Winooski River Fish Lift and Salmon Investigations

Vermont Fish and Wildlife Department
Annual Report

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Summary

In 1993, the Winooski One fish passage facility began operation as part the construction of a new hydroelectric facility located on the Winooski River at the Winooski Falls in the City of Winooski, Vermont, upstream of Lake Champlain. The project was designed to restore landlocked Atlantic salmon populations and provide recreational fisheries in the Winooski River and Lake Champlain.

A total of 89 adult salmon were processed, transported and released upstream during the fall 2016 fish lift season. Thirteen steelhead were trapped during the spring 2017 lift season. The lamprey wounding rate of 11 wounds per 100 fish was calculated for the returning adult salmon. A total of 36 redds was recorded with the majority being in the Winooski River. Forty wild salmon were found in the Winooski watershed in 2016. A rotary screw trap in the Huntington River captured 87 smolts; the majority originated from fingerling stocking. A total of 31,400 salmon smolts, 32,298 fingerling salmon and 20,000 steelhead rainbow trout were stocked in the Winooski River watershed.

Introduction

Lake Champlain supported indigenous populations of landlocked and/or sea-run Atlantic salmon during its early settlement. Salmon were rapidly depleted as development in the area progressed during the 1800s. In the late 1950s and early 1960s, New York and Vermont began stocking lake trout and landlocked Atlantic salmon that produced a limited fishery.

On November 3, 1988, the City of Burlington Electric Department and the Winooski One Partnership was issued a Federal Energy Regulatory Commission (FERC) License to construct, operate, and maintain the Chase Mill Hydroelectric Project No. 2756. This hydroelectric facility is located on the Winooski River at the Winooski Falls in the City of Winooski, Vermont, approximately 16.5 kilometers (km) upstream of Lake Champlain (Figure 1). The project was completed in 1993 and consists of three large generating units with a capacity of producing 7.5 megawatts.

The installation and operation of a fish passage facility was a requirement of licensing. FERC license article 408 states "The licensee, after consultation with the Vermont Department of Fish and Wildlife (VTDFW) and the U.S. Fish and Wildlife Service (USFWS) shall develop plans for a trap and truck facility immediately downstream of the project dam to ensure upstream fish passage past the project dam". Winooski One is also required to operate in an "instantaneous run-of-river mode" (article 405) which provides protection of fish downstream of the dam.

The Winooski One project is the first upstream barrier on the Winooski River. Two more hydroelectric facilities owned by the Green Mountain Power Corporation, Gorge #18, 2.8 km upstream of Winooski One, and Essex #19, 13.2 km upstream, are additional barriers to fish migration. Favorable salmonid habitat is accessible upstream of Essex #19 dam for approximately 33.5 km to Green Mountain Power's Bolton Falls dam.

The Winooski One fish lift has allowed fisheries managers the opportunity to restore wild migratory salmonid populations and fisheries in the lower Winooski River that have been restricted by barriers built on the river. The lift has enabled migrating Lake Champlain landlocked Atlantic salmon *Salmo salar* and steelhead rainbow trout *Oncorhynchus mykiss* access to critical spawning and nursery habitat above the Winooski One hydroelectric station. The goals of the project are:

1. To create a quality stream fishery for lake-run steelhead rainbow trout and landlocked Atlantic salmon in the Winooski River.

2. To encourage natural reproduction of Lake Champlain landlocked Atlantic salmon in the Winooski River watershed.

The objectives of the project are:

- To move migratory landlocked Atlantic salmon and steelhead rainbow trout above the first dam on the Winooski River.
- To determine if salmon transported and released upstream resulted in redd construction and spawning activity.
- To assess salmonid habitat within the Winooski River watershed.
- To assess natural reproduction of resident salmonids, survival of stocked salmon fry and/or fingerlings and spawning success of lifted adult salmonids.
- To assess out-migration of salmon smolts.
- To estimate angler fishing effort and catch of returning salmonids.

The results of this study would provide information on 1) relative abundance and population dynamics of Lake Champlain salmon and steelhead returning to the Winooski River; 2) the success of specific stocking strategies; 3) the status of natural recruitment of salmon in the Winooski River; 4) lamprey wounding rate data for evaluation of the sea lamprey control program; 5) and the recreational fishery. Improvement in survival of stocked fish would result in benefits to the angler in both the quality and quantity of fish available in the fishery. Improved

angling opportunities may encourage greater participation in angling. Documentation of salmon natural recruitment would be an important milestone in the restoration of this species, and if significant, may lead to stocking rate adjustments to maintain predator-prey balances.

Methods

Fish Lift Monitoring

Stocking

The adult salmon and steelhead returning to the Winooski River originate from stocking juvenile fish in the watershed. Salmon and steelhead smolts will be reared at State of Vermont's Ed Weed Fish Culture Station in Grand Isle, Vermont and receive a fin clip before being stocked.

Fall fingerlings will come from the Dwight D. Eisenhower National Fish Hatchery. Prior to stocking, fingerlings will receive an adipose fin clip (AD) and coded wire tag (CWT) for future identification. Fingerlings less than 70 millimeters (mm) or greater than 120 mm will be excluded. Fall fingerling stocking replaces salmon fry stocking in the Huntington River.

Fish Lift Operation

The fish lift is scheduled to operate in the spring (March 15 – May 15) and fall (September 15 – November 15). Power company personnel activate the lift 1-3 times a day (0800 hr, 1300 hr, and 1600 hr). Lift frequency is based on the numbers of fish being lifted. Lifted fish are placed in a sorting tank where targeted species are separated from the other catch. A daily log is kept of the number of lifts, time, species numbers, flows, water temperature, and general weather.

Targeted species are saved for processing by state or federal biologists while other fish species are released back downstream. Biological data recorded include length, weight, sex (when possible), scales for age analysis, fin erosion and sea lamprey attacks. Fish are tagged with a serially numbered floy-type tag (yellow for salmon, red for steelhead) under the dorsal fin to determine movements and contribution to the fishery, and the release site recorded.

In addition to the biological information collected at the lift, an hourly flow history is provided by United States Geological Survey as well as the power company for the fish lift period. Hourly temperature data at the lift is also recorded by the power company.

Evaluation of Salmon Spawning

The Winooski River watershed is divided into four sampling areas, A-D, from the fish release site on the Winooski River upstream to Bolton Dam (Table 1, Figure 1). Groups B and C include parts of the Winooski River as well as tributaries. Each group consisted of several sampling locations and was surveyed once per week starting with Group B on Monday. However, the Huntington River (in Group B) is surveyed twice per week – Monday with group B and Friday alone. Tributaries are surveyed from their mouth to the first upstream barrier. At each location, the surveyor walked the accessible portions of the river searching for evidence of redd construction and/or salmon. Redds found were marked by GPS and a painted rock placed within each redd to prevent double counting. Average water depth was estimated by measuring

water depth on the left, right and upstream edge of redd. Sampling begin in early October and continued into December.

While not part of this study, students from Concordia University, Montreal, Quebec, working in cooperation with the Vermont Fish and Wildlife Department and US Fish and Wildlife Service surveyed the rivers for wild fry. Sampling consisted of spring snorkeling and electrofishing later in the season. The snorkeling methods used are of interest as this could be incorporated in this project at a later time.

Winooski River and Tributary Habitat Assessment

Water temperature data was collected for the Winooski River and several tributaries using temperature loggers from Onset Instruments, (Pocasset, MA); model HOBO Water Temp Pro v2. Temperature loggers are programmed to record every hour. Temperature data is summarized (May – October) for each stream based on temperature preferences of either salmon (Winooski, Huntington and Mill Brook) or brook trout *Salvelinus fontinalis* (all other streams). Temperature preferences (in Celsius degrees) were categorized as below optimal, optimal, upper range, or above range. The following optimal and upper range temperature categories were chosen for each species: Salmon optimal 12.8-20, upper range 20.1-24; brook trout optimal 12.8-14.4, upper range 14.5-22. These temperatures were chosen based on the literature and conversations with fish culture biologists (Stanley and Trial 1995; Raleigh 1982; Henry Bouchard, USFWS, personal communication).

Winooski River Tributary Salmonid Assessment

Survival, growth and abundance of juvenile salmon stocked as fingerlings and other salmonid populations are evaluated during August and September. Sampling is accomplished by electrofishing with a ABP-2 backpack electrofishing unit(s) (ETS Electrofishing, LLC, Verona WI). Electrofishing stations vary in length from approximately 100 to 175 meters. Sampling accessibility and general habitat characteristics determined site selection.

Population size is estimated using a maximum weighted likelihood modification of the Zippin removal method (Carl and Strub 1978). Multiple sampling runs (usually 3) are conducted at each station until the last run collected no more than 20 percent of the total trout collected in the previous runs. This ensured that allowable coefficient of variation values resulted from calculated population estimates.

Captured salmon and trout are identified, measured, weighed. A scale sample was taken from some salmon. Scale samples from these and salmon captured in the out-migration study (see Salmon Smolt Out-Migration below) as well as length-frequency analysis was used to assign ages to salmon. Young-of-year (YOY) fish are weighed collectively.

Salmon Smolt Out-Migration

A rotary screw trap (E.G. Solutions, Corvallis, Oregon) is deployed in the Huntington River at river kilometer 0.5. The trap consists of two 8-meter floating pontoons between which a revolving mesh–covered cone is suspended. The large end of the cone (2.4 m diameter) is facing upstream and an internal screw built into the cones center axle rotates the cone as the water current exerts pressure on it. Downstream migrating fish that enter the cone are passed to

the end of the cone and collected in a live box. The trap was tied to the shore and positioned in the upstream end of a pool at the end of a shallow riffle that funnels much of the flow into the cone.

Discharge in the Huntington River is monitored daily with a staff gauge placed near the trap location. Stream temperature is monitored using a temperature logger from Onset Instruments, (Pocasset, MA), model HOBO Water Temp Pro v2. The temperature logger is programmed to record every hour.

The trap was checked at least once per day in the morning. Captured salmon are measured for total length, weighed and a scale sample was taken from a sample of trapped salmon for age verification. Salmon were marked by punching a 3.5 mm (1/8 inch) hole in the tail to help identify potential re-captures. After processing, salmon are placed in a cage 400 meters upstream and held from 8-24 hours before being released in order to estimate trap efficiency (see below).

Rotary screw traps sample only a portion of the cross-sectional area of the stream. For this reason, numbers of migrants were estimated by the trap-efficiency method. Trap efficiency was calculated by releasing marked salmon upstream of the trap. The estimated number of migrants was calculated by the following formula:

Efficiency = Recaptured marked salmon / Marked fish released

The total number of fish migrating past the trap site was then estimated by:

Number of fish = unmarked fish caught / Efficiency

Angler Exploitation

Angler exploitation was measured by angler tag returns and volunteer reporting on angler creel survey forms posted at the Winooski One fish lift.

Results

Fish Lift Monitoring

Stocking

Salmon smolts --- A total of 31,400 Sebago strain salmon smolts were stocked in the Winooski River in spring, 2017 (Table 2). The salmon lots had mean lengths ranging from 188 – 195 mm and were reared at State of Vermont's Ed Weed Fish Culture Station in Grand Isle, Vermont. Salmon received a left ventral fin clip (LV) and were stocked on March 28 and March 30.

Salmon Fingerlings --- On October 31 and November 1, 2016, 32,298 fingerling salmon were stocked in the upper Huntington River (above the gorge) in ~2,259 salmon units (~14.3 fish per unit; a salmon unit is 100 square meters) (Table 3). These fish came from the Dwight D.

Eisenhower National Fish Hatchery and averaged 102 mm total length. Prior to stocking fingerlings received an adipose fin clip (AD) and coded wire tag (CWT) for future identification. A pre-stocking assessment of 300 fingerlings found 18 (6%) fingerlings above the 120-mm cut-off and no fish less than 70 mm. Additionally, 25 (8.3 %) were miss-marked, i.e. no CWT and/or AD clip.

Steelhead smolts --- A total of 20,000 steelhead rainbow trout were stocked in the Winooski River in 2017 (Table 4). These fish came from the Ed Weed Fish Culture Station. Equal numbers of the Chambers Creek (LV clipped) and Lake Memphremagog strains (RV clipped) were stocked at the Winooski One dam and at the fishing access near the mouth of the river. The fish were stocked on March 28 and March 30.

Fall lift season

The fish lift operated continuously from September 14 thru November 11, 2016 (Figure 2). A total of 89 adult salmon were processed, transported and released upstream above the Essex 19 dam (Table 5). There were 49 male and 40 female salmon processed at the lift. Sixty-seven of the 88 salmon aged had spent one year in the lake (1-lake-year) (Table 6). Mean total lengths of male and female 1-lake-year salmon were 568 and 546 mm, respectively. Nineteen salmon were 2-lake-year fish with mean TL's of 688 mm for males and 623 mm for females. Table 7 summarizes mean length and Fulton's condition factor (K) for 1-lake-year male salmon, 2007-2016.

Fifty-two of the returning adult salmon had an RV clip (Table 8). The majority (86%) of the RV fish were 1-lake-year indicating they were stocked in 2015 (Table 2). Three of the 6 2-lake-year fish also had a CWT which matches up with the 2014 stocking. Ten of the 11 salmon with an LV clip were lake age 2; these fish were stocked in 2014. Twenty salmon had no clip of which 18 fish were 1-lake year. In addition to the above, two AD and four ADLV salmon were trapped.

The lift was also checked prior to the regular lifting season to monitor earlier running salmon. Lifting occurred on July 28-29, August 15-18, and August 25-26. No salmon were trapped.

In addition to the salmon, only 1 steelhead rainbow trout was lifted in the fall, 2016 (Table 5 and 9).

Spring lift season

The fish lift operated from March 14 through May 18, 2017; there were five days during the period where high flows prevented operation of the lift. Thirteen adult steelhead rainbow trout were trapped (Table 5); these included five Chambers Creek strain, six Lake Memphremagog strain, and two no-clip steelhead processed (Table 9). The majority of the aged fish were 1-lake-year fish (Table 10).

In addition to adult steelhead, many recently stocked smolts were lifted. These were mostly steelhead that "failed" to out-migrate to the lake as expected. In 2017, 25 steelhead smolts were measured and fin clip recorded. Like previous years, the majority (19) were

chambers Creek steelhead (LV clipped). Since 2012, over 400 steelhead smolts have been examined at the lift; 81 percent have been Chambers Creek strain which typically average 200 mm total length at stocking (Table 4).

Lamprey wounding rates

Sea lamprey attacks on salmonids were categorized using the standard classification system from Ebener, et al. (2006). Stage A1 (fresh wounds) and A2-A3 (healing wounds) were used in the wounding rate calculations. The goal of the Lake Champlain sea lamprey control program is to achieve or surpass the fish population, recreational fishery and economic benefits realized during the 1990-97 experimental sea lamprey control program (Fisheries Technical Committee 2001). To this end, a lamprey wounding rate objective of 15 wounds per 100 fish was established for landlocked salmon in the 432-533 mm length class. In 2016, 20 salmon fell within this length class with a calculated lamprey wounding rate of 20 wounds per 100 fish (Table 11).

Evaluation of Salmon Spawning

Salmon redd surveys began on October 6 with the last sampling event occurring on December 7, 2016 (Tables 1 and 12). A total of 36 redds were recorded with the majority being in the Winooski River (Figure 3). Many of the redds on the Huntington River were located near the confluence with the Winooski River. The peak period of redd construction occurred in early November. Three salmon were seen during the survey in the Huntington River.

Thirty-nine salmon fry were collected by students from Concordia University, Montreal, Quebec in the Winooski River watershed in 2016. Most of the fry (38) were found in the Winooski River near redds located in Richmond, VT. Snorkeling (with the fry captured with small aquarium nets) accounted for 25 of these collected salmon. One salmon was snorkeled in the Huntington River.

Winooski River and Tributary Habitat Assessment

Table 13 summarizes water temperature data in several tributaries in the Winooski watershed. Recorded water temperatures during the months of May through October fell within the optimal and upper range for salmon 69 percent of the time in the Huntington River and 75 percent in Mill Brook. The Winooski River logger was lost in 2016. Temperatures in the other tributaries fell within optimal and upper range for brook trout 62 to 71 percent of the time for the period and above the upper range in Joiner Brook for only 1 percent of the time.

Winooski River Tributary Salmonid Assessment

Salmon and trout were sampled on the Huntington River, including four of its tributaries, and eight other Winooski River tributaries (Table 14). Only one wild young-of-year salmon parr was found in Preston Brook in 2016. Three other salmon YOY were found in Joiner Brook but these fish were probably from fry stocked by students in the spring. Five age-1 salmon were collected at the upper Huntington River station. Four of these were AD clipped indicating they were stocked the previous fall as fingerlings. The density of age-1 salmon found at the upper sampling location was 0.16 fish per salmon unit (Table 15, Figure 4).

A total of 723 trout were collected from 17 Winooski River tributaries during the 2016 sampling effort. Table 16 summarizes population estimates and biomass for the tributaries sampled in 2016. Brook trout made up 58 percent of the fish collected followed by rainbow trout (22%) and brown trout (20%). Figure 5 illustrates the variability of rainbow trout population estimates over time for three tributaries sampled.

Salmon Smolt Out-Migration

The rotary screw smolt trap was deployed on April 24 and fished until June 19, 2017 (Table 17). The trap fished 41 days during the period and captured 87 salmon smolts. Trapping conditions were good during most of spring with only 14 days missed due to excessive flows. However, water temperatures remained cool throughout the period which could explain why out-migration began about a week later than expected and extended into June (Figure 6). In previous years about 80 percent of the smolts were captured during the last two weeks of May.

Trap efficiency for the entire period of trapping was 0.097 and calculated from the recapture of 9 out of 93 marked and released smolts. About 899 salmon smolts passed the trapping site based on the estimated trap efficiency and a total of 87 unmarked salmon captured. Table 16 compares the 2017 trapping efforts to previous years trapping.

Eight-four of the trapped smolts had an adipose clip and coded wire tag indicating they were stocked as fall fingerlings in 2016. Mean length of these smolts was 140 mm (SD=9.7) and ranged from 122-170 mm (Table 18). Pre-stocking assessment of 300 fingerlings indicated 6 percent of the sample over 120 mm.

The remaining 3 smolts (those originating from fry stocking) would have originated from the 2014 stocking of 62,000 fry in the Huntington River. Mean length of these smolts was 212 mm (SD=38) and ranged from 175-250 mm.

Angler Exploitation

Only one fish tagged at the Winooski One fish lift was reported caught by an angler between July 1, 2016 and June 30, 2017. This was a steelhead tagged on May 2, 2017 and caught on May 12 in the LaPlatte River.

There were 14 entries on the volunteer angler survey forms between September 5, 2016 and December 12, 2016. Based on information provided by anglers, it took approximately 5.8 hours of fishing effort to catch either a salmon or steelhead during this period. Only three salmon and 2 steelhead were reported to have been caught in 29.2 hours of fishing effort below the Winooski One dam.

Discussion

Numbers of returning landlocked Atlantic salmon to the Winooski River continue to be strong although lower than recent years. The slightly elevated wounding rate and an extremely dry fall in 2016 may have contributed to the decrease in returns. However, the discovery of the first wild fry in the watershed is very exciting news for the program.

Replacing fry stocking with fall fingerlings in the upper Huntington River produced immediate benefits in the form of early out-migrating smolts in spring 2017. The objective of the stocking was to produce smolts in 19 months (at age 2) but it appears the larger of the fingerlings moved out early.

The numbers of returning steelhead rainbow trout continue to fall short of expectations. It's possible that steelhead stocked in the Winooski River are not imprinting to the river. Size at stocking can be an important determinate to successful imprinting. If a fish is too large it may have physiologically missed the imprinting window.

Since 2012, two strains of steelhead have been stocked into the Winooski River. The Chambers Creek strain are larger at stocking than the Memphremagog strain (~200 mm vs ~175 mm). The larger Chambers Creek smolts appear not to leave the river as quickly as the Memphremagog strain as seen by the numbers of fish trapped at the lift post-stocking. Total adult steelhead returns since 2013 have been dominated by Memphremagog steelhead with 72 fish returning versus 35 Chambers Creek steelhead. This suggests that the smaller Memphremagog smolts are imprinting better to the river relative to the larger Chambers Creek steelhead.

Conclusions

The Winooski River fish passage program continues to grow with steady numbers of salmon returning, evidence of successful natural reproduction and new stocking strategies that may help contribute to adult salmon returns. Steelhead numbers have not been as promising. There is evidence to suggest that the Chambers Creek strain may not be imprinting to the Winooski River and thus, not returning as adults as well as the Memphremagog strain steelhead.

Recommendations

Continue to monitor the fall salmon and spring steelhead run on the Winooski River. Evaluate the Huntington River fall fingerling stocking by electro-fishing and at the smolt trap. Explore utilizing snorkeling to monitor emerging wild salmon fry. Re-evaluate the Winooski River steelhead stocking strategy.

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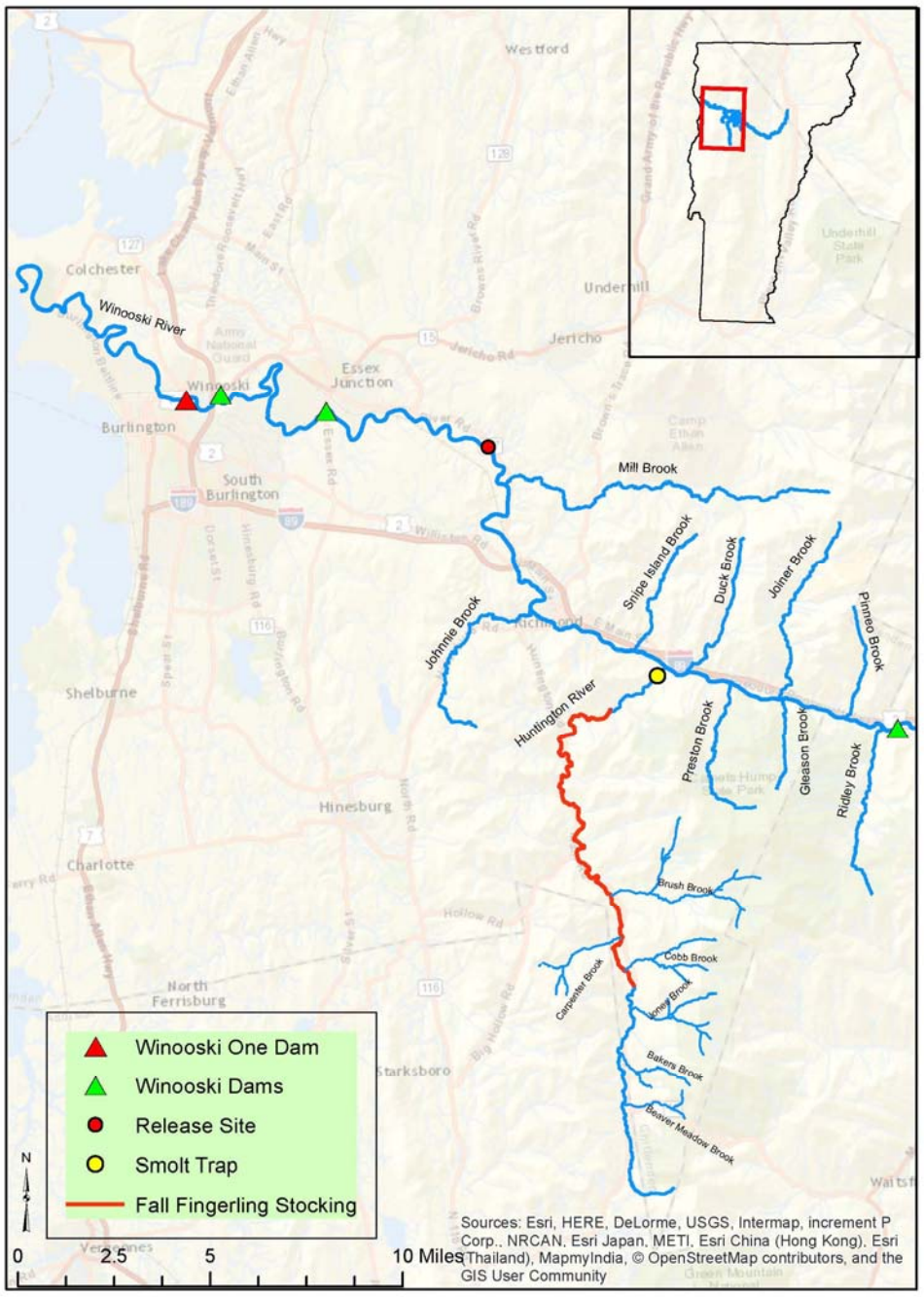

Figure 1. Map of lower Winooski River drainage showing Winooski One Dam, the fish release site, named tributaries, and fall fingerling stocking areas.

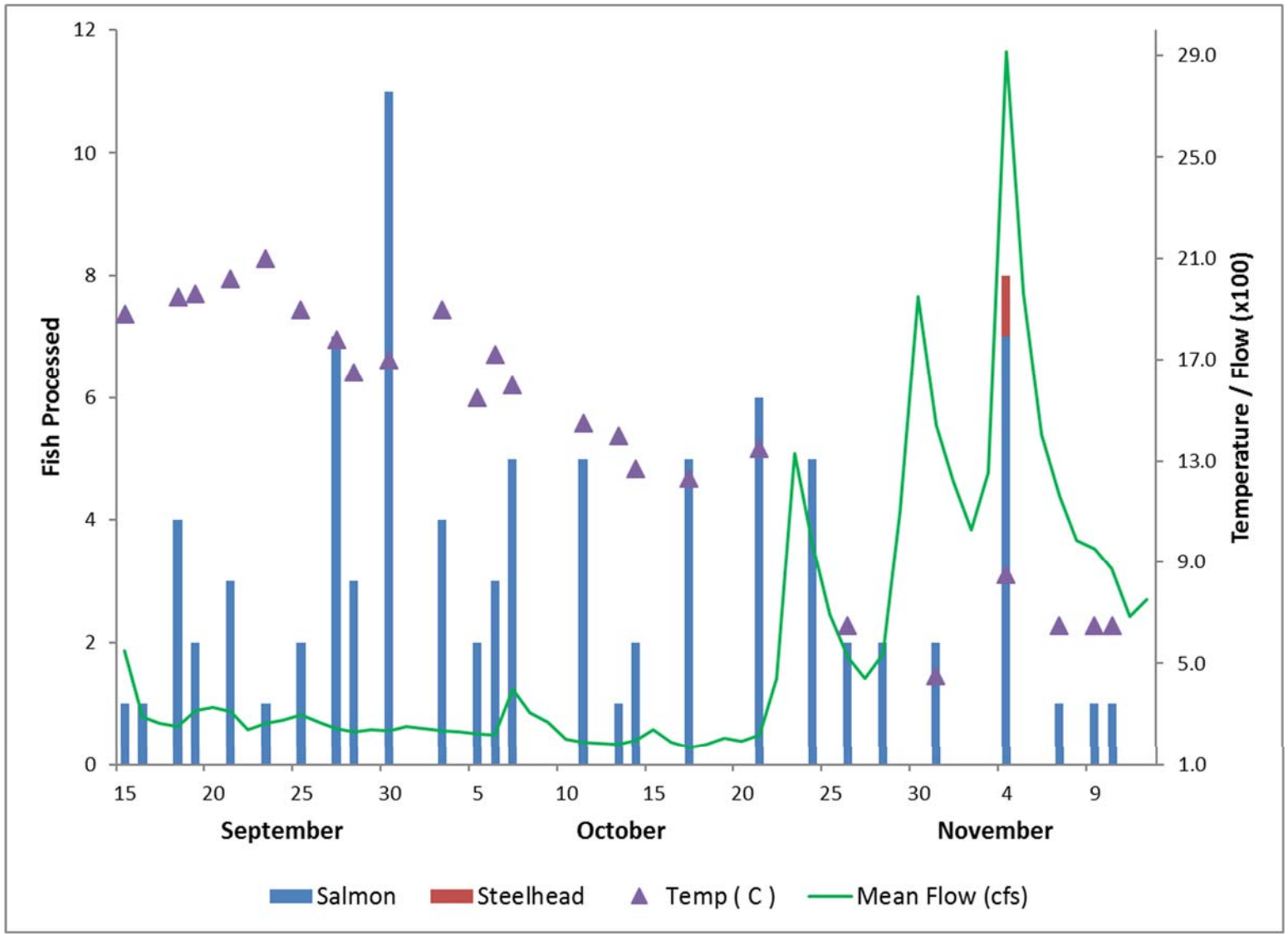

Figure 2. Numbers of new salmon and steelhead processed by date at the Winooski One fish passage facility in fall, 2016.

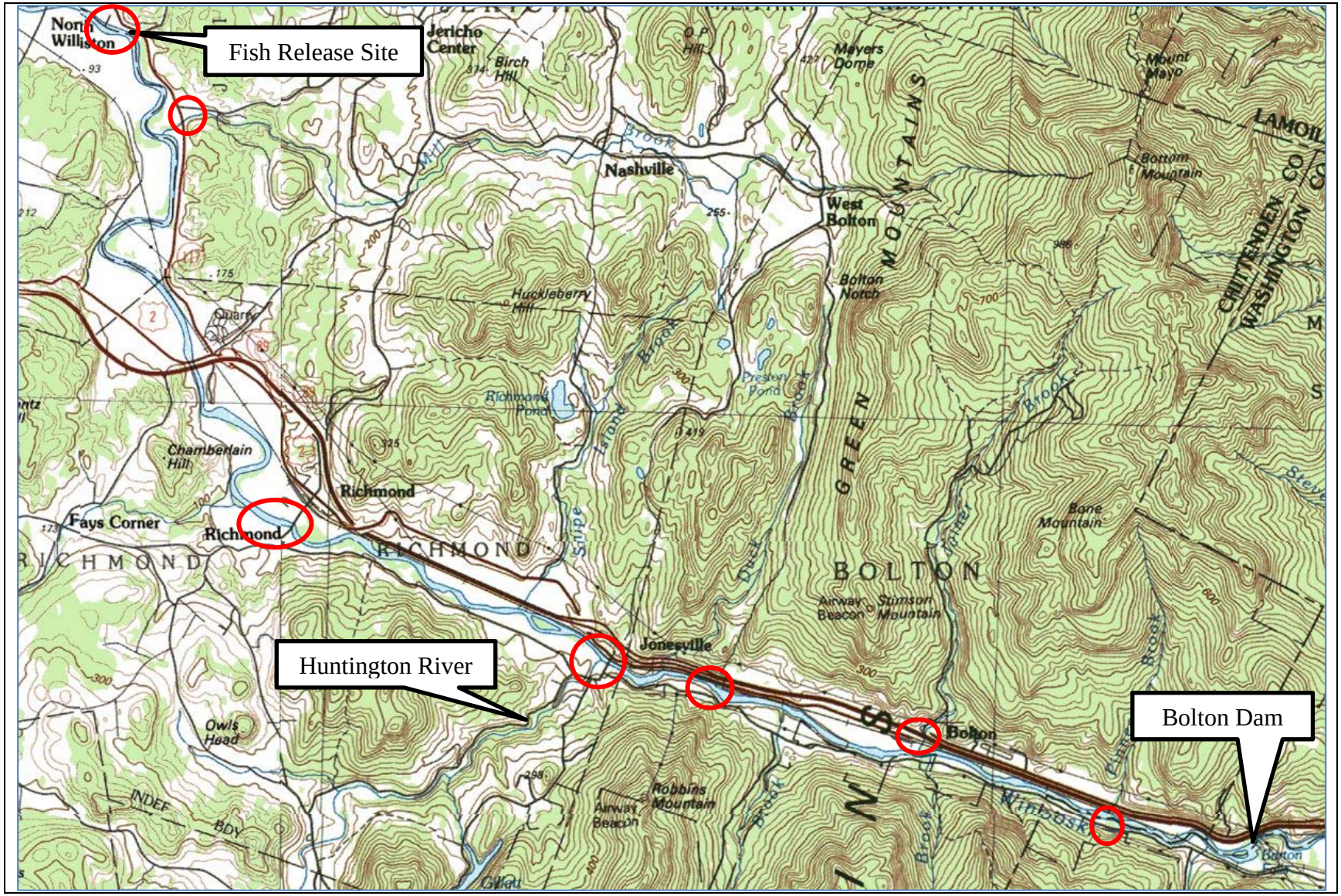

Figure 3. Section of Winooski River where salmon redd searches were conducted with circled areas indicating where redds were found in 2016

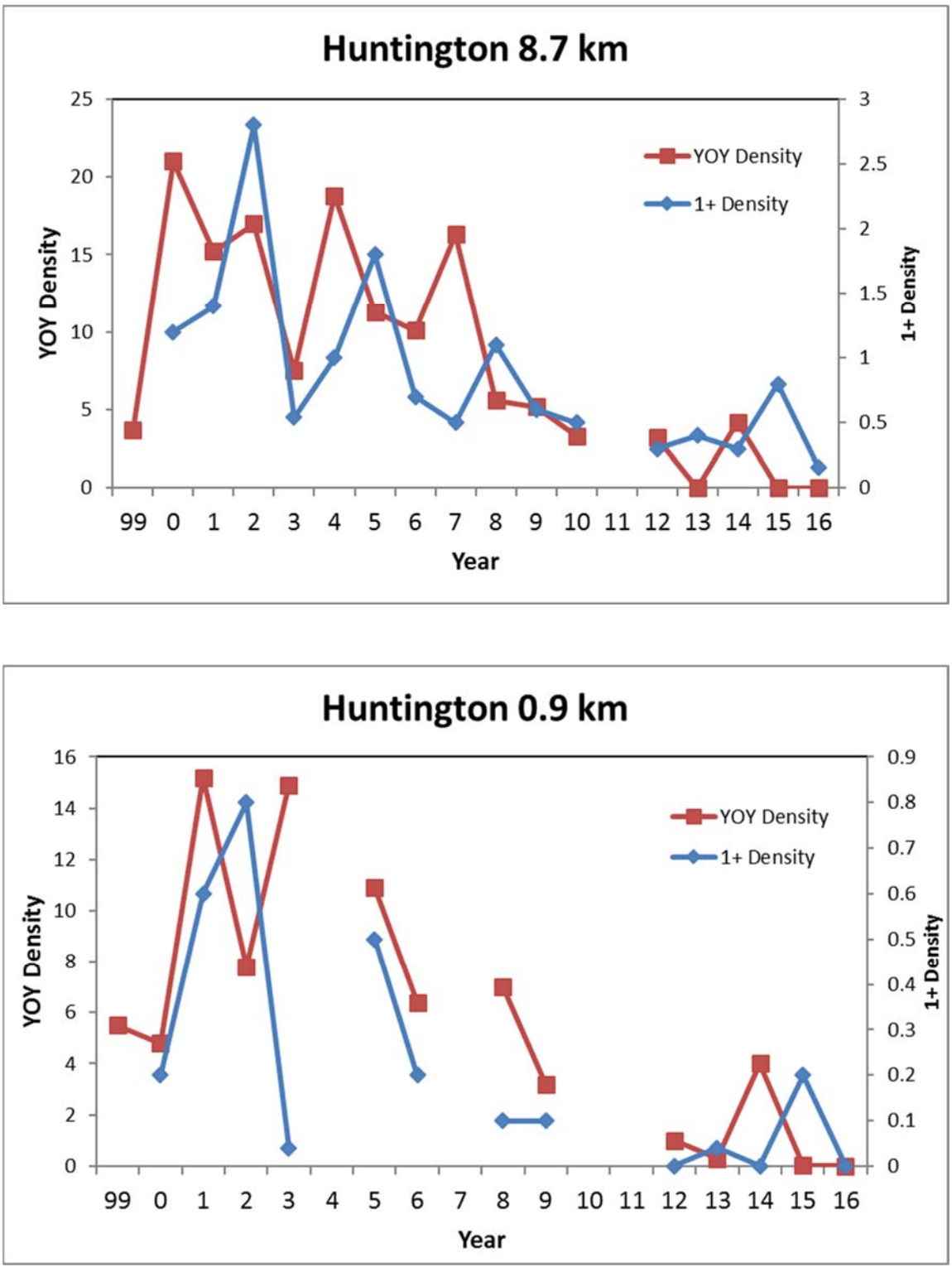

Figure 4. Summary of salmon young-of-year (YOY) and age 1+ density on the Huntington River. The 8.7 km station (2013-2016) also includes the 7.7 km station (1999-2012). Density is number of salmon per 100 square meters.

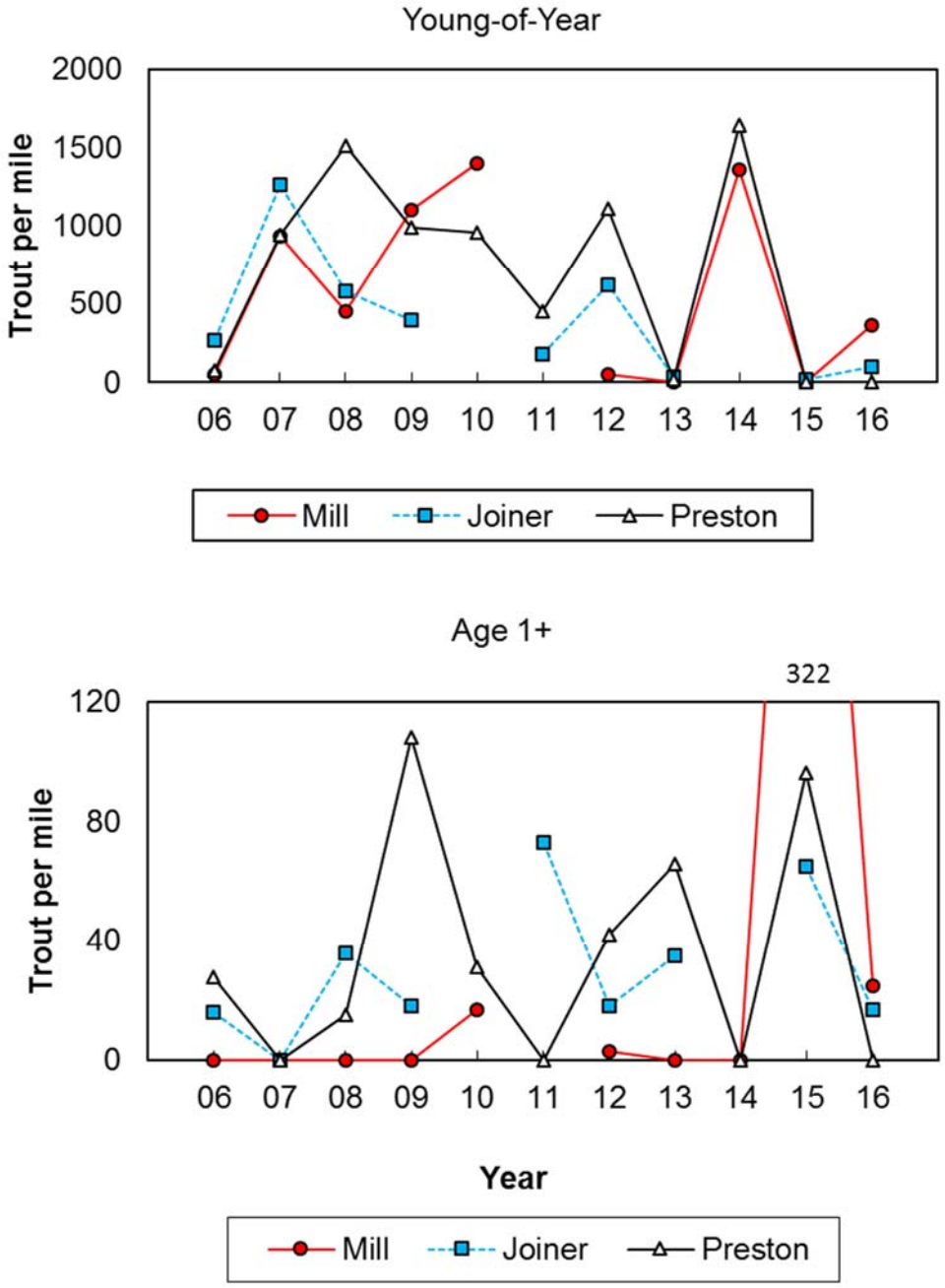

Figure 5. Estimated number per mile of young-of-year and 100-152 mm length class (age 1+) rainbow trout for Mill, Joiner, and Preston Book, 2006 – 2016.

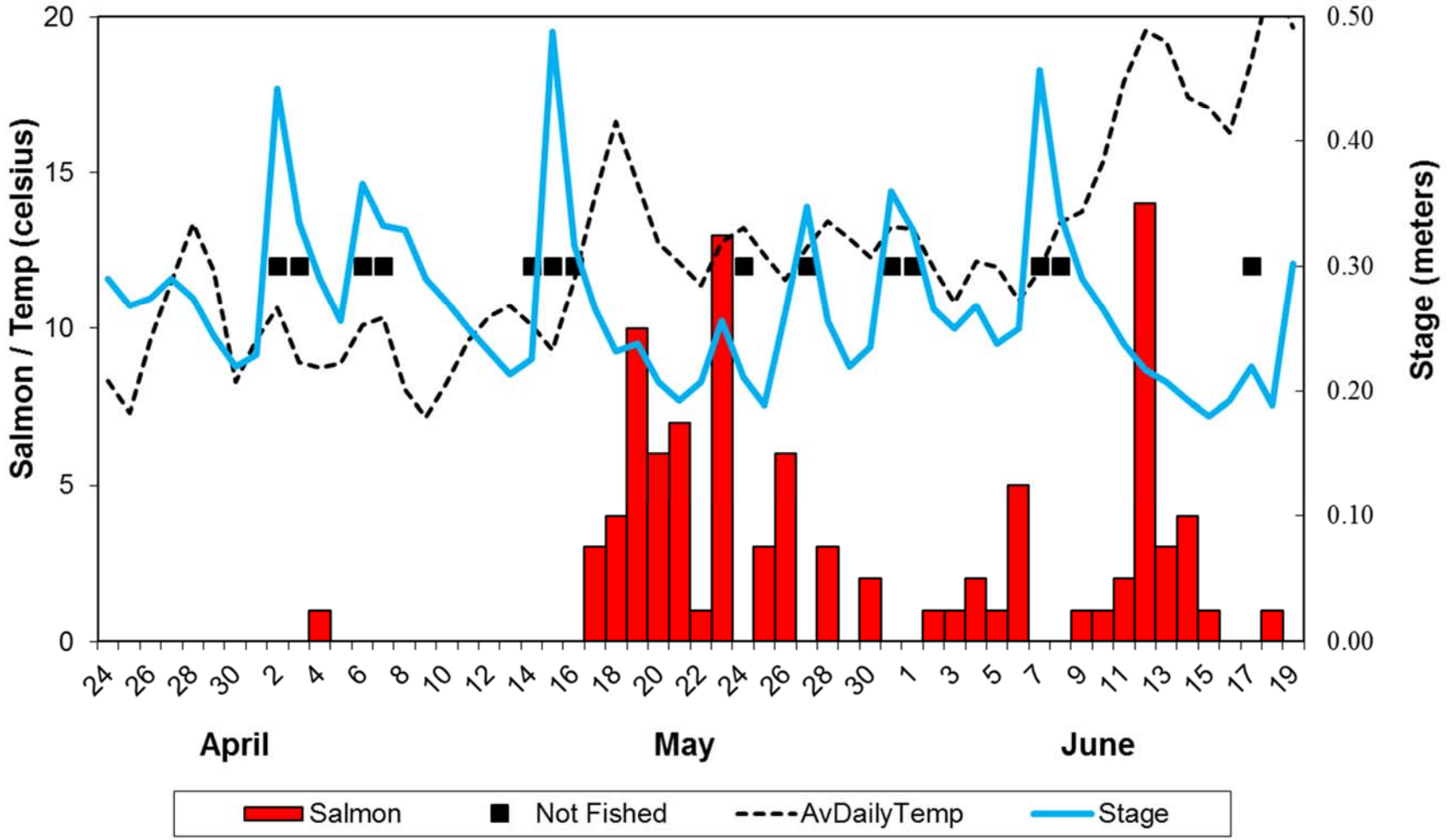

Figure 6. Comparison of stream stage, mean daily stream temperature and number of landlocked Atlantic salmon smolts trapped in the Huntington River.

Table 1. List of salmon redd sampling locations on the Winooski River and tributaries. Also included is number of times each location was sampled in 2016.

Group	River	Location	Code	Times Sampled
A	Winooski River	Fish release site	WR-1	2
A	Winooski River	Railroad bridge	WR-3	
A	Winooski River	Richmond Rt 2 Bridge	WR-4	1
A	Winooski River	Johnnie Brook Rd Lower	WR-5	
A	Winooski River	Johnnie Brook Rd Upper	WR-6	
A	Winooski River	Richmond recreation fields	WR-7	4
A	Winooski River	Cementery Island	WR-8	2
A	Winooski River	Cochran Ski Area	WR-9	1
A	Winooski River	Richmond canoe access	WR-10	
B	Winooski River	Horse farm island	WR-11	
B	Winooski River	Huntington River mouth	WR-12	2
B	Huntington River	Huntington River	HR-1	6
B	Winooski River	Preston Brook mouth	WR-17	1
B	Preston Brook	Below bridge	PB-2	1
B	Preston Brook	Above bridge	PB-1	1
B	Gleason Brook	Gleason Brook	GB-1	
B	Winooski River	Railroad trestle/Ridley mouth	WR-24	
B	Ridley Brook	Below bridge	RB-2	3
B	Ridley Brook	Above bridge	RB-1	3
B	Winooski River	Bolton Dam islands	WR-25	
C	Mill Brook	Below bridge	MB-2	5
C	Mill Brook	Above bridge	MB-1	2
C	Winooski River	Mill Brook Mouth	WR-2	1
C	Johnnie Brook	Johnnie Brook	JNY-1	
C	Snipe Island Brook	Snipe Island Brook	SIB-1	
C	Winooski River	Snipe Island Mouth	WR-11	
C	Duck Brook	Duck Brook	DB-1	
C	Joiner Brook	Below bridge	JB-2	5
C	Joiner Brook	Above bridge	JB-1	4
C	Winooski River	Pinneo Brook Island	WR-21	2
C	Pinneo Brook	Pinneo Brook	PIN-1	
D	Winooski River	Duxbury Rd first corner	WR-13	2
D	Winooski River	Duxbury Rd red house	WR-14	2
D	Winooski River	Long Trail bridge	WR-15	2
D	Winooski River	Temp logger corner	WR-16	1
D	Winooski River	Bolton island	WR-18	1
D	Winooski River	Town line island	WR-19	
D	Winooski River	High road island	WR-20	
D	Winooski River	Fishing Island - lower	WR-22	1
D	Winooski River	Fishing Island - upper	WR-23	

Table 2. Summary of recent landlocked Atlantic salmon smolt stocking in the Winooski River, 2010 – 2017. Stockings are typically split between the boat access near the river mouth and below the Winooski One dam. Sources include the State of Vermont's Ed Weed Fish Culture Station and Dwight D. Eisenhower National Fish Hatchery.

Year Stocked	Stocking Location	Number Stocked	Size (mm)	Source[1]	Total Stocked	Clip
2010	W. One Mouth	15,466 15,703	178 - 192	Ed Weed	31,169	RV
2011	W. One Mouth	15700 16010	178 - 203	Ed Weed	31,710	RV
2012	W. One W. One Mouth Mouth	8,711 7,803 8,313 10,481	194 174 194 174	Eisenhower (well) Eisenhower (brk) Eisenhower (well) Eisenhower (brk)	35,308	LV LV LV LV
2013	W. One W. One Mouth Mouth W. One	7,387 7,757 4,563 2,370 7,500	197 180 178 194 194	Eisenhower (well) Eisenhower (brk) Eisenhower (brk) Ed Weed Ed Weed	29,577	LV LV LV RV/CWT RV/CWT
2014	W. One W. One W. One	10,863 15,554 10,000	200 175 204	Eisenhower (well) Eisenhower (brk) Ed Weed	36,417	LV LV RV/CWT
2015	W. One Mouth	15,688 15,700	184 192	Ed Weed	31,388	RV
2016	W. One Mouth Mouth	15,700 12,377 4,893	190 156 180	Ed Weed	32,970	RV
2017	W. One Mouth	15,700 15,700	188 195	Ed Weed	31,400	LV

[1] Eisenhower - Well = salmon cultured in well water at nearly constant temperature (~8.0 degrees). Brk = salmon cultured in Furnace Brook water with variable temperature.

Table 3. Summary of landlocked Atlantic salmon fall fingerling stocking in the main stem of the Winooski River and Huntington River, 2009 – 2016. Sources include the State of Vermont's Ed Weed Fish Culture Station (2009-2010) and Dwight D. Eisenhower National Fish Hatchery (2011-2016).

Year	Number	Mean size (mm)	Clip
Winooski River			
2009	30,000	115	No clip
2010	33,000	114	No clip
2011	39,000	105	Adipose
2012	20,000	102	Adipose
2013	13,800	93	Adipose
2014	8,860	93	Adipose
Huntington River			
2015	8,456	116	Adipose
2016	32,298	102	Adipose/CWT

Table 4. Summary of recent steelhead rainbow trout smolt stocking in the Winooski River, 2009 – 2017. All steelhead are raised at State of Vermont's Ed Weed Fish Culture Station.

Year Stocked	Stocking Location	Number Stocked	Size (mm)	Strain	Total Stocked	Clip
2009	Mouth W. One	10,000 10,000	211	Chambers	20,000	AD
2010	Mouth W. One	10,410 10,270	203	Chambers	10,680	None
2011	Mouth W. One	11,876 9,000	203	Chambers	20,876	None
2012	W. One W. One Mouth Mouth	5900 5776 5900 4100	201 182 201 182	Chambers Magog Chambers Magog	21,676	LV RV LV RV
2013	W. One W. One Mouth Mouth	5,000 5,000 5,000 5,000	200 171 203 171	Chambers Magog Chambers Magog	20,000	LV RV LV RV
2014	W. One W. One	10,000 10,000	206 161-171	Chambers Magog	20,000	LV RV
2015	W. One W. One Mouth Mouth	5,000 5,000 5,000 5,000	202 175 196 171	Chambers Magog Chambers Magog	20,000	LV RV LV RV
2016	W. One W. One Mouth Mouth	5,000 5,000 5,500 5,500	198 163 198 163	Chambers Magog Chambers Magog	21,000	LV RV LV RV
2017	W. One W. One Mouth Mouth	5,000 5,000 5,000 5,000	210 188 210 188	Chambers Magog Chambers Magog	20,000	LV RV LV RV

Table 5. Summary of landlocked Atlantic salmon and steelhead rainbow trout lifted at the Winooski One fish passage facility, 1993 – spring 2017.

Year	Spring		Fall	
	Steelhead	Salmon	Salmon	Steelhead
1993	NA	0	36	7
1994	179	0	32	15
1995	38	0	12	8
1996	45	0	11	1
1997	4	0	116	21
1998	24	0	81	80
1999	54	0	51	11
2000	22	0	29	3
2001	7	0	6	0
2002	5	1	21	3
2003	5	2	15	3
2004	17	0	10	1
2005	4	0	15	5
2006	1	2	23	5
2007	0	0	35	2
2008	6	1	26	0
2009	2	0	38	26
2010	13	3	132	61
2011	37	0	189	18
2012	16	0	44	37
2013	44	0	115	13
2014	9	0	158	27
2015	31	0	124	8
2016	23	0	89	1
2017	13	1	na	na

Table 6. Summary of mean total lengths of aged landlocked Atlantic salmon collected at the Winooski One fish passage facility, fall 2016. All lengths in millimeters with 95% confidence intervals. Number of fish in parenthesis.

Sex	Lake Age 0	Lake Age 1+	Lake Age 2+	Lake Age 3+	Total
Male	---	568 ± 14 (41)	688 ± 41 (6)	710 (1)	48
Female	---	546 ± 12 (26)	623 ± 33 (13)	669 (1)	40
Total	0	67	19	2	88

Table 7. Summary of mean total length and condition factor (K) with 95% confidence intervals of lake age 1 male landlocked Atlantic salmon collected at the Winooski One fish passage facility, 2007 – 2016.

Year	Mean Length	Number	Condition	Number
2007	555 ± 14	16	0.93 ± .05	16
2008	553 ± 45	5	0.88 ± .11	5
2009	548 ± 26	12	0.86 ± .17	11
2010	580 ± 13	38	0.93 ± .03	38
2011	536 ± 8	69	0.93 ± .04	68
2012	560 ± 18	14	1.04 ± .05	14
2013	580 ± 17	35	1.01 ± .04	35
2014	586 ± 11	69	1.04 ± .03	69
2015	559 ± 9	58	0.94 ± .03	58
2016	568 ± 14	41	0.96 ± .03	41

Table 8. Summary of fin clips of returning adult landlocked Atlantic salmon trapped at the Winooski One fish lift in 2016.

Age	Clip				
	RV	LV	No clip	AD	ADLV
1	44	1	18	1	3
2	6	10	1	1	1
3	1	0	1	0	0
Not aged	1	0	0	0	0
Total	52	11	20	2	4

Table 9. Summary of mean total lengths of steelhead rainbow trout by strain collected at the Winooski One fish passage facility, fall 2016 and spring, 2017. All lengths in millimeters with 95% confidence intervals.

Strain (Clip)	Number	Mean Length	95% Confidence Interval
Fall 2016			
No Clip	0	---	---
Chambers Creek (LV)	0	---	---
Lake Memphremagog (RV)	1	401	na
Spring 2017			
No Clip	2	520	89
Chambers Creek (LV)	5	509	71
Lake Memphremagog (RV)	6	503	62

Table 10. Summary of mean total lengths of aged steelhead rainbow trout by strain collected at the Winooski One fish passage facility, spring 2017. All lengths in millimeters with 95% confidence intervals. Number of fish in parenthesis.

Sex	Lake Age 1	Lake Age 2	Total
Chambers Creek			
Male	454 ± 29 (3)	558 (1)	4
Female	---	626 (1)	1
Total	3	2	5
Memphremagog			
Male	466 ± 8 (2)	---	2
Female	470 (1)	640 (1)	2
Total	3	1	4

Table 11. Summary of sea lamprey attacks on Landlocked Atlantic salmon in the 432-533 mm length class lifted at the Winooski One fish lift, 1993 - 2016.

Year	Number of Salmon	Stage A1 wounds	Stage A2&A3 wounds	Stage A4 wounds	Total wounds (A1-A3)	Wounds/ 100 fish
1993	14	0	4	9	4	28.6
1994	10	0	3	7	3	30.0
1995	3	0	0	4	0	0
1996	6	0	0	2	0	0
1997	112	4	21	30	25	22.3
1998	15	0	1	5	1	6.7
1999	14	3	7	9	10	71.4
2000	6	0	4	3	4	66.7
2001	4	1	2	2	3	75.0
2002	7	0	3	10	3	42.8
2003	3	2	3	8	5	166.6
2004	4	0	0	6	0	0
2005	7	7	4	9	11	157.1
2006	16	4	18	29	22	137.5
2007	10	2	5	13	7	70.0
2008	11	0	9	12	9	81.8
2009	12	0	10	14	10	83.3
2010	20	1	8	15	9	45.0
2011	96	4	26	73	30	31.3
2012	13	1	9	8	8	76.9
2013	21	1	3	12	4	19.0
2014	36	2	3	28	5	13.9
2015	28	1	2	16	3	10.7
2016	20	0	4	8	4	20.0

Table 12. Summary of new redds found by date and stream during fall, 2016.

Date	Stream					
	Winooski River	**Huntington River**	**Mill Brook**	**Preston Brook**	**Ridley Brook**	**Joiner Brook**
October 6	0	0				
October 11	0		0			
October 12	0					0
October 21	0	0	0			
October 24		0			0	
October 25	0					0
October 28		0				
October 31		0[1]				
November 1			0			
November 2		2		0	0	
November 7	1	3	3			1
November 8	15[2]				1[3]	
November 28	6[2]	5				
December 7		0	0			0
Total Redds	**22**	**10**	**3**	**0**	**1**	**1**

1. 3 Salmon seen
2. Cluster of redds; hard to count
3. Brown trout on redd

Table 13. Summary of stream temperature data expressed as a percentage within each category collected May - October 2016. The Huntington River and Mill Brook are based on temperature preferences of salmon; the remaining streams are based on brook trout.

Stream	Stream Temperature Categories			
	Below Optimal	**Optimal**	**Upper Range**	**Above Range**
Huntington River	22	42	27	9
Mill Brook	25	50	24	1
Preston Brook	38	13	49	0
Ridley Brook	38	11	51	0
Pinneo Brook	38	14	48	0
Joiner Brook	29	14	57	1
Snipe Island Brook	31	13	56	0
Brush Brook	36	14	50	0

Table 14. Winooski River tributaries sampled in 2016.

Stream	Date	Elevation	Latitude	Longitude	Town	County
Cobb Brook	8/8/2016	775	44.272	-72.96062	Huntington	Chittenden
Brush Brook	8/8/2016	820	44.29838	-72.94903	Huntington	Chittenden
Texas Brook	8/9/2016	605	44.33691	-73.00696	Huntington	Chittenden
Pinneo Brook	8/9/2016	370	44.36422	-72.8427	Bolton	Chittenden
Preston Brook	8/10/2016	365	44.37259	-72.90627	Bolton	Chittenden
Ridley Brook	8/15/2016	360	44.35719	-72.82791	Duxbury	Washington
Mill Brook	8/16/2016	300	44.45666	-73.01408	Jericho	Chittenden
Duck Brook	8/18/2016	320	44.38365	-72.92529	Bolton	Chittenden
Snipe Island Brook	8/18/2016	300	44.39509	-72.94971	Richmond	Chittenden
Bakers Brook	8/19/2016	1075	44.23333	-72.96333	Huntington	Chittenden
Beaver Meadow Brook	8/19/2016	1135	44.21849	-72.96531	Starksboro	Addison
Joiner Brook	8/22/2016	350	44.37373	-72.87832	Bolton	Chittenden
Interchange Brook	8/23/2016	335	44.43204	-73.00138	Richmond	Chittenden
Huntington River	8/24/2016	590	44.34606	-72.99198	Huntington	Chittenden
Huntington River	8/24/2016	310	44.37785	-72.94722	Huntington	Chittenden
Carpenter Brook	8/25/2016	800	44.27941	-72.9751	Starksboro	Addison
Jones Brook	8/25/2016	820	44.25483	-72.96079	Huntington	Chittenden
Brush Brook trib	8/26/2016	820	44.29868	-72.94945	Huntington	Chittenden
Huntington River	8/31/2016	1145	44.21656	-72.96678	Huntington	Chittenden

Table 15. Population estimates and calculated densities (with 95% confidence interval) by age class for landlocked Atlantic salmon collected in Winooski River tributaries in 2016.

Tributary	Age group	Sample Size	Population Estimate	Density (no./unit)	95% C.I.
Huntington 0.9 km	0+	0	---	---	---
	1+	0	---	---	---
Huntington 8.7 km	0+	0	---	---	---
	1+	5[1]	5 ± 0	0.16	0.16 – 0.16

[1]Four of these had AD clips indicating they were stocked as fall fingerlings in 2015.

Table 16. Population estimates for salmon and trout collected in Winooski River tributaries in 2016.

LEGEND – Table 16

Stream – Name of tributary; may be followed by river kilometer from mouth of stream
Len. – Survey section length (feet)
Width – Average stream width (feet)

Species –
RBT = Rainbow trout
BNT = Brown trout
BKT = Brook trout
LLS = Landlocked Atlantic salmon

Class – Size/age class
YOY – young-of-year
<6 – yearling or older trout measuring less than 6.0 inches total length
6-9.9 - yearling or older trout measuring between 6.0 and 9.9 inches total length
10 - yearling or older trout measuring between 10.0 and 11.9 inches total length
12+ - yearling or older trout measuring greater than 11.9 inches total length
1+ and 2+ - Salmon age class

Num – Number of fish collected
Est – Population estimate
LOCI/UPCI – Upper and Lower 95% confidence interval expressed as a percentage of the population estimate

Popmi – Population estimate expressed as number per mile
Popkm - Population estimate expressed as number per kilometer

MnWt – Mean weight of fish (grams)
Lbac – Estimated pounds per acre
Kghec – Estimated kilograms per hectare

Table 16. Population estimates for salmon and trout collected in Winooski River tributaries in 2016

Stream	Len	Width	Spp	Class	Num	Est	LOCI	UPCI	Popmi	Popkm	MnWt	Lbac	Kghec
Duck Brook	333	11	RBT	YOY	24	27	11.1	29.4	428	266	1.8	1.27	1.42
320 ft				<6	1	1	0.0	143.8	16	10	31.0	0.81	0.91
			Total		25	28			444	276		2.08	2.33
			BNT	YOY	7	7	0.0	9.2	111	69	4.3	0.79	0.88
			BKT	6-10	2	2	0.0	0.0	32	20	81.0	4.25	4.76
			Trout	**Totals**	34	37			587	365		7.12	7.97
Huntington Rv.	576	61.5	BNT	12+	1	1	0.0	339.5	9	6	713.0	1.93	2.17
590 ft													
			BKT	<6	1	1	0.0	0.0	9	6	25.0	0.07	0.08
			LLS	1+	5	5	0.0	0.0	46	28	33.2	0.45	0.50
			Trout	**Totals**	7	7			64	40		2.45	2.75
Huntington Rv.	765	44.6	BNT	YOY	1	1			7	4	5.0	0.01	0.02
310 ft													

Table 16. Continued.

Stream	Len	Width	Spp	Class	Num	Est	LOCI	UPCI	Popmi	Popkm	MnWt	Lbac	Kghec
Joiner Brook	313	20.8	RBT	YOY	6	6	0.0	32.7	101	63	2.0	0.18	0.20
350 ft				<6	1	1	0.0	0.0	17	10	24.0	0.35	0.40
			Total		7	7			118	73		0.53	0.60
			BNT	YOY	6	6	0.0	32.7	101	63	4.0	0.35	0.40
			BKT	YOY	9	9	0.0	20.6	152	94	2.9	0.38	0.43
				<6	1	1	0.0	0.0	17	10	23.0	0.34	0.38
				6-10	2	2	0.0	0.0	34	21	72.0	2.12	2.38
			Total		12	12			202	126		2.84	3.19
			LLS	YOY	3	3	0.0	0.0	51	31	4.0	0.18	0.20
			Trout	**Totals**	28	28			472	293		3.90	4.39
Mill Brook	421	20.3	RBT	YOY	27	29	6.9	19.9	364	226	2.7	0.87	0.97
300 ft				<6	2	2	0.0	101.7	25	16	24.0	0.54	0.60
				6-10	3	3	0.0	46.3	38	23	96.3	3.25	3.64
			Total		32	34			427	265		4.66	5.21
			BNT	YOY	25	27	7.4	20.1	339	210	3.3	1.01	1.13
				<6	1	1	0.0	143.8	13	8	35.0	0.39	0.44
				6-10	2	2	0.0	37.7	25	16	65.0	1.46	1.64
				10-12	2	2	0.0	0.0	25	16	189.0	4.25	4.76
			Total		30	32			402	250		7.11	7.97
			BKT	YOY	1	1	0.0	0.0	13	8	2.0	0.02	0.03
				<6	1	1	0.0	0.0	13	8	21.0	0.24	0.26
				6-10	2	2	0.0	0.0	25	16	64.5	1.45	1.62
			Total		4	4			51	32		1.71	1.91
			Trout	**Totals**	66	70			880	547		13.48	15.09

Table 16. Continued.

Stream	Len	Width	Spp	Class	Num	Est	LOCI	UPCI	Popmi	Popkm	MnWt	Lbac	Kghec
Pinneo Brook	355	12.3	RBT	YOY	11	11	0.0	5.8	150	93	1.6	0.43	0.48
370 ft													
			BNT	YOY	8	8	0.0	9.7	109	68	2.4	0.45	0.51
			BKT	YOY	2	2	0.0	0.0	27	17	2.0	0.10	0.11
				<6	1	1	0.0	0.0	14	8	17.0	0.41	0.45
			Total		3	3			41	25		0.51	0.56
			Trout	**Totals**	22	22			300	186		1.39	1.55
Preston Brook	380	14	RBT	6-10	6	6	0.0	0.0	83	52	65.2	7.06	7.91
365 ft													
			BNT	YOY	12	12	0.0	5.1	167	104	2.9	0.63	0.71
				<6	1	1	0.0	0.0	14	9	27.0	0.49	0.55
					13	13			181	113		1.12	1.26
			BKT	YOY	4	4	0.0	30.0	56	35	3.3	0.23	0.26
				<6	3	3	0.0	48.7	42	26	16.0	0.87	0.97
					7	7			98	61		1.1	1.23
			Trout	**Totals**	26	26			362	226		9.28	10.4
Ridley Brook	397	18.6	RBT	YOY	22	32	31.3	84.9	426	264	2.2	0.93	1.04
360 ft													
			BNT	YOY	14	14	0.0	0.9	186	116	4.1	0.74	0.83
				6-10	1	1	0.0	0.0	13	8	41.0	0.53	0.60
			Total		15	15			199	124		1.27	1.43
			BKT	YOY	1	1	0.0	0.0	13	8	2.0	0.03	0.03
			Trout	**Totals**	38	48			638	396		2.23	2.50

Table 16. Continued.

Stream	Len	Width	Spp	Class	Num	Est	LOCI	UPCI	Popmi	Popkm	MnWt	Lbac	Kghec
Snipe Island Bk	589	11.9	RBT	YOY	54	55	1.8	5.0	493	306	1.8	1.35	1.52
300 ft				<6	1	1	0.0	0.0	9	6	24.0	0.33	0.37
				6-10	2	2	0.0	37.7	18	11	62.5	1.71	1.92
			Total		57	58			520	323		3.39	3.81
			BNT	YOY	18	18	0.0	7.1	161	100	3.4	0.85	0.95
			BKT	YOY	2	2	0.0	37.7	18	11	3.0	0.08	0.09
				<6	1	1	0.0	0.0	9	6	27.0	0.37	0.41
			Total		3	3			36	17		0.45	0.50
			Trout	**Totals**	78	78			717	440		4.69	5.26
Texas Brook	287	16	BNT	YOY	15	15	0.0	7.6	276	171	3.5	1.09	1.22
605 ft				<6	2	2	0.0	98.0	37	23	17.5	0.73	0.82
				6-10	1	1	0.0	0.0	18	11	34.0	0.71	0.80
			Total		18	18			331	205		2.53	2.84
			BKT	YOY	2	2	0.0	0.0	37	23	2.0	0.08	0.09
				<6	3	3	0.0	0.0	55	34	16.0	1.00	1.13
			Total		5	5			92	57		1.08	1.22
			Trout	**Totals**	23	23			423	262		3.61	4.06

Table 16. Continued.

Stream	Len	Width	Spp	Class	Num	Est	LOCI	UPCI	Popmi	Popkm	MnWt	Lbac	Kghec
Huntington Rv.	320	16	BNT	YOY	2	2	0.0	101.7	33	21	4.0	0.15	0.17
1145 ft				6-10	1	1	0.0	0.0	17	10	160.0	3.00	3.36
			Total		3	3			50	31		3.15	3.53
			BKT	YOY	31	32	3.1	10.7	528	328	3.4	2.03	2.28
				<6	10	10	0.0	16.8	165	103	16.9	3.17	3.55
				6-10	1	1	0.0	0.0	17	10	45.0	0.84	0.95
			Total		42	43			710	441		6.04	6.78
			Trout	**Totals**	45	46			760	472		9.19	10.31
Jones Brook	245	15.6	BKT	YOY	11	11	0.0	18.2	237	147	2.7	0.75	0.84
820 ft				<6	10	10	0.0	4.7	216	134	17.3	4.35	4.87
				6-10	1	1	0.0	0.0	22	13	56.0	1.41	1.58
			Trout	**Totals**	22	22			475	294		6.51	7.29
Brush Brook	463	16.7	BNT	YOY	1	1	0.0	0.0	11	7	2.0	0.02	0.03
820 ft				6-10	2	2	0.0	0.0	23	14	85.5	2.12	2.38
				10-12	1	1	0.0	0.0	11	7	265.0	3.29	3.69
			Total		4	4			45	28		5.43	6.1
			BKT	YOY	19	20	5.0	18.6	228	142	3.0	0.74	0.84
				<6	11	11	0.0	10.3	125	78	16.3	2.22	2.49
				6-10	3	3	0.0	0.0	34	21	57.7	2.15	2.41
			Total		33	34			387	241		5.11	5.74
			Trout	**Totals**	37	38			432	269		10.54	11.84

Table 16. Continued.

Stream	Len	Width	Spp	Class	Num	Est	LOCI	UPCI	Popmi	Popkm	MnWt	Lbac	Kghec
Brush Brook Trib	345	7.3	BNT	6-10	1	1	0.0	0.0	15	10	103	3.93	4.40
820 ft													
			BKT	YOY	51	51	0.0	3.2	781	485	3.3	6.40	7.18
				<6	3	3	0.0	0.0	46	29	18.7	2.13	2.39
			Total		54	54			827	514		8.53	9.57
			Trout	**Totals**	55	55			842	524		12.46	13.97
Interchange Bk	394	6.2	RBT	YOY	1	1	0.0	339.5	13	8	2.0	0.08	0.09
335 ft													
			BNT	YOY	2	2	0.0	0.0	27	17	6.5	0.51	0.57
			BKT	YOY	10	11	9.1	52.6	147	92	5.1	2.20	2.47
				<6	3	3	0.0	0.0	40	25	22.7	2.67	3.00
				6-10	2	2	0.0	0.0	27	17	36.5	2.87	3.22
			Total		15	16			214	134		7.74	8.69
			Trout	**Totals**	18	19			254	159		8.33	9.35
Bakers Brook	313	8.7	BKT	YOY	71	73	2.7	5.9	1231	765	3.9	9.97	11.18
1075 ft				<6	34	34	0.0	6.3	574	356	16.8	20.17	22.61
				6-10	6	6	0.0	21.7	101	63	49.0	10.37	11.62
			Trout	**Totals**	111	113			1906	1184		40.51	45.41

Table 16. Continued.

Stream	Len	Width	Spp	Class	Num	Est	LOCI	UPCI	Popmi	Popkm	MnWt	Lbac	Kghec
Beaver Meadow	418	11.5	BKT	YOY	48	50	4.0	9.4	632	392	2.5	2.50	2.80
1135 ft				<6	19	19	0.0	11.3	240	149	19.1	7.25	8.13
				6-10	3	3	0.0	46.3	38	24	52.7	3.16	3.54
			Trout	**Totals**	70	72			910	565		12.91	14.47
Cobb Brook	372	14.8	BNT	YOY	2	2	0.0	0.0	28	18	3.0	0.12	0.14
775 ft													
			BKT	YOY	24	24	0.0	1.7	341	212	2.3	1.17	1.31
			Trout	**Totals**	26	26			369	230		1.29	1.45
Carpenter Brook	315	7.9	BNT	YOY	15	15	0.0	3.6	251	156	4.9	2.85	3.20
800 ft													
			BKT	YOY	6	6	0.0	34.4	101	62	3.7	0.85	0.95
				<6	1	1	0.0	0.0	17	10	26.0	1.00	1.12
			Total		7	7			118	72		1.85	2.07
			Trout	**Totals**	22	22			369	228		4.7	5.27

Table 17. Summary of out-migrating smolt trapping on the Huntington River, 2004 – 2017. The old trap which had a cone diameter of 1.8 meters was used from 2004-2006.

Year	Start Date	End date	Days Fished	First fish	Number new, unmarked Trapped	Number Marked and released[1]	Number Recaptured	Estimate	Trap Efficiency
2017	April 24	June 19	41	May 4	87	93	9	899	.097
2016	April 18	May 29	39	May 2	15	13	1	195	.077
2015	April 28	June 8	34	April 30	137	144	14	1,412	.097
2014	April 29	June 11	31	May 8	24	na	na	na	na
2013	April 23	June 6	28	Apr 26	82	na	na	na	na
2012	Mar 30	June 8	37	May 6	79	na	na	na	na
2011	May 9	May 26	10	May 10	43	na	2	na	na
2010	April 19	June 1	41	Apr 26	205	214	16	2,733	.075
2009	April 16	June 12	52	May 2	76	88	16	418	.182
2008	April 24	June 13	49	May 6	360	412	66	2,250	.16
2007	May 1	June 15	44	May 9	288	276	19	4,174	.069
2006	April 11	June 9	49	May 3	60	39	0	Nd	na
2005	April 14	June 9	49	Apr 21	126	135[2]	6	2,864	.044
2004	May 6	June 4	25	May 12	57	0	na	na	na

1 Includes recaptured smolts released again.
2 Includes 35 hatchery smolts.

Table 18. Summary of mean total lengths (mm) and weights (grams) of aged landlocked Atlantic salmon collected in the rotary screw trap in 2017. All measurements include 95% confidence intervals and range.

Age	**Number**	**Mean Length** (range)	**Mean Weight** (range)
1 (AD clip)	84	140 ± 2.1 (122 – 170)	22 ± 1.3 (13 – 42)
2	---	---	---
3	2	192 ± 34 (175 – 210)	56 ± 24 (44 – 68)