey in eleven streams during the spring of 2007 (Table 2).

Table 2. Number of migratory-phase sea lamprey captured during 2007 in Lake Champlain tributaries where traps and pots were deployed and relative differential compared with 2006 catches.

Stream	Date Set	Date Pulled	# Lamprey Caught	% change from '06
Sunderland Brook	5/2/2007	6/12/2007	5	0%
Indian Brook	4/25/2007	6/12/2007	0	NA
Pond Brook	4/29/2007	6/18/2007	0	0%
Malletts Creek	4/24/2007	6/18/2007	237	65.73%
Trout Brook	4/20/2007	6/18/2007	37	-22.92%
Stone Bridge	4/20/2007	6/18/2007	128	85.51%
Great Chazy	5/2/2007	6/11/2007	383	80.66%
Beaver Brook	4/23/2007	6/14/2007	230	96.58%
Mullen Brook[a]	5/3/2007	6/14/2007	11	NA
Mill Brook[a]	4/27/2007	6/14/2007	11	NA
Boquet River	5/30/2007	6/14/2007	0	NA

[a] Pots were used to collect sea lamprey in Mill Brook and Mullen Brook

- On five of those streams trapping was implemented as the primary method of control. Trapping has been implemented as a control technique in small streams where trapping efficiency is thought to be high, and where suitable trapping sites exist downstream of spawning habitat.

- In the Great Chazy River, trapping is part of an integrated approach to controlling sea lamprey that includes lampricide treatments and a barrier with a trapping facility. However, the barrier has proven to be ineffective in preventing lamprey penetration above the dam. Engineering and/or repair work is needed to make the dam an effective barrier.

- A hardened trap was constructed on Beaver Brook, in Westport, NY to help facilitate trapping operations there. Beaver Brook is a small tributary which is difficult to treat with lampricides. If trapping there proves to be effective at controlling larval sea lamprey populations, it would eliminate the need for conducting lampricide treatments upstream of the trap.

- Removal of the Boquet River dam in Willsboro, NY is under consideration. Removal of the dam may allow access by spawning sea lamprey to a new, extensive reach of the river. Two traps were set in the Willsboro Fishway, a fish ladder installed to facilitate landlocked Atlantic salmon passage past the Willsboro Dam. No sea lamprey were captured in the fishway.

Sea Lamprey Control in the Pike River System

- In 2002 the U.S. Fish and Wildlife Service contacted the Quebec Ministry of the Environment to initiate the planning and permitting process for a barrier dam on Morpion Stream. In 2005 the U.S. Fish and Wildlife Service completed a final report that addressed hydrologic modeling, siting analysis, and four alternative weir designs with their associated cost estimates.

- A temporary delay in our ability to spend federal funds in Canada was finally resolved with the intervention of the Great Lakes Fishery Commission. Current plans are to fund the remainder of the project using prior Federal appropriations made to the Cooperative. This includes contracting a Quebec consultant to shepherd permits through the appropriate Canadian Federal and Provincial agencies and construction costs.

- It is hoped that construction can commence during the summer of 2008. Under this scenario, Morpion Stream will continue to produce parasitic phase sea lamprey through 2012, due to the sea lamprey life cycle.

Sea Lamprey Assessment - ammocoetes and transformers in tributaries

- QAS surveys were conducted on six tributaries during the summer of 2007. Three streams were surveyed in preparation for lampricide treatments scheduled for the fall of 2008. Population estimates derived from the surveys on these seven streams are listed in Table 3.

Table 3. Results of quantitative assessment surveys conducted for baseline data for 2008 lampricide treatments.

Stream	**Population Estimate-Ammocoetes**	**Population Estimate-Transformers**
Great Chazy River - Reach 1	26,775	0
Great Chazy River - Reach 2	24,028	0
Great Chazy River - Reach 3	357,325	0
Mt. Hope Brook[a]	15,894	0
Mill Brook	12,683	785
Otter Creek	0	0
Winooski River - Reach 1	174,462	0
Winooski River - Reach 2	1,532	0
Malletts Creek	1,237	618

[a] Mill Brook survey was not done according to standard sea lamprey assessment protocols due to the short reach of stream surveyed. Crews surveyed all accessible habitat in the stream and densities were expanded across larval habitat which was surveyed at six transects.

- Results indicate that all three streams will need to be treated with lampricides, and the Great Chazy sea lamprey barrier dam in Champlain has failed as an effective deterrent to passage by spawning sea lamprey necessitating the treatment be conducted upstream to the dam in Mooers.

- Mill Brook in NY was found to contain a significant sea lamprey population for the first time. This brook was not part of the original control program, so its addition will necessitate addressing both SEQR and NEPA requirements, as well as necessary permit modifications. The NEPA process was also initiated for Otter Creek, Pond Brook and the Lamoille River.

- The Missisquoi River in Vermont was found to contain a significant larval sea lamprey population during previous surveys. The Missisquoi is in the process of being added to the control program and will receive a lampricide treatment in fall 2008 pending the Vermont permitting process.

Sea Lamprey Assessment - ammocoetes in deltas

- Deepwater assessment is another critical piece of our larval sampling program. Larval populations are known to exist on the deltas of up to nine NY tributaries and possibly some in VT. Assessing the presence and abundance of these deepwater populations guides our decisions of where to control these deepwater populations in the face of a limited supply of Bayluscide.

- Larval sea lamprey populations were assessed on the Saranac and Boquet river deltas during the summer of 2007 in preparation for Bayluscide treatments scheduled for the fall of 2008 (Table 4). Based on these results, treatment of only the Saranac delta is recommended.

Table 4. Results of quantitative assessment sampling surveys conducted during the summer of 2007.

Delta	Larval population estimate
Saranac River	258,074
Boquet River	6,714

- A partial DQAS survey was conducted on Putnam Creek delta to determine if a population was present. No lamprey were collected on the Putnam Creek delta in 56 samples.

- Deep-water sampling on the Mill Brook delta in 2006 and 2007 indicate that a larval population exists but is limited to the north of the pier at the mouth of Mill Brook. Data do not indicate a large population, but one that may still justify treatment.

Detection sampling

- The USFWS annually investigates "negative streams" where sea lamprey populations are not known to exist, but where there may be suitable habitat. The lake basin is divided into quadrants which are rotated annually so that all streams are surveyed on a four year cycle. In 2007, presence absence surveys were conducted in the northern Vermont quadrant and several other streams of interest. Site visits were conducted on several tributaries of the Richelieu River in Quebec. No sea lamprey were collected during any negative stream surveys.

Alternative Control: Alternatives Workgroup

- An "alternatives workgroup" was formed to evaluate sea lamprey control methodologies that do not involve the use of lampricides. The workgroup consists of 30 members from 16 governmental and non-governmental organizations, and is chartered as a federal advisory committee under the Federal Advisory Committee Act. The workgroup provides recommendations to the Fisheries Technical Committee for funding of research projects related to alternative control techniques.

  - During 2007, three proposals were reviewed by the working group. These included a project to assess statolith stability as part of developing a tool to use statolith microchemistry to track tributary origins of parasitic sea lamprey, a project to estimate the abundance of spawning-phase sea lamprey in Lake Champlain, and a project that would use literature reviews to determine the historic causes of the present ecological imbalance of sea lamprey numbers in Lake Champlain and the potential importance of different ecological control mechanisms for reestablishing a dynamic balance, followed by field and/or laboratory investigations to reduce critical gaps in knowledge concerning potential ecological control mechanisms and/or the feasibility of their restoration. Recommendations by the workgroup on these potential projects were expected during 2008.

Forage Fish Assessment

- Rainbow smelt are the primary food for walleye and salmonids, and also comprise an important winter sport fishery in Lake Champlain. Predation on rainbow smelt is likely to increase as sea lamprey control yields increased survival of salmonids. Therefore a program was initiated in 1990 to monitor rainbow smelt stocks annually in several areas of the lake.

- Monitoring in 2007 indicated smelt catch rates were within 5-year averages.

- Large numbers of young-of-year alewife were documented for the first time.

Salmon and Trout Management

Salmonid Stocking Summary

- Salmonid stockings in Lake Champlain during 2007 included about: 160,000 landlocked Atlantic salmon (smolt equivalents); 47,000 steelhead (smolt equivalents); 85,000 lake trout; and 35,000 brown trout (Table 5). The list includes landlocked Atlantic salmon and steelhead that were stocked in the tributaries to the lake. Also listed in Table 3 are the stocking targets for each species. The stocking numbers are presented as ▪stocking equivalents.• Salmonids are stocked at widely varying sizes, from recently hatched fry that spend two years in the tributaries before emigrating to the lake, to smolts and yearlings that are ready to begin life in the lake at the time of stocking. The numbers stocked are adjusted to stocking equivalents to better represent the effective numbers stocked.

Table 5. Numbers (in stocking equivalents [a]) of salmonids stocked in Lake Champlain during 2007, and stocking targets for the lake.

Species	Main Lake		Malletts Bay/Inland Sea		Total number stocked in 2007
	Target	2007	Target	2007	
Landlocked salmon	207,000	159,855	60,000	21,900	181,755
Lake trout	82,000	85,365	0		85,365
Steelhead	73,000	46,906	12,000	4,410	51,316
Brown trout	38,000	34,839	40,000	29,997	64,836
Total	400,000	326,965	112,000	56,307	383,272

[a] Salmonids are stocked in a range of sizes which exhibit very different survival rates. The numbers stocked are converted to stocking equivalents based on expected survival rates.

Sea Lamprey Attack Rates on Salmonids

- Wounding rates on lake trout and salmon were above objectives during 2007, though there was a substantial drop in wounding rates on lake trout. (Table 4 and Figure 1).

Table 4. Wounding rates on Lake Champlain lake trout and salmon during 2007.

Species	Number of lamprey wounds per 100 fish			
	Objective	Pre-control	Eight-year control	Year 2007
Lake trout[a]	25	55	38	46
Landlocked salmon[b]	15	51	22	71

[a] Lake trout in the 533-633 mm (21.0-24.9 inches) length interval. For lake trout, pre-control included 1982 - 92, while eight-year control includes 1993 - 97.

[b] Salmon in the 432-533 mm (17.0-21.0 inches) length interval. For salmon, pre-control included 1985 - 92, while eight-year control includes 1993 - 98.

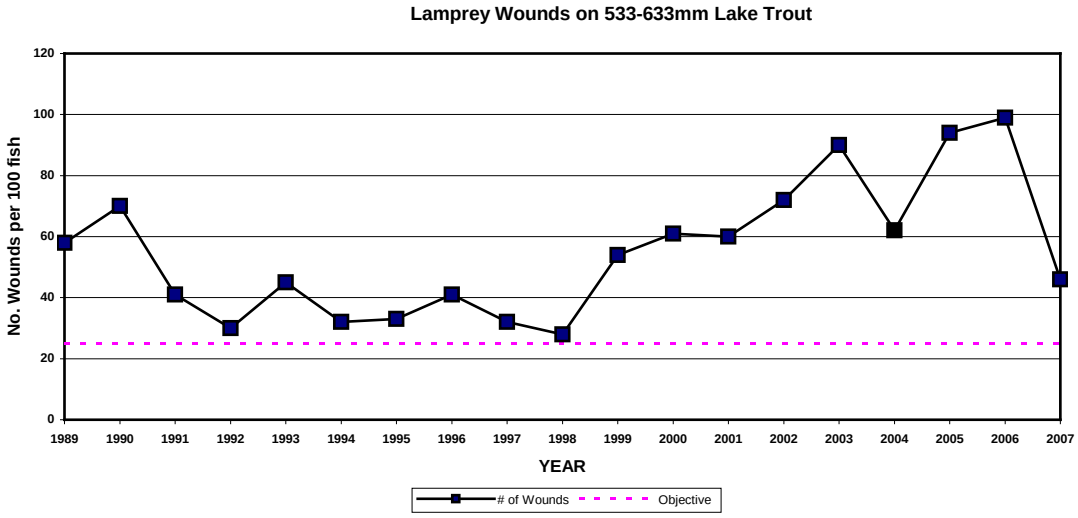

Figure 1. Sea lamprey wounds (fresh and healing) per 100 lake trout (533-633 millimeters total length) sampled in the main lake by fall electrofishing, 1989-2007. For reference, the target wounding rate of 25 wounds per 100 fish is also presented (dashed line).

Fish Passage

- Three adult salmon were collected in the Willsboro Fishway during 2007.

- A total of 2 steelhead and 35 salmon were captured at the Winooski One hydroelectric fish lift station in Winooski, Vermont.

Spring and Fall Salmonid Assessments

- Spring and fall boat electrofishing surveys for salmonids are conducted annually. This sampling allows for the collection of biological data including length, sex and age information as well as lamprey wounding data. The data are utilized in hatchery product/strain evaluations and to monitor sea lamprey control progress through time.

- Salmon catches continue to be dominated by small, young salmon, indicating sea lamprey predation is preventing the recruitment of salmon older than one lake-year.

- Sebago-strain salmon were more prevalent in both spring and fall sampling relative to the Memphremagog and Little Clear strains.

Lake Champlain Salmonid Angler Diary Program

- During the 2006 open-water fishing season, 43 cooperators recorded information from 601 fishing trips. (The 2006 data were analyzed during the period covered by this progress report. The 2007 data have not been analyzed yet.)

- Catch rates for legal-sized lake trout (≥15”) improved slightly, while catch rates for legal-sized landlocked salmon (≥ 15") improved more substantially in the Main Lake in 2006 (Figure 2).

- Cooperators reported only 63 lake-caught brown trout and nine steelhead, and no lake trips solely targeting either of these two species were made during 2006. Cooperators reported catching just 12 brown trout and 8 steelhead during fishing trips on tributaries.

- In contrast to lake fishing for landlocked salmon, tributary fishing worsened slightly in 2006 from 2005 (Figure 3). In 2006 it took 10 hours to catch a legal-sized landlocked salmon. Cooperators reported catching 43 landlocked salmon from tributaries.

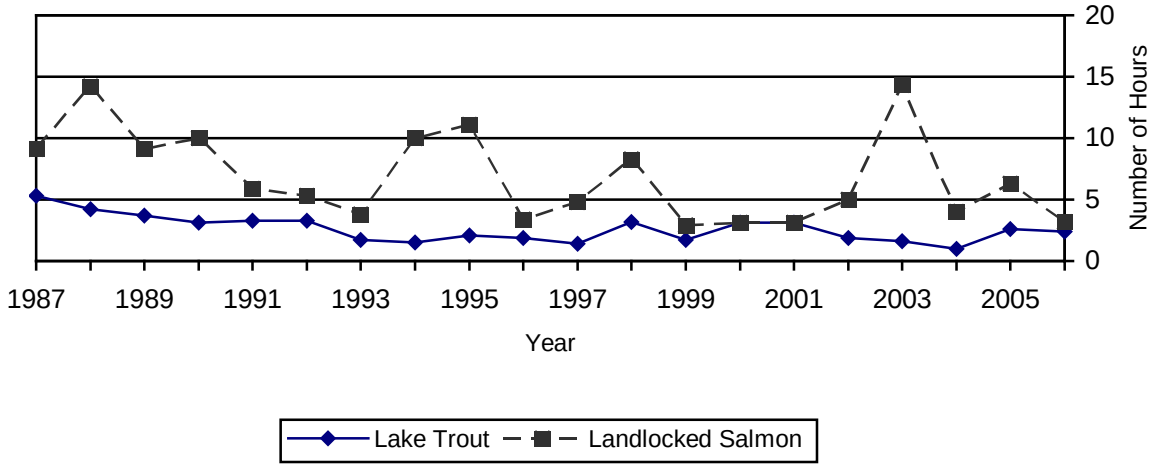

Figure 2. Main lake catch rates (hours of fishing per fish) for legal-sized lake trout and landlocked salmon, 1987 - 2006.

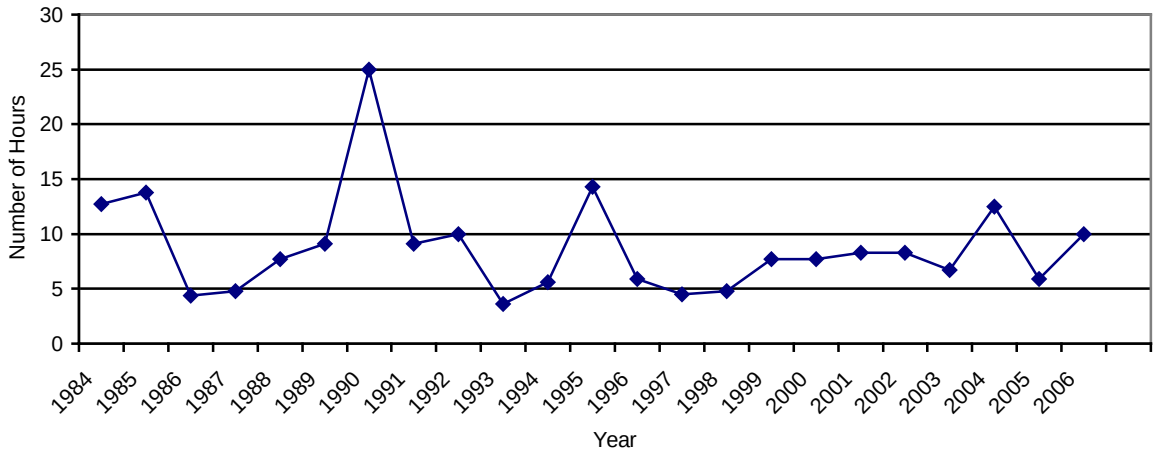

Figure 3. Tributary catch rates (hours of fishing per fish) for legal-sized landlocked salmon for the years 1984 through 2006. These include trips where salmon alone or in combination with another salmonid were listed as the angler's target.

Sturgeon Management

- Lake Champlain once supported a small commercial fishery for lake sturgeon that harvested from 50 to 200 fish annually in the late 1800's and early 1900's. Annual harvest declined rapidly in the late 1940's, and the fishery was closed in 1967. Lake sturgeon are currently listed as endangered by the states of NY and Vermont.

- Recent sampling efforts have been focused on historic spawning sites found in the Lamoille, Winooski, and Missisquoi rivers and Otter Creek. Sampling with gillnets for spawning lake sturgeon near historic spawning sites in the Lamoille and Winooski Rivers occurred from 1998 thru 2002. Gillnets were also set in the Missisquoi River in 2001 and 2003. Trotlines were also set for lake sturgeon in the Winooski and Lamoille rivers in 2002. Sampling for sturgeon eggs in spawning tributaries began in 2003 and continued thru 2007. Limited sampling for drifting sturgeon larvae in the Winooski and Lamoille rivers occurred in 2004 and 2005.

- Although recent surveys indicate that the numbers of adult sturgeon spawning in tributaries are low, sturgeon are still spawning successfully in 3 of the 4 tributaries used historically.

- Sampling for sturgeon eggs was conducted in the Winooski, Lamoille, and Missisquoi rivers during the spring of 2007. Ninety eight sturgeon eggs were collected in the Winooski. No sturgeon eggs were collected in the Lamoille or Missisquoi Rivers.

Walleye Management

- Walleye management activities on Lake Champlain included monitoring adult walleye during the spawning runs in the Missisquoi, Winooski, Lamoille, and Poultney rivers, collection of brood stock from the Missisquoi River for the fish culture and stocking program, evaluation of OTC marking, evaluation of the contribution of stocked walleye to spawning populations and continuation of the angler diary program.

- In 2007, 5.4 million eggs were collected from 35 pairs of walleye collected from the Missisquoi River resulting in 2.5 million fry and 172 thousand fingerlings being stocked into Lake Champlain. All fry were marked with OTC and all fingerlings received a second OTC mark before being stocked. The number of adults collected for the stocking program was reduced because all adults used for spawning are now killed for disease testing.

- Twenty nine walleye between 330 and 450 mm were collected from the Winooski River to determine if they had been marked with OTC. Otoliths from only 26 fish were usable. OTC marks recovered on the otoliths of these 3 year old walleye collected from the 2007 Winooski River spawning run indicate that 39% had been stocked. Eight walleye were stocked as fingerlings and two were stocked as fry in 2004.

- Sea lamprey wounding rates on walleye collected in 2007 were far above the objective of 2 wounds per hundred walleye.

Research and Information Needs

- Limited resources frequently constrain the acquisition of information needed to make management decisions. Additional resources and effort are needed to fully develop some of these monitoring and research efforts. Examples of additional, non-prioritized information and research needs include:

  - Establishment of a standardized bass monitoring program
  - Prey-independent estimates of sea lamprey parasite abundance
  - Status and population trajectory of lake whitefish and burbot and factors affecting population stability
  - Estimates of juvenile (age 1-3) lake trout post-stocking survival.
  - Out-migration success of landlocked Atlantic salmon smolts over existing barriers
  - Adult salmon movement above fish passage facilities
  - Factors that affect adult salmon abundance and spawning success
  - Harvest, catch, and effort estimates for popular sport fisheries, including bass, salmonids, walleye, esocids, smelt, and yellow perch
  - Population estimates for significant sport fish species
  - Lake sturgeon distribution, abundance, age structure, and spawning success
  - Angler and stakeholder attitude surveys
  - Estimates of the abundance, age, growth, and condition factors of spawning walleye stocks, lamprey wounding rates, and contribution of stocked walleye to spawning populations
  - Identification of major impediments to aquatic connectivity
  - Potential impacts of pathogens and other non-native species that are likely to enter the Lake Champlain basis
  - Data on fish species that can serve as indicators for the tributary fish community and the near-shore fish community.
  - Assessments of northern pike and other esocids, including species distributions and prevalence of diseases such as *Esox lymphosarcoma*
  - Expanded community monitoring to include more areas south of Burlington also look at additional sampling methods.
  - the fate of post-emergent lake trout fry and factors that affect recruitment to age-2
  - impacts of angling tournament on fishes
  - impacts of alewife on viability of cultured salmonid fry from feral brood stock; prevalence of early mortality syndrome
  - impacts of alewife on rainbow smelt
  - transformation rates of larval sea lamprey among rivers, streams, and deltas
  - identifying major sources of parasitic lamprey by linking parasites to their natal streams

Appendix 1: Schedule of completed Lake Champlain lamprey treatments through 2007, and projected treatments for 2008 and beyond.

1990: Salmon River
Little Ausable River
Ausable River (and Dry Mill Brook)
Boquet River
Beaver Brook
Putnam Creek
Lewis Creek

1991: Mount Hope Brook (and Greenland Br.)
Stone Bridge Brook
Ausable Delta
Saranac Delta
Little Ausable Delta
Salmon Delta
Boquet Delta

1992: Great Chazy River
Saranac River
Poultney River (and Hubbardton River)

1993: no treatments

1994: Salmon River
Little Ausable River
Ausable River (and Dry Mill Br.)
Boquet River
Putnam Creek
Lewis Creek

1995: Mount Hope Brook (and Greenland Br.)
Trout Brook
Ausable delta
Salmon delta
Boquet delta
Saranac delta

1996: Great Chazy River
Poultney River (and Hubbardton River)

1997: no treatments

1998: Little Ausable River
Salmon River
Putnam Creek
Beaver Brook

1999: Mount Hope Brook (and Greenland Br.)
Boquet River
Ausable River (and Dry Mill Brook)

2000: Great Chazy

2001: no treatments

2002: Little Ausable River
Ausable River (and Dry Mill Brook)
Salmon River
Putnam Creek
Beaver Brook - postponed
Lewis Creek

2003: Mount Hope Brook – postponed
Beaver Brook
Boquet River
Ausable delta
Salmon delta - no treatment required
Little Ausable delta - no treatment required
Winooski River - postponed

2004: Great Chazy River
Saranac delta
Boquet delta – no treatment required
Mount Hope Brook
Winooski River

2005: no treatments

2006: Little Ausable River
Ausable River (and Dry Mill Brook)
Salmon River
Putnam Creek
Lewis Creek

2007: Beaver Brook
Boquet River
Ausable delta
Little Ausable delta – no treatment required
Salmon delta – no treatment required
Poultney River (and Hubbardton River)

2008: Great Chazy River
Mount Hope Brook
Saranac delta
Boquet delta
Winooski River
Missisquoi River

2009: no treatments

2010 and beyond: Repeat the cycle listed above for 2006 through 2009. Other rivers such as the Pike, Missisquoi and Lamoille may be added as appropriate.

Committee members of the Lake Champlain Fish and Wildlife Management Cooperative Fisheries Technical Committee:

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