Appendix 10

2021 Interim Species Protection Plan and Draft Biological Assessment for the Shawmut Project (May 31, 2021)

Brookfield
Renewable

May 31, 2021 **Shawmut Project (FERC No. 2322)**

Via E-Filing

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

RE: Shawmut Project (FERC No. 2322) Interim Species Protection Plan

Dear Secretary Bose:

Brookfield White Pine Hydro, LLC (BWPH), licensee for the Shawmut Project (Project) located on the lower Kennebec River in Maine, herein requests the Federal Energy Regulatory Commission (FERC or Commission) approve the following Interim Species Protection Plan for the Project. A Biological Assessment (BA) analyzing the effects of the Project's Interim Species Protection Plan (ISPP) is likewise included. The expiration for the current FERC license for the Project is January 31, 2022. The ISPP includes actions that will be undertaken until the issuance of a new license for the Shawmut Project.

Background

In 2012, BWPH proactively initiated Section 7 consultation ahead of any pending federal action, including the relicensing of the Shawmut Project, by filing a comprehensive Interim Species Protection Plan (ISPP) for the Shawmut and the Lockwood and Weston Projects, also located on the lower Kennebec River. The National Marine Fisheries Service (NMFS) issued a Biological Opinion (BO) for the three Projects in 2013, which included Incidental Take Statements (ITSs) and Reasonable and Prudent Measures (RPMs) necessary to "minimize and/or monitor incidental take and set(s) forth terms and conditions with which the action agency must comply."

Specifically, the ISPP for the Lockwood, Shawmut and Weston Projects was filed with FERC February 21, 2013. The BO for the Lockwood, Shawmut and Weston Projects was issued by NMFS on July 19, 2013. FERC issued an *Order Amending License to require the ISPP and the Handling and Protection Plan for Shortnose and Atlantic Sturgeon for the Lockwood, Shawmut and Weston Projects* on May 19, 2016. Among the measures included in the Lockwood, Shawmut and Weston ISPP/BO were an upstream fish lift and downstream baseline whole station survival studies for Atlantic salmon smolts at the Shawmut Project.

In consultation with the agencies, the Licensee completed CFD modeling for the Shawmut fish lift in 2016, an upstream alosine siting study in 2016 and the conceptual, 30%, 60%, 90% and final design phases throughout 2016 to 2019. The final designs for the Shawmut fish lift were filed with the FERC on December 31, 2019. In addition, BWPH completed three years of Atlantic salmon smolt studies at the Project with a three-year whole station survival of 90.6 to 96.3%. As a result, BWPH implemented supplemental spill to achieve a whole station survival of at least 95%.

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Because the ISPP for the Projects expired on December 31, 2019, the Licensee filed a final SPP and draft Biological Assessment (BA) for Atlantic salmon with the Commission. The SPP described the measures the licensee would take at the lower Kennebec Projects to avoid and minimize impacts to Atlantic salmon for the duration of the licenses (including the anticipated issuance of a new license for the Shawmut Project following its 2022 expiration), including operation of the previously-authorized and required upstream fish passage facilities, the implementation of downstream passage improvements at the Projects, performance standards, monitoring studies and a Sturgeon Handling Plan.

On July 13, 2020, in response to agency comments[1], the Commission issued a letter rejecting the Licensee's request to amend the Project licenses to include the provisions of the SPP. Therein FERC states "[i]n light of these agencies' comments, Commission staff is unable to accept the Final Plan and draft BA. The extension of time granted for the Lockwood and Weston Projects, issued concurrently with this letter, should provide you with the additional time necessary to work with NMFS, FWS, Maine DMR, and other relevant state and federal agencies to address any outstanding issues for the Final Plan and draft BA for the Lockwood, Weston, and Hydro-Kennebec Projects. We encourage you to re-file the Final Plan once those concerns have been resolved."

A second letter was issued by the Commission on July 13, 2020, stating that the Commission "does not intend to act on your request to amend the Shawmut license to incorporate the proposed Final Plan, or to review your draft BA in support of the proposed amendment. In addition, Commission staff will not review your final design drawings submitted for the upstream fish passage facility, or act on any request to commence construction of the fishway under the Interim Plan". The Shawmut letter indicated that the upstream fish passage facility would be considered as part of relicensing.

Interim Species Protection Plan

To accommodate the time needed to consult with NMFS on the Shawmut relicensing, BWPH proposes the following Interim Species Protection Plan, which would continue the protection measures contained in the expired ISPP, plus additional supplemental measures and the terms and conditions contained in the expired ITS and BO issued by NMFS on May 25, 2017 until such time as it is supplanted by a new BO issued for the Shawmut Project as part of relicensing.

For the duration of the current Shawmut Project license term, including any potential forthcoming annual licenses to be issued by the FERC, BWPH will undertake the following actions at the Shawmut Project:

- Operate the existing downstream fish passage facility in accordance with the agency approved Fish Passage Operation and Maintenance Plan
  - Provide downstream fish passage through the surface sluice (6% of station flow) and Taintor gate (600 cfs)
  - Provide downstream passage via these routes from April 1 through June 15 and November 1 to December 31 for Atlantic salmon and other anadromous species
- Implement adaptive management measures as necessary to comply with take limits

[1] Comment letters dated February 7, 2020 from NMFS; February 28, 2020 from the US Fish and Wildlife Service; and March 20, 2020 from the MDMR.

  - Lower 4 sections of hinge boards adjacent to the canal headworks for the Atlantic salmon smolt migration season to provide approximately 560 cfs of spill flow
  - Provide this supplemental flow from May 1 to May 31, annually.
- Prepare annual fishway monitoring reports and hold an annual meeting with fishery agencies
- Notify NMFS of any changes in operation including maintenance activities and debris management at the Project during the term of the ISPP
- Contact NMFS within 24 hours of any interactions with Atlantic salmon, including non-lethal and lethal takes (Dan Tierney: by email (Dan. Tierneyncaa.gov) or phone (207) 866-3755 and the Section 7 Coordinator (incidental.take@noaa.gov).
- In the event of any lethal takes, any dead specimens or body parts must be photographed, measured, and preserved (refrigerate or freeze) until disposal procedures are discussed with NMFS.

While not proposed as part of this ISPP, trap and truck operations from the Lockwood Dam will continue to provide upstream passage for all anadromous species around the Shawmut Project. In accordance with the existing Lockwood Project FERC license and agency approved Fish Passage Operation and Maintenance Plan, the Lockwood lift is operated from May 1 to November 15. Trap and truck operations at the Lockwood Project will be carried out in coordination with MDMR, who transports Atlantic salmon directly to spawning habitat in the Sandy River. As a result, upstream migrating adult Atlantic salmon are not anticipated to be present in the Project area for the duration of the ISPP term.

Biological Assessment

BWPH herein provides a Biological Assessment (BA) that includes information regarding the "*the status of the species and the environmental baseline, including information obtained from…survival and passage effectiveness studies"* and an assessment of the effects of the proposed action (*"i.e. effects to listed species and critical habitat of the continued operation of the projects" for "the complete time period contemplated*") (FERC, December 2, 2020).

FERC License Amendment

BWPH requests that FERC amend the Shawmut Project license to incorporate the measures contained in the above ISPP and provides the attached BA in support of this request.

In addition, BWPH requests that FERC amend the Shawmut Project license to remove the requirement for the construction of an upstream fishway at the Project under the current Shawmut Project license term, pursuant to the May 19, 2016 *Order Amending Licenses to Require Interim Species Protection Plan for Atlantic Salmon, and Handling and Protection Plan for Shortnose and Atlantic Sturgeon,* as the proposed fish lift is being considered as part of the current Shawmut Project relicensing as indicated in FERC's July 13, 2020 letter.

Please contact me at 207-233-1995 or by email at Kelly.Maloney@brookfieldrenewable.com if you have any questions or comments.

Sincerely,

Kelly Maloney
Manager, Compliance - Northeast

cc: M. Buyoff, J. Crocker; NMFS
K. Maloney, J. Seyfried, N. Stevens, S. Michaud, J. Rancourt, R. Dorman; Brookfield

INTERIM SPECIES PROTECTION PLAN

BIOLOGICAL ASSESSMENT FOR ATLANTIC SALMON

FOR THE SHAWMUT PROJECT ON THE KENNEBEC RIVER, MAINE

Prepared for:

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May 2021

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INTERIM SPECIES PROTECTION PLAN EXTENSIONS
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FOR ATLANTIC SALMON
SHAWMUT PROJECT

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1.0 BACKGROUND

1.1 OVERVIEW

Brookfield Renewable Partners LLC (Brookfield) indirectly owns and operates four hydroelectric projects (collectively, the "Projects") located on the Kennebec River in Maine, including the Shawmut Project, licensed to Brookfield White Pine Hydro LLC (BWPH or Licensee). The expiration for the current FERC license for the Project is January 31, 2022[1].

The Project occurs within the range of the endangered Gulf of Maine Distinct Population Segment (GOM DPS) of Atlantic salmon (*Salmo salar*), and is located entirely within designated critical habitat for salmon. The continued operation of this Project may have effects on the GOM DPS of Atlantic salmon and its designated critical habitat[2].

Because the Project is located within designated critical habitat of this species and this species does or could occur within the Project area, FERC is required to engage in endangered species consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS, collectively the "Services") pursuant to Section 7 of the Endangered Species Act (ESA) when a FERC federal action is pending. Section 7 of the ESA mandates that federal agencies consult with the Secretaries of Interior (through USFWS) and Commerce (through NMFS) to determine whether a proposed action is likely to jeopardize listed species and/or adversely affect designated critical habitat for such species.

In 2012 and 2013, the Licensees proactively initiated Section 7 consultation ahead of any pending federal action (such as an amendment of license(s) or relicensing), by filing Interim Species Protection Plans (ISPPs) for the Lockwood, Hydro-Kennebec, Shawmut and Weston Projects and requesting that FERC incorporate the terms of the ISPPs into the existing FERC

[1] By Order dated December 11, 2018, FERC extended the term of the existing license for the Shawmut Project by one year to January 31, 2022 (165 FERC ¶ 62,152).

[2] The Lockwood Project tailwater area is in designated critical habitat for the threatened Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus) and within the known range of the endangered shortnose sturgeon (Acipenser brevirostrum). However, neither of these species nor their critical habitats are located in the vicinity of the Shawmut Project.

licenses for each Project.[3] Subsequently, the National Marine Fisheries Service (NMFS) issued Biological Opinions (BOs) for the four Projects in 2012, 2013 and 2017, which included Incidental Take Statements (ITSs) and Reasonable and Prudent Measures (RPMs) necessary to "minimize and/or monitor incidental take and set(s) forth terms and conditions with which the action agency must comply".

The ISPP for the Shawmut Project was filed with FERC February 21, 2013, which also included the Lockwood and Weston Projects. The BO for the Lockwood, Shawmut and Weston Projects was issued by NMFS on July 19, 2013. FERC issued an Order Amending License to require the ISPP and the Handling and Protection Plan for Shortnose and Atlantic Sturgeon for the Lockwood, Shawmut, and Weston Projects on May 19, 2016.

The ISPP and BO included significant provisions and measures for the protection of habitat and provision of passage for Atlantic salmon as well as other diadromous fish species. Among the measures included in the Lockwood, Shawmut and Weston ISPP/BO were the addition of volitional passage at Lockwood,[4] an upstream fish lift at Shawmut, and an upstream fish lift at Weston. The ISPP also included fishway monitoring, and various studies to evaluate the effectiveness of upstream and downstream fish passage facilities. In addition, an adaptive management plan ensured that take limits prescribed in the BO would not be exceeded.

Because the ISPP for the Projects were set to expire on December 31, 2019, two years in advance of the expiration date, the Licensees initiated consultation with the fisheries agencies on a final Species Protection Plan (SPP) that included the Lockwood, Shawmut and Weston Projects, and the Hydro-Kennebec Project, also located on the lower Kennebec River downstream of the Shawmut Project. The Licensees filed a final SPP and draft Biological Assessment (BA) for Atlantic salmon with FERC on December 31, 2019. The SPP described the measures the Licensees would undertake at the four Projects to avoid and minimize impacts to Atlantic salmon, Atlantic sturgeon, and shortnose sturgeon for the duration of the FERC licenses, including the new license for the Shawmut Project anticipated to be issued in 2022. The measures contained in the SPP included operation of the previously-authorized upstream fish passage facilities (required under the ISPPs), the implementation of downstream passage improvements at the four Projects, fishway effectiveness performance standards, monitoring studies, and a Sturgeon Handling Plan (for Lockwood).

[3] The development of a Species Protection Plan (SPP) to protect, mitigate, or enhance species listed under the ESA, and to provide take coverage for such species, or the development of an ISPP to provide take coverage while consulting with the NMFS or USFWS, have no basis in ESA statute or regulation. Rather, these documents are negotiated to create PME measures that would otherwise be developed through consultation between the federal action agency the federal resource agency(ies). Filing the document voluntarily with the action agency triggers ESA consultation in the absence of a federal nexus such as a FERC license proceeding.

[4] Presumed in the ISPP to be a flume volitionally connecting the existing Lockwood fish lift to the headpond.

Also on December 31, 2019, BWPH filed its design plans for the construction of an upstream fish lift facility at the Shawmut Project, in conformance with the provisions of the ISPP and existing FERC license, as amended by Order issued May 19, 2016.[5] In accordance with the ISPP and current FERC license, the Shawmut upstream fishway was scheduled to be constructed in 2020 and operational in 2021.[6]

On January 31, 2020, BWPH, filed with FERC a Final License Application (FLA) for the Shawmut Project.[7] On March 2, 2020 FERC issued an Additional Information Request (AIR) to BWPH. On June 1, 2020 BWPH filed the requested information. On July 1, 2020, FERC issued its Notice of Application Accepted for Filing, Soliciting Motions to Intervene and Protests, Ready for Environmental Analysis, and Soliciting Comments, Recommendations, Preliminary Terms and Conditions, and Preliminary Fishway Prescriptions (REA Notice).

By letter dated February 7, 2020, NMFS expressed concern that the Final SPP lacked sufficient analysis to adequately proceed with formal consultation and failed to address concerns NMFS raised during the informal consultation process. On February 28, 2020 and March 20, 2020, USFWS and MDMR, respectively, notified FERC of their support for the comments provided in the NMFS February 7, 2020 letter.

On July 13, 2020, FERC issued an Order denying the extension of time to construct upstream fish passage at the Shawmut Project and keeping in place certain provisions of the ISPP, including annual reporting with updates on the status of the preparation of any Final Species Protection Plan.[8] Also on July 13, 2020, FERC issued a letter to BWPH informing the Licensees that construction of a new upstream fishway at the Shawmut Project would be considered as part of the ongoing relicensing proceeding.[9] FERC also stated that it did not intend to act on the Licensees' request to amend the current Shawmut license to incorporate the final SPP, review the final upstream fish passage design drawings[10] that were submitted, or act on any request to

[5] Order Amending Licenses to Require Interim Species Protection Plan For Atlantic Salmon, and Handling and Protection Plan for Shortnose and Atlantic Sturgeon May 19, 2016 , 155 FERC ¶ 61,185 (2016).

[6] Id.

[7] Application for License of Brookfield White Pine Hydro LLC under P-2322 (January 21, 2020).

[8] FERC Order on Request for Extensions of Time to Install Fish Passage (Issued July 13, 2020). FERC order denying the extension of time to construct upstream fish passage at the Shawmut Project, though approving the extensions of time to construct upstream fish passage at the Lockwood and Weston Projects.

[9] FERC Letter to Brookfield White Pine Hydro, LLC discussing the proposed Lower Kennebec Species Protection Plan for Atlantic Salmon, etc. and the related draft Biological Assessment for four hydroelectric projects including the Shawmut Project under P-2322, July 13, 2020.

[10] Brookfield White Pine Hydro LLC Brookfield White Pine Hydro, LLC submits the final design drawings operation and maintenance plan and consultation records for the Shawmut Upstream Fish Passage Facility re the Shawmut Hydro Project under P-2322, December 31, 2019. The final upstream fish passage design drawings were completed with full agency consultation at all phases of design.

commence fishway construction at Shawmut under the ISPP, pursuant to FERC's Order dated May 19, 2016.

In a separate letter, on July 13, 2020, in response to agency comments,[11] FERC issued a letter rejecting the Licensees' request to amend the Project licenses to include the provisions of the SPP. Therein FERC stated "In light of these agencies' comments, Commission staff is unable to accept the Final Plan [SPP] and draft BA. The extension of time granted for the Lockwood and Weston Projects, issued concurrently with this letter, should provide you with the additional time necessary to work with NMFS, FWS, Maine DMR, and other relevant state and federal agencies to address any outstanding issues for the Final Plan and draft BA for the Lockwood, Weston, and Hydro-Kennebec Projects. We encourage you to re-file the Final Plan once those concerns have been resolved." By letter dated December 2, 2020, FERC clarified that "although no deadline was set in the July 13, 2020 letter rejecting the Final Plan, Commission staff has set a deadline of May 31, 2022, for the filing of a Final Plan for the Lockwood, Weston, and Hydro-Kennebec Projects."

On July 29, 2020, the Licensees filed comments with FERC regarding their determinations for both the Shawmut fish lift construction plans, and its rejection of the final SPP. In that letter, the Licensees requested that FERC extend the terms of the ISPPs until such time that the ISPPs were supplanted by a final SPP to allow time to develop a revised Final SPP in consultation with the agencies as well as comply with the requirements for the construction of the Lockwood and Weston upstream fish passage facilities; measures from the ISPP that had been incorporated into the respective Project licenses but which had not yet been completed upon expiration of the ISPP/BO on December 31, 2019.

In a letter to FERC filed in September 2020, NMFS noted that coincident with the expiration of the ISPPs on December 31, 2019, the underlying consultation for the proposed action lapsed, along with the associated authorization for the incidental take of listed species under Section 10(a)(1)(b) of the ESA. NMFS further indicated that FERC's extension of the ISPPs would require consultation under Section 7 of the ESA, and to proceed without having the effects of extending the ISPPs considered in a BO, would leave no incidental take coverage in place.

In a letter dated December 2, 2020, FERC indicated that they would consider the request for an extension of the ISPPs to provide the Licensees with incidental take coverage but ordered the Licensees to file a BA within 60 days (on or before February 2, 2021) in support of the request to extend the ISPPs. In response to this letter request, the Licensees prepared and filed a BA on February 1, 2021 that evaluated the effects of extending the terms of the ISPPs for the Weston, Shawmut, Hydro-Kennebec, and Lockwood Project until May 31, 2022, including the construction of the previously approved new fishways at Lockwood and Weston. The NMFS

[11] Comment letters dated February 7, 2020 from NMFS; February 28, 2020 from the US Fish and Wildlife Service; and March 20, 2020 from the MDMR.

issued a letter on December 18, 2020 indicating that "any section 7 consultation carried out on the effects of the continued operations of these facilities must consider the remaining duration of their licenses."

Subsequently, correspondence between the NMFS, FERC and the Licensees for the Shawmut, Hydro-Kennebec, Weston and Lockwood Projects resulted in the determination that a final revised SPP would be filed for the Lockwood, Hydro-Kennebec and Weston Projects no later than June 30, 2021[12] and that the Section 7 ESA consultation for the Shawmut Project would be undertaken as part of relicensing. While the license expiration for the Shawmut Project is January 31, 2022, BWPH herein provides its ISPP for the Shawmut Project for the intervening time to issuance of a new license for the Project, including any potential forthcoming annual licenses for the Project that may be issued by the FERC.

Consistent with its designation as FERC's non-federal representative for ESA consultation for the development of the SPP, the Licensee has developed this BA for the federally endangered GOM DPS of Atlantic salmon for the Shawmut Project.

1.2 PURPOSE AND DESCRIPTION OF DRAFT BIOLOGICAL ASSESSMENT

Section 9 of the ESA prohibits the take of endangered species unless the take is authorized under specific provisions of the ESA. "Take" is defined by the ESA as "to harass, harm, pursue, ban, shoot, wound, kill, trap, capture, or collect," these species, or to attempt to engage in any such conduct. Exemptions to the prohibitions of take under Section 9 of the ESA can be provided by the Services through Section 10 or Section 7 of the ESA. Under ESA Section 10(a)(1)(B), permits may be issued for taking that is incidental to the purposes of an otherwise lawful activity (incidental take permits). Under ESA Section 7(a)(2), ITS may be issued to exempt the Licensee or Project owner from the prohibitions of any take anticipated as an incidental result of an activity conducted, permitted, or funded by a federal agency, provided this take would not be likely to result in jeopardy to the species or destruction of its critical habitat.

Section 7 of the ESA mandates that all federal agencies consult with the Secretaries of Commerce and Interior to determine whether a proposed action is likely to be categorized with respect to listed species and designated critical habitat, as follows:

- No Effect: No effects to the species and its critical habitat from the proposed action, either positive or negative, are expected.
- May Affect, Not Likely to Adversely Affect: All effects of the proposed action to the species and its critical habitat are beneficial, insignificant, or discountable. Beneficial effects have positive effects to the species or its critical habitat. Insignificant effects relate to the size of the impact and should not reach the scale where incidental or unintentional

[12] By letter dated April 30, 2021, the Licensees for the Lockwood, Weston and Hydro-Kennebec Projects committed to filing a revised final SPP no later than June 30, 2021.

take (harming or killing) occurs. Discountable effects are those that are extremely unlikely to occur. Determinations of "not likely to adversely affect" due to beneficial, insignificant, or discountable effects require written concurrence from the USFWS or NMFS.

- May Affect, Likely to Adversely Affect: The action would have an adverse effect on the species or its critical habitat. Any action that would result in take of an endangered species is considered an adverse effect. A combination of beneficial and adverse effects is still considered "likely to adversely affect" even if the net effect is neutral or positive. Adverse effects are not considered discountable because they are expected to occur. This determination requires formal consultation with the USFWS or NMFS.

The purpose of this draft BA is to evaluate the potential effects of the action of continuing the measures included in the now expired February 21, 2013 ISPP and the Reasonable and Prudent Measures (RPMs) and Terms and Conditions (T&Cs) of the expired 2013 BO on the listed species and designated critical habitat and to determine whether the listed species or critical habitats are likely to be adversely affected by the action.

1.3 PROPOSED ACTION – INTERIM SPECIES PROTECTION PLAN (ISPP)

Because the ISPP for the Project expired December 31, 2019, and because FERC rejected the final SPP for the lower Kennebec Project Projects and returned it to the Licensees for further consultation with the agencies, the Licensees are requesting that the Commission approve the continuation of the terms of the 2013 ISPP and BO, along with supplemental proposed actions detailed below, until such time that they are supplanted by a new license for the Shawmut Project.

By continuing the ISPP terms, supplemental actions, and terms of the respective BO, Atlantic salmon will be protected through a combination of upstream and downstream passage, avoiding and minimizing delay, injury, and protection of critical migration habitat in the Project areas.

A summary of the measures that will be carried out by BWPH for the protection of Atlantic salmon through the license term are outlined in Table 1-1. These measures are discussed in more detail in Section 5.0 and Section 6.0.

TABLE 1-1 OVERVIEW OF PROPOSED ISPP EXTENSION MEASURES

PROJECT	UPSTREAM PASSAGE MEASURES	DOWNSTREAM PASSAGE MEASURES	MONITORING MEASURES AND MANAGEMENT
Shawmut	N/A *Fish will continue to bypass the Shawmut Project through the required trap and truck operations of the Lockwood Project, which provides upstream passage for all anadromous species around the Shawmut Project.*	Continue to provide downstream fish passage through the surface sluice and Tainter gate April 1 through June 15 and November 1 to December 31 for Atlantic salmon and other anadromous species. As an additional "adaptive management" measure, continue to lower 4 sections of hinge boards adjacent to the canal headworks for the Atlantic salmon smolt migration season to provide approximately 560 cfs of spill flow. Continue to operate the deep gate for 8 hours a night for 6 weeks starting September 15, in conjunction with nighttime shutdown of Units 7 and 8 for American eel passage.	Continue to implement the site- specific fish passage operational plan. Continue to prepare annual fishway monitoring reports and hold annual meeting with fishery agencies.

1.4 ESA LISTING OF ATLANTIC SALMON

The GOM DPS of Atlantic salmon was first listed as endangered by the Services on November 17, 2000 (USFWS and NMFS 2000). The GOM DPS designation in 2000 included all naturally reproducing Atlantic salmon populations occurring in an area from the Kennebec River downstream of the former Edwards Dam site extending north to the international border between

Canada and the United States at the mouth of the St. Croix River. The November 2000 final rule listing the GOM DPS did not include fish that inhabit the mainstem and tributaries of the Penobscot River above the site of the former Bangor Dam, the Kennebec River above the site of the former Edwards Dam, or the Androscoggin River (USFWS and NMFS 2000).

The 2006 Status Review for anadromous Atlantic salmon in the U.S. (Fay et al. 2006) assessed genetic and life history information and concluded that the GOM DPS, as defined in 2000, should be redefined to encompass the Penobscot, Kennebec, and Androscoggin rivers. On June 19, 2009, the Services published a final rule determining that naturally spawned and conservation hatchery populations of anadromous Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River, including those that were already listed in November 2000, constitute a distinct population segment (DPS) and hence a "species" for listing as endangered under the ESA (USFWS and NMFS 2009). This range includes the lower portions of the Kennebec River.

The GOM DPS of Atlantic salmon is divided into three salmon habitat recovery units (SHRUs) within the range of the GOM DPS and includes the following: the Downeast Coastal SHRU, the Penobscot Bay SHRU, and the Merrymeeting Bay SHRU. The three SHRUs were created to ensure that Atlantic salmon were widely distributed across the DPS such that recovery of the GOM DPS of Atlantic salmon is not limited to one river or one geographic location, because widely distributed species are less likely to become threatened or endangered by limited genetic variability and tend to be more stable over space and time (NMFS 2009a).

The Merrymeeting Bay SHRU contains historically accessible spawning and rearing habitat for Atlantic salmon. Most of the habitat within the Merrymeeting Bay SHRU is in the Kennebec River basin. A variety of issues and conditions, including dams, affect Atlantic salmon recovery in the Kennebec River, also including agriculture, forestry, changing land use, hatcheries and stocking, roads and road crossings, mining, dredging, aquaculture, and introductions of non-native species such as smallmouth bass (NMFS 2009a).

1.4.1 CRITICAL HABITAT DESIGNATION

As a result of the June 19, 2009, endangered species listing, NMFS was required to evaluate historical occupancy of the watershed for the process of designating critical habitat for the GOM DPS. Section 3 of the ESA defines critical habitat as the following:

1. Specific areas within the geographical area occupied by the species at the time of listing, in which are found those physical or biological features that are essential to the conservation of the listed species and that may require special management considerations or protection; and
2. Specific areas outside the geographical area occupied by the species at the time of listing that are essential for the conservation of a listed species.

As part of the critical habitat designation, NMFS described the known primary constituent elements (PCEs) that are deemed essential to the conservation of the GOM DPS, including (1) sites for spawning and rearing and (2) sites for migration (excluding marine migration). The physical and biological features of the two PCEs for Atlantic salmon critical habitat are as follows:

Physical and Biological Features of the Spawning and Rearing PCE:

A1. Deep, oxygenated pools and cover (e.g., boulders, woody debris, vegetation, etc.), near freshwater spawning sites, necessary to support adult migrants during the summer while they await spawning in the fall.

A2. Freshwater spawning sites that contain clean, permeable gravel and cobble substrate with oxygenated water and cool water temperatures to support spawning activity, egg incubation, and larval development.

A3. Freshwater spawning and rearing sites with clean, permeable gravel and cobble substrate with oxygenated water and cool water temperatures to support emergence, territorial development and feeding activities of Atlantic salmon fry.

A4. Freshwater rearing sites with space to accommodate growth and survival of Atlantic salmon parr.

A5. Freshwater rearing sites with a combination of river, stream, and lake habitats that accommodate parr's ability to occupy many niches and maximize parr production.

A6. Freshwater rearing sites with cool, oxygenated water to support growth and survival of Atlantic salmon parr.

A7. Freshwater rearing sites with diverse food resources to support growth and survival of Atlantic salmon parr.

Physical and Biological Features of the Migration PCE:

B1. Freshwater and estuary migratory sites free from physical and biological barriers that delay or prevent access of adult salmon seeking spawning grounds needed to support recovered populations.

B2. Freshwater and estuary migration sites with pool, lake, and instream habitat that provide cool, oxygenated water and cover items (e.g., boulders, woody debris, and vegetation) to serve as temporary holding and resting areas during upstream migration of adult salmon.

B3. Freshwater and estuary migration sites with abundant, diverse native fish communities to serve as a protective buffer against predation.

B4. Freshwater and estuary migration sites free from physical and biological barriers that delay or prevent emigration of smolts to the marine environment.

B5. Freshwater and estuary migration sites with sufficiently cool water temperatures and water flows that coincide with diurnal cues to stimulate smolt migration.

B6. Freshwater migration sites with water chemistry needed to support sea water adaptation of smolts.

On June 19, 2009, NMFS designated as critical habitat 45 specific areas occupied by GOM DPS Atlantic salmon at the time of listing. Critical habitat includes the stream channels within the designated stream reaches, and includes a lateral extent as defined by the ordinary high-water line (33 C.F.R. 329.11). Critical habitat in estuaries is defined by the perimeter of the water body as displayed on standard 1:24,000 scale topographic maps or the elevation of extreme high water, whichever is greater. Critical habitat is designated to include all perennial rivers, streams, and estuaries and lakes connected to the marine environment within the range of the GOM DPS of Atlantic salmon, except for those particular areas within the range which are specifically excluded (NMFS 2009b).

The Lockwood, Hydro-Kennebec, Shawmut, and Weston projects all lie within the designated critical habitat of the Merrymeeting Bay SHRU for Atlantic salmon. Critical habitat is further delineated into HUC 10 watersheds. At the time that Atlantic salmon were listed under the ESA, NMFS reported that in the Merrymeeting Bay SHRU (including the Androscoggin River, Sheepscott River and Kennebec River) there were an estimated 372,600 units of historically accessible spawning and rearing habitat for Atlantic salmon, found among approximately 5,950 km2 of historically accessible rivers, streams, and lake. Of these units, 136,000 units of habitat were considered to be critical habitat. Of these, NMFS estimated there to be nearly 40,000 functional equivalents of habitat or approximately 11 percent of the historical functional potential. This estimate was based on the configuration of dams within the SHRU that limit migration and degradation of physical and biological features from land use activities which reduce the productivity of habitat within each HUC 10 (NMFS 2009b). NMFS further determined that for each SHRU to achieve recovery objectives for Atlantic salmon, 30,000 fully functional units of habitat are needed (NMFS 2018).[13]

The Kennebec River in the vicinity of the Lockwood, Hydro-Kennebec, Shawmut, and Weston Projects serves as migration habitat for adults returning to freshwater to spawn and for smolts and kelts returning to the ocean. According to the 2013 BO, the nearest mapped rearing habitat upstream of the four Projects is within the Sandy River located approximately 11miles upstream of the Weston Project dam. However, a GIS-based Atlantic salmon habitat model (Wright et al. 2008) shows that habitat exists in the mainstem of the Kennebec River downstream of the Shawmut, Hydro-Kennebec, and Lockwood Projects (NMFS 2013). The available habitat units downstream of Lockwood is currently accessible to pre-spawn adults and could be used for spawning[14] and rearing of juvenile salmon. There is also significant juvenile habitat in

[13] More recent and detailed estimates of salmon spawning and rearing habitat in the Kennebec River basin are available on Maine's Stream Viewer. https://webapps2.cgis-solutions.com/MaineStreamViewer/.

[14] Although the model does not identify habitat that is suitable for spawning, MDMR has conducted field surveys of mainstem habitat and certain tributaries in order to identify areas of suitable habitat for salmon spawning and

Wesserunsett Stream which flows into the mainstem Kennebec River downstream of Weston dam. Despite this production potential, it is unlikely that much of this habitat is used, as pre-spawn salmon are currently trucked from Lockwood to spawning and rearing habitat in the Sandy River (NMFS 2013).

1.4.2 ATLANTIC SALMON RECOVERY PLAN

Efforts by federal, state, and local government agencies, as well as many private conservation organizations aimed at protecting Atlantic salmon and its habitat in Maine have been underway for well over 100 years. The 2019 *Final Recovery Plan for the Gulf of Maine Distinct Population Segment of Atlantic Salmon* (the Plan) for listed GOM DPS presents a strategy for recovering Atlantic salmon in the rivers listed as endangered under the ESA (USFWS and NMFS 2019).

The Plan focuses on the three statutory requirements in the ESA including: site-specific recovery actions; objective, measurable criteria for delisting; and time and cost estimates to achieve recovery and intermediate steps. It is based on two premises: first, that recovery must focus on rivers and estuaries located in the GOM DPS until threats in the marine environment are better understood; and second, that survival of Atlantic salmon in the GOM DPS depends on conservation hatcheries through much of the recovery process (USFWS and NMFS 2019). The main objectives of the Plan are to maintain self-sustaining, wild populations with access to sufficient suitable habitat in each SHRU, and to ensure that necessary management options for marine survival are in place. In addition, the plan seeks to reduce or eliminate all threats that either individually or in combination might endanger the DPS (USFWS and NMFS 2019).

The current recovery criteria for downgrading classification from endangered to threatened consist of:

1. Abundance: The entire DPS has a total annual returns of at least 1,500 adults originating from wild origin, or hatchery stocked eggs, fry or parr spawning in the wild, with at least two of the three SHRUs having a minimum annual escapement of 500 naturally reared adult returns;
2. Productivity: The population in each of at least two of the three SHRUs must have a positive mean growth rate greater than 1.0 in the 10-year (two generation) period preceding reclassification; and
3. Habitat: In each of the SHRUs where the abundance and productivity criterion have been met, there is a minimum of 7,500 accessible and suitable spawning and rearing habitat for the offspring of the 1,500 naturally reared adults (USFWS and NMFS 2019).

The longer-term recovery target for the delisting of Atlantic salmon consists of:

rearing. These efforts have identified suitable spawning habitat in the mainstem river below the Lockwood Project, some of which is within 300 meters of the Project.

1. Abundance: The DPS has a self-sustaining annual escapement of at least 2,000 wild origin adults in each SHRU for a DPS-wide total of at least 6,000 wild adults;
2. Productivity: Each SHRU has a positive mean growth rate of greater than 1.0 in the 10-year (two generation) period preceding delisting. In addition, at the time of delisting, the DPS demonstrates self-sustaining persistence; whereby the total wild population in each SHRU has less than a 50-percent probability of falling below 500 adult wild spawners in the next 15 years based on population viability analysis (PVA) projections and
3. Habitat: Sufficient suitable spawning and rearing habitat for the offspring of 6,000 wild adults is accessible and distributed throughout designated Atlantic salmon critical habitat, and with at least 30,000 accessible and suitable habitat units in each SHRU, located according to the known migratory patterns of returning wild adult salmon. This would require both habitat protection and restoration at significant levels.

According to the 2020 Report for the *Collaborative Management Strategy for the Gulf of Maine Distinct Population Segment of Atlantic Salmon*, the abundance of wild and naturally reared returning s remains well below what is needed for either reclassification or delisting with 6 percent of the total of 1,528 pre-spawn salmon returning to the Merrymeeting Bay SHRU. Progress is being made, however, as the abundance of returning salmon was more than 20 percent higher than the 10-year average and the proportion of naturally reared fish was 8 percent higher than the 10-year average. The mean 10-year population growth rate for the GOM DPS as a whole was reported to be 1.12 in 2019 and was 1.84 for the Merrymeeting Bay SHRU. The amount of habitat that is considered "suitable and accessible" in the Merrymeeting Bay SHRU is 12,423 habitat units; representing 166 percent of the units needed for downlisting and 41.41 percent of the units needed for delisting (CMS 2020)

The recovery plan focuses on the site-specific actions necessary to recover the GOM DPS of Atlantic salmon. The eight categories of recovery actions include:

- Habitat Connectivity, intended to enhance connectivity between the ocean and freshwater habitats important for salmon recovery;
- Genetic Diversity, intended to maintain the genetic diversity of Atlantic salmon populations over time;
- Conservation Hatchery, intended to increase adult spawners through the conservation hatchery program;
- Freshwater Conservation, intended to increase adult spawners through the freshwater production of smolts;
- Marine and Estuary, intended to increase survival in these habitats by increasing understanding of these salmon ecosystems and identifying the location and timing of constraints to the marine productivity of salmon in support of management actions to improve survival;
- Federal/Tribal Coordination, intended to ensure federal agencies and associated programs continue to recognize and uphold federal Tribal Trust responsibilities;

- Funding Program Actions, intended to identify funding programs that support state, local and NGO conservation efforts that benefit Atlantic salmon recovery; and
- Outreach, Education, and Engagement, intended to collaborate with partners and engage interested parties in recovery efforts for the GOM DPS (USFWS and NMFS 2019).

For geographically based recovery actions, the SHRU-level work plans describe threats and recovery activities with a high priority within a 5-year period. Threats listed for the overall Merrymeeting Bay SHRU consist of:

- Climate change and the adverse effect it may have on habitats most suitable for Atlantic salmon;
- Dams and culverts that block or impede access to Atlantic salmon spawning and rearing habitat degrade habitat features for native riverine species;
- The stocking and introduction of non-native species, particularly smallmouth bass, that compete with and prey on Atlantic salmon;
- No dedicated hatchery stocks for a stocking program within the SHRU (except the Sheepscot River);
- Pollution attributed to land use and development practices in the Merrymeeting Bay SHRU that can harm Atlantic salmon and degrade the productive capacity of freshwater and estuary habitats;
- Historic and current land uses that have degraded the complexity and productivity of freshwater habitats that support Atlantic salmon (e.g., historic log drives, past and current agriculture and forestry practices, and residential development practices); and
- Limited resources to assess all areas that could be occupied by Atlantic salmon.

Recovery actions are also outlined in the recovery plan (USFWS and NMFS 2019). The overarching recovery actions identified for the Merrymeeting Bay SHRU and/or the Kennebec River that are relevant to the Kennebec projects ISPP are:

- Seek out opportunities at dams and road crossings throughout the SHRU where access can be improved for diadromous fish, including river herring and Atlantic salmon.
- Evaluate, through consultation, dam or culvert modification or installation project to assure that projects provide for upstream and downstream passage of all life stages of Atlantic salmon sufficient to sustain recovery.
- Develop production capacity and an independent donor broodstock program to support the Merrymeeting Bay SHRU that: 1) preserves and promote the genetic diversity of existing stocks, 2) prevents the further loss of family groups, 3) allows for marine and freshwater selection to maximize fitness, 4) accounts for habitat variability and climate change scenarios, and 5) promotes the development of locally adapted stocks.

The Plan includes a table (Table 1-1) that generally identifies the priority, timing, and involved parties for the various actions, but it is important to recognize that annual decisions regarding recovery priorities would be formulated with the SHRU-level work plans (USFWS and NMFS 2019). SHRU-level work plans provide the basis for determining activities that should be implemented in the short-term for each of the Plan's recovery actions. The *Merrymeeting Bay Work Site Specific Threats Work Plan* includes the following actions relevant to the Kennebec River or the Shawmut Project:

- Develop performance standards for the Shawmut dam and incorporate them into a final SPP. Final SPPs will be in place by 2020. *As indicated herein, the requisite Section 7 consultation for the Shawmut Project is being undertaken as part of relicensing and performance standards may be incorporated into the Project license under that consultation.*
- Conduct downstream survival studies to assess effects of this Project on smolt survival, and modify operations to improve survival necessary to meet or exceed performance standards. *Three years of downstream smolt studies have been conducted (2013 – 2015) to date with an efficiency range of 90.6 to 96.3 percent.*
- Construct effective upstream fish passage at Shawmut by 2019. *As indicated herein, the upstream fish passage facility at Shawmut is currently part of the proposed action for relicensing at the specific request of the NMFS.*
- Test upstream survival and fish passage efficiency at Shawmut to assure that the effects of the dam and its operations meet or exceed the performance standards. *To be completed once constructed.*
- The Sandy River is a priority area for receiving a donor stock from an out of basin source for population rebuilding in the Merrymeeting Bay SHRU. *Dam owners are identified as implementing entities for broodstock efforts in the Kennebec basin.*

The 2019 recovery plan generally discusses the successes of combined efforts undertaken on the Kennebec River to restore Atlantic salmon to the river as follows:

> *There has also been significant conservation successes in the Kennebec River watershed. The Kennebec River Diadromous Fish Restoration Project was initiated in 1986 when the Maine Department of Marine Resources (MDMR) signed a settlement agreement with the Kennebec Hydro-Developers Group (KHDG). A second settlement agreement signed in 1998 by state and federal fisheries resource agencies, non-governmental organizations, and the KHDG resulted in the removal of Edwards Dam in Augusta to provide fish passage for all diadromous fish species, instituted schedules or triggers for fish passage at the seven KHDG dams, and provided additional funding for the stocking program. From 1837 to 1999 the Edwards Dam in Augusta prevented any upstream fish passage. Removal of Edwards dam restored full access to historical spawning habitat for species like Atlantic sturgeon, shortnose sturgeon, and rainbow smelt, but not for species including alewife, American shad and Atlantic salmon that migrated much further up the river (MDMR, 2007). With the removal of Edwards Dam, the first dam on the Mainstem*

is now the Lockwood Dam in Waterville. In 2006, a fish lift was constructed with the ability to trap and truck Atlantic upstream of three dams that continued to block access to the Sandy River. The Sandy River contains high quality, abundant Atlantic salmon spawning and nursery habitat.

2.0 PROJECT DESCRIPTIONS

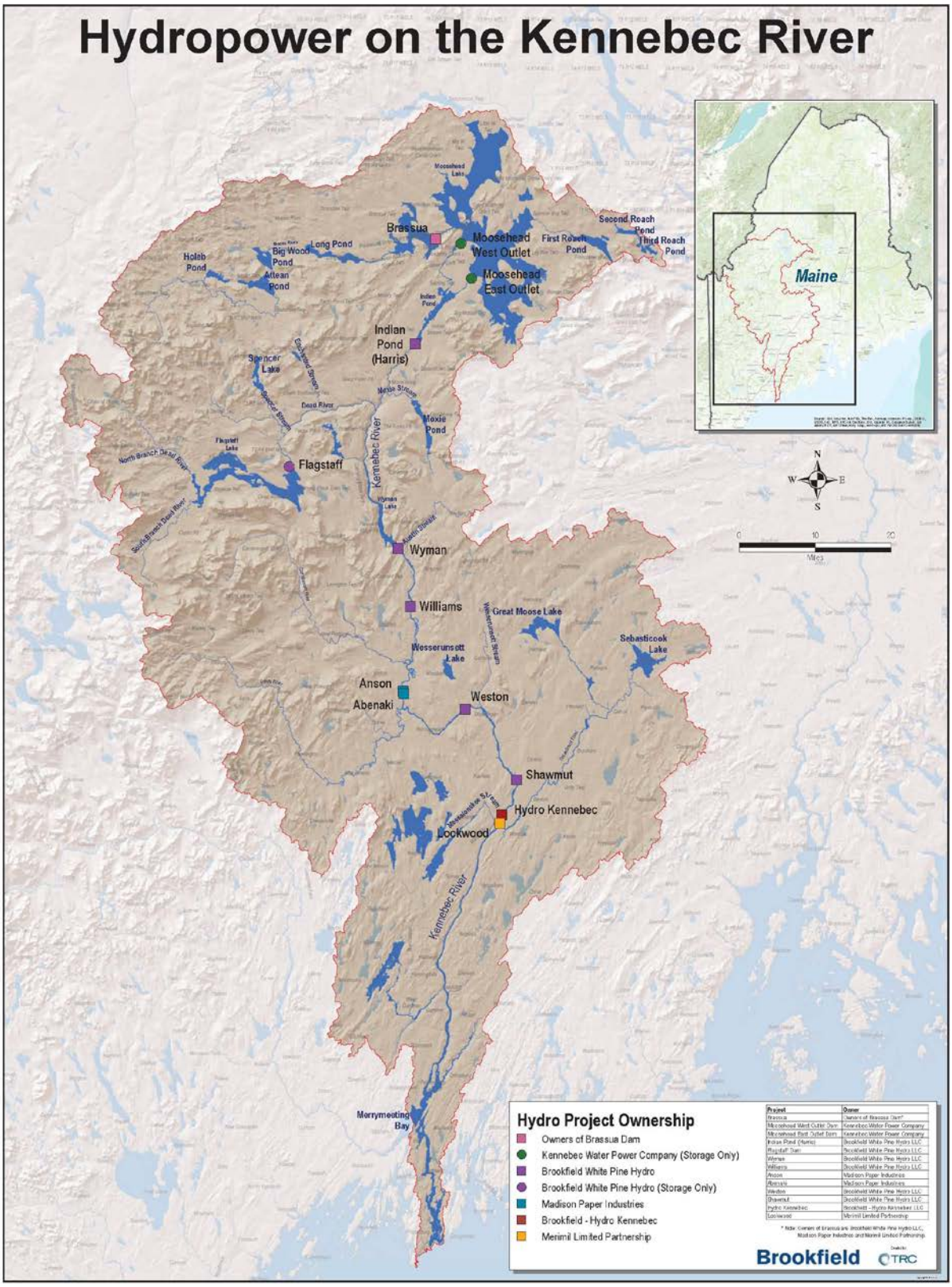
2.1 KENNEBEC RIVER BASIN

The Kennebec River basin is the largest of the watersheds that comprise the Merrymeeting Bay SHRU. The Kennebec River watershed covers an area of 5,910 square miles, approximately 1/5 of the state of Maine, and flows 138-miles from Moosehead Lake to Merrymeeting Bay where it joins the Androscoggin River. The Kennebec watershed is bordered on the west by the Androscoggin River basin, on the north and east by the Penobscot River basin, and by coastal streams and the Gulf of Maine on the south.

The Kennebec River's mainstem originates at the outlet of Moosehead Lake and flows generally southward through the towns and cities of Bingham, Solon, Anson, Madison, Norridgewock, Skowhegan, Waterville, and Augusta. The river transitions from a high gradient cold water river from upstream of Indian Pond to Madison, to a warmwater river from Skowhegan to Augusta. A 24-mile-long, mostly freshwater tidal segment of the river exists downstream from Augusta, and slightly brackish conditions exist periodically in Merrymeeting Bay (CABB 2006).

The Kennebec River basin has been extensively developed for over a century for industrial use, including driving of logs and pulp, mills, and hydroelectric power production. The Lockwood Project, located at river mile (RM) 63, is the lowermost dam and hydroelectric plant on the mainstem river. The drainage area above the Lockwood Project is 4,228-square miles. Other mainstem projects upstream of Lockwood include Hydro-Kennebec, Shawmut, Weston, Abenaki, Anson (FERC Project No. 2365), Williams (FERC Project No. 2335), Wyman (FERC Project No. 2329), and Harris (FERC Project No. 2142) (Figure 2-1). The Fort Halifax Project (FERC No. 2552), which was removed in 2008, was formerly located near the mouth of the tributary Sebasticook River, approximately 0.5 miles downstream of Lockwood. Edwards dam (FERC Project No. 2389), which was removed in 1999, was located about 18 miles downstream of Lockwood on the main stem.

FIGURE 2-1 LOCATION OF HYDROELECTRIC PROJECTS IN THE KENNEBEC RIVER BASIN



Source: Brookfield White Pine Hydro, 2019

2.2 EXISTING PROJECT FACILITIES AND OPERATIONS

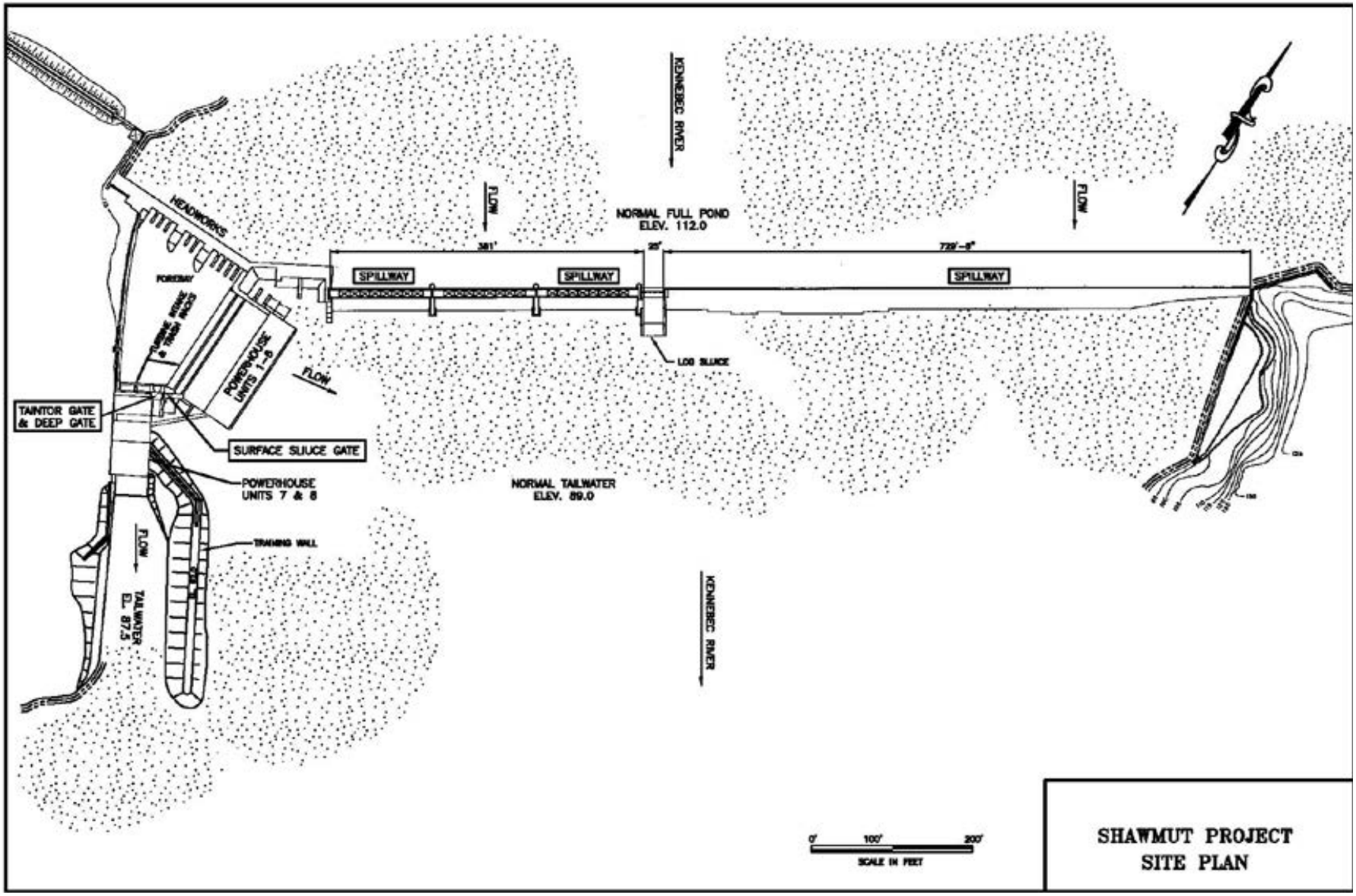
The Shawmut Project is located at RM 70 and is the third dam on the main stem of the Kennebec River. It includes a 1,310-acre impoundment, a 1,135-ft long dam with an average height of about 24 ft, headworks structure, enclosed forebay, and two powerhouses with intake structures. The crest of the dam has 380 ft. of hinged flashboards 4-ft high serviced by a steel bridge with a gantry crane, a 730-ft. long inflatable bladder composed of three sections, each 4.5-ft. high when inflated and a 25-ft.- wide by 8-ft. deep sluice equipped with a timber and steel gate.

The headworks and intake structures are integral to the dam and the powerhouses, respectively. The forebay intake section contains 11 headgates and 2 filler gates. Five of the headgates are installed in openings 10-ft. wide by 15.5-ft. high and six are installed in openings 10-ft. by 12.5-ft. The two filler gate openings are 4-ft. by 6-ft. A non-overflow concrete gravity section of dam connects the west end of the concrete filled forebay gate openings with a concrete cut-off wall which serves as a core wall for an earth dike.

The forebay is located immediately downstream of the headgate structure and is enclosed by two powerhouse structures, the 1924 powerhouse located to the east and the 1982 powerhouse located to the south. An approximately 240-ft. long concrete retaining wall is located on the west side of the forebay. Located at the south end of the forebay between the powerhouses is a 10-ft. by 7-ft. Tainter gate. In addition, a 6-ft. by 6-ft.-deep gate and a surface sluice (4-ft.-wide by 22-inch-deep, passing 35 cfs) which discharges into a 3-ft. deep plunge pool are located at the south end of the forebay. In the original powerhouse, the intake section has six open flumes each fitted with two 10.5-ft. by 14-ft. double-leaf slide gates and a continuous trash rack. In the newer powerhouse, the intake section contains two openings fitted with vertical headgates about 12-ft.high by 12-ft wide and operated by hydraulic cylinders. The trash racks are serviced by a track mounted, hydraulically operated trash rake with trash removal capabilities. The trash racks screening the intakes are 1.5-inch clear spacing in front of Units 1-6 and 3.5-inch clear spacing in front of Units 7 and 8.

The original powerhouse contains six horizontal Francis-design units and the newer powerhouse contains two horizontal propeller units, having a total combined authorized capacity of 8.74 MW and combined station flow of approximately 6,700 cfs. The Project's tailrace channels are excavated riverbed located downstream of the powerhouses. The Project is typically operated in a run-of-river mode, normally passing a minimum flow of 2,110 cfs, with a normal full pond elevation of about 112.0 ft msl.

FIGURE 2-2 SHAWMUT PROJECT



2.3 FISH PASSAGE FACILITIES

2.3.1 UPSTREAM PASSAGE

There are currently no upstream fish passage facilities at the Project. Fish are trapped and trucked around the Shawmut Project via the Lockwood fish lift located downstream. As such, there are no upstream migrating adult Atlantic salmon in the Project area.

An upstream passage facility (fish lift) for the Shawmut Project was designed and submitted for approval under the FERC license pursuant to the ISPP and BO. On December 31, 2019, the Licensee filed final Shawmut fishway plans for review and approval by FERC. In a letter dated July 13, 2020, FERC determined that final fish lift approval would be considered in conjunction with the ongoing relicensing of the Shawmut Project and is not proposed as an interim action here. Until the Shawmut fish lift is completed, required trap and truck operations from Lockwood will continue to move fish past the Shawmut Project to habitats further upstream.

2.3.2 DOWNSTREAM PASSAGE

Downstream passage for Atlantic salmon at Shawmut is currently provided through a combination of a surface weir (sluice), Tainter gate, and opened hinged flashboards. The sluice is located within the forebay at the right side of the intake structure next to Unit 6. It is 4-ft wide by 22-inches deep and flow can be adjusted by adding or removing stoplogs. With all stoplogs removed, the sluice passes between 30 and 35 cfs which is discharged over the sill into a 3-ft deep plunge pool. The Tainter gate located next to the sluice measures 7 ft. high by 10-ft wide and can pass up to 600 cfs.

The sluice and Tainter gate are operated for Atlantic salmon smolt and kelt passage typically from April 1 through June 15 and from November 1 through December 31, as river flow and ice conditions allow. Downstream passage is also provided along the Shawmut spillway during periods of excess river flow that results in spill. To provide an additional passage during the Atlantic salmon smolt migration season, the Licensee also drops several sections of flashboards. Currently, four hinged flashboards sections located immediately adjacent to the power canal headworks are opened for the Atlantic salmon smolt migration season, April 1 to June 15, and provide up to approximately 560 cfs of spill flow.[15]

The downstream passage facility and supplemental spill flows are proposed to continue under the interim term as part of the ISPP.

[15] The hinged flashboard sections pass a flow of approximately 140 cfs per section. With three sections down the flow is approximately 420 cfs; with four sections down the flow is approximately 560 cfs.

3.0 ATLANTIC SALMON LIFE HISTORY

Anadromous Atlantic salmon have a complex life history that includes spawning and rearing in freshwater rivers and streams, as well as extensive feeding migrations and sexual maturation in the marine environment (Fay et al. 2006). The freshwater juvenile stage of the life cycle can last from one to three years, after which juveniles undergo a physiological transformation (called smoltification) and migrate downstream to spend one to three years at sea before returning to freshwater to spawn in their natal rivers. Unlike Pacific salmon, Atlantic salmon do not die after spawning, and can return to sea to repeat the migratory cycle.

Although spawning by Atlantic salmon does not occur until late October or November, most adult Atlantic salmon ascend rivers beginning in the spring. In the GOM rivers, the peak upstream migration occurs in June, but may persist until the fall (Fay et al. 2006). After fish enter the freshwater environment, they cease feeding and darken in coloration. Salmon that return early in the spring spend nearly five months in the river before spawning, seeking cool water refuges (e.g., deep pools, springs, and mouths of small cold-water tributaries) during the summer months (Fay et al. 2006). Following spawning, adults (referred to as "kelts") may move downstream in either the fall or the following spring, eventually reaching the estuary and ocean. Once in the marine environment, these salmon resume feeding and a very small percentage may return as repeat spawners one to two years later.

Preferred spawning habitat consists of gravel substrate with adequate water circulation to keep buried eggs well oxygenated. Water depth at spawning sites is typically 30 centimeters (cm) to 61 cm, and water velocity averages 60 cm per second (Fay et al. 2006). Spawning occurs from late October through November when water temperatures are roughly between 7.2 degrees Celsius (°C) to 10.0°C. The female uses its tail to scour or dig a series of nests in the gravel where the eggs are deposited; this series of nests is called a redd. One or more males fertilize the eggs as they are deposited in the redd. The female then continues digging upstream of the last deposition site, burying the fertilized eggs with clean gravel. A female salmon returning to spawn after spending two years at sea will produce approximately 7,500 eggs (Fay et al. 2006).

The eggs hatch in late March or April. At this stage, the young salmon are referred to as alevin or sac fry. Alevins remain in the redd for about six more weeks and are nourished by their yolk sac. Alevins emerge from the gravel in mid-May, and begin active feeding, at which time they are called fry (Fay et al. 2006). Within days, the salmon fry enter the parr stage, indicated by vertical bars (parr marks) visible on their sides. Parr prefer areas with adequate cover, water depths ranging from approximately 10 cm to 60 cm, water velocities between 30 cm and 92 cm per second, and water temperature near 16°C (Fay et al. 2006). Juvenile salmon are territorial and feed on a variety of aquatic invertebrates, including larvae of mayflies, stoneflies, chironomids, and caddis flies; aquatic annelids; mollusks; and numerous terrestrial invertebrate species that fall into the river (Fay et al. 2006). In fall as flows increase, and as temperature and day length

decrease, parr often shelter in the substrate. Movement may be quite limited in the winter, but can occur, particularly if the formation of ice reduces available habitat (Fay et al. 2006).

After remaining in freshwater habitat for one to three years (typically two years in Maine), parr undergo a series of physiological, morphological, and behavioral changes in a process called "smoltification." This transformation occurs in the spring and prepares the salmon "smolt" for its dramatic change in osmoregulatory needs that come with movement from a freshwater to marine environment (Fay et al. 2006). The smolt emigration period is rather short and lasts only two to three weeks for each individual (NMFS 2008). While not specifically assessed in the Kennebec River, naturally reared and wild smolts in Maine typically enter the sea during May to begin their ocean migration (Fay et al. 2006).

In the Penobscot River, smolts migrate between late April and early June with a peak migration in early May (Fay et al. 2006). The majority of smolts migrate in a short period of time, as demonstrated by NMFS' Penobscot River smolt trapping studies conducted between 2000 and 2005. These data show that 74 percent of the downstream run occurs in 15 days in mid-May and that the majority of the smolt migration appears to take place after water temperatures rise to 10°C (USFWS unpublished cited in Black Bear 2012). The USFWS conducted a review of literature regarding diurnal migration timing and found that a median of 80.7 percent of smolts migrated at night (USFWS unpublished cited in Black Bear 2012).

Smolts have been documented to move through the Narraguagus River estuary (located in Downeast Maine) to the middle portion of the bay at 0.7 kilometers per hour (km/h) and 1.0 km/h in the outer Narraguagus Bay (Kocik et al. 2009). Higher survival rates were observed for smolts that exhibited a reversal migratory pattern through the bay, suggesting that smolts moving out to sea with the flooding and ebbing tides are more likely to survive than those that do not, likely falling prey to various predators. Overall, this study documented low survival between the estuary and open marine environment from 36 percent to 47 percent (Kocik et al. 2009).

In the Kennebec River basin, rotary screw trap sampling conducted in the Sandy River during 2012-2015 provides some information on the seasonal timing of smolt outmigration for the Kennebec River projects (FPLE 2013; BWPH 2014, 2015). Although the dates of sampler installation and removal varied among years due to river conditions and site access, the date of peak capture for Atlantic salmon smolts ranged from May 7 to May 18 among the four sampling years. Atlantic salmon smolts were observed out-migrating from the Sandy as early as April 18 and as late as June 2, which corresponds to the generally accepted smolt outmigration period between late April and early June with a peak migration in early to mid-May.

Similar to the Narraguagus River, a two year study using wild smolts captured in the Sandy River screw traps confirmed that the smolts preferred to move at night in the estuary (USASAC 2017 Working Paper No. 17-05, unpublished). Upon reaching the extensive tidal estuary in Lower Kennebec River, smolts shifted from almost exclusive night migration to more daylight migration, despite the presence of predators such as Seals, harbor porpoise, abundant Striped

Bass, and other predatory fishes. Migration in the estuaries of both the Narraguagus and Kennebec rivers were influenced by tidal stage, which may cause the observed variability of net downstream movement rates through these estuaries.

Like the Narraguagus estuary, smolt survival is low in the Kennebec estuary. The two year study by NMFS and MDMR documented that survival from Lockwood Dam through the Merrymeeting Bay estuary was 37 percent in 2014 and 32 percent in 2015 (USASAC 2017 Working Paper No. 17-05, unpublished).

Once in the ocean, Atlantic salmon become highly migratory and undertake long migrations from their natal rivers (Fay et al. 2006). Major feeding areas in the ocean include the Davis Strait between Labrador and Greenland (USFWS and NMFS 2009). During their time at sea, Atlantic salmon undergo a period of rapid growth until they reach maturity and return to their natal river to complete the life cycle.

Although the GOM DPS yields the highest adult returns from natural reproduction and egg planting, particularly in rivers such as the Narraguagus and Sandy River, millions of salmon are stocked annually as eggs, fry, parr and smolts to provide adequate returns to continue the hatchery supplementation program throughout the DPS. Freshwater and marine survival rates of both wild and hatchery origin salmon remain extremely low (USFWS and NMFS 2009). According to the 2013 BO, “freshwater and marine survival rates…medians have been estimated by NMFS as 1.1% and 0.4%, respectively” (NMFS 2013). Such low rates cannot sustain a wild salmon population reliant upon natural reproduction.

4.0 STATUS OF ATLANTIC SALMON IN THE KENNEBEC RIVER AND PROJECT AREA

Runs of Atlantic salmon and other anadromous fish were once common in the Kennebec River, but have declined since the late 1700s and early 1800s with the industrialization of the river, which contributed to water quality issues, and the construction of dams throughout the river basin, including dams at the outlets of many of the lakes and ponds in the drainage, which prevents full access of migratory fish to historical habitat (NMFS 2013). Commercial harvesting, which has been restricted internationally since 2002, likewise contributed to historically depleted stocks. More recently, information indicates that climate change is having significant impacts on the overall survival and recovery of Atlantic salmon through effects to habitats, hydrologic regimes, environmental cues, and food sources (USFWS and NMFS 2019). Most significantly, however, are the rates of marine survival of GOM DPS Atlantic salmon, which are very low (NMFS' estimated median marine survival of 0.4%) (USFWS and NMFS, 2019 and NMFS, 2013).

Since the 1970s, the state of Maine and federal fishery agencies have undertaken numerous activities and efforts to restore anadromous fish stocks to the Kennebec. These efforts have focused on restoration of American shad, river herring, alewife, and Atlantic salmon. Today, the state of Maine has an established Kennebec River Diadromous Fish Restoration Project, the goal of which is to restore Maine's native diadromous fishes to their historic range and abundance in the watershed. These species include the alewife (*Alosa pseudoharengus*), American shad (*Alosa sapidissima*), blueback herring (*Alosa aestivalis*), Atlantic sturgeon (*Acipenser oxyrhinchus oxyrhinchus*), shortnose sturgeon (*Acipenser brevirostrum*), rainbow smelt (*Osmerus mordax*), Atlantic salmon (*Salmo salar*), striped bass (*Morone saxatilis*), Atlantic tomcod (*Microgadus tomcod*), sea lamprey (*Petromyzon marinus*), and American eel (*Anguilla rostrata*) (State of Maine 2019). Major restoration efforts that have been undertaken by the state and federal fishery agencies, along with hydroelectric project and dam owners include:

- 1987 – First Kennebec Hydro Developers Group (KHDG) settlement agreement signed
- 1998 – Second KHDG settlement agreement signed
- 1987 – 1999 DMR stocks nearly 644,000 adult alewife into spawning and nursery habitat
- 1999 – Removal of Edwards Dam (Kennebec River)
- 2002 – Fish passage completed at Plymouth Pond Dam
- 2003 – Fish passage completed at Sebasticook Lake Dam (Sebasticook River)
- 2006 – Fish lift operational at the Lockwood Project (Kennebec River)
- 2006 – Fish lift operational at Benton Falls Project (Sebasticook River)
- 2006 – Fish lift operational at Burnham Project (Sebasticook River)

- 2006 – Removal of Madison Electric Works Project Dam (Sandy River)
- 1987 – 2007 DMR stocks over 37 million American shad fry into spawning and nursery habitat in the main stem river.
- 2009 – Removal of Fort Halifax Dam (Sebasticook River)
- 2001-2018 – Atlantic salmon egg, fry and smolt stocking in the Sandy River
- 2005-2019 – Installation and improvements to various downstream fish passages at Lockwood, Hydro-Kennebec, Shawmut, and Weston hydroelectric projects
- 2017 – Fish lift operational at Hydro-Kennebec Project
- 2019 – Fish lift design plans for Shawmut finalized
- January 2021 – Upstream fishway design plans for Lockwood bypass near finalized
- January 2021 – Upstream fish lift design plans for Weston near finalized

In the 1980s and 1990s, state and federal fishery agencies periodically stocked juvenile life states of Atlantic salmon in the Kennebec River drainage, primarily in the Sandy River. Starting in 2001, an egg planting program was undertaken in the Sandy River, which has become the primary Atlantic salmon hatchery supplementation strategy for the Kennebec River (USASAC 2019). Table 4-1 lists the Atlantic salmon stocking efforts undertaken in the Kennebec River basin in recent years. In addition, in 2020, 88,753 Atlantic salmon smolts were stocked in the mainstem Kennebec below Lockwood (MDMR 2020, personal communication).

TABLE 4-1 NUMBER OF ATLANTIC SALMON STOCKED BY LIFE STAGE IN THE SANDY RIVER

YEAR	EGGS	FRY	PARR	SMOLTS
2001-2008	320,000	169,000	0	0
2009	159,000	2,000	0	200
2010	600,000	147,000	0	0
2011	810,000	2,000	0	0
2012	921,000	2,000	0	0
2013	654,000	2,000	0	600
2014	1,151,000	2,000	0	0
2015	275,000	2,000	0	0
2016	619,000	3,000	0	0
2017	447,000	0	0	0
2018	1,228,000	0	0	0
2019	917,614	0	0	0
2020	672,580	0	0	0

Source: USASAC 2019; MDMR 2020.

Since 2006, returns of adult Atlantic salmon to the Kennebec River have been estimated based on the number of fish captured in the Lockwood fish lift. These totals are shown in Table 4-2[16] and Table 4-3. Table 4-3 provides age and origin information for returning adult salmon. Detailed biological information on all of the Atlantic salmon captured at the Lockwood fish lift since 2006, including date of capture, age, sex, origin, river temperature and river flow is provided in the annual Kennebec River Diadromous Fish Passage Reports (FPL Energy 2006-2011; Brookfield 2012-2018). As discussed elsewhere, upstream migrating adult Atlantic salmon are trapped at the Lockwood fish lift and trucked around the Shawmut Project so there are no upstream migrating adult Atlantic salmon in project waters.

Currently, there are no reliable estimates of smolt production in the Sandy River. However, NMFS has estimated smolt production based on egg to smolt survival estimates from the literature to be 1.5% (NMFS 2013). On this basis, cohort estimates for smolt production from recent egg stockings in the Sandy River (Table 4-1) range from 2,385 (2009) to 18,420 (2018). According to NMFS, given that the Sandy River is relatively pristine, it is possible that production could exceed these estimates (NMFS 2013). In fact, some juvenile production data from the Sandy River suggests these smolt estimates are likely low (NMFS 2013). In addition, some amount of natural reproduction is likely occurring in the Sandy River (NMFS 2013).

[16] Since 2006, 19 Atlantic Salmon have been captured during annual spillway flashboard maintenance fish stranding surveys. In coordination with MLP, these fish were trucked by MDMR to the Sandy River and are not reflective in the above Lockwood lift totals.

TABLE 4-2 NUMBER OF ATLANTIC SALMON ADULTS CAPTURED AT THE LOCKWOOD PROJECT

YEAR	NUMBER OF ATLANTIC SALMON CAPTURED	NUMBER TRUCKED TO SANDY RIVER	NOTES
2006	15	15	-
2007	16	16	-
2008	22	22	-
2009	32	26	6 fish were domestic Salmon that had been stocked in the Sandy River in the fall 2008
2010	5	5	-
2011	60	60	-
2012	5	5	-
2013	7	7	-
2014	18	18	-
2015	31	30	1 fish that MDMR thought was a landlocked Salmon was not trucked to Sandy
2016	37	33	4 adult Salmon that were tagged and released downstream of Lockwood as part of a study were not trucked [A]
2017	39	35	4 adult Salmon that were tagged and released downstream of Lockwood as part of a study were not trucked [A]
2018	11	9	2 adult Salmon that were tagged and released downstream of Lockwood as part of a study were not trucked [B]
2019	56	40	16 adult Salmon tagged and released downstream of Lockwood as part of study were not trucked [B]
2020	51	51	

Sources: Brookfield 2020; USASAC 2020.

Notes:

A: Adult Salmon radio tagged and released back downstream by the Licensee in support of required passage studies.

B: Adult Salmon tagged and released downstream in support of a bio-energetic study being conducted by the University of Maine.

TABLE 4-3 ADULT SALMON RETURNS BY ORIGIN TO THE KENNEBEC RIVER 2006-2020*

	HATCHERY ORIGIN				WILD ORIGIN				
YEAR	1SW	2SW	3SW	REPEAT	1SW	2SW	3SW	REPEAT	TOTAL
2006	4	6	5	0	3	2	0	0	15
2007	2	5	0	0	2	6	0	0	16
2008	6	15	1	0	0	0	0	0	21
2009	0	16	0	6	1	10	0	0	33
2010	0	2	0	0	1	2	0	0	5
2011	0	21	0	0	2	41	0	0	64
2012	0	1	0	0	0	4	0	0	5
2013	0	1	0	0	0	7	0	0	8
2014	0	2	0	0	3	13	0	0	18
2015	0	2	0	0	3	26	0	0	31
2016	0	0	0	0	1	38	0	0	39
2017	0	0	0	0	3	25	2	0	40
2018	0	1	0	0	3	7	0	0	11
2019	2	0	0	0	3	49	0	1	55
2020	0	0	0	0	4	46	0	0	50

Source: USASAC 2019, MDMR (2020, preliminary total).

*USASAC totals and totals that Brookfield records at Lockwood may differ.

5.0 POTENTIAL EFFECTS FROM EXISTING CONDITIONS ON LISTED ALTANTIC SALMON

Hydroelectric projects can affect Atlantic salmon in a variety of ways including hydrologic alteration, habitat alteration, upstream migratory impediment, entrainment/impingement of downstream migrant fishes, and water quality. The Shawmut Project is operated as run-of-river projects and so has little effect on river hydrology (e.g., water quantity) nor on water quality and retention.

Water quality at the Project is good both upstream and downstream of the dams, and Project waters at all four Projects generally meet state water quality standards. The Project operates under a water quality certification issued by the Maine Department of Environmental Protection (MDEP). Water quality at the Shawmut Project was recently evaluated as part of the ongoing FERC relicensing effort, and the study data shows that Project waters meet the state standards.[17]

Currently, the portion of the Kennebec River in which the Project is are located serves as an upstream and downstream migration corridor to and from suitable spawning and rearing habitat. It is not known how much the Project dam and impoundment have altered spawning and rearing habitat.

There is limited documented salmon spawning and rearing habitat downstream of the Lockwood Project (NMFS 2013). There is some spawning and rearing habitat between the four Projects primarily in tributaries such as Wesserunsett Stream, which joins the Kennebec River mainstem between the Shawmut and Weston projects. But the majority of the spawning and rearing habitat in the Kennebec River basin lies upstream of the Weston Project in the Sandy River and other major tributaries.

The 2013 BO states that a GIS-based Atlantic salmon habitat model (Wright et al. 2008) indicated that the majority of the spawning and rearing habitat in the Kennebec River basin lies upstream of the Weston Project in the Sandy River and other major tributaries. More recently, NMFS estimated the spawning and rearing habitat below each of the lower Kennebec dams using the Maine Stream Habitat Viewer which includes information regarding surveyed spawning habitat, surveyed rearing habitat, and modeled rearing habitat based on Wright et. al, 2008[18] (D. Tierney, NMFS, Pers Comm., 2019) (Table 5-1).

[17]In a letter dated December 3, 2018, the Maine Department of Environmental Protection concluded that the Shawmut Project impoundment and tailwaters meet applicable water quality standards.

[18] This habitat layer predicts the proportion of stream reaches containing Atlantic Salmon rearing habitat within the Gulf of Maine Atlantic Salmon Distinct Population Segment. The model uses 1) slope for stream reaches that are derived from contour and digital elevation model datasets, 2) cumulative drainage area, and 3) physiographic province, to identify stream reaches that have similar characteristics to areas where field crews have identified Atlantic Salmon rearing habitat. Given the predicted values, the legend categories are not distributed across the

According to the model, there is salmon habitat in the mainstem of the Kennebec River downstream of the Shawmut, Hydro-Kennebec, and Lockwood projects. Collectively, these 8,725 units of estimated mainstem rearing habitat (Table 5-1) has the potential to produce thousands of smolts annually.[19] Despite the distribution of some habitat between Lockwood and Weston, including Shawmut project waters, it is unlikely that much of this habitat is currently used as pre-spawn salmon are currently trucked to spawning and rearing habitat in the Sandy River upstream of the Weston Project. However, the 3,131 habitat units downstream of Lockwood is currently accessible to pre-spawn adults and could be used for spawning and rearing of juvenile salmon. Although the model does not identify habitat that is suitable for spawning, MDMR has conducted field surveys of mainstem habitat and certain tributaries to identify areas of suitable habitat for salmon spawning and rearing. These field efforts have identified suitable spawning habitat as close as 300 meters of the Lockwood Project. However, based on redd and electrofishing surveys of the habitat, MDMR has concluded that the habitat is rarely used for spawning (P. Christman, MDMR, Pers. Comm., 2013).

TABLE 5-1 NMFS ESTIMATED SALMON HABITAT BY REACH IN THE LOWER KENNEBEC

REACH	DOWNSTREAM HABITAT UNITS	PERCENTAGE OF TOTAL
Lockwood	3,131	4.3%
HK	2,081	2.9%
Shawmut	3,513	4.9%
Weston	16,576	23.0%
Above Weston*	46,833	64.9%
River Reach Total	**72,134**	**100%**

* Not including the Carrabassett River

The life stages of Atlantic salmon directly affected by the Shawmut Project include downstream migrating smolts and kelts (Fay et al. 2006). Effects to downstream migrating smolts and kelts have been mitigated through the provision of downstream fish bypass facilities and supplemental spill at the Project which will continue through the term of the existing license (including any annual licenses that may be issued by the FERC).

There are no upstream migrating adult Atlantic salmon in the Project area because these fish are trapped at the Lockwood lift and transported around the Shawmut Project. This required

entire 1-100% range. Categories are: Class 1: Prediction that >50% of modeled reach is suitable habitat; Class 2: Prediction that 26-50% of modeled reach is suitable habitat; Class 3: Prediction that 10-26% of modeled reach is suitable habitat.

[19] Even based on a conservative production assumption of 0.5 smolt per unit of habitat, the collective habitat units below Shawmut have the potential to produce over 4,300 smolts and the collective habitat units below Weston have the potential to produce over 12,000 smolts annually.

operation will perpetuate during the ISPP term and therefore upstream migrating adult Atlantic salmon are not anticipated in the Project area for the duration of the license term[20,21,22].

[20] Some of the effects of the Project on returning Atlantic salmon adults have already been reduced through provision of upstream fish passage facilities (fish lifts) at Lockwood and Hydro-Kennebec, and trap and truck operations from Lockwood. However, while trap and truck operations can be highly effective at moving migrating salmon to upstream spawning areas (Sigourney et.al. 2015), such operations potentially can also result in impacts including injury, disorientation, disease, mortality, delay in migration, and interruption of the homing instinct. (NMFS 2013). Coldwater habitats in the Sandy River mitigate potential negative effects of transportation since the receiving waters are cold, well oxygenated, and provide abundant structural habitats for salmon to hold through the summer and spawn in the fall.

[21] The long-term effects of the Project on returning adult Atlantic salmon are anticipated to be further reduced through provision of additional authorized upstream fish passage facilities that are proposed for the Shawmut Project as part of relicensing (fish lift).

[22] An upstream fish lift for Shawmut was previously authorized under the 2013 ISPP. In July 2020 FERC determined that the proposed Shawmut fish lift would be evaluated in conjunction with the Shawmut Project relicensing project. The December 31, 2019 Shawmut fish lift design is now being proposed as part of the final license application for the Shawmut Project.

6.0 PROPOSED ACTION AND EFFECTS ANALYSIS

6.1 PROPOSED ISPP MEASURES

The proposed action being considered in this BA is to continue the measures outlined in the expired 2013 ISPP until such time as a new license is issued for the Shawmut Project. Under this proposal, BWPH would continue to operate the Project and its associated downstream fish passage facilities and measures and comply with the appropriate terms of the expired 2013 BO in support of FERC's issuance of a new Project license to incorporate the terms of this ISPP and any anticipated future BO issued specifically for this ISPP.

The Shawmut Project occurs within the range of the endangered GOM DPS Atlantic salmon and is located entirely in designated critical habitat for the species. The continued operation of the Project may have adverse effects on the GOM DPS of Atlantic salmon and its designated critical habitat.

FERC's approval of the ISPP until a new license is issued for the Shawmut Project will 1) protect the listed species in the Project area, and 2) allow the development by NMFS of an Incidental Take Statement (ITS) to account for any unavoidable "take" of each species for the duration of the extension.

The ISPP continues the commitments and measures for the protection of GOM DPS of Atlantic Salmon at the Project. Atlantic salmon will be protected through a combination of upstream passage elsewhere in the system (via Lockwood fish lift trap and truck activities) and continued downstream (including supplemental spill) passage operations. Together these measures will avoid and minimize delay, injury and predation, and will protect critical migration habitat in the Project area for the short duration requested.

The following sections discuss the proposed measures of the ISPP and the anticipated effects of the proposed ISPP on Atlantic salmon.

6.2 UPSTREAM PASSAGE FOR ATLANTIC SALMON

The Shawmut Project currently has no upstream passage facilities and adult migrating upstream Atlantic salmon are not present at the Project and will not be in the Project area for the duration of the ISPP. Upstream passage for Atlantic salmon and other anadromous species for the term of the new Shawmut Project license is being evaluated as part of the ongoing Shawmut relicensing process. As a result, there will be no permanent upstream passage facilities at Shawmut during the interim ISPP extension period.

Trap, sort, and truck operations from the Lockwood fish lift during Atlantic salmon migration periods (May 1 through October 31) pass Atlantic salmon and other diadromous species around

the Shawmut Project. This activity is required under the existing March 4, 2005 Lockwood Project license and is reasonably certain to occur for the duration of the Shawmut license.

6.3 DOWNSTREAM PASSAGE FOR ATLANTIC SALMON

Downstream passage for Atlantic salmon at Shawmut is provided through a combination of a sluice, Tainter gate and opened hinged flashboards (see Section 2.3.2). The results of downstream smolt studies conducted in 2013, 2014 and 2015 found passage effectiveness and station survival at Shawmut varied considerably depending on river flows, Project operations, and gate openings (see Table 6-2). On whole, the studies found that the 3-year station survival estimate for salmon smolts at Shawmut was 93.5%. Based on 2013-2015 study results and the Licensee's different tests of adding downstream passage through the Tainter gate and lowered flashboard sections, it was concluded that the lowering of one more hinged flashboard section (for a total of four sections), raising the flow from (420 cfs to 560 cfs) was expected to provide adequate flow to allow additional smolts to pass via this route. NMFS, by letter dated May 22, 2017, concluded that the additional measures are expected to result in whole station survival rates of more than 95%. During the ISPP period, BWPH will continue to operate the existing downstream passage facilities at Shawmut, as summarized below, and will undertake the following additional operational measures:

- Operate the forebay bypass gate for utilization by adult and juvenile Atlantic salmon April 1 through June 15 and November 1 to December 31, as river conditions allow.
- Ensure that the forebay bypass gate is operated to maintain a flow of 6% of station unit flow through the gate.
- Provide a flow of 600 cfs through the Tainter gate for the smolt and kelt passage seasons.
- Undertake measures necessary to keep the bypass facilities in good operating condition. If the facilities become damaged, repairs will be made as soon as can be safely and reasonably done.
- Lower four sections of hinged flashboard (passing about 560 cfs in total) for the month of May during the smolt passage season.

6.4 ADDITIONAL PROPOSED MEASURES

In addition to the above referenced measures, BWPH proposes the following actions for the duration of the Shawmut license term:

- Prepare annual fishway monitoring reports and hold an annual meeting with fishery agencies.
- Notify NMFS of any changes in operation including maintenance activities and debris management at the project during the term of the ISPP.

- Contact NMFS within 24 hours of any interactions with Atlantic salmon, shortnose sturgeon or Atlantic sturgeon including non-lethal and lethal takes (Dan Tierney: by email (Dan. Tierneyncaa.gov) or phone (207) 866- 3755 and the Section 7 Coordinator (incidental.take@noaa.gov).

- In the event of any lethal takes, any dead specimens or body parts must be photographed, measured, and preserved (refrigerate or freeze) until disposal procedures are discussed with NMFS.

6.5 EFFECTS OF ISPP ON ATLANTIC SALMON

6.5.1 EFFECTS OF ISPP ON UPSTREAM PASSAGE FOR ATLANTIC SALMON

There are no upstream fish passage facilities at the Shawmut Project and none are proposed for the term of the ISPP. As a result, upstream migrating adult Atlantic salmon are not present in the Project area. Upstream fish passage (a proposed fish lift) for the Shawmut Project is being considered as part of the relicensing proceedings for the Shawmut Project and will not be constructed during the ISPP term.

For the duration of the ISPP term, the operation of the downstream Lockwood fish lift that will result in the trap and truck passage of Atlantic salmon from below Lockwood Dam to spawning habitat in the Sandy River, above Weston Dam; thereby bypassing the mainstem Kennebec Projects of Hydro-Kennebec, Shawmut, and Weston is reasonably certain to occur. The operation of the Lockwood fish lift is required as part of the Project's 2005 FERC license. Therefore, operation of the Lockwood fish lift and trap and truck operations will provide salmon that are captured and trucked a 100% upstream passage rate at the Shawmut Project through the ISPP period.

6.5.2 EFFECTS OF ISPP ON DOWNSTREAM PASSAGE FOR SALMON SMOLTS

The Licensee has conducted a number of downstream smolt passage studies at the four Kennebec River Projects, including most recently four years of study under the provisions of the Project ISPPs (2012-2015). These study results provide information that can be used to assess the effects of continued operation of the downstream passage facilities under the ISPP period. Table 6-1 summarizes the Atlantic salmon smolt studies conducted by the Licensee during 2012-2015 at the Shawmut Project. The results of the studies are summarized in which provides 3-year average results for smolt studies conducted over the period 2012-2015. Table 6-2 includes whole station survival estimates based on 3-year averages, and also provides robust estimates for passage route utilization and survival based on all smolts released upstream the Project.

TABLE 6-1 SUMMARY OF DOWNSTREAM SMOLT PASSAGE STUDIES CONDUCTED ON KENNEBEC PROJECTS 2012-2015

STUDY YEAR	STUDY REPORT NAME	STUDY DESCRIPTION
2012	*Downstream bypass effectiveness for the passage of Atlantic salmon smolts at the Weston, Shawmut, and Lockwood Projects, Kennebec River, Maine* (Normandeau 2012b)	Radio-tagged, hatchery-reared Atlantic salmon smolts were released into the Kennebec River upstream of the Weston and Lockwood Projects during the spring 2012 outmigration period to evaluate the effectiveness of the existing downstream bypass structures at Weston, Shawmut, and Lockwood.
2013	*Evaluation of Atlantic salmon passage at the Weston, Shawmut, Hydro-Kennebec, and Lockwood Projects, Kennebec River and Brunswick Project, Androscoggin River, Maine, Spring 2013* (Normandeau 2013)	Smolt passage during the spring 2013 outmigration period was assessed using an array of stationary radio-telemetry receivers installed at the Weston, Shawmut, Hydro-Kennebec, and Lockwood, Projects. Radio-tagged, hatchery-reared Atlantic salmon smolts were released upstream and downstream of each Project to facilitate the use of a paired release-recapture model for estimation of dam passage survival.
2014	*Evaluation of Atlantic salmon passage at the Weston, Shawmut, Hydro-Kennebec, and Lockwood Projects, Kennebec River and Brunswick Project, Androscoggin River, Maine, Spring 2014* (Normandeau 2014)	Smolt passage during the spring 2014 outmigration period was assessed using an array of stationary radio-telemetry receivers installed at the Weston, Shawmut, Hydro-Kennebec, and Lockwood, Projects. Radio-tagged, hatchery-reared Atlantic salmon smolts were released upstream and downstream of each Project to facilitate the use of a paired release-recapture model for estimation of dam passage survival.
2015	*Evaluation of Atlantic salmon passage at the Weston, Shawmut, and Lockwood Projects, Kennebec River and Pejepscot and Brunswick Projects, Androscoggin River, Maine, Spring 2015* (Normandeau 2015)	Smolt passage during the spring 2015 outmigration period was assessed using an array of stationary radio-telemetry receivers installed at the Weston, Shawmut, and Lockwood, Projects. Radio-tagged, hatchery-reared Atlantic salmon smolts were released upstream and downstream of each Project to facilitate the use of a paired release-recapture model for estimation of dam passage survival.

TABLE 6-2 CURRENT DOWNSTREAM SMOLT PASSAGE ROUTES (PERCENT UTILIZATION) AND WHOLE STATION SURVIVAL RATES (BASED ON 3-YEARS, 2012-2015)

PROJECT	ROUTE	% UTILIZATION[3]	% SURVIVAL[1,2]
Shawmut (2013-2015)	Downstream bypass	38.7%	97.4%
	Powerhouses		
	Units 1-6	11.6%	92.1%
	Units 7-8	21.1%	93.1%
	Hinged board spill[4]	5.2%	86.7%
	Spillway[4]	21.4%	100.0%
	WHOLE STATION	-	93.5%

Notes:

[1] Route-specific percent (%) survival values are based on the full number of radio-tagged smolts determined to have utilized a particular route regardless of release location (i.e., values for Shawmut represent smolts released upstream and downstream of Weston as well as immediately upstream of Shawmut). These values are adjusted to account for background mortality in the section of river between the dam and first downstream receiver.

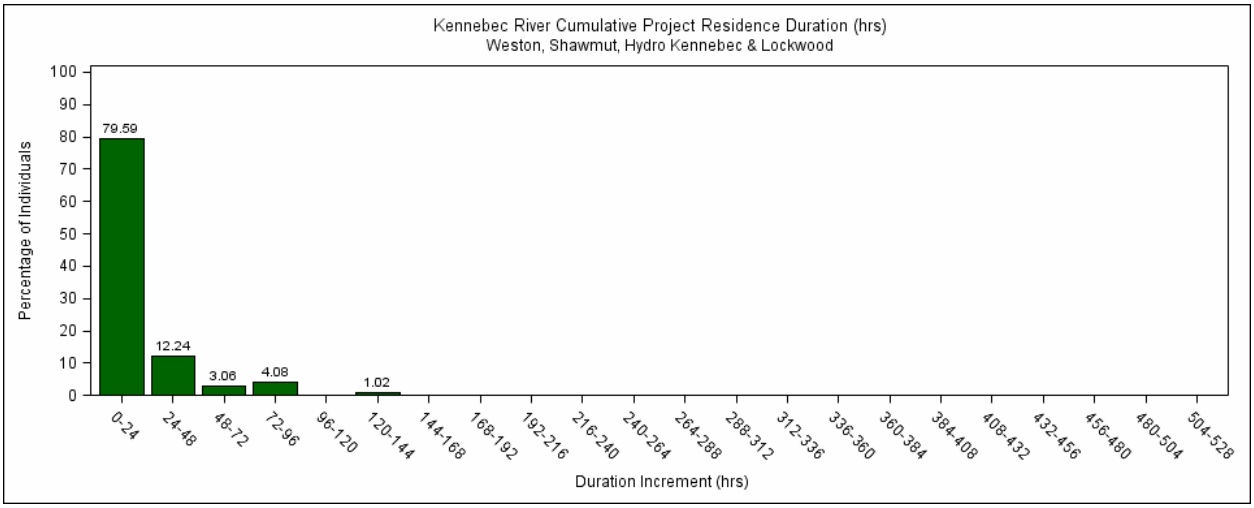
[2] Whole-station survival values represent the three year average at each project location based upon the subset of smolts released immediately upstream of each dam and adjusted for background mortality using passage success of the concurrent subset of smolts released immediately downstream of each dam.

[3] The percent (%) utilization represents the percentage of smolts utilizing a particular route over the three-year study period. Note that totals do not sum to 100% as during some years individuals which approached the project may have failed to pass or did so undetected.

[4] Hinge board spill only available during final release of 2014 study and 2015 study year and refers to smolts passing via the three sections opened adjacent to the power canal. Spillway refers to smolts passing via the central log sluice or Obermeyer sections (not distinguished).

Although smolt movement through a river system may be influenced by factors other than just passage through hydropower project dams and facilities, in the Kennebec, radio-tagged smolt passage results from the 2014-2015 study years provide some information about time of passage through the Project (i.e. potential delay). As shown in Figure 6-1, of the nearly 100 radio-tagged smolts released upstream of Weston and confirmed to have successfully passed downstream of Lockwood, approximately 99% did so in 96 or fewer hours of cumulative project residence duration at the four dams. This result suggests that timely downstream passage is being achieved at the four Kennebec Projects.

FIGURE 6-1 DISTRIBUTION OF THE CUMULATIVE RESIDENCE DURATIONS FOR RADIO-TAGGED SMOLTS OBSERVED AT THE WESTON, SHAWMUT, HYDRO-KENNEBEC, AND LOCKWOOD PROJECTS DURING THE 2013 AND 2014 STUDY YEARS



In addition to the route of passage survival estimates outlined above and summarized in Table 6-2, some level of injury to smolts may occur during entrainment or via passage over Project spillways. Existing information is insufficient to quantify the level of injury.

Continued operation of the downstream passage facilities at Shawmut with the proposed during the ISPP period will provide out-migrating smolts with safe, timely and effective passage. The results of studies conducted in 2012-2015 and summarized in Table 6-2, demonstrate that the majority of smolts pass the Shawmut Project via the downstream bypass (sluice gate) (38.7%) and that the survival rate for these fish is 97.4%. The second largest portion of smolts pass via spill (21.4%) with a 100% survival rate. Only 5.2% of fish were found to pass the project via hinged board spill. The resulting whole stations survival estimate for Shawmut, based on three-year average data is 93.5%.

However, since that time, in consultation with the agencies the Licensee has implemented additional measures to increase overall smolt survival by opening more flashboard sections and creating more spill. The practice of opening four flashboard sections during the smolt migration season in May will continue through the ISPP period and in combination with the other downstream passage measures is expected to provide a whole station survival rate for salmon smolts of 95% or greater.

6.5.3 EFFECTS OF ISPP ON DOWNSTREAM PASSAGE FOR SALMON KELTS

Due to the limited availability of adult salmon, downstream passage studies for kelts in the Kennebec are limited to a single pilot study which was conducted at Lockwood during the late-fall and early-winter 2007 (Normandeau 2008). Downstream passage data collection was limited to eleven hatchery-reared Atlantic salmon kelts that were released either just upstream of

Lockwood or directly into the Lockwood power canal. The limited observations during this study indicated that 60% of out-migrating kelts passed downstream via spill into the bypassed reach with the remaining fish entering the power canal. Once in the power canal, kelts utilized the downstream bypass (50%) and the single Kaplan unit (Unit 7; 50%).

Although the Kennebec kelt study was limited to a handful of fish, more robust studies of Atlantic salmon kelts have been conducted on the Penobscot River and the results of those studies offer important insights into passage conditions and behaviors that would likely also occur on the lower Kennebec including the Shawmut Project.

In particular, kelt studies conducted in the lower Penobscot River documented that most kelts passed the dams in spilled water, typically over the spillways but also through gates and sluices (Hall and Shepard 1990). Kelts that approached powerhouse intakes were deterred by coarse trash rack spacing and sought alternative routes of passage—typically passing via spillage after hours to days at the site (GNP 1989, Hall, and Shepard 1990). Observation of the initial approach of kelts at the Veazie and Milford projects generally reflected the distribution of flow, whereby the proportion of kelts that approached spillways was correlated with spillway flow (Hall and Shepard, 1990).

Lacking site-specific Kennebec River kelt studies, in support of the 2013 BO, whole station kelt survival for each of the Projects was estimated by integrating river flows, project operating flows, spill effectiveness, downstream bypass effectiveness rates, turbine entrainment rates and spillway and turbine survival rates. The estimates of whole station kelt survival at the Shawmut Project under median flow conditions was estimated to be 89%.

On the Penobscot River, research has shown that adult salmon can drop downstream quickly past many dams. In 2010, eight fish that migrated downstream of Veazie Dam were recaptured 17 days after being released in the Piscataquis River, and “appeared in excellent condition and showed no adverse effects from passing downstream over multiple (seven) dams”. MDMR researchers noted that “the presence of dams did not appear to impede downstream movement of motivated salmon and some fish passed seven dams in as many days.” (Spencer et al. 2010, 2011). These studies suggest that project trashrack spacing and configuration minimizes or eliminates impingement and directs fish to downstream passage routes, and that at all Projects that have downstream passage facilities, adult salmon would be expected to find safe downstream passage. During periods of no spill (through gates or a fishway sluice), kelts may experience minor passage delay but are still likely to find a safe route of passage through spilled water.

Combined, the Penobscot River kelt studies along with the very small study of kelts conducted at Lockwood suggest that most Atlantic salmon kelts would be expected to pass the Shawmut Project via spill in the spring, either through gates, over spillways and/or through bypass sluice gates.

The Licensee's proposal to operate the Shawmut bypass facilities during the ISPP period will also benefit Atlantic salmon kelt downstream passage at the Project. While there are not currently enough returning adult Atlantic salmon to conduct studies of downstream kelt passage, it is likely that the majority of kelts pass the Project through the downstream bypass (38.7%) or via spill (21.4%), and therefore are currently afforded safe and effective downstream passage at the Project.

7.0 DETERMINATION OF EFFECTS

Based on the analyses contained in this BA, the determination of effect of the proposed ISPP for Atlantic salmon (and its designated critical habitat) is provided below.

As discussed in Section 6.0, continuing the operation of the Shawmut Project with the fish passage measures and facilities operated under the terms of the ISPP and consistent with the terms of the 2013 BO is likely to adversely affect (LAA) a small proportion of GOM DPS Atlantic salmon at the Project. While these effects are detailed within this BA and summarized below, the duration of this activity is brief; generally impacting only a few passage seasons or none, depending on the likelihood of timely license issuance.

There are no upstream migrating adult Atlantic salmon at the Shawmut Project as there are no upstream fish passage facilities and all upstream migrating adult Atlantic salmon are trucked past the Shawmut Project from the Lockwood fish lift. During the ISPP period, the operation of the upstream fish passage facilities at the Lockwood (and supplementally at the Hydro-Kennebec Project as directed by the MDMR[23]) will continue under the requirements of the respective Project licenses and upstream migrating adult Atlantic salmon will be excluded from the Project area for the term of the ISPP.

Downstream migrating smolts and kelts are likely to be adversely affected as a result of the extension of measures proposed in the ISPP. Downstream passage whole station survival estimates for the Project was 96.3 percent (2013), 93.6 percent (2014) and 90.6 percent (2015). However, additional measures that have been instituted at the Project and which will be continued during the ISPP period, including particularly the dropping of four hinged flashboards at Shawmut during the smolt migration season, is likely to improve the smolt survival rate. Although there is no site-specific information on kelt survival on the lower Kennebec, kelts are also likely to be adversely affected by the ISPP at rates similar to smolts. The Licensee will continue to manage the Project to avoid or minimize the effects on smolts and kelts through the continued operation of the downstream fishways and the additional fish protection and enhancement measures that have been instituted at the Project and consistent with the terms and conditions of the 2013 BO and any new BO issued for this ISPP. In addition it is important to note, that any minor impacts to aquatic habitats in general, and listed species habitats in particular, are temporary and very short-term.

[23] A fish lift was constructed at the Hydro-Kennebec Project in 2016-2017 and became operational in September 2017. The Licensee operates the FERC authorized lift in coordination with MDMR wherein the MDMR provides guidance for the duration and frequency of lift operation following camera observations of salmon at the fishway entrance, which are anticipated to have reached the Project by passing the Lockwood Project bypass reach during high flow events. The Licensee then provides any captured salmon to MDMR to be trucked to the Sandy River.

The Licensee foresees no overall destruction or adverse modification of critical habitat as a result of the ISPP, though there will be continued effects to the migratory primary constituent elements (PCEs) of the critical habitat designated for Atlantic salmon (see discussion in Section 1.0). The measures to promote restoration of GOM DPS Atlantic salmon in the Kennebec River, as undertaken through previous and ongoing implementation of the provisions of the ISPP and through activities at other lower Kennebec River Projects, including fishway construction, have resulted in improvements to upstream and downstream fish passage measures at the Lockwood, Hydro-Kennebec, Shawmut, and Weston Projects over the years. The ISPP measures and the terms and provisions of 2013 BO proposed to continue under the ISPP, including operation of fish passage facilities, consultation, and annual reporting, will ensure protection and/or appropriate mitigation for migratory PCEs for GOM DPS Atlantic salmon and is expected to minimize adverse effects to Atlantic salmon and its critical habitat.

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