Lake Champlain Sea Lamprey Assessment Program

Results of Sea Lamprey Assessment Activities 2009

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Summary

Sea lamprey assessment activities conducted during the spring and summer of 2009 included the trapping of migrating adult sea lamprey and electrofishing surveys of larval populations. Traps were installed on five streams during the spawning migration to limit reproduction or assess spawner abundance in these tributaries. In an effort to address the continued escapement of sea lamprey above the barrier and trap on the Great Chazy River, the lamprey lip on the dam was repaired and the trap reconfigured to eliminate possibility that sea lamprey are moving either over the dam or through the trap.

Quantitative electrofishing surveys (QAS) were conducted on five streams scheduled for treatment in the fall of 2010. Post treatment electrofishing surveys were conducted on four streams to determine the effectiveness of treatments conducted during the fall of 2008.

A QAS survey was conducted on the LaPlatte River to determine the extent of infestation and obtain a population estimate for the stream reach above the falls in the village of Shelburne.

Presence/absence surveys were conducted on tributaries in the southwest quadrant of Lake Champlain.

The Saranac and Mill Brook deltas were surveyed in 2009 to confirm the effectiveness of delta treatments that took place during the fall of 2008.

1.0 Adult Trapping

The primary reason for trapping sea lamprey in Lake Champlain is to prevent them from reproducing. Small streams that lend themselves to trapping and may possess species of concern which preclude other forms of control are trapped annually. On occasion, trapping is conducted to determine if adults are using specific areas of a stream or enlisting a new stream in their migrations. These detection efforts help guide our decisions in where and how to control existing or emerging populations. Every year, the Lake Champlain Fish and Wildlife Management Cooperative gives trapped adult sea lamprey to researchers to help them learn more about the biology and behavior of sea lamprey. Their innovative research benefits universities by developing students and publishing research and benefits our control program by developing new techniques which may enhance the control of sea lamprey and reduce our reliance on pesticides.

1.1 Control Program

Sea lamprey spawning runs were monitored in five streams during the spring of 2009 (Table 1) using portable assessment traps. 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. Lamprey pots were used in the Boquet River for a second year to assess sea lamprey abundance and migration patterns during the spawning migration (Figure 2). Sea lamprey were removed from the traps every 2-4 days. Captured non-target species were identified, recorded, and released. Any mortality was recorded and reported to state permitting agencies.

Streams where traps were deployed in 2009 included three streams in Vermont where trapping was identified as the primary control method in the supplemental EIS. A more substantial sea lamprey trap site was operated for a second year on Beaver Brook, Westport, NY. Stream bank erosion immediately below the trap site, caused by high spring flows which inundated the weir, was addressed using stacked stone to armor one of the banks. Modifications to the weir panels to increase the discharge capacity of the structure and reduce the chances of further erosion are planned to be completed prior to the 2010 trapping season.

In order to address the continued escapement of spawning run sea lamprey above the Frog Pond Dam on the Great Chazy River in Champlain, NY, a new lamprey lip was installed. The lip is made of steel plates affixed to the crest of the dam creating a four inch overhang. The screen panels of the trap were also reconfigured to eliminate the possibility of sea lamprey getting under one panel of the trap and moving upstream. If fully functional the barrier on the Great Chazy River would eliminate access to approximately 13 miles of sea lamprey spawning and larval habitat and the need for lampricide treatments above the barrier.

Table 1. Results of migratory phase sea lamprey trapping 2009.

Stream	Date Trap Set	Date Trap Pulled	Number lamprey 2009	% change from 08
Beaver Brook	4/15/2009	6/22/2009	24	-7.69%
Trout Brook	4/13/2009	7/1/2009	55	66.67%
Stonebridge Brook	4/13/2009	7/1/2009	120	64.38%
Great Chazy River	4/23/2009	6/17/2009	195	-10.14%
Malletts Creek	4/14/2009	6/25/2009	95	-40.25%
Boquet River Pots	4/23/2009	6/16/2009	0	
Boquet River Fishway	4/23/2009	6/12/2009	0	
Total			489	-3.74%

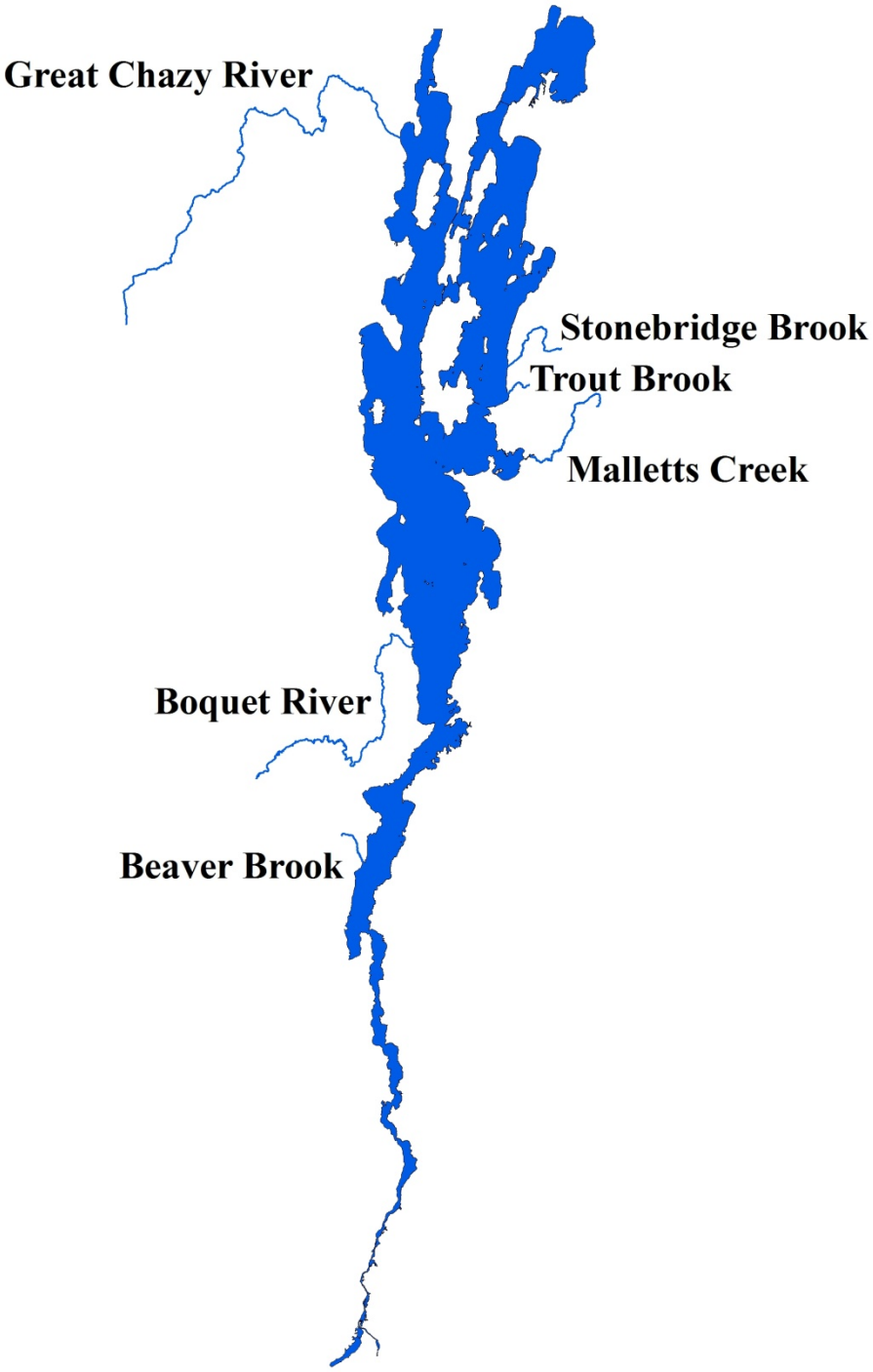


Figure 1. Location of trapping sites operated during the spring of 2009 to capture migrating adult sea lamprey.

1.2 Detection of spawning runs

Removal of the Boquet River dam in Willsboro, NY is under consideration. Removal of this dam may allow sea lamprey to access a new reach of the river. In an effort to determine the likelihood of sea lamprey negotiating the falls immediately downstream of the dam, two traps were set in the Boquet River fishway for a second season. No sea lamprey were captured in the fishway.

Lamprey pots were also deployed in the Boquet River; one in the pool approximately half way up the cascades for a second season and one immediately below the entrance to the fishway for the first time (Figure 2). This effort was an attempt to determine if lamprey were able to negotiate the lower section of the cascades. No lamprey were collected in either pot While this does not prove lamprey could not negotiate the falls in the absence of the dam, successive years of data suggest that the falls do and would limit the ability of lamprey to migrate upstream of the falls under most conditions.

Figure 2. Location of sea lamprey traps and pots in the Boquet River.

1.3 Providing lampreys to researchers

Sea lamprey that are trapped are either killed on site or given to researchers. In 2009, the USFWS coordinated with Dr. Rejean Dubuc's laboratory at the Département de Physiologie, Université de Montréal, to provide sea lamprey for research. A total of 100 lamprey were given to the university, collected from the trap on the Great Chazy River. Spawning phase sea lamprey tissue samples from several sites were given to an undergraduate student at Middlebury College for a genetics project. Samples of American brook lamprey larvae collected from the Ausable River during post treatment electrofishing surveys were given to Dr. Matthew White at Ohio University for genetic research, and tissue samples from silver lamprey larvae were collected from The Poultney River, Lewis Creek, and the Missisquoi River for a genetics project being conducted by an undergraduate student at Green Mountain College.

2.0 Larval Assessment

Larval populations assessments include determining spatial distribution throughout the basin and estimating population sizes within streams based on densities among quantified habitats. These assessments are a tool used for selecting where and how to control sea lamprey in the Lake Champlain Basin. Areas of known colonization are assessed quantitatively following the Great Lakes Fishery Commission's (GLFC) Quantitative Assessment Sampling (QAS) protocol. Surveys are also conducted post-treatment to determine treatment effectiveness. Streams being monitored for signs of new colonization are sampled using a detection protocol designed to locate larvae in areas they are most likely to inhabit. Larval assessment is also done to verify the effectiveness of our adult trapping program. Surveys are done below and above our trapping sites to determine how many (if any) larvae were produced by spawning sea lamprey despite our trapping efforts.

2.1 Stream quantitative assessment sampling (QAS)

Quantitative assessment surveys were conducted on five streams in preparation for scheduled lampricide treatments in the fall of 2010 (Table 2; Figures 3-8). A QAS survey was also conducted on the LaPlatte River above the falls in the town of Shelburne (Figure 9) to determine the larval sea lamprey population size and distribution.

Table 2. Results of quantitative assessment surveys conducted in 2009.

Stream and Reach	**Population Estimate-Ammocoetes**	**Population Estimate-Transformers**
Ausable River-	393,570	0
Little Ausable River-	119,090	0
Salmon River-	123,594	373
Putnam Creek-	232,351	718
Lewis Creek- Reach 1	59,507	3,169
Reach 2	2,452	2,020
LaPlatte River- Reach 2	4,711	342

Ausable River:

In addition to the sampling conducted below the confluence of Dry Mill Brook and the Ausable River (Figure 3), two alternative sites for TFM application were evaluated. The site located on the RALAS Corp. land was found to be technically feasible for an application site, however limited sampling at that site indicated that sea lamprey larvae were present and their distribution most likely extends above this location. A site immediately below the Ausable Chasm tour route was also evaluated. This site could be used as an application point, however the logistics of treating two channels around a large island would be formidable. Therefore, it is not recommended that the application point be moved downstream from the Rainbow Falls site used in the past to either site evaluated.

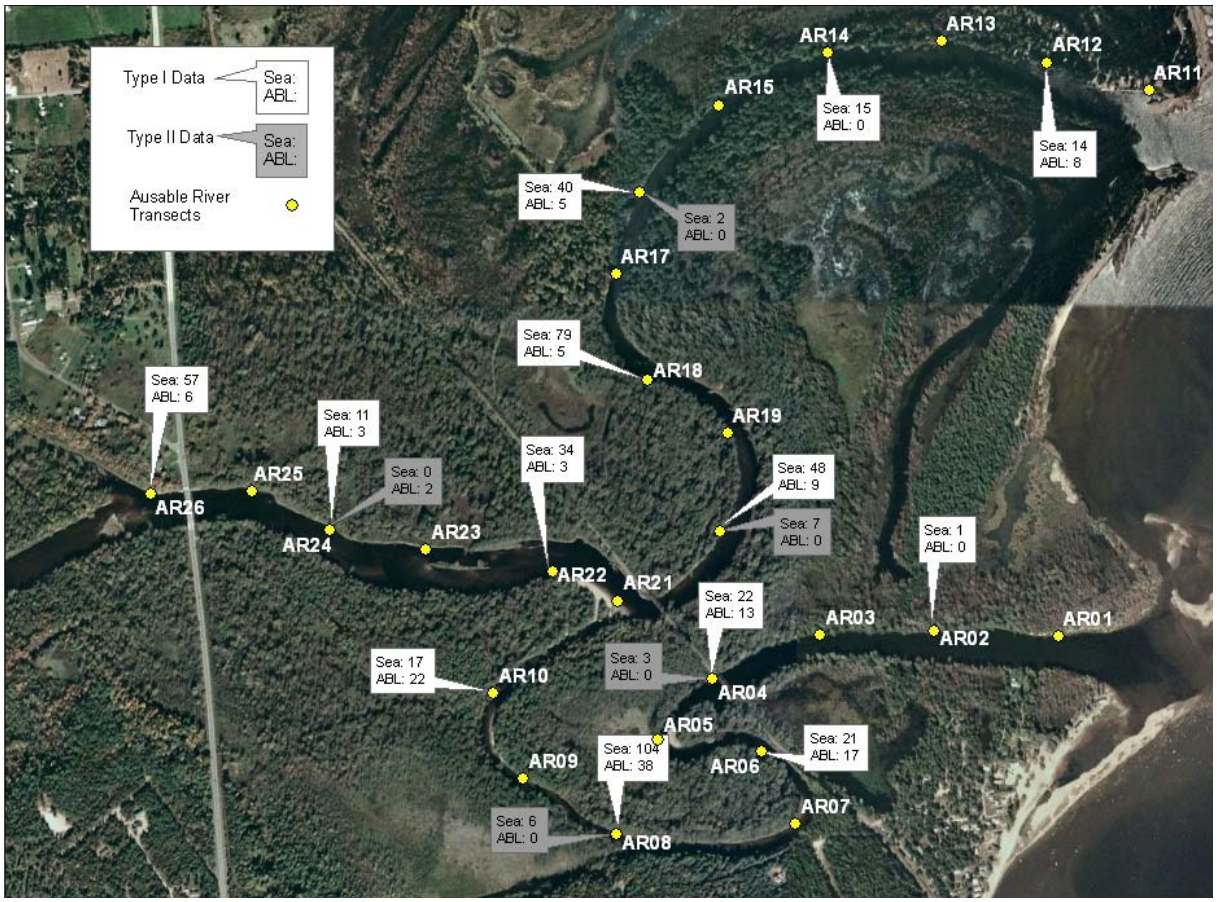


Figure 3. Ausable River sampling locations and number of sea and American brook (ABL) lamprey collected in Type I and Type II habitats.

Little Ausable River:

During previous surveys on the Little Ausable, access sites were used at six locations from the Route 9 crossing to Laphams Mills Rd. which was thought to be the upstream extent of sea lamprey migration. Following the 2006 TFM treatment, secondary application crews identified a falls approximately 1.7 km downstream which likely represents the upstream extent of sea lamprey migration. This is supported by previous surveys which have not collected sea lamprey larvae from the area upstream of the falls. During the 2009 QAS survey, transects were evenly spaced from the Route 9 crossing upstream to these falls (Figure 4). It is recommended that this site be evaluated for a potential application site prior to the 2010 TFM treatment.

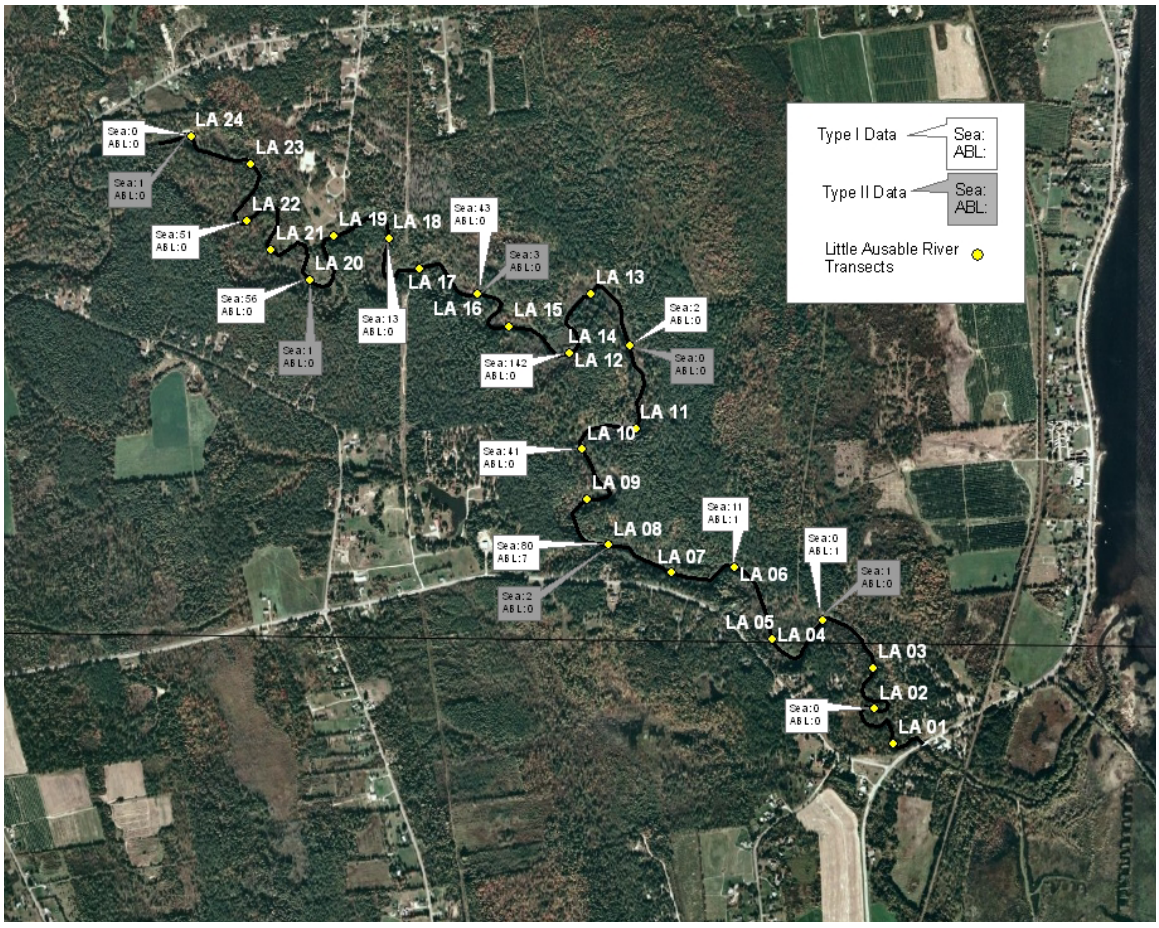


Figure 4. Little Ausable River sampling locations and number of sea and American brook (ABL) lamprey collected in Type I and Type II habitats.

Salmon River:

In 2009, survey protocols were changed on the Salmon River from an access site based method to evenly-spaced transects. Sampling was also conducted above the falls at Mr. Santor's residence which is thought to be the upstream extent of sea lamprey migration. No sea lamprey were collected from areas sampled above the falls.

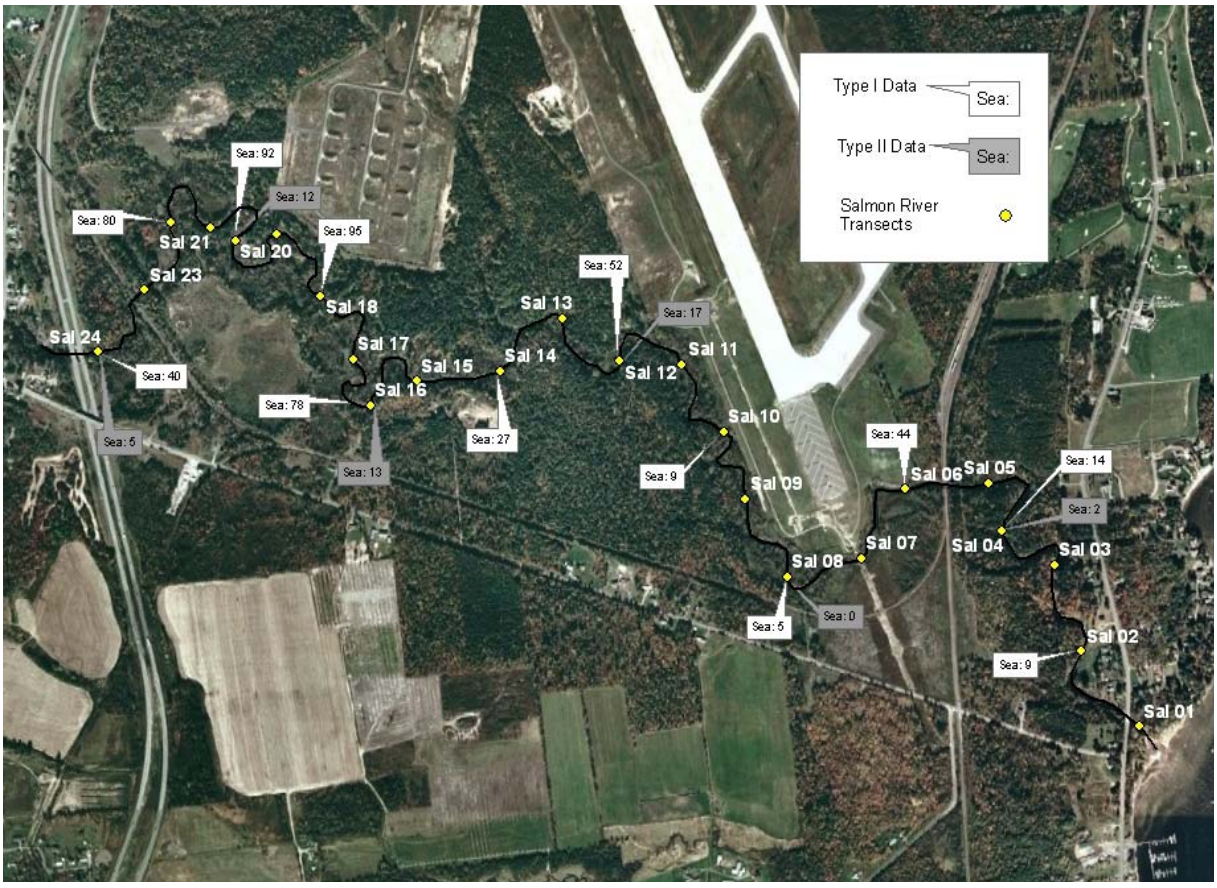


Figure 5. Salmon River sampling locations and number of sea lamprey collected in Type I and Type II habitats.

Putnam Creek:

In 2009 survey protocols were changed on Putnam Creek from an access site based method to evenly-spaced transects (Figure 6). Sampling was conducted throughout the entire infested reach. One sea lamprey larva was collected from Rainy Brook on the Essex Co. Fish hatchery property just below the water intake dam and seven lamprey were collected from the hatchery settling pond.

In addition to sampling in Putnam Creek, crews investigated Brevoort Brook (AKA Buttermilk Brook ; Figure 7) and Cold Spring Brook (AKA Factoryville Brook; Figure 8) which enters Putnam Creek downstream of the fisherman's access on Factoryville Rd. On Brevoort Brook, high densities of sea lamprey were found in the lower portion, and sea lamprey larvae were collected just below a falls at 3.4 km. It is recommended that both Brevoort Brook and Factoryville Brook be included in the 2010 lampricide treatment. Additional sampling in Factoryville Brook may be necessary to identify the most appropriate application site.

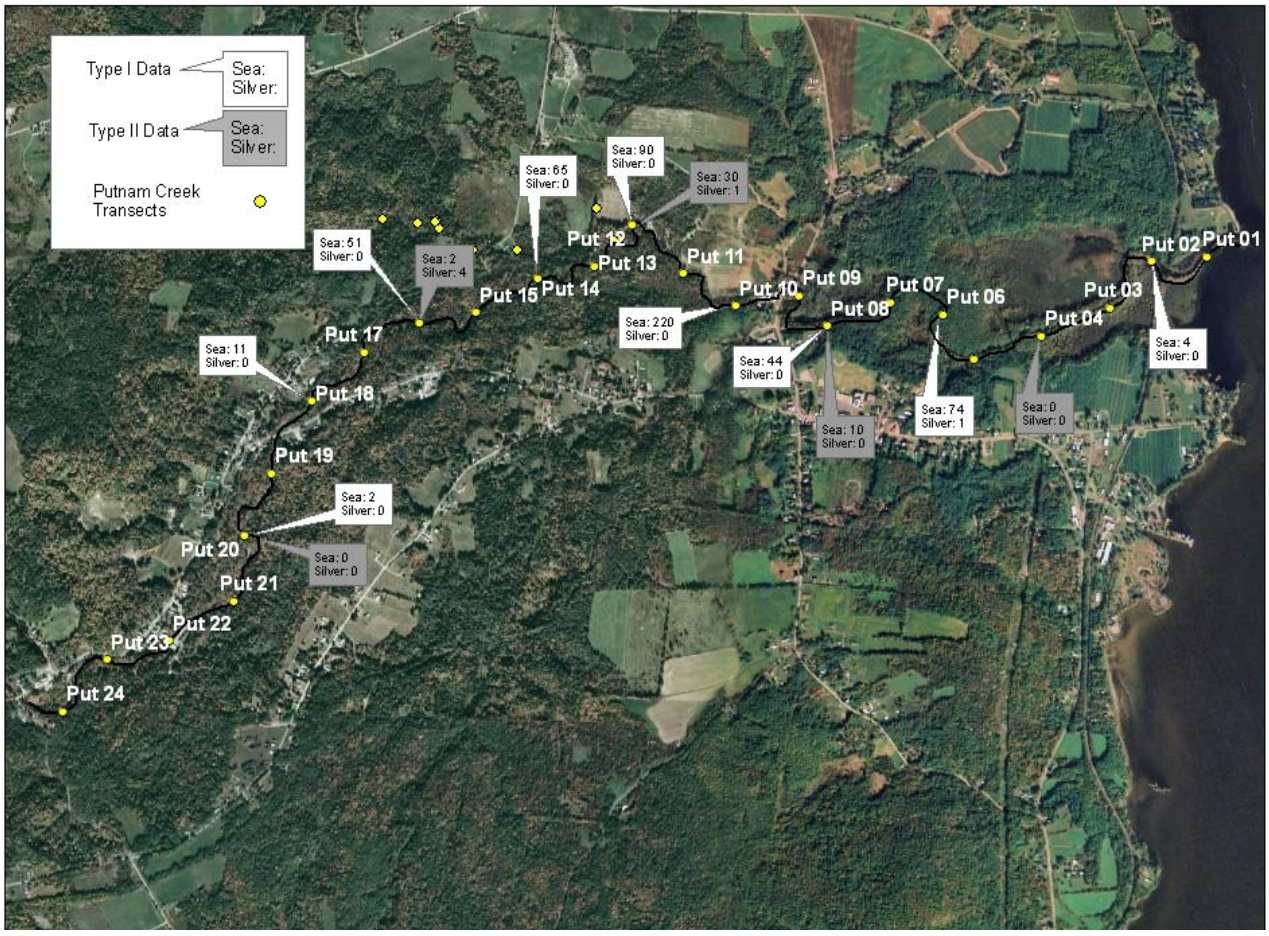


Figure 6. Putnam Creek sampling locations and number of sea and silver lamprey collected in Type I and Type II habitats.

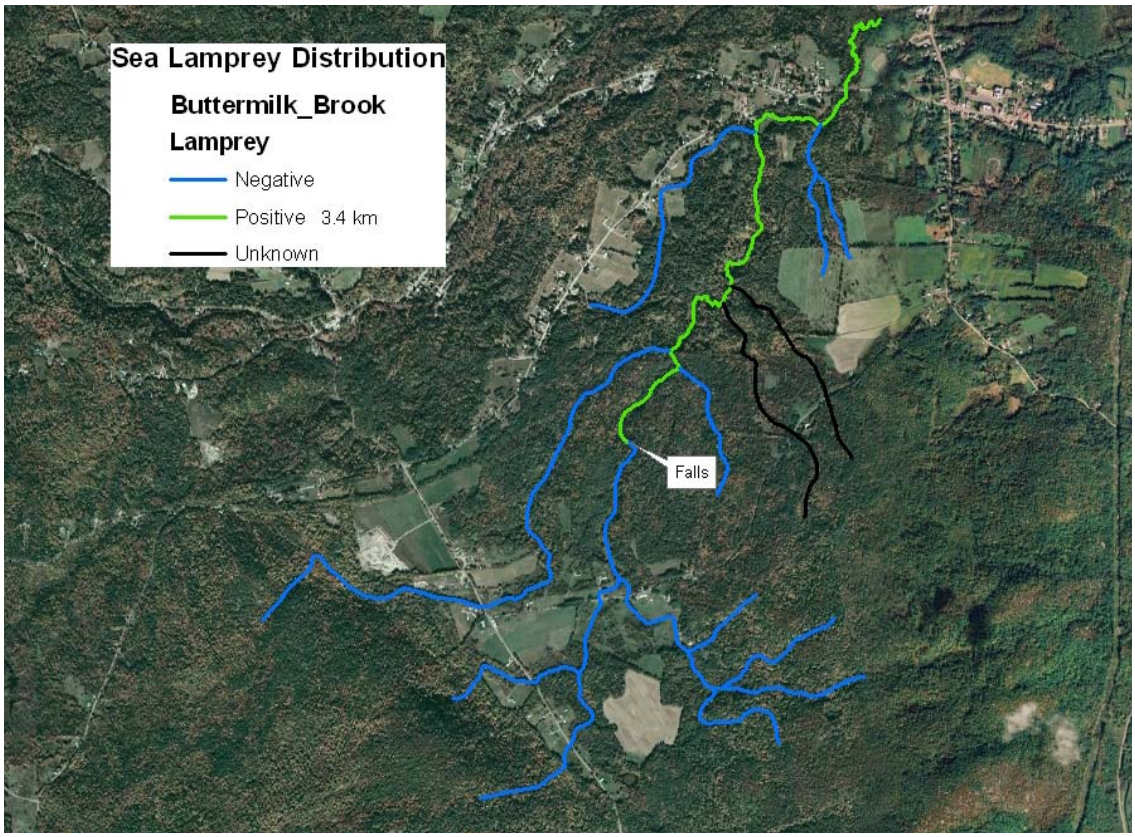


Figure 7. Distribution of sea lamprey in Brevoort Brook a tributary to Putnam Creek.

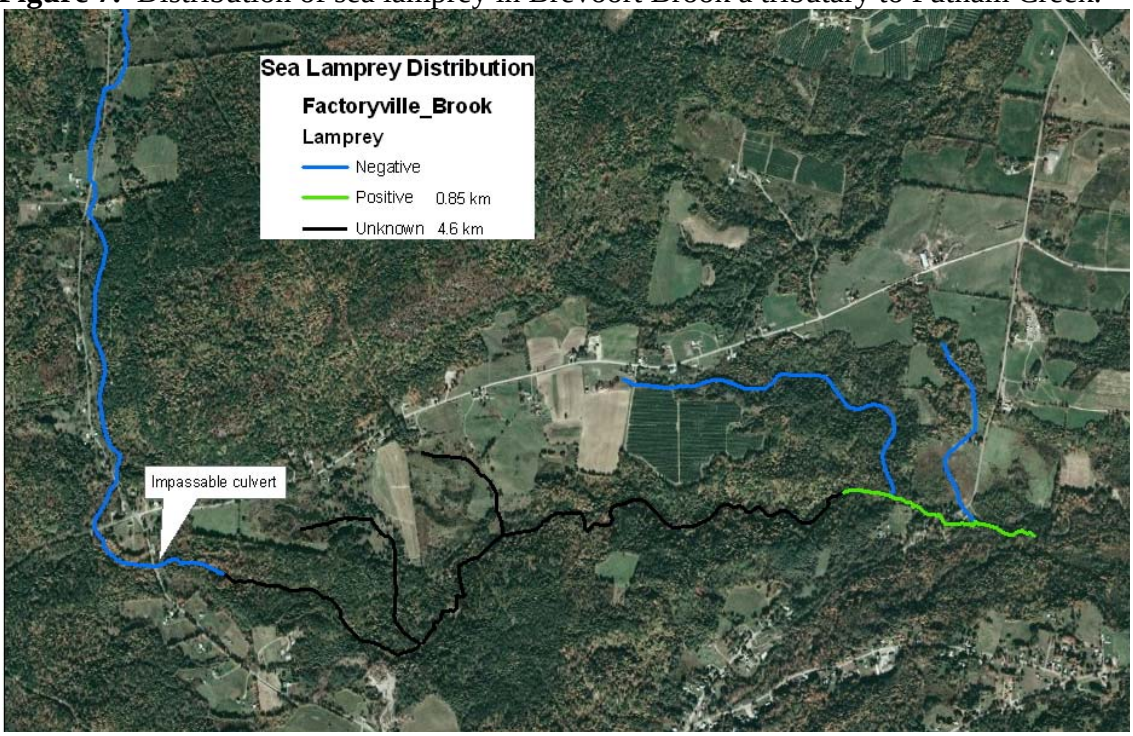


Figure 8. Known distribution of sea lamprey in Factoryville Brook, a tributary of Putnam Creek.

Lewis Creek:

In 2009, survey protocols were changed from an access site based method to evenly-spaced transects in Reach 1 of Lewis Creek (Mouth to falls in North Ferrisburg; Figure 9). Survey crews were unable to sample some areas near the mouth due to water depth. One tributary of Lewis Creek was identified as being a potential concern for providing a fresh-water refuge during treatment. This stream is located below the Route 7 bridge. A perched culvert near the mouth likely blocks access to migrating adult sea lamprey. Flows during the time of treatment may dictate whether a chemical block is necessary.

Reach 2 of Lewis Creek was surveyed using evenly-spaced transects (falls to Scotts Pond Dam; Figure 10). Limited sampling occurred in the lower portion of Reach 2 due to the lack of suitable habitat. Several large ammocoetes and transformers were collected from Reach 2. It is recommended that the treatment in 2010 include both reaches of Lewis Creek.

Figure 9. Lewis Creek Reach 1 sampling locations and number of sea and silver lamprey collected in Type I and Type II habitats.

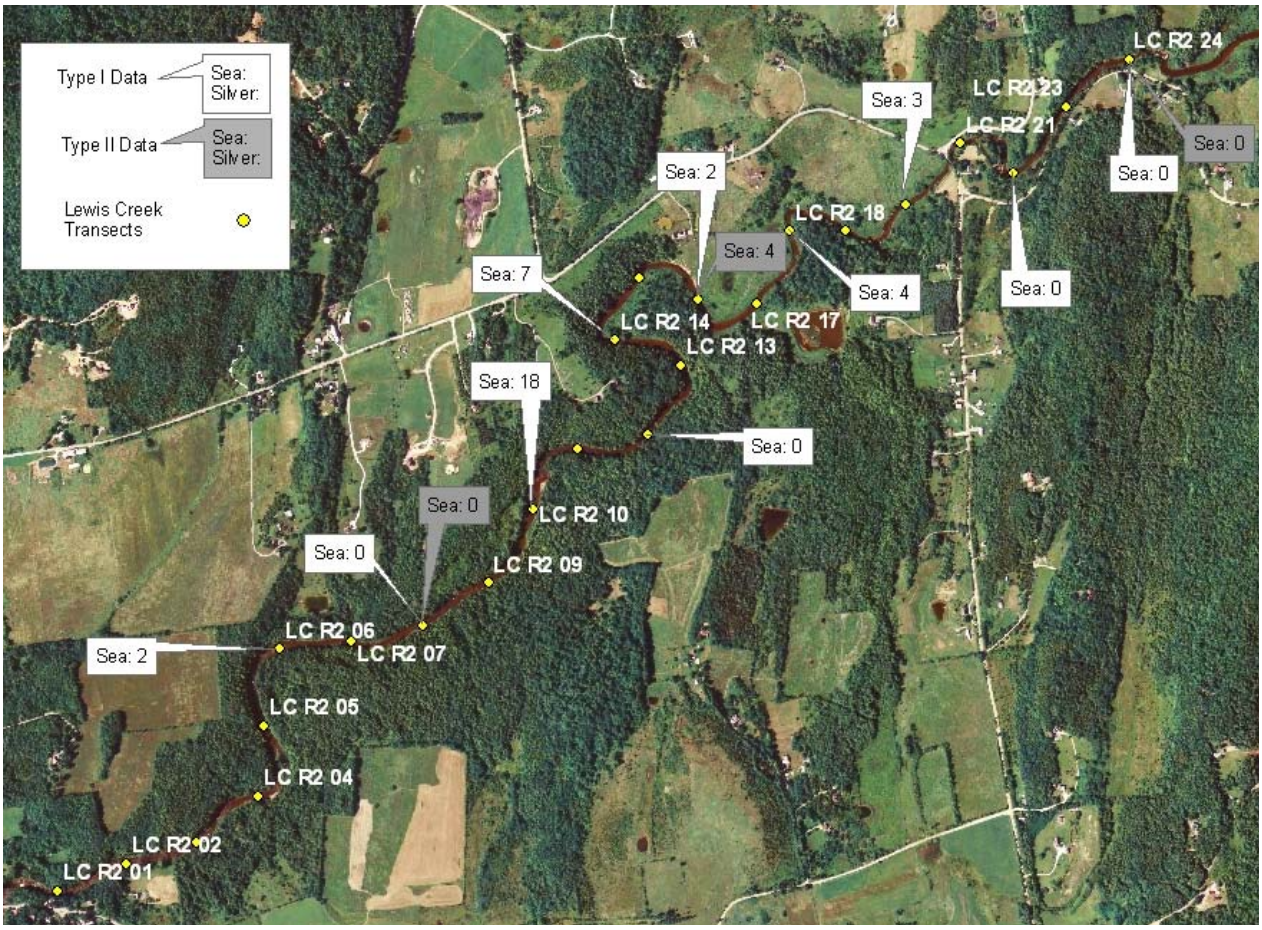


Figure 10. Lewis Creek Reach 2 sampling locations and number of sea lamprey collected in Type I and Type II habitats.

LaPlatte River:

Sea lamprey were first documented above the falls in Shelburne in 2007. An attempt was made to survey the reach (designated Reach 2) above the falls in 2008, however high stream flows prevented the completion of that survey. During 2009, crews sampled at evenly spaced transects from the falls upstream to Leavensworth Rd. in Hinesburg, VT (Figure 11). Sea lamprey were captured from above the falls to a sampling site in the vicinity of the Spear St. crossing. This represents an additional 5.7 km of infested stream. The population estimate for this reach (Table 2) of the LaPlatte River does not include the areas above transect 10 (the farthest point upstream where sea lamprey were detected).

Sampling was also conducted in the portion of the LaPlatte River below the Route 7 bridge. Past surveys of Reach 1 on the LaPlatte River included only the area above the Route 7 Bridge and below the falls in Shelburne. No sea lamprey were collected from this lower area.

Figure 11. LaPlatte River Reach 2 sampling locations and number of sea lamprey collected in Type I and Type II habitats.

2.2 Detection sampling

The Service 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 where one quadrant is sampled each year producing a system whereby all streams in the basin are surveyed within a four-year cycle. Investigations consist of a site visit to determine if there is the potential for a sea lamprey population and electrofishing sampling if conditions are favorable. Many of these streams are seasonal in nature and dry at the time of site visits. If there is available habitat, electrofishing is used to determine presence / absence of sea lamprey larvae. In 2009, presence absence surveys were conducted in the southern New York quadrant and several other streams of interest (Table 3). No new sea lamprey infestations were found in any streams surveyed.

Table 3. List of Southern New York and other negative streams investigated in 2009.

Date	Location	Habitat Type Sampled	Area sampled (m2)	Positive or Negative
8/4/2009	Stacy Brook at Camp Dudley		6.7	Negative
8/4/2009	Grove Brook Downstream from Rt 22	1 & 2	22.3	Negative
8/4/2009	McKenzie Brook Downstream from Rt 22	1 & 2	21.0	Negative
5/22/2009	Keller Bay South end of Grand Isle	2	12.7	Negative
8/31/2009	La Chute- Several locations accessed by boat	1	71.0	Negative
6/2/2009	Charter Brook	N/A	0.0	N/A
5/21/2009	Unnamed Clemons	1	25.3	Negative
5/21/2009	Pine Lake Brook Catden Rd.	1	4.0	Negative
5/21/2009	Pike Brook	1	24.0	Negative
8/11/2009	Unnamed trib. North of Crater Club	N/A	0.0	N/A
6/2/2009	Mill Brook	N/A	0.0	N/A
5/22/2009	Hatchery Brook Ed Weed FCS outlet	2	15.0	Negative
8/4/2009	5 mile creek Shore-Airport Rd.	1 & 2	18.0	Negative
8/3/2009	Appletree Brook 146 Appletree Point Rd.	1	10.0	Negative
8/19/2009	Unnamed trib. Whallon Bay	1	24.0	Negative
8/19/2009	Unnamed trib. At Essex Ferry landing	1	3.7	Negative
8/19/2009	Hoisington Brook Delta and stream	1	26.7	Negative

2.3 Post-treatment larval assessment

During the summer of 2009, post-treatment surveys were conducted on five streams to determine the effectiveness of treatments conducted during the falls of 2008 and 2009 (Table 4). Mt. Hope Brook, which was also treated during the fall of 2008, was surveyed immediately post-treatment and the results can be found in the 2008 annual report. Population estimates for Mill Brook are based on 6 habitat transects spaced evenly throughout the lamprey-accessible reach and sea lamprey larval densities from electrofishing samples collected from all available habitat. No American Brook lamprey were captured in the Missisquoi River or the Winooski River during pre-treatment or post-treatment electrofishing surveys.

Table 4. Pre-treatment and post-treatment population estimates, numbers of lamprey collected, and percent reduction in ammocoetes levels for streams where post-treatment assessments were conducted during 2009.

River/Reach	Pre-treatment		Post-treatment		% reduction
	Pop est	n	Pop est	n	
G. Chazy R2	24,028	203	112	1	99.53%
G. Chazy R3	357,325	120	2,521	1	99.29%
Missisquoi	63,173	13	36,967	5	41.48%
Mill Brook	13,468	117	2,032	14	84.91%
Winooski R1	174,462	13	0	0	100.00%
Winooski R2	1,532	9	0	0	100.00%
Lamoille	38,719	12	2,232	1	94.24%

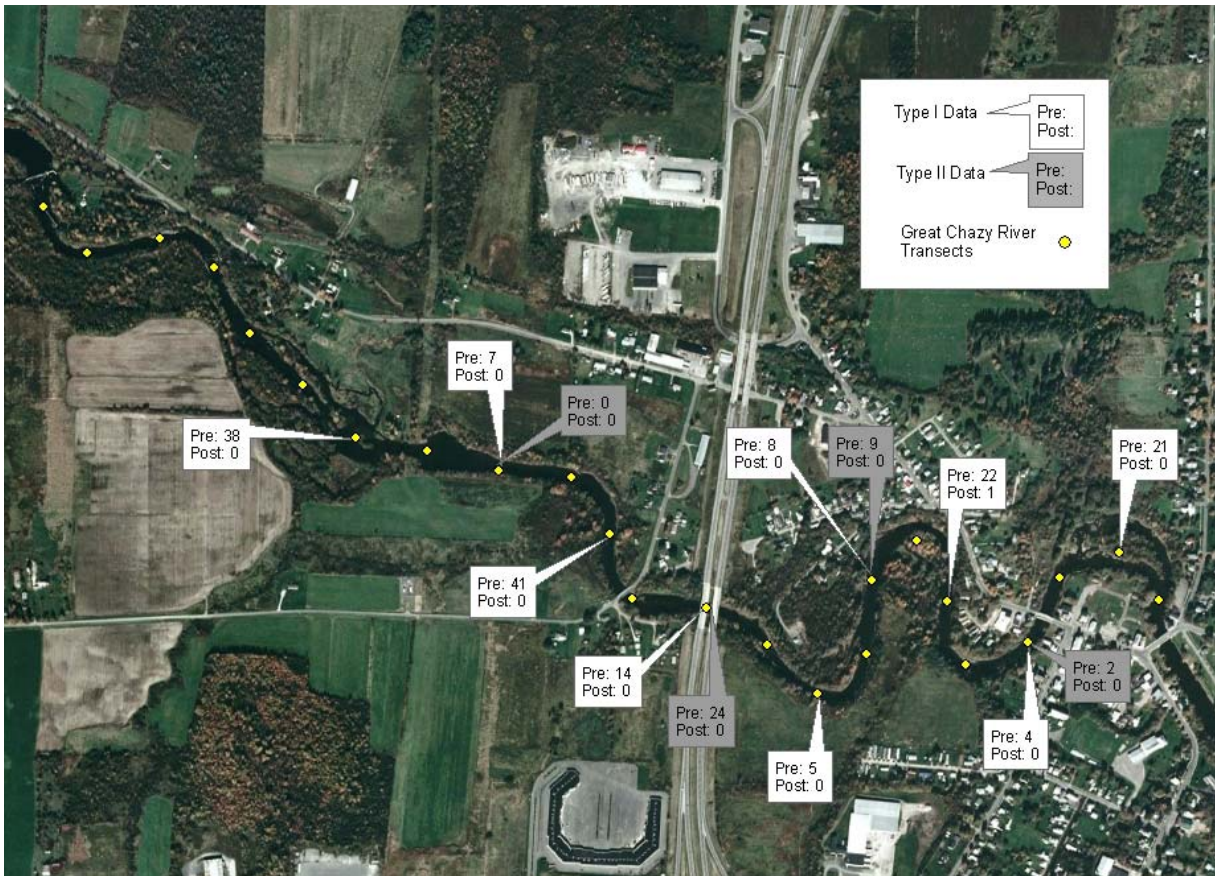


Figure 12. Great Chazy River, Reach 2 sampling locations and numbers of sea lamprey captured prior to and following a lampricide treatment in 2008. Pre-treatment data collected during the summer of 2007; post-treatment data collected during the summer of 2009.

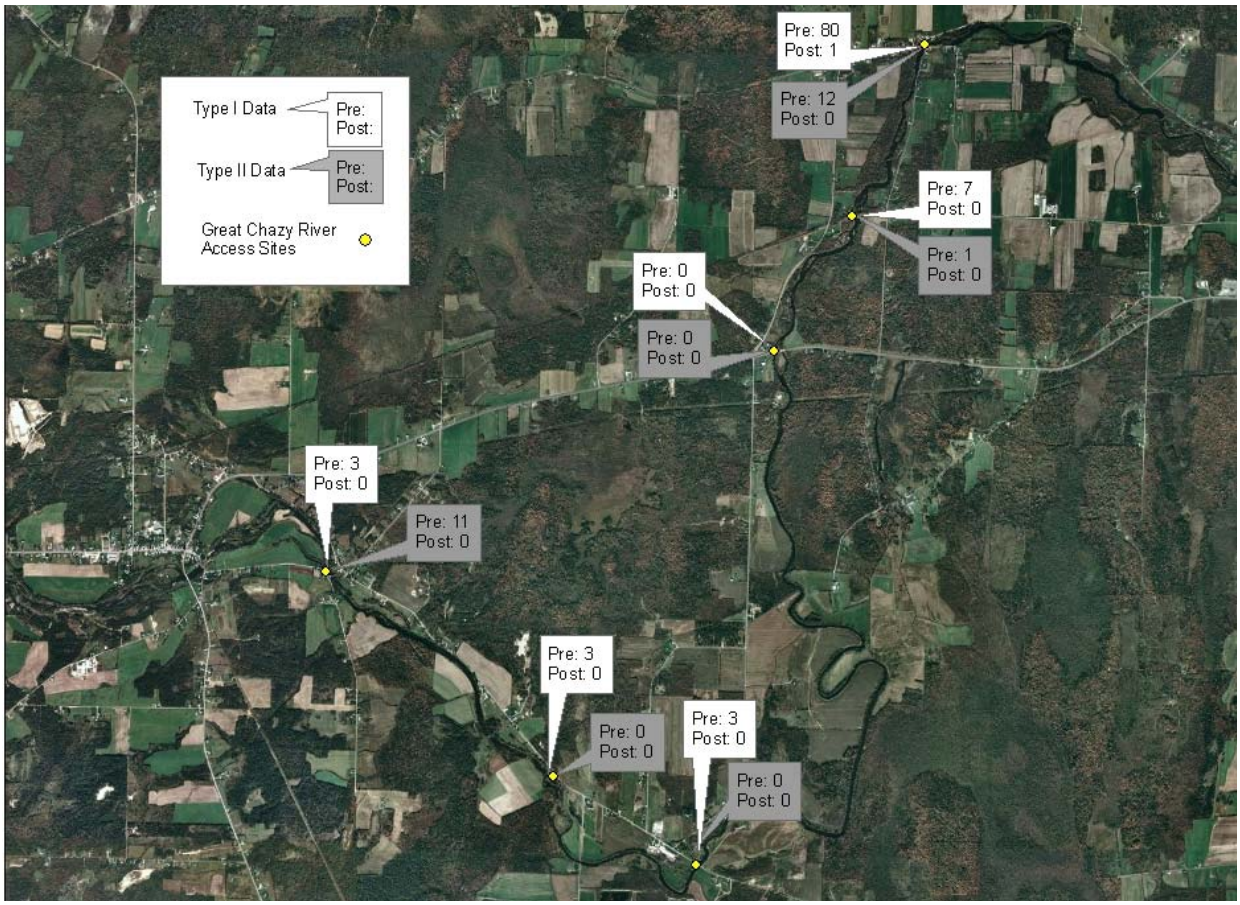


Figure 13. Great Chazy River, Reach 3 sampling locations and numbers of sea lamprey captured prior to and following a lampricide treatment in 2008. Pre-treatment data collected during the summer of 2007; post-treatment data collected during the summer of 2009.

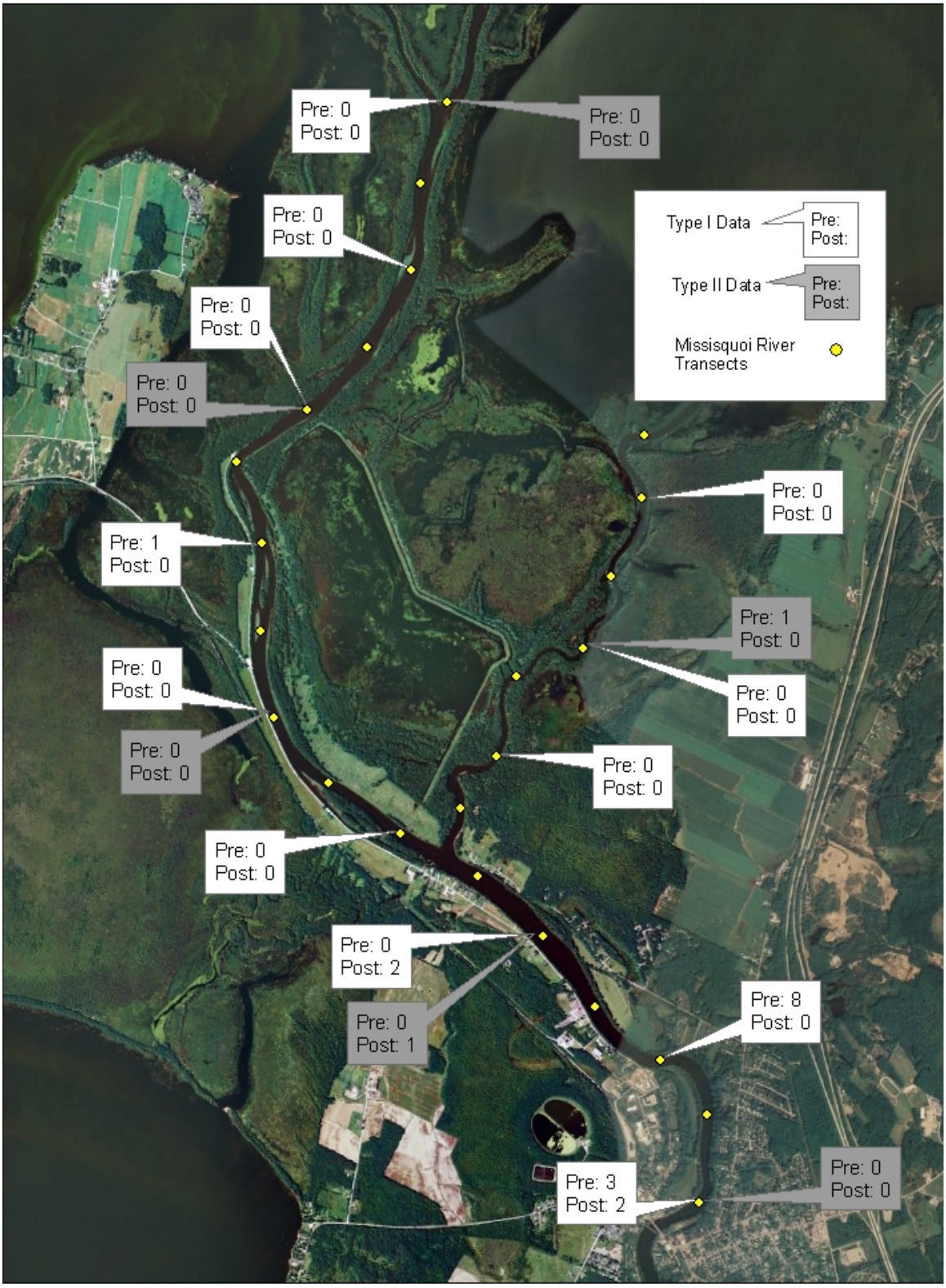


Figure 14. Missisquoi River sampling locations and numbers of sea lamprey captured prior to and following a lampricide treatment in 2008. Pre-treatment data collected during the summer of 2007; post-treatment data collected during the summer of 2009.

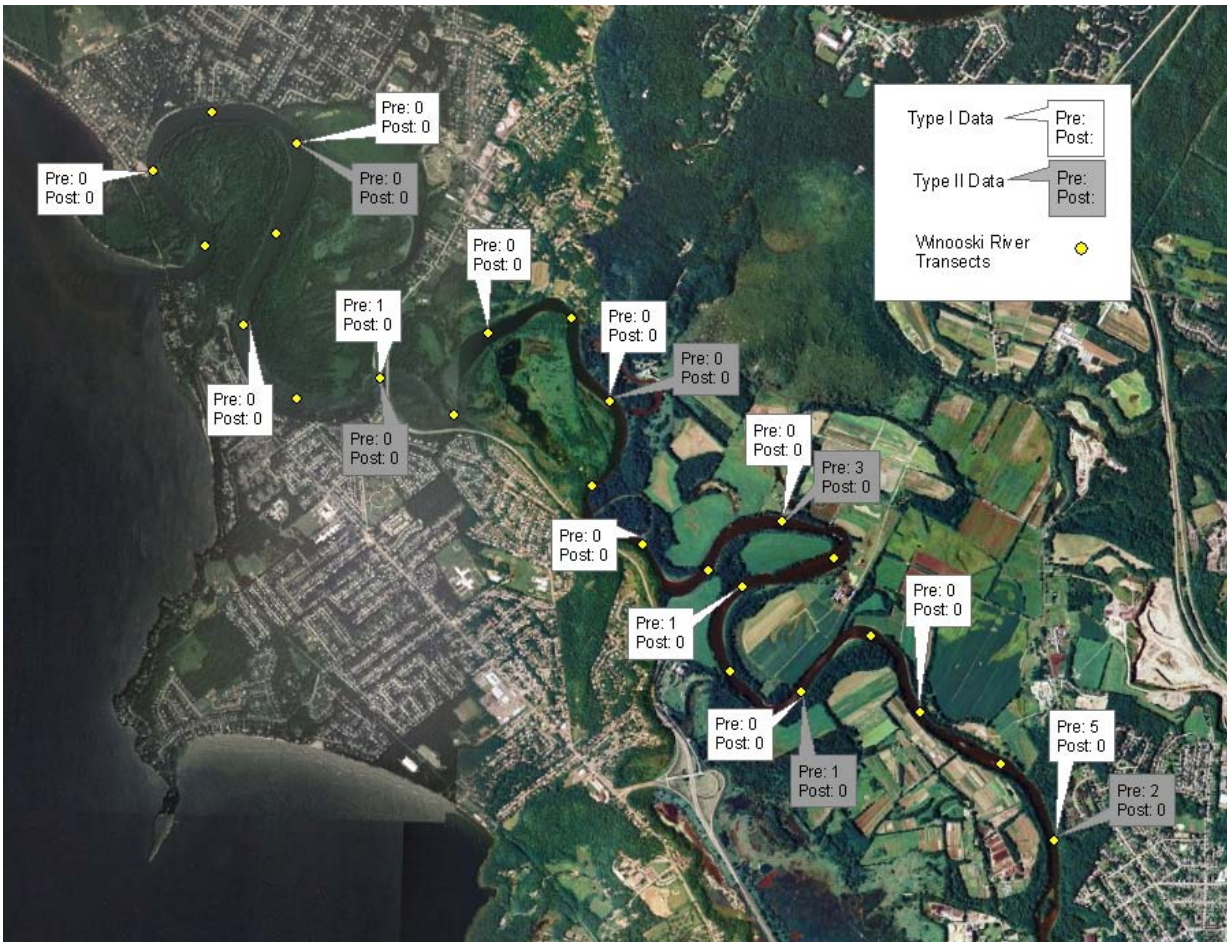


Figure 15. Winooski River, Reach 1 sampling locations and numbers of sea lamprey captured prior to and following a lampricide treatment in 2008. Pre-treatment data collected during the summer of 2007; post-treatment data collected during the summer of 2009.

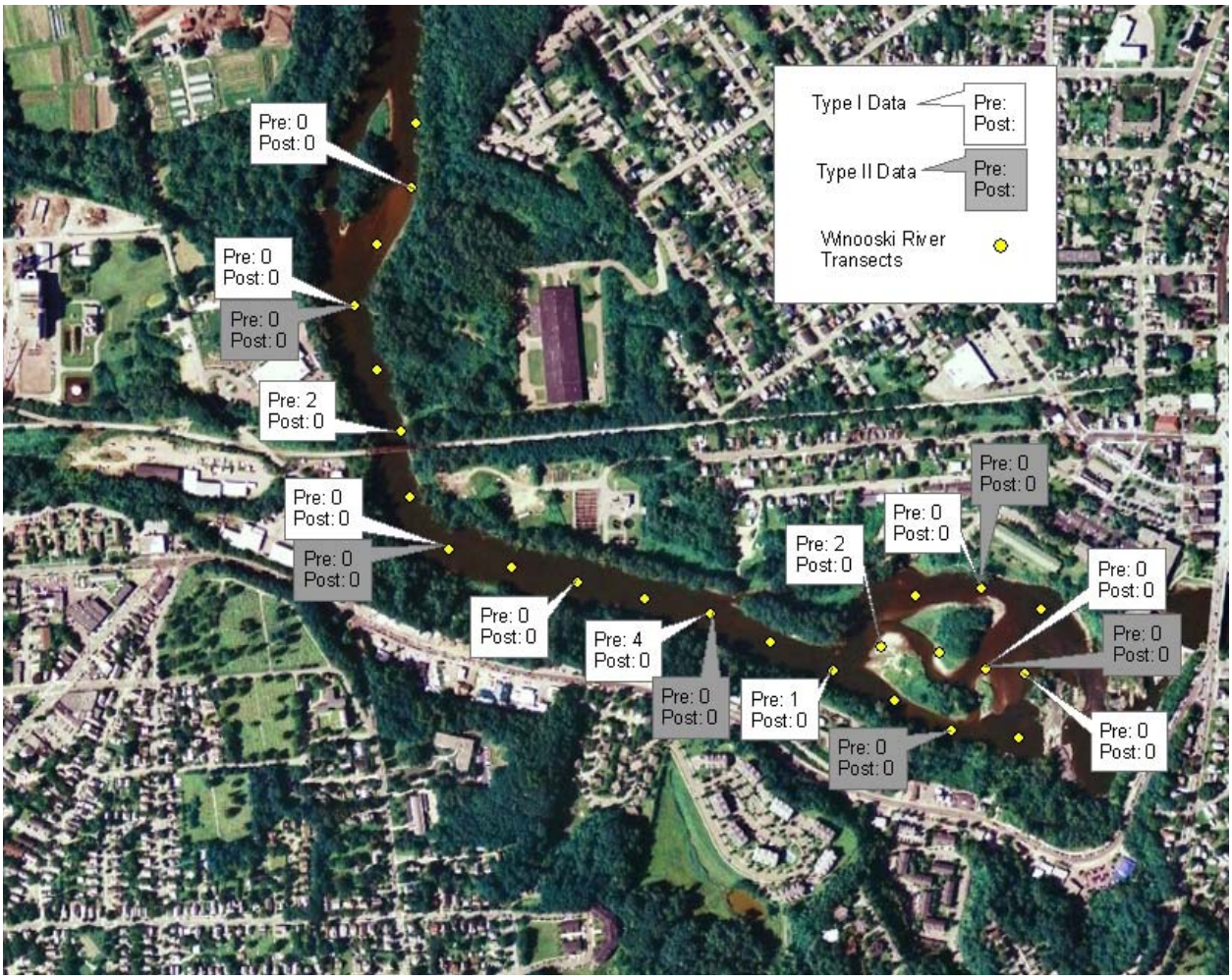


Figure 16. Winooski River, Reach 2 sampling locations and numbers of sea lamprey captured prior to and following a lampricide treatment in 2008. Pre-treatment data collected during the summer of 2007; post-treatment data collected during the summer of 2009.

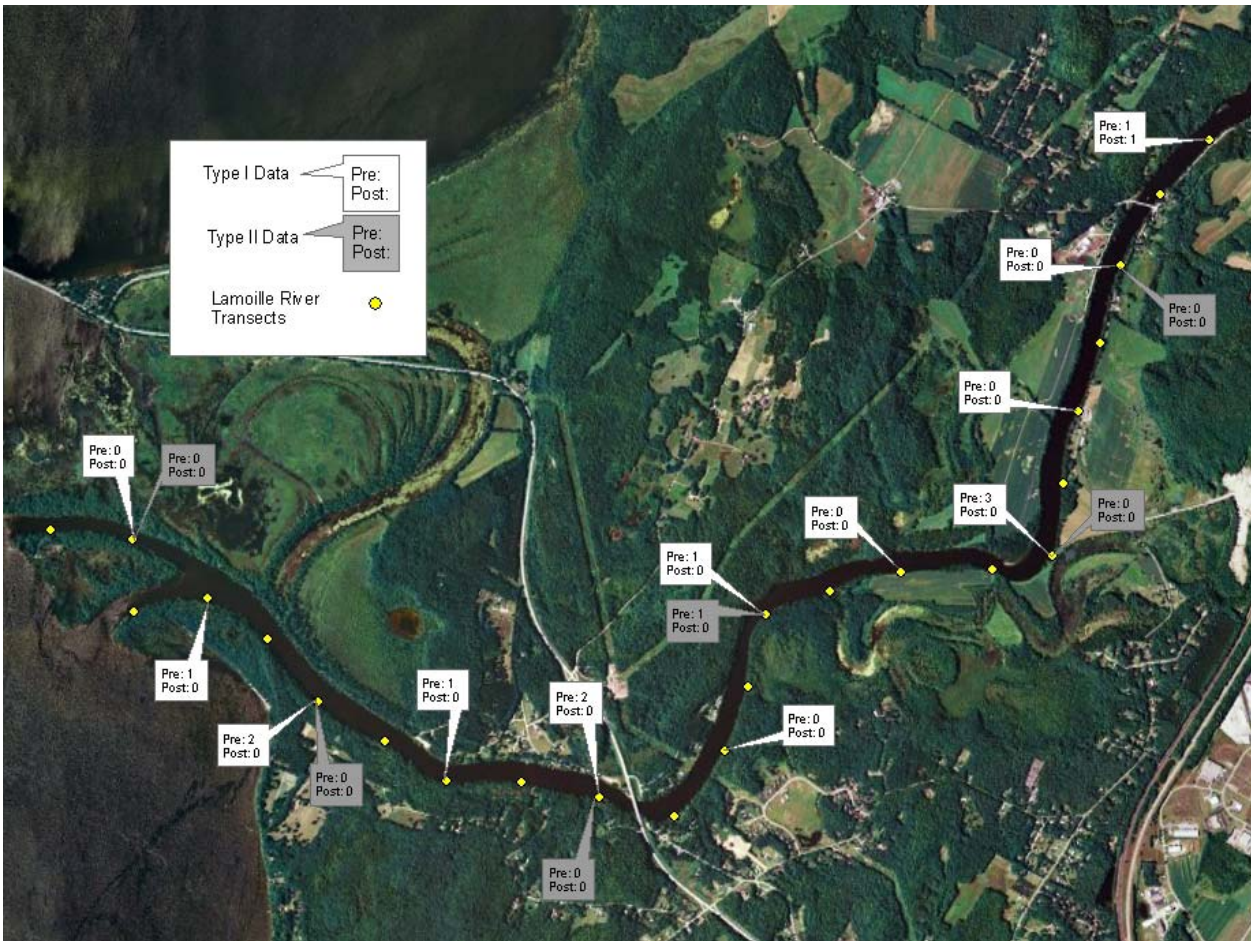


Figure 17. Lamoille River sampling locations and numbers of sea lamprey captured prior to and following a lampricide treatment in 2009. Pre-treatment data collected during the summer of 2005; post-treatment data collected during the fall of 2009.

2.4 Post-treatment mortality collections

Following TFM treatments in the state of Vermont, up to 20 dead lamprey from each even-numbered, QAS-corresponding transect are collected to determine the lamprey species composition. Collections were made on the Lamoille River (Figure 18; Table 5) following a lampricide treatment in the fall of 2009.

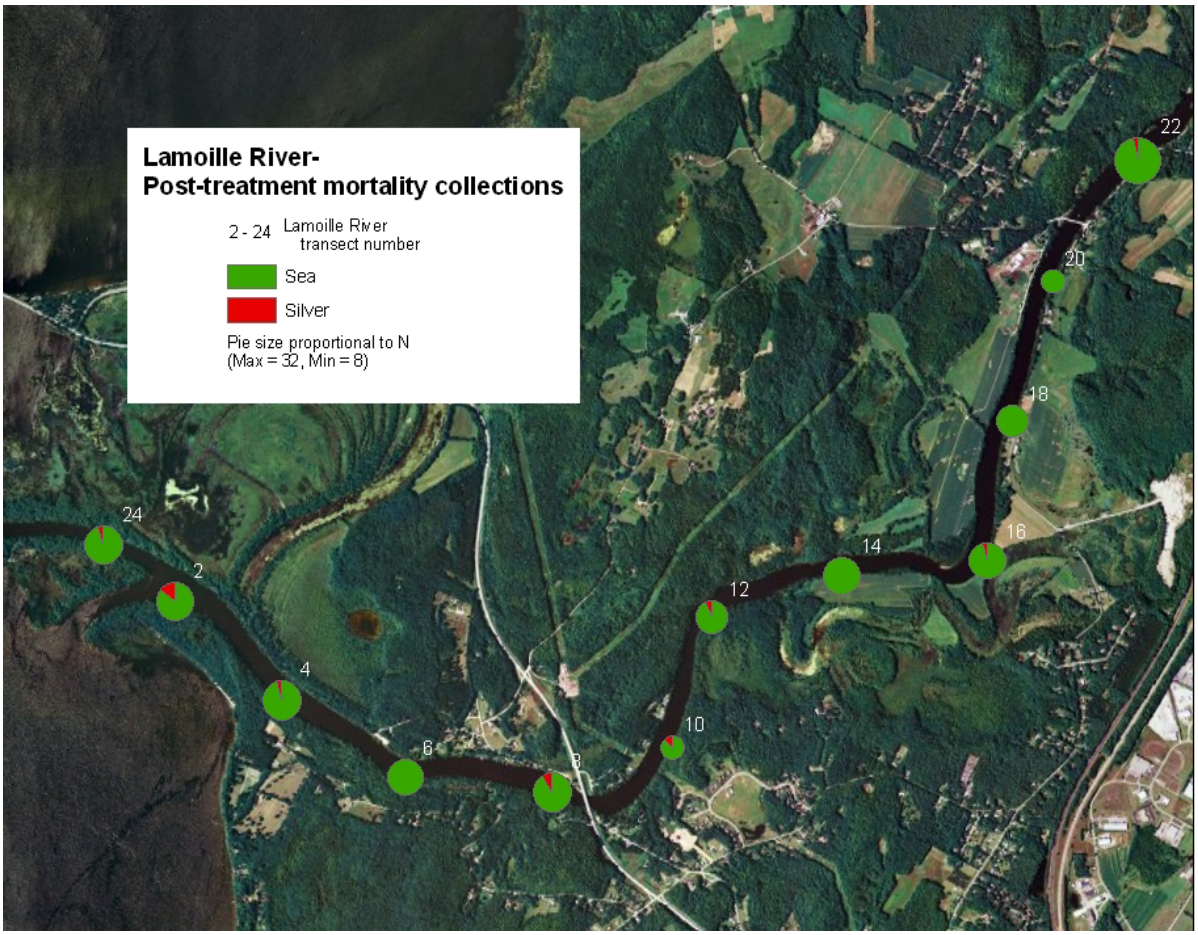


Figure 18. Proportion of sea and silver lamprey collected following lampricide treatment on the Lamoille River.

Table 5. Numbers of sea and silver lamprey collected following lampricide treatment on the Lamoille River.

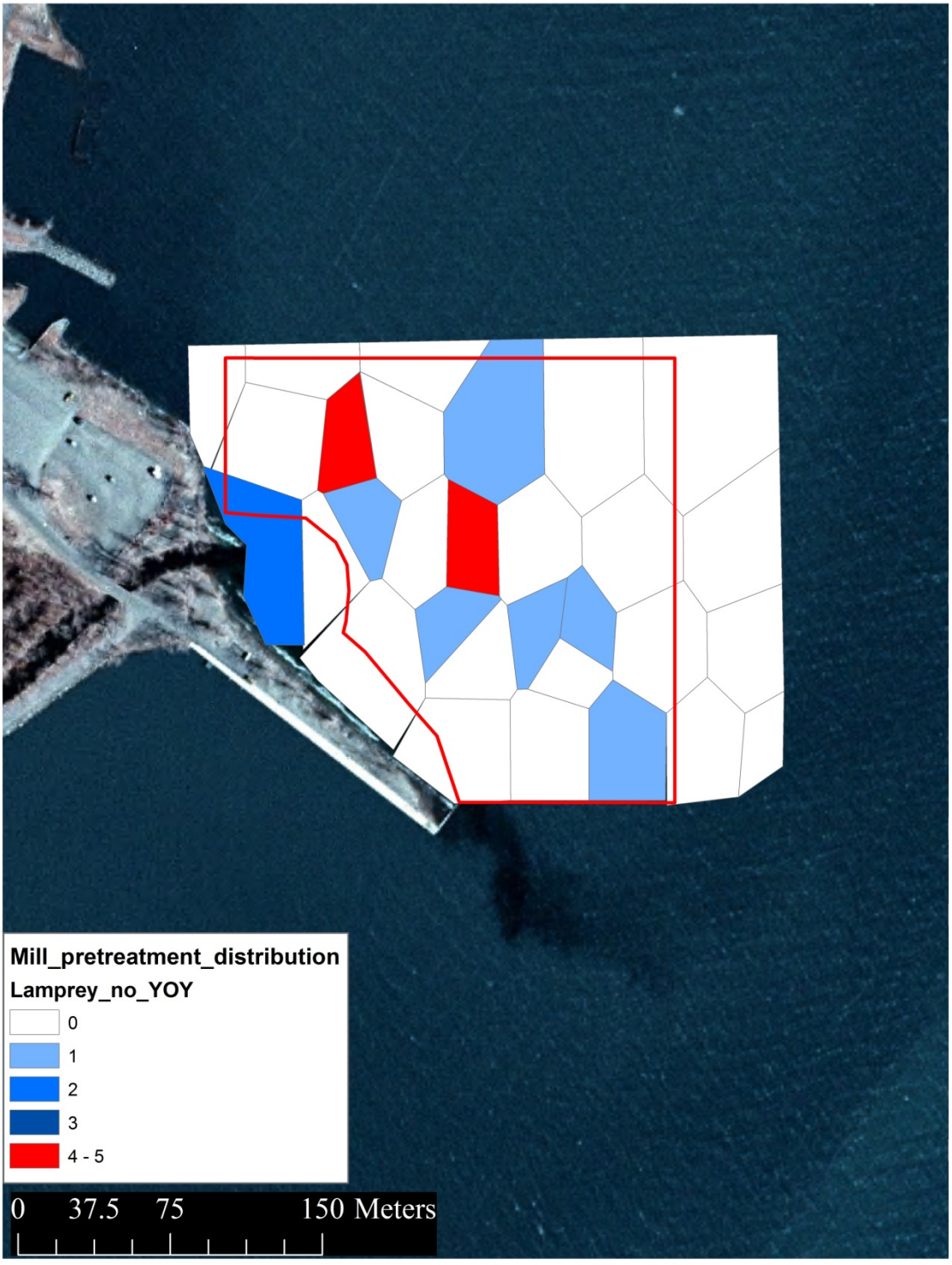
	Sea lamprey				Silver lamprey				
Transect	**Ammo**	**%**	**Trans**	**%**	**Ammo**	**%**	**Trans**	**%**	**Total**
2	18	86%	0	0%	2	10%	1	5%	21
4	22	96%	0	0%	1	4%	0	0%	23
6	19	95%	1	5%	0	0%	0	0%	20
8	21	91%	0	0%	2	9%	0	0%	23
10	7	88%	0	0%	0	0%	1	13%	8
12	15	94%	0	0%	1	6%	0	0%	16
14	21	100%	0	0%	0	0%	0	0%	21
16	19	95%	0	0%	1	5%	0	0%	20
18	15	100%	0	0%	0	0%	0	0%	15
20	8	100%	0	0%	0	0%	0	0%	8
22	31	97%	0	0%	1	3%	0	0%	32
24	20	95%	0	0%	1	5%	0	0%	21
Total	**216**	**95%**	**1**	**0%**	**9**	**4%**	**2**	**1%**	**228**

3.0 Larval Assessment – Deltas and Deepwater

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.

3.1 Deep-water post Bayluscide treatment surveys

In September of 2008, approximately 115 acres of the Saranac River delta, and approximately 9.5 acres of the Mill Brook delta were treated with granular Bayluscide to eliminate larval sea lamprey populations that were found to occur there. In 2009, a deepwater electrofishing survey was conducted over the treatment areas to determine treatment effectiveness. Assessment of treatment effectiveness is a critical component of a successful lamprey control program. Results of the post-treatment survey are found in Figures 11 and 12. The post-treatment survey resulted in the collection of 18 larvae on the Mill Brook delta and 32 larvae on the Saranac delta in the areas that were treated in 2008. The size structure of the collected animals suggests that the majority of these larvae (16 of 18 on Mill and 32 of 32 on Saranac) are young of year or one-year old larvae which would have been young-of-year in 2008. This year class (2008) may well have emigrated from the river out onto the delta following the treatment in 2008. We compared the length frequency of the larvae collected after treatment with the length frequency of the larvae collected before and during the treatment to illustrate this idea. (Figure 13 and 14).


Mill_pretreatment_distribution
Lamprey_no_YOY
0
1
2
3
4 - 5
0 37.5 75 150 Meters

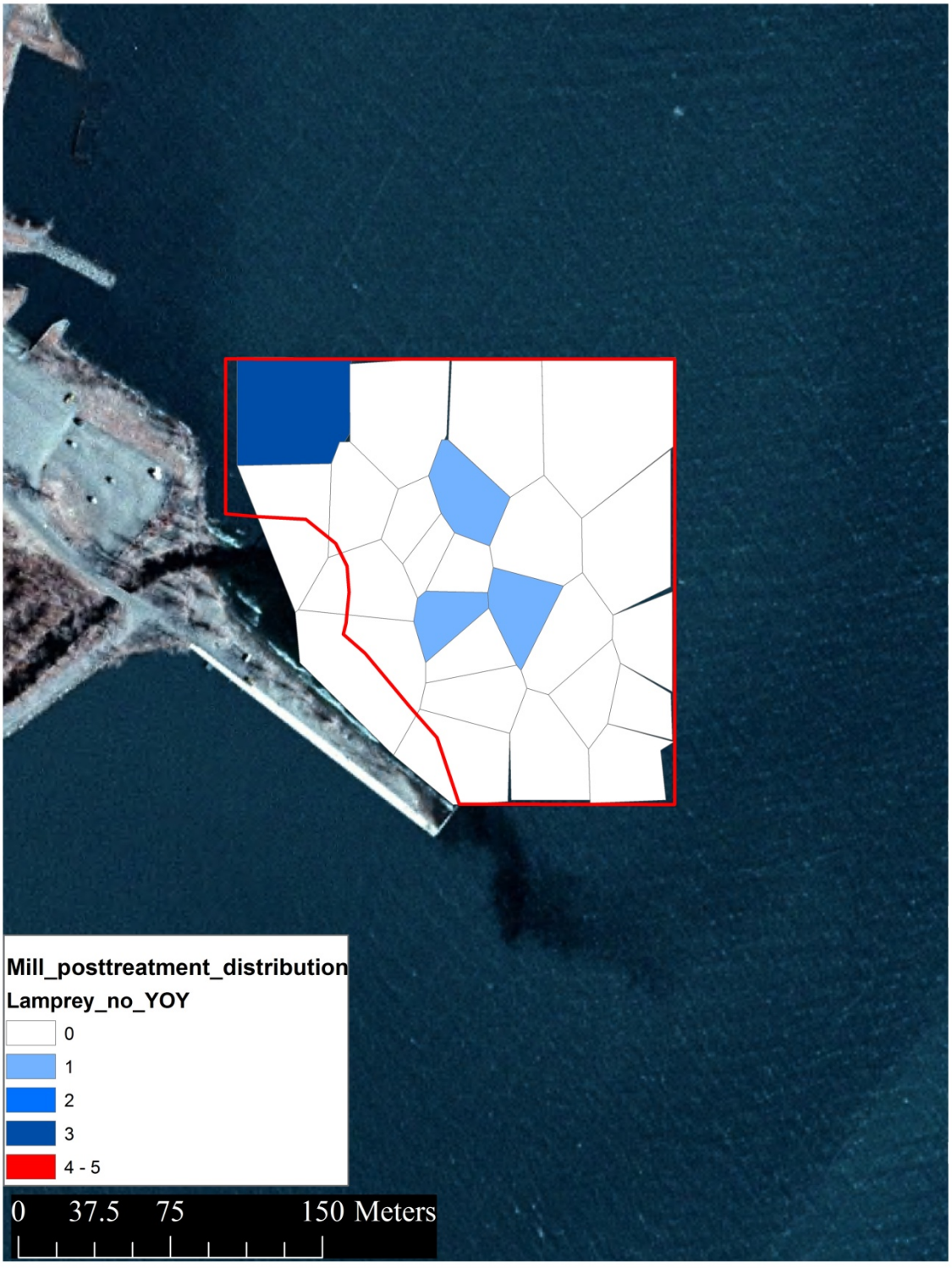


Figure 11. Deep-water electrofishing sample locations and number of lamprey captured on the Mill Brook Delta before and after treatment with Bayluscide, red line indicates the zone that was treated. Only lamprey age 1+ included.

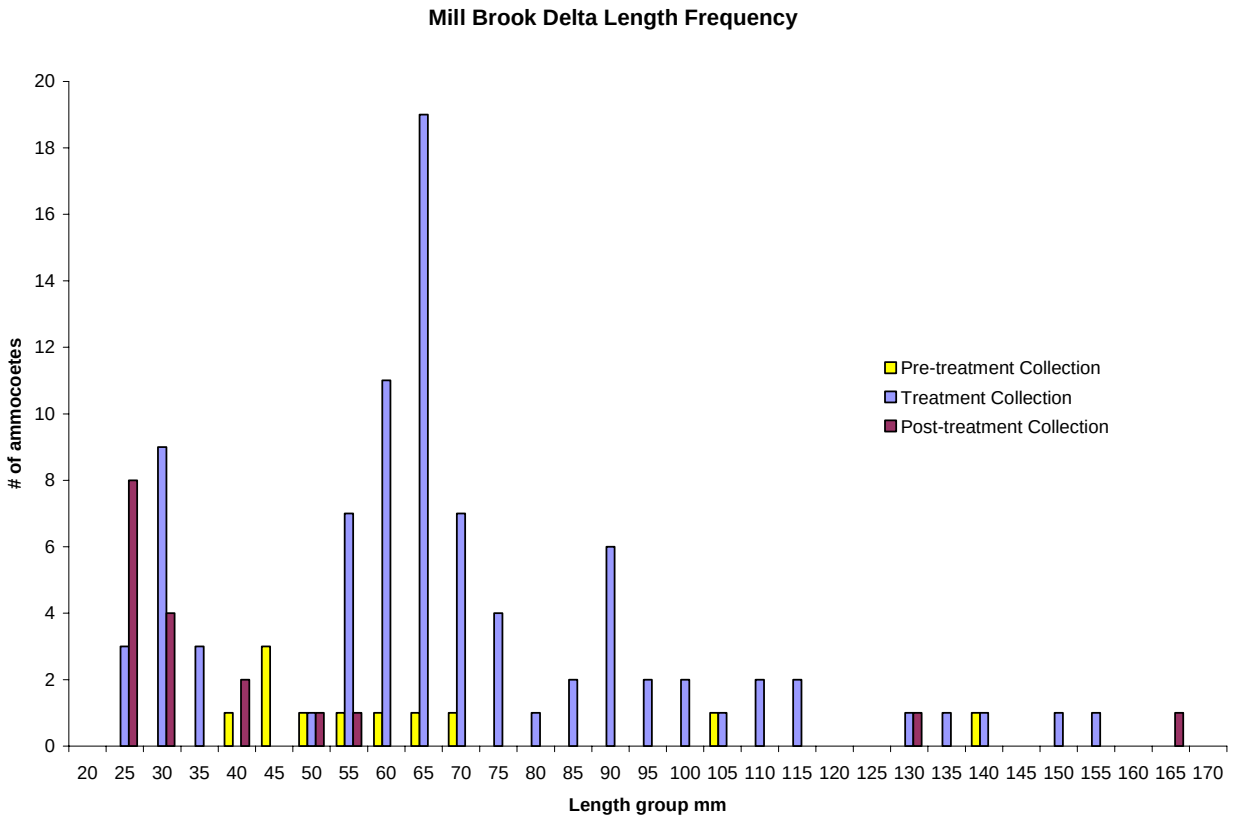


Figure 12. Pre and Post-Bayluscide treatment deepwater electrofishing lamprey collections on the Mill Brook delta.

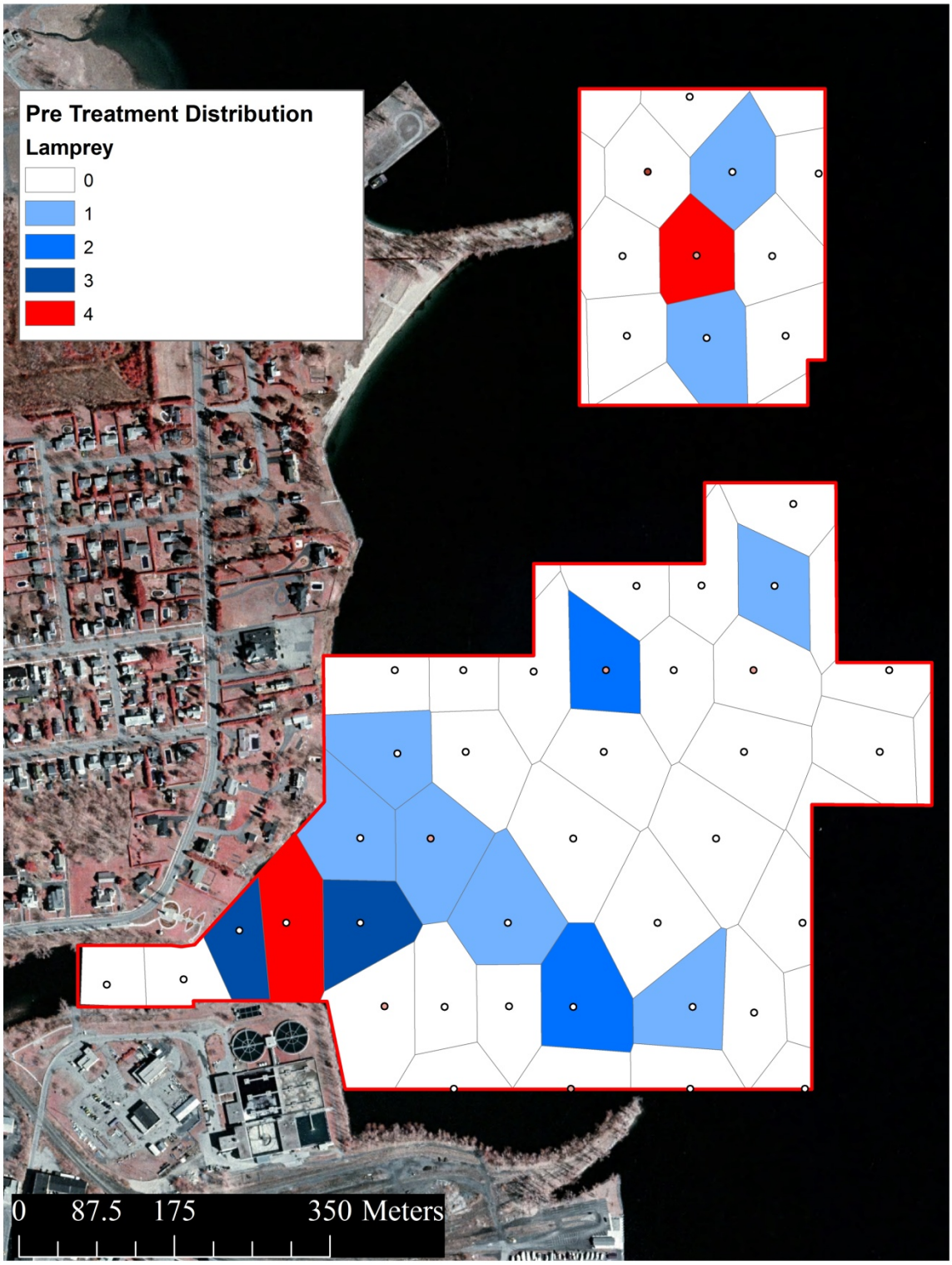


Figure 13A. Deep-water electrofishing sample locations and number of lamprey captured on the Saranac River Delta **before** treatment with Bayluscide, red line indicates the zone that was treated. Only lamprey age 1+ included.

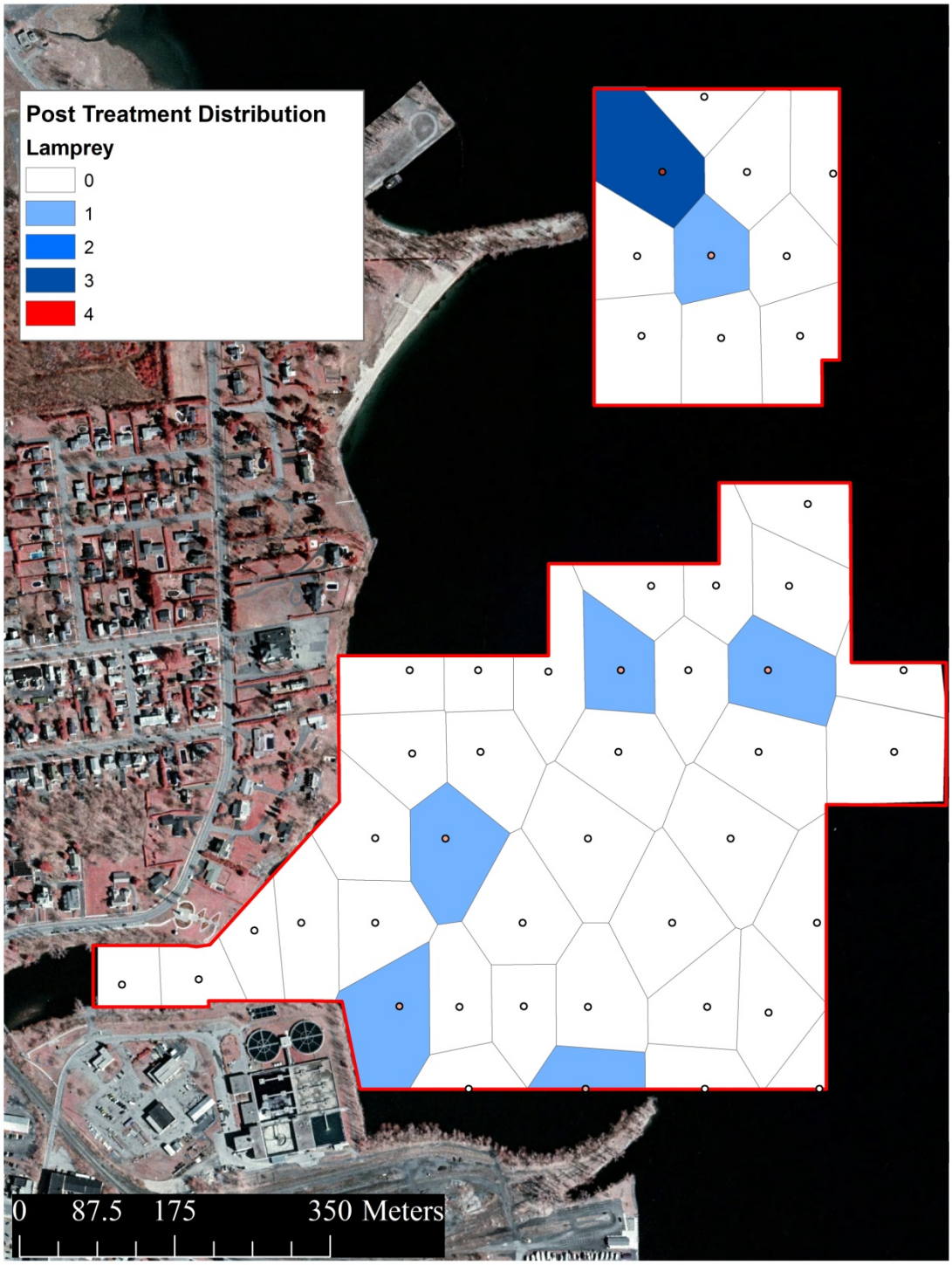


Figure 13B. Deep-water electrofishing sample locations and number of lamprey captured on the Saranac River Delta **after** treatment with Bayluscide, red line indicates the zone that was treated. Only lamprey age 1+ included.

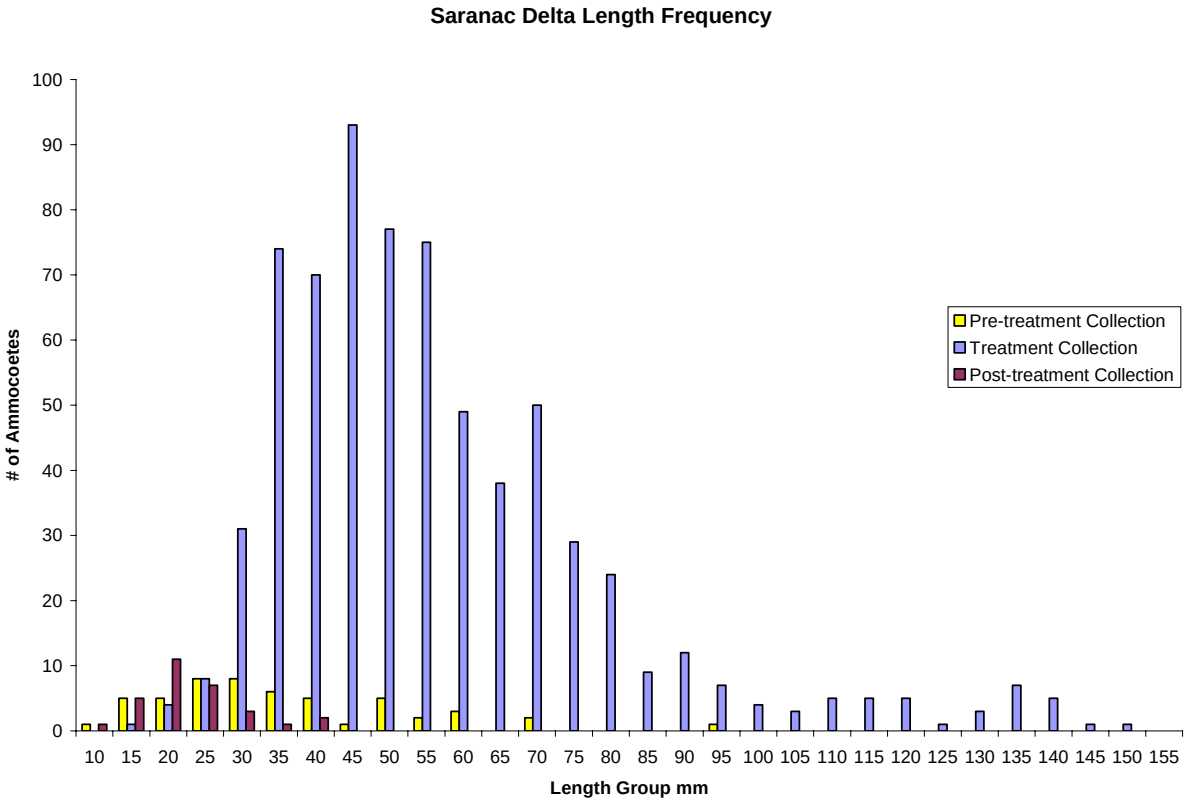


Figure 14. Pre and Post-Bayluscide treatment deepwater electrofishing lamprey collections on the Saranac River delta.