

## 2014 Milltown Fishway Trap Report St. Croix River, New Brunswick and Maine

Atlantic Salmon Federation  
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### Summary

Anadromous fish inbound to spawn in the St. Croix River have been counted at a research trap in the Milltown dam fishway since 1981. The dam is at head-of-tide on boundary waters between Maine, USA and New Brunswick, Canada, and is owned by the New Brunswick Power Corporation (NB Power). The fishway and research trap are located on the Canadian side of the river and are under the jurisdiction of Canada's Department of Fisheries & Oceans (DFO).

From 1981 to 2006, the counting facility was operated from May through October to record Atlantic salmon (*Salmo salar*) and river herring, the latter being both alewives or gaspereau (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*). Since 2007, a reduced operation from May to July has focused on documenting the river herring run.

In 2014, the Atlantic Salmon Federation (ASF) operated the research trap and collected data under agreements and/or partnerships with DFO, the U.S. Fish & Wildlife Service (USFWS), the International Joint Commission (IJC), NB Power and the Maine Department of Marine Resources (DMR).

The Milltown fishway and research trap were activated simultaneously on May 5 when spring water flows had fallen to levels that allowed for effective fishway operation. The trap was then operated continuously, with all fish counted individually, until July 8 when it was lifted due to hazardous conditions resulting from high flows and debris from an intense tropical storm. Unfavorable water conditions persisted into mid-July and trap counts to July 8 are presumed to record the full 2014 run. After July 8, NB Power continues to operate the fishway until November, without recording fish passage.

A total of 27,312 river herring were counted during the ten weeks of monitoring in 2014, nearly 40% of these in a single day. This was the third highest return in the last 16 years but still lower than anticipated. Reduced freshwater or marine survival of one or more year classes may have been a contributing factor as may have been a technical difficulty encountered with the fishway attraction flow that will be studied for next year.

Similar to last year, one blueback herring was recorded in the collected samples.

Anadromous sea lamprey and three 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, May 5- July 8, 2014.

Species	2014 trap count
Alewife ( <i>Alosa pseudoharengus</i> ) and Blueback herring ( <i>Alosa aestivalis</i> )	27,312
Sea lamprey ( <i>Petromyzon marinus</i> )	2
White sucker ( <i>Catostomus commersonii</i> )	40
Smallmouth bass ( <i>Micropterus dolomieu</i> )	8
Brook trout ( <i>Salvelinus fontinalis</i> )	2

In 2014, the Milltown trap also supplied a 60-fish sample to support a USFWS fish health study and live fish for research into alewife migration within the St. Croix watershed. Brief summaries of these studies appear later in this report.

## **Milltown fishway operation and trap counts**

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

In 2014, the Milltown fishway and research trap were activated together early on May 5 to meet license requirements. At the time, spring river flows exceeded 9,000 cubic feet per second (cfs). Due to the configuration of the Milltown dam and fishway, river flows greater than 5,000 cfs significantly restrict attraction to, and effective operation of, the fishway. Flows of less than 3,000 cfs generally support good attraction and passage conditions, and are typical for most of the monitoring period. The first fish were recorded in the trap on May 12, when river flows subsided into the 5,000 cfs range.

The trap was operated continuously for ten weeks until an intense tropical storm on July 4-5 deposited five inches of rain across the watershed in 24 hours and led to the trap being lifted on July 8 due to hazardous operating conditions caused by high water and floating debris. Debris and flows above the fishway's 5,000 cfs effective operating threshold persisted into mid-July, past the date when river herring have been recorded entering the river. It is presumed that the count to July 8 reflects the full 2014 run.

After the research trap is lifted, NB Power continues to operate the fishway, without monitoring, until mid-November.

### **River herring**

Table 2 summarizes river herring returns to the St. Croix River from 1981 to the present.

The 2014 run of 27,312 was the third highest return in the last 16 years but still lower than anticipated. Variability in freshwater or marine survival of one or more year classes may have been a contributing factor. A technical issue with the fishway attraction flow was also noted and preliminarily investigated by the Department of Fisheries & Oceans. This will be examined further for 2015.

There has been a general trend toward improving returns in recent years, presumably due to DFO trap-and-truck operations (2001-2008) and the State of Maine's re-opening of the Woodland fishway (2008-present) that together restored access to 475 hectares (1,174 acres) of river herring spawning habitat, and Maine's re-opening of the Grand Falls fishway in 2013 to restore access to another 16,724 hectares (41,325 acres) of spawning habitat in the upper watershed. Prior to spawning barriers first being initiated in 1987, these St. Croix waters supported a run of up to 2.6 million alewives in the mid-1980s (Table 2).

A total of 39 alewives were lethally sampled at Milltown for fork length, body weight, gonad weight, sexual maturity stage, scale age and previous spawning record (Table 3a). An additional 30 alewives were live sampled for fork length, scale age and previous spawnings for the tracking study described below. The age data for these fish and the Milltown sample are included in a cumulative Milltown alewife data summary in Table 4.

Scale reading identified one fish as a blueback herring (Table 3b): a three-year-old male returning for the first time. This is the second consecutive year that a blueback herring has appeared in the Milltown sample, after more than a decade of absence. This fish and a seven-year-old female recorded in 2013 suggest that blueback herring have continued to comprise a portion of the St. Croix river herring run over the long term, generally undetected in the small Milltown sample size.

Table 4 compares available alewife (*Alosa pseudoharengus*) data from the Milltown trap, 1981-present. While variable sampling methodologies and small sample sizes do not support statistical analyses, the 2014 data do suggest a significant increase in the number of three-year-old fish (by more than 50%) and reduction in the number of five-year-old fish (by nearly 50%) compared to recent years, with four-year-old fish continuing to comprise the majority of the run. Future returns will indicate whether these are an anomaly or the start of a trend.

### **Other species**

Other fish captured in the Milltown trap during the course of the monitoring period are counted and immediately released upstream, unharmed, unless specified by fisheries agencies for removal.

In 2014, three 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.

Four diadromous fish species in addition to river herring have been recorded at the Milltown trap at various times since 1981. In 2014 only one was documented: individual sea lamprey (*Petromyzon marinus*) were passed at the trap on June 3 and June 30. Both were approximately 40 cm in length. Juvenile American eel (*Anguilla rostrata*) can pass through the trap's 1-inch mesh unimpeded and therefore are rarely recorded. Wild Atlantic salmon (*Salmo salar*) have not been recorded at the Milltown trap since 2006 and American shad (*Alosa sapidissima*) have not been recorded since 1999. Escaped farmed salmon have been recorded at the trap in the past.

### **Additional studies**

#### **USFWS fish health testing**

On request, ASF collected 60 alewives at Milltown on June 2 that were shipped on the same day by the USFWS via overnight mail service to its Northeast Fish Health Center in Lamar, PA for fish health studies. 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.

#### **St. Croix alewife tracking study**

In May 2014, the Atlantic Salmon Federation implanted 30 alewives with acoustic tags (at Milltown trap) and tracked the movement of these fish until August using 21 underwater receivers sited throughout the watershed and two receivers in the upper estuary.

Three of these fish presumably spawned in Woodland Flowage and one in Grand Falls Flowage or in the west branch lakes below the West Grand dam; 15 others approached but did not pass the Woodland dam. Twenty-four of the 30 fish successfully returned to salt water and most remained in the upper estuary for some time before travelling out of range of the receivers.

The tracking study is supported by a number of partners and funders; additional information will be provided by the Atlantic Salmon Federation at a later time.

### **Public information**

Weekly reports of the Milltown river herring count were issued to 94 individuals and organizations by email and to others by phone, from mid May to early July. Additional requests for general or technical information on St. Croix river herring were answered on a regular basis.

### **Acknowledgements**

The Atlantic Salmon Federation gratefully acknowledges financial support for the 2014 Milltown research program from the U.S. Fish & Wildlife Service, International Joint Commission, National Oceanic and Atmospheric Administration, Atlantic States Marine Fisheries Commission, Maine Outdoor Heritage Fund, Fisheries and Oceans Canada, and the New Brunswick Wildlife Trust Fund.

It also sincerely acknowledges in-kind support from the New Brunswick Power Commission for on-site operations and from the Maine Department of Marine Resources for scale aging.

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**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), St. Croix International Waterway Commission (1991-2011), Atlantic Salmon Federation (2012-).

YEARS >>>	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
April 30-May2	--	0	0	0	0	5460	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
May 10-16	7510	32160	16970	6000	0	75150	171500	468750	0	305370	14740	8910	0	0	5898	11178	0
May 17-23	47450	64120	<b>44050</b>	40300	70000	429400	559500	760280	200610	319380	133820	<b>74120</b>	12000	102210	<b>109388</b>	202188	<b>122478</b>
May 24-30	47770	<b>74800</b>	33760	<b>67100</b>	<b>149890</b>	<b>772800</b>	<b>764990</b>	<b>464390</b>	<b>411090</b>	<b>154560</b>	45520	<b>146600</b>	116020	<b>99847</b>	188538	93000	
May 31- June 6	<b>48310</b>	56930	20770	26200	96740	628300	645300	370750	424550	141490	51110	24780	102800	<b>144700</b>	0	<b>231870</b>	4091
June 7-13	16000	4610	35650	13300	26900	57200	480400	187800	63940	132030	4010	50420	2260	0	0	9390	5951
June 14-20	1760	250	620	0	21040	0	83900	13770	11370	0	0	0	26060	0	0	0	0
June 21-27	790	210	0	0	1060	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
July 5-11	0	1	130	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
July 19-25	0	0	2	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
Spawning escapement	169620	233102	151952	152900	368900	1984720	2624700	2590750	1164860	1339050	358410	203750	289720	362930	215133	645978	225521
Harvest	0	0	0	0	0	0	0	0	0	192200	228500	0	8000	15400	8000	0	0
TOTAL RUN	169620	233102	151952	152900	368900	1984720	2624700	2590750	1164860	1531250	586910	203750	297720	378330	223133	645978	225521
YEARS >>>	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
April 30-May2	0	0	0	0	0	0	0	0	0	--	--	--	--	--	--	--	--
May 3-9	0	0	<b>3966</b>	0	2	0	0	0	18	0	0	0	0	0	993	342	0
May 10-16	<b>77394</b>	195	142	160	6	3	0	0	577	0	4	1	9748	1657	343	362	7
May 17-23	25705	5933	2011	505	23	603	0	2	3111	0	33	12	<b>17731</b>	<b>13053</b>	<b>22260</b>	178	16
May 24-30	71534	<b>13615</b>	377	<b>2625</b>	325	2115	0	20	<b>3155</b>	2	119	3740	17008	1227	11190	<b>10542</b>	29
May 31- June 6	2684	5476	2067	1735	<b>494</b>	<b>3163</b>	0	5277	2540	0	<b>11797</b>	42	8520	7750	1175	5107	<b>19971</b>
June 7-13	0	108	6	123	35	999	<b>951</b>	<b>6220</b>	1096	<b>1225</b>	61	2	4446	1387	197	37	6775
June 14-20	0	0	0	54	15	1018	108	113	1227	66	23	<b>6627</b>	1126	50	10	83	95
June 21-27	0	0	0	0	0	0	79	0	105	1	221	26	140	10	0	23	143
June 28 - July 4	0	0	0	0	0	--	150	--	--	--	3	0	45	7	--	3	267
July 5-11	0	0	0	0	0	--	11	--	--	--	--	--	9	1	--	--	9
July 12-18	0	0	0	0	0	--	0	--	--	--	--	--	3	--	--	--	--
July 19-25	0	0	0	0	0	--	0	--	--	--	--	--	--	--	--	--	--
July 26 - later	0	0	0	0	0	--	0	--	--	--	--	--	--	--	--	--	--
Spawning escapement	177317	25327	8569	5202	900	7901	1299	11632	11829	1294	12261	10450	58776	25142	36168	16677	27312
Harvest	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL RUN	177317	25327	8569	5202	900	7901	1299	11632	11829	1294	12261	10450	58776	25142	36168	16677	27312

**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, this 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 to 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 July 19 in 2010 at the presumed end of each year's run. Any fish entering the river after these dates were not recorded

**Table 3a. 2014 St. Croix adult alewife/gaspereau field data (Atlantic Salmon Federation).**

Sites listed by River km: Milltown fishway 2.26, Woodland Flowage @ Hanson Cove 19.2. Maturity (sex) stage is 1-7 Nikolsky index. Scale aging by Maine Department of Marine Resources.

Date yyyy/mm/dd	Site River km	Fish #	FL (mm)	WT (g)	Sex	Gonad Wt (g)	Sex Stage	Scale sample	Scale Age	Prev Spawn #	Comment	Disposal if not on site
2014/05/28	2.26	SCR-14-001	242	182.5	M	8.5	3	Y	4	0	sacrifice	
2014/05/31	2.26	SCR-14-002	250	225.5	M	11.2	3	Y	5	1	sacrifice	
2014/06/01	2.26	SCR-14-003	224	164.1	M	9.5	3	Y	3	0	sacrifice	
2014/06/01	2.26	SCR-14-004	250	216.8	M	13.1	3	Y	5	1	sacrifice	
2014/06/01	2.26	SCR-14-005	240	165.4	M	9.0	3	Y	4	0	sacrifice	
2014/06/01	2.26	SCR-14-006	281	324.3	F	36.1	3	Y	6	2	sacrifice	
2014/06/01	2.26	SCR-14-007	249	219.7	F	23.3	3	Y	4	0	sacrifice	
2014/06/01	2.26	SCR-14-008	257	222.0	M	13.7	3	Y	4	0	sacrifice	
2014/06/01	2.26	SCR-14-009	239	188.9	F	18.2	3	Y	4	0	mortality	
2014/06/01	2.26	SCR-14-010	241	181.8	M	8.1	3	Y	4	0	mortality	
2014/06/01	2.26	SCR-14-011	220	129.1	M	4.9	3	Y	3	0	mortality	
2014/06/01	2.26	SCR-14-012	229	163.0	M	9.2	3	Y	3	0	mortality	
2014/06/03	2.26	SCR-14-013	256	236.7	F	19.5	3	Y	4	0	sacrifice	
2014/06/03	2.26	SCR-14-014	248	198.1	M	10.8	3	Y	6	1	sacrifice	
2014/06/04	2.26	SCR-14-015	272	253.3	F	28.9	3	Y	6	2	sacrifice	
2014/06/04	2.26	SCR-14-016	238	185.3	M	11.8	3	Y	4	0	sacrifice	
2014/06/04	2.26	SCR-14-017	245	211.0	M	11.3	3	Y	4	0	mortality	
2014/06/05	2.26	SCR-14-018	260	207.4	F	20.3	3	Y	4	0	sacrifice	
2014/06/05	2.26	SCR-14-019	229	151.0	F	12.8	3	Y	4	0	sacrifice	
2014/06/05	2.26	SCR-14-021	238	185.7	F	16.3	3	Y	3	0	sacrifice	
2014/06/06	2.26	SCR-14-022	211	105.7	M	9.0	3	Y	4	1	sacrifice	
2014/06/06	2.26	SCR-14-023	247	189.8	F	17.1	3	Y	4	0	sacrifice	
2014/06/08	2.26	SCR-14-024	240	187.1	F	13.8	3	Y	4	0	mortality	
2014/06/08	2.26	SCR-14-025	232	201.3	F	17.1	3	Y	3	0	sacrifice	
2014/06/08	2.26	SCR-14-026	245	189.6	F	20.8	3	Y	4	0	sacrifice	
2014/06/08	2.26	SCR-14-027	229	173.2	F	18.7	3	Y	4	0	sacrifice	
2014/06/09	2.26	SCR-14-028	247	179.1	M	9.0	3	Y	4	0	sacrifice	
2014/06/09	2.26	SCR-14-029	256	224.5	F	22.4	3	Y	4	0	sacrifice	
2014/06/10	2.26	SCR-14-030	213	133.4	M	6.6	3	Y	3	0	sacrifice	
2014/06/10	2.26	SCR-14-031	258	228.8	F	21.1	3	Y	4	0	sacrifice	
2014/06/11	2.26	SCR-14-032	259	211.3	F	20.9	3	Y	4	0	sacrifice	
2014/06/11	2.26	SCR-14-033	226	146.2	M	5.3	3	Y	4	0	sacrifice	
2014/06/13	2.26	SCR-14-034	242	181.9	F	20.7	3	Y	4	0	sacrifice	
2014/06/14	2.26	SCR-14-035	240	180.0	M	7.5	3	Y	4	0	sacrifice	
2014/06/19	2.26	SCR-14-036	252	215.3	F	28.0	4	Y	5	0	sacrifice	
2014/06/20	2.26	SCR-14-037	228	154.0	M	7.2	5	Y	4	0	sacrifice	
2014/06/23	2.26	SCR-14-038	246	198.4	F	15.8	3	Y	4	0	sacrifice	
2014/06/25	2.26	SCR-14-039	248	196.3	M	5.3	5	Y	4	0	sacrifice	
2014/06/27	2.26	SCR-14-040	216	126.8	F	7.2	3	Y	3	0	sacrifice	

**Table 3b. 2014 St. Croix adult blueback herring field data (Atlantic Salmon Federation).**

Date yyyy/mm/dd	Site River km	Fish #	FL (mm)	WT (g)	Sex	Gonad Wt (g)	Sex Stage	Scale sample	Scale Age	Prev Spawn (#)	Comment	Disposal if not on site
2014/06/05	2.26	SCR-14-020	193	86.6	M	5.5	3	Y	3	0	sacrifice	

