



30 International Drive, Suite 6, Pease International Tradeport
 Portsmouth, NH 03801
 Tel (603) 319-5300 Fax (603) 334-6397
 www.normandeau.com

2011 Hydro-Kennebec Smolt Release Summary:

Atlantic salmon smolts were obtained from the Green Lakes NFH (Ellsworth, ME) and used in the evaluation of the efficiency of the downstream bypass at the Brookfield Power Hydro-Kennebec facility on the Kennebec River during spring, 2011. Smolt releases were conducted upstream of the Project during the evening hours on 19 May, 22 May, 25 May, 2 June and 3 June 2011. It should be noted that approximately 200 ft of flashboards immediately adjacent to the Project spill gates were missing for the duration of the study period. A total of 98 radio-tagged Atlantic salmon smolts were released and downstream movements past the Project were monitored using fixed radio-telemetry. Radio-tagged Atlantic salmon smolts were recorded passing the project by dropper antennas located within Unit 1, Unit 2, and plunge basin of the downstream bypass. A downstream stationary receiver was located approximately 0.5 miles below the Project. Individuals detected by that downstream receiver but not detected as having passed the Project via either the turbines or downstream bypass were considered to have spilled. A summary of passage routes during each of the five releases is presented below.

Release 1:

A total of 18 Atlantic salmon smolts were released between 2020 and 2045 on 19 May 2011. Kennebec river conditions on that date consisted of a water temperature of 45 °F and a discharge of 26,832 cfs. Approximately six feet of water was passing the Project through the missing flashboards. Gate 1 was open 19 feet, Gate 2 was open 5 feet and Gate 3 was in the closed position. Units 1 and 2 were operating at 100% and the bypass setting was at its maximum open position (4%). All 18 smolts passed the Project: 88.9% (16 of 18) on spill and 11.1% (2 of 18) through the units. Turbine passed smolts were divided equally between units with 50% (1 individual) passing via Unit 1 and 50% (1 individual) passing via Unit 2.

Release 2:

A total of 19 Atlantic salmon smolts were released between 2000 and 2025 on 22 May 2011. Kennebec river conditions on that date consisted of a water temperature of 45 °F and a discharge of 37,288 cfs. Approximately six feet of water was passing the Project through the missing flashboards. Gate 1 was set at 65%, Gate 2 was set at 63% and Gate 3 was set at 81%. Units 1 and 2 were operating at 100% and the bypass setting was at its maximum open position (4%). Eighteen of the 19 smolts were recorded as having passed the Project with all of them passing on spill. A single individual passed the Project without being detected on any receivers. It should be noted that this individual was detected on a stationary receiver downstream of the Lockwood hydroelectric project later during the night of its release.

Release 3:

Bedford, NH (Corporate)

Arcata, CA	Falmouth, ME	Westmoreland, NH	Stowe, PA	Stevenson, WA
North Haven, CT	Falmouth, MA	Haverstraw, NY	Aiken, SC	Vancouver, WA
Lewes, DE	Hampton, NH	Oswego, NY	Moncks Corner, SC	E. Wenatchee, WA
Gainesville, FL	Portsmouth, NH	Drumore, PA		



A total of 20 Atlantic salmon smolts were released between 2129 and 2200 on 25 May 2011. Kennebec river conditions on that date consisted of a water temperature of 46 °F and a discharge of 16,896 cfs. Approximately five feet of water was passing the Project through the missing flashboards. Gate 1 was set at 81%, Gate 2 was set at 81% and Gate 3 was set at 81%. Units 1 and 2 were operating at 100% and the bypass setting was at its maximum open position (4%). All 20 smolts were detected passing the Project: 55.0% (11 of 20) on spill, 35.0% (7 of 20) through the units, and 10.0% (2 of 20) via the downstream bypass. Turbine passed smolts during release 3 were all detected as having passed downstream via Unit 1.

Release 4:

A total of 26 Atlantic salmon smolts were released between 2105 and 2128 on 2 June 2011. Kennebec river conditions on that date consisted of a water temperature of 55 °F and a discharge of 19,231 cfs. Approximately six feet of water was passing the Project through the missing flashboards. Gates 1, 2, and 3 were all set at 81%. Units 1 and 2 were operating at 100% and the bypass setting was at its maximum open position (4%). All 26 smolts were detected passing the Project: 34.6% (9 of 26) on spill, 23.1% (6 of 26) through the units, and 42.3% (11 of 26) via the downstream bypass. Turbine passed smolts were divided between units with 83.3% (6 individuals) passing via Unit 1 and 16.7% (1 individual) passing via Unit 2.

Release 5:

A total of 15 Atlantic salmon smolts were released between 2021 and 2049 on 3 June 2011. Kennebec river conditions on that date consisted of a water temperature of 55 °F and a discharge of 21,583 cfs. Approximately six feet of water was passing the Project through the missing flashboards. Gate 1 was set at 79%, Gate 2 was set at 81% and Gate 3 was set at 81%. Units 1 and 2 were operating at 100% and the bypass setting was at its maximum open position (4%). Twelve of the 15 smolts were detected passing the Project: 83.3% (10 of 12) on spill, 8.3% (1 of 12) through the units, and 8.3% (1 of 12) via the downstream bypass. The single turbine passed smolt during release 5 was detected as having passed downstream through Unit 1. The three remaining smolts were not detected as having moved downstream through the Project.

Summary:

Overall, a total of 95 out of the 98 Atlantic salmon smolts released upstream of Hydro-Kennebec passed the Project (Table 1). Of the individuals which moved downstream, 67.4% passed on spill, 16.8% passed via the turbine units and 14.7% utilized the downstream bypass. Usage rates (among releases) for the downstream bypass ranged from 0.0% to 42.3%. Simultaneous to the study at Hydro-Kennebec, downstream bypass efficiency was also investigated at the Lockwood Project (owned and operated by NextEra) located one mile downstream. Since radio-transmitter frequencies were the same for the two studies, smolts released at Hydro-Kennebec were also detected passing the Lockwood Project. Of the 95 smolts determined to have passed Hydro-Kennebec, it was determined that only two individuals did not pass Lockwood and remained in the stretch of river between the two projects. One of those individuals was a smolt passed by spill during release 3 and the other was a smolt passed via Unit 2 during release 4.



Table 1. Route selection (by release date) past the Hydro-Kennebec Project for Atlantic salmon smolts released during the spring, 2011.

Release Date	No. Released	No. Remaining Upstream	No. Passed Project	Route Selection			
				No. by Spill	No. by Turbine	No. by DS Bypass	No. Unknown
19-May-11	18	0	18	16	2	0	0
22-May-11	19	0	19	18	0	0	1
25-May-11	20	0	20	11	7	2	0
2-Jun-11	26	0	26	9	6	11	0
3-Jun-11	15	3	12	10	1	1	0
TOTAL	98	3	95	64	16	14	1
Percent of Total Passed Project				67.4%	16.8%	14.7%	1.1%