

**2017 Milltown Fishway Research Trap Report**  
 St. Croix River, New Brunswick and Maine  
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**Summary**

Anadromous fish inbound to spawn in the St. Croix River have been counted at a research trap at the Milltown dam fishway since 1981. The dam is located at the head-of-tide on this International Boundary water between Maine and New Brunswick, and is owned by the New Brunswick Power Corporation (NB Power). The fishway and research trap are 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 seasonally for up to seven months each year to document all inbound fish; notably Atlantic salmon (*Salmo salar*) and river herring (alewives (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*)). Since 2007, a reduced operation has focused primarily on documenting the annual river herring run from May - July.

In 2017 the St. Croix International Waterway Commission operated the Milltown research trap and collected relevant data under agreements and/ partnerships with DFO, NB Power, the U.S. Fish & Wildlife Service (USFWS), the International Joint Commission (IJC), Maine Department of Marine Resources (DMR), and the Sipayik Environmental Department.

The Milltown fishway and research trap were both activated on April 26; all fish were counted until July 21 when the trap was lifted at the presumed end of the river herring run. The run is considered to end when there are three consecutive days with no fish in the fish trap. NB Power continues to operate the fishway until mid-November, as required by federal agreement, but no fish count is conducted. All fish species captured in the trap are recorded in Table 1.

A total of 157,750 river herring were recorded at the Milltown trap in 2017, an increase from the 33,016 river herring counted in 2016. The ten year average is 47,142 (2008 – 2017).

Ten other freshwater species were also documented at the trap (Table 1). 45 American Shad (*Alosa sapidissima*) were documented in the trap, 11 Shad were documented in 2015 having been recorded for the first time since 1999. No Atlantic Salmon were recorded in 2017.

**Table 1.** Counts of inbound fish at the Milltown fishway research trap, St. Croix River, between May 1 and July 21, 2017.

| Species   | 2017 trap count |
|---|-----------------|
| River herring: alewife ( <i>Alosa pseudoharengus</i> ) and blueback herring ( <i>Alosa aestivalis</i> ) | 157,750         |
| White sucker ( <i>Catostomus commersonii</i> )  | 94              |
| Smallmouth bass ( <i>Micropterus dolomieu</i> )   | 45              |
| Brook trout ( <i>Salvelinus fontinalis</i> )  | 2               |
| Rainbow smelt ( <i>Osmerus mordax</i> )   | 1               |
| American shad ( <i>Alosa sapidissima</i> )  | 56              |
| Lamprey ( <i>Petromyzon marinus</i> )   | 8               |
| American Eel ( <i>Anguilla rostrata</i> )   | 5               |
| Golden shiner ( <i>Notemigonus crysoleucas</i> )  | 3               |
| Common shiner ( <i>Luxilus cornutus</i> )   | 2               |
| Sunfish ( <i>Lepomis auritus</i> )  | 1               |

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

In 2017 the Milltown fishway and research trap were both activated on April 26. At the time of activation spring river flows exceeded 5000 cubic feet per second (cfs). Due to the configuration of the Milltown dam and fishway, river flows greater than 5000 cfs significantly limit attraction and effective operation of the fishway. River flows remained above 5000 cfs until May 20. During the first two weeks high water levels caused the lower portion of the fishway to be submerged and created a large amount of turbulence, preventing fishway attraction.

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, until the run increased to several thousand fish per day. When the number of fish reached 5000 or more per day the trap was left open and fish entering the trap were counted in 10 minute intervals between 0800h and 2230h to reduce stress on the fish. This was repeated every 30 minutes, and the total number of fish was extrapolated by multiplying the 10 minute count by 3. The final numbers of fish species recorded in Table 1 are minimum counts for 2017.

The hydroelectric turbine adjacent to the fishway was turned on this year, while the other turbines remained turned off for repair. The fishway is designed to operate with all turbines working, this configuration may have altered flow conditions above and below the fishway which in turn may have influenced fish passage. The turbine was shut down during peak run times to allow easier passage for fish. The turbine was turned off on May 31, June 2 – 5, and then turned off on June 8 for the remainder of the run. Fish numbers increased on days the turbine was turned off, which may suggest the altered configuration in 2017 may have impacted attraction to the fishway.

The trap was operated continuously from May 1 to June 7 without interruption. On June 7 the waterway was dewatered during low tide to remove the automated counter. The fishway was dewatered for less than 1.5 hours. Fish that remained in the fishway during the dewatering were netted, counted and released upstream. Normal counting resumed following the dewatering.

After the fisheries research trap was lifted on July 21, 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 2017. The 2017 run of 157,750 river herring was the highest recorded since 1998.

The first river herring was recorded in the trap on May 12. On May 19 adjustments were made to the fishway by DFO and NB Power. This was the first day to have a large run of herring, with 11,739 fish counted that day after adjustments. This was also the largest single-day count of the season. NB Power made further adjustments to the fishway on May 24. There were 10,545 fish the following day (May 25), and thousands of fish per day until June 15.

## Other Species

Other fish and marine species 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 2017, seven 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*

Fifty-six American shad (*Alosa sapidissima*) were observed and recorded in 2017. On days in which the fish run exceeded 5000 fish, the trap was left open and fish were counted in ten minute intervals every half hour between 0800h and 1010h, with the total number of river herring extrapolated from these observations. Only shad that were directly observed passing through the fishway during a counting interval were recorded, making it possible that more than 56 shad passed through the fishway in 2017. No shad were recorded in 2016. In 2015 eleven shad were recorded in the fish trap after appearing in the St. Croix for the first time since 1999. Several shad were spotted going back down river in 2017, presumably after spawning; approximately six on July 3 and twelve on July 11.

### *American eel*

The St. Croix supports an active American eel (*Anguilla rostrata*) population and significant commercial fishery for juvenile eels on the Maine shore. Five American eels were recorded in the trap in 2017. Inbound juvenile eels (elvers) can pass through the research trap's 1-inch mesh unimpeded and are therefore rarely recorded.

### *Sea Lamprey*

Eight Sea Lamprey (*Petromyzon marinus*) were recorded in the trap in 2017; all lamprey were attached to river herring and were released upstream unharmed.

### *Atlantic salmon*

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

## **Additional studies**

### Fish Health Testing

Fish health testing was not conducted in 2017.

### Scale Aging

Sixty-one river herring were lethally sampled by SCIWC staff for the purpose of scale aging by Maine DMR. Of these, 45 were alewife and 16 were blueback herring. All of the fish sampled in May were alewife, and most fish sampled in June were blueback. Two fish were possible hybrids.

The overall average age of river herring was found to be 4.25 years, with females averaging 4.65 and males averaging 4.45. The average age of Alewife (*Alosa pseudoharengus*) was 4.56 years, with females averaging 4.65 years and males 4.45 years. Blueback (*Alosa aestivalis*) were found to have an average age of 3.38 years, with females being 3.14 years and males 3.56 years. The oldest fish sampled was a 7 year-old male alewife that had spawned 3 times.

Of the samples, the overall length of all fish was 209.19mm. Alewife were an average of 252.64mm, with females being 256.24mm and males 248.87mm. Blueback had an average length of 209.19mm, with females being 208.14mm and males 210.0mm.

Of the 61 fish sampled, 18 had spawned previously: 14 alewife (8 female, 6 male) and 4 blueback (1 female, 3 male). Nine fish spawned for the first time. The average age of fish that spawned for the first time was 4.67 years, and their average length was 241.05mm.

## River Herring Tracking Studies

In addition to the counting operation, Milltown fisheries staff supplied a sample of alewives for a tagging study to track spawners in the St. Croix watershed. The St. Croix International Waterway Commission, fisheries agencies, and the Sipayik Environmental Department collaborated on a St. Croix river herring tracking study. On May 23, 140 fish were implanted with Passive Integrated Transponder (PIT) tags, on June 6 160 fish were implanted with PIT tags, and on June 21 another 100 fish were tagged. These fish were all released above the fishway. These tags will be tracked by stationary receivers placed along the river and in Woodland and Grand Falls Flowages. Additional information will be available at a later date.

## Automated Fish Counter

The Sipayik Environmental Department installed an automated tube counter at the top of the Milltown fishway within the exit channel; fish would pass through the count immediately after being hand counted and released from the trap. Numbers from the automated counter were compared to the numbers acquired during hand counting. On May 20<sup>th</sup> the amount of fish being released from the trap exceeded the space available for schooling in front of the automated counter. The counter was closed for the rest of the fish run. On June 7<sup>th</sup> the fishway was dewatered at low tide and the automated counter was removed. The fishway was dewatered for less than 1.5 hours.

## **Public information**

The Milltown river herring count is issued weekly to 117 individuals and organizations by email and phone.

## **Acknowledgements**

The St. Croix International Waterway Commission gratefully acknowledges financial support for the 2017 Milltown research program from the International Joint Commission's (IJC) International Watershed Initiative, United States Fish & Wildlife Service (USFWS), Maine's Department of Marine Resources (MDMR) and the Sipayik Environmental Department. The SCIWC would also like to acknowledge New Brunswick Power (NB Power) and the Department of Fisheries and Oceans (DFO) for their cooperation on this project.

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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), Atlantic Salmon Federation (2012-2014), St. Croix International Waterway Commission (1991-2011, 2015-present).*

|                  | 1981         | 1982         | 1983         | 1984         | 1985          | 1986          | 1987          | 1988          | 1989          | 1990          | 1991          | 1992         | 1993          | 1994          | 1995          | 1996          | 1997          | 1998         |
|------------------|--------------|--------------|--------------|--------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|--------------|---------------|---------------|---------------|---------------|---------------|--------------|
| YEARS >>>        |              |              |              |              |               |               |               |               |               |               |               |              |               |               |               |               |               |              |
| 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             | <b>77394</b> |
| May 17-23        | 47450        | 64120        | <b>44050</b> | 40300        | 70000         | 429400        | 559500        | 760280        | 200610        | 319380        | 133820        | <b>74120</b> | 12000         | 94304         | <b>109388</b> | 202188        | <b>122478</b> | 25705        |
| May 24-30        | 47770        | <b>74800</b> | 33760        | <b>67100</b> | <b>149890</b> | <b>772800</b> | <b>674700</b> | <b>764990</b> | <b>464390</b> | <b>411090</b> | <b>154560</b> | 45520        | <b>146600</b> | 99150         | 99847         | 188538        | 93000         | 71534        |
| May 31 - June 6  | <b>48310</b> | 56930        | 20770        | 26200        | 96740         | 628300        | 645300        | 370750        | 424550        | 141490        | 51110         | 24780        | 102800        | <b>125900</b> | 50946         | <b>231870</b> | 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             | 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 >>>        |              |              |              |              |               |               |               |               |               |               |               |              |               |               |               |               |               |              |
| April 14-29      | --           | --           | --           | --           | --            | --            | --            | --            | --            | --            | --            | --           | --            | --            | --            | --            | --            | --           |
| 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            | <b>3966</b>  | 0            | 2            | 0             | 0             | 0             | 18            | 0             | 0             | 0             | 0            | 0             | 0             | 993           | 342           | 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            | <b>17731</b> | <b>13053</b>  | <b>22260</b>  | 178           | 16            | 126           | 269          |
| May 24-30        | <b>13615</b> | 377          | <b>2625</b>  | 325          | 2115          | 0             | 20            | <b>3155</b>   | 2             | 119           | 3740          | <b>17731</b> | 1227          | 11190         | <b>10542</b>  | 29            | <b>32637</b>  | <b>14304</b> |
| May 31-June 6    | 5476         | 2067         | 1735         | 35           | 3163          | 0             | 5277          | 2540          | 0             | 1197          | 42            | 8520         | 7750          | 1175          | 5107          | <b>19971</b>  | 16875         | 12781        |
| June 7-13        | 108          | 6            | 123          | 35           | 999           | 0             | <b>6220</b>   | 1096          | <b>1225</b>   | 61            | 2             | 4700         | 1387          | 197           | 37            | 6775          | 27150         | 3038         |
| June 14-20       | 0            | 0            | 54           | 15           | 1018          | 108           | 113           | 1227          | 66            | 23            | <b>6627</b>   | 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            | --            | --            | --            | --            | 0             | 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        |



**Table 3:** St. Croix River Anadromous Fish Scale Aging 2017, provided by Maine Department of Marine Resources (DMR).

| Year | Species | Sex | FL     | Age | Repeat |
|------|---------|-----|--------|-----|--------|
| 2017 | ALEWIFE | F   | 266.7  | 5   |        |
| 2017 | ALEWIFE | M   | 234.95 | 4   |        |
| 2017 | ALEWIFE | M   | 260.35 | 6   | 2      |
| 2017 | ALEWIFE | M   | 273.05 | 4   |        |
| 2017 | ALEWIFE | F   | 266.7  | 6   | 2      |
| 2017 | ALEWIFE | M   | 234.95 | 4   |        |
| 2017 | ALEWIFE | M   | 254    | 5   |        |
| 2017 | ALEWIFE | F   | 254    | 5   | 1      |
| 2017 | ALEWIFE | M   | 241.3  | 3   |        |
| 2017 | ALEWIFE | F   | 266.7  | 6   | 2      |
| 2017 | ALEWIFE | F   | 247.65 | 4   |        |
| 2017 | ALEWIFE | M   | 273.05 | 6   | 1      |
| 2017 | ALEWIFE | M   | 285.75 | 6   | 2      |
| 2017 | ALEWIFE | F   | 247.65 | 4   |        |
| 2017 | ALEWIFE | F   | 279.4  | 5   | 1      |
| 2017 | ALEWIFE | F   | 273.05 | 5   |        |
| 2017 | ALEWIFE | M   | 266.7  | 6   | 2      |
| 2017 | ALEWIFE | F   | 273.05 | 6   | 2      |
| 2017 | ALEWIFE | F   | 247.65 | 4   |        |
| 2017 | ALEWIFE | M   | 228.6  | 4   |        |
| 2017 | ALEWIFE | F   | 273.05 | 6   | 2      |
| 2017 | ALEWIFE | M   | 234.95 | 4   |        |
| 2017 | ALEWIFE | M   | 241.3  | 4   |        |
| 2017 | ALEWIFE | M   | 228.6  | 3   |        |
| 2017 | ALEWIFE | M   | 247.65 | 3   |        |
| 2017 | ALEWIFE | F   | 254    | 4   |        |
| 2017 | ALEWIFE | M   | 260.35 | 5   |        |
| 2017 | ALEWIFE | F   | 247.65 | 4   |        |
| 2017 | ALEWIFE | F   | 247.65 | 4   |        |
| 2017 | ALEWIFE | M   | 247.65 | 5   | 1      |
| 2017 | ALEWIFE | M   | 279.4  | 7   | 3      |
| 2017 | ALEWIFE | F   | 241.3  | 4   |        |
| 2017 | ALEWIFE | F   | 234.95 | 4   |        |
| 2017 | ALEWIFE | F   | 247.65 | 4   |        |
| 2017 | ALEWIFE | F   | 260.35 | 5   | 1      |
| 2017 | ALEWIFE | M   | 241.3  | 3   |        |
| 2017 | ALEWIFE | M   | 228.6  | 4   |        |
| 2017 | ALEWIFE | M   | 247.65 | 4   |        |
| 2017 | ALEWIFE | M   | 234.95 | 4   |        |
| 2017 | ALEWIFE | F   | 273.05 | 6   | 2      |

| <b>Table 3 Continued</b> |          |   |       |   |   |
|--------------------------|----------|---|-------|---|---|
| 2017                     | ALEWIFE  | F | 241.3 | 4 |   |
| 2017                     | BLUEBACK | M | 215   | 3 |   |
| 2017                     | BLUEBACK | M | 205   | 3 |   |
| 2017                     | BLUEBACK | M | 210   | 3 |   |
| 2017                     | ALEWIFE  | F | 245   | 4 |   |
| 2017                     | BLUEBACK | M | 220   | 4 | 1 |
| 2017                     | BLUEBACK | F | 230   | 4 | 1 |
| 2017                     | BLUEBACK | M | 195   | 4 | 1 |
| 2017                     | ALEWIFE  | F | 250   | 4 |   |
| 2017                     | BLUEBACK | F | 222   | 3 |   |
| 2017                     | BLUEBACK | F | 215   | 3 |   |
| 2017                     | BLUEBACK | M | 220   | 3 |   |
| 2017                     | BLUEBACK | F | 175   | 3 |   |
| 2017                     | BLUEBACK | F | 210   | 3 |   |
| 2017                     | BLUEBACK | M | 205   | 4 |   |
| 2017                     | BLUEBACK | M | 210   | 4 | 1 |
| 2017                     | BLUEBACK | F | 225   | 3 |   |
| 2017                     | ALEWIFE  | F | 255   | 4 |   |
| 2017                     | BLUEBACK | F | 180   | 3 |   |
| 2017                     | ALEWIFE  | M | 230   | 4 |   |
| 2017                     | BLUEBACK | M | 210   | 4 |   |