

## **Beaver Dam Management Project 2017**

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## Introduction

Beaver dams are known barriers to adult Atlantic salmon migrating upstream to spawn, blocking access to habitat in the upper reaches of brooks and streams. Female salmon have been observed below beaver dams in large numbers and are forced to build multiple redds in confined areas of the stream, often with habitat of lower quality than would otherwise be available. The survival of eggs in these crowded, overlapping redds is severely reduced and can negatively impact juvenile salmon production within the stream. Upstream areas of brooks and streams are often excellent spawning and juvenile habitat with a high percentage of gravel and cobble substrates, cold ground fed water, and low numbers of predators. After several years of blocked access, these upstream reaches run the risk of becoming devoid of salmon fry and parr which can potentially lower the number of stream imprinted adult salmon returning to these areas. Improving access to upstream habitat on individual streams could be beneficial to egg survival and juvenile production. If upstream habitat on multiple streams within a watershed is improved, the total number of returning adult salmon in the following years could be increased.

To achieve the maximum benefit of dam breaching efforts, the timing of behaviour changes and movements of salmon must be considered. On the Miramichi River these fish typically begin moving out of large holding pools, and travel upstream to find spawning habitat, from late September to late October. Salmon are likely to encounter beaver dams in these upstream areas with high populations of beavers. Small dams may not pose much of an issue during high water flows, as the fish are able swim over them, but large dams will stop any further upstream movements. Beavers can repair active dams within a 24 hour time frame, which means the notching or removal of the dams must be correctly timed with the upstream migrations of the salmon so as to not waste time and resources.

Beaver dam removal initiatives by the Miramichi Salmon Association in the past have shown potential as a tool for salmon conservation. Several locations within the watershed have shown improved juvenile counts after the dams were notched during critical salmon migrations. Before 2006, very few salmon fry were found on Betts Mills Brook near Doaktown, NB despite the construction of a fish ladder, just upstream from the mouth of the brook, at a highway crossing. In 2006 a large beaver dam blocking the fish ladder was removed and an

additional 21 dams were notched or removed on the brook. This opened more than 50,000m<sup>2</sup> of spawning habitat for the salmon. Electrofishing results by DFO and MSA showed salmon fry present in Betts Mills Brook the following year. Big Hole Brook (also near Doaktown) and Porter Brook (near Boiestown) both have high quality salmon habitat and with the removal of dams on these watercourses adults were able to access to upstream sections. High densities of salmon fry were noted in both of these brooks the following year.

By providing access to crucial spawning habitat for adult Atlantic salmon in the Miramichi River, we will ensure that a strong juvenile production rate is maintained. High numbers of juvenile salmon migrating to the ocean could potentially increase the number of adult salmon returning, improving the conservation outlook for this iconic Miramichi River species.

## **Methods**

Miramichi Salmon Association staff flew a helicopter reconnaissance flight on the Southwest Miramichi watershed to locate and GPS beaver dams. Flight paths for 2017 were determined ahead of time based on previous year's results and known beaver activities in given areas. The flight was done on October 5<sup>th</sup> and surveyed eleven tributaries on the Southwest system: Burntland Brook, Porter Brook, Salmon Brook, Muzzeroll Brook, Six Mile Brook, the Main Cains River, Otter Brook, Leighton Brook, Big Hole Brook, Burnthill Brook, and Clearwater Brook. Tributaries on the Northwest system were not flown, but areas were checked based on previous year's information and known beaver activity.

Any dams discovered were marked with hand-held Garmin GPS units and mapped using Google Earth and ArcGIS software to coordinate ground crew activities. Dams were accessed on foot and removed when possible, otherwise stream sections were canoed to remove the impoundments. Field crews began accessing and removing dams on September 28<sup>th</sup> and finished on November 3<sup>rd</sup>. Active dams were notched on multiple occasions following repairs by beavers.

## Results

In the Northwest Miramichi basin, 4 dams were initially breached by field crews on three tributaries – the Sevogle, the north branch of the Sevogle, and the Northwest Millstream (Figure 1). In the Southwest Miramichi basin, 39 dams were initially breached by field crews on 10 tributaries (Big Hole Brook, Betts Mills Brook, Rocky Brook, Porter Brook, Sabbies River, Six Mile Brook, Salmon Brook, Muzzeroll Brook, Otter Brook, and the Main Cains) (Figure 2 a&b). Dams on Big Hole Brook, Betts Mills Brook, Rocky Brook, Sabbies River, Six Mile Brook, Salmon Brook, and the north branch of the Northwest River had to be breached on multiple occasions after beavers repaired them. A total of 43 dams were initially breached in 2017 (Appendix 1).

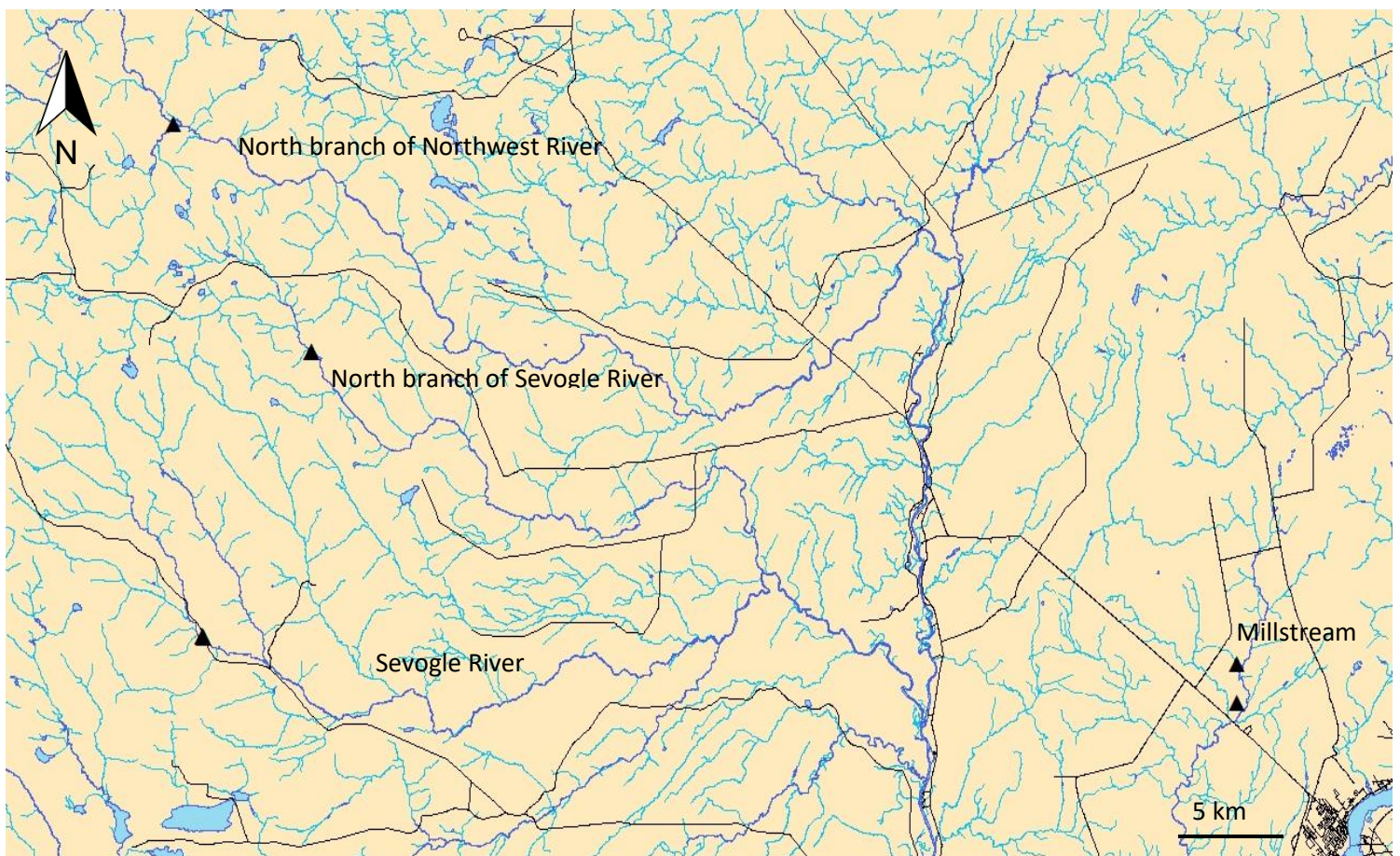


Figure 1: Tributaries of the Northwest Miramichi watershed. Beaver dams breached in 2017 are marked with a '▲'.

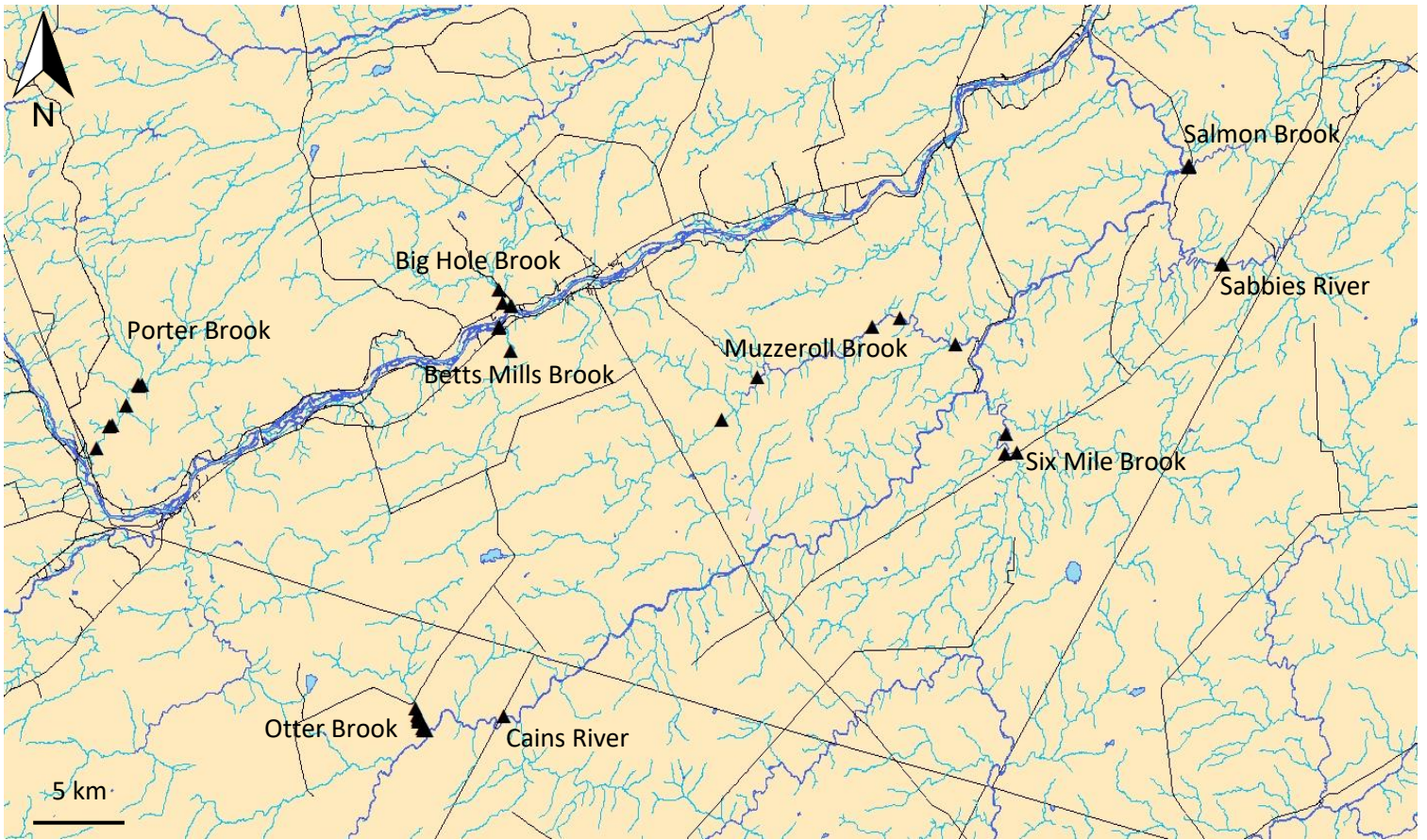


Figure 2a: Tributaries of the Southwest Miramichi watershed. Beaver dams breached in 2017 are marked with a '▲'.

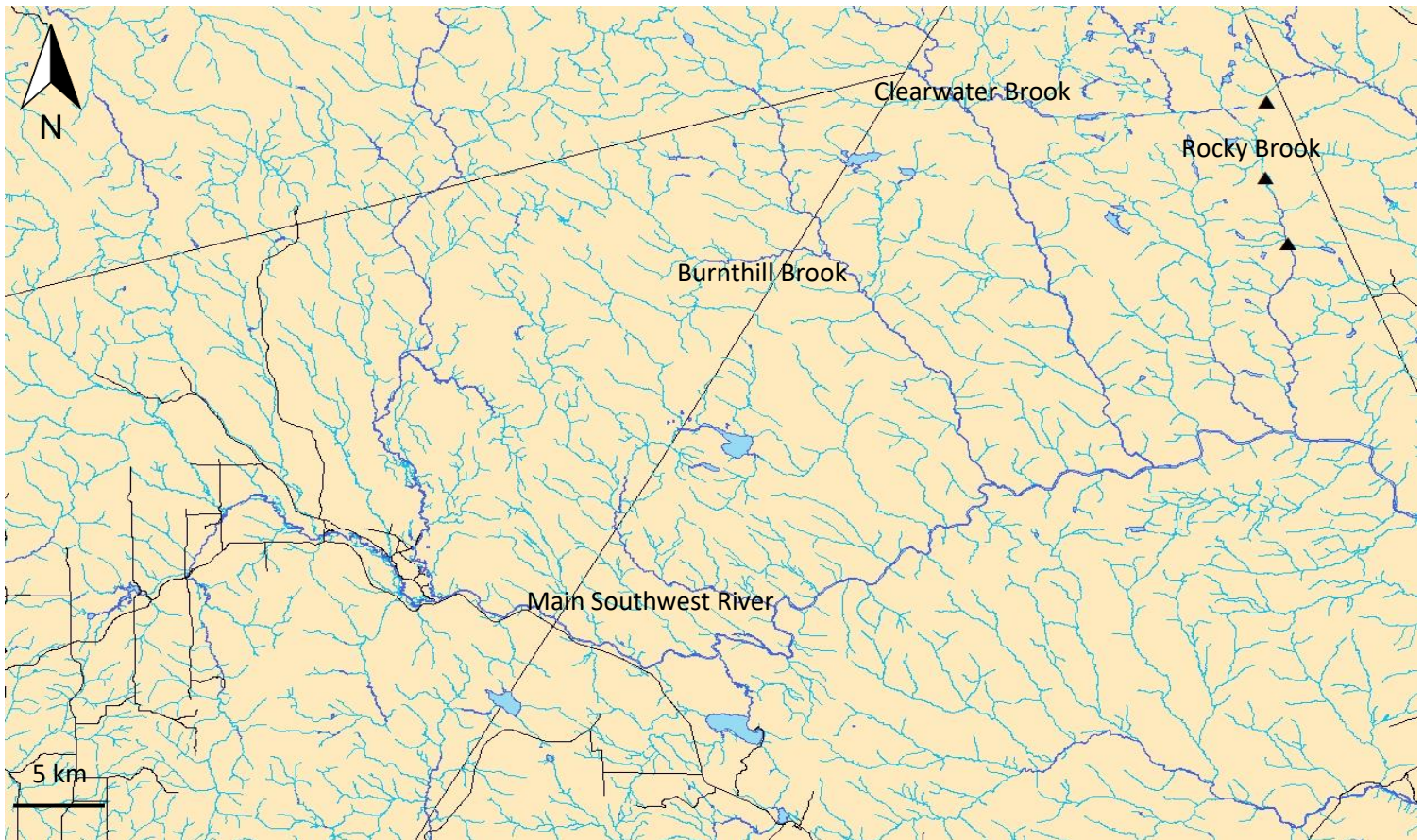


Figure 2b: Tributaries of the Southwest Miramichi watershed. Beaver dams breached in 2017 are marked with a '▲'.

## Discussion

The Miramichi watershed has a large number of tributaries with beaver dam activities, more than would be possible for field crews to remove in the scope of this project. Flight paths for 2017 were chosen based on beaver activity locations noted in previous years, and focused on larger and wider tributaries of the Miramichi River which offered more clear line-of-site observations from the air of the dams, and on areas where river access was easy to moderately acceptable for field crews.

A total of 49 dams/obstructions were observed from the air on the Southwest River; the majority of them on Otter Brook and Porter Brook. Field crews located 32 dams on the Southwest branch in 2017 with a large number of them on the Betts Mills Brook, and Salmon Brook, which were not flown because of the difficulty seeing the tributary from the air. Water levels in 2017 were extremely low compared to previous years and made it difficult to view obstructions from the air, and also limited where crews could canoe sections of rivers. Most dams were accessed on foot, except for those on Big Hole Brook, Otter Brook, and Porter Brook on the Southwest branch.

The number of dams breached in 2017 (42) was less than that of 2016 (76) due to water levels being extremely low during the fall of 2017 and there being limited access to for the field crews. In 2015 (35) dam breaching was low (35) because of a large rain storm that occurred during the fall of 2015, that washed out many of the dams. The number of dams removed in 2014 (167) and 2013 (112) exceeded those removed in 2017 and 2016 and is most likely related to the water level being ideal during those field seasons as opposed to the poor water conditions of 2017 and 2016.

Although beaver activity was present throughout the watershed, levels of activity varied between river systems. In the Southwest system, Rocky Brook, Porter Brook, Burntland Brook, and Muzzeroll Brook all had zero to relatively low levels of beaver activity whereas Salmon Brook, Big Hole Brook, Betts Mills Brook, and Sabbies River had higher activity levels. In the Northwest system, the north branch of the Sevogle River and Barracks Brook had high levels of beaver dam activity.

Just over half (56%) of the electrofishing surveys completed in the summer of 2017 by MSA focused on areas upstream of beaver dams removed in 2016; 7 on the Southwest and 2 on the Northwest. Out of the 16 sites surveyed, 4 of these sites had fry present, which were located on the Bartholomew River, Gordon Brook, Big Hole Brook, and the Northwest river. These sites were in lower to midstream reaches of the tributaries, suggesting adult salmon did make it past dams that were breached in the lower sections, but were not able to access the more upstream habitat. Beavers can repair active dams within a 24 hour time frame, so the timing of notching/removing dams is crucial in helping the fish access ideal spawning habitat. Field crews can only access and remove so many dams per day and the efficiency of the beavers in repairing them can still pose problems for adult salmon migrating upstream to spawn.

In the summer of 2018 electrofishing surveys will be conducted upstream of dams breached/removed in 2017 to assess the impact of the program on Atlantic salmon fry production.

## **Acknowledgements**

The Miramichi Salmon Association would like to thank the following people for their help with this program:

- IP/Rocky Brook Camp field crews for their help removing dams on the Southwest Miramichi
- J.D. Irving Ltd. for their helicopter donation to conduct aerial surveys on a section of the Southwest Miramichi River from 2013 - 2017
- DFO (RFCPP) for their funding contribution to the project from 2013 - 2017

Appendix 1: GPS coordinates of breached beaver dams in 2017.

Date	Tributary	Latitude	Longitude	Active (Y/N)	Initial/Return Visit (I/R)	Breached on Return (Y/N)
28-Sep-17	Six Mile	46.48309	-65.82796	N	I	N/A
28-Sep-17	Sabbies	46.56393	-65.68379	Y	I	N/A
28-Sep-17	Salmon Brook	46.60675	-65.70585	Y	I	N/A
2-Oct-17	Sabbies	46.56363	-65.68291	Y	R	Y
2-Oct-17	Sabbies	46.56367	-65.68464	N	I	N/A
2-Oct-17	Salmon Brook	46.60675	-65.70585	Y	R	Y
2-Oct-17	Big Hole Brook	46.95385	-65.65707	Y	I	N/A
2-Oct-17	Barracks Brook	47.079637	-66.300708	Y	I	n/a
4-Oct-17	Muzzeroll Brook	46.45715	-66.01131	Y	I	N/A
4-Oct-17	Big Hole Brook	46.54818	-66.17863	Y	R	Y
4-Oct-17	Barracks Brook	47.07964	-66.30071	y	R	y
4-Oct-17	Depot	47.27451	-66.3195	y	R	n/a
4-Oct-17	Salmon Brook	46.60675	-65.70585	Y	R	Y
4-Oct-17	Sabbies	46.56363	-65.68291	Y	R	Y
5-Oct-17	North Sevogle	47.188	-66.23046	n	I	n/a
6-Oct-17	Big Hole Brook	46.95385	-65.65707	Y	R	Y
6-Oct-17	Salmon Brook	46.60675	-65.70585	Y	R	Y
6-Oct-17	Salmon Brook	46.60643	-65.70606	Y	I	N/A
6-Oct-17	Betts Mills Brook	46.52859	-66.17974	Y	I	N/A
6-Oct-17	Betts Mills Brook	46.5387	-66.188	Y	I	N/A
10-Oct-17	Betts Mills Brook	46.53877	-66.18781	Y	R	Y
10-Oct-17	Salmon Brook	46.60682	-65.70579	Y	R	Y
10-Oct-17	Rocky Brook	46.690556	-66.636111	Y	R	Y
11-Oct-17	Main Cains	46.36966	-66.18562	Y	I	N/A
11-Oct-17	Betts Mills Brook	46.53868	-66.18777	Y	R	Y
11-Oct-17	Muzzeroll Brook	46.49818	-66.03316	Y	I	N/A
11-Oct-17	Muzzeroll Brook	46.51662	-66.00797	Y	I	N/A
12-Oct-17	Muzzeroll Brook	46.53794	-65.92776	Y	I	N/A
12-Oct-17	Muzzeroll Brook	46.54195	-65.90849	N	I	N/A
12-Oct-17	Muzzeroll Brook	46.53029	-65.86972	Y	I	N/A
13-Oct-17	Rocky Brook	46.757778	-66.649722	Y	R	Y
16-Oct-17	Barracks Brook	47.08002	-66.3008	y	R	y
16-Oct-17	North Sevogle	47.188	-66.23046	y	R	y
16-Oct-17	Big Hole Brook	46.549567	-66.185278	Y	R	Y
16-Oct-17	Big Hole Brook	46.54822	-66.17975	Y	R	Y



<b>Date</b>	<b>Tributary</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Active (Y/N)</b>	<b>Initial/Return Visit (I/R)</b>	<b>Breached on Return (Y/N)</b>
16-Oct-17	Betts Mills Brook	46.53865	-66.18787	Y	R	Y
16-Oct-17	Sabbies	46.56395	-65.6838	Y	R	Y
17-Oct-17	Big Hole Brook	46.55518	-66.1875	N	R	N
17-Oct-17	Betts Mills Brook	46.53865	-66.18787	Y	R	Y
17-Oct-17	Salmon Brook	46.60678	-65.70591	Y	R	Y
17-Oct-17	Salmon Brook	46.60678	-65.70591	Y	R	Y
18-Oct-17	Rocky Brook	46.757778	-66.649722	Y	R	Y
19-Oct-17	Porter Brook	46.51411	-66.43917	Y	I	N/A
19-Oct-17	Porter Brook	46.50517	-66.44752	Y	I	N/A
19-Oct-17	Porter Brook	46.49652	-66.45682	Y	I	N/A
19-Oct-17	Porter Brook	46.49616	-66.45885	Y	I	N/A
19-Oct-17	Porter Brook	46.48659	-66.46806	Y	I	N/A
19-Oct-17	Porter Brook	46.51437	-66.43632	Y	I	N/A
19-Oct-17	Porter Brook	46.51396	-66.43864	Y	I	N/A
19-Oct-17	Salmon Brook	46.60678	-65.70591	Y	R	Y
19-Oct-17	Betts Mills Brook	46.53865	-66.18787	Y	R	Y
23-Oct-17	Salmon Brook	46.60678	-65.70591	Y	R	Y
23-Oct-17	Betts Mills Brook	46.53906	-66.18707	Y	R	Y
23-Oct-17	Porter Brook	46.49614	-66.45876	Y	I	N/A
23-Oct-17	Porter Brook	46.50534	-66.44754	Y	I	N/A
23-Oct-17	Rocky Brook	46.690556	-66.636111	Y	R	Y
24-Oct-17	Otter Brook	46.37329	-66.24651	N	I	N/A
24-Oct-17	Otter Brook	46.37009	-66.245	N	I	N/A
24-Oct-17	Otter Brook	46.36967	-66.24488	Y	I	N/A
24-Oct-17	Otter Brook	46.36929	-66.24416	Y	I	N/A
24-Oct-17	Otter Brook	46.36889	-66.24419	Y	I	N/A
24-Oct-17	Otter Brook	46.36857	-66.24471	Y	I	N/A
24-Oct-17	Otter Brook	46.36818	-66.24485	Y	I	N/A
24-Oct-17	Otter Brook	46.36743	-66.24486	Y	I	N/A
24-Oct-17	Otter Brook	46.36502	-66.24129	Y	I	N/A
24-Oct-17	Otter Brook	46.36459	-66.24161	Y	I	N/A
24-Oct-17	Otter Brook	46.36382	-66.2412	Y	I	N/A
24-Oct-17	Otter Brook	46.36369	-66.23925	Y	I	N/A
24-Oct-17	North Sevogle	47.188	-66.23046	y	R	y
24-Oct-17	Barracks Brook	47.08001	-66.30077	y	R	y
25-Oct-17	Big Hole Brook	46.95385	-65.65707	Y	R	Y
25-Oct-17	Betts Mills Brook	46.53869	-66.1878	Y	R	Y
26-Oct-17	Salmon Brook	46.60678	-65.70591	Y	R	N
26-Oct-17	Salmon Brook	46.60679	-65.70644	Y	R	N

<b>Date</b>	<b>Tributary</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Active (Y/N)</b>	<b>Initial/Return Visit (I/R)</b>	<b>Breached on Return (Y/N)</b>
26-Oct-17	Salmon Brook	46.60654	-65.70681	Y	R	N
26-Oct-17	North Sevogle	47.188	-66.23046	y	R	n
26-Oct-17	Barracks Brook	47.08001	-66.30077	y	R	n
27-Oct-17	Six Mile	46.48239	-65.83595	N	I	Y
27-Oct-17	Six Mile	46.49113	-65.83536	N	I	Y
27-Oct-17	Northwest Millstream	47.051667	65.633056	y	I	n/a
30-Oct-17	Northwest Millstream	47.066389	65.633056	y	I	n/a
16-Nov-17	Rocky Brook	46.721944	-66.649722	Y	I	Y