



Removal of natural obstructions to improve Atlantic Salmon and Brook Trout habitat in western NL

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Introduction

Flat Bay Brook and Harry's River are popular Atlantic Salmon and Brook Trout fishing systems in western Newfoundland. As of July 2014, the retention level for Atlantic Salmon on these systems was increased from two to four fish (DFO 2014). Increased fishing pressure may slow or prevent future population growth. Furthermore, large expanses of breeding habitat along Flat Bay Brook and Harry's River tributaries are inaccessible due to natural obstructions. Active and inactive beaver dams coupled with low water levels can prevent the upstream migration of Atlantic Salmon and instream migration of Brook Trout (Collen and Gibson 2001, Mitchell and Cunjak 2007, Taylor et al. 2010). These obstructions can prevent Atlantic Salmon from accessing upstream spawning habitat, while simultaneously increasing competition for downstream spawning habitat. We propose the removal of natural obstructions along the Sheep Brook, Cold Brook, and Ahwachenjeech tributaries, which will restore natural riverine flow conditions and open approximately 4.5 km of benthic habitat. These restoration activities will increase Atlantic Salmon spawning habitat, allow the in-stream migration of Brook Trout, and will promote sustainable recreational fisheries in western Newfoundland.

The results of this project will be used to determine the short term effects of removing natural habitat obstructions on river health and population dynamics of Atlantic Salmon and Brook Trout. Periodic monitoring beyond 2015 will determine long term benefits of removing natural obstructions. This project aligns closely with conservation projects headed under Qalipu Mi'Kmaq First Nation Band's Aboriginal Fisheries Strategy. Mi'kmaq Alsumk Mowimsikik Koqoey Association (MAMKA) has worked closely with Aboriginal Fisheries Guardians to protect our watersheds from illegal activities, while improving stewardship through river side clean ups and Atlantic Salmon redd, benthic habitat, and obstruction monitoring. This project also aligns closely with MAMKA's Aboriginal Funding for Species at Risk projects, including monitoring the distribution and abundance of American Eel and Banded Killifish in Newfoundland.

Methods

Initial site assessments were completed in August for Ahwachenjeech, Sheep Brook, and Cold Brook (Table 1, Appendix A). Six complete obstructions, two per tributary, were identified and photographed. Additional site assessments were carried out at Ahwachenjeech in December and Sheep Brook in January (Appendix B). The length, height, downstream depth, upstream depth, conductivity, pH, and temperature were measured for the two obstructions on Ahwachenjeech in December. The length and height of the first obstruction were measured at Sheep Brook, but heavy snow accumulation precluded measurements for the second obstruction. Similarly, heavy snow accumulation precluded measurements for obstructions on Cold Brook. Additional site assessments will be carried out in the spring prior to obstruction removal to ensure that removal strategy will operate effectively and that all physical data are collected before obstruction removal.

Preliminary Results and Discussion

During low water in August, the first obstruction on Ahwachenjeech hindered the downstream movement of water, resulting in the pooling and damming of water upstream (Appendix A). Although water flowed freely over the first obstruction on Ahwachenjeech during high water in December, a considerable reservoir had formed (Appendix B). Obstruction 1 on Ahwachenjeech was 1.0 m in height, with a downstream plunge depth of 0.4 m during high water in December. The height of the obstruction during high water was 2.5 times greater than the plunge depth, which is sufficient to block the upstream migration of Atlantic Salmon (Bjornn and Reiser 1991). Low water during the summer and fall would increase the height differential between plunge depth and obstruction height, preventing the upstream migration of Atlantic Salmon. The second obstruction on Ahwachenjeech was smaller in size, but was extensive enough to impede the movement of water downstream (Appendix B). This obstruction measured 8.9 m across the stream and was 0.9 m in height. The plunge depth was 0.6 m during high water in December, which may not prevent the movement of Atlantic Salmon, but will seriously impede migration of Brook Trout during lower water in the summer and fall. Low water during the summer and fall may increase the height differential at the second obstruction, fully impeding upstream migration of Atlantic Salmon.

Table 1: Downstream physical characteristics of obstructions and water at three tributaries in western Newfoundland

Date	Tributary	Obstruction #	Latitude	Longitude	Across stream length (cm)	Height (cm)	Depth (cm)	Temp (C)	pH	Conductivity
17-Dec-14	Awachenjeech	1	48.65230	-58.26805	1050	100	35	1.72	7.54	98
17-Dec-14	Awachenjeech	2	48.65308	-58.26483	890	85	55	1.72	8.09	95
15-Jan-15	Sheep Brook	1	48.38358	-58.42901	1490	170	na	na	na	na
15-Jan-15	Sheep Brook	2	48.38456	-58.42939	na	na	na	na	na	na
12-Aug-14	Cold Brook	1	48.37265	-58.45337	na	na	na	na	na	na
12-Aug-14	Cold Brook	2	48.37303	-58.45355	na	na	na	na	na	na

Table 2: Upstream physical characteristics of obstructions and water at three tributaries in western Newfoundland

Date	Tributary	Obstruction #	Latitude	Longitude	Depth (cm)	Temp (C)	pH	Conductivity
17-Dec-14	Awachenjeech	1	48.65223	-58.26809	85	1.73	7.95	102
17-Dec-14	Awachenjeech	2	48.65308	-58.26483	70	1.75	7.75	102
15-Jan-15	Sheep Brook	1	48.38357	-58.42901	na	na	na	na
15-Jan-15	Sheep Brook	2	48.38455	-58.42939	na	na	na	na
12-Aug-14	Cold Brook	1	48.37265	-58.45337	na	na	na	na
12-Aug-14	Cold Brook	2	48.37303	-58.45355	na	na	na	na

The downstream obstruction on Sheep Brook consisted of two large log jams that spanned two separate forks. These log jams were extensive and resulted in a considerable reservoir of water developing upstream of the obstruction. The log jam obstructing the main fork of Sheep Brook measured 1.7 m in height and was 14.9 m in length (Table 1). Due to the extensive snow cover, accurate measurements for obstruction 2 on Sheep Brook and Obstructions 1 and 2 on Cold Brook were not carried out.

Discussions with Fisheries and Oceans Biologists identified that removal of natural obstructions during low water will not result in a substantial increase in sedimentation, downstream flooding, or destabilization of shoreline habitat. MAMKA identified that adequate outreach and education will be necessary to ensure that stakeholders are aware of restoration activities and how these activities will positively affect recreational fisheries. Finally, restoration activities will have to be carried out in such a way to ensure that dislodged debris does not float downstream, creating a new log jam or negatively affecting pools or other important Atlantic salmon habitat. Removal of obstructions will likely facilitate the movement of Atlantic salmon and brook trout during low water, but may reduce brook trout habitat in areas where a substantial headwater has formed.

References

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Appendix A: Images showing obstructions on three tributaries in western NL



Figure 1: First obstruction (downstream) on Sheep Brook, Flat Bay Brook, during low water in August. This section blocks the main fork of Sheep Brook.



Figure 2: First obstruction (downstream) on Sheep Brook, Flat Bay Brook, during low water in August. This section blocks a secondary fork of Sheep Brook.



Figure 3: Second obstruction (Upstream) on Sheep Brook, Flat Bay Brook, during low water in August.



Figure 4: First obstruction (downstream) on Cold Brook, Flat Bay Brook, during low water in August.



Figure 5: Second obstruction (downstream) on Cold Brook, Flat Bay Brook, during low water in August.



Figure 6: First obstruction on Ahwachenjeech, Harry's River, during low water in August.

Appendix B: Images showing obstructions on three tributaries in western NL



Figure 7: First obstruction (downstream) on Sheep Brook, Flat Bay Brook, in January. This section blocks the main fork of Sheep Brook. Coordinates: 48.38358, -58.42901



Figure 8: Second obstruction (upstream) on Sheep Brook, Flat Bay Brook, in January. Coordinates: 48.38456, -58.42939



Figure 9: First obstruction (downstream) on Ahwachenjeech, Harry's River, during high water in December. Coordinates: 48.65230, -58.26805



Figure 10: Second obstruction (upstream) on Ahwachenjeech, Harry's River, during high water in December. Coordinates: 48.65308, -58.26483

Appendix C: Draft sign illustrating obstruction removal on three tributaries in western NL

Removal of natural obstructions to improve Brook Trout and Atlantic Salmon habitat in Western Newfoundland

Pre-obstruction removal		Post-obstruction removal	
 <p style="font-size: small;">First obstruction on Awachnechee, a tributary of Harry's River, before removal. The obstruction was 10.5 m long and 1.0 m in height.</p>	 <p style="font-size: small;">Second obstruction on Awachnechee, a tributary of Harry's River, before removal. The obstruction was ## m long and ## m in height.</p>	 <p style="font-size: small;">First obstruction on Awachnechee, a tributary of Harry's River, after removal. The obstruction was 10.5 m long and 1.0 m in height.</p>	 <p style="font-size: small;">Second obstruction on Awachnechee, a tributary of Harry's River, after removal. The obstruction was ## m long and ## m in height.</p>
 <p style="font-size: small;">First obstruction on Cold Brook a tributary of Flat Bay Brook, before removal. The obstruction was 14.9 m long and 1.7 m in height.</p>	 <p style="font-size: small;">Second obstruction on Cold Brook a tributary of Flat Bay Brook, before removal. The obstruction was ## m long and ## m in height.</p>	 <p style="font-size: small;">First obstruction on Cold Brook a tributary of Flat Bay Brook, after removal. The obstruction was 14.9 m long and 1.7 m in height.</p>	 <p style="font-size: small;">Second obstruction on Cold Brook a tributary of Flat Bay Brook, after removal. The obstruction was ## m long and ## m in height.</p>
 <p style="font-size: small;">First obstruction on Sheep Brook, a tributary of Flat Bay Brook, before removal. The obstruction was ## m long and ## m in height.</p>	 <p style="font-size: small;">Second obstruction on Sheep Brook, a tributary of Flat Bay Brook, before removal. The obstruction was ## m long and ## m in height.</p>	 <p style="font-size: small;">First obstruction on Sheep Brook, a tributary of Flat Bay Brook, after removal. The obstruction was ## m long and ## m in height.</p>	 <p style="font-size: small;">Second obstruction on Sheep Brook, a tributary of Flat Bay Brook, after removal. The obstruction was ## m long and ## m in height.</p>
<p style="font-size: x-small;">By increasing available spawning habitat, we can ensure that Atlantic Salmon and Brook Trout maintain sustainable populations for future generations to enjoy.</p>		<p style="font-size: x-small;">Removal of these obstructions will increase connectivity in Flat Bay Brook and Harry's River by opening up new spawning habitat and allowing for the unimpeded migration of Atlantic Salmon and Brook Trout.</p>	
<p>MAMKA worked in collaboration with Qalipu Mi'kmaq First Nation and Fisheries and Oceans Canada to remove obstructions along one tributary of Harry's River and two tributaries of Flat Bay Brook.</p>			
			

Note: Images and text in post-obstruction removal are place holders. Final images and text will be added after obstruction removal