Lake Champlain Sea Lamprey Assessment Program

Results of Sea Lamprey Assessment Activities 2006

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Summary

Sea lamprey assessment activities conducted during the spring and summer of 2006 included the trapping of migrating adult sea lamprey and electrofishing surveys of larval populations. Traps were installed on seven streams during the spawning migration to limit their reproduction in these tributaries. Trapping of migratory phase sea lamprey was identified as a primary control method for seven streams and as part of an integrated approach on one stream in the supplemental EIS. A trap was also set in Beaver Brook, New York for the third consecutive year to evaluate the potential of using traps to control larval populations in this stream where lampricide treatments have been known to be problematic. Electrofishing surveys were conducted on a total of 11 streams. Three of those streams are scheduled for lampricide treatment in the fall of 2006. The Poultney and Hubbardton Rivers were also surveyed in preparation for a potential 2007 lampricide treatment, depending on the results of wounding rate assessments. Five streams were surveyed following lampricide treatments in the fall of 2006 to determine treatment effectiveness. One stream was surveyed to assess the effectiveness of continued trapping operations. Sea lamprey larvae were also collected for bioassay tests conducted prior to lampricide treatments conducted in 2006.

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 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 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 their 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 six streams during the spring of 2006 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. Sea lamprey were removed from the traps every 2-4 days. Non-target species captured were identified, recorded, and released. Any mortalities were recorded and reported to state permitting agencies.

Streams where traps were deployed included five streams in Vermont where trapping was identified as the primary control method in the supplemental EIS (Figure 1). A trap was set in Beaver Brook, Westport, NY, for a third year, to evaluate the feasibility of using

traps to control the larval population there. Beaver Brook has been problematic for lampricide treatments due to low discharge and the perceived low number of lamprey killed per cost of treatment. Results of trapping operations are listed in Table 1.

Table 1. Results of migratory phase sea lamprey trapping 2006.

Stream	Date Set	Date Pulled	# Lamprey Caught	% change from '05
Sunderland Brook	5/5/2006	6/12/2006	5	60.00%
Pond Brook	5/5/2006	6/14/2006	0	0.00%
Malletts Creek	4/17/2006	6/19/2006	143	-4.20%
Trout Brook	4/12/2006	6/12/2006	48	22.92%
Stone Bridge	4/12/2006	6/7/2006	69	52.17%
G. Chazy	4/28/2006	6/14/2006	212	9.43%
Beaver Brook	4/10/2006	6/23/2006	117	-20.51%

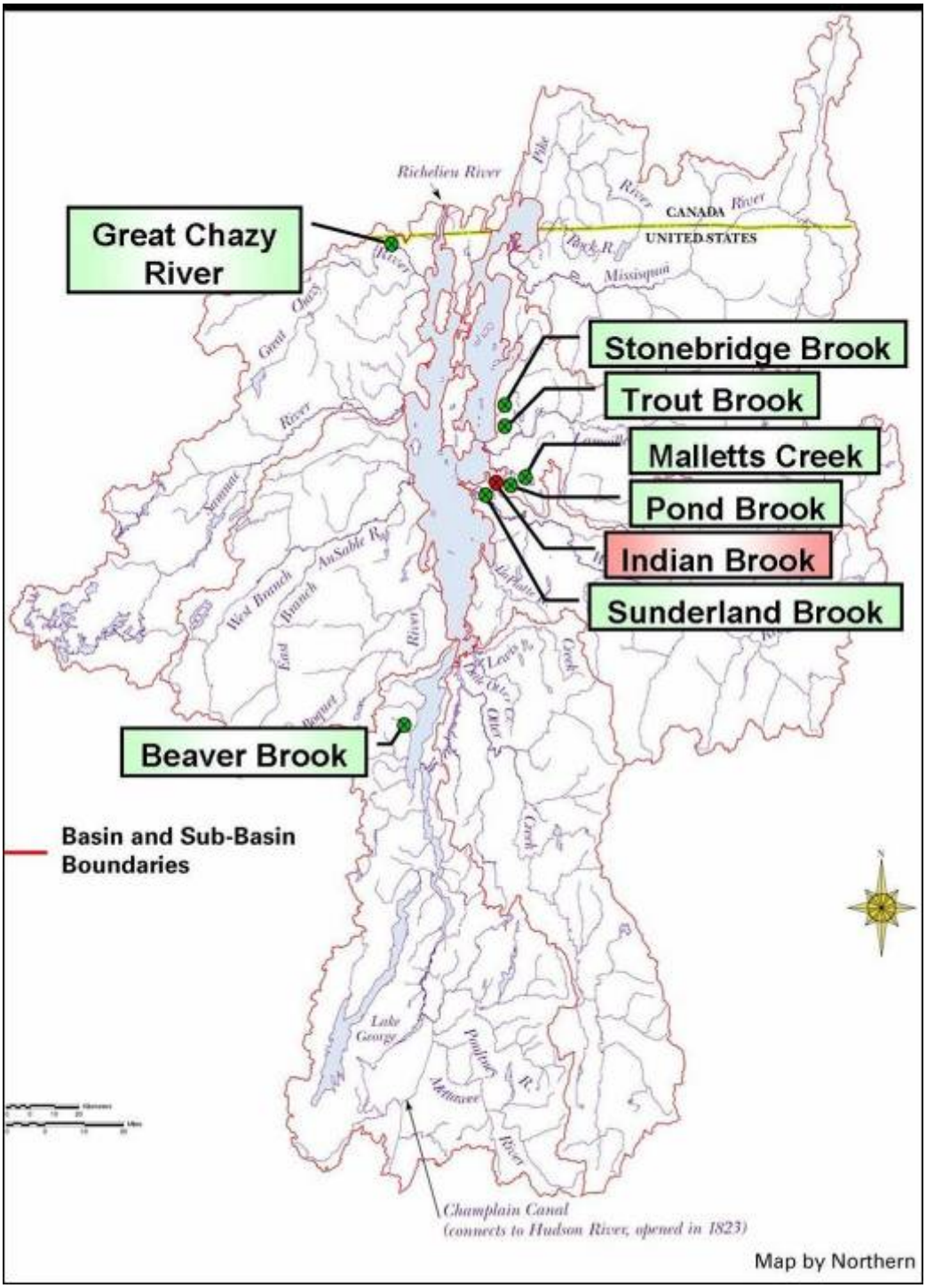

Figure 1. Location of trapping sites operated during the spring of 2006 to capture migrating adult sea lamprey. Green points continued to be trapped while red points were removed from trapping program.

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. Two traps were set in the Boquet River fishway in the town of Willsboro, NY to determine if sea lamprey are able to negotiate the falls immediately downstream of the dam. No sea lamprey were captured. This does not definitively prove that lamprey are unable pass this natural barrier, but the lack of any captured adults in a river with a sizable spawning population suggests limited if any movement above the falls. Additional trapping may be conducted in 2007 to satisfy concerns about movement above the falls.

1.3 Providing lampreys to researchers

Lamprey that are trapped are either killed on site, or more frequently, given to researchers. In 2006, the USFWS coordinated with both Dr. Réjean Dubuc of the Univesity of Montreal and Dr. Donna Parrish of the USGS Cooperative Fish and Wildlife Research Unit at the University of Vermont to provide them with sea lampreys. Dr. Dubuc received about 120 adults from the Great Chazy River to conduct neuro-biology research related to lamprey locomotion during the final stages of life. Dr. Parrish received over 100 lampreys from a variety of the trapped streams for use in pheromone research designed to develop methods for attracting spawning adults into traps and away from mates.

2.0 Larval Assessment

Larval populations are assessed by determining distribution throughout the basin and within streams and by estimating population sizes 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. Streams being monitored for signs of new colonization are sampled using a detection protocol designed to locate larvae in areas they are most probable to inhabit. Larval assessment is also done to verify the effectiveness our adult trapping program. Surveys are done below our trapping sites to determine how many (if any) larvae were produced by spawning sea lamprey despite our trapping efforts. If larval populations are being suppressed at acceptable levels, trapping is continued. If larval populations are unacceptably high, alternative methods to trapping are considered. Transformers are not true larvae, but they are the last phase of the stream resident portion of their life history. Transformers are found in uncontrolled streams and as "residuals" in streams where control methods are not 100% effective. Occasionally, we set traps to determine whether transformers are emigrating from streams scheduled for treatment with lampricide, prior to the treatment date.

2.1 Quantitative assessment sampling

Larval sea lamprey populations were surveyed in five tributaries during the summer of 2006 in preparation for lampricide treatments scheduled for the fall of 2007 (Table 2). These surveys are needed to confirm the need for treatment and to help determine the contribution of a stream to the Lake Champlain lamprey population.

In New York, the Boquet River (Figure 2), and Beaver Brook (Figure 3) were surveyed. In Vermont the Poultney River (Figures 4 and 5) and Hubbardton River (Figure 6) were surveyed in preparation for a 2007 lampricide treatment. The LaPlatte River (Figure 7) was surveyed to obtain data necessary to proceed with the plans for a sea lamprey barrier which, because of the presence of stonecats (VT state listed species), is the only form of control currently feasible.

Table 2. Results of quantitative assessment surveys conducted for baseline data for 2006 lampricide treatments.

Stream	Population Estimate-Ammocoetes	Population Estimate-Transformers
Boquet River	3,446	0
LaPlatte River	1,399	0
Beaver Brook	3,398	0
Hubbardton River	8,850	0
Poultney River- Reach 1	66,335	2,456
Poultney River- Reach 2	96,364	1,438

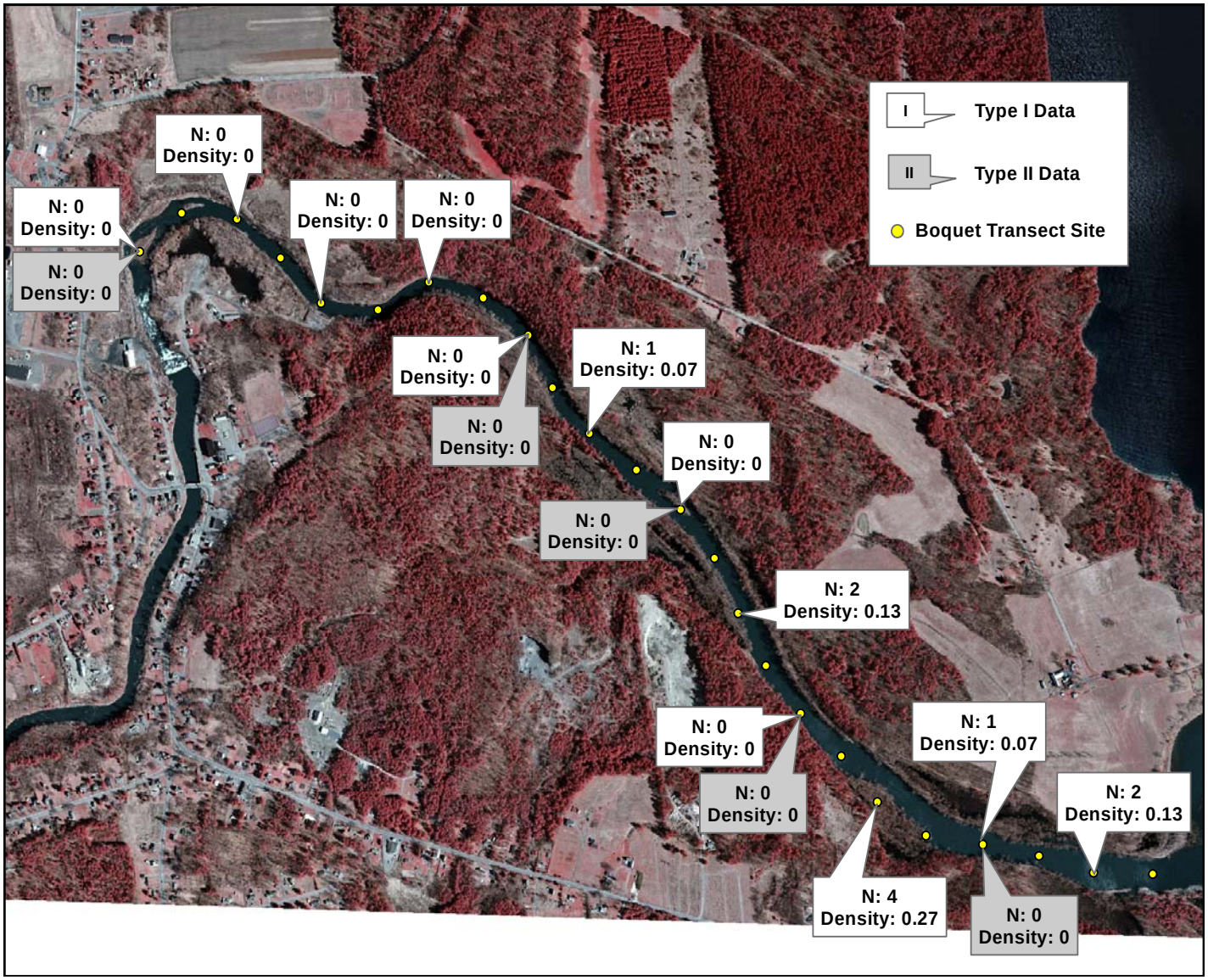

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Figure 2. Boquet River sampling locations, number of sea lamprey collected and density (larvae/m²) in type I and Type II habitats.

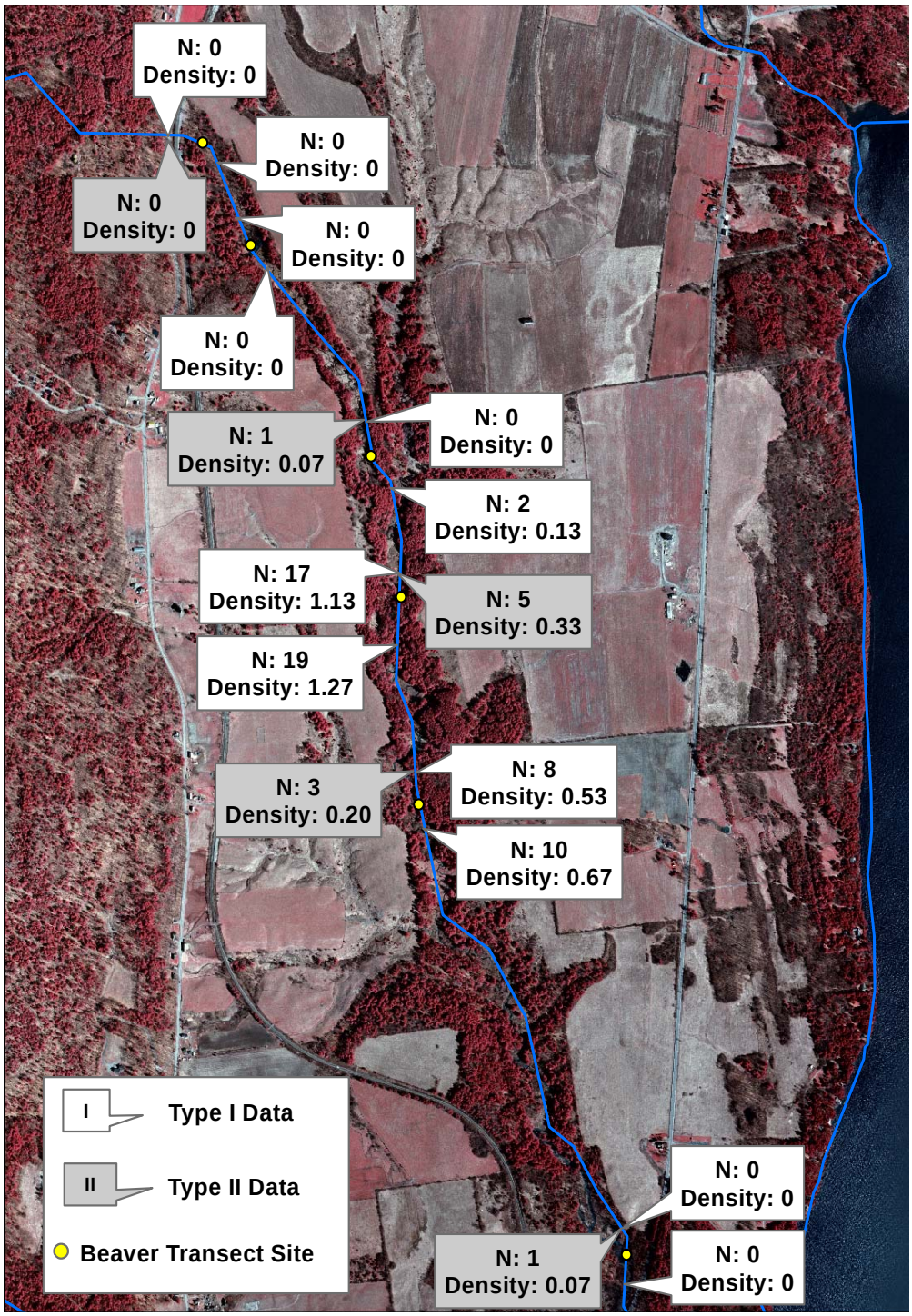


Figure 3. Beaver Brook sampling locations, number of sea lamprey collected and density (larvae/m²) in type I and Type II habitats.

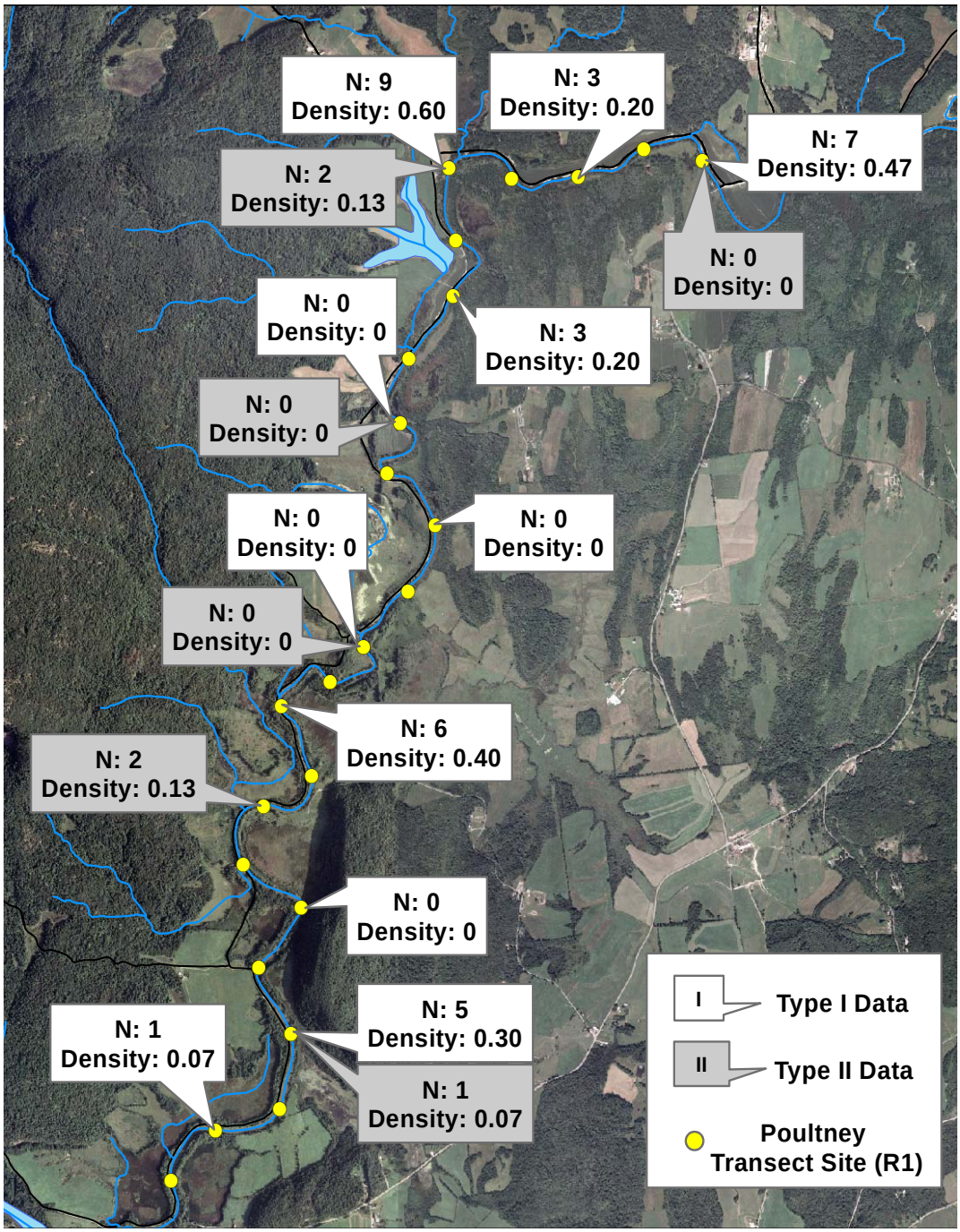


Figure 4. Poultney River, Reach 1 (East Bay Bridge to Coggmann Bridge), sampling locations number of sea lamprey collected and density (larvae/m²) in type I and Type II habitats.

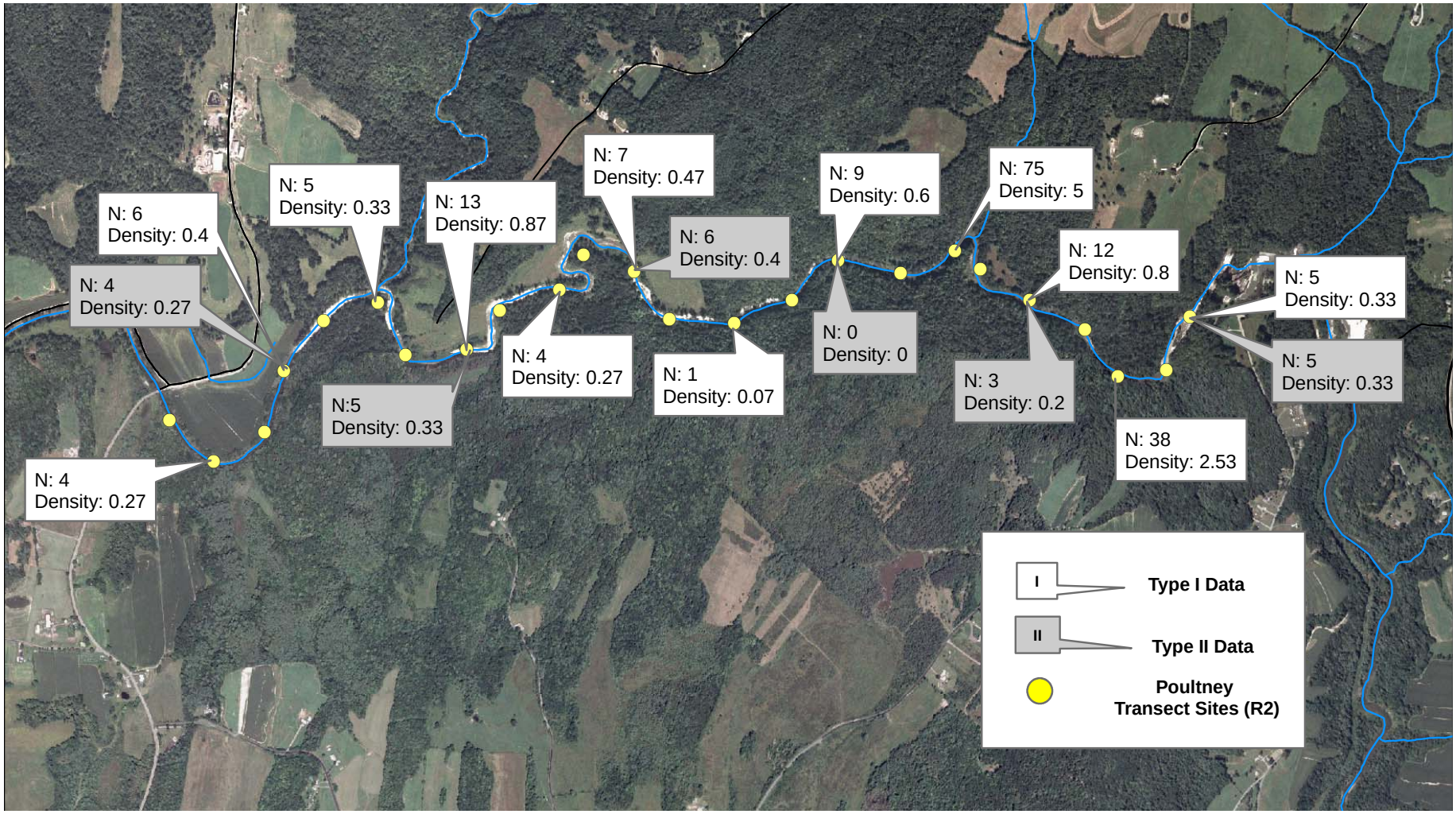


Figure 5. Poultney River, Reach 2 (Coggmann Bridge to Carver's Falls), sampling locations number of sea lamprey collected and density (larvae/m²) in type I and Type II habitats.

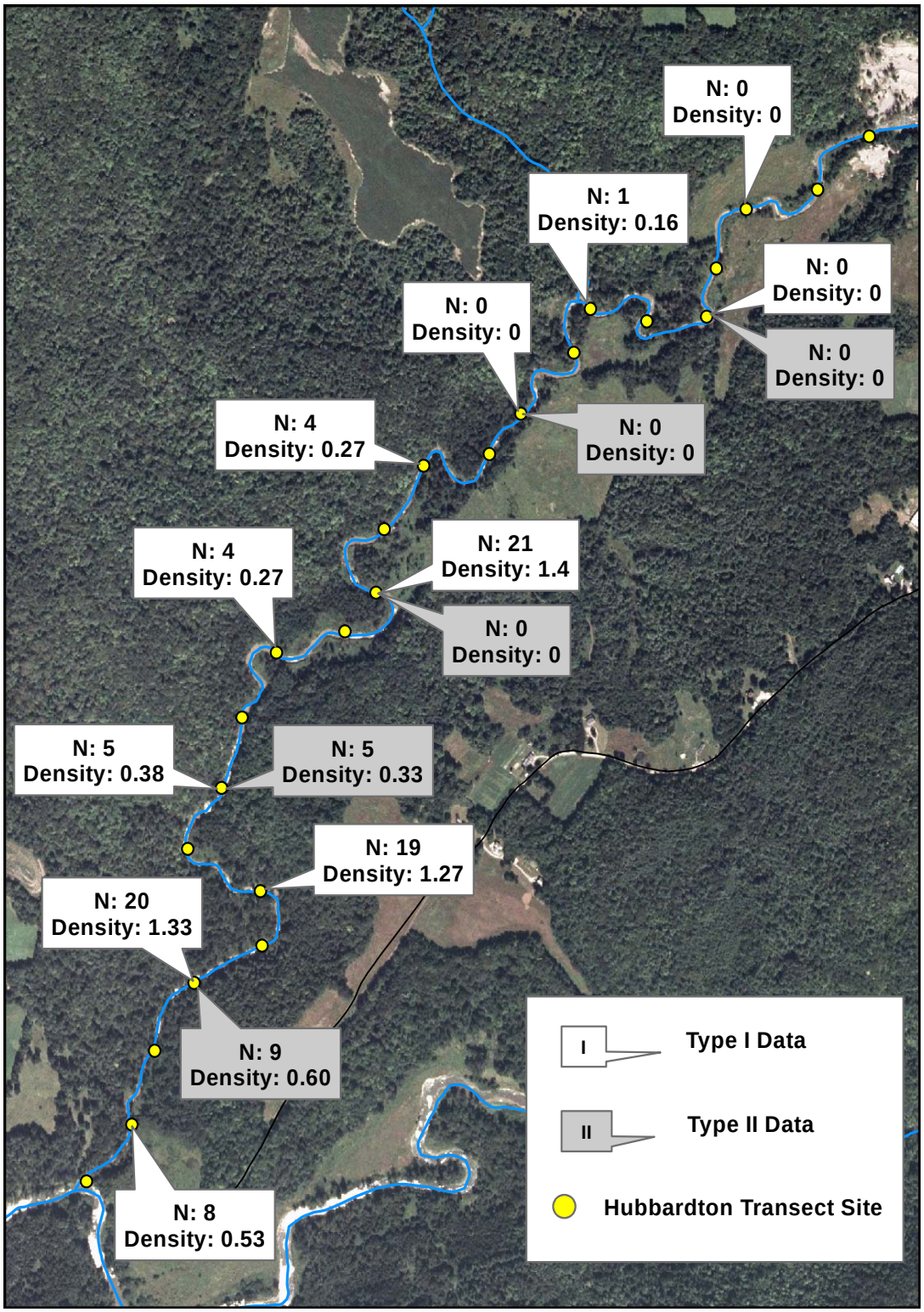


Figure 6. Hubbardton River sampling locations, number of sea lamprey collected and density (larvae/m²) in type I and Type II habitats.

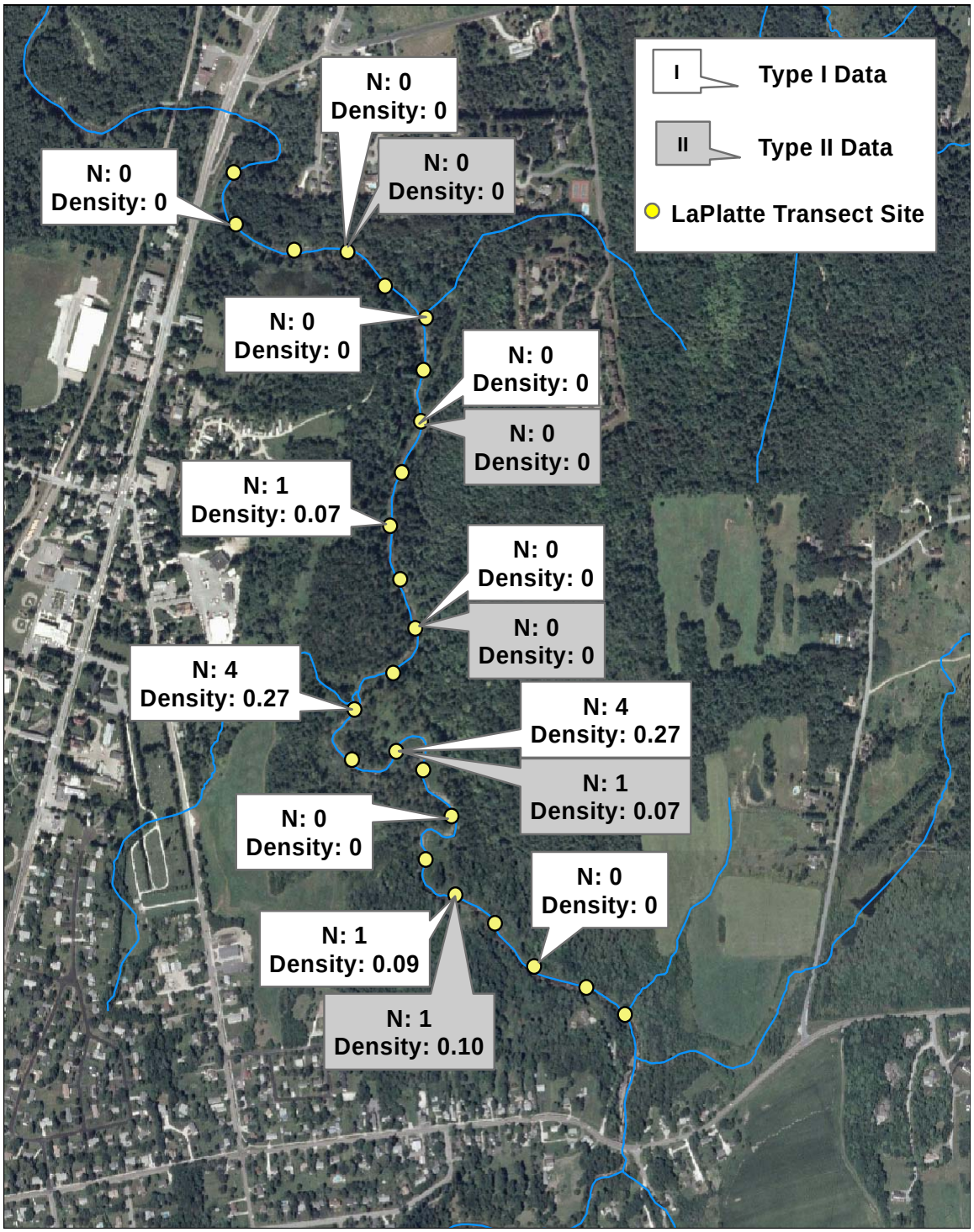


Figure 7. LaPlatte River sampling locations, number of sea lamprey collected and density (larvae/m²) in type I and Type II habitats.

2.2 Detection sampling

Qualitative sampling (Presence/Absence)-

Great Chazy River- Sampling above the sea lamprey barrier was conducted to determine if sea lamprey continue to penetrate the barrier. Two sites were sampled where historically high abundances of sea lamprey larvae were captured during the previous QAS. No sea lamprey larvae were found.

Youngman Brook- 3 sites were sampled to determine if sea lamprey were present. No sea lamprey were observed.

Little Chazy- 2 sites were sampled to determine if sea lamprey were present. No sea lamprey were observed.

Little Otter Creek- Little Otter Creek was sampled below the falls which is the barrier to sea lamprey migration to determine if any sea lamprey larvae were present. Approximately 30 m^2 was sampled and no sea lamprey larvae were observed.

2.3 Verification of trapping program

A detection survey was conducted on Stone Bridge Brook, Vermont, where trapping has been an ongoing effort since the inception of the experimental program in 1990. Stone Bridge Brook received a lampricide application in 1991 as part of the experimental program. Since then, trapping has prevented the reestablishment of larval sea lamprey populations as documented by repeated sampling efforts. In 2006, a detection survey of all available habitat from the trapping site at Bee Bee Hill Rd. to the mouth, confirmed the continued absence of sea lamprey larvae.

2.4 Transformer emigration

One of the several concerns we have with our control program is whether our fall treatment schedule allows transformers to emigrate from the streams prior to being treated. To assess this potential problem, we set trap nets in Lewis Creek from September 1st through September 22nd. Trapping right up until the treatment date (October 4th) would have been preferable, but was not possible with commitments to the NY treatments during this time.

During this period, no substantial precipitation events occurred and the traps remained fairly free of debris. They nets were checked and cleaned every other day (M,W,F) or sometimes more often. During this period no lamprey were collected in the nets. This sampling was inadequate to answer the question of whether transformer emigration is a significant problem prior to treatments, but it at the least shows that large numbers of transformers are not leaving Lewis Creek in the weeks preceding a treatment.

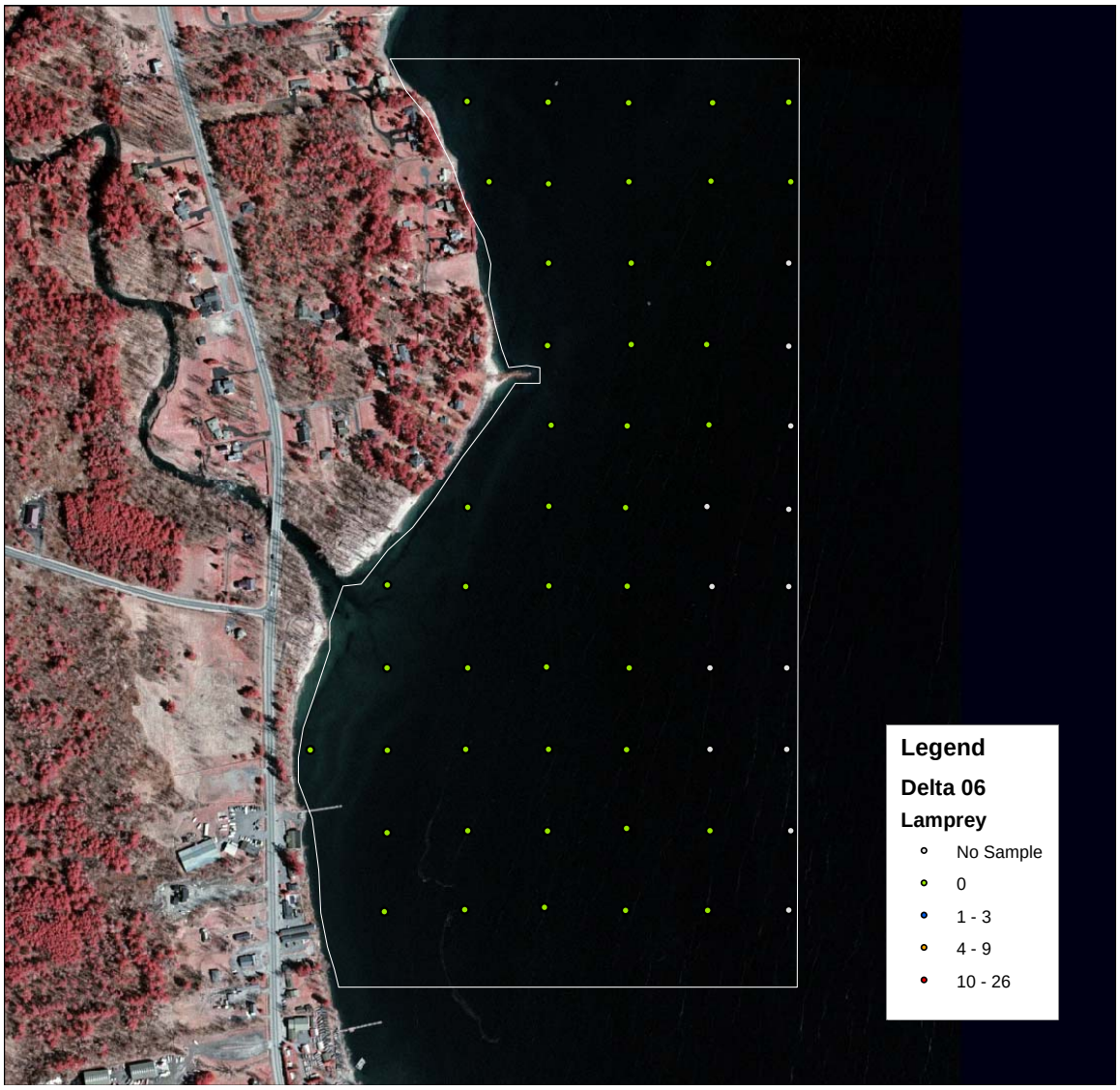
3.0 Larval Assessment – Deltas and Deepwater

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.

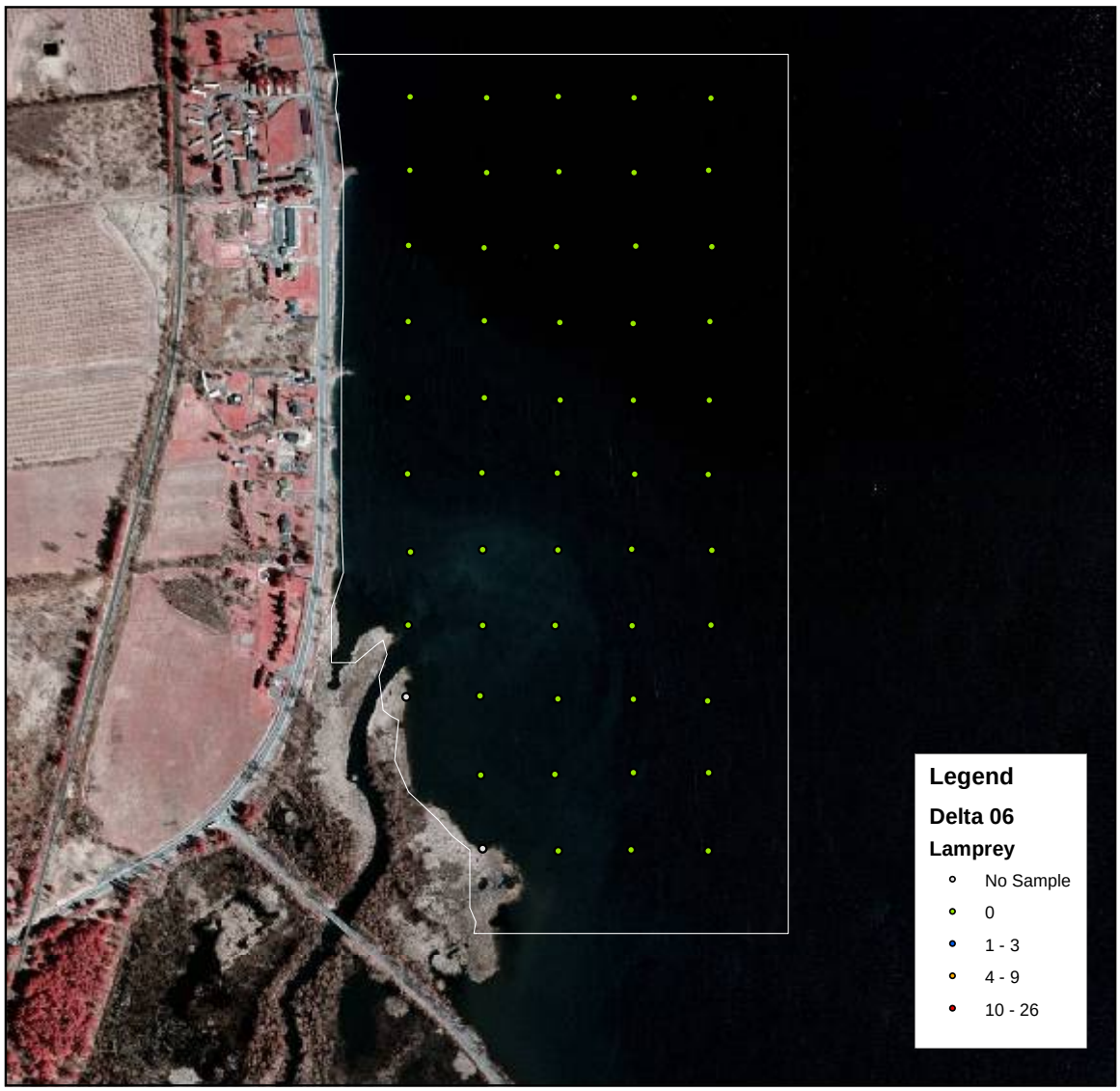
Our delta assessment and control program suffered a crippling loss this year. The supervisor of all delta work, Dave Nettles, was killed in an automobile accident in October. His expertise in this difficult area of assessment will be missed. Although his fieldwork was done by that time, analyses of the delta data are still being processed. The data below are incomplete, yet they at least show some preliminary results of the work completed.

3.1 Sampling

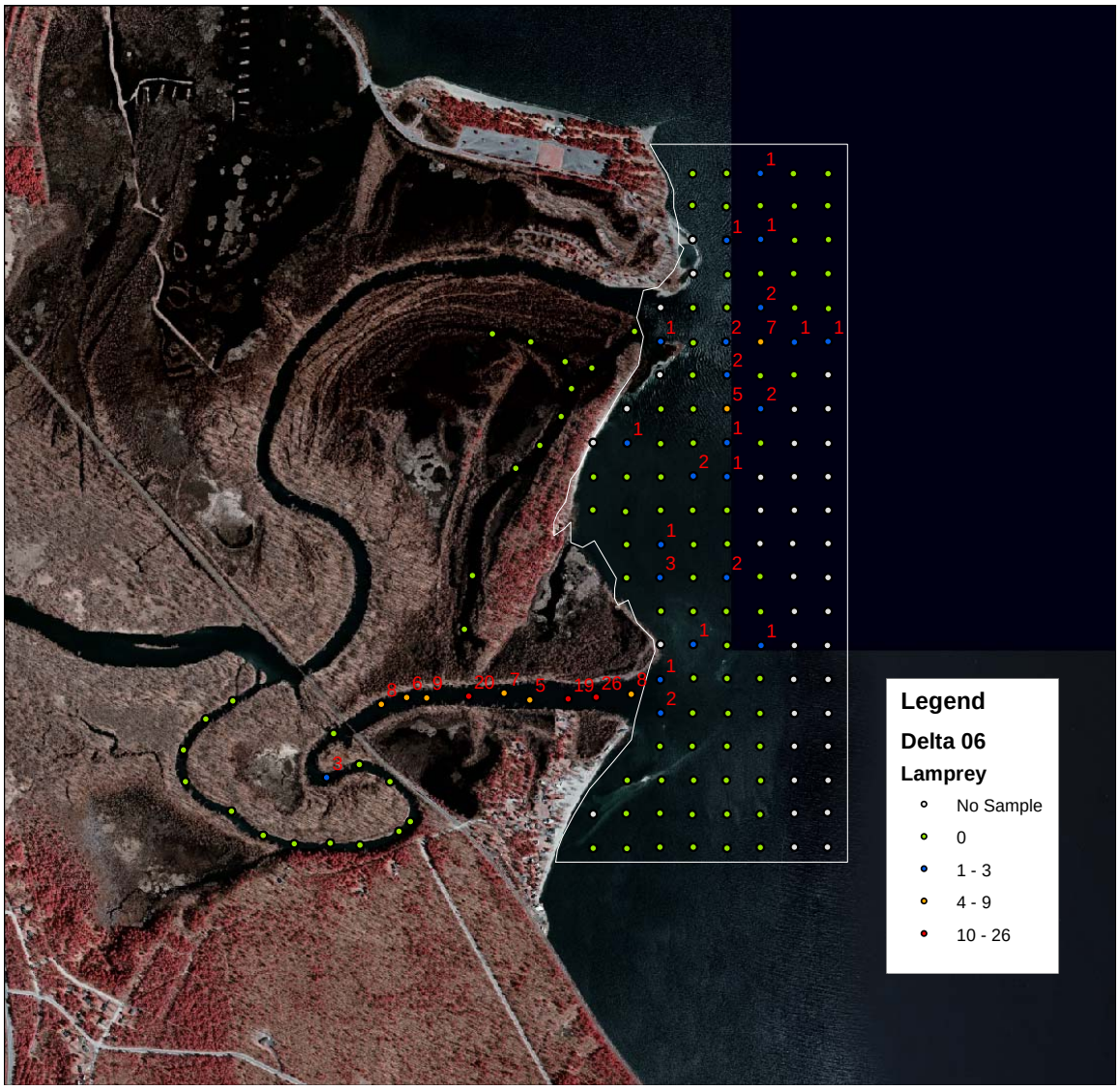
Salmon River Delta: No sea lamprey larvae collected
Ausable River Delta: More than 40 sea lamprey larvae collected
Little Ausable River Delta: No sea lamprey larvae collected
Mill Brook Delta: 3 sea lamprey larvae collected
Mullen Brook Delta: 1 sea lamprey larvae collected
Beaver Brook Delta: No sea lamprey larvae collected



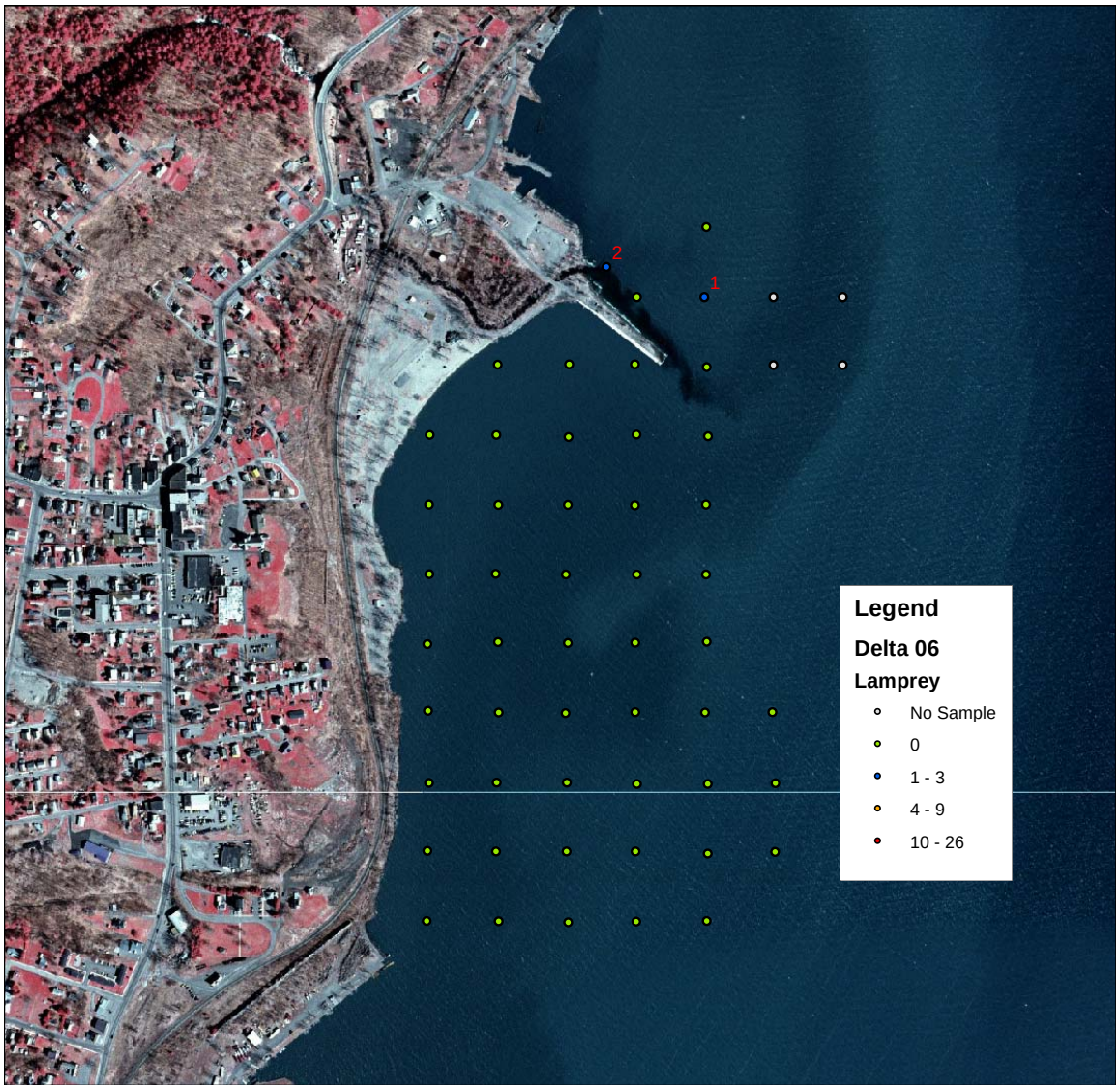
Salmon River deep-water electrofishing sample locations and number of lamprey captured during 2006.



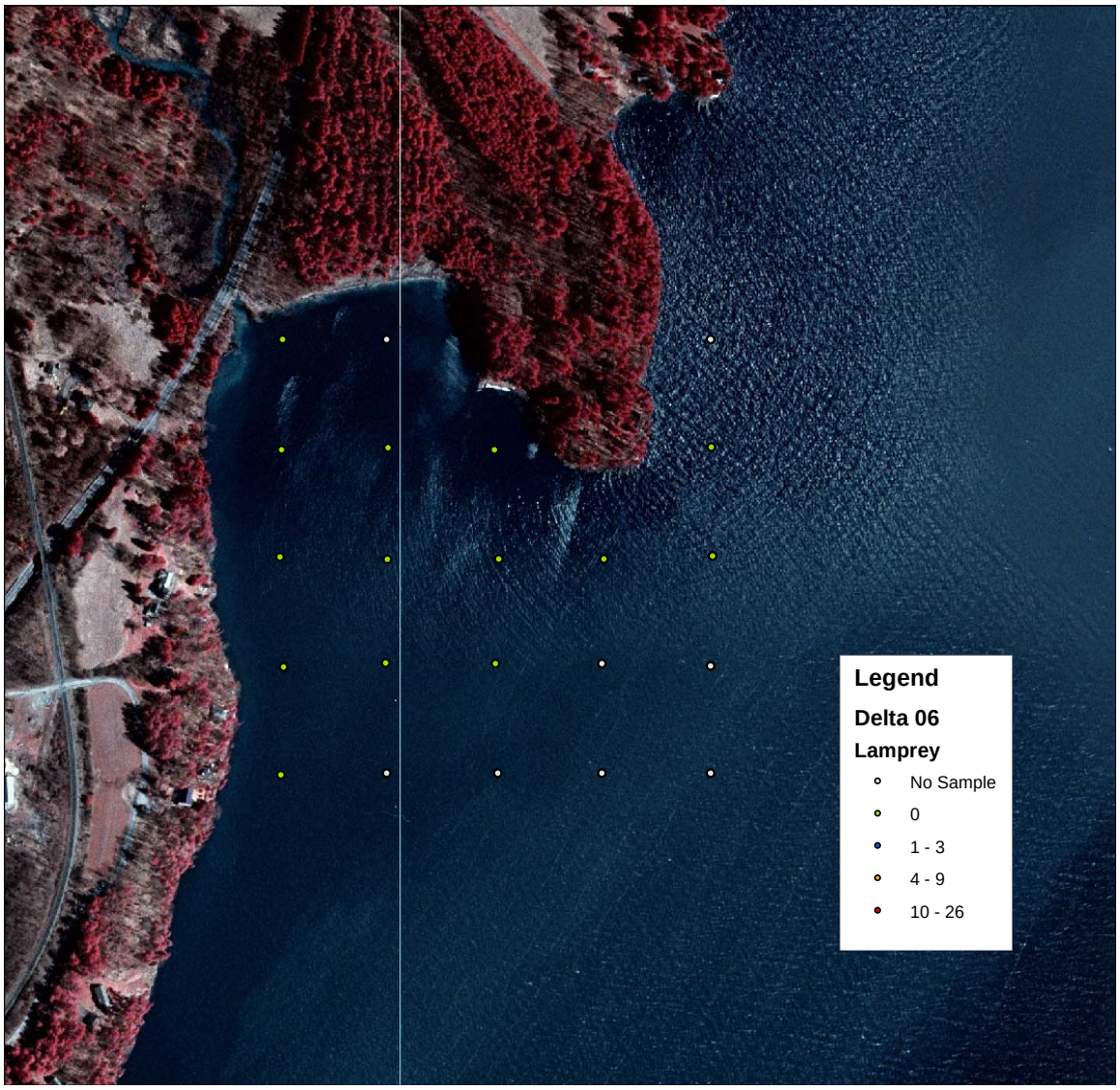
Little Ausable River deep-water electrofishing sample locations and number of lamprey captured during 2006.



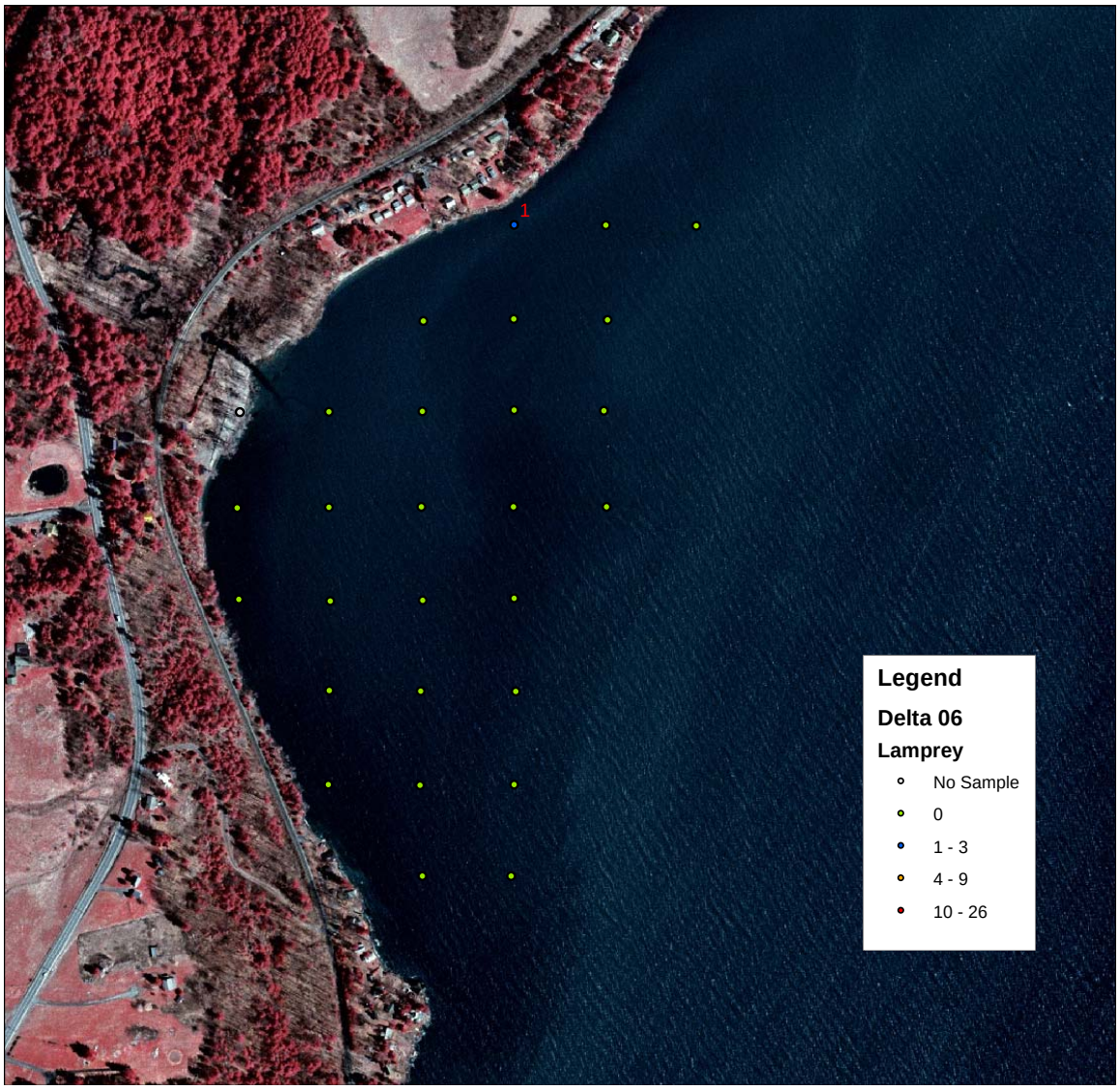
Ausable River deep-water electrofishing sample locations and number of lamprey captured during 2006.



Mill Brook deep-water electrofishing sample locations and number of lamprey captured during 2006.



Beaver Brook deep-water electrofishing sample locations and number of lamprey captured during 2006.



Mullen Brook deep-water electrofishing sample locations and number of lamprey captured during 2006.

3.2 Detection

Ausable mouth: Sea lamprey larvae were collected. Number is not known presently.
Ausable backwater (between mouths): Spot check sampling was done and found no larvae in the deepwater habitats. Backpack shocking in shallow habitats had found only a few.

Additional sampling of the mouths of the Ausable was planned for late fall of 2006 to assess whether survivors were left after the treatment. The results of post-assessment backpack surveys found enough residual survivors, indicating less than a fully successful treatment, and precluded the need for deepwater sampling.

4.0 Post-Treatment Larval Assessment

The quantitative determination of successful lampricide treatments in Lake Champlain has long been neglected. Because one of our possible reasons for lack of programmatic success is less than fully successful lampricide treatments, we decided it was critically important to survey a stream after treatment to accurately assess whether the treatment had truly eliminated the sea lamprey population as intended.

4.1 QAS sampling

Surveys were conducted on all streams treated with lampricide during the fall of 2006. The following data provide comparisons of larvae collected at all sites sampled before (2005 survey data) and after lampricide treatments. Sampling effort between the two years was similar if not identical in most cases.

The results of the post-treatment assessment are fairly easy to interpret. Putnam Creek (Table 4, Figure 8), the Salmon River (Table 5, Figure 9), and the Little Ausable River (Table 6, Figure 10) were all successful treatments with only very few and isolated pockets of survival. These survivors were always found in backwater eddies or near freshwater input.

The Ausable River was somewhat surprising in the number of surviving residual lampreys collected (Sea and American Brook). The even spatial distribution of larvae in the post-treatment QAS (Table 7, Figure 11) allowed a standard population estimate to be produced (Table 3).

Table 3. Pre- and Post-Treatment QAS population estimates for Sea and American Brook Lampreys.

Population Estimate	Sea Lamprey	Am. Brook Lamprey
Pre-treatment	648,532	484,433
Post-treatment	88,992	148,235
% Reduction	86.3	69.4
% Survival	13.7	30.6

Although a substantial amount of sea lamprey were eliminated from the Ausable River, our target of 99% reduction was not reached. In fact, survival was considerable despite the best efforts of the treatment crew to maximize the concentration of TFM within the permitted bounds.

Lewis Creek was treated at a lower target concentration than the NY streams for physiographic and hydrologic reasons. Despite the relatively lower concentration, the Lewis Creek post-treatment assessment found the treatment to be 100% effective. No lampreys of any species were found in any of the surveys (Table 8, Figure 12).

Table 4. Pre- and post-treatment survey results for Putnam Creek.

Site X1 is Brevort Brook.
Site A4 Down is 100 m downstream of the confluence of the two channels which rejoin near the NYSDEC fishing access pullout. This is the orange dot on the accompanying map.
Site A4 Up is a side small side channel, about 100m upstream of the confluence of the two channels. This tertiary channel is between the two main side channels.
Site X2 is the main secondary channel which begins just below the bridge in Factoryville and rejoins the main channel at site A4.
Site A5 is about 100 m downstream of the Factoryville bridge, in a "backwater pocket" of the main channel.

River	Site	Up or Down	Hab Type	Sampled		**Sea Lamprey**			
						Ammo		Trans	
				Pre	Post	Pre	Post	Pre	Post
Putnam	A1	U	1	X	X	11	0	0	0
Putnam	A1	D	1	X	X	72	0	0	0
Putnam	A1	U	2	X	X	3	0	0	0
Putnam	A2	U	1	X	X	28	0	0	0
Putnam	A2	D	1	X	X	52	0	0	0
Putnam	A2	U	2	X	X	10	0	0	0
Putnam	A3	U	1	X	X	31	0	0	0
Putnam	A3	D	1	X	X	37	0	0	0
Putnam	A3	U	2	X	X	12	0	0	0
Putnam	X1	NA	1,2		X	-	8	-	0
Putnam	A4	U	1	X	X	34	2	0	0
Putnam	A4	D	1	X	X	39	19	0	0
Putnam	X2	NA	1,2		X	-	1	-	0
Putnam	A5	D	1	X	X	31	1	0	0
Putnam	A5	U	2	X	X	0	0	0	0
Putnam	A6	U	2	X	X	3	0	0	0
Putnam	X3	NA	1,2		X	-	0	-	0
Putnam	X4	NA	1,2		X	-	0	-	0

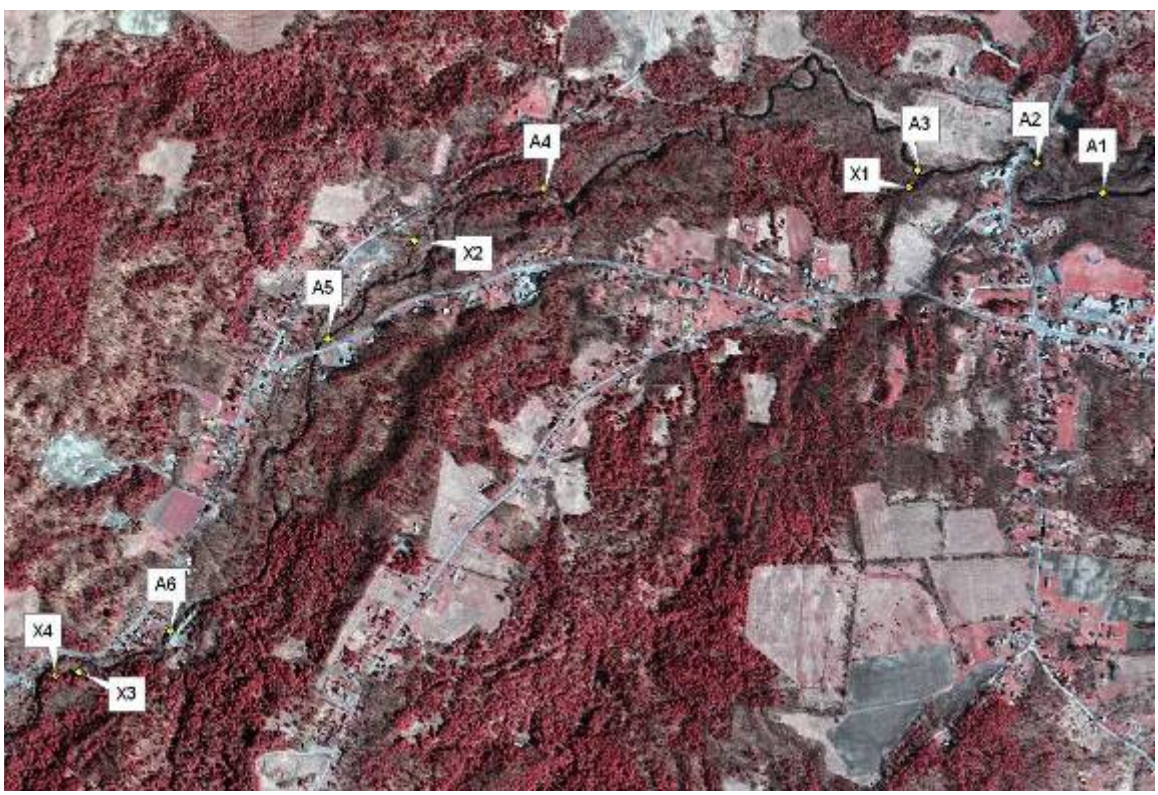


Figure 8. Putnam Creek Post-treatment sampling locations.

Table 5. Pre- and post-treatment survey results for Salmon River.

Site A6 Up: The 25 yoy's were collected in a backwater pocket on the north bank, immediately below the large pool located between I-87 and the upper Railroad Bridge.

Site A6 Down was about 100m downstream of the upper railroad bridge. One yoy was collected in a south bank, backwater pocket, off the main channel.

River	Site	Up or Down	Hab Type	Sampled		**Sea Lamprey**			
						Ammo		Trans	
				Pre	Post	Pre	Post	Pre	Post
Salmon	A1	U	1	X	X	0	0		
Salmon	A1	D	1	X	X	9	0		
Salmon	A2	U	1	X	X	13	0		
Salmon	A2	D	1	X	X	23	0		
Salmon	A2	D	2	X	X	23	0		
Salmon	A3	U	1	X	X	12	0		
Salmon	A3	D	1	X	X	22	0		
Salmon	A4	U	1	X	X	28	0		
Salmon	A4	D	1	X	X	10	0		
Salmon	A4	D	2	X	X	0	0		
Salmon	A5	U	1	X	X	31	0		
Salmon	A5	D	1	X	X	66	0		
Salmon	A5	U	2	X	X	1	0		
Salmon	A6	U	1	X	X	33	25yoy		
Salmon	A6	D	1	X	X	123	1yoy		
Salmon	A6	D	2	X	X	3	0		

Figure 9. Salmon River Post-treatment sampling locations.

Table 6. Pre- and post-treatment survey results for Little Ausable River.

River	Site	Up or Down	Hab Type	Sampled		**Sea Lamprey**			
						Ammo		Trans	
				Pre	Post	Pre	Post	Pre	Post
L. Ausable	A1	U	1	X	X	55	3		
L. Ausable	A1	D	1	X	X	43	0		
L. Ausable	A1	U	2	X	X	2	0		
L. Ausable	A2	U	1	X	X	73	0		
L. Ausable	A2	D	1	X	X	29	2		
L. Ausable	A2	U	2	X	X	8	0		
L. Ausable	A3	U	1	X	X	126	6		
L. Ausable	A3	D	1	X	X	29	0		
L. Ausable	A3	U	2	X	X	15	0		
L. Ausable	A4	U	1	X	X	21	9		
L. Ausable	A4	D	1	X	X	70	2		
L. Ausable	A4	D	2	X	X	4	0		
L. Ausable	A5	U	1	X	X	61	0		
L. Ausable	A5	D	1	X	X	40	10		
L. Ausable	A5	U	2	X	X	17	0		
L. Ausable	A6	U	1	X	X	0	0		
L. Ausable	A6	D	1	X	X	0	0		

Site A1 Up: Is about 50m upstream of the boost site (shallow rocky crossing for 4-wheelers). This was an isolated $0.5m^2$ patch of alluvium where a tiny freshwater seepage came down the north bank.

Site A2 Down: This is a non-descript point between Site A1 and the power lines, reached by following an overgrown logging path. This is the yellow dot on the accompanying map. Lamprey were caught in a backwater pocket off the main channel.

Site A3 Up: located upstream of the power lines. Lamprey were caught in eddy pools below bends.

Site A4 Up: This is upstream of the east end of the Desotell property and the pink dot on the map. Lamprey were caught in the main channel in weed beds.

Site A4 Down: This is downstream of the east end of the Desotell property and the pink dot on the map. Lamprey were caught in the main channel in weed beds.

Site A5 Down: This is downstream of the west end of the Desotell property and the blue dot on the map. Lamprey were caught in the main channel in weed beds.

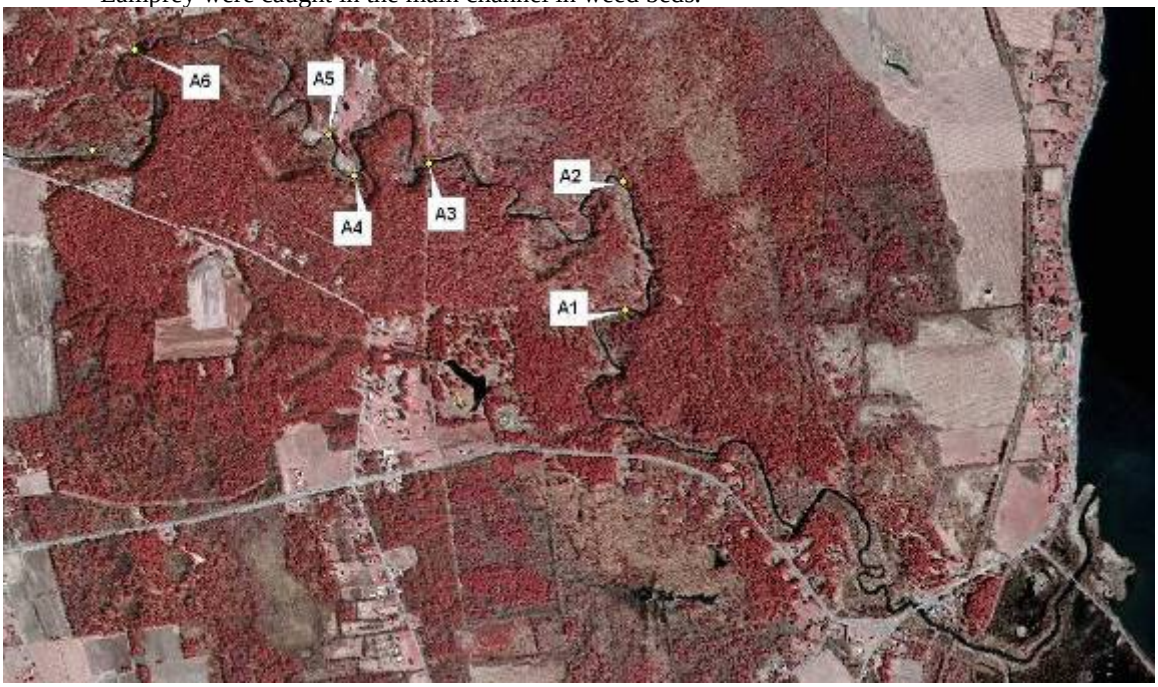


Figure 10. Little Ausable Post-treatment sampling locations.

Table 7. Pre- and post-treatment survey results for Ausable River

River	Site	Hab Type	Sampled m^2		**Sea Lamprey**			
					Ammo		Trans	
			Pre	Post	Pre	Post	Pre	Post
Ausable	2	1	15	15	60	28		
Ausable	4	1	15	15	53	9		
Ausable	4	2	15	15	10	1		
Ausable	6	1	15	15	47	3		
Ausable	8	1	15	15	45	27		
Ausable	8	2	15	15	3	0		
Ausable	10	1	15	15	74	0		
Ausable	12	1	15	15	32	1		
Ausable	12	2	15	15	1	0		
Ausable	14	1	15	15	17	0		
Ausable	16	1	15	15	42	3		
Ausable	16	2	15	15	6	2		
Ausable	18	1	15	15	62	1		
Ausable	20	1	15	15	31	0		
Ausable	20	2	15	15	6	1		
Ausable	22	1	15	15	38	0		
Ausable	24	1	15	15	158	3		
Ausable	24	2	15	15	2	1		
Ausable	26	1	15	15	33	11		

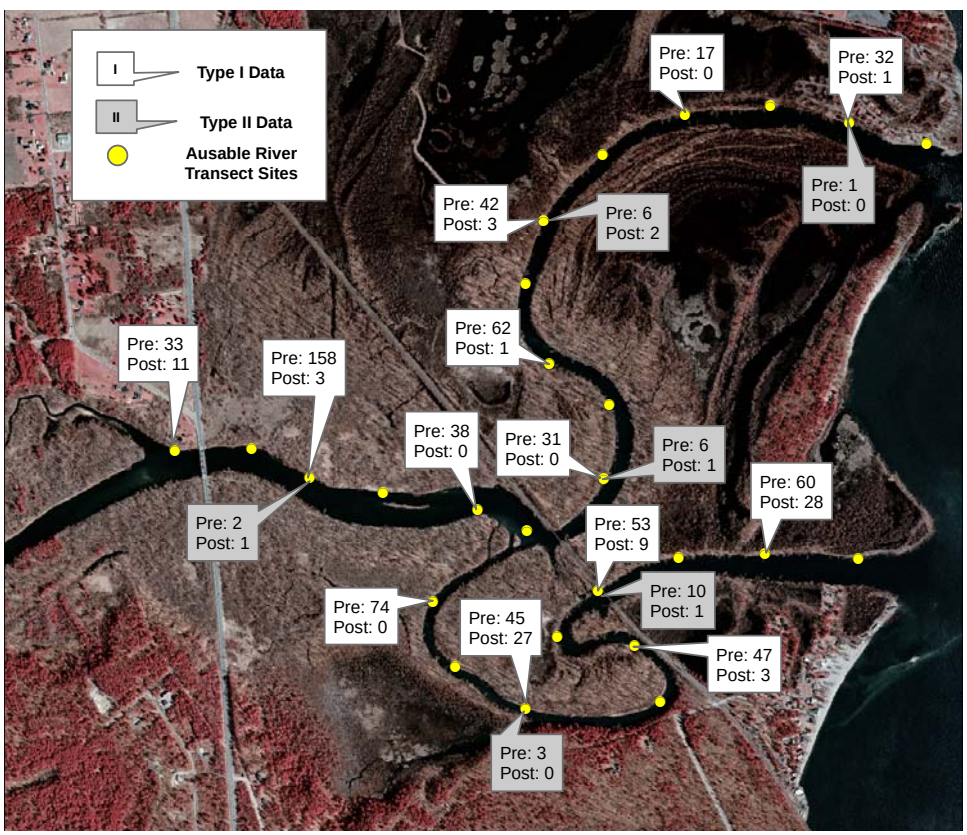


Figure 11. Ausable River sampling locations for pre- and post-treatment electrofishing surveys and number of sea lamprey collected in type I and Type II habitats. All electrofishing plots were 15 m².

Table 8. Pre- and post-treatment survey results for Lewis Creek.

River	Site	Up or Down	Hab Type	m^2 Sampled		**Sea Lamprey**			
						Ammo		Trans	
				Pre	Post	Pre	Post	Pre	Post
Lewis	A1	U	1	0	15	-	0		
Lewis	A1	D	1	15	15	1	0		
Lewis	A1	U	2	11	15	1	0		
Lewis	A2	U	1	15	15	5	0		
Lewis	A2	D	1	0	15	-	0		
Lewis	A2	D	2	15	10	1	0		
Lewis	A3	U	1	15	6	14	0		
Lewis	A3	D	1	15	6	21	0		
Lewis	A3	U	2	15	0	4	-		
Lewis	A4	U	1	15	10	54	0		
Lewis	A4	D	1	15	10	45	0		
Lewis	A4	D	2	15	3	11	0		
Lewis	A5	U	1	15	15	44	0		
Lewis	A5	D	1	6	15	29	0		
Lewis	A5	U	2	15	7	10	0		
Lewis	A6	U	1	15	15	1	0		
Lewis	A6	D	1	15	10	9	0		
Lewis	A6	D	2	15	10	0	0		

Figure 12. Lewis Creek sampling locations sampled following fall 2006 lampricide treatment.

4.2 Statolith aging

In another attempt to identify potential sources of lamprey production that are being missed by our control program, we have saved statoliths from sea lamprey transforms collected dead following the treatments. At this time, statoliths have been removed from heads, but not yet viewed to enumerate growth rings. During the winter, we will finish aging the statoliths to determine if some sea lamprey are transforming and emigrating in 3 years rather than the expected 4-year interval matched by our treatments. If 3-year transformers are found, it will mean that we are letting an entire year class escape each treatment cycle.

5.0 Proposed Fieldwork for 2007

Assessment fieldwork in 2007 will be lead by Wayne Bouffard and a soon-to-be-hired new biologist who will fill Dave Nettles' position. These two field supervisors will share two temporary 6-month technicians and two temporary 3-month technicians during the field season.

5.1 Trapping

Sunderland Brook
Malletts Creek
Pond Brook
Indian Brook
Trout Brook
Stonebridge Brook
Great Chazy River
Beaver Brook
Mill Brook (Port Henry)
Willsboro Fishway

5.2 Larval QAS

Great Chazy River
Winooski River
Mount Hope Brook
Otter Creek
Missisquoi River

5.3 Delta sampling

Saranac River
Boquet River
Putnam Creek