

**2016 Milltown Fishway Research Trap Report
St. Croix River, New Brunswick and Maine
R. Goreham and H. Almeda**

St. Croix International Waterway Commission
P.O. Box 610, Calais, ME 04619 and P. O. Box 2, St. Stephen, NB E3L 2W9

Summary

Anadromous fish have been counted at the research trap at the Milltown dam fishway since 1981. The dam, located at the head-of-tide on the St. Croix River between New Brunswick and Maine, is property of the New Brunswick Power Corporation (NB Power). Both the fishway and the research trap are on the Canadian side of the river and are under the jurisdiction of Canada's Department of Fisheries and Oceans (DFO).

From 1981 to 2006, the counting facility was operated seasonally for up to seven months each year to document inbound fish, notably Atlantic salmon (*Salmo salar*) and river herring. River herring is a collective term used for alewives/gaspereau (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*). Since 2007, a reduced operation in May to July has focused on documenting the annual river herring run.

In 2016 the St. Croix International Waterway Commission (SCIWC) operated the Milltown research trap and collected relevant data under agreements and partnerships with DFO, NB Power, U.S. Fish & Wildlife Service (USFWS), the International Joint Commission (IJC), the Atlantic Salmon Federation (ASF), Maine Department of Marine Resources (DMR), and the Pleasant Point Passamaquoddy Tribe Environmental Department.

The Milltown research trap was activated on April 14 and monitored until July 11 when the trap was lifted at the presumed end of the river herring run. NB Power continues to operate the fishway until mid-November, as required by federal agreement, but with no fish count. All fish species captured in the trap are recorded in Table 1.

A total of 33,016 river herring were recorded at the Milltown trap in 2016, a large drop from 2015 but still higher than the ten year average of 27,765 (2006 – 2015).

Notably, in 2015 the hydroelectric turbine adjacent to the fishway was offline; this turbine was in operation for 2016, altering flow conditions above and below the fishway. The turbine was occasionally shut down during peak run times (1200h – 2000h) to allow easier passage for fish.

No shad were recorded in 2016, after appearing in the St. Croix last season for the first time since 1999.

In addition to the counting operation, Milltown fisheries staff supplied a sample of 60 river herring for a USFWS fish health report and 155 river herring for a tagging study to track spawners in the St. Croix watershed. Fifty-two fish were sent to the Maine Department of Natural Resources for scale aging.

Four freshwater species were also documented at the trap (Table 1). No Atlantic salmon were recorded.

Table 1. Counts of inbound fish at the Milltown fishway research trap, St. Croix River, April 14 – July 11, 2016.

Species	2016 trap count
River herring: alewife (<i>Alosa pseudoharengus</i>) and blueback herring (<i>Alosa aestivalis</i>)	33,016
White sucker (<i>Catostomus commersonii</i>)	14
Smallmouth bass (<i>Micropterus dolomieu</i>)	24
Brook trout (<i>Salvelinus fontinalis</i>)	13
Common shiner (<i>Luxilus cornutus</i>)	3

Milltown Fishway Operation and Trap Counts

All fish entering the research trap at the top of the Milltown fishway were individually hand netted and hand counted to ensure a complete record before they were released upstream.

This year, the Milltown fishway and research trap were both activated on April 14. At the time of activation, spring river flows exceeded 8,000 cubic feet per second (cfs). Due to the configuration of the Milltown dam and fishway, river flows greater than 5,000 cfs significantly limit attraction and effective operation of the fishway. River flows remained above 5,000 cfs until April 21. The first fish was recorded in the trap on May 11 and the last fish was recorded on July 7.

The hydroelectric turbine directly adjacent to the fishway was re-activated this season, after being offline last year for refurbishment. Its re-activation caused added turbulence which possibly confused some of the fish and may have prevented them from going up the fishway. To compensate for this, NB Power shut the turbine off on various days beginning May 25 during peak run times (1200-2000).

The trap was operated continuously from April 14 until July 11. The St. Croix River's water level remained lower than past years during the operation, with levels dropping to 935 cps on June 22, and rarely exceeding 1,200 cps. Air and Water temperature data may be found in Table 3; water temperature exceeded 20°C from June 22 to July 26, as shown in Table 3. Low water levels and high water temperatures may have contributed to a lower river herring count this year.

After the fisheries research trap was lifted on July 11, NB Power assumed operation of the fishway as specified by DFO, without fish counts, until mid-November.

River herring

Table 2 summarizes river herring returns to the St. Croix River from 1981 to 2016. The 2016 run of 33,016 river herring was lower than anticipated and approximately one third of what was recorded in 2015. Low water flows, combined with high water temperatures, may have contributed to the low numbers of fish seen at the fishway this year.

This year the biggest run was seen on June 1 with 10,947 fish entering the fishway, representing 33% of the yearly total.

Fifty-two river herring were sent to the Maine Department of Natural Resources for aging. It was found that 42% of the fish were four years of age, and 50% of fish were five years of age. River herring in the St. Croix typically spawn at four and five years of age, and 65% of the fish sampled were spawning for the first time. The average fork length was found to be 251mm. No blueback herring were found in the samples collected in 2016.

Other species

Other fish captured in the Milltown trap during the course of the monitoring period are counted and immediately released upstream, unharmed, unless fisheries agencies specify their removal as exotics.

In 2016, four freshwater fish species were recorded in small numbers (Table 1); these are all assumed to have passed over the dam spillway or through open gates and returned up the fish ladder after encountering brackish water.

American shad

No American shad (*Alosa sapidissima*) were recorded in 2016, despite seeing the fish return last year for the first time since 1999.

American eel

The St. Croix supports an active American eel (*Anguilla rostrata*) population and significant commercial fishery for juvenile eels on the Maine shore. Inbound juvenile eels (elvers) can pass through the research trap's 1-inch mesh and are therefore rarely recorded.

Atlantic salmon

Wild Atlantic salmon (*Salmo salar*) have not been recorded at the Milltown trap since 2006.

Additional studies

Fish health testing

Sixty river herring were collected from the Milltown trap on June 6 and were shipped to the U.S. Fish & Wildlife Service's Northeast Fish Health Center in Lamar, PA for fish health testing on June 7. All fish tested were found to be alewife, not blueback herring.

The USFWS conducted standardized tests for seven major pathogens: furunculosis, Enteric Red Mouth Disease (ERM), Infectious Hematopoietic Necrosis (IHN), Infectious Pancreatic Necrosis (IPN), Infectious Salmon Anemia (ISA), *Oncorhynchus masou* virus (OMV) and Viral Hemorrhagic Septicemia (VHS). No bacterial or viral pathogens were detected in any of the fish sampled.

River herring tracking studies

On June 1 and June 9 The Pleasant Point Passamaquoddy Tribe Environmental Department, with assistance from the Atlantic Salmon Federation, implanted Passive Integrated Transponder (PIT) tags into 155 river herring from the research trap and released them upriver at the Milltown boat launch. Additional information will be available at a later date.

Public information

The Milltown river herring count is issued weekly to 115 individuals and organizations by email, from May to mid-July. Additional requests for general or technical information on St. Croix river herring were answered on a regular basis.

Acknowledgements

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For additional information, contact:

Heather Almeda, General Manager

St. Croix International Waterway Commission

PO Box 610, Calais, ME 04619 *and* PO Box 2, St. Stephen NB E3L 2W9

Telephone: 506-466-7550

Email: staff@stcroix.org

Web: www.stcroix.org

Table 2. St. Croix River ME/NB alewife/gaspereau/blueback herring spawning runs, 1981- present (bold = 7-day peak)

Sources: Fisheries & Oceans Canada (1981-1990), Atlantic Salmon Federation (2012-2014), St. Croix International Waterway Commission (1991-2011, 2015-present).

YEARS >>>	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
April 30-May2	--	0	0	0	0	5460	0	0	0	0	0	0	0	0	0	0	0	0
May 3-9	--	0	0	0	0	16410	9400	24410	0	29690	170	0	0	0	0	2814	0	0
May 10-16	7510	32160	16970	6000	0	75150	171500	468750	0	305370	14740	8910	0	0	5898	11178	0	77394
May 17-23	47450	64120	44050	40300	70000	429400	559500	760280	200610	319380	133820	74120	12000	94304	109388	202188	122478	25705
May 24-30	47770	74800	33760	67100	149890	772800	674700	764990	464390	411090	154560	45520	146600	99150	99847	188538	93000	71534
May 31- June 6	48310	56930	20770	26200	96740	628300	645300	370750	424550	141490	51110	24780	102800	125900	50946	231870	4091	2684
June 7-13	16000	4610	35650	13300	26900	57200	480400	187800	63940	132030	4010	50420	2260	15400	0	9390	5951	0
June 14-20	1760	250	620	0	21040	0	83900	13770	11370	0	0	0	26060	0	0	0	0	0
June 21-27	790	210	0	0	1060	0	0	0	0	0	0	0	0	0	0	0	0	0
June 28 - July 4	30	20	0	0	3270	0	0	0	0	0	0	0	0	0	0	0	0	0
July 5-11	0	1	130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
July 12-18	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
July 19-25	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
July 26 - later			0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Escapement	169620	233102	151952	152900	368900	1984720	2624700	2590750	1164860	1339050	358410	203750	289720	334754	266079	645978	225521	177317
Harvest	0	0	0	0	0	0	0	0	0	192200	228500	0	8000	15400	8000	0	0	0
TOTAL RUN	169620	233102	151952	152900	368900	1984720	2624700	2590750	1164860	1531250	586910	203750	297720	350154	274079	645978	225521	177317

YEARS >>>	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
April 14-29	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0
April 30-May2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
May 3-9	0	3966	0	2	0	0	0	18	0	0	0	0	0	993	342	0	0	0
May 10-16	195	142	160	6	3	0	0	577	0	4	1	9748	1657	343	362	7	16	125
May 17-23	5933	2011	505	23	603	0	2	3111	0	33	12	17731	13053	22260	178	16	126	269
May 24-30	13615	377	2625	325	2115	0	20	3155	2	119	3740	17008	1227	11190	10542	29	32637	14304
May 31- June 6	5476	2067	1735	494	3163	0	5277	2540	0	11797	42	8520	7750	1175	5107	19971	16875	12781
June 7-13	108	6	123	35	999	951	6220	1096	1225	61	2	4700	1387	197	37	6775	27150	3038
June 14-20	0	0	54	15	1018	108	113	1227	66	23	6627	1126	50	10	83	95	11871	2000
June 21-27	0	0	0	0	0	79	0	105	1	221	26	255	10	0	23	143	3817	471
June 28-July 4	0	0	0	0	--	150	--	--	--	3	0	45	7	--	3	267	816	27
July 5-11	0	0	0	0	--	11	--	--	--	--	--	9	1	--	--	9	161	1
July 12-18	0	0	0	0	--	0	--	--	--	--	3	--	--	--	--	--	34	--
July 19-25	0	0	0	0	--	0	--	--	--	--	--	--	--	--	--	--	--	--
July 26 - later	0	0	0	0	--	0	--	--	--	--	--	--	--	--	--	--	--	--
Escapement	25327	8569	5202	900	7901	1299	11632	11829	1294	12261	10450	59145	25142	36168	16677	27312	93503	33016
Harvest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL RUN	25327	8569	5202	900	7901	1299	11632	11829	1294	12261	10450	59145	25142	36168	16677	27312	93503	33016

Note 1. Enumeration. Prior to 1999, river herring were enumerated by counting all fish for 10min/hr and multiplying by 6 to yield an hourly total, for each hour the fishway was open. In 1999 and 2000, "light" run periods were enumerated by shutting off the fishway exit for 4 hour intervals and then individually counting all fish in the trap, while "heavy" run periods were enumerated as in previous years. Since 2001, all fish have been counted individually.

Note 2. Upstream passage. Beginning in 1995, the State of Maine blocked the upstream fishways at Woodland and Grand Falls to spawning river herring. In 2001, Fisheries & Oceans Canada began to truck a portion of the spawning run from Milltown to Woodland Flowage. Number of river herring transported to Woodland: 2001 (3756), 2002 (807), 2003 (6805), 2004 (392), 2005 (7100), 2006 (6653), 2007 (1169). In 2008, Maine removed the Woodland fishway barrier, allowing river herring direct access to Woodland Flowage, and Fisheries & Oceans discontinued its trucking operation. In 2013, Maine removed the Grand Falls fishway barrier, allowing river herring access the upper watershed.

Note 3. Duration of count. Monitoring was discontinued on June 27 in 2006, 2007 and 2012; on July 3 in 2008; July 4 in 2009 and 2013; July 8 in 2014; July 11 in 2011 and 2016; July 18 in 2015 and July 19 in 2010 at the presumed end of each year's run. Any fish entering the river after these dates were not recorded

Note 4. Correction of 1994, 1995 and 2010 counts. In 2016, errors in the day counts for these three years was discovered and corrected. This increased earlier reported totals for 1995 and 2010 and decreased 1994.

Table 3. St. Croix River ME/NB air temperature/water temperature April 14-July 11 2016*Sources: R. Goreham, L. Sochasky, H. Almeda, B. Richardson*

DATE	AIR TEMP(°C)	WATER TEMP (°C)	TIME	DATE	AIR TEMP(°C)	WATER TEMP (°C)	TIME
April 14/16	12.1	6.8	1352	June 3/16	16.0	18.7	1500
April 16/16	0.0	6.4	925	June 4/16	16.0	18.2	1400
April 20/16	12.1	9.3	1300	June 5/16	21.0	18.8	1230
April 22/16	18.0	9.9	1140	June 6/16	16.0	18.4	1925
April 24/16	6.9	10.6	1520	June 7/16	19.0	19.3	1230
April 26/16	5.6	10.0	1545	June 8/16	18.1	18.4	1005
April 28/16	3.2	9.8	1520	June 9/16	12.6	17.8	1130
April 30/16	8.0	9.7	1055	June 10/16	14.5	17.0	1420
May 4/16	9.8	10.5	1430	June 11/16	21.0	17.9	1445
May 9/16	8.1	10.3	1305	June 12/16	14.0	17.8	1330
May 10/16	13.5	10.2	1225	June 13/16	12.0	16.9	1430
May 11/16	19.0	11.7	1330	June 14/16	11.8	16.3	1340
May 12/16	21.0	12.8	1555	June 15/16	13.7	16.1	940
May 13/16	18.0	12.8	1316	June 16/16	15.2	17.1	1035
May 14/16	25.0	14.2	1610	June 17/16	24.0	18.5	1330
May 15/16	16.0	13.8	1605	June 18/16	26.0	19.6	1400
May 16/16	8.7	12.3	1337	June 19/16	27.0	19.8	1300
May 17/16	15.0	12.4	1340	June 20/16	25.0	19.1	1500
May 18/16	19.2	13.2	1330	June 21/16	28.0	19.6	1545
May 19/16	21.2	14.1	1220	June 22/16	23.4	20.7	1430
May 20/16	21.0	14.7	1350	June 23/16	25.5	21.3	1755
May 21/16	27.6	15.4	1100	June 24/16	21.5	21.6	1315
May 22/16	18.2	15.8	1400	June 25/16	31.0	23.0	1710
May 23/16	21.8	16.2	1330	June 26/16	27.2	23.3	2045
May 24/16	18.9	17.6	1545	June 27/16	30.0	24.0	1405
May 25/16	19.0	17.6	1430	June 29/16	18.0	21.7	1545
May 26/16	18.4	17.8	1230	June 30/16	24.0	22.8	1725
May 27/16	10.0	17.7	1430	July 1/16	26.0	24.4	1815
May 28/16	20.0	17.1	1210	July 2/16	26.3	24.0	1530
May 29/16	12.0	18.8	1015	July 3/16	16.9	21.9	2100
May 30/16	14.0	16.7	1350	July 4/16	29.0	23.3	1300
May 31/16	27.2	18.4	1350	July 5/16	24.8	23.6	1010
June 1/16	21.3	20.4	1300	July 6/16	24.0	24.4	1055
June 2/16	18.3	20.4	1315	July 11/16	15.8	19.2	1015