LAKE CHAMPLAIN FISH AND WILDLIFE MANAGEMENT COOPERATIVE

FISHERIES TECHNICAL COMMITTEE
ANNUAL REPORT
2013

Executive Summary

Salmonid restoration efforts continued to be the primary focus of the Lake Champlain Fisheries Technical Committee. The number of salmonids stocked was about 10,000 less than requested. The shortfall was due to the reduced numbers of steelhead and brown trout available. Sea lamprey wounding rates on salmon remain lower than the average rates observed during the 1990's experimental sea lamprey control program, but lake trout wounding rates increased and have approached pre-control levels. The wounding rates for walleye collected from the Missisquoi River were below the Cooperative's lamprey wounding objective for walleye of 2 wounds per 100 walleye. The number of salmon captured at the Winooski fishway rebounded from the low numbers captured in 2012 while returns to the Boquet fishway remained low in 2013.

Lampricide treatments were successfully completed on Putnam Creek, Stone Bridge Brook, and the Saranac and Lamoille rivers. The Morpion Stream removable screen barrier in Quebec was completed in 2013 and will be used to trap adult sea lamprey during the spring spawning run in 2014.

Members of the Fisheries Technical Committee continued working on a wide variety of projects including development of an intensive culture system for rearing walleye fingerlings, monitoring sea lamprey, forage fish, bass, walleye, and yellow perch populations. Research efforts included investigating the status of stonecat populations in Vermont, experimentation with fish rearing practices and stocking strategies to enhance salmon survival and adult returns to spawning tributaries, movements of black bass after tournament weigh-ins, and investigation of the timing of sea lamprey mortality when exposed to TFM.

Introduction

Management of the fishery resources of Lake Champlain is coordinated by the Lake Champlain Fisheries Technical Committee, which is a workgroup of the Lake Champlain Fish and Wildlife Management Cooperative. Members and advisors of the Fisheries Technical Committee includes staff from the Vermont Department of Fish and Wildlife (VTDFW), New York State Department of Environmental Conservation (NYSDEC), US Fish and Wildlife Service (USFWS), University of Vermont (UVM), Vermont Cooperative Fish and Wildlife Research Unit (VCFWRU), Quebec Ministry of Natural Resources, Lake Champlain Sea Grant, and other universities.

This report briefly summarizes fisheries management and research activities carried out on Lake Champlain during 2013. The names of Project Leaders are listed after section headings and their affiliation can be found on the Fisheries Technical Committee Membership list at the end of this

document. More details on specific projects can be obtained by contacting project leaders.

SALMONIDS

Stocking Summary (Chipman)

Salmonid stockings in Lake Champlain during 2013 included about: 296,000 landlocked Atlantic salmon (smolt equivalents); 57,000 steelhead (smolt equivalents); 85,000 lake trout; and 65,000 brown trout (Table 1). The list includes landlocked Atlantic salmon and steelhead that were stocked in the tributaries to the lake. Also listed in Table 1 are the stocking targets for each species. Stocking numbers are presented as "stocking equivalents." Salmonids are stocked at 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 (smolt/yearling) equivalents to better represent the effective numbers stocked. The number of landlocked Atlantic salmon stocked in 2013 was increased to balance the decreased number of steelhead available.

Table 1. Numbers (in stocking equivalents) of salmonids stocked in Lake Champlain during 2013, and stocking targets for the lake.

	Main Lake		Malletts Bay/Inland Sea		Total number stocked in 2013
Species	Target	2013	Target	2013	
Landlocked salmon	227,000	220,143	77,000	75699	295,842
Lake trout	82,000	84,534	0	0	84,534
Steelhead	53,000	51,836	5,000	5,094	56,930
Brown trout	38,000	32,941	40,000	32,206	65,147
Total	400,000	389,454	112,000	112,999	502,453

Fish Passage (Staats, Smith)

Fifteen adult landlocked Atlantic salmon were trapped at the Willsboro fish ladder on the Boquet River in September and October of 2013.

A total of 115 adult landlocked salmon and 12 steelhead rainbow trout were trapped at the Winooski One fish passage facility in the fall 2013 while 44 steelhead were processed in the spring (Figure 1). All lifted fish were tagged and released downstream of the dam. The threat of viral hemorrhagic septicemia has curtailed the movement of fish upstream of the Winooski One Dam at this time.

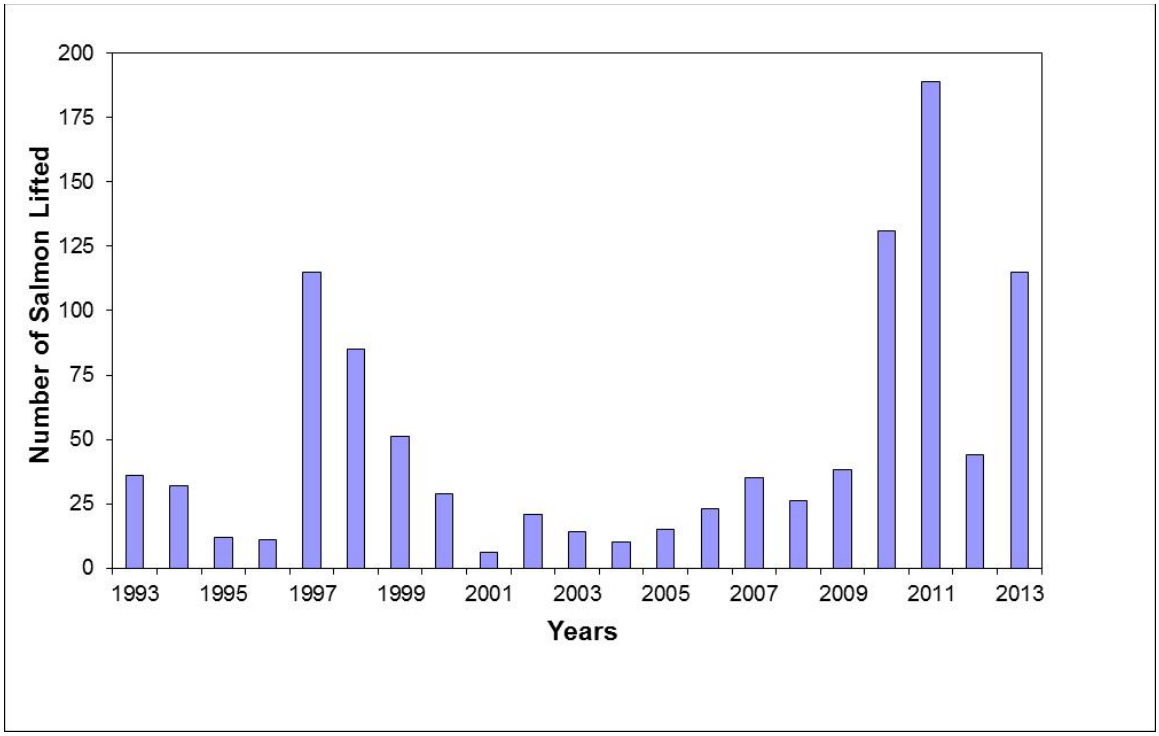


Figure 1. Summary of landlocked Atlantic salmon lifted at the Winooski River fish lift, 1993 – 2013.

Spring and Fall Nearshore and Tributary Assessments **(Chipman, Smith)**

Spring and fall boat electrofishing surveys for salmonids are conducted annually. This sampling allows for the collection of biological data including total length (TL), 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.

Springtime electrofishing was not conducted in 2013.

Fall nearshore salmonid sampling was focused on traditional sites in Willsboro and Whallon bays, and at the Grand Isle Ferry Breakwater. Catches in the Whallon Bay and Willsboro Bay areas consisted of 182 lake trout, 42 salmon, 10 steelhead, and 7 brown trout, while 342 lake trout were collected at the Grand Isle site. Whallon and Willsboro bay salmon catches were down drastically from recent years even with an increase in effort. All 2013 sampling occurred later in November than usual due to delays caused by unfavorable weather conditions, and water temperatures were lower than in previous years. Salmon in the 450-460mm length group made up the largest proportion of the nearshore sample (Figure 2).

Fifteen days of dip netting and electrofishing sampling in Hatchery Brook (Ed Weed Fish Culture Station discharge stream) yielded a catch of 411 returning salmon, 21 brown trout, and 11 steelhead. Salmon in the 500-520mm length group made up the largest proportion of the Hatchery Brook sample, and like the 2012 sample, larger salmon (> 640mm TL) continued to be more prevalent than in previous years (Figure 3).

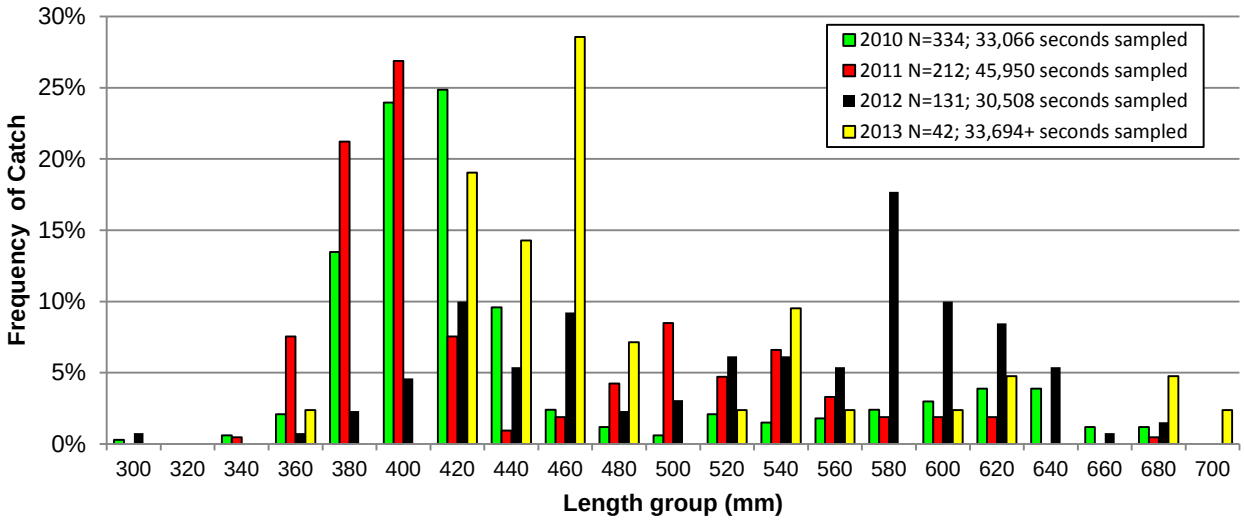


Figure 2. Length frequency distributions of landlocked Atlantic salmon collected from Willsboro and Whallon bays by electrofishing, 2010-2013.

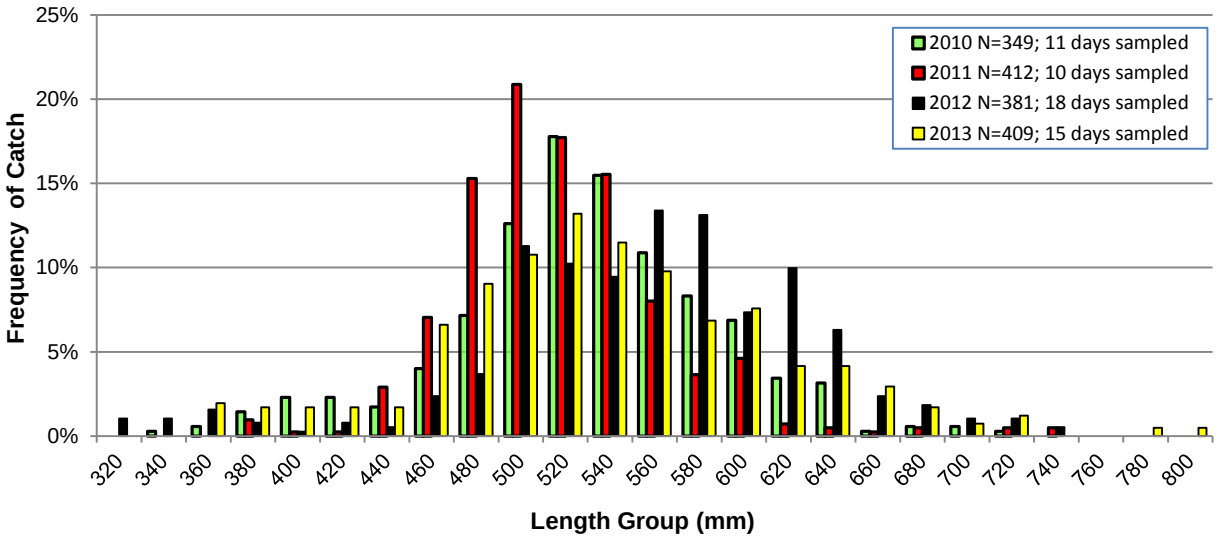


Figure 3. Length frequency distributions of landlocked Atlantic salmon collected from fall spawning runs in Hatchery Brook, 2009-2012.

A total of 134 salmon were collected in 14 days of sampling in the Lamoille River, which is the largest number of salmon collected there since 1998. Limited sampling was conducted in two other Vermont rivers. Two salmon were collected in four trips to Otter Creek, and no salmon were observed during four trips to the Missisquoi River. No salmonids were observed or collected in two trips to the Sandbar Causeway Bridge. Low lake levels prevented electrofishing boat access to the Sandbar Causeway Bridge for most of the season.

Adult Sebago-strain salmon were retained for use as broodstock at Ed Weed FCS, including 206 from Hatchery Brook and two more from the Lamoille River.

The fourth year of experimental trap netting was conducted at Hatchery Cove in Grand Isle to evaluate an alternative lake trout sampling technique. One trap net was deployed from the shore over 10 nights in November, to cover the major portion of the lake trout spawning period. The net was tended daily, and captured 1,406 lake trout and 133 salmon. The lake trout spawning stocks at these locations continue to be healthy and abundant.

A workgroup of the Fisheries Technical Committee continued work on development of a plan to assess salmonid stocking rates. Fall salmonid sampling data will be used to calculate important indicators of fish condition and abundance.

Pre-stocking Landlocked Salmon Assessments (Ardren)

In the spring of 2013, landlocked salmon yearlings from Eisenhower National Fish Hatchery, Ed Weed Fish Culture Station, and Adirondack Fish Hatchery were assessed as part of a long-term monitoring database needed for managers to better understand the percentage of stocked fish that are viable smolts. Many hatchery programs that rear one year old smolts have developed a size threshold for classifying a stocked fish as a smolt. Fish that do not reach this size threshold are expected to remain as parr and will not undergo the parr-smolt transformation that year. Biologists working with anadromous Connecticut River salmon have established a smolt threshold of greater than or equal to 150 mm total length. Our first year of data collection in 2011 revealed almost all yearlings released from Ed Weed and Eisenhower hatcheries exceeded the 150 mm size threshold. However, over 75% of yearlings reared at Adirondack hatchery in 2011 did not exceed 150 mm, indicating they were stocked as parr not smolts. The small size distribution was likely cause by the use of substandard fish feed with poor nutrient content. We saw a similar pattern in fish size for all three hatcheries in 2012. In 2013, we continued to see Ed Weed and Eisenhower hatcheries stocking smolts sized yearlings with 99% of fish over the smolt size threshold; Figure 4). Size of fish released from Adirondack Hatchery increased in 2013 with 83% of fish stocked over the 150 mm size threshold (Figure 4).

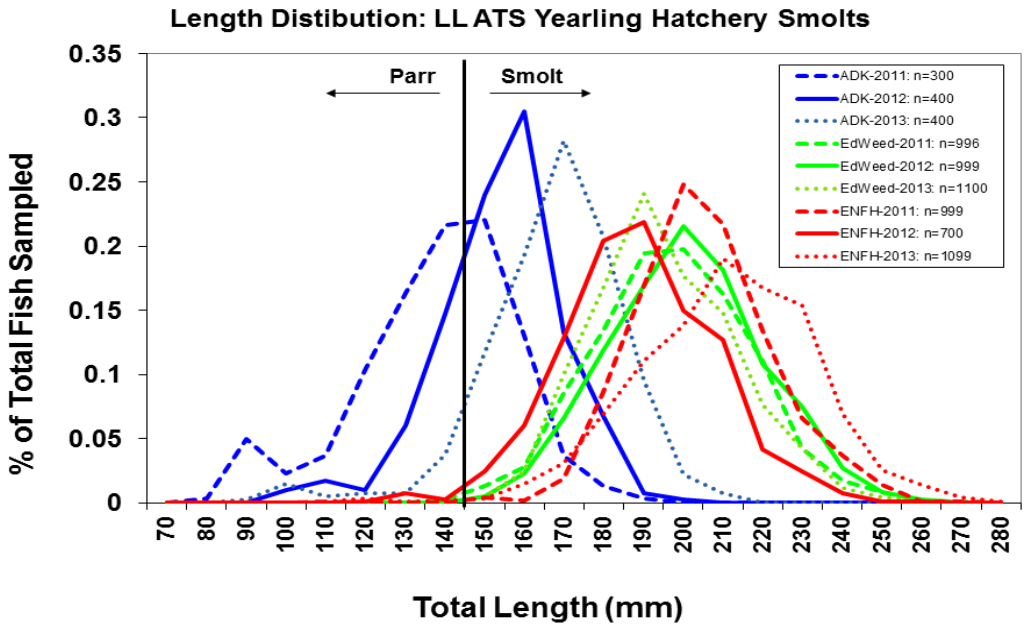


Figure 4. Total length distribution of hatchery-reared yearling landlocked Atlantic salmon stocked into the Lake Champlain Basin from three hatcheries in 2011, 2012, and 2013.

To more accurately differentiate between parr and smolts, we are also collecting data on length, weight, silvering, darkening of fin margins, abdomen hardening, changes in body shape, fin condition, and physiology. Having more accurate estimates of the percentage of stocked fish that are viable smolts will be useful for setting stocking rates and evaluating adult return rates to the fishery and rivers. A better understanding of the timing for parr-smolt transformation at each hatchery will also help establish optimal release times for stocking.

SEA LAMPREY

The objective of the sea lamprey control program is to achieve and maintain wounding rates at or below 25 wounds per 100 lake trout, 15 wounds per 100 landlocked Atlantic salmon (salmon), and 2 wounds per 100 walleye.

Pre-treatment Quantitative Assessment Sampling (QAS) (Allaire)

Pre-treatment QAS surveys were conducted in five Lake Champlain tributaries (Ausable River, Little Ausable River, Salmon River, Boquet River, and Lewis Creek) in preparation for scheduled lampricide treatments in the fall of 2014, and in the Lamoille River scheduled for treatment in the fall of 2013 (Table 2).

Table 2. Larval population estimates for pre-treatment QAS surveys conducted in 2013.

Stream	Sea Lamprey Larval Population Estimate	Type I Larval Density (m^2)	Type II Larval Density (m^2)
Ausable River	870,823	3.622 / m^2	1.040 / m^2
Little Ausable River	166,858	3.115 / m^2	.967 / m^2
Salmon River	214,691	3.899 / m^2	1.478 / m^2
Boquet River	22,495	0.012 / m^2	0.098 / m^2
Lewis Creek-Reach 1	162,112	0.897 / m^2	1.067 / m^2
Lewis Creek-Reach 2	7,977	0.476 / m^2	0.069 / m^2
Lamoille River	23,145	0.011 / m^2	0.011 / m^2

Post-treatment Quantitative Assessment Sampling (QAS) (Allaire)

Post-treatment QAS surveys were conducted in five Lake Champlain tributaries (Great Chazy River, Mill Brook, Mount Hope Brook, Winooski River, and Missisquoi River) in 2013 to evaluate the effectiveness of lampricide treatments conducted in 2012 (Table 3). Unexpected water chemistry challenges during the Winooski River treatment limited effectiveness.

Table 3. Pre-treatment and post-treatment QAS survey results for streams treated with lampricides during the fall of 2012.

Stream	Pre-treatment (2011) population estimate	Post-treatment (2013) population estimate	Percent reduction in sea lamprey larvae
Great Chazy River	42,955	2,978	93.1%
Mill Brook	938	97	89.7%
Mount Hope Brook	34,812	10,276	70.5%
Winooski River	79,462	128,497	-161.7%
Missisquoi River	408,283	0	100%

Detection Sampling (Allaire)

In 2013, staff visited 47 tributaries in the southwestern quadrant of Lake Champlain that were considered "negative" for the presence of sea lamprey. From these site visits 17 tributaries were determined to warrant further investigating through the use of electrofishing gear.

One larval sea lamprey was collected in Mackenzie Brook in Port Henry, NY. A total of 33 larval silver lamprey, plus many young-of-year (YOY) were collected on the La Chute River in Ticonderoga, New York, but no larval sea lamprey were collected.

Another area that has been considered "negative" for the presence of larval sea lamprey is the Missisquoi River between Swanton Dam and Highgate Dam. During the summer of 2013 staff investigated this stretch of the Missisquoi River, including Hungerford Brook and Kelly Brook and found American Brook Lamprey, but no sea lamprey.

Sea lamprey larvae were also found in a large backwater area just south of the mouth to the Ausable River.

Delta Assessment (Allaire)

Since 2011, deepwater surveys have been conducted during the same year as scheduled lampricide treatments to shorten the time between assessment data and treatments. This theoretically increases treatment effectiveness by limiting the amount of redistribution between surveys and treatments. With no delta treatments scheduled for 2013 the only delta assessment work that was done in 2013 was a very limited detection survey at the mouth of the La Chute River, which found no larval lamprey.

Lampricide Control (Smith)

Lampricide treatments were completed on four tributaries in 2013, the Saranac River and Putnam Creek in New York, and Stone Bridge Brook and the Lamoille River in Vermont (Table 4). Control status of Lake Champlain tributaries is presented in Appendix 2. A treatment history and schedule of future treatments is presented in Appendix 3.

Table 4. Summary of 2013 lampricide applications in tributaries to Lake Champlain.

Stream or delta	Date treated	Flow (CFS)	TFM (lbs. active ingredient)	Miles treated	Niclosamide (lbs. active ingredient)
Saranac River	Sept 18	629	2,271	2.5	38
Putnam Creek*	Sept 24	3.7	274	9.2	-
Stone Bridge Brook	Oct 23	3.5	44.6	3.6	-
Lamoille River	Oct 30	1,100	4,043	6.0	-
		Totals:	**6,632.6**	**21.3**	**38**

*Includes Brevoort and Cold Spring Brooks

Trapping and Barriers **(Allaire, Young)**

Adult sea lamprey were trapped in 9 streams during the spring of 2013 to prevent or limit reproductive success (Table 5). A permanent trap associated with the Frog Pond Dam on the Great Chazy River has been operated since 1995 and is part of an integrated control approach.

Baited pots were deployed above trap sites on Stone Bridge Brook, Malletts Creek, and Trout Brook to capture sea lamprey which had escaped above the trap. No lamprey were captured in the pots in Stone Bridge Brook, or Trout Brook, while 4 adult sea lamprey (2.5% of catch) were captured in pots in Malletts Creek. We will continue to use pots in areas where we are unable to deploy traps as well as above traps to gauge the amount of escapement past trap sites.

Over all we had a very good trapping season. During the peak of the spawning run we had low flows and on a number of days some traps were effectively blocking upstream passage, but water levels were below the entrance of the trap preventing the adults from entering. Many of the days where traps were not operating properly were at the very beginning or end of the trapping season.

Table 5. Results of adult sea lamprey trapping in 2013

Stream	Date Trap Set	Date Trap Removed	% of Days Trap Operational	Number of Lamprey Captured **(2012)**	Number of Lamprey Captured **(2013)**	% Change From 2012
Beaver Brook	4/9	6/11	95%	40	33	-18%
Trout Brook	4/10	6/11	81%	44	37	-16%
Stonebridge Brook	4/8	6/11	89%	73	98	-26%
Malletts Creek	4/11	6/11	57%	160	161	1%
Great Chazy River	5/14	6/5	100%	321	146	-55%
Pond Brook	4/16	6/13	77%	6	20	+233%
Rea Brook	4/10	6/5	86%	9	14	+56%
Sunderland Brook	4/16	6/13	71%	27	18	-33%
Mullen Brook	4/9	6/11	82%	18	28	+56%
			TOTAL	**723**	**530**	-27%

* Note that the trap on the Great Chazy was operational the entire time it was installed, but we know that lamprey are passing under the dam and gaining access to upstream spawning habitat. We are looking into doing some additional trapping at this location in 2014.

The Morpion Stream removable screen barrier in Quebec was completed in 2013. It was tested in November and stored on site. It will be installed in the spring of 2014 when it will begin controlling sea lamprey in that tributary for the first time. Larval surveys will be completed in 2014 as baseline data. Four years later, another survey will be done to assess the effectiveness of the barrier.

Wounding Rates (Chipman, Smith)

Sea lamprey wounding rates calculated for lake trout increased in 2013, to 54 wounds per 100 fish (Figure 5). Wounding on Main Lake salmon in 2013 declined slightly to 15 wounds per 100 fish matching the program objective; however wounding on Inland Sea and Malletts Bay salmon increased, to 33 wounds per 100 fish (Figure 6). The salmon wounding rates remain lower than the average rates observed during the 1990's experimental sea lamprey control program, but lake trout wounding rates have approached pre-control levels (Table 6)

The sea lamprey wounding rate for walleye (TL 534 to 634 mm) collected in spring 2013 from the Missisquoi River was 1.5 wounds per 100 fish, which is below the Cooperative's lamprey wounding rate objective for walleye of 2 wounds per 100 walleye.

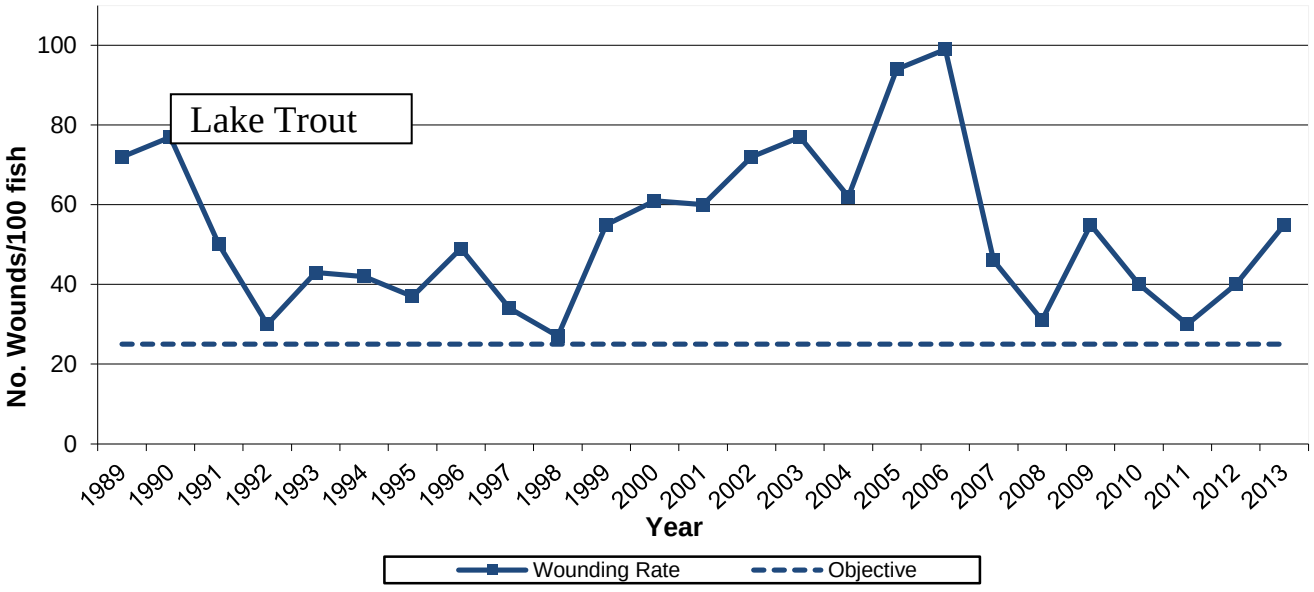


Figure 5. Type A1-A3 sea lamprey wounds (fresh and healing) per 100 lake trout (533-633 mm total length) from fall sampling in the Main Lake basin, 1989-2013. For reference, the target wounding rate of 25 wounds per 100 fish is also presented (dashed line).

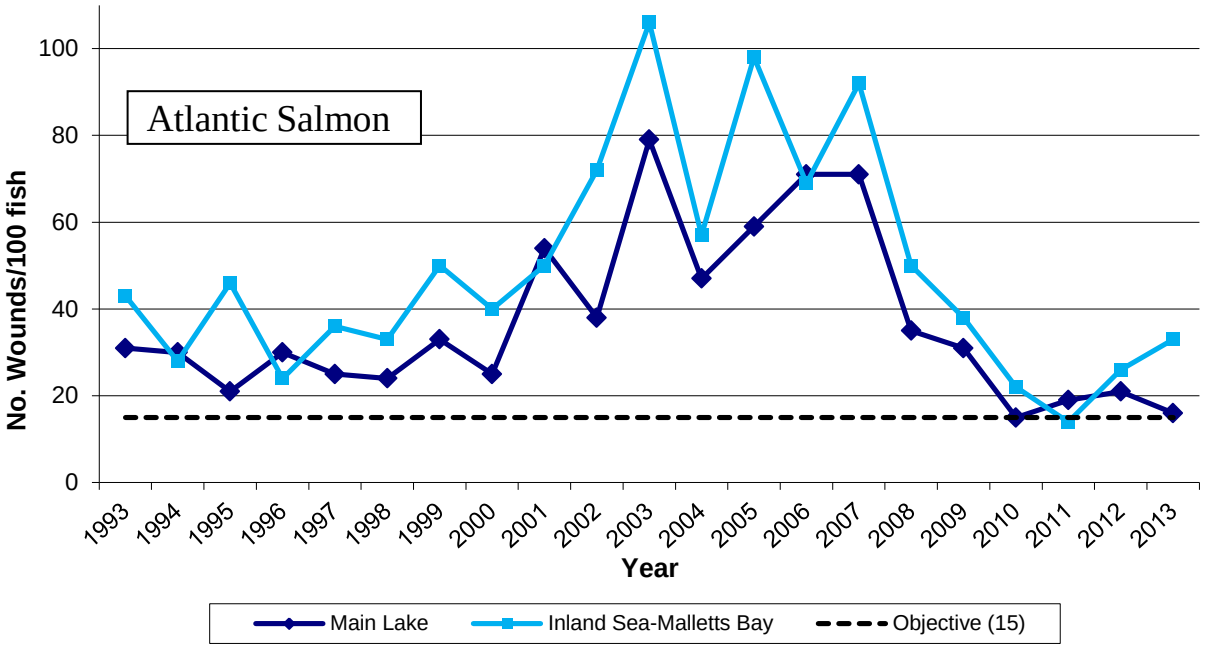


Figure 6. Type A1-A3 sea lamprey wounds (fresh and healing) per 100 salmon (432-533 mm total length) from fall sampling in the Main Lake and Inland Sea-Malletts Bay basins, 1993-2013. For reference, the target wounding rate of 15 wounds per 100 fish is also presented (dashed line).

Table 6. Sea lamprey wounding rates on Lake Champlain lake trout and salmon during 2013, compared with pre-control and eight-year experimental control program results.

	Number of type A1-A3 lamprey wounds per 100 fish			
	Objective	Pre-control	Experimental control	2013
Lake trout[a] (Main Lake)	25	55	38	54
Salmon[b] (Main Lake)	15	51	27	15
Salmon[b] (Malletts Bay-Inland Sea)	15	37	40	33

[a] Lake trout in the 533-633 mm (21.0-24.9 inches) length interval. For lake trout, pre-control included 1982 - 92, while experimental 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 experimental control includes 1993 - 98.

FORAGE FISH

Smelt (Staats)

Twenty midwater trawls for rainbow smelt were conducted in late summer, 2013 (Table 6). Mean catch per 55 minute trawl (CPUE) declined at all stations with record lows recorded at Malletts Bay, the Northeast Arm, Barber Point, and nearly so at the Valcour Island station

(Figure 4). Preliminary analysis suggest the main lake stations were dominated by only a single age class (age 2) and mean length of this year class (106 mm) was about 18% smaller than the long term average.

The decline of smelt abundance and changes in the age structure in the three Lake Champlain basins is likely the result of the establishment of alewife in the lake (see below). Alewives are known to compete with other planktivores for food resources and feed on the eggs and larvae of native fish species including young smelt. Thus the abundance of forage relied upon by the lake's major predators haven't necessarily declined; it is now dominated by alewife.

Alewives (Pientka)

Alewives were first discovered in Lake Champlain in 2004 and their numbers have increased since. A sampling program is being developed to monitor their abundance and population characteristics. Since 2008, floating gill nets have been utilized to collect alewife samples for age and growth analysis. In 2013, both young-of-year and older alewife were collected at all sampling stations. Large numbers of young-of-year alewife were collected by standard mid-water trawl at all but the Barber Point station. An estimated 17,000 young-of-year alewives were collected in the Northeast Arm; 859 at Valcour Island; 669 in Malletts Bay; and 487 at Juniper Island.

Hydroacoustics (Pientka)

Hydroacoustics assessment of Northeast Arm, Malletts Bay and Main Lake was conducted between July 31 and August 20, 2013 following the same procedures as prior years. The 2013 assessment transects covered 13.8 nautical miles in the Northeast Arm, 9.8 nautical miles in Malletts Bay and 63.8 nautical miles in the Main Lake. Along with the acoustic transects, targeted trawls were performed to confirm species compositions. In 2013, 8 tucker and 16 midwater trawls were performed. Processing of the acoustic data is currently ongoing.

Table 7. Mean catch per 55 minute trawl (CPUE with 95% confidence interval) of rainbow smelt in 2013 and comparison to pre- (1990-2004) and post-alewife invasion mean CPUE (2005-2013).

Station	Number of trawls	CPUE	Pre-Alewife Mean	Post-Alewife Mean	N years
Main Lake					
Barber Point	4	12 ± 9	206	357	20
Juniper Island	4	255 ± 83	180	195	24
Valcour Island	4	68 ±40	423	165	14
Malletts Bay					
Malletts Bay	4	25 ± 6	1124	473	24
Inland Sea					
Northeast Arm	4	20 ± 11	1363	218	24

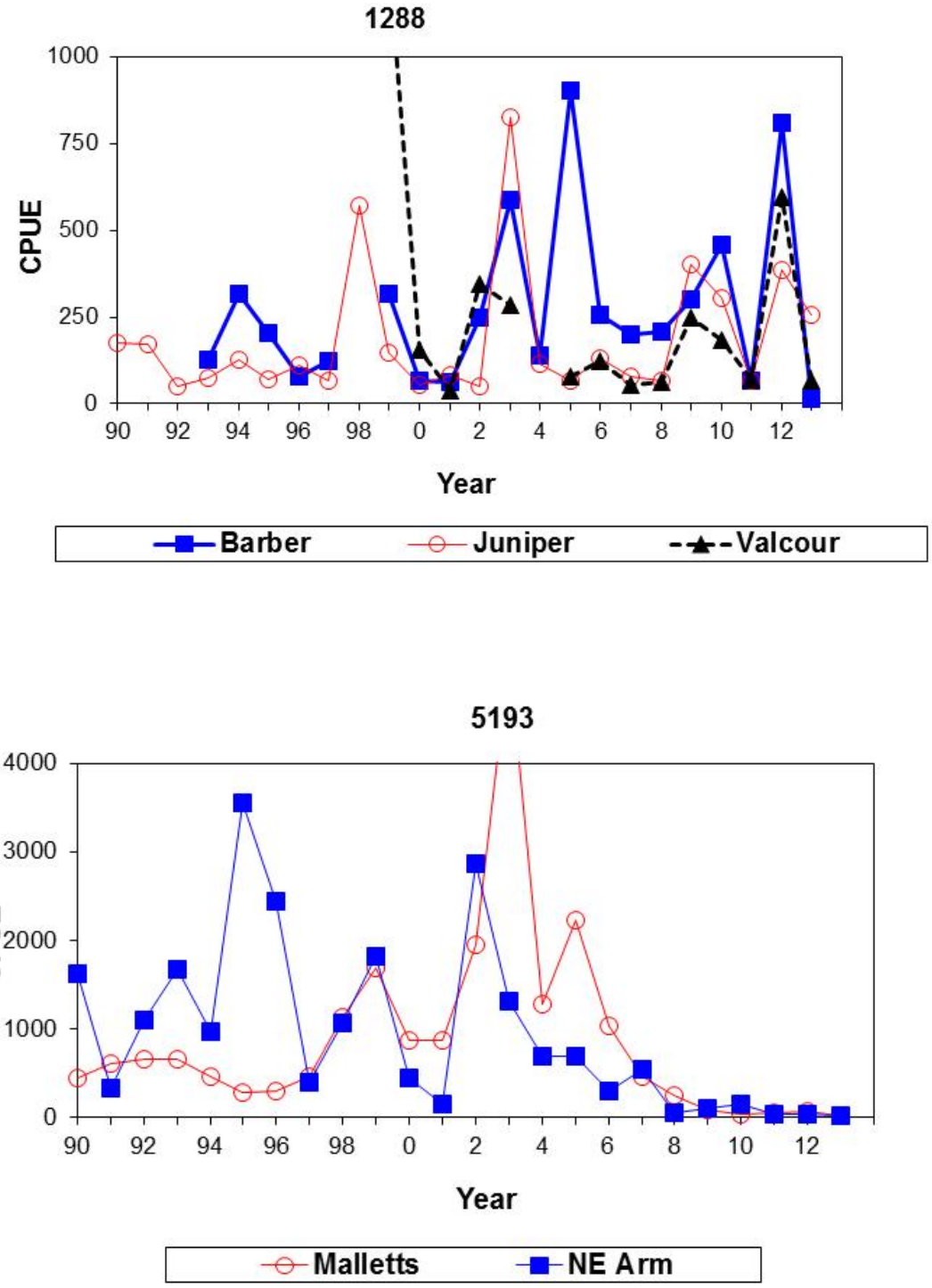


Figure 7. Mean catch per 55-minute trawl for smelt in Lake Champlain.

PERCIDS

Yellow Perch (Pientka)

Experimental gillnets are set overnight at multiple locations in order to monitor the Lake Champlain fish community. While these nets are not specifically targeting yellow perch they do give insight into relative abundance. In 2013, the sampling occurred between June 24th and July 9th. Yellow perch catch per overnight set (CPUE) at Shelburne Bay was similar to St. Albans Bay levels (Figure 8). Missisquoi Bay had a high CPUE in 2010, with the lowest values observed in 2012 and 2013. Sampling will continue in 2014.

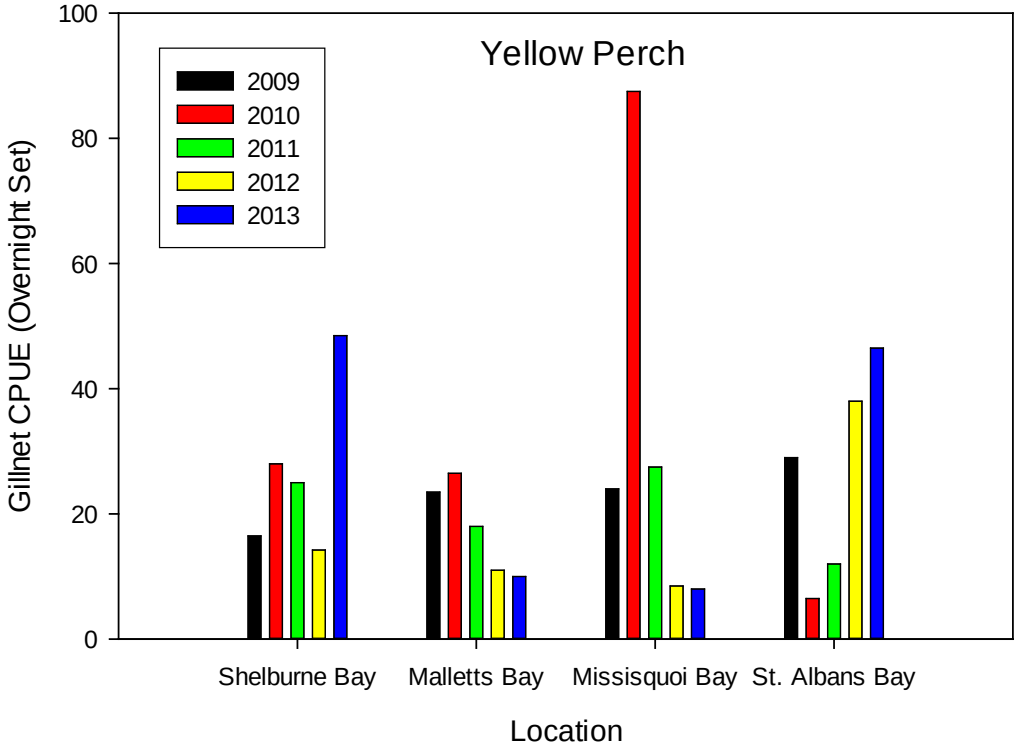


Figure 8. Yellow Perch CPUE for 2009-2013 at four Lake Champlain Locations.

Walleye (MacKenzie, Pientka)

Walleye management activities on Lake Champlain in 2013 included the collection of brood stock and an evaluation of the contribution of stocked walleye in the spawning run in the Missisquoi River.

Twenty pairs of walleye collected from the Missisquoi River were spawned resulting in 3,820,000 eggs. Eggs were hatched at the Ed Weed Fish Culture Station (FCS) in Vermont. Fingerlings were reared in the intensive culture system located at the Ed Weed FCS and in 4 ponds managed by the Lake Champlain Walleye Association. There were 173,000 fry and 81,500 fingerlings stocked into the lower Missisquoi River, Missisquoi Bay and lower Otter Creek. All fry and fingerlings were marked with OTC prior to stocking.

All adults used for spawning were sacrificed for disease testing. Testing results were negative for fish pathogens of concern.

Otoliths were collected from 11 age-3 fish collected from the Missisquoi River to evaluate the contribution of stocked fish to the age-3 year class in the Missisquoi River spawning population. All otoliths had OTC marks indicating all 11 fish had been stocked as fingerlings.

CENTRARCHIDS

Largemouth and Smallmouth Bass (Good, Pientka)

Angling for largemouth and smallmouth bass in Lake Champlain continues to increase in popularity. The lake is frequently named as one of the top 5 bass fishing destinations in the country by numerous popular national fishing magazines. It not only attracts and supports a high level of recreational fishing pressure, but multiple professional bass fishing tournament trails have added Lake Champlain as an annual stop. For the FLW Outdoors Series, results indicate that tournament catches have remained very consistent since their first tournament was held on Lake Champlain in 2002 (Figure 9). Both major U.S. professional bass fishing tournament series, Bassmaster and Forrest L. Wood (FLW) Outdoors, have held annual events on the lake.

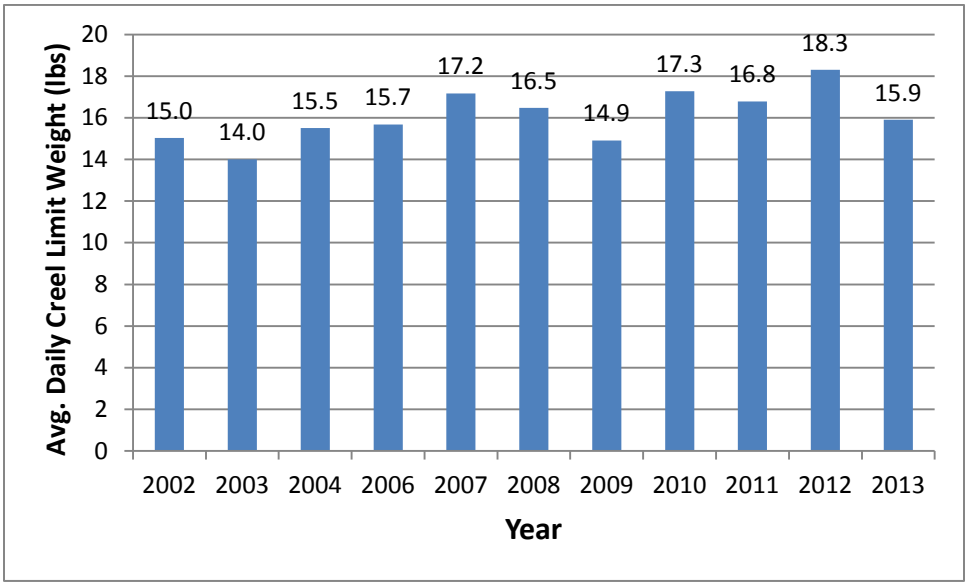


Figure 9. Average daily creel limit weights for the Top 10 anglers from each of the 10 professional-level FLW Outdoors tournaments held on Lake Champlain since 2002.

Due to unfavorable lake conditions, no spring or summer bass sampling was conducted on Lake Champlain in 2013. Spring and summer sampling events are planned for 2014.

ESOCIDS

Northern Pike (Good, Pientka)

In 2013, trapnets were set at the mouth of South Hero Marsh in Keeler Bay, a northern pike spawning marsh on northern Lake Champlain, so as to intercept fish moving in to spawn or exiting the marsh after spawning was completed. Nets were set on April 8 and tended for 16 days, through April 23. A total of 91 northern pike were collected from the trapnet, with 70% of them being females. The total numbers of pike caught and numbers of pike caught per net day (CPUE) are reported in Table 8.

Table 8. Summary of ice-out trapnet effort and northern pike catches at southern and northern Lake Champlain sampling sites, 2009 through 2012.

Year	Trapnet Effort (d)	# Northern Pike			CPUE (net days)
		M	F	Unk	
2009 (south)	16	42	99		8.8
2010 (south)	19	156	288		23.4
2011 (south)	7	19	59		11.1
2011 (north)	6	34	107		23.5
2012 (north)	2	13	6	4	11.5
2013 (north)	16	26	64	1	5.8

Sea lamprey wounding rates calculated for northern pike collected in 2013 from the north lake sampling location was 43 A1–A3 wounds per 100 pike greater than 610 mm total length (Table 9).

Table 9. Lamprey wounding rates (A1–A3 wounds) for northern pike (≥610mm TL) collected from southern and northern Lake Champlain populations.

Southern Lake Champlain				
Year	# NP	# ≥610mm	#A1, A2, A3	Wounds/100
2009	141	97	8	8
2010	444	247	26	11
2011	78	53	3	6

Northern Lake Champlain				
	# NP	# ≥610mm	#A1, A2, A3	Wounds/100
2005	88	24	2	8
2010	281	54	6	11
2011	141	75	10	13
2012	23	17	2	12
2013	91	40	17	43

Muskellunge (Good)

In 2013, VTDFW stocked 7,580 muskellunge into the lower Missisquoi River and areas of Missisquoi Bay, including Campbell's Bay (Table 10). The muskellunge were provided by NYSDEC's Chautauqua Lake Hatchery.

Table 10. Muskellunge stocking numbers for Lake Champlain, 2008-2013.

Date	Strain	Source	Number Received	Avg. Length (Inches)	Total Wt. (Lbs)	Life Stage	Stocking Location
2008	Chautauqua	NYSDEC	250	6.1	4.35	Summer Fingerling	Missisquoi River & Bay
2009	Chautauqua	NYSDEC	10,000	5.04	174	Summer Fingerling	Missisquoi River & Bay
2010	--	NYSDEC	0	--	--	--	--
2011	Chautauqua	NYSDEC	5,150	5.0	95.5	Summer Fingerling	Missisquoi River & Bay
2012	Chautauqua	NYSDEC	8,800	5.4	185	Summer Fingerling	Missisquoi River & Bay
2013	Chautauqua	NYSDEC	7,580	5.32	155	Summer Fingerling	Missisquoi River & Bay

ANGUILLIDS

American Eel (Staats)

In 1997, an eel ladder was constructed at the Richelieu River dam in Chambly, Quebec and in 2001 a fish ladder and an eel ladder were built at the St Ours dam on the Richelieu. Faune Québec, in cooperation with a commercial fishing union and Hydro-Québec, initiated an eel stocking program in 2005 in the Richelieu River to further enhance eel recruitment. In order to monitor the success of these stocking efforts and new passage facilities, Québec asked members of Fisheries Technical Committee to monitor eel in Lake Champlain.

No eel sampling was scheduled for 2013. However, eels were collected during adult sea lamprey trapping operations (Table 11). The majority were larger eels (>600 mm), but some smaller eels were also handled (300-450 mm) (Anthony Curtis, USFWS, personal communication).

Table 11. Summary of American eel captured during annual sea lamprey trapping conducted in the spring, 2010-2013.

Stream	2013	2012	2011	2010
Main Lake				
Great Chazy River, NY	0	0	1	1
Sunderland Brook, VT	2	1	---	0
Mullen Brook, NY	0	0	0	0
Rea Brook, NY	1	0	---	
Inland Sea, VT				
Stone Bridge Brook	24	12	11	2
Trout Brook	0	1	0	0
Malletts Bay, VT				
Pond Brook	1	0	3	0
Indian brook	---	5	---	---

RESEARCH

Lampricide Research (Calloway)

Two research projects were conducted during the summer field season to investigate lampricide impacts. The first project investigated the mortality patterns of sea lamprey ammocoetes that were exposed to less than the 9-hour minimum lethal concentration of TFM for periods longer than 9 hours. The research indicated that significant mortalities do not occur at lower concentrations of TFM when exposure time is increased to 18 hours. This project will not be investigated further because there is not a pattern of mortality that could be used to develop alternative management strategies. The second project was conducted to determine if there would be an observed difference between bioassays performed with two different niclosamide formulations: wettable powder versus emulsifiable concentrate. It was determined that both products produced the same results. The USFWS is currently developing a Standard Operating Procedure for bioassays using the emulsifiable concentrate niclosamide formulation in order to streamline our procedures and make them consistent with the formulation used during treatments.

Post Tournament Release Movements of Black Bass in Lake Champlain (Malchoff)

Researchers at SUNY Plattsburgh recently completed a technical report on dispersal and survival of bass in Lake Champlain following angling tournaments. The project evaluated stress indicators on bass and their potential impacts on post-tournament survival of the tournament fish, and dispersal from tournament release points. The study investigated several thousand bass during the course of nine tournaments held in Plattsburgh during the 2011 and 2012 field seasons. Researchers found that there was a direct relationship between fish stress and distance traveled in a live-well. For largemouth bass, TL was a significant predictor of stress, with longer fish more likely to be wounded or exhausted. Additional technical results on the stress component portion of the study are available in the Open Fish Science Journal: http://www.benthamscience.com/open/tofishsj/articles/V006/78TOFISHSJ.pdf Average immediate mortality was under 5% for both species. Delayed mortality (0-48 hrs.) for fish subject to surgical radio tag implantation was approximately 3 percent. Delayed fish dispersal (T-bar tag returns and radio-tag methods) was common. In general, it took fish at least two weeks, and often several months to disperse beyond Cumberland Bay. Many fish ultimately dispersed with 56% of 53 radio-tagged smallmouth bass and 44% of 38 radio-tagged largemouth bass leaving the bay during our study. Dispersal patterns were similar for T-bar tags. As time post-release increased, higher proportions of tag returns came from outside of Cumberland Bay; however, tag returns from the bay continued throughout the study. Of the nearly 2400 fish tagged (T-bar and radio), only one tagged fish returned to its original capture location following release in Plattsburgh. Sampled fish exhibited a tendency to disperse to the northern regions of Lake Champlain.

Status of Stonecats in Vermont (Elizabeth Puchala and Donna Parrish)

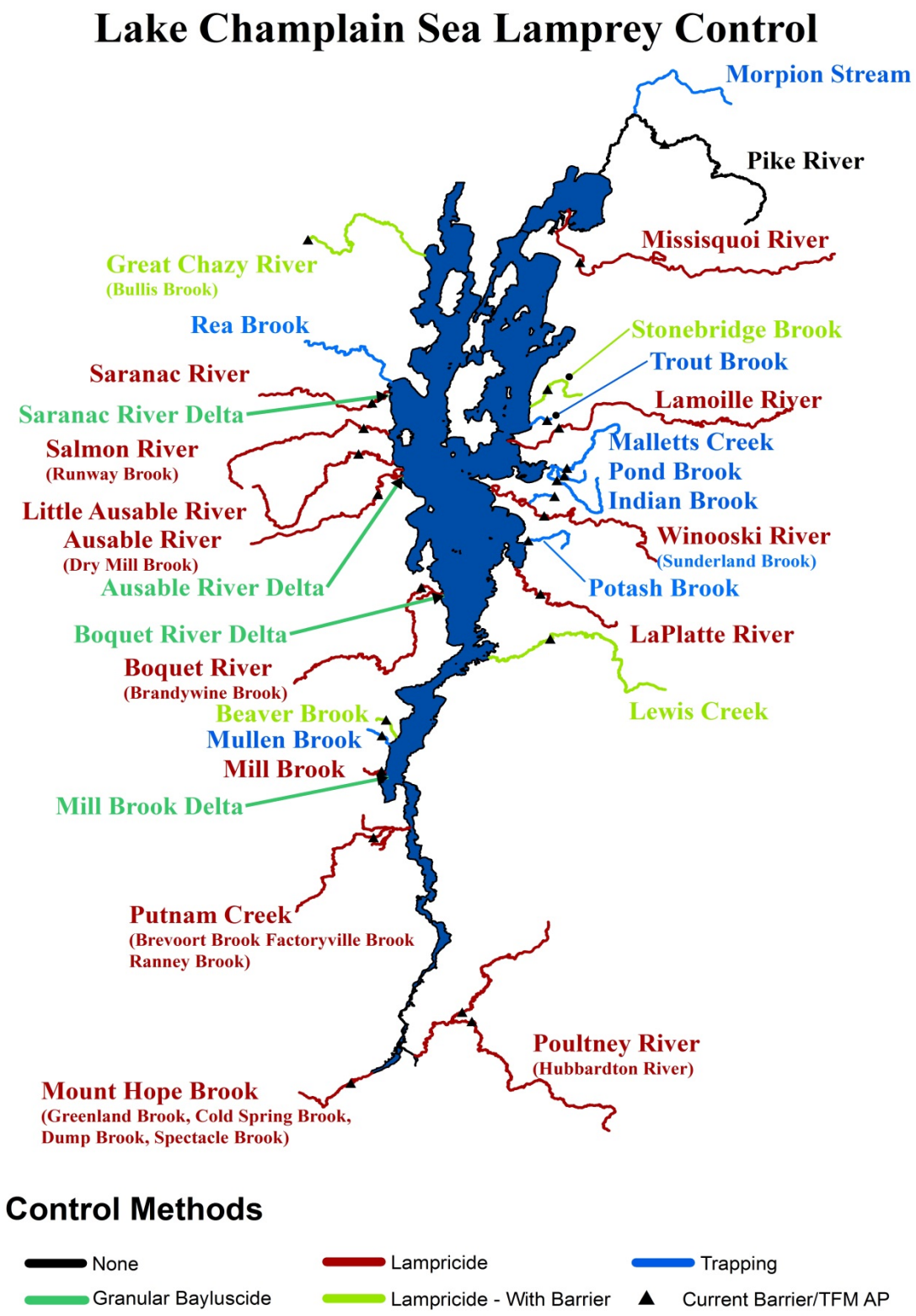
Research on stonecat populations in the two known Vermont locations, the LaPlatte and Missisquoi rivers, focuses on attempting to estimate population sizes and survivorship. From May to October 2013, the second year of our study, we captured and marked 1,024 stonecats in the LaPlatte River and 40 in the Missisquoi River below Swanton Dam using backpack electrofishing and minnow traps. Sampling will resume in spring 2014 to increase the number of marked fish.

River-run Restoration of Landlocked Salmon (Ardren)

The U.S. Fish and Wildlife Service is leading a large adaptive management experiment focused on restoring and enhancing river-runs of landlocked salmon to Lake Champlain. The goals of this program are to: (1) Increase returns of hatchery-origin salmon to rivers; (2) Enhance the tributary fishery for salmon in Lake Champlain; (3) Restore naturally spawning populations of salmon.

Landlocked Atlantic salmon (Salmo salar) were extirpated from Lake Champlain in the early 1800s. Management actions, including sea lamprey control and stocking yearling smolts, provide for a popular salmon fishery in the lake. However, spawning runs of salmon to rivers (i.e., river-runs) have remained low. In 2010, we initiated a long-term adaptive management experiment focused on increasing river-runs of salmon to enhance in-river fisheries and restore natural populations. Examples of ongoing experiments include: (1) identifying indicators of smolting to optimize timing of stocking to periods when fish are likely to imprint on rivers and (2) evaluating alternative hatchery rearing methods. We identified gill Na+/K+ ATPase activity during the spring as a potential indicator of smolting for landlocked salmon but activity levels were much lower than observed in anadromous populations. We also observed a large impact of alternative hatchery rearing on adult returns to a focal river in 2013. There was a sevenfold increase in adult return rate of smolts reared in river water with an ambient temperature profile compared to smolts reared on well water with an increased temperature profile. Our results demonstrate potential for rapid increases in river-runs using hatchery smolts combined with targeted research and adaptive management.

Partners: US Sen. Leahy, USFWS, VTDFW, NYSDEC, USGS-Conte Lab, Dartmouth College, Concordia University, UVM, Middlebury College. Funding: Great Lakes Fishery Commission, USFWS, VTDFW, Concordia University, and Dartmouth College.



Appendix 2: Map of Lake Champlain tributaries included in the sea lamprey control program and control methods planned for use on those tributaries.

Appendix 3: Schedule of completed Lake Champlain lamprey treatments through 2012 and projected treatments for 2013-2020. The "T" denotes completed TFM only treatments, "B" denotes completed Granular Bayluscide, "C" denotes completed TFM + 1% Niclosamide and "P" denotes proposed treatments. **Green** represents the number of years *ahead* of schedule and **Red** represents the number of years *behind* schedule (delayed) that proposed treatments would occur to get them onto the basin realignment plan.

			90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
New York	WEST	Great Chazy River			T				T				T				T				T				T		P				P		
		Saranac River			T																					C					P		
		Saranac Delta		B				B									B				B				B		P				P		
		Salmon River	T				T				T				T				T				T				P				P		
		Salmon Delta		B				B																									
		Little Ausable River	T				T				T				T				T				T				P				P		
		Ausables Delta Complex		B				B								B				B				B			P				P		
		Ausable River	T				T					T			T				T	T			T				P				P		
		Boquet River	T				T					T				T				T				C			P				P		
		Boquet Delta		B				B																									
	SOUTH	Beaver Brook	T								T					T				T													
		Mill Brook																			T				T			P				P	
		Mill Delta																			B				B			P				P	
		Putnam Creek	T				T				T				T				T				T			T		P				P	
		Mt. Hope Brook (incl. tribs)		T				T				T					T				T				T			P				P	
		Poultney & Hubbardton rivers			T				T											T				T				P				P	
		Lewis Creek	T				T								T				T				T				P				P		
Vermont	EAST	LaPlatte River																											P				P
		Winooski River															T				T				T				P				P
		Trout Brook						T																									
		Stonebridge Brook		T																						T			P				P
		Lamoille River																				T				T			P				P
		Missisquoi River																			T				T				P				P

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