Atlantic Whitefish Recovery Project

Water Quality & River Surveys

Summary Report

April 2009 to March 2010

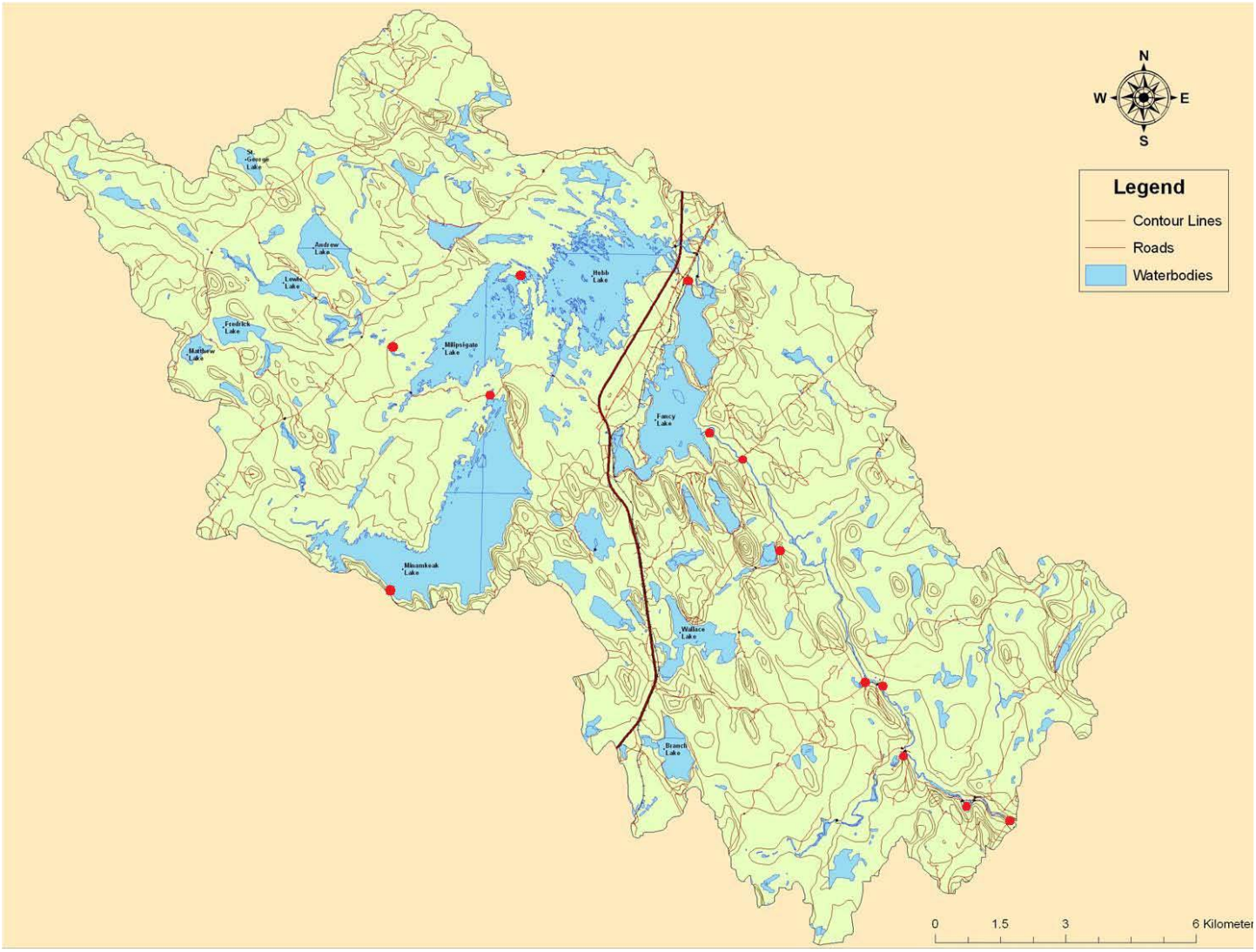
WATER QUALITY MONITORING 2010

Water quality was conducted from June 5th to July 17th, 2009. The average water temperatures during this time period were fairly consistent throughout the system, getting cooler only when you reach the estuary. The average specific conductivity is variable throughout the system with the three lakes showing the same measure of specific conductivity with a spike at the Birch Brook site, most likely a result of the influx of runoff from tailing ponds at the nearby quarry. Following these sites, specific conductivity increases to Fitch Brook and then decreases towards the estuary.

Dissolved solids were higher at Birch Brook and Fitch Brook then at the rest of the sites. Salinity was consistent throughout the lake systems and higher in Birch Brook and the river itself, most likely due to the nearby quarry and residential housing along the river. The percentage of total dissolved oxygen at each site along the Petite Rivière watershed was between 90 and 110. The last graph shows pH per site and indicates a decreasing trend in pH as you move from the upper lakes to the estuary.

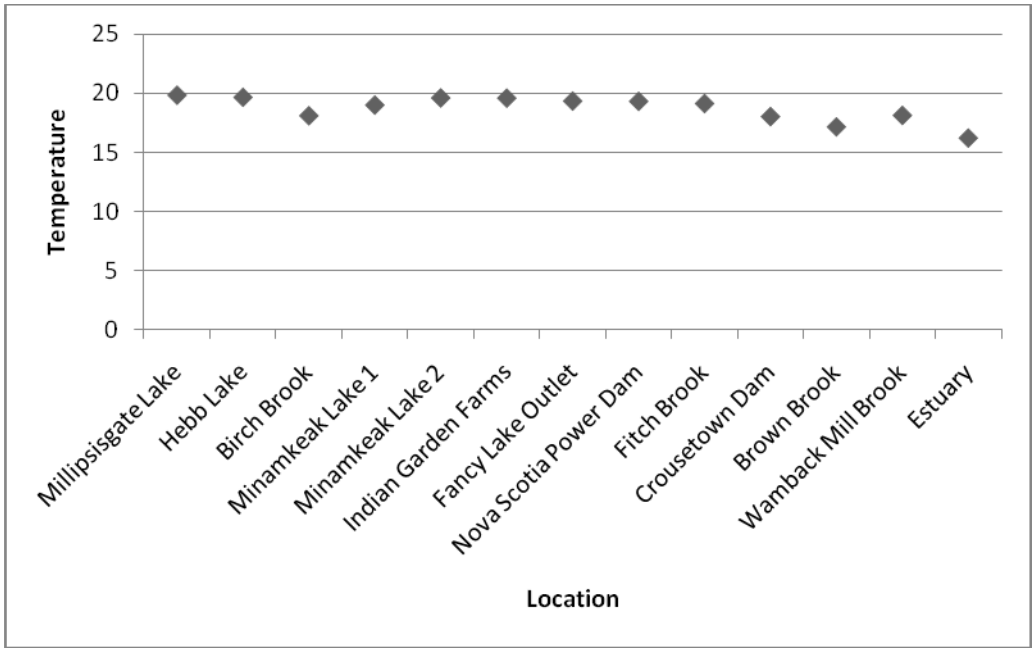
The following graphs show average variations in water quality on the 13 sites sampled throughout the Petite Rivière Watershed from June 5-July 17th. Overall, this data suggest that the water of the Petite Rivière watershed is of good quality and provides good aquatic habitat for the Atlantic whitefish as it moves upstream. The lakes in which the landlocked Atlantic whitefish populations reside has superior water quality, making it an ideal place for the whitefish to make their home. This aspect results from the fact that these lakes are protected as the supply drinking water to the Town of Bridgewater. One area that needs to be addressed in terms of water quality is the inflow of water from Birch Brook into Milipsigate Lake, as it contains a lot of dissolved solids and possible chemicals from the tailings ponds located near the brook from the rock quarry.

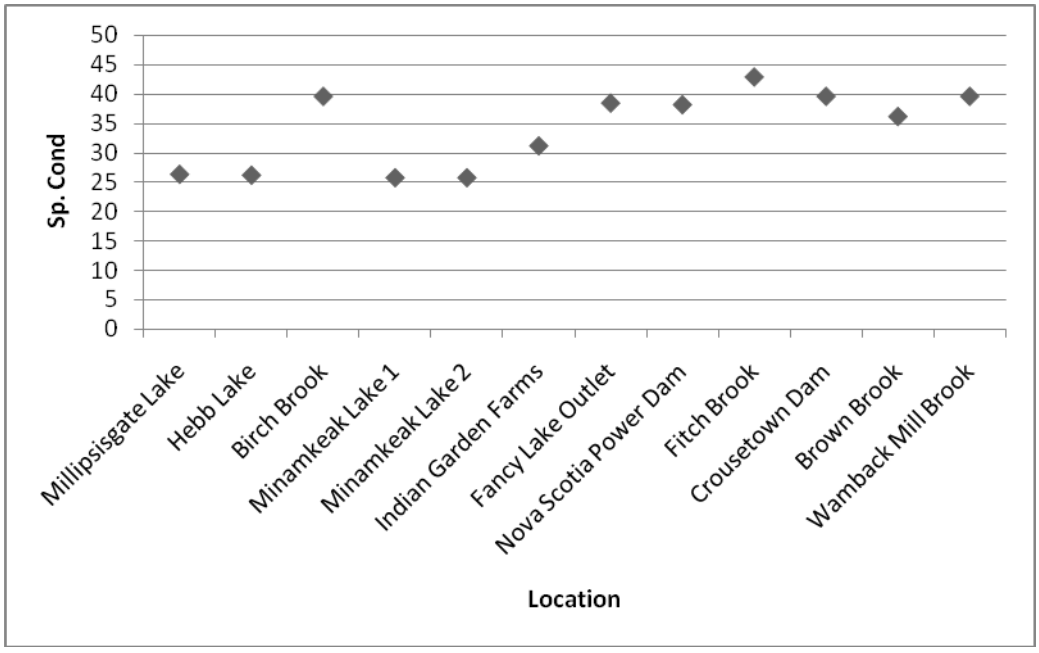
Sample Sites
Milipsigate Lake
Hebb Lake
Birch Brook
Minamkeak Lake (Camperdown)
Minamkeak Lake dam
Indian Garden Farms Train Bridge
Fancy Lake outlet
Conquerall Mills dam
Fitch Lake Brook
Junction of the Conquerall Mills and Crousetown roads
Crousetown Dam
Brown Brook
Wamback Mill Brook
Estuary (Bridge)



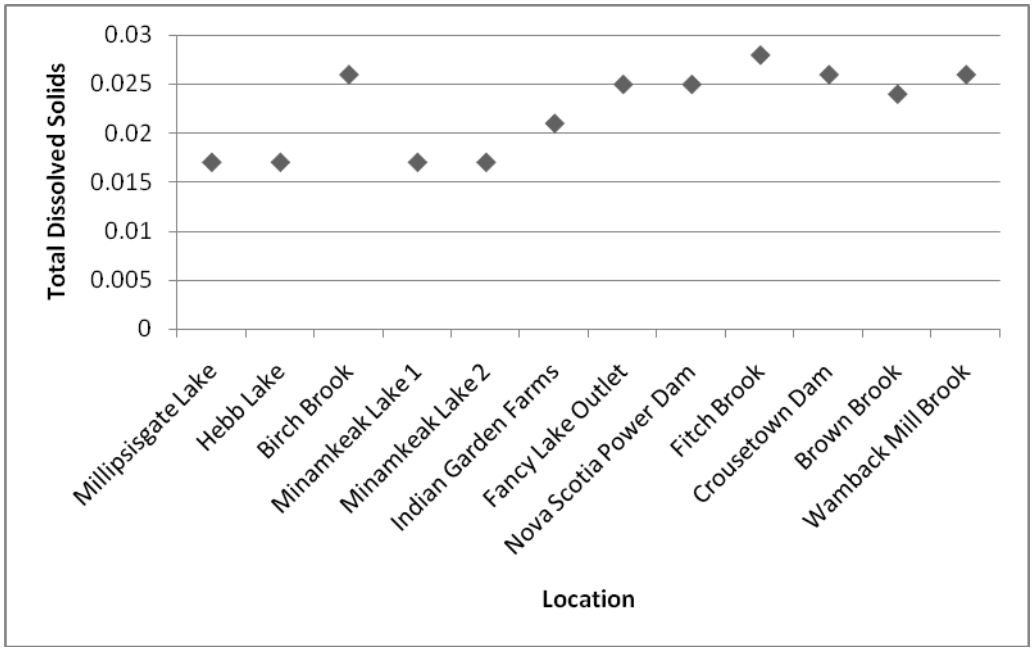
Map indicating water sample site locations.

Graph 1: Average temperature per site (June 5-July 17, 2009)

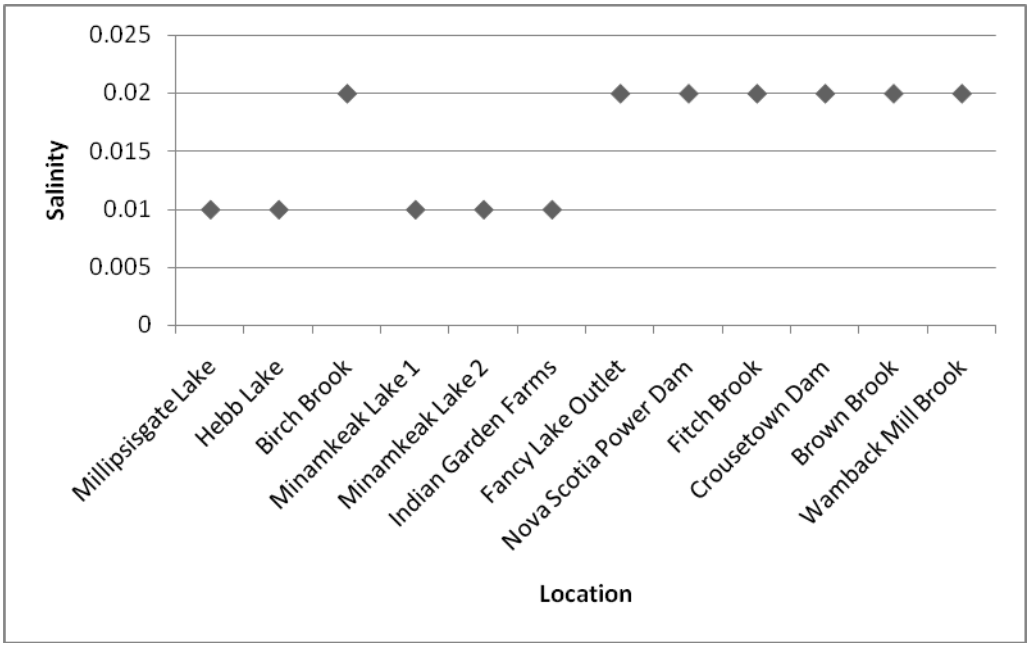




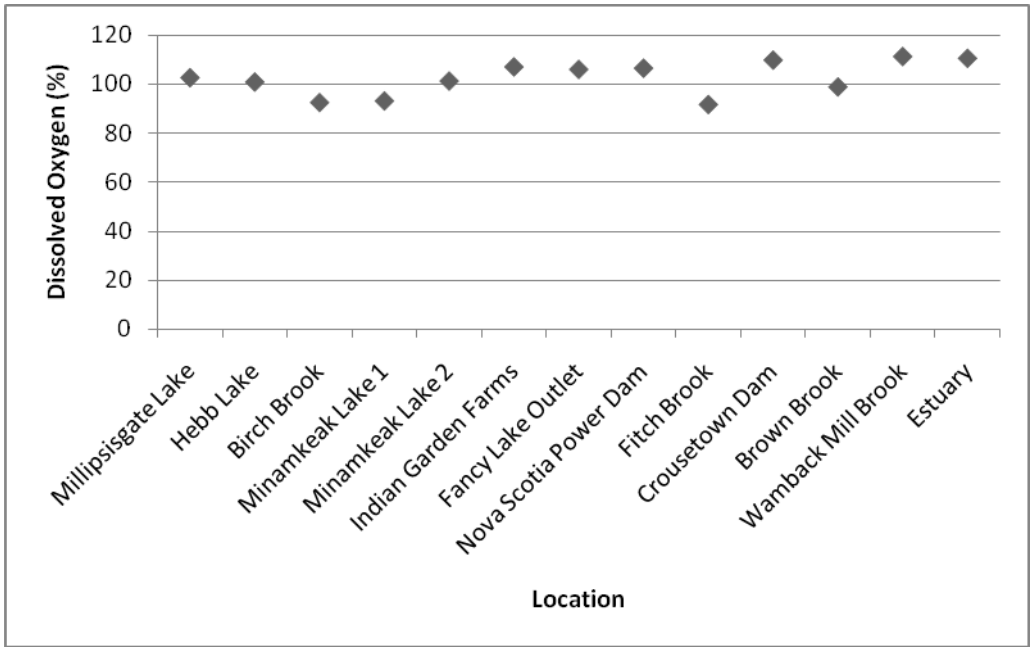
Graph 2: Average specific conductivity per site (June 5-July 17, 2009)



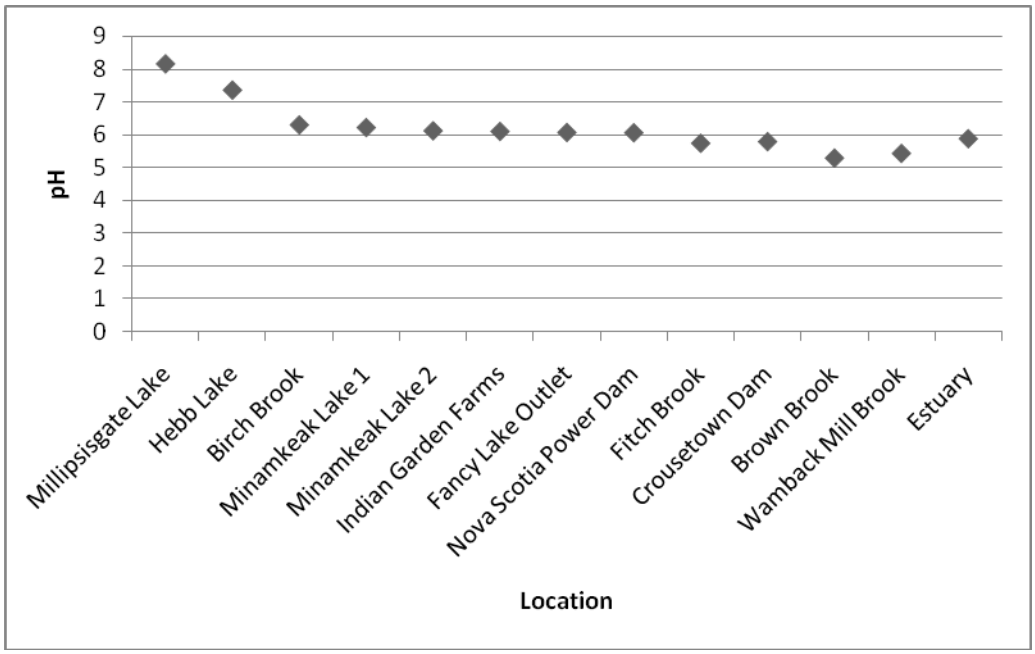
Graph 3: Average total dissolved solids per site (June 5-July 17, 2009)



Graph 4: Average salinity per site (June 5-July 17, 2009)



Graph 5: Average dissolved oxygen (%) per site (June 5-July 17, 2009)



Graph 7: Average pH per site (June 5-July 17, 2009)

RIVER SURVEYS 2009

River surveys were conducted along the main branch of the Petite Rivière from the estuary to the head of the river at the Fancy Lake outlet following the Nova Scotia Salmon Association's Adopt-A-Stream survey protocols. For each section of the river, a GPS location was taken at the start and finish of each assessment and water temperature was recorded. Water level, adjacent land uses, condition of the banks, channel width, water movement, water depths, obstructions, pools, cover, substrate size, embeddedness, and aquatic insects were all recoded. In light of the results produced from the river surveys, and visual assessment of the river, several locations were identified as being in need of restoration in order to improve the upstream passage for the Atlantic whitefish.

In several locations there are rock wall structures remaining from previous damming operations in the past on the Petite Rivière. The Crousetown dam site is the most obvious site. Above and below the dam there are two places where a man-made rock wall exists. The first (below the dam) is a small rock wall that is intended to direct water around an island and help to increase the water depth in this area. Although, on one hand, it may be helping a little bit with the water depth on the other end of the island, the fish can still attempt to make their way up stream and get blocked by the rock wall and have to move back downstream to locate the correct passage. In addition, at this site, as a result of the numerous diversions around islands and the rock wall, there has been erosion occurring on the right side of the bank as well as sediment deposition causing the area to become very wide and shallow. The site upstream from the fire pond consists of a large rock wall stretching across the width of the entire river with a fish passage of less than 1 metre on the left bank (see below). The rocks in this wall are very large and there is a large still water behind it. Restoration needs to be done here to increase water flow through the whole width of the river and to increase the area for fish passage across the rock wall.

Full length rock wall above Fire Pond bridge.

Another location flagged for restoration this summer is an area at the outlet of the fire pond in Petite Rivière (see below). Where the bank has eroded between the pond and the river at this site, there is a steady stream of water flowing out of the pond and merging with the river; however, the angle of the fire pond outflow is causing the adjacent bank to become eroded at this point. As a result this area is very flat and shallow with a build up of sediment. Building up the opposing bank and reinforcing it would decrease the rate of erosion and help to divert water back into the channel to increase its depth.

Fire Pond outlet.

Stream Assessments: Petite Rivière Main Branch (2009)

Date	June 10 (4 sections)	June 18 (4 sections)	July 7 (5 sections)	July 14 (6 sections)	July 16 (4 sections)	July 20 (1 section)	July 21 (1section)	July 28 (1 section)
Location	**1:** 44°14.315N 64°27.387W **2:** 44°14.334N 64°27.308W **3:** 44°14.313N 64°27.046W **4:** 44°14.274N 64°27.187W	**1:**44°14.103N 64°26.886W **2:** 44°14.120N 64°26.942W **3:** 44°14.126N 64°27.036 **4:** 44°14.130N 64°27.098W	**1:** 44°14.236N 64°27.337W **2: N/A** **3:** 44°14.177N 64°27.511W **4:** 44°14.322N 64°27.6239W **5:** 44°14.363N 64°27.827W	**1:** 44°15.723N 64°29.109W **2:** 44°15.694N 64°29.068W **3:** 44°15.584N 64°28.966W **4:** 44° 14.894N 64°28.603W **5:** 44°14.946N 64°28.556W **6:** N/A	**1:** 44°15.741N 64°29.344W **2:** 44°18.469N 64°31.469W **3:** 44°18.330N 64°31.339W **4:** 44°18.040N 64°31.021W	44°17.170N 64°30.193W	44°16.878N 64°29.874W	N/A
Water Temperature	**1:** 17.4°C **2:** 16.7°C **3:** 17.1°C **4:** 17.8°C	**1:** 17.5°C **2:** 17.8°C **3:** 18.5°C **4:** 18.6°C	**1:** 17.7°C **2:** N/A **3:** 18.7°C **4:** 18.5°C **5:** 18.7°C	**1:** 19.8°C **2:** 19.8°C **3:** 20.1°C **4:** 19.1°C **5:** 19.5°C **6:** 20.1°C	**1:** 21.3°C **2:** 21.3°C **3:** 21.1°C **4:** 21°C	20.8°C	22.7°C	23.4°C
Water Level	**1:** Low **2:** Low **3:** Low **4:** Low	**1:** low **2:** N/A **3:** low **4:** N/A	**1:** mid-flow **2:** mid-flow **3:**mid-flow **4:** N/A **5:** N/A	**1:** low **2:** low **3:** low **4:** low **5:** low **6:** low	**1:** low **2:** low **3:** low **4:** low	low	low	low
Adjacent Land Uses	**1:** Bridge, residential dwelling, dirt road. **2:** Grassy lawn dirt road, tree line. **3:** Grass lawn, rural highway, steep bank with vegetative cover. **4:** Provincial highway, steep bank with vegetation.	**1:** fire hall, commercial buildings, residential buildings, bridge **2:** rocky vegetation, steep bank **3:** residential area, overhanging vegetation, sturdy bank **4:** highway, forest	**1:** bridge, shrubs, rocks, residential area up steep slope **2:** fire dept. water supply pond, swamp, residential area **3:** residential area, swamp, rocky area, berm separating pond from river **4:** bridge, residential area, road, moss & vegetative cover **5:** forested area, swamp, distant	**1:** wooden dam, grassy residential area, bridge, rocky area, mill building **2:** residential area to river edge, dugout area for swimming **3:** forested **4:** residential area, forested, private bridge **5:** forest and field **6:** forest and residential area	**1:** residential area, road **2:** community hall, road, forested area, bridge upstream **3:** forested **4:** forested	Forested	Forested, clear cut area about 100m from bank	Forested, old dam site (walls, fences, etc)

			road					
Condition of Bank	**1:** stable **2:** stable **3:** stable **4:** potentially unstable	**1:** left bank stable, right bank potentially unstable (human causes) **2:** N/A **3:** stable **4:** potentially unstable (closeness of road)	**1:** stable, right bank steeper **2:** right potentially unstable, left is muddy (swamp) **3:** slightly unstable **4:** stable **5:** potentially unstable	**1:** stable, right bank steeper **2:** manmade rock walls on both sides, cement on right **3:** stable **4:** stable, manmade rock wall on right **5:** stable **6:** stable	**1:** stable, rocky to bridge **2:** very stable **3:** stable **4:** stable	Stable	Stable	Stable, narrow channel shows flood plane
Channel Width (wetted, bank-to-bank)	**1:** 15-17m **2:** 40.5-42m **3:** braided: 8m (L), 7.10m (R), 6.10 m (M) **4:** 35-40m	**1:** 22-35m **2:** 20-24m, riffle 11m **3:** 17.4-20.5m **4:** 8.3-11.9m	**1:** 16-20m **2:** 30-33m **3:** 16-18m **4:** 22-24m **5:** 42-45m	**1:** 25-32m **2:** 16-20m **3:** 30-40m **4:** 10-14m **5:** 10-20m **6:** 13-20m	**1:** 35-45m **2:** 10-14m **3:** 16-18m **4:** 16-19m	18-20m	16-18m	Narrow: 9-12m Wide: 18-22m
Water Movement	**1:** shallow, fast **2:** shallow, fast and deep, fast **3:** braided: shallow, fast (L); shallow, fast (R); deep, fast (M) **4:** shallow, fast	**1:** shallow, fast **2:** shallow, slow (L), shallow, fast (R & M) **3:** shallow, fast; deep, fast in riffle **4:** deep, fast (L & M), slow, shallow (R)	**1:** shallow, fast **2:** deep, very slow (almost stagnant) **3:** shallow, fast **4:** shallow, fast (L); deep, fast (R) **5:** deep, slow	**1:** shallow, fast **2:** shallow, fast **3:** shallow, fast **4:** shallow, fast **5:** shallow, fast; deep, fast (waterfall) **6:** shallow, fast	**1:** deep, slow (pool above dam) **2:** deep, fast **3:** shallow, fast **4:** shallow, fast	Shallow, slow	Shallow, slow and shallow, fast (in different areas)	Shallow, fast
Water Depth	**1:** riffle, short and isolated, 43cm (L), 20cm (R), 50cm (M) **2:** deep pool, stretch of riffles **3:** 15cm (L), 30cm(R), 90cm (M) **4:** small riffles, 10-15cm	**1:** flat, steady (close to estuary) **2:** 55cm in riffles **3:** deep before/after riffle, pools to left and right of riffles, slight back eddies **4:** long stretch of riffles, 70cm in middle, 10 cm on left, 25 cm on right	**1:** shallow riffles (55cm), no distinct pools **2:** deep pool, no riffles **3:** shallow, indistinct riffles, no pools **4:** deep and shallow riffles, deep pool behind rock island **5:** riffles below boulders, deep, still water above boulders	**1:** 39 cm, no pool **2:** 40cm in riffle, deep pool after house (75m long) **3:** 25cm in riffles **4:** shallow, fast riffles **5:** riffles and drops (waterfall) **6:** 20cm	**1:** deep (over chest height) **2:** 95cm **3:** shallow riffles **4:** riffles approx 25cm	Pools, limited riffles	40cm	Riffle 35cm, pools <1m
Obstructions	**1:** bridge (not major) **2:** big boulders **3:** fallen tree w.	**1:** bridge above river (non-issue) **2:** human-cut log in river, old boat slip	**1:** bridge downstream **2:** grassy islands in still water	**1:** dam **2:** partial beaver dam **3:** logs, islands,	**1:** bridge, logs under bridge, beaver dam **2:** bridge upstream,	none	Trees in river, islands, rock wall	Dam structure downstream

	limbs, boulders, grassy islands **4:** grass island, boulders	on right **3:** none **4:** line of boulders to right	**3:** grassy islands **4:**line of boulders, grassy islands **5:**boulder wall	rocks **4:** none **5:** fast moving water **6:** boulders	old dam **3:** wooden box, parts of dock **4:** none			
Pools	**1:** none **2:** large at head of riffles **3:** none **4:** few	**1:** not many **2:** unnatural-looking pool to right **3:** 5 channel width between ponds **4:** none	**1:** 1m deep pool **2:** 1 large pool **3:** none **4:** small pool behind rock wall **5:** still water	**1:** none **2:** 75m long pool after riffle **3:** none **4:** none **5:** none **6:** 2 main pools between riffles, widen out	**1:** large deep pool above dam **2:** 1 small, 1 large below riffles **3:** none **4:** no defined	None	None	None
In-stream Cover	**1:** lack of undercut banks, turbulence & boulders, lack of debris **2:** turbulence, rock cover, **3:** turbulence, boulders, vegetation **4:** eel grass	**1:** boulders, one end is undercut, limited turbulence **2:** turbulence, boulders **3:** turbulence, boulders, depth **4:** turbulence	**1:**turbulence, boulders **2:** grass/reeds **3:** boulders, some turbulence **4:** turbulence, boulders **5:** boulder wall	**1:** boulders, turbulence **2:** boulders in stream **3:** boulders, woody debris, turbulence **4:** turbulence, overhanging vegetation **5:** turbulence, boulders **6:** boulders, turbulence	**1:** reeds, depth **2:** undercut banks, turbulence, boulders **3:** turbulence, boulders **4:** turbulence, undercut bank	Undercut banks, few larger rocks	Undercut banks, slight turbulence	Overhanging vegetation, some boulders
Substance Size	**1:** Boulder – 55% Cobble – 40% Gravel – 4% Pebble – 0.5% Sand – 0.5% Silt – 0% **2:** Boulder – 40% Cobble – 45% Gravel – 10% Pebble – 2% Sand – 2% Silt – 1% **3:** Boulder – 60% Cobble – 30% Gravel – 5% Pebble – 3% Sand – 2% Silt – 0%	**1:** Boulder – 15% Cobble – 60% Gravel – 20% Pebble – 25% Sand – 25% Silt – 0% **2:** Boulder – 10% Cobble – 50% Gravel – 20% Pebble – 10% Sand – 5% Silt – 5% **3:** Boulder – 40% Cobble – 40% Gravel – 5% Pebble – 5% Sand – 2.5% Silt – 2.5%	**1:** Boulder – 25% Cobble – 25% Gravel – 25% Pebble – 10% Sand – 10% Silt – 5% **2:** Boulder – 0% Cobble – 0% Gravel – 10% Pebble – 5% Sand – 20% Silt - 50% **3:** boulder – 5% Cobble – 40% Gravel – 40% Pebble – 5% Sand – 5% Silt – 5%	**1:** Boulder – 35% Cobble – 30% Gravel – 20% Pebble – 10% Sand – 5% Silt – 5% **2:** Boulder -10% Cobble – 50% Gravel – 10% Pebble – 20% Sand – 5% Silt – 5% **3:** Boulder – 60% Cobble – 30% Gravel – 2.5% Pebble – 2.5% Sand – 2.5% Silt – 2.5%	**1:** boulder – 0% Cobble – 15% Gravel – 30% Pebble – 30% Sand – 10% Silt – 15% **2:** boulder – 40% Cobble – 40% Gravel – 5% Pebble – 5% Sand – 10% Silt – 0% **3:** boulder – 30% Cobble – 40% Gravel – 10% Pebble – 10% Sand – 5% Silt – 5%	boulder – 0% Cobble – 5% Gravel – 5% Pebble – 2.5% Sand – 2.5% Silt – 85%	boulder – 10% Cobble – 30% Gravel – 30% Pebble – 5% Sand – 20% Silt – 5%	boulder – 10% Cobble – 70% Gravel – 10% Pebble – 2.5% Sand – 2.5% Silt – 2.5%

	4: Boulder – 10% Cobble – 75% Gravel – 10% Pebble – 2% Sand – 3% Silt – 0%	**4:** boulder – 45% Cobble – 30% Gravel – 10% Pebble – 10% Sand – 2.5% Silt – 2.5%	**4:** Boulder – 40% Cobble – 20% Gravel – 10% Pebble – 10% Sand – 10% Silt – 10% **5:** Boulder – 10% Cobble - 40% Gravel – 15% Pebble - 15% Sand – 10% Silt – 10%	**4:** Boulder – 10% Cobble – 60% Gravel – 10% Pebble – 90% Sand – 5% Silt – 5% **5:** Boulder – 90% Cobble – 5% Gravel – 5% Pebble – 0% Sand – 0% Silt – 0% **6:** Boulder – 45% Cobble – 40% Gravel – 5% Pebble – 5% Sand – 2.5% Silt – 2.5%	**4:** boulder – 0% Cobble – 95% Gravel – 2.5% Pebble – 2.5% Sand -0% Silt – 0%			
Embeddedness	**1:** very little, bottom sand & cobble **2:** loose **3:** sand, loose rocks **4:** loose rocks	**1:** sediment, sand and gravel **2:** some sediment, not many rocks embedded **3:** sediment, rocks removed easily **4:** sediment, loose rock	**1:** 85% sediment, 15% sand, rocks more embedded here **2:** muddy, anoxic soil, not much rock (heavily embedded) **3:** 5% embedded, sediment (right), silt (left) **4:** mainly cobble with sand and eels grass **5:** silt, reeds & swamp	**1:** 50% silt, 50% sediment, some rocks embedded **2:** loose substrate in river, embedded in pools **3:** sediment, silt & small rocks on edges **4:** mainly sediment, little embeddedness **5:** fast moving sediment **6:** sediment	**1:** silty, muddy bottom, anoxic **2:** sediment, loose rock **3:** sediment, 10% embedded **4:** loose sediment	Silty, 75% embedded	Silt and sediment, lots of eel grass, little rock. 50% embedded	5% embedded
Aquatic Invertebrates	**1:** on bottoms of rocks **2:** yes **3:** yes **4:** yes	**1:** yes, low amounts **2:** yes **3:** yes **4:** yes	**1:** yes **2:** limited in water column **3:** yes **4:** yes **5:** yes (in reeds)	**1:** yes **2:** yes **3:** yes **4:** yes **5:** few (fast water speed) **6:** yes	**1:** undetermined **2:** yes **3:** yes **4:** yes, lots in eel grass	Unknown	Yes	yes

****For more detailed analysis, see assessment sheets.**

PROJECT PARTNERS:

BCAF would like to acknowledge and thank our many project partners and supporters. Without the generous contributions of these groups and individuals, BCAF would not be able to deliver all the various components of the Atlantic Whitefish Recovery Project.

A special thanks to the dedicated members of the Atlantic Whitefish Conservation and Recovery Team who help guide the project through their combined knowledge, expertise, and advise; as well as brainstorm new ideas for future project components and funding opportunities.

Thank you to all our 2009-10 AWRP funding partners, making it possible to complete all the activities outlined in this report. Funders include:

- Habitat Stewardship Program for Species at Risk
- Fisheries and Oceans Canada
- NS Co-operative Employment Program for Students
- NS Fisheries and Aquaculture

BCAF would also like to thank all the many volunteers and in-kind partners for their generous support throughout the duration of the project. Your hard work and generosity does not go unnoticed or underappreciated. The list is too long to include in this report; however, you know who you are and BCAF thanks you.

John Whitelaw, DFO and C&P officers helping with AW release and education event at Petite Rivière Elementary School.

Brittany Hachey at Pleasant River Species at Risk Day highlighting BCAF's SAR Projects.

BCAF and DFO – Communications staff at Bridgewater Exhibition parade.