

Appendix 2

Updated Shawmut Project Fish Passage Measures (October 2021)

BROOKFIELD WHITE PINE HYDRO LLC
SHAWMUT PROJECT (FERC NO. 2322)
UPDATED DESCRIPTION OF FISH PASSAGE, PROTECTION, MITIGATION, AND ENHANCEMENT
(PME) MEASURES, AND ADAPTIVE MANAGEMENT PLANS
(OCTOBER 2021)

The following summarizes Brookfield White Pine Hydro LLC's (BWPH or Licensee) protection, mitigation, and enhancement measures to be implemented at the Shawmut Project (Project) for upstream and downstream fish passage. These measures are a combination of the proposed measures included in the January 31, 2020 Final License Application submitted to the Federal Energy Regulatory Commission (FERC), as otherwise accepted or modified by the FERC in its July 1, 2021 Draft Environmental Assessment (DEA) and draft license conditions recommended by FERC Staff (Appendix E of the DEA), and by the Section 18 mandatory fish passage prescriptions issued for the Project on August 28, 2020 by the Department of Commerce (National Marine Fisheries Service or NMFS) and on August 27, 2020 by the Department of the Interior (US Fish and Wildlife Service or USFWS). Collectively, these measures are expected to become conditions of any new license issued by FERC for the Project and, as such, the effects of these measures are analyzed in FERC's DEA. These measures also comprise the entirety of the actions that the Maine Department of Environmental Protection (MDEP) should consider in evaluating the compliance of the Project discharge on state water quality standards pursuant to Section 401 of the Clean Water Act.

Upstream Passage

The Shawmut Project does not currently have upstream fish passage facilities for anadromous fish species. The Shawmut Project has existing upstream eel passage facilities. The following upstream passage measures are anticipated for the term of any new license for the Shawmut Project.

Structural – BWPH will construct a new upstream anadromous fish lift adjacent to the 1912 Powerhouse to provide volitional upstream passage for approximately 1,540,000 blueback herring, 134,000 alewife, 177,000 American shad, and 12,000 Atlantic salmon; consistent with the Maine Department of Marine Resource's (MDMR) specified design populations for the fish lift and the final design plans filed with FERC on December 31, 2019. The lift will be constructed within 2 years of FERC license issuance.

Structural – BWPH will construct a new concrete upstream fish passage flume to provide volitional passage from the 1982 Powerhouse tailrace across an island to the 1912 Powerhouse tailrace, so fish can access the new fish lift entrance, consistent with the final design plans filed with the FERC on December 31, 2019. The flume will be constructed at the same time as the fish lift, within 2 years of license issuance.

Structural – If determined, as necessary, following the eel siting studies (discussed below), BWPH will construct a volitional upstream eelway designed in accordance with the USFWS's

Design Criteria Manual to provide volitional upstream eel passage at the Project. BWPH will consult with the fishery agencies in all phases of design by year 5 or 6, depending on the extent of siting studies.

Operational – Once constructed, BWPH will operate the new upstream fish lift and upstream passage flume from May 1 to November 10 each year, including at least one season of “shake-down” operation, during which operations are refined.

Operational – BWPH will operate the existing and new upstream eelways from June 1 to September 15 each year to provide upstream passage for American eels.

Downstream Passage

Structural – BWPH will install a fish guidance boom in the forebay upstream of the 1982 Powerhouse to direct downstream migrating fish away from the turbines and toward the forebay Tainter and surface sluice gates within 2 years of license issuance. The guidance boom would consist of 10-foot-deep rigid panels with 0.5-inch perforations and 48% open area. Should only 1.5-inch clear spaced trashracks be feasible for installation at the 1982 Powerhouse, the guidance boom panels will be extended to 20 feet deep.

Structural – BWPH will install new trash racks or overlays with 1-inch or 1.5-inch clear spacing on the intakes for Units 7 and 8 (pending the determination of approach velocities) to protect downstream migrating Atlantic salmon kelts and adult American shad from entrainment within two years of license issuance.

Structural - BWPH will install new trash racks or overlays with 1-inch clear spacing on the intakes for Units 1 through 6 (pending the determination of approach velocities) to protect downstream migrating Atlantic salmon kelts and adult American shad from entrainment within two years of license issuance.

Operational – Once all upstream and downstream structural modifications described herein are fully installed, BWPH will prioritize operation of the generating units in the 1912 Powerhouse such that Unit 1 is the first on and last off, followed consecutively by Units 2 through 6, during the period April 1 to December 31 to increase attraction to the new fish lift entrance and improve downstream passage of anadromous fish.

Operational – BWPH will continue to implement the following downstream passage operational measures at the Shawmut Project:

From April 1 to June 15, open the Tainter gate to 6% of station flow (approximately 425 cfs; the total capacity of the gate is 600 cfs) 24 hours/day, 7 days/week, targeting the downstream passage of Atlantic salmon smolt, as river and ice conditions allow.

From November 1 to December 31, open the Tainter gate to 6% of station flow (approximately 425 cfs; the total capacity of the gate is 600 cfs) 24 hours/day, 7

days/week, targeting the downstream passage of Atlantic salmon kelt, as river and ice conditions allow.

From April 1 to December 31, open the surface sluice as river and ice conditions allow, providing 30 to 35 cfs for downstream passage continually throughout the downstream passage season.

Operational – As an interim measure, until all new anadromous fish downstream passage measures required by the FERC license have been constructed and operated for a one-season shakedown period, BWPH will continue to drop four hinged flashboard sections from April 1 to June 15 to provide an additional 560 cfs in augmented spill flows for the downstream passage of Atlantic salmon smolt. This measure has also been reserved as a potential adaptive management measure.

Operational – As an interim measure, until all new anadromous fish downstream passage measures required by the license have been constructed and operated for a one-season shakedown period, BWPH will open the deep drain gate next to Unit 7 to 425 cfs (approximately 6% of total station capacity), as river conditions allow, for 8 hours per night beginning 1 hour after sunset, 7 days/week and simultaneously shut down all units during this period. The opening of the deep gate and simultaneous unit shut-downs will be implemented August 15 to October 31. This is specific to enhancing safe, timely, and effective downstream passage of adult eels.

Structural/Operational – Should 1-inch clear spaced trashracks not be feasible for installation at the 1912 Powerhouse, BWPH will implement additional downstream passage measures specified by NMFS. These measures could include but are not limited to: (1) alternate unit operating prioritization, (2) unit shutdowns, (3) lowering sections of hinged flashboards, (4) replacing the upward-opening Tainter gate with a downward-opening slide gate, or (5) installing a guidance boom or new trash rack structure upstream of the headworks to direct downstream migrants away from the forebay and powerhouses.

Other

BWPH will revise and implement the Fish Passage Operations and Maintenance Plan (FPOMP) within 12 months of license issuance to include: a schedule for routine fishway maintenance to ensure the fishways are ready for operation at the start of the migration season; procedures for routine upstream and downstream fishway operations; procedures for monitoring and reporting on the operation and maintenance of the facilities as they affect fish passage; the operating dates required by the mandatory fishway prescriptions, and emergency and power outage procedures. BWPH will consult with the fishery agencies in the development of the FPOMP. BWPH will review and update the FPOMP annually, as necessary, to reflect any changes in fishway operation and maintenance planned for the year or if any additional fish passage structures have been completed.

BWPH will continue to prepare annual fishway monitoring reports and hold annual meetings with fishery agencies as discussed in further detail below.

BWPH will continue to pass large woody debris that accumulates at the Project downstream to enhance aquatic habitat in the Kennebec River.

Performance Standards

BWPH proposes to achieve the following performance standards for upstream and downstream passage of Atlantic salmon. BWPH also proposes to reduce passage delay with a target passage timing goal for upstream and downstream passage discussed below.

Effectiveness

The facilities and measures proposed for the protection and enhancement of listed Atlantic salmon and its critical habitat are founded on achieving certain standards for the safe and effective passage of Atlantic salmon at the Project. BWPH proposes, and NMFS has preliminarily prescribed the following passage performance standards, as follows:

- Downstream Salmon Smolt Passage Standard – The objectives of safe and effective passage are considered to be met for the Shawmut Project when a whole station survival of at least 97% is achieved¹. Achievement of the standard will be based on an average of three years of smolt passage performance data.
- Upstream Adult Salmon Passage Standard – The objectives of safe and effective passage are considered to be met for the Shawmut Project when a passage rate of at least 96% is achieved². Achievement of the standard will be based on the quantitative adult passage performance study data.
- Upstream Alosine Passage Standard – Performance standards for alosine will be similar to those required on other river systems, such that upstream passage efficiency will be at least 70% within 48 hours of a fish approaching the Project works.
- Downstream Alosine Passage Standard – The objectives of safe and effective passage are considered to be met for the Shawmut Project when a whole station survival of at least 95% is achieved.

¹ The 97% smolt downstream passage standard is based on NMFS' preliminary Section 18 prescription in their letter dated August 28, 2020.

² The 96% adult upstream passage standard is based on NMFS' preliminary Section 18 prescription in their letter dated August 28, 2020.

Delay

The facilities and measures proposed for the protection and enhancement of listed Atlantic salmon and its critical habitat are also founded on the goal of reducing delay through timely passage of Atlantic salmon through the Project. Accordingly, for downstream passage, BWPH proposes the goal to pass Atlantic salmon smolts within no more than 24 hours.³ Achieving this standard will minimize the potential for dam-induced delay and potential delay-induced estuarian mortality. For upstream passage of adults, BWPH proposes the goal to pass Atlantic salmon adults through the Project within no more than 48 hours⁴.

Studies

To determine whether the upstream and downstream fish passage improvements are achieving the upstream and downstream passage performance standards and are successful in reducing delay, BWPH proposes to undertake the following studies:

Upstream Studies

- Once fishways at all four lower Kennebec Projects (Lockwood, Shawmut, Hydro-Kennebec and Weston) are constructed, operational, and have completed one season of shakedown, BWPH will conduct up to 2 years of qualitative adult salmon upstream passage studies to initially evaluate salmon passage conditions at the Project facilities to help refine operations⁵. The proposed study would utilize up to 20 adult Atlantic salmon, of Kennebec origin. (Because it is anticipated that adults that were hatched and reared in the Kennebec River basin will be scarce, the study may be conducted using adults that were hatchery reared and stocked as fry or smolts into the Sandy River.) BWPH will consult with the fishery resource agencies in the development of a detailed study plan for this effort.
- Once fishways at all four lower Kennebec Projects (Lockwood, Shawmut, Hydro-Kennebec and Weston) are constructed, operational and have completed one season of shakedown operation, at such time that there are 200 returning adult salmon of Kennebec origin available for study use, BWPH will conduct a comprehensive quantitative upstream passage study to evaluate the overall contribution of the Project to achieving the performance standard. BWPH will consult with the fishery resource agencies in the development of a detailed study plan for this effort and will utilize methods that are acceptable to both BWPH and the agencies. If the quantitative study results demonstrate that the upstream performance standard is not being met, BWPH will consult with the fishery resource agencies regarding potential modifications to the upstream fishways or

³ Within each study year following the implementation of the downstream fish passage facilities and measures, residence time for each individual smolt will be calculated as the duration of time from first detection at the point 200 meters upstream of the dam until the determined time of downstream passage.

⁴ Within each study year following the implementation of the upstream fish passage facilities and measures, upstream passage delay for each individual adult will be calculated as the duration of time from first detection at the point 200 meters downstream of the dam until the determined time of upstream passage.

⁵ The qualitative studies are intended to identify any operational modifications that could be implemented to improve passage conditions as part of the fishway shakedown period and are not intended to demonstrate attainment of the performance standard.

fishway operations to improve upstream passage pursuant to the adaptive management plan outlined below. and discussed in the lower Kennebec Species Protection Plan (May 31, 2021). The implementation of any new operational or facility modifications or measures will necessitate an additional monitoring period or a desktop evaluation, if such an evaluation is determined an appropriate alternative to an empirical study, in consultation with the agencies.

- Once all upstream fishways have been installed at the four lower Kennebec Projects (Lockwood, Shawmut, Hydro-Kennebec and Weston) and are fully operational and the initial quantitative adult salmon study has been completed and compliance with the performance standard is achieved, BWPH will recheck the effectiveness of upstream passage at the Project by conducting a single-season adult passage study every 10 years. BWPH will consult with the fishery agencies in the development of a detailed study plan for this effort and will utilize methods that are acceptable to both BWPH and the agencies.
- After construction of the new upstream anadromous fishways at the Project and an initial one-year shakedown operation period, BWPH will conduct one to two years of siting studies to verify that upstream migrating juvenile eels continue to congregate near the location of the existing interim upstream eelway and to determine areas where eels otherwise congregate below the dam, and then construct an upstream eelway required by Interior. BWPH will consult with the fishery agencies in the development of a detailed study plan for this effort and will utilize methods that are acceptable to both BWPH and the agencies.
- BWPH will conduct a one-year upstream eelway effectiveness study after completion of a required new upstream eelway, in year one of operation, to determine the percentage of eels that successfully pass through the eelway. BWPH will consult with the fishery agencies in the development of a detailed study plan for this effort and will utilize methods that are acceptable to both BWPH and the agencies.

Downstream Studies

- Once fishways at all four lower Kennebec Projects (Lockwood, Shawmut, Hydro-Kennebec and Weston) are constructed, operational and have completed one season of shakedown, BWPH will conduct up to three years of additional downstream smolt passage studies designed to evaluate whole station survival at the Project, and the overall contribution of the Project to achieving the performance standard. BWPH will consult with the fishery agencies in the development of a detailed study plan for this effort and will utilize methods that are acceptable to both BWPH and the agencies. The studies will be designed to provide a reasonable estimate of whole station survival for salmon smolts. The average of the whole station survival estimates for the three study years will be evaluated relative to the downstream salmon smolt station survival standard. If the smolt study results demonstrate that the downstream performance standard is not being met, BWPH will initiate the adaptive management process described below by consulting with the fishery agencies regarding potential modifications to the downstream fishways or fishway operations to improve downstream passage pursuant to the adaptive management plan outlined below and discussed in the May 31, 2021 lower Kennebec Species Protection Plan. The implementation of any new operational or facility modifications or measures will necessitate an additional monitoring period or a desktop evaluation, if such

an evaluation is determined an appropriate alternative to an empirical study in consultation with the agencies.

- Once the salmon smolt studies (up to 3 years) have been completed and demonstrated that the downstream passage standard is being met, BWPH will recheck the effectiveness of downstream passage at the Project by conducting a single-season smolt passage study every 10 years. BWPH will consult with the fishery agencies in the development of a detailed study plan for this effort and will utilize methods that are acceptable to both BWPH and the agencies.
- BWPH will conduct a study to evaluate injury via dam passage as contributing to the fate of Atlantic salmon smolts in the Kennebec estuary. BWPH will consult with the fishery agencies in the development of a detailed study plan for this effort and will utilize methods that are acceptable to both BWPH and the agencies.
- Once downstream fishways at the Project are constructed, operational and have completed one season of shakedown, BWPH will conduct balloon tag and radio telemetry studies to determine eel passage routes and survival rates, and then implement any downstream eel passage measures required by Interior. BWPH will consult with the fishery agencies in the development of a detailed study plan for this effort and will utilize methods that are acceptable to both BWPH and the agencies.
- BWPH will conduct two years of downstream eel effectiveness studies after completion of any required new downstream eel fishways. BWPH will consult with the fishery agencies in the development of a detailed study plan for this effort and will utilize methods that are acceptable to both BWPH and the agencies.
- BWPH will determine the approach velocities in front of the 1982 and 1912 powerhouse intakes to assess whether the approach velocities with new trashracks with 1 inch bar spacing would be too high to prevent impingement. BWPH will consult with the fishery agencies in the development of a detailed study plan for this effort and will utilize methods that are acceptable to both BWPH and the agencies.

Adaptive Management Plan

If during the term of the license, it is determined that either the upstream or downstream performance standard for Atlantic salmon is not being achieved, BWPH proposes to implement the Adaptive Management Plan, described in detail in the May 31, 2021 lower Kennebec Species Protection Plan (attached), as summarized for the Shawmut Project below. Atlantic salmon are listed as endangered under the Endangered Species Act and the survival and recovery of this listed species is supported by achievement of the performance standards outlined herein, however, any changes made to improve passage conditions for Atlantic salmon will have benefits to other anadromous species.

BWPH will continue to meet annually⁶ with the fishery agencies. During the annual meeting, BWPH will consult with the agencies to consider adaptations that could be made to achieve the

⁶ Annual meetings between the Licensees and the fishery agencies have been occurring for many years in accordance with the provisions of the KHDG Agreement. These same meetings will be used to consider the need

standard if either the upstream or downstream standard for Atlantic salmon is not being met. While it is not known today exactly which measures might be most effective in improving passage performance, there are certain activities or measures that BWPH and agencies could consider as potential “tools” in improving passage performance. The following table outlines a series of adaptive management concepts, tools and measures that BWPH proposes could be considered in the future, if needed, in order to improve upstream or downstream passage performance for Atlantic salmon at the Project.

Adaptive Management Tools and Measures for Atlantic Salmon

Observed Effect	Adaptive Management Considerations	Adaptive Management Tools/Options
Upstream Passage		
Cumulative Performance Standard Not Achieved	Identify Project fishway modifications(s) with best opportunity to improve upstream passage	<ul style="list-style-type: none"> • Field observations • Engineering review • Monitoring study results
	Evaluate fishway entrance conditions or source of fishway hesitancy/seeking behavior.	<ul style="list-style-type: none"> • Field observations • CFD modeling • Sound study
	Potential modifications to fishway operations to improve effectiveness	<ul style="list-style-type: none"> • Operational timing • Modify fishway flows • Modify attraction flows • Unit prioritization • Lift frequency
	Potential modifications to fishway entrance to improve performance	<ul style="list-style-type: none"> • Engineering review • Gate reconfiguration • Flume modifications
	Potential modifications to fishway design to improve performance	<ul style="list-style-type: none"> • Modify attraction flow • Second entrance/Relocate entrance
Downstream Passage		

for any adaptive management measures included in the AMP for the Shawmut Project, as well as the AMP for the other three lower Kennebec projects that are covered under the Species Protection Plan (SPP) for those projects.

Observed Effect	Adaptive Management Considerations	Adaptive Management Tools/Options
Cumulative Performance Standard Not Achieved	Identify Project fishway modification(s) with best opportunity to improve downstream passage	<ul style="list-style-type: none"> • Field observations • Engineering review • Monitoring study results
	Potential modifications to increase bypass utilization	<ul style="list-style-type: none"> • Increase conveyance flow • Second entrance • Relocated entrance • Alden style weir
	Potential options for increasing bypass survival	<ul style="list-style-type: none"> • Flume modifications • Gate modifications
	Potential options for increasing spill route utilization	<ul style="list-style-type: none"> • Unit turn-down • Partial unit shutdown • Unit shut-down • Dedicated spill
	Potential options for reducing turbine entrainment/passage	<ul style="list-style-type: none"> • New/additional guidance boom • Tighter rack spacing • Rack overlay • Unit turn-down • Partial unit shut-down • Unit shut-down
	Potential options for increasing turbine survival	<ul style="list-style-type: none"> • Unit prioritization • Unit turn-down • Partial unit shut-down • Unit shut-down

BWPH will submit annual reports to report on fishway operations, and on fish passage monitoring/studies being conducted at the Projects. Annual reports will include passage counts for each species as available, daily river flow conditions, fishway operational settings, and information on project operation. Annual reports will be provided to the agencies in advance of the proposed annual meeting and will form the basis of discussion at the annual meeting.

As stated above, BWPH will convene an annual meeting to provide an opportunity for BWPH and agencies to discuss study results, along with potential opportunities to make minor adjustments fishway operations that might improve passage for Atlantic salmon and protection for sturgeon. The meetings may also be used to adjust ongoing fish passage monitoring/studies, and to modify study plans, as appropriate, for the upcoming study season. The annual agency

meetings will also be used to disseminate any study information that may reveal issues and impediments to achieving the performance standards. If any monitoring studies indicate that the fish passage and protection measures included herein do not meet the proposed standards for Atlantic salmon passage, BWPH will coordinate with the fisheries resource agencies and NMFS to consider measures, as appropriate and reasonable, to avoid and minimize effects to the species, to the extent practicable. The annual agency meetings will also be used to discuss other issues related to the GOM DPS of Atlantic salmon restoration and cooperative management activities that may be relevant to the Kennebec River and the Shawmut Project such as availability of hatchery stocks for studies and restoration efforts and coordination of fish passage study efforts with agency studies or the studies being conducted by other hydropower project owners in the watershed.