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August 9, 2022

Susan S. Lessard, Chair
Board of Environmental Protection
17 State House Station
Augusta, ME 04333-17

RE: Response to the Sebago Chapter of Trout Unlimited Appeal of Water Quality Certification, Brookfield White Pine Hydro LLC (BWPH), Hiram Hydroelectric Project, #L007780-33-L-N

Dear Chair Lessard:

On behalf of Brookfield White Pine Hydro LLC ("BWPH"), licensee of the Hiram Hydroelectric Project (the "Hiram Project"), this letter responds to the March 31, 2022 appeal by the Sebago Chapter of Trout Unlimited ("TU") of the above-captioned Water Quality Certification ("WQC") issued by Maine Department of Environmental Protection ("DEP" or the "Department) on March 4, 2022. *See* **Exhibit A**.

In issuing the WQC, the Department, based on its review and analysis of the Hiram Project's current and proposed operations, determined that BWPH has demonstrated the following:

1. The Hiram riverine impoundment and the outlet stream below the Hiram Dam are suitable for the designated uses as habitat for fish and other aquatic life and support indigenous aquatic species.

2. The waters discharged to the outlet of the Hiram Dam meet Class A aquatic life criteria and can be characterized as "natural."

3. The Hiram Project waters are sufficiently oxygenated; dissolved oxygen ("DO") concentrations meet Class A standards.

4. The Hiram Project waters are suitable for the designated uses of recreation in and on the water,[1] fishing, and navigation.

5. The Hiram Project meets the state's antidegradation policy as its in-stream uses have remained generally the same since 1975 and level of water quality to protect those uses has been maintained.

[1] Condition 5.A of the WQC requires BWPH to secure permanent rights for the existing impoundment boat launch or develop and include a plan and schedule for construction of a new boat launch. The existing impoundment boat launch is located on privately owned land adjacent to a residential home. The owner has allowed the public to use the boat launch for decades on an entirely informal basis. BWPH will either obtain a formal access agreement from the owner for the duration of the FERC license or develop the boat launch on land to which BWPH has secured the necessary rights.

As reflected in the WQC, DEP carefully considered TU's comments on BWPH's WQC application and the draft WQC and met with TU representatives to discuss their concerns and to explain the Department's analysis of BWPH's supporting studies. Nonetheless, TU takes issue with all of DEP's conclusions and insists that the WQC was issued on an arbitrary and capricious basis by the Department. This is not the case.

Rather than reiterate what DEP has already thoroughly explained in its WQC, this response addresses only TU's assertions and complaints.

1. <u>TU incorrectly asserts that the Hiram Project waters are subject to water classification standards that are not found in Maine law</u>.

TU acknowledges that the Hiram Project waters are classified as Class A by the Maine Legislature,[2] but insists that the Legislature's true intent was for this stretch of the Saco River to be subject to an unspecified level of "special scrutiny". TU's only support for this assertion consists of general statements, cherry-picked from the following Maine statutes, none of which create or establish water quality or water classification standards:

(a) 38 M.R.S. Section 480-P, Natural Resources Protection Act ("NRPA")

Section 480-P, entitled, "*Special protection for outstanding river segments*," includes portions of the Saco River. As TU candidly admits, NRPA does not establish water quality standards for classification purposes. Thus, other than having a conveniently monikered section title,[3] there is nothing in Section 480-P that rises to the level of a standard applicable to this or any other water quality certification proceeding.

(b) 38 M.R.S. Sections 951 *et seq*. ("Chapter 6")

Chapter 6 is the statutory framework creating the Saco River Corridor Commission (the "Commission"). The Commission is a planning body that issues development permits subject to performance standards such as for building construction; sewage disposal; docks, piers and floats; tillage; land clearing; timber harvesting; minimum lot sizes, and so forth. 38 M.R.S. § 962. The jurisdiction of the Commission does <u>not</u> include water quality certification. Further, Chapter 6 specifies that the Commission is not allowed to adopt any rule establishing air or water quality standards in conflict with DEP rules without the prior approval of the Board of Environmental Protection. 38 M.R.S. § 961.

(c) 12 M.R.S., Sections 401 *et seq*. ("Chapter 200")

In Chapter 200, the Legislature established a policy on "new dams and diversion projects" and "redevelopment of existing dams" for certain river and stream segments. 12 M.R.S. §

[2] 38 M.R.S. § 467(12)(A)(4) provides: 12. Saco River Basin. A. Saco River, main stem. (4) From its confluence with the impoundment of the Hiram Dam to a point located 1,000 feet below the Hiram Dam - Class A.
[3] Headings are not part of the legal provision for purposes of statutory interpretation. *See* 1 M.R.S. § 71(10); *Grant v. Town of Belgrade*, 2019 ME 160, ¶ 19 n.3, 221 A.3d 112.

> 403. While the Saco River is recognized as one of the 18 river and stream segments meriting special protection, *id*., the Department correctly found in the WQC that "[n]o new dams or diversion projects and no redevelopment is proposed for the Hiram Hydroelectric Project." Ex. A at 8, n.15. Thus, Chapter 200 simply does not apply here. Chapter 200 also explicitly declares that a "carefully considered and well-reasoned balance among competing uses of the state's rivers and streams," must be struck. 12 M.R.S. § 402. These uses include not only fisheries, scenic beauty, and recreation, but also hydropower—specifically to *"[i]ncrease the hydroelectric power available to replace foreign oil in the State*." 12 M.R.S. § 402(6) (emphasis added). Chapter 200 cannot be read to create any special water quality scrutiny.

In sum, the segment of the Saco River relevant to the Hiram Project is Class A and is subject to Class A standards only – and not to any other "special" standard.

2. <u>TU incorrectly asserts that so-called "dewatering" below the Hiram dam violates Maine water quality standards and therefore DEP is required to conduct a Use Attainability Analysis ("UAA")</u>.

TU fundamentally misunderstands the federal regulations concerning UAAs set forth in 40 CFR 131.10(g).[4] A UAA is a scientific assessment of the factors affecting the attainment of the "fishable/swimmable" uses specified in Clean Water Act Section 101(a)(2). A UAA is required only if a state wishes to demonstrate that attaining a designated use is not feasible (based on one or more of the six technical factors specified in subsection 10(g)). Here, the Department is neither removing a designated use nor making a designated use subject to a less stringent standard than Class A. Thus, no UAA is required.

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[4] Section 131.10(g) provides: States may designate a use, or remove a use that is not an existing use, if the State conducts a use attainability analysis as specified in paragraph (j) of this section that demonstrates attaining the use is not feasible because of one of the six factors in this paragraph. If a State adopts a new or revised water quality standard based on a required use attainability analysis, the State shall also adopt the highest attainable use, as defined in § 131.3(m).
(1) Naturally occurring pollutant concentrations prevent the attainment of the use; or
(2) Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met; or
(3) Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or
(4) Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use; or
(5) Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or
(6) Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.

3. TU incorrectly asserts that the WQC must require that BWPH provide vistas of Hiram falls and that the WQC does not address management of Project recreation sites.

TU complains that the Project has lost certain recreational features over the years. Specifically, TU wants the Project to provide vistas of the falls, more parking, and a canoe portage with a year-round watered terminus.

Scenic views are not a state water quality standard or a designated use of Class A waters. There are no water quality standards or designated uses for scenic views associated with Class A waters in Maine. In fact, scenic views are not part of any standard or designated use for any classification of freshwaters in Maine. Nonetheless, while views from the Scenic Overlook have gradually been obscured by natural tree growth with the passage of time,[5] views of the pools, cascades, and ledges below the Hiram dam are available from the tailwater recreation site, including from the popular sand bar area, which, depending on where one stands on the sand bar, offers views of the Project dam, powerhouse, tailwater and ledges. *See, e.g.*, **Exhibit B,** *Hiram Hydroelectric Project Initial Study Report* (ISR) at 2-96 (Photo 2.3-11), for an example of a view from the sand bar toward the powerhouse.

TU's assertion that the WQC does not address management of the Hiram Project recreational sites is incorrect. Condition 5.A of the WQC requires BWPH to prepare and implement a plan to address management of the Project recreation sites over the term of the new license, including securing permanent rights to access, operate, and maintain the existing informal impoundment boat launch or providing a plan and schedule for constructing a new boat launch developed in consultation with MDIFW.[6] It is DEP's observation such plans have worked well at other hydropower facilities. Ex. A at 23, n.32. Thus, the WQC addresses TU's concerns regarding recreational facilities.

4. TU incorrectly asserts that the DEP is required or empowered to rewrite the Fisheries Agreement in this water quality certification proceeding in order to provide for "immediate" native brook trout passage.

The Fisheries Agreement, **Exhibit C**,[7] most recently amended in 2019, is a FERC-approved comprehensive settlement agreement regarding six hydropower projects on the Saco River (of which

[5] The Scenic Overlook "provides no physical access to Project lands or waters, and the visual access once available there is now gone, the result of vegetative growth that has fully obscured views of the powerhouse, the Project dam or the Saco River." Ex. A at 21. Therefore, BWPH seeks to remove the Scenic Overlook from the Project's formal recreation sites because it no longer provides views of the Project and so no longer serve a Project purpose. Ex. A at 22.

[6] Condition 5.A also addresses those comments on the WQC application by MDIFW concerning the boat launch that were cited by TU.

[7] The Fisheries Agreement consists of (a) the Saco River Fish Passage Agreement, dated May 24, 1994 and Annex I: Assessment Process and Criteria dated January 20, 1995 (collectively, the "1994 Agreement"), which was entered into by Central Maine Power Co. (CMP); the Maine Atlantic Sea Run Salmon Commission (MASRSC); the Maine Department of Inland Fisheries and Wildlife (MDIFW), the Maine Department of Marine Resources (MDMR); the Maine State Planning Office (MSPO); U.S. Fish and Wildlife Service (USFWS); National Marine Fisheries Service (NMFS); Saco River Salmon Club (SRSC); Trout Unlimited; Maine Council, Trout Unlimited; Atlantic Salmon Federation (ASF); Maine Council, Atlantic Salmon Federation (MC-ASF); American Rivers, Inc.; City of Saco; City of Biddeford; and the New Hampshire Department of Fish and Game (NHDFG); (b) the Saco River Fisheries Assessment Agreement, dated February 2007 (the "2007 Agreement"), which was entered into by then project owners FPL Energy Maine Hydro LLC (FPL) and Saco River

the Hiram Project is the most upstream) that coordinates the installation of diadromous fish passage along the Saco River. The Fisheries Agreement provides a process by which all the parties would assess the need, design, and schedule for providing fish passage. The gravamen of TU's issues with the Fisheries Agreement appears to be that it does not "immediately" require fish passage for native brook trout. Therefore, TU asks the Department to use the water quality certification process as an opportunity to revise the Fisheries Agreement to accomplish TU's goals. Notably, TU wants to reach its preferred result through water quality certification without the buy-in or agreement of any of the parties to the carefully negotiated contract.

In fact, the WQC addresses TU's interest in the passage of native brook trout, albeit not necessarily on TU's preferred schedule. As noted by DEP, MDIFW requested that native trout resources be considered when, in accordance with the Fisheries Agreement, fish passage at the Project dam is addressed in 2032. Ex. A at 27. Condition 3 of the WQC responds to MDIFW's (and TU's) concerns, by requiring BWPH to continue to implement the Fisheries Agreement, including all FERC-approved amendments, and to consult with MDIFW regarding native trout. Ex. A at 32. DEP's reliance on the Fisheries Agreement, negotiated with federal and state fisheries experts and numerous non-governmental environmental organizations focused on fish passage (including, at least at one point, both the Maine Council of Trout Unlimited and its parent organization, Trout Unlimited), is reasonable and not arbitrary or capricious.

5. <u>TU incorrectly asserts that the Project does not meet Class A water quality criteria</u>.

To meet Class A standards, the benthic macroinvertebrate community must attain Class A aquatic life criteria consistent with the Department's rules set forth in Chapter 579 and the flow of water must be sufficient to support the designate use of habitat for fish and other aquatic life. The Department found that BWPH had demonstrated both criteria were met. Ex. A at 13.

TU argues that the Saco River below the Hiram Project powerhouse and dam does not meet Class A standards because the macroinvertebrate sampling point was located near the west bank of the river and therefore, because algal growth is often present at the edge of streams due to the presence of rooted aquatic grasses and filamentous algae, the selected sampling point was not representative of the river as a whole. This is incorrect for two reasons. First, the sampling location was <u>not</u> on the west bank of the stream – the sampling location was in the middle of the river channel, as shown in the ISR. *See* 106129 Ex. B at 2-15 (Figure 2.1-3) and 2-18 (Photos 2.1-3 and 2.1-4). Second, as noted by the Department, the presence of rooted grasses and filamentous algae would be expected *throughout* the riverbed. Ex. A at 15. Thus, even <u>if</u> the sampling point had been closer to the bank (which is clearly not the case), it <u>still</u> would have been representative of the river segment as a whole.

Hydro LLC (SRH) and most of the parties to the 1994 Agreement (but not Trout Unlimited; Maine Council, Trout Unlimited; MSPO; the City of Saco, or the City of Biddeford); (c) Saco River Fisheries Assessment Agreement Amendment No. 1, dated May 2009, entered into by project owners FPL, SRH, USFWS, NMFS, MASC, MDIFW, MDMR, SRSC, ASF, MC-ASF, and NHDFG and (d) Saco River Fisheries Assessment Agreement Amendment No. 2, dated February 2019, which was entered into by BWPH (as successor to FPL), MC-ASF, MDIFW, MDMR, USFWS, NMFS, and the Saco Salmon Restoration Alliance.

TU also takes issue with the fact that the macroinvertebrate sampling location was taken from Class AA waters, slightly below the Class A portion of the outlet stream. The Department determined that this sampling location was appropriate because the deep sandy-bottomed tailwater pool immediately downstream of the Hiram Project (i.e., within 1,000 feet downstream of the dam) in Class A water was not the typical habitat targeted for river and stream macroinvertebrate sampling[8] and therefore sampling of the tailwater pool would produce ambiguous results. Ex. A at 15, n.21. Regardless, as the macroinvertebrate communities representative of Class A waters are the same as the communities representative of Class AA waters, DEP reasonably concluded that the macroinvertebrate community sampled by BWPH was representative of Class A water quality criteria. *Id*.

Further, TU takes issue with the location of the tailwater DO monitoring location, which, as shown in the ISR, was installed approximately 1,000 feet downstream of the powerhouse and just downstream of the large tailwater pool. *See* Ex. B at 2-5 (Figure 2.2-1) and 2-10 (Photo 2.1-2). This location was chosen to represent water temperature and DO conditions in accordance with the Department's *Sampling Protocol for Hydropower Studies* (December 2017), and is consistent with DEP's March 28, 2018 letter to FERC providing comments on the Pre-Application Document (PAD), **Exhibit D**. Locating the DO monitoring station any closer to the dam or powerhouse would have placed the sensor (sonde) in the large tailwater pool that dominates the area within the first 1,000 feet of the Hiram dam, and not have been in a well-mixed, representative area, as required by DEP's sampling protocols for hydropower projects. DEP did not take issue with the location of the DO monitoring station downstream of the Project because the monitoring location was selected in accordance with DEP protocols. DEP concluded that the monitoring results were indicative of DO conditions in the waters downstream of the Project, and "DEA [Division of Environmental Assessment] staff have not identified a reason to believe that water closer to the powerhouse would have lower DO concentrations than water measured in the chosen location." Ex. A at 18, n.26.

TU claims the DO study should be repeated in its entirety. Specifically, it complains that sampling program for DO in the bypass reach, *i.e.*, the ledge area below Hiram dam, was incomplete because of sensor (sonde) malfunctions, with the result that data was reported from only two of the five ledge pools and did not include Pool #5, the so-called "stagnant" pool which TU asserts (without support) is the pool of greatest concern. TU's assertion that the sampling program is somehow insufficient is not correct.

At no point did FERC (or DEP) suggest that all five pools be monitored for DO. In fact, a July 18, 2018 letter from FERC to BWPH explains this is not the case. As described in the letter, FERC observed during a June 12, 2018 site visit that the reach "is composed entirely of ledge/bedrock, with only two pools providing aquatic habitat." *See* **Exhibit E** at Schedule A, § 1 n.4. Consequently, in a meeting FERC held with BWPH and the relicensing stakeholders (including TU) the next day, FERC "clarified that our focus will be on maintaining dissolved oxygen and water temperature in the bypassed reach's two pools." Ex. E at Schedule A, § 1. Therefore, it was determined by FERC that DO

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[8] The benthic macroinvertebrate assessment criteria routinely used by DEP are found in the Department's *Methods for Biological Sampling and Analysis of Maine's Inland Waters* (Davies and Tsomides 2014). These criteria, as DEP notes, were developed from baseline data collected from representative flowing streams and rivers with hard, eroded substrate, not sandy-bottomed pools. *See* Davis and Tsomides at 5.

monitoring of the bypass reach should focus on the two pools in question (Pools #1 and #3) because they were the only pools capable of providing habitat.

Further, DEP approved the detailed study plan for the bypass reach. *See* Ex. A at 18. *See also* **Exhibit F**, a May 23, 2019 email from Kathy Howatt to BWPH in which DEP provided its review and comments on the final study plan for monitoring in the two pools in the bypassed reach. DEP did not direct BWPH to redo the DO/temperature monitoring that was conducted in the reach below the dam, because the sondes were placed in locations with flowing water and sufficient depth to keep them wet throughout the sampling period in keeping with DEP's standard sampling protocol. Ex. A at 18, n.26.

TU also asserts that sampling from the Hiram bypass reach did not comply with DEP's *Sampling Protocol for Hydropower Studies* (December 2017) because it did not take place in all five pools. This is patently incorrect because water quality sampling took place in the bypass reach, which is all that the protocol calls for.

In sum, it was not unreasonable or arbitrary for DEP to approve the selected sampling locations for purposes of evaluating whether aquatic life and DO numeric standards were met.

6. <u>TU incorrectly asserts that the Project violates anti-degradation standards because the Class A river segment below the Hiram Dam cannot be characterized as "natural" and because a significant portion of the segment does not meet the standards for Class A waters</u>.

To meet Class A standards, among other things, habitat for fish and other aquatic life "must be characterized as natural." 38 M.R.S. § 465(2)(A). TU asserts that the segment below the dam cannot be characterized as natural because it is "dewatered." At best, this term is an exaggeration. In fact, flow is present at all times, ranging from leakage flow to several thousand cfs when water is spilling at the dam. TU also maintains that there is simply no way for the segment below the dam to be "natural" because it is impacted by the dam's "man-made" operations. It would be one thing if that were the legal standard (in which case, it is a standard that no hydropower project could ever meet). However, this is not the standard that BWPH must meet under Maine law.

"Natural" is defined in 38 M.R.S. § 466(9) as meaning "living in, or as if in, a state of nature not measurably affected by human activity." The Supreme Judicial Court of Maine in *Watts v. Bd. of Envtl. Prot.*, noted that the words "or as if in" are significant:

> The definition of "natural" as "living in, *or as if in*, a state of nature not measurably affected by human activity" allows for a range of habitat conditions that may be deemed "natural" while simultaneously accounting for the various designated uses of Class A waters. 38 M.R.S. § 466(9) (emphasis added). These designated uses include not only habitat for fish and other aquatic life, but also fishing, recreation, agriculture, drinking water supply <u>and hydroelectric power generation</u>.

2014 ME 91, ¶ 10, 97 A.3d 115 (italics in original; underlining supplied).

Thus, it is simply incorrect that the river segment below the dam cannot be characterized as natural merely because it is altered by the Hiram Project dam.

In addition, TU asserts, without explanation, that the antidegradation policy is being violated because alleged "dewatering" began on or about 2008. As noted by DEP, to meet the antidegradation policy an applicant must show that project waters maintain in-stream water uses occurring on or after November 28, 1975. DEP found that while the Hiram Project structures have been replaced and maintained over time, in-stream uses (including hydropower generation, recreation in and on the water including fishing and navigation, and as habitat for fish and other aquatic life) are generally the same after November 1975. Ex. A at 26. TU has not demonstrated that there has been a change to in-stream uses that would result in a violation of the anti-degradation policy or that Class A standards have not been met.

As noted by DEP, BWPH had to demonstrate that the macroinvertebrate community attains Class A aquatic life criteria in accordance with Chapter 579 and that the flow is sufficient to support the designated use of habitat for fish and other aquatic life as reflected in the Department's Hydropower Project Flow and Water Level Policy. Ex. A at 13. DEP determined that "the natural conditions that characterize the falls do not support benthic organisms" and that ledge pools, while deep enough to support transient fish, lacked other critical characteristics, specifically a substrate that would support the diverse vegetative and macroinvertebrates communities that would, in turn, support a resident aquatic community. Ex. A at 14. Based on what DEP has characterized appropriately as "anecdotal reports" that the ledge pools are fishable and swimmable, TU asks that current leakage flows be increased, but, as DEP found, this would not render the falls more suitable for the designated use of habitat for fish or other aquatic life.

The DEP correctly found that the defining characteristics of the reach below the dam, which include flow over high gradient ledge and extensive bedrock substrate, are not qualities that support the diverse vegetative or macroinvertebrate communities needed to sustain a resident aquatic community. Based on the assessment by the DEA, the qualitative assessment of BWPH and in the exercise of its professional judgement, the DEP determined that increasing minimum flows over Hiram Falls will not alter the defining characteristics of the falls – high gradient bedrock ledge – or make the reach suitable for benthic macroinvertebrates or enable the falls to support a resident aquatic community. Ex. A at 14-17. FERC, it should be noted, came to the same conclusion. In its response to TU comments on FERC's draft Environmental Assessment to the effect that dewatering the Hiram falls impairs water quality and is detrimental to aquatic species and plant life, FERC concluded in its Final Environmental Assessment, that since "*the project is operated in a run-of-river mode which prevents dewatering of the river below the project . . . there is no evidence that the Hiram Project is adversely affecting water quality*." *See* **Exhibit G** at 76.

In sum, TU has failed to show that the Project violates state anti-degradation policy or that the Project adversely affects water quality.

* * *

TU has not demonstrated that the Department acted unreasonably, arbitrarily, or capriciously in issuing the WQC. The WQC sufficiently addresses all concerns raised by TU in its appeal. TU has not shown why the BWPH should be directed to resubmit information or study data to the Department for reevaluation or why the Board should agree to TU's various specific "remedial" requests. We ask that the Board affirm the WQC as issued by the Department.

Very truly yours,

Sharon G. Newman

SGN/bh
Attachments (A-G)
cc: William F. Hinkel, BEP
Kyle Olcott, DEP
Marybeth Richardson, DEP
Scott Boak, Office of the Maine Attorney General
Robert Martin, Office of the Maine Attorney General
Scott J. Sells, Esq.
Matthew Warner, Esq.

Exhibit List[9]
Response to TU Appeal of Hiram WQC

A. DEP Water Quality Certification, Brookfield White Pine Hydro LLC (BWPH), Hiram Hydroelectric Project (Approval), #L007780-33-L-N, March 4, 2022.

B. Brookfield White Pine Hydro LL, Initial Study Report, Hiram Hydroelectric Project (FERC No. 2530-054) (TRC February 11, 2019).

C. Fisheries Agreement (1994-2019).

D. Letter dated March 28, 2018 to Kimberly Bose (FERC) from Kathy Howatt (DEP Hydropower Coordinator) re: *FERC – Hiram Hydroelectric Project, Pre-Application Document Comment*.

E. Letter dated July 18, 2018 to Frank Dunlap (BWPH) from Steven Bowler (FERC) re: *Staff Comments on the Proposed Study Plan for the Hiram Hydroelectric Project*.

F. Email dated May 23, 2019 to Jesse Wechsler and Frank Dunlap (BWPH) from Kathy Howatt (DEP Hydropower Coordinator) re: *Hiram Falls Aquatic Habitat Study Plan*.

G. FERC Final Environmental Assessment for Hydropower License, Hiram Hydroelectric Project, P-2530-057, Maine (April 2022).

[9] BWPH has confirmed with Kyle Olcott, DEP Hydropower Coordinator, that the documents in BWPH's Exhibit List are included in the administrative record for the Appeal.

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 STATE HOUSE STATION AUGUSTA, MAINE 04333-0017

Exhibit A

DEPARTMENT ORDER

IN THE MATTER OF

BROOKFIELD WHITE PINE HYDRO LLC Hiram, Baldwin, Denmark, and Brownfield Oxford and Cumberland Counties HIRAM HYDROELECTRIC PROJECT PROJECT #L007780-33-L-N (APPROVAL)	MAINE WATER QUALITY PROGRAM CLEAN WATER ACT WATER QUALITY CERTIFICATION

Pursuant to the provisions of 38 M.R.S. §§ 464 *et seq*., Section 401 of the Clean Water Act, 33 U.S.C. §§ 1341, and Department Rules 06-096 CMR Chapters 579-581, the Department of Environmental Protection (Department) has considered the application of BROOKFIELD WHITE PINE HYDRO LLC (Applicant or BWPH) with all supporting data, agency review comments, public review comments, and other related materials in the administrative record. Based on the record evidence and its professional judgment and expertise, the Department makes the following findings of fact, determinations, and conclusions:

1. APPLICATION SUMMARY

A. <u>Application</u>

On March 12, 2021, the Applicant submitted an application to the Department for Water Quality Certification (WQC) pursuant to Section 401 of the CWA for the proposed relicensing and continued operation of the existing Hiram Hydroelectric Project, P-2530, (the Project) located on the Saco River in the towns of Hiram, Baldwin, Denmark, and Brownfield, Maine.

B. <u>History</u>

The Department finds that the site of the Hiram Hydroelectric Project was first developed for hydroelectric power generation in 1917. The Project was first licensed by FERC in 1970 with an effective date of 1955, following FERC criteria for initial operating licenses at existing hydropower plants. Initially the Project included a single generating unit; in 1984 a second generating unit was added and the wood stave penstock was replaced with a metal penstock, bifurcated to deliver water to each generating unit. In 2013, two sections of inflatable rubber dam were installed on the 258-foot-long concrete spillway, replacing flashboards at the spillway crest.

C. Existing Project Features

The existing Hiram dam consists of a 448-foot-long dam topped with two section of rubber bladders; a 254-acre impoundment; an intake structure integral to the dam; a 320-foot-long penstock; a powerhouse containing two generating units with a total generating capacity of 11.633 megawatts (MW); and appurtenant facilities.

1) Project Dam. The Hiram dam is 448 feet in length including the intake section, founded on bedrock, and topped by an inflatable rubber bladder installed on the crest of each of two spillway sections.[1] Features of the dam include four sluiceways with gates, an old intake structure, a concrete abutment, a new intake structure, and a concrete bulkhead. The concrete spillway extends a total of 258 feet into the river from the west shore; the section closest to the shore is approximately 143 feet long, and the second section is approximately 105 feet long. Piers located on either side of the spillway and between the two spillway sections comprise the remaining ten feet of the spillway length.[2] The crest elevation for both spillway sections is 343.62 feet[3]; the crest elevation of the fully inflated rubber bladder sections is 349.25 feet. A set of four sluiceways extends approximately 64 feet east of the spillway. The first sluiceway section contains a deep sluice with a 10-foot-wide by 8.5-foot-high lift gate with a sill at elevation 341.0 feet; the second sluiceway section contains a 10-foot-wide by 7.5-foot-high Tainter gate with a sill elevation of 341.5 feet installed on top of a former log sluice; the third sluiceway section comprises a trash sluice with a 6.75-foot-wide by 5.2-foot-high lift gate with a sill elevation of 343.5 feet; the fourth sluiceway section contains a large Tainter gate, measuring 22-feet-wide by 11-feet high, with a sill elevation of 338 feet. An old intake structure is located next to the sluiceways, extending 29 feet east to a 9-foot-wide concrete abutment. The still-existing old intake structure and original wooden penstock are filled with concrete and are inoperable. The current intake is constructed of reinforced concrete, is 88 feet long by approximately 40 feet in height and is located adjacent to the original intake. The top of the intake is at elevation 341.5 feet and the bottom is at elevation 318.75 feet. The intake contains two openings, each 15 feet wide by 24 feet high and is protected by trash racks with 3.25 inch clear spacing and two wheeled gates. A 30-foot-wide bulkhead to the eastern shore completes the dam structure.

[1] The inflatable flashboard system, or rubber dams, were installed to replace wooden flashboards in 2013.
[2] Piers between the sluiceways, moving from west to east, are 4 feet wide, 4.5 feet wide, and 3 feet wide, respectively.
[3] All elevations described in this water quality certification are referenced to U.S. Geological Service (USGS) datum.

2) Project Impoundment. The Project dam impounds approximately 572 acre-feet of water over 254 acres at a normal full pond elevation of 349.0 feet. The impounded water extends approximately 7.5 miles upstream of the dam. Impoundment fluctuations during normal Project operations are limited to one foot from October 1 to November 15, annually, and limited to two feet during the remainder of the year.

3) Penstocks. The Project penstock is constructed of metal and is 320 feet long by 15.5 feet wide, bifurcating to a 10-foot-diameter, 170-foot-long penstock leading to turbine-generator unit 1, and a 15.5-foot-diameter 80 foot-long penstock leading to turbine-generator unit 2.

4) Powerhouse. The powerhouse is constructed of reinforced concrete and is 133.42 feet long by 50 feet wide. The powerhouse contains a control room, two generator rooms, wheel pits, and several small utility rooms. Each generator room contains a single Francis runner turbine-generator unit; unit 1 has a capacity of 3.008 MW and unit 2 has a capacity of 8.625 MW, for a total rated generating capacity of 11.633 MW at a normal operating head of 349.0 feet. The minimum hydraulic capacity is 30 cubic feet per second (cfs) and the maximum hydraulic capacity is 2,310 cfs. The two turbine pits each contain a vertical shaft waterwheel. A stoplog slot is mounted outside the draft tube for unit 1; an 11-foot stop log gate is mounted outside of unit 2.

5) Bypass. The configuration of the Project dam and powerhouse creates an approximately 500-foot-long bypass reach of Hiram Falls. The approximate 55-foot tall cascading falls contain four deep pools connected by shallower cascades of flowing water during low-flow, non-spill conditions. Hiram Falls is watered by leakage flows from the dam gates and by spill over the dam. A fifth pool measuring 25.5 feet wide by 30.4 feet long and located outside the main channel near the top of the reach becomes isolated during low-flow conditions. The dominant substrate at Hiram Falls is bedrock ledge with some minor large boulders, small boulders, and cobbles present.

D. Existing Project Operation

The Project is operated in accordance with the flow and impoundment level provisions of the 1997 Instream Flow Agreement[4] (the Agreement) to maintain the impoundment water elevation within one or two feet of normal full pond elevation of 349.0 feet. The

[4] The 1997 Instream Flow Agreement was incorporated into the Project License in 1998 by amendment. Document Accession #19981208-0241, dated December 7, 1998.

Agreement calls for a minimum flow of 300 cfs or inflow, whichever is less, from November 16 through September 30 with pond drawdown limited to 2 feet or less from full pond during normal operation or from spillway crest when the flashboards (rubber dams[5]) are down; and run-of-river operation from October 1 through November 15, with pond drawdown limited to 1 foot or less from full pond elevation or from the spillway crest when the flashboards (rubber dams) are down. The timing of the six-week fall flow period may be changed in accordance with the provisions of the Agreement.

The Hiram Project has a maximum hydraulic capacity of 2,310 cfs through its two generating units. Inflow to the Project exceeds the station maximum hydraulic capacity approximately 30 percent of the time, on average. Inflow in excess of the maximum hydraulic capacity is passed downstream at the rubber dams and Project gates, beginning with the automated log sluice gate, followed by the large Tainter gate, trash sluice gate, and deep sluice gate, in that order, which are operated manually to pass flows between 2,310 cfs and the capacity of the four gates (approximately 4,681 cfs) and the rubber dams which can be operated manually or will deflate when overtopped sufficiently. When flows exceed 4,681 cfs the rubber dams are manually deflated to pass water downstream.

Project minimum flows are passed through the powerhouse or spilled at the dam, or both. The automated log sluice gate is designed to automatically open to pass minimum flows when the station trips off-line.

The Project powerhouse and the log sluice gate are monitored and operated remotely, 24 hours per day, 7 days per week by the Applicant’s North American System Control Center. All other gate changes are managed by local operations. The local operating crew also performs routine maintenance of the facility. During both scheduled and unscheduled maintenance and unit shutdown events inflow to the Project impoundment is passed downstream through operation of the remaining unit, through the sluiceways, Tainter gates, vertical spill gates, or though spill by deflating the rubber bladders as necessary.

E. Project Proposals

No new power development structures or generating facilities are proposed in this license application for the Project, however, new upstream and downstream fish passage facilities are scheduled to be installed later during the term of a new license, in accordance with the Fisheries Agreement[6] that provides for fish passage at dams on the

[5] Subsequent to the execution of the 1997 Instream Flow Agreement, the flashboard sections on the spillway were replaced with two inflatable rubber bladders, referred to as rubber dams.
[6] The Fisheries Agreement refers collectively to the 1994 Saco River Fish Passage Agreement and associated revisions and amendments in 2007, 2009, and 2019.

mainstem of the Saco River, including the Hiram Project, for the purpose of restoring populations of migratory fish. Conceptual designs and permit applications will be submitted at that time.

The Applicant proposes to enhance some existing Project recreation sites and facilities and to discontinue some amenities at the Nature Trail site,[7] though none of the proposed recreation enhancements require significant construction.

In its Final License Application[8] (FLA), the Applicant proposes to modify the Project boundary to remove the Overlook from its list of FERC approved Project recreation sites. The Overlook site provides no access to Project lands or waters and no longer offers a view of Project features; thus, the Applicant finds it is not necessary for Project purposes and wishes to remove it from the Project boundary. Application materials indicate that Maine Department of Transportation will continue to maintain the site as a roadside emergency pull-out.

F. Proposed Operation, Minimum Flow, and Impoundment Water Level

The Hiram Project is located at river mile 46 on the Saco River, approximately 30 miles northwest of the City of Saco. There is no headwater storage on the Saco River, therefore, river flow tends to follow natural runoff patterns for precipitation and snowmelt. The Project is one of seven FERC licensed hydropower project on the mainstem of the Saco River, whose operations are set by the 1994 In-stream Flow Agreement and by FERC Orders.

The Applicant proposes to continue current Project operations in accordance with the provisions of the Agreement. The Agreement terminates upon expiration of the FERC licenses for downstream Bonny Eagle and Skelton Projects (FERC No. 2529 and FERC No. 2527, respectively) on January 31, 2038, or subsequent annual licenses, if applicable at that time; however, the Applicant proposes to continue the current operation during the term of a new Project license with a formal condition to continue to provide a minimum flow of 300 cfs and maintain the impoundment water level within 2 feet of the normal full pond elevation of 349.0 feet between November 16 and September 30, and within 1 foot of full pond from October 1 through November 15.

[7] The Applicant proposes to discontinue the informational kiosk, the picnic area and the parking area inside the Nature Trail gate.
[8] The Final License Application is incorporated into the WQC Application by reference.

G. Proposed Protection, Mitigation and Enhancement Measures

The Applicant proposes the following measures to protect and enhance environmental resources:

1. Develop and implement a Recreation Facilities Management Plan and, through that plan, continue to maintain and provide access to the existing Canoe Portage Trail and Parking area recreation site. The Applicant proposes to continue to provide access to and will make improvements at the Downstream Access Trail, Parking and Sandbar site with additional signage and installation and maintenance (in July and August) of a portable toilet[9] and trash receptacle, and to increase site security by installing a locking swing gate. BWPH is proposing to discontinue the information kiosk, picnic area and parking area inside the Nature Trail[10] site gate. A parking area will be maintained outside the access road gate and the Nature Trail site will remain available for informal, walk-in, public use.

2. BWPH proposes to remove the Overlook from the Project boundary and from the FERC approved Project recreation sites listing. The Overlook no longer provides views of the Project or access to Project lands or waters and so is not necessary for Project purposes. The site will continue to be maintained by MDOT[11] as a roadside emergency pull-out.

3. BWPH proposes to continue to implement the applicable provisions of the Fisheries Agreement, including schedules and processes to implement fish passage measures for migratory species, including new upstream and downstream fish passage measures for American eel[12] and for anadromous fish species.[13] Such measures are anticipated to be implemented at the Project

[9] A concrete slab may be necessary for the portable toilet and the access road may need to be upgraded to allow access by a pump truck to service the portable toilet.
[10] The Nature Trail recreation site is formerly known as the Nature Study Area.
[11] MDOT means Maine Department of Transportation.
[12] Under the terms of the Fisheries Agreement, upstream passage for American eel is scheduled to be installed by June 1, 2025; downstream passage for American eel is scheduled to be installed by September 1, 2032.
[13] Under the terms of the Fisheries Agreement, upstream passage for Atlantic salmon is anticipated to be installed by May 1, 2032, depending on the need for passage at that time as determined in consultation with the fisheries resource agencies. Downstream passage for Atlantic salmon is anticipated to be installed by April 15 two years following written notification that annual stocking of juvenile Atlantic salmon in the Saco River watershed above the Hiram dam has commenced pursuant to a written agency-approved Atlantic salmon stocking program to be developed by USFWS, NMFS, or New Hampshire Fish and Game Department, or once the operation of permanent upstream fish passage facilities for Atlantic salmon commences at the Hiram Project.

during the term of a new license; conceptual designs will be developed in coordination with the fisheries agencies.[14]

4. BWPH will develop and implement a Historic Properties Management Plan to provide for management of historic properties through the term of a new FERC license and an Operations Monitoring Plan to specify methods for monitoring and reporting minimum flows and pond levels to demonstrate compliance with the terms of a new license.

5. And BWPH proposes to develop and implement a plan to monitor dissolved oxygen downstream of the Project dam in Hiram Falls and below the Project tailrace to reaffirm that applicable Class A water quality standards are met.

2. JURISDICTION

The proposed continued operation of the Project qualifies as an "activity…which may result in [a] discharge into the navigable water [of the United States]" under Section 401 of the Clean Water Act (CWA). Section 401 of the CWA requires that any applicant for a federal license or permit to conduct such an activity must obtain a certification that the discharge will comply with applicable State water quality standards. State law authorizes the Department to issue a WQC pursuant to Section 401 of the CWA when the standards of classification of the water body and the State's antidegradation policy are met. 38 M.R.S. § 464(4)(F)(3).

State WQC for the Project was last issued by the Department on October 29, 1982, pursuant to installation of hydroelectric power generating facilities at the Hiram Hydroelectric Project. Under a 1996 Executive Order of the Governor of the State of Maine, the Department is designated as the certifying agency for issuance of Section 401 WQC for all activities in the State not subject to Land Use Planning Commission (LUPC) permitting and review. Therefore, the DEP is the certifying agency for the Project. Executive Order No. 3 FY 96/97.

The Project is licensed by FERC as a water power project under the Federal Power Act (FERC Project No. 2530). The initial FERC license was issued on November 19, 1970, and expired on December 31, 1993. A subsequent amendment and new FERC license was issued in 1982 for a term of 40 years, and will expire on December 31, 2022. BWPH

[14] Fisheries agencies include Maine Department of Marine Resources (MDMR), Maine Department of Inland Fisheries and Wildlife (MDIFW), U.S. Fish and Wildlife Service (USFWS), and National Marine Fisheries Service (NMFS).

has filed an Application for New License with FERC to continue to operate the project for another 40 years. That application is currently pending before FERC.

3. APPLICABLE STATE WATER QUALITY STANDARDS

A. Classification

The Saco River meets the definition of a river, stream or brook pursuant to 38 M.R.S. § 480-B(9). The portion of the Saco River at issue in the application is designated as Class A waters from the confluence with the impoundment of the Hiram Dam to a point located 1,000 feet below the Hiram Dam. 38 M.R.S. § 467(12)(A)(4).[15]

B. Designated Uses

The Applicant must demonstrate that the Hiram Project riverine impoundment and Saco River below the Project meet the Class A water classification standards and the designated uses described at 38 M.R.S. § 465(2)(A):

> Class A waters must be of such quality that they are suitable for the designated uses of drinking water after disinfection; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation, except as prohibited under Title 12, section 403; navigation; and as habitat for fish and other aquatic life. The habitat must be characterized as natural.

C. Numeric Standards

The Applicant must demonstrate that the Hiram Project impoundment and the Saco River below the Project dam meet the following numeric Class A standard[16] set forth in 38 M.R.S. § 465(2)(B):

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[15] Segments of the Saco River are classified Class AA in recognition of their outstanding character, including the segment upstream of the Hiram impoundment and the segment downstream of the Project. The segment that includes the Hiram Hydroelectric Project is not included in the Class AA classification. Additionally, the Saco River from the Little Ossipee River to the New Hampshire border is designated an Outstanding River Segment. 38 M.R.S. § 480-P. New dams and diversions projects and redevelopment of existing dams will alter the physical and chemical characteristics and designated uses of the waters of these river and stream segments and constitute violations of the State's water quality standards. 12 M.R.S. § 403. No new dams or diversion projects and no redevelopment is proposed for the Hiram Hydroelectric Project.

[16] The Class A classification standard applies to Project waters within 1,000 feet of the Hiram dam and Class AA classification standard applies beginning 1,000 feet downstream of the Hiram dam, a point located in the pool at the base of Hiram Falls. The numeric DO standard for Class A waters is 7 parts per million; DO in Class AA waters must be as naturally occurs. The aquatic habitat and life criteria is the same for Class A and Class AA waters.

The dissolved oxygen (DO) content of Class A waters shall be not less than 7 parts per million or 75% of saturation, whichever is higher. The aquatic life and bacteria content of Class A waters shall be as naturally occurs.

D. Narrative Standards

The Applicant must demonstrate that the Saco River below the Hiram dam meets the following Class A narrative standards 38 M.R.S § 465(2)(C):

1) Direct discharges to these waters licensed after January 1, 1986 are permitted only if the discharged effluent will be equal or better than the existing water quality of the receiving waters. Prior to issuing a discharge license, the Department shall require the applicant to objectively demonstrate to the Department's satisfaction that the discharge is necessary and that there are no other reasonable alternatives available.[17]

2) Hydropower facilities managed under riverine classifications under 38 M.R.S. § 465 (such as the Hiram riverine impoundment) are additionally subject to 38 M.R.S. § 464(10) in recognition of some changes to aquatic life and habitat that have occurred due to the existing impoundments of these projects. Under Section 464(10), Class A and Class B riverine impoundments (including the Hiram impoundment) are generally deemed to meet their respective classification standards if the aquatic life and habitat in those impounded waters achieve Class C aquatic life criteria found at 38 M.R.S. § 464(4)(C), provided that no changes can be made to improve such habitat that does not significantly affect existing energy generation capacity. 38 M.R.S. § 464(10)(A)-(B). In addition, when the actual water quality of water affected by this standard attain higher water quality classification or criteria, that water quality must be maintained and protected. 38 M.R.S. § 464(10)(D).

E. Antidegradation

The Department may only approve WCQ if the standards of classification of the waterbody and the requirements of the State's antidegradation policy will be met. The Department may approve WQC for a project affecting a waterbody in which the standards of classification are not met if the project does not cause or contribute to the failure of the waterbody to meet the standards of classification. 38 M.R.S. § 464(4)(F)(3).

[17] 38 M.R.S § 465(2)(C).

F. Department Rules

Attainment of water quality standards is assessed through application of the following Department Rules.

1) 06-096 Chapter 579: Classification Attainment Evaluation Using Biological Criteria for Rivers and Streams.

Criteria to quantify aquatic life standards for Classes AA, A, B, and C waters are defined in this chapter. The benthic macroinvertebrate community is used as a surrogate to determine conformance with statutory aquatic life standards, related statutory definitions, and statutory provisions for the implementation of biological water quality criteria that are provided in Maine's standards for classification of fresh surface waters. Methods described in this chapter are used to make decisions about classification attainment.

2) 06-096 Chapter 581: Regulations Relating to Water Quality Evaluations.

These rules provide for the maintenance of stream and lake classifications without violations by computing capacity of the waters to break down waste and shows fish, wildlife, and organisms in the receiving water to migrate both up and downstream in an undisturbed section of river adjacent to the waste discharge outfall. In addition, a scale of 0-100 is established in order to measure the trophic state or degree of enrichment of lakes due to nutrient input.

4. DEPARTMENT ANALYSIS

A. Aquatic Habitat (38 M.R.S. § 465(2)(A); 38 M.R.S. § 464(10)(A)(1))

For this standard, the Applicant must demonstrate that the Hiram riverine impoundment and outlet stream below the dam are suitable for the designated use as habitat for fish and other aquatic life. The Applicant also must demonstrate that this impounded section of the Saco River and portion of the river below the dam are of sufficient quality to support indigenous aquatic species consistent with the applicable narrative standard.

1) Aquatic Habitat-Riverine Impoundment (38 M.R.S. § 465(2)(A); 38 M.R.S. § 464(10)(A)(1))

Attainment of aquatic habitat standards can be demonstrated in a variety of ways, including through evaluation of the structure and function of the biotic community, and measurement or submission of other data or evidence that demonstrates a sufficient maintenance of the impoundment's littoral zone.[18]. Absent other evidence, and based on its professional experience, expertise, and judgment, the Department generally presumes the presence and suitability of sufficient aquatic life and habitat, especially for small or young fish as well as other aquatic life that rely on that refuge and forage provided by nearshore aquatic vegetation, when at least 75% of an impounded area, called the littoral zone, as measured from full pond conditions, remains watered at all times. Conversely, and again absent other evidence, water levels that provide wetted conditions for approximately 75% of the littoral zone of an impounded area, as measured from full pond conditions, are generally presumed necessary to meet aquatic life and habitat standards. This reputable presumption, as developed through the exercise of the Department's professional experience, expertise, and judgment also is reflected in the Department's Hydropower Project Flow and Water Level Policy, dated February 4, 2002 (Water Level Policy). This rebuttable presumption is not a rule, but a guideline the Department applies on a case-by-case basis, informed by best professional judgment, and considering site-specific circumstances.

a. Existing Habitat and Resources

The Department finds that the Hiram impoundment is narrow and riverine in character, extending approximately 7.5 miles upstream of the Project dam with a surface area of 254 acres at normal full pond elevation of 349.0 feet. Impoundment fluctuations are limited to within two feet of full pond from November 16 to September 30 and to within one foot during a six-week period in the fall, from October 1 to November 15, in accordance with the provisions of the Saco River Instream Flow Agreement.[19] The

[18] The 'littoral zone' of lakes and lake-like waterbodies, including some riverine impoundments, is defined in limnology as the portion of a lake where light penetration allows plant growth on the bottom. The littoral zone extends from the shoreline to the maximum depth where plants on the bottom receive enough sunlight for photosynthesis. This depth, known as the euphotic zone, is commonly estimated as the depth which receives approximately 1% of incident light (Cole, 1979). While depth of the zone varies with many factors, it can be estimated as a multiple of the Secchi disk transparency (SDT). Based on Tyler (1968), for more than 20 years DEP has delineated the littoral zone using a depth two times the SDT for purposes of determining attainment of Maine's Water Quality Standards.

[19] The Saco River Instream Flow Agreement expires on January 31, 2038 or upon expiration of the FERC licenses for BWPH's Skelton and Bonny Eagle Projects, including, if applicable, subsequent annual licenses. BWPH proposes in its FAL to continue applying the provisions of this agreement for term of a new FERC License for the Hiram Hydroelectric Project. MDIFW requested the agreement be renegotiated at the end of its present term rather than be unilaterally extended until the end of the term of a new FERC license for the Hiram Hydroelectric Project.

shoreline is steep-sided, especially in the upper half of the impoundment. The dominant substrate is sand with several sand bars occurring throughout the impounded river reach. Both shorelines support bands of submerged and emergent aquatic plant beds with woody debris, undercut banks and overhanging vegetation prevalent. The average water depth is approximately 9 feet and the average width is approximately 200 feet.

b. Studies

The Applicant completed an Impoundment Habitat Study in 2018 to determine the extent to which Project operations may affect the littoral zone and to assess the ability of the riverine impoundment to support habitat for fish and other aquatic life. The Applicant collected bathymetric data in the impoundment and measured Secchi disk transparency throughout the summer. The average Secchi disk transparency was 17.5 feet; calculated at twice the Secchi disk transparency measurement, the littoral zone would extend to a depth of 35 feet. However, the maximum depth of the impoundment is 31.2 feet. Therefore, the entire impoundment is littoral in character. The Applicant calculated, and the Department finds, that the volume of the impoundment at the normal full pond elevation of 349.0 feet to equal 62,506 cubic feet (1,435 acre-feet) and surface area equal to 7,359,825 square feet (169 acres); the volume and surface area of the impoundment at a headpond elevation of 347.0 feet is 47,787,525 cubic feet (1,097 acre-feet) and 7,355,343 square feet (168.8 acres) respectively. A maximum drawdown of 2 feet, therefore, maintains 76.5% of the impoundment volume and 99.9% of the surface area of the impoundment, demonstrating that Project operations that limit the impoundment drawdown to not more than 2 feet maintain at least 75% of the littoral zone at the lowest authorized impoundment elevation of 347.0 feet.

c. Discussion and Findings

The Applicant demonstrated and the Department finds that through its bathymetric survey, Secchi disk transparency analysis and depth measurements that the littoral zone in the impounded reach of the Saco River within the Hiram Project boundary extends to the riverbed. Further, the Applicant demonstrated and the Department finds that the proposed maximum water level fluctuation of 2 feet maintains approximately 76.5 % of the volume and 99.9% of the surface area of the riverine impoundment. Accordingly, the Department presumes the presence and suitability of habitat based on the Project's proposed operation that will continue to limit impoundment drawdowns to not more than 2 feet. Based on its review of the evidence presented in the Final License Application,

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See Section 5(A) of this certification. While not a signatory to the Agreement, the Department agrees with MDIFW that a negotiated settlement should not extend beyond its agreed upon term without the expressed consent of all signatories.

the Department finds and determines that Project operations meet the Class A designated use of habitat for fish and other aquatic life in the Hiram impoundment.

2) Aquatic Habitat – Outlet Stream (38 M.R.S. (38 M.R.S. § 465(2)(A))

For this standard, the Applicant must demonstrate that the Class A waters, such as those at the outlet of the Hiram dam, must be of such quality that they are suitable for the designated use of habitat for fish and other aquatic life. The habitat must be characterized as natural. In addition, the aquatic life of Class A waters must be as naturally occurs. In addition to satisfying all other requirements, discharges to Class A waters must be equal to or better than the existing water quality of the receiving waters.

To meet Class A aquatic life standards in the riverine outlet waters, the Applicant must demonstrate two things. First, the Applicant must show that the macroinvertebrate community attains Class A aquatic life criteria according to the Department's Chapter 579 rule. The benthic macroinvertebrate community is an indicator of the general state of aquatic life for the purpose of attainment of outlet stream aquatic classification standards. Where there is documented evidence of conditions that could result in uncharacteristic findings, allowances may be made to account for those situations by adjusting the classification attainment decision through the use of professional judgment. 06-096 C.M.R. Chapter 579, § 3(G).

Second, the Applicant must show that the flow of water in the Saco River is sufficient to support the designated use of habitat for fish and other aquatic life. The Department generally presumes, absent evidence to the contrary, that flow providing wetted conditions for at least 75% of the cross-sectional area of the affected river or stream, as measured from bankfull conditions, is needed to meet aquatic life and habitat standards. The second demonstration may be met if the Applicant demonstrates that 75% of the cross-section of the outlet stream is wetted at all times. This rebuttable presumption, as developed through the exercise of the Department's professional experience, expertise, and judgment also is reflected in the Department's Water Level Policy. Consistent with the Water Level Policy, on a case-by-case basis, the Department may establish alternative flows or water levels under certain circumstances where the alternative flows for water levels can be shown to meet all water quality standards, including where site-specific conditions limit the impact of flows or water levels on the quality or quantity of aquatic habitat.

a. Existing Habitat and Resources

The reach of the Saco River downstream of the Project dam includes two types of substrate. Hiram Falls, located immediately downstream of the Hiram dam, is comprised of bedrock ledge with some large boulders, small boulders and cobble. The falls drop approximately 55 feet over about 500 feet of distance in a cascade. The falls contain four deep pools connected by shallower cascades to the plunge pool below the falls and a fifth pool is located outside the main channel. Hiram Falls is watered by leakage flows from the dam and by spill during conditions that overtop the dam. The Hiram Falls ledges consist of extensive bedrock and cobble substrate and have a high gradient. DEP's DEA has determined that the natural conditions that characterize the falls do not support benthic organisms. Additionally, while the ledge pools located at the falls are deep enough with sufficient flow and the water oxygenated enough to support transient fish that drop down from the impoundment, these pools at the falls lack other characteristics, including fine grained substrate that supports the diverse vegetative and macroinvertebrate communities needed support and sustain a resident aquatic community. Downstream of the falls the Saco River becomes primarily deep pool or deep run habitat with sand, fine sand or silt, or cobble substrate. The channel is incised, with steep riverbanks comprised of fine sediments, undercut banks and canopy cover. Woody debris is present along both the right and left banks. Cover for fish and other aquatic organisms is provided in the river reach downstream of Hiram Falls by stream vegetation, riparian canopy, deep pools, woody debris, and cobbles.

b. Studies

The Applicant completed a number of studies in the Saco River downstream of Hiram Falls, including a survey of water quality and aquatic habitat in the falls themselves to ascertain whether habitat sufficient to support and sustain resident aquatic life is present there; a benthic macroinvertebrate study to determine if the aquatic community meets Maine's water quality standards in the waters downstream of the Project tailrace; and an aquatic habitat cross-section flow study to determine if there is sufficient water to maintain wetted conditions in at least 75% of the bankfull cross-sectional area.

At the Department's request, the Applicant conducted a qualitative survey of aquatic habitat and an assessment of dissolved oxygen in the 500-foot-long Hiram Falls bypass under non-spill, low river flow conditions. The Hiram Falls habitat study demonstrated that pool and cascade habitat exist in the Hiram Falls reach throughout the range of flows, including during low-flow, higher temperature periods in summer. The four large ledge pools are connected by smaller cascades and provide egress for fish that may be washed over the dam during higher flows but provide limited habitat for benthic macroinvertebrates. A fifth pool is not connected to the four in the main channel. DO concentrations measured in two representative pools were found to be greater than 7 mg/L in 99.7 percent of the measurements collected.[20] Water temperature was collected in Hiram Falls, tailwater, and impoundment from July 3 to September 12, 2019 and was found to be generally consistent, with average ranges between 22.0ºC and 22.5ºC.

The Applicant conducted a Benthic Macroinvertebrate Study in the Saco River downstream of the dam and the Project tailwater, in accordance with the Department's *Methods for Biological Sampling and Analysis of Maine's Inland Waters* (Davies and Tsomides 2002. Rock baskets were installed on July 18, 2018 and retrieved on August 15, 2018 in a location approved by the Department, approximately 975 feet downstream of the powerhouse in representative riverine habitat.[21] TU commented that the selected sample location was not representative of Class A waters and was inappropriately located near the west bank and not representative of the river as a whole because of the presence of rooted aquatic grasses and filamentous algae, noting that such algal growth is often present on the edges of streams. The Department notes here, and as discussed elsewhere in this certification, that Secchi disk transparency measurements indicate that the entire riverbed in this reach of the Saco River is littoral in character and so the presence of rooted grasses and filamentous algae would be expected throughout the riverbed and not only on its banks. The macroinvertebrate community sampled downstream of the Hiram Project was found to be abundant and rich in taxa, populated by 25 different taxa with a total of 812 individuals. Ephemeroptera, Plecoptera and Trichoptera (stoneflies, mayflies, and caddisflies) represented 64 percent of the benthic community. These species are sensitive to pollution and so their presence and abundance are important indicators of good water quality.

Results of the macroinvertebrate study were analyzed by the Department using its linear discriminant model and determined to attain Class A criteria after the initial finding was raised by Department staff[22] from Class B to Class A based on lake outlet effect. Lake

[20] A total of 3,280 hourly measurements of DO were collected in the Hiram Falls reach during the 2019 field season.
[21] The deep, sandy bottomed tailwater pool immediately downstream of the Project was determined to be not typical habitat targeted for river and stream macroinvertebrate sampling and assessment results would be ambiguous. Therefore, a suitable sampling site and a sampling station representative of river habitat was selected downstream of the pool but within 1000 feet, and approved by Department staff in accordance with Department guidance. While the approved sampling location was outside the boundary of Class A waters, macroinvertebrate communities representative of Class A and Class AA waters are the same, thus Department's DEA determined that the macroinvertebrate community present in the approved sample location was representative of both Class A and Class AA water quality criteria.
[22] The Department's Chapter 579 rule addresses how benthic macroinvertebrate samples must be collected and the process for analyzing these samples using its linear discriminant model to evaluate whether a stream is in attainment. Site selection, data collection and processing must be in conformance with the Department's approved methods. Chapter 579 establishes that where there is documented evidence of conditions that could result in uncharacteristic findings, allowances may be made to account for those situations by adjusting the classification

outlet effect is a condition commonly found in the outlet streams of both natural and impounded water bodies. The quiescent water in impoundments, like that of natural lakes and ponds, promote the growth of zooplankton and phytoplankton. The zooplankton and phytoplankton are a food source for macroinvertebrates and their increased numbers promote higher densities of plankton consumers immediately downstream of the lake or impoundment outlet. As long as the underlying communities contain sensitive macroinvertebrates such as mayfly and stonefly larvae, the high abundance of filterers is known to be a natural, common phenomena. Maine's aquatic life criteria are identical for Class A and Class AA waters and finding that Project water meet Class A aquatic life criteria also meets the narrative standard, "as naturally occurs."

The Applicant also conducted a Cross Section Flow Study to evaluate tailwater habitat conditions including an aquatic habitat survey. Habitat in the study area is primarily deep run or deep pool with sand, sand and silt, or cobble substrates. The channel has steep riverbanks of fine sediment with undercut banks and woody debris, and a canopy cover. Average water depth across the two study transects at low-flow conditions was 4.1 feet and 3.3 feet, the maximum water depth was 5.3 feet and 5.6 feet. Bankfull elevations at each transect were estimated by assessing the active channel based on the extent of undercut banks and distinct slope breaks on the bank.[23] Bankfull width was estimated at 199.0 feet and 213.5 feet at the transects, respectively. Using a HEC-RAS model, the Applicant showed that an average river flow of 724 cfs wet the 100% of the bankfull width, and that the area measured 1,031 ft^2 and 1,033 ft^2 at transect 1 and 2, respectively. A flow of 383 cfs wetted 91.9% and 96.0% of the bankfull channel width and 70.4% and 67.0 % of the cross-sectional area as measured from bankfull conditions, respectively. The current minimum flow of 300 cfs wetted 89.8 % of the bankfull width across both transects and 60.6% and 56.3% of the cross-sectional area measured from the bankfull conditions, respectively, with an average value of 58.5%.

c. Discussion and Findings

Studies conducted by the Applicant demonstrate and the Department finds and determines that the existing Project flow regime maintains and supports habitat for aquatic species in the Saco River downstream of the Project dam. An Aquatic Habitat Study in the Hiram Falls reach demonstrated that there is sufficient DO to sustain any aquatic life that drops down from the impoundment and that the pools there are connected to the outlet stream through a series of several cascades that provide sufficient egress through the pools to the large tailwater pool and the lower Saco River. The Applicant

attainment decision through use of professional judgement. Ch. 579, § 3(G). Factors that may allow adjustment of the model outcome include habitat factors such as lake outlets, as occurred here.

[23] Bankfull elevations and characteristics were determined using the USGS method developed by Powell and others (2004).

reports and the Department finds and determines that the high gradient flow and extensive bedrock substrate, defining characteristics of the falls, are not conditions that support benthic macroinvertebrates in the Hiram Falls reach. Additionally, Hiram Falls is not characterized by the types of qualities, including a diverse and abundant vegetative and biotic community, that support a resident aquatic community. Trout Unlimited (TU) commented that the Hiram Falls ledge pools are wadable and fishable based on anecdotal reports, and requests that minimum flows over the ledges be increased from the current leakage flows of approximately 2 cfs. Such a change, however, will not alter the defining characteristics of the falls or make the falls suitable for benthic macroinvertebrates or enable the falls to support a resident aquatic community. Whether at the flows proposed by the Applicant or TU the water at the falls will be equally suitable for the designated use of habitat fish or other aquatic life.

The Applicant demonstrated through a Benthic Macroinvertebrate study and the Department determined using its linear discriminant model that the benthic community downstream of the Project meets Class A aquatic life criteria and can be characterized as natural. Further, the Applicant showed through its Aquatic Habitat Cross Section Flow Study and the Department finds and determines based on that study, that the minimum flow of 300 cfs maintains at least 75% of the wetted width of the outlet stream. While the study showed that just an average of 58.5% of the bankfull area is maintained at the minimum flow, sites with steep banks typically to do not provide wetted conditions in 75% of the cross-sectional area. Other site characteristics then must be considered. Information provided by the Applicant demonstrated that a depth of 4 to 5 feet is maintained in the channel and provides a zone of passage for all resident and diadromous fish species across most of the channel. Further, the Applicant demonstrated through its Secchi disk transparency measurements that the water clarity[24] in the Project area supports littoral habitat throughout the full depth of the river in the downstream reach. Based on information in the administrative record, the Department determines that site specific conditions, including the depth of water in the channel that provides a zone of passage equaling 4-5 feet and the extent of littoral habitat in the Project area, support a project-specific flow less than the flow that provides wetted conditions in at least 75% of the cross-sectional area. The Department, therefore, determines that flows provided by current and proposed Project operations provides sufficient water quality and sufficient water quantity to support the Class A designated use of habitat for fish and other aquatic life downstream of the Project.

[24] Water clarity is demonstrated by Secchi disk transparency measurements (averaging 5.1 meters or 16.7 feet) in the impoundment and are extrapolated to the downstream waters.

B. Dissolved Oxygen (38 M.R.S. § 465(2)(B))

For this standard, the Applicant must demonstrate that the dissolved oxygen content shall be not less than 7 parts per million or 75% saturation, whichever is higher.

a. Existing Habitat and Resources

The Department finds that the Hiram impoundment has a surface area of approximately 254 acres at full pond, with a water surface elevation of 349.0 feet. The impoundment extends approximately 7.5 miles upstream at full pond. The Saco River below the Hiram Project powerhouse and dam receives flows released from the powerhouse, leakage flow from the dam, runoff and ice melt. The Project is located approximately 46 miles upstream of the mouth of the Saco River, 39.2 miles downstream of Swans Falls Hydro and 20 miles upstream of Bonny Eagle Hydroelectric Project. The drainage area at the Hiram dam is 830 square miles.

b. Studies

The Applicant submitted data collected during water quality studies in the impoundment, collected twice each month between June and October 2018. Samples were collected from a location approximately 24 feet deep and 1,600 feet upstream of the Project dam, in accordance with a study plan approved by the Department, to assess the effects of Project operation on impoundment water quality. DO is dependent on temperature; as temperature decreases DO increases. DO profiles in the Hiram riverine impoundment were generally uniform throughout the sampling period, varying less than 0.3 mg/L, and all DO concentrations were at least 7 mg/L[25] or 75% saturation.

The Applicant conducted a Dissolved Oxygen and Temperature Study downstream of the tailwater pool between July 12 and September 13, 2018, in accordance with a Study Plan approved by the Department.[26] Data was collected using a Onset Hobo U-26 datasonde at a depth two feet below the water surface in a location with a total depth of four feet. Water temperature ranged from 21.4 ºC to 27.2 ºC, averaging 24 ºC, 24.3 ºC and 22.7 ºC

[25] One part per million is equal to 1 mg/L.

[26] TU comments that the Department erred in approving a location for DO sampling downstream of the Class AA-Class A line and, therefore, water quality sampling results do not demonstrate attainment of Class A DO criteria. The Department disagrees; there are no indications of stratification effects or DO depletion in the impounded waters and no indication that the presence or operation of the Hiram Project causes or contributes to diminished DO downstream of the Project. DO sondes were installed within 1000 feet of the dam in a location approved by Department staff with flowing water and sufficient depth to keep the sonde wet throughout the sampling period, in accordance with standard Department sampling protocol. Results are indicative of DO conditions in the waters downstream of the Project and DEA staff have not identified a reason to believe that water closer to the powerhouse would have lower DO concentrations than water measured in the chosen location.

in July, August, and September, respectively. DO concentrations ranged from 6.4 mg/L to 9.5 mg/L, DO saturation ranged from 74.7 to 103.5%. DO concentrations met or exceeded Maine's Class A water quality standard 97.8% of the time, and DO saturation met or exceeded 75% throughout the sampling period. The Department's Division of Environmental Assessment analyzed the slight DO excursions downstream of the dam and determined them to be the result of plant respiration.

c. Discussion and Findings

DO data collected by the Applicant in the Hiram impoundment and submitted for Department consideration indicates that water in the Hiram Project impoundment is sufficiently oxygenated. Based on evidence in the record the Department finds that the Project meets Class A water quality standards under current and propose operating conditions.

DO data collected by the Applicant indicates, and the Department finds, that water in the Saco River downstream of the Project dam meets the Class A water quality standard of 7 parts per million 97.8% of the time; DEA analysis determined that the slight DO excursions are likely the result of plant respiration. Further, the Applicant reports and the Department finds that DO saturation met or exceeded water quality standards throughout the sampling period. In its FLA, BWPH proposes to develop a DO Monitoring Plan in consultation with the Department, to monitor and reaffirm that DO concentrations in the Hiram Falls reach and in the tailwater area downstream of the Project continue to meet applicable Class A standards. Based on results of sampling conducted by the Applicant and analysis by the Department's DEA staff, the Department determines that DO saturation met the Class A water quality standard and the slight DO excursions are not caused or contributed to by the presence and operation of the dam. Therefore, the Department determines that the Project meets the applicable Class A water quality standard under current and proposed operating conditions.

C. Fishing, Navigation and Recreational Access and Use (38 M.R.S. § 465 (2)(A))

For this standard, the Applicant must demonstrate that the project water are suitable for the designated uses of recreation in and on the water, fishing, and navigation. It's the Department's longstanding position that a hydropower impoundment may be found suitable for recreation in and on the water if it has a stable or decreasing trophic state and is free of culturally induced algal blooms that impair its use and enjoyment.

A hydropower impoundment shall be considered to have stable or declining trophic state unless it exhibits (1) a perceivable and sustained increase in its trophic state as characterized by its Trophic State Index or other appropriate indices, or (2) the onset of algal blooms. 06-096 C.M.R. Chapter 581 § 6(C). The trophic state is the ability of water to produce algae and other aquatic plants. The trophic state a body of water is a function of its nutrient content and may be estimated using the Maine Trophic State Index (TSI), which includes measurements of chlorophyll, phosphorus or Secchi disc transparency. 06-096 C.M.R. Chapter 581 § 6(A). An algal bloom is defined as a planktonic growth of algae which causes Secchi disk transparency to be less than 2.0 meters. 06-096 C.M.R. Chapter 581 § 6(B).

1) Existing Facilities and Use

The Applicant reports that the area around the Hiram Hydroelectric Project provides varied recreational opportunities, including biking, hiking, fishing, camping, wildlife viewing, snowmobiling and skiing in Sebago Lake State Park, located approximately 20 miles from the Project. The Applicant further notes that the Saco River is a popular regional recreational resource, and that the upper Saco River is a popular for boating, including day use and overnight paddling trips. There are nine publicly and privately owned public boat launches on the Saco River, the closest is located approximately 17.5 miles upstream of the Hiram Project dam in Brownfield, providing a carry-in launch with five vehicle and trailer spaces, 31 vehicle parking spaces and toilet facilities. A private boat launch is located 3 miles upstream of the Hiram dam in Hiram, which provides access to the Project impoundment.

Recreation within the Project boundary can be accessed at three formal Project recreation sites, including the Canoe Portage Trail and Parking, the Downstream Access Trail, Parking, and Sandbar, and the Overlook. The Project also includes an informal boat launch that provides access to the Project impoundment, and a walk-in Nature Trail.[27]

2) Water Quality Data.

The Applicant conducted a Trophic State Study in accordance with the Department's Lake Trophic State Sampling Protocol for Hydropower Studies (2017). Water Quality samples were collected from the deepest portion of the impoundment upstream of the boat barrier at a depth of approximately 24 feet, twice per month for five consecutive months from June through October 2018. Data collected by the Applicant indicates, and the Department finds, that sample results indicate the Hiram impoundment does not stratify, and is mesotrophic (total phosphorus ranged from 8 µ/L to 180 µ/L with a

[27] The Nature Trail is also referred to as Nature Study Area and was previously recognized by FERC as a formal recreation site, while the Applicant describes it as an informal recreation site. Addition of a security gate in the 2000s resulted in a decline in use and the Applicant subsequently discontinued maintenance of the Nature Study Area as a formal recreation site. The Nature Trail remains an informal walk-in site associated with the Project.

median of 14.5 µ/L and average of 30.1 µ/L; chlorophyll-*a* ranged from 0.001 mg/L to 0.003 mg/L, averaging 0.002 mg/L; and Secchi disk transparency measurements ranged from 3.5 meters to 6.2 meters, averaging 5.1 meters). Both phosphorus and chlorophyll-*a* concentration measured in the Hiram impoundment were below the threshold for mesotrophic waters except for a total phosphorus concentration measured on a single day, following a significant rainstorm.[28] Secchi disk transparency measurements indicate no nuisance algal blooms were present, supporting a finding that the Hiram impoundment is mesotrophic.

The Applicant conducted an inventory and conditions assessment of the existing recreational sites[29] and facilities during the 2018 field season and relied on FERC reporting in 2014 to estimate recreation site use. The assessment included formally recognized Project recreation sites and the non-Project informal boat launch; the 2014 FERC use reports include only formally recognized Project recreation sites. The informal boat launch was included in the 2018 inventory to assess the location that serves as the impoundment boat launch although no use counts were made there. The Applicant reports, and the Department finds, that overall recreational use at the Hiram Project is low, estimating 4,000 recreation days at all the formal, FERC approved sites. Use of the Overlook was found to be 25% of capacity, use of the Nature Study Area was found to be 25% of capacity, and use of the Canoe Portage Trail was found to be 5% of capacity. No reports of recreational use of the Downstream Access Trail or the Sandbar area were included, however the 2018 study found the Canoe Portage and Downstream Access Trail sites were generally in good condition but showed evidence at the sandbar of unauthorized fired, vegetation damage, and litter. The Overlook was found to be in reasonable condition; however, the site provides no physical access to Project lands or waters, and the visual access once available there is now gone, the result of vegetative growth that has fully obscured views of the powerhouse, the Project dam or the Saco River. The 2020 site visit to the Nature Study Area revealed the trail to be in good condition but the picnic and parking areas were found in poor condition due to lack of maintenance. The Applicant reports that access to the impoundment is available at a non-Project informal boat launch, capable of launching small, motorized watercraft as well as hand-carry boats. In its Draft Environmental Assessment for the Project, FERC recommends that BWPH secure the rights to operate and maintain the facility in perpetuity and should include operation and maintenance tasks for the facility in its proposed Recreational Facilities Management Plan. FERC recommends that BWPH propose to construct a new facility if it is unable to secure rights to the existing facility.

[28] The measurement of 180 µ/L total phosphorus was determined to be an outlier, measured following a significant 2-day, 1.5 inch rainstorm. All other samples were equal to or below the proposed state water quality standard of 18 µ/L.
[29] The 2018 recreational use survey and condition assessment did not include the Nature Trail facility, which was assessed in June 2020.

The Applicant also conducted a fish assemblage study in 2019 using a boat electrofishing unit and gill nets to survey Project waters in spring (late May) and fall (early October). The study intended to document existing fish assemblage, collect information about the abundance and distribution of brook trout, document the relative abundance and distribution of cold and warmwater species, evaluate size class, and evaluate species diversity in the Project area. The Applicant reports, and the Department finds, that 16 species are present, dominated by yellow perch, white sucker, fallfish and common shiner, with pickerel, sunfishes, basses, stocked trout, shiners and American eel also present but in lower numbers. Stocked trout[30] made up a small percentage of the overall fish assemblage; no wild trout were collected in either 2006[31] or 2019 in the Project area. Survey results indicate that Project waters support common warmwater species and stocked trout, as well as American eel. The adult fish collected were described as healthy, well-nourished individuals.

3) Discussion and Findings

The Applicant reports and the Department finds and determines that regional recreational opportunities include biking, hiking, fishing, camping, wildlife viewing, snowmobiling and skiing, and that the Hiram impoundment additionally supports and provides for fishing and non-motorized boating. The Applicant reports and the Department finds that the Project's Canoe Portage and Downstream Access Trail sites in generally good condition but found evidence of unauthorized uses and damage. The Overlook site was found to be in reasonable condition however the Applicant seeks to remove it from the Project's formal recreation sites because it no longer provides views of the Project and so no longer serves a Project purpose. The Nature Study Area was found to be in good condition, but its associated picnic and parking areas were found to be in poor condition from lack of maintenance. The Applicant wishes to remove the Nature Study Area from Project's formal recreation sites citing continued concerns about Project security and periodic report of illicit use but would continue to maintain the nature trail itself for informal public use. The Applicant proposes to make improvements and upgrades to the Downstream Access Trail by installing additional signage, providing a portable toilet and trash receptacle, and increasing site security. Use of the Downstream Access Trail was found to meet its use and capacity levels, and improvements there will ensure access to that portion of the Project waters. The Applicant reports that the informal impoundment boat launch is expected to continue providing public access to the impoundment. FERC

[30] Maine DIFW stocks brook trout and brown trout annually in the Saco River in the towns of Baldwin and Hiram to support the coldwater fishery. From 2015 to 2019 MDIFW stocked 3,000 brown trout in Baldwin and Hiram and 2,150 brook trout near the town of Hiram.

[31] Midwest Biodiversity Institute completed boat electrofishing surveys in the Saco River near the Hiram Project in 2006, establishing a baseline of fish species presence and relative abundance.

recommends that BWPH secure rights to that facility in perpetuity or establish an alternate boat launch site if it is unsuccessful in acquiring permanent access at the existing facility. DIFW concurs with FERC and recommends the Applicant legally secure the private informal access site or secure an alternative site for suitable access to the impoundment for small motorized and hand-carry watercraft. The Applicant proposes to prepare and implement a Recreation Facilities Management Plan to address management of the remaining formal Project recreation sites over the term of a New License.[32] Finally, the Applicant proposes some minor revisions to the Project boundary to remove some lands that are not necessary for Project purposes, including contraction of the downstream boundary of the Project to 1,000 feet below the Project dam and removing approximately 32 acres of Project lands above elevation 349.0 feet associated with a bog located upstream of the dam, retaining the boglands below 349.0 feet within its boundaries. The Department finds that there is sufficient capacity and access opportunities to Project waters to meet current and future uses. The Department finds and determines, based on information reported by the Applicant, that the Hiram impoundment is mesotrophic, with nutrient levels in the higher end of the trophic state guidelines for mesotrophic waters, but that there are no algal blooms present and Secchi disk transparency measurements were greater than 2.0 meters. Secchi disk measurements consistently greater than two meters indicates a low potential for nuisance algal blooms. Therefore, in the Department's professional judgement and consistent with 06-096 C.M.R. ch. 581, the Department concludes that the trophic state of the Hiram impoundment is stable and its waters are suitable for recreational use.

Additionally, the Department finds that resident fish are present in the Project area and the DIFW provides and Project operations support a sport fishery for resident fish and stocked trout above and below the Hiram dam. A Fisheries Agreement (see footnote 6) as approved by FERC and incorporated into the current Hiram Project license remains in effect for the Project waters and will guide the need for and installation of fish passage facilities and measures for diadromous fish species at the Project during the term of a New License.[33, 34] The 2019 amendments to the Fisheries Agreement settled all diadromous fisheries issues in the watershed and were signed by the state and federal fisheries resource agencies. The Applicant reports and the Department finds that that

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[32] TU comments that a Recreational Facilities Management Plan (RFMP) proposed for the Project will not address vandalism and neglect currently evident at Project recreational facilities. The Department observes that while there is not currently an RFMP for the Project, its experience is that development and implementation of such a plan as a condition of a WQC and incorporation of such a condition into a New License and implemented under FERC oversight has been successful at other hydropower projects in Maine. See Condition 5.A of this Certification.

[33] MDIFW requests in its comments that use of Project waters by native trout be considered when fish passage for Atlantic salmon is addressed in 2032, in accordance with the terms of the Fisheries Agreement. See section 5(A) Comments on Application.

[34] TU comments that "[t]he 2007 Settlement will never provide fish passage at Hiram Dam on its present course." However, the Fish Passage Agreement will address fish passage in 2032, during the term of a New License and DIFW requested that resident fish passage be considered at that time. See Condition 3(B) of this Certification.

access to the impoundment is available at a non-Project informal boat launch, capable of launching small, motorized watercraft as well as hand-carry boats. Ensuring that this or alternative public access to the impoundment, through the term of any new license is necessary to ensure the riverine impoundment continues to meet the Class A designated us of recreation in and on the water and navigation in the impounded portion of the Project. Further, the Department finds that based on studies conducted by the Applicant, the quality and quantity of water in the Project area is sufficient to support a sport fishery and that DIFW stocks trout into the Saco River in the vicinity of the Project. Based on the evidence in the record, the Department determines that Project operations meet the Class A designated uses of recreation in and on the water, fishing, and navigation, provided BWPH secures permanent rights to access, operate and maintain the existing informal impoundment boat launch or develops and includes in its final Recreational Facilities Management Plan a plan and schedule for constructing a new boat launch providing access to the impoundment as specified in the conditions below.

D. Hydroelectric Power Generation (38 M.R.S. § 465(2)(A))

For this standard, the Applicant must demonstrate that the Project waters are suitable for the designated uses of hydroelectric power generation.

1) Existing Generation

The Department finds that the Project operates in accordance with a 1997 Instream Flow Agreement, maintaining a water elevation within one or two feet of normal full pond and a minimum flow of 300 cfs or inflow, whichever is less. The Project has a total authorized nameplate generating capacity of 11.633 MW and is capable of producing a gross average energy output of 49,287 megawatt hours of electricity annually. This is equivalent to the energy that would be produced by burning 82,145 barrels of oil or 22,839 tons of coal each year.

2) Energy Utilization

BWPH sells Project power wholesale to ISO[35] New England for the New England market. The Project interconnects with the electrical grid via a substation located adjacent to the powerhouse and the transmission circuit connecting the substation to a non-profit switching station.

[35] ISO means Independent System Operator. ISO New England serves as the independent system operator of the regional bulk power system and administers the wholesale marketplace. Its primary responsibilities are to coordinate, monitor and direct the operations of the major generating and transmission facilities in the region while its objective is to promote a competitive wholesale electricity marketplace while maintaining the electrical system's integrity and reliability.

3) Discussion and Findings

The Applicant proposes to continue generating power under the current operational mode during the term of a new Project license, providing a dependable source of energy to the public power grid. The Applicant proposes no changes or additions to the existing turbine-generator units or other redevelopment activities. Based on the evidence on record, the Department determines that the Project operations meet the Class A designated use of hydroelectric power generation.

E. Drinking Water Supply (38 M.R.S. § (465(2)(A))

Class A standards indicate that water must be of sufficient quality to be used as drinking water after disinfection.

1) Discussion and Findings.

The Applicant did not submit information indicating that the Hiram Project impoundment or the Saco River is used as a drinking water supply. However, water quality data collected for the Trophic State Study in the Project impoundment and DO data collected downstream of the dam indicate that generally, water quality meets state standards and there are no culturally induced algal blooms. Based on the evidence on record, the Department determines that the Project operations meet the Class A designated use of drinking water after disinfection.

F. Industrial Process or Cooling Water Supply (38 M.R.S. § 465(2)(A))

Class A standards indicate that water must be of sufficient quality to be used as industrial process or cooling water supply.

1) Discussion and Findings

The Hiram Project impoundment and the Saco River downstream of the dam are not used for any industrial processes beyond a cooling water supply for energy generation equipment at the Project. However, water quality data indicates that it would be suitable as an industrial process water supply in addition to its present use as a cooling water supply. Based on the evidence on record, the Department determines that the Project operations meet the Class A designated use of industrial process or cooling water supply.

G. Antidegradation (38 M.R.S. § 464(4)(F))

For this standard, the Applicant must demonstrate that the Project waters maintain existing in-stream water uses occurring on or after November 28, 1975. The Department may approve a WQC pursuant to Section 401 of the CWA if the standards of classification of the water body and the State's antidegradation policy are met, or for a project affecting a water body in which the standards are not met, if the project does not cause or contribute to the failure of the water body to meet the standards of classification. 38 M.R.S. § 464(4)(F).

1) Discussion and Findings

The Department finds that the Hiram Hydroelectric Project was first developed for power generation in 1917 and included a single generating unit. A second generating unit was added in 1984 and the original wood stave penstock was replaced with a bifurcated metal penstock. Two sections of inflatable rubber bladders were installed to replace existing flashboards on the spillway crest in 2013. While structures have been replaced and maintained over time, in-stream uses are generally the same on and after November 1975 and include hydropower generation, recreation in and on the water including fishing and navigation, and as habitat for fish and other aquatic life. Based on the evidence on record, the Department determines that the Project operations meets the requirement of the antidegradation policy.

5. PUBLIC COMMENTS

A. Comments on Application

The Department received comments on the water quality certification application from eight citizens, from Trout Unlimited Sebago Chapter (TU), and from DIFW. Citizen's comments generally expressed concern around the lack of upstream and downstream fish passage, with some also noting the poor condition of the Project's amenities. TU advocates for fish passage as well, and is concerned that the locations of the BMI samples and the locations of the DO sondes are not representative of Class A waters and that the resultant data cannot, therefore, be relied upon to demonstrate attainment of applicable classification standards. DIFW advocates for permanent public recreational access to Project waters and is concerned that access to the impoundment relies on a single, private, informal access point that is not well advertised and may not persist for the duration of a new license. DIFW believes the methodology used to assess recreational access underestimates recreational use, particularly use of an informal access site and requests that access to the Project impoundment be formally included in the provisions of a new Project license. DIFW further requests that the Saco River Instream Flow Agreement be re-negotiated at the end of its term,[36] rather than extended for the term of a new license. And finally, DIFW requests that native trout resources be considered when fish passage at the Project dam is addressed in 2032.

The Department reviewed and considered the comments received and accepted all comments into the record.

Department staff met with TU on June 7, 2021 to discuss their comments and to explain that the water quality standards for Class AA and Class A are identical with regard to measurements of aquatic habitat water quality[37] and that the cascades that comprise Hiram Falls do not contain the substrate necessary to support a robust macroinvertebrate community and that the Department views the habitat as naturally unable to sustain fish in the pools there. Department staff also explained its position that DO standards are met in the Project waters, specifically Class AA must be as naturally occurs and Class A waters must have at least 7 parts per million DO or 75% of saturation, whichever is higher; the DO saturation in the receiving waters of the Saco River meet 75% of saturation at all times, and that small deviations below 7 parts per million were not caused or contributed to by Project operations but likely are the result of plant respiration. Regardless of those small excursions, meeting 75% of saturation demonstrates that the Class A DO standard is met in Project waters downstream of the dam. TU questioned and Department staff explained that locations where measurements were collected were appropriate for the sampling methods and devices used and were considered and approved by the Department and that the sample location favored by TU was a poorer fit because of the quiescent nature of the plunge pool waters.

With regard to fish passage at the Project, the fish resource agencies negotiated a Fisheries Agreement in 1994, which was revised and amended in 2007, 2009, and as recently as 2019 that provides for fish passage at dams on the mainstem of the Saco River, including the Hiram dam. That agreement establishes a schedule for downstream fish passage facilities at all BWPH facilities on the Saco River including at the Hiram dam, and a process for evaluating the need, design and schedule to provide upstream passage at its Bar Mills, Bonny Eagle, West Buxton and Hiram projects in a coordinated

[36] The Saco River Instream Flow Agreement expires on January 31, 2038 or upon expiration of the FERC licenses for BWPH's Skelton (FERC No. 2527) and Bonny Eagle (FERC No. 2529) including, if applicable, subsequent annual licenses. BWPH proposes in its FLA to continue applying the provisions of this agreement for the term of a new FERC license.

[37] Assessment of benthic macroinvertebrate communities through the Department's linear discriminant model is routinely used to indicate attainment of aquatic habitat water quality, in accordance with Department policy and practice (see section 4. A. 2) of this certification).

manner. DIFW has requested that this certification support consideration of native brook trout when passage for Atlantic salmon is addressed in 2032.

B. Comments on Draft Order. On February 24, 2022, the Department issued a draft Order approving water quality certification for the continued operation of the existing Hiram Hydroelectric Project. Comments on the draft order were invited from the Applicant, DIFW, and Trout Unlimited (TU), as each party commented on the WQC Application. The deadline for comments was 5:00 P.M. on March 3, 2022.

Comments on the draft Order were received from DIFW, requesting the WQC include a condition to provide permanent access to the impoundment for small, trailered boats and hand-carry watercraft, as recommended by FERC in its Draft Environmental Assessment. The Applicant had no substantial comments but offered two corrections that were made in the Final WQC. TU's also submitted comments, which largely reiterated the comments it previously provided on the WQC application, that recreational facilities associated with the Project are not adequately managed or maintained and a recreational facilities management plan required in this certification will not address the recreational needs of the Project; that sample locations selected by the Applicant and approved by Department staff did not accurately reflect Class A waters and were located too close to the shoreline; that the Department erred in its findings regarding DO and its use of professional judgement in determining that aquatic habitat and aquatic life criteria meet Class A criteria and in finding that habitat for fish and other aquatic life can be characterized as natural; that the ledges making up Hiram Falls should be considered habitat and receive more water than provided under the existing In-Stream Flow Agreement in order to improve its aesthetic quality and provide fishing opportunities in the open ledge pools, and that the Department is not bound by Agreement; that fish passage should be required immediately for indigenous species, including salmonid species rather than through the timelines and processes included in the Fisheries Agreement; that the Applicant should be required to provide the public with views of Hiram Falls; and that the upper Saco River is granted special status by Maine Legislature and entitled to special protection.

Comments on the draft Order were reviewed and incorporated into the final Order, as appropriate.

6. DEPARTMENT CONCLUSIONS

BASED on the above Findings of Fact and the evidence contained in the application and supporting documents, and subject to the conditions listed below, the Department CONCLUDES that the continued operation of the HIRAM HYDROELECTRIC PROJECT, as described above, will result in all waters affected by the project being suitable for all designated uses and meeting all other applicable water quality standards:

A. The Applicant has provided sufficient evidence and the Department finds and determines that the Saco River in the Hiram Project impoundment and downstream of the Project dam meets all of the narrative classification standards for Class A waters and is determined to be of such quality that it is suitable for the designated uses of drinking water after disinfection; recreation in and on the water; fishing; agriculture; industrial process and cooling water supply; hydroelectric power generation; navigation and as habitat for fish and other aquatic life. 38 M.R.S. § 465(2)(A).

B. The Applicant has provided sufficient evidence that DO concentrations in the Hiram Project impoundment meet the applicable Class A DO standard. The Applicant further provided evidence that DO concentrations in the Saco River downstream of the Hiram dam meets 75% of saturation all of the time, and meets the Class A standard of 7 parts per million 97.8% of the time; and that minor, short duration excursions of DO concentrations are the result of plant respiration and not caused by operation of the Project. The Applicant has demonstrated that Project waters meet the numeric water quality standard for dissolved oxygen by meeting 75% of saturation, and that the slight excursions in DO concentrations are not caused by Project operations. Further, the Applicant has proposed to develop and implement a DO Monitoring Plan to affirm that the DO standard continues to be met. The Department concludes that the DO concentrations in the Saco River meets applicable numeric Class A DO standards. 38 M.R.S. § 465(2)(B).

C. The Applicant has provided sufficient evidence and the Department finds and determines that the macroinvertebrate community downstream of the Project dam indicates some impact from "lake outlet effect." However, lake outlet effect is a common occurrence below natural lakes and in the Department's professional judgment and experience, the impact measured below the Hiram dam is not significantly different than that observed below natural lakes. The Department concludes, therefore, that water discharged from the impoundment meets the classification standards for Class A waters and that aquatic habitat in the Saco River is characterized as natural. 38 M.R.S. § 465(2)(A).

D. The Applicant provided sufficient evidence and the Department finds and determines that existing in-stream uses which have actually occurred on or after November 28, 1975 and the level of water quality necessary to protect those uses are maintained. The Department concludes that the Project meets the state's antidegradation policy. 38 M.R.S. § 464(4)(F)(3).

7. DECISION AND ORDER

THEREFORE, the Department APPROVES the water quality certification of BROOKFIELD WHITE PINE HYDRO, LLC and CERTIFIES pursuant to Section 401 (a) of the Clean Water Act that there is a reasonable assurance that the continued operation of the HIRAM HYDROELECTRIC PROJECT, as described above will not violate applicable Class A water quality requirements, SUBJECT TO THE FOLLOWING CONDITIONS:

1) WATER LEVELS

A. Except as temporarily modified by 1) approved maintenance activities, 2) extreme hydrologic conditions,[38] 3) emergency electrical system conditions,[39] or 4) agreement between the Applicant, the Department, and appropriate state and/or federal agencies, daily Project impoundment water levels shall be maintained in accordance with the provisions of the Instream Flow Agreement for Hydroelectric Projects on the Saco River. Current provisions of the Agreement require the impoundment water level remain within 2 feet of the normal full pond elevation of 349.0 feet between November 16 and September 30 and within 1 foot of full pond from October 1 through November 16.

B. The Applicant shall, in consultation with the signatories to the Instream Flow Agreement, review, reconsider, and renegotiate, if such consultation determines necessary, the terms of the Agreement upon its expiration in 2038, coincident with expiration of BWPH’s Skelton and Bonny Eagle Project licenses, or subsequent annual licenses, if applicable.

C. The Applicant shall, within six months of issuance of a New License for the Project by FERC or upon such schedule as established by FERC, submit a Final Operations Monitoring Plan to the Department for providing and monitoring Project impoundment water levels required by Part A of this condition.

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[38] For the purpose of the certification and Order, extreme hydrologic conditions mean the occurrence of events beyond the Licensee’s control such as, but not limited to, abnormal precipitation, extreme runoff, flood conditions, ice conditions, drought, or other hydrologic conditions such that operational restrictions and requirements contained herein are impossible to achieve or are inconsistent with the safe operation of the Project.

[39] For the purpose of this certification and Order, emergency electrical system conditions mean operating emergencies beyond the Licensee’s control which require changes in flow regimes to eliminate such emergencies which may in some circumstances include, but are not limited to, equipment failure or other temporary abnormal operating conditions, generating unit operations or third-party mandated interruptions under power supply emergencies, ad orders from local, state, or federal law enforcement or public safety authorities.

D. These conditions regarding water levels are necessary to ensure that the discharge from the Project will comply with water quality requirements, including those found at 38 M.R.S. § 465(2)(A) and as discussed above at section 4(A) and (C). The water levels of the impoundment, which are determined by the discharge, affect, among other things, the water quality requirements of the designated uses of fishing; recreation in and on the water; navigation; and habitat for fish and other aquatic life.

2) MINIMUM FLOWS

A. The Applicant shall provide flow releases from the Hiram Hydroelectric Project in accordance with the provisions of the Instream Flow Agreement for Hydroelectric Projects on the Saco River. Except as temporarily modified by 1) approved maintenance activities, 2) extreme hydrological conditions (see footnote 30), 3) emergency electrical system conditions (see footnote 31), or 4) agreement between the Applicant, the Department and appropriate state and/or federal agencies, an instantaneous minimum flow equal to 300 cfs or inflow, whichever is less, shall be released from the Project dam from November 16 to September 30, annually. From October 1 through November 15 annually, or for such alternate six week period as may be mutually agreed to by the Applicant and state and federal fisheries resource agencies, outflow from the Project shall be approximately equal to inflow under run-of-river operation, while allowing for up to one foot drawdown of the impoundment. All required flows shall be the sum of generating flows from the powerhouse and sluice gate/Taintor gate/leakage/spillage flows from the dam.

B. The Applicant shall, in consultation with the signatories to the Instream Flow Agreement for Hydroelectric Projects on the Saco River, review, reconsider, and renegotiate the terms of the Agreement upon its expiration in 2038, coincident with expiration of BWPH's Skelton and Bonny Eagle Project licenses, or subsequent annual licenses, if applicable.

C. The Applicant shall, within six months of issuance of a New License for the Project by FERC or upon such schedule as established by FERC, submit a Final Operations Monitoring Plan to the Department for providing and monitoring Project minimum flows required by Part A of this condition.

D. These conditions regarding minimum flows are necessary to ensure that the discharge from the Project will comply with water quality requirements, including 38 M.R.S. § 465(2)(A) as discussed above at section 4(A) and (C). The flow of the discharge from the Project affects, among other things, whether the receiving waters are of sufficient quality to support the designated uses of fishing; recreation in and on the water; navigation; and habitat for fish and other aquatic life.

3) UPSTREAM and DOWNSTREAM FISH PASSAGE

A. The Applicant shall continue to implement the applicable provisions of the 2007 Saco River Fisheries Assessment Agreement, including all amendments as approved by FERC, at the Hiram Project to provide upstream and downstream fish passage facilities and measures for migratory fish species.

B. Upon commencement of fish passage planning, the Applicant shall consult with DIFW to include, as needed, studies, measures and facilities to provide access to Project waters upstream and downstream of the Hiram dam for native trout species.

C. These conditions regarding fish passage measures are necessary to ensure that the discharge from the Project will comply with water quality requirements, including 38 M.R.S. § 465(2)(A) as discussed above at sections 4(A) and (C). The nature of the Project's discharge affects, among other things, whether the receiving waters are of sufficient quality to support the designated uses of fishing and habitat for fish and other aquatic life, including use of all Project waters.

4) DISSOLVED OXYGEN

A. The Applicant shall, within six months of issuance of a New License for the Project by FERC or upon such schedule as established by FERC, and in consultation with the Department, submit a Final Dissolved Oxygen and Temperature Monitoring Plan for Department review and approval that provides for monitoring DO concentrations in Hiram Falls and in the Project tailrace for a single season within two years of final issuance of a New License by FERC.

B. This condition is necessary to reaffirm that the discharge from the Project will comply with water quality requirements, including 38 M.R.S. § 465(2)(B) as discussed above at sections 4(B). The nature of the Project's discharge affects, among other things, whether the receiving waters are of sufficient quality to support the growth of salmonid fish and support the designated uses of fishing and habitat for fish and other aquatic life.

5) RECREATIONAL ACCESS AND USE

A. The Applicant shall continue to provide formal and informal access to the Project waters upstream and downstream of the Project dam for the purpose of recreation in and on the water, for fishing, and for navigation to the extent possible, for the term of a New License. The Applicant shall submit a final Recreational Facilities Management Plan to the Department that provides for the maintenance and management of Project Recreational sites. Further, the Applicant shall secure permanent rights to access, operate and maintain the existing informal impoundment boat launch or shall develop and include in its final Recreational Facilities Management Plan a plan and schedule for constructing a new boat launch providing access to the impoundment, developed in consultation with DIFW. The Recreational Facilities Management Plan shall provide for installation of sufficient signage and directions for the public to locate and use the impoundment access site.

B. This condition is necessary to ensure that the discharge from the Project will comply with water quality requirements, including 38 M.R.S. § 465(2)(A), as discussed above at section 4(A) and (C). Because the discharge affects, among other things, the water level of the impoundment and the flow downstream of the dam, it necessarily affects the water quality requirements of the designated uses of fishing, recreation in and on the water, and navigation, among others.

6) WATER QUALITY

Upon any future determination by the Department that operation of the Hiram Project, as approved by the certification and as conditioned by FERC for the Project, may be causing or contributing to a decline in water quality or non-attainment of water quality standards, the Department reserves the right to, in its discretion and upon notice to the Applicant and opportunity for hearing in accordance with its regulations, reopen this certification to consider requiring modifications to the certification or additional conditions as may be deemed necessary by the Department to ensure that the Project does not cause or contribute to any decline in water quality or non-attainment of water quality standards.

7) STANDARD CONDITIONS

The Applicant shall comply with all Standard Conditions attached to the certification, with such compliance to be determined by the Department.

8) LIMITS OF APPROVAL

This approval is limited to and includes the proposals and plans contained in the application and supporting documents submitted and affirmed to the Department by the Applicant. Any variations from the plans and proposals contained in said documents are subject to the review and approval of the Department prior to implementation.

9) COMPLIANCE WITH ALL APPLICABLE LAWS

The Applicant shall secure and appropriately comply with all applicable federal, state, and local licenses, permits, authorizations, conditions, agreements, and Orders required for the operation of the Project, in accordance with the terms and conditions of the certification, as determined by the Department.

10) EFFECTIVE DATE

This water quality certification shall be effective concurrent with the effective date of the New License issued by FERC for the Project.

11) SEVERABILITY

In the event any provision, or part thereof, of this certification is declared to be unlawful by a reviewing court, the remainder of the certification shall remain I n full force and effect, and shall be construed and enforced in all respects as if such unlawful provision, or part thereof, had been omitted, unless otherwise ordered by the court.

DONE AND DATED AT AUGUSTA, MAINE, THIS 4TH DAY OF MARCH, 2022.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY:____________________________________
For: Melanie Loyzim, Commissioner

PLEASE NOTE THE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES.

KH/L007780LN/ATS87301

FILED

March 4, 2022

State of Maine
Board of Environmental Protection

STANDARD CONDITIONS

1. Noncompliance. Should the project be found, at any time, not to be in compliance with any of the conditions of this approval, or should the permittee construct or operate this project in any way other than specified in the application or supporting documents, as modified by the conditions of this approval, then the terms of this approval shall be considered to have been violated.
2. Inspection and Compliance. Authorized representatives of the Commissioner or the Attorney General shall be granted access to the premises of the permittee at any reasonable time for the purpose of inspecting the operation of the project and assuring compliance with the conditions of this approval.
3. Assignment of Transfer of Approval. This approval shall expire upon the assignment or transfer of the property covered by this approval unless written consent to transfer this approval is obtained from the Commissioner. To obtain approval of transfer, the permittee shall notify the Commissioner 30 days prior to assignment or transfer of property which is subject to this approval. Pending Commissioner determination on the application for a transfer or assignment of ownership of this approval, the person(s) to whom such property is assigned or transferred shall abide by all of the terms and conditions of this approval. To obtain the or Commissioner’s approval of transfer, the proposed assignee or transferee must demonstrate the financial capacity and technical ability to (1) comply with all terms and conditions of this approval and (2) satisfy all other applicable statutory criteria.

    A “transfer” is defined as the sale or lease of property which is the subject of this approval or the sale of 50 percent or more of the stock of or interest in a corporation or a change in a general partner of a partnership which owns the property subject to this approval.

DEP INFORMATION SHEET

Appealing a Department Licensing Decision

Dated: August 2021 **Contact: (207) 314-1458**

SUMMARY

This document provides information regarding a person's rights and obligations in filing an administrative or judicial appeal of a licensing decision made by the Department of Environmental Protection's (DEP) Commissioner.

Except as provided below, there are two methods available to an aggrieved person seeking to appeal a licensing decision made by the DEP Commissioner: (1) an administrative process before the Board of Environmental Protection (Board); or (2) a judicial process before Maine's Superior Court. An aggrieved person seeking review of a licensing decision over which the Board had original jurisdiction may seek judicial review in Maine's Superior Court.

A judicial appeal of final action by the Commissioner or the Board regarding an application for an expedited wind energy development (35-A M.R.S. § 3451(4)) or a general permit for an offshore wind energy demonstration project (38 M.R.S. § 480-HH(1)) or a general permit for a tidal energy demonstration project (38 M.R.S. § 636-A) must be taken to the Supreme Judicial Court sitting as the Law Court.

I. ADMINISTRATIVE APPEALS TO THE BOARD

LEGAL REFERENCES

A person filing an appeal with the Board should review Organization and Powers, 38 M.R.S. §§ 341-D(4) and 346; the Maine Administrative Procedure Act, 5 M.R.S. § 11001; and the DEP's *Rule Concerning the Processing of Applications and Other Administrative Matters* (Chapter 2), 06-096 C.M.R. ch. 2.

DEADLINE TO SUBMIT AN APPEAL TO THE BOARD

Not more than 30 days following the filing of a license decision by the Commissioner with the Board, an aggrieved person may appeal to the Board for review of the Commissioner's decision. The filing of an appeal with the Board, in care of the Board Clerk, is complete when the Board receives the submission by the close of business on the due date (5:00 p.m. on the 30th calendar day from which the Commissioner's decision was filed with the Board, as determined by the received time stamp on the document or electronic mail). Appeals filed after 5:00 p.m. on the 30th calendar day from which the Commissioner's decision was filed with the Board will be dismissed as untimely, absent a showing of good cause.

HOW TO SUBMIT AN APPEAL TO THE BOARD

An appeal to the Board may be submitted via postal mail or electronic mail and must contain all signatures and required appeal contents. An electronic filing must contain the scanned original signature of the appellant(s). The appeal documents must be sent to the following address.

Chair, Board of Environmental Protection
c/o Board Clerk
17 State House Station
Augusta, ME 04333-0017
ruth.a.burke@maine.gov

The DEP may also request the submittal of the original signed paper appeal documents when the appeal is filed electronically. The risk of material not being received in a timely manner is on the sender, regardless of the method used.

At the time an appeal is filed with the Board, the appellant must send a copy of the appeal to: (1) the Commissioner of the DEP (Maine Department of Environmental Protection, 17 State House Station, Augusta, Maine 04333-0017); (2) the licensee; and if a hearing was held on the application, (3) any intervenors in that hearing proceeding. **Please contact the DEP at 207-287-7688 with questions or for contact information regarding a specific licensing decision.**

REQUIRED APPEAL CONTENTS

A complete appeal must contain the following information at the time the appeal is submitted.

1. *Aggrieved status*. The appeal must explain how the appellant has standing to bring the appeal. This requires an explanation of how the appellant may suffer a particularized injury as a result of the Commissioner's decision.
2. *The findings, conclusions, or conditions objected to or believed to be in error.* The appeal must identify the specific findings of fact, conclusions of law, license conditions, or other aspects of the written license decision or of the license review process that the appellant objects to or believes to be in error.
3. *The basis of the objections or challenge.* For the objections identified in Item #2, the appeal must state why the appellant believes that the license decision is incorrect and should be modified or reversed. If possible, the appeal should cite specific evidence in the record or specific licensing criteria that the appellant believes were not properly considered or fully addressed.
4. *The remedy sought.* This can range from reversal of the Commissioner's decision on the license to changes in specific license conditions.
5. *All the matters to be contested*. The Board will limit its consideration to those matters specifically raised in the written notice of appeal.
6. *Request for hearing.* If the appellant wishes the Board to hold a public hearing on the appeal, a request for hearing must be filed as part of the notice of appeal, and it must include an offer of proof regarding the testimony and other evidence that would be presented at the hearing. The offer of proof must consist of a statement of the substance of the evidence, its relevance to the issues on appeal, and whether any witnesses would testify. The Board will hear the arguments in favor of and in opposition to a hearing on the appeal and the presentations on the merits of an appeal at a regularly scheduled meeting. If the Board decides to hold a public hearing on an appeal, that hearing will then be scheduled for a later date.
7. *New or additional evidence to be offered.* If an appellant wants to provide evidence not previously provided to DEP staff during the DEP's review of the application, the request and the proposed supplemental evidence must be submitted with the appeal. The Board may allow new or additional evidence to be considered in an appeal only under limited circumstances. The proposed supplemental evidence must be relevant and material, and (a) the person seeking to add information to the record must show due diligence in bringing the evidence to the DEP's attention at the earliest possible time in the licensing process; or (b) the evidence itself must be newly discovered and therefore unable to have been presented earlier in the process. Requirements for supplemental evidence are set forth in Chapter 2 § 24.

OTHER CONSIDERATIONS IN APPEALING A DECISION TO THE BOARD

1. *Be familiar with all relevant material in the DEP record.* A license application file is public information, subject to any applicable statutory exceptions, and is made accessible by the DEP. Upon request, the DEP will make application materials available to review and photocopy during normal working hours. There may be a charge for copies or copying services.

2. *Be familiar with the regulations and laws under which the application was processed, and the procedural rules governing the appeal.* DEP staff will provide this information upon request and answer general questions regarding the appeal process.
3. *The filing of an appeal does not operate as a stay to any decision.* If a license has been granted and it has been appealed, the license normally remains in effect pending the processing of the appeal. Unless a stay of the decision is requested and granted, a licensee may proceed with a project pending the outcome of an appeal, but the licensee runs the risk of the decision being reversed or modified as a result of the appeal.

WHAT TO EXPECT ONCE YOU FILE A TIMELY APPEAL WITH THE BOARD

The Board will acknowledge receipt of an appeal, and it will provide the name of the DEP project manager assigned to the specific appeal. The notice of appeal, any materials admitted by the Board as supplementary evidence, any materials admitted in response to the appeal, relevant excerpts from the DEP's administrative record for the application, and the DEP staff's recommendation, in the form of a proposed Board Order, will be provided to Board members. The appellant, the licensee, and parties of record are notified in advance of the date set for the Board's consideration of an appeal or request for a hearing. The appellant and the licensee will have an opportunity to address the Board at the Board meeting. The Board will decide whether to hold a hearing on appeal when one is requested before deciding the merits of the appeal. The Board's decision on appeal may be to affirm all or part, affirm with conditions, order a hearing to be held as expeditiously as possible, reverse all or part of the decision of the Commissioner, or remand the matter to the Commissioner for further proceedings. The Board will notify the appellant, the licensee, and parties of record of its decision on appeal.

II. JUDICIAL APPEALS

Maine law generally allows aggrieved persons to appeal final Commissioner or Board licensing decisions to Maine's Superior Court (see 38 M.R.S. § 346(1); 06-096 C.M.R. ch. 2; 5 M.R.S. § 11001; and M.R. Civ. P. 80C). A party's appeal must be filed with the Superior Court within 30 days of receipt of notice of the Board's or the Commissioner's decision. For any other person, an appeal must be filed within 40 days of the date the decision was rendered. An appeal to court of a license decision regarding an expedited wind energy development, a general permit for an offshore wind energy demonstration project, or a general permit for a tidal energy demonstration project may only be taken directly to the Maine Supreme Judicial Court. See 38 M.R.S. § 346(4).

Maine's Administrative Procedure Act, DEP statutes governing a particular matter, and the Maine Rules of Civil Procedure must be consulted for the substantive and procedural details applicable to judicial appeals.

ADDITIONAL INFORMATION

If you have questions or need additional information on the appeal process, for administrative appeals contact the Board Clerk at 207-287-2811 or the Board Executive Analyst at 207-314-1458 bill.hinkel@maine.gov, or for judicial appeals contact the court clerk's office in which the appeal will be filed.

Note: This information sheet, in conjunction with a review of the statutory and regulatory provisions referred to herein, is provided to help a person to understand their rights and obligations in filing an administrative or judicial appeal. The DEP provides this information sheet for general guidance only; it is not intended for use as a legal reference. Maine law governs an appellant's rights.

Exhibit B

BROOKFIELD WHITE PINE HYDRO LLC

INITIAL STUDY REPORT
HIRAM HYDROELECTRIC PROJECT
(FERC NO. 2530-054)

VOLUME I OF II

Submitted by:

Brookfield White Pine Hydro LLC

Prepared by:

TRC

February 11, 2019

Brookfield

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DEFINITIONS OF TERMS, ACRONYMS, AND ABBREVIATIONS

C	Celsius
CFR	Code of Federal Regulations
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
DO	dissolved oxygen
DOC	dissolved organic carbon
F	Fahrenheit
ft/sec	feet per second
FERC	Federal Energy Regulatory Commission
GIS	geographic information system
GPS	global positioning system
HBI	Hilsenhoff's Biotic Index
HEC-RAS	Hydrologic Engineering Center's River Analysis System
HETL	Health and Environmental Testing Laboratory
Hiram Project	Hiram Hydroelectric Project
ILP	Integrated Licensing Process
ISR	Initial Study Report
LDM	linear discriminant water quality model
Licensee	Brookfield White Pine Hydro LLC
m	meter
MDEP	Maine Department of Environmental Protection
µg/L	microgram per liter
mg/L	milligram per liter
MME	Moody Mountain Environmental
MNAP	Maine Natural Areas Program
MRS	Maine Revised Statute
msl	mean sea level
MW	megawatt
NEPA	National Environmental Protection Act
NHPA	National Historic Preservation Act
NOI	Notice of Intent
PAD	Pre-Application Document
PCU	platinum cobalt units
PEM	palustrine emergent
PFO	palustrine forested
POW	palustrine open water
Project	Hiram Hydroelectric Project
PSS	palustrine scrub-shrub
RTE	rare, threatened, and endangered species
RSP	Revised Study Plan
SD1	Scoping Document 1
SD2	Scoping Document 2
sq ft	square feet
Study Plan	Revised Study Plan

USGS	United States Geological Survey
USR	Updated Study Report
White Pine Hydro	Brookfield White Pine Hydro LLC
WSEL	water surface elevation
1997 Flow Agreement	1997 Saco River Instream Flow Agreement
2007 Fisheries Agreement	2007 Saco River Fisheries Assessment

1.0 OVERVIEW

Brookfield White Pine Hydro LLC ("White Pine Hydro" or "Licensee") hereby files this Initial Study Report (ISR) with the Federal Energy Regulatory Commission (FERC or Commission) as part of the relicensing of the Hiram Hydroelectric Project (Hiram Project), FERC No. 2530. The Licensee is proposing to continue the current operations of the Project under a new license.

The current license expires November 30, 2022, and the Licensee is using FERC's Integrated Licensing Process (ILP) regulations (18 Code of Federal Regulations [CFR] § 5.15) to relicense the Project. The Licensee filed a Pre-Application Document (PAD) and Notice of Intent (NOI) to seek a new license for the Project on November 30, 2017. Following the filing of the PAD, FERC prepared and issued Scoping Document 1 (SD1) on January 29, 2018. FERC held agency and public scoping meetings and a site visit on February 28, 2018 and issued Scoping Document 2 (SD2) on May 11, 2018.

The PAD, SD1, SD2, and National Environmental Protection Act (NEPA) scoping process identified potential effects of Project operations on the existing environment for which the existing, relevant, and reasonably available information was insufficient. As such, the Licensee filed a Proposed Study Plan with FERC on May 14, 2018 to address the information needs. The Licensee filed a Revised Study Plan (Study Plan or RSP) with FERC on September 11, 2018. The RSP contained modifications to address written comments provided by stakeholders and changes in the scope of studies resulting from discussions that occurred at a series of meetings held during the summer and fall of 2018. FERC approved the RSP, with minor revisions, in its Study Plan Determination issued on October 11, 2018 (Appendix A). The FERC Study Plan Determination identified the studies to be completed as part of the relicensing.

The Licensee began the studies in the summer of 2018 and consulted with interested stakeholders by e-mail, telephone, and in-person throughout the 2018 field season to finalize specific study details (Appendix B). This ISR is being submitted in accordance with FERC's ILP regulations and the Revised Process Plan and Schedule issued by the Commission on July 18, 2018 and describes the Licensee's overall progress in implementing the Study Plan and an explanation of variances, if any, from the Study Plan.

Volume I of this ISR includes results of the natural resource studies identified in the Study Plan that were completed in 2018 (first-year studies). Results of the first year of Cultural Resources Surveys are included in a separate volume of this ISR (Volume II) and are being filed as

"Privileged" to protect sensitive archaeological data and other culturally important information in accordance with FERC regulations. Information related to protecting sensitive archaeological data and other culturally important information is also restricted under Section 106 of the National Historic Preservation Act (NHPA).

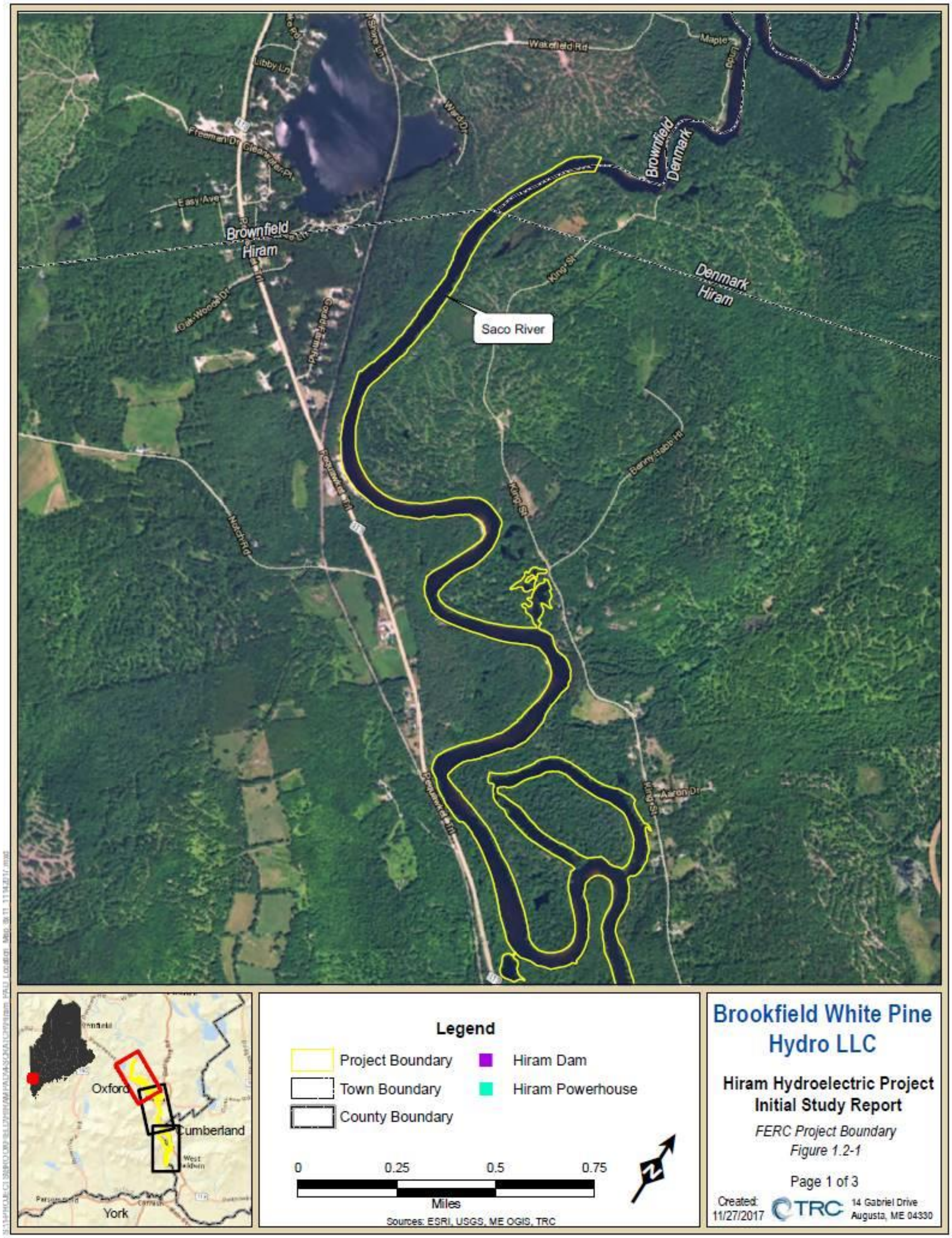
1.1 Project Location and Area

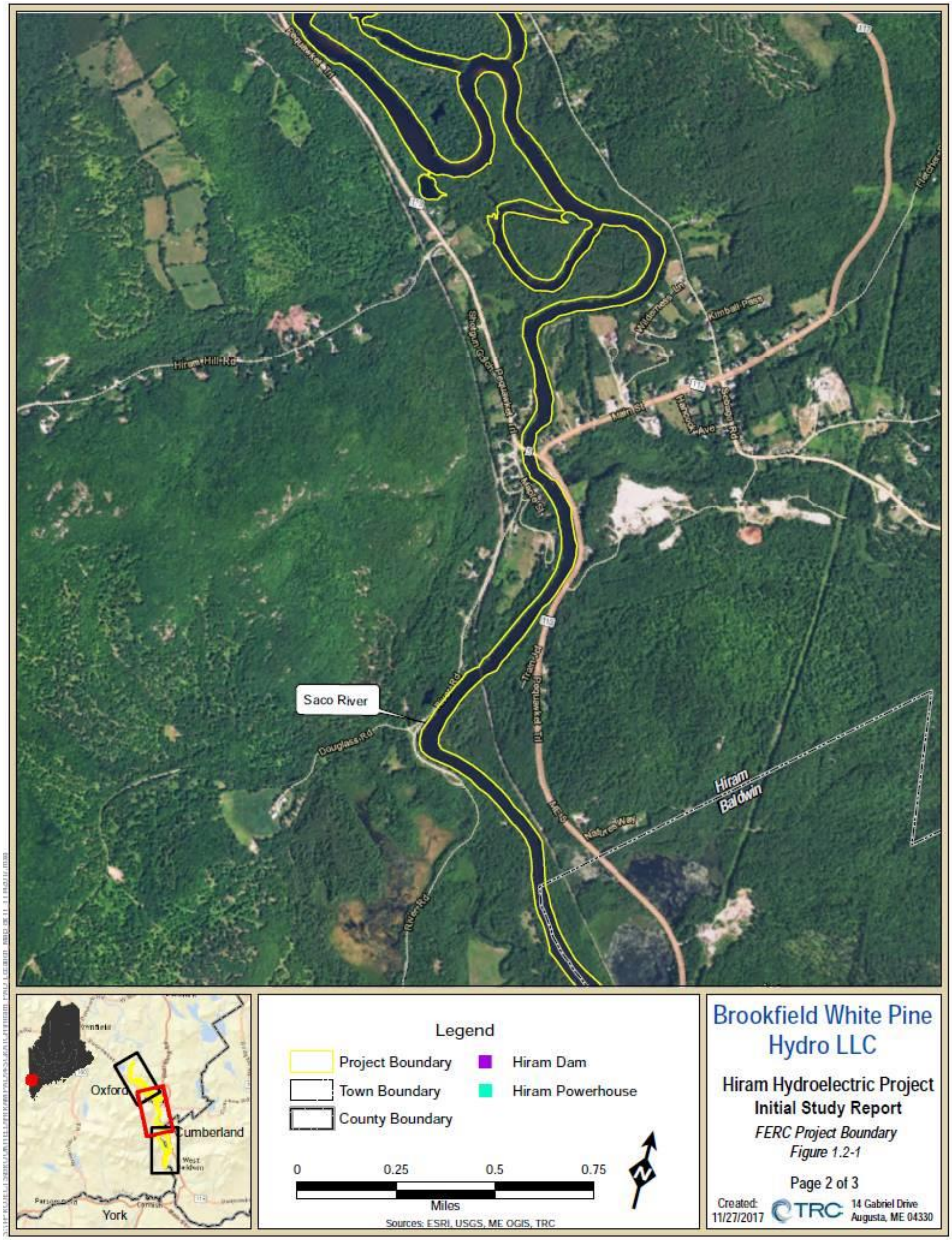
The Hiram Project is located 46 river miles upstream from where the mouth of the Saco River meets the Atlantic Ocean at Camp Ellis, Maine. The Project is located in the towns of Hiram, Baldwin, Brownfield, and Denmark, within Oxford and Cumberland Counties, Maine, and is about 39.2 miles downstream from Saco River Hydro LLC's Swans Falls Project No. 11365 (the upper-most project on the Saco River), and about 20 miles upstream of White Pine Hydro's Bonny Eagle Project No. 2529.

1.2 Project Description

The Hiram Project facilities consist of an impoundment, a dam, an intake that is integral to the dam, and a powerhouse that contains two turbine generating units, with a combined authorized capacity of 10.5 megawatts (MW). The Project is operated in accordance with the 1997 Saco River Instream Flow Agreement (1997 Flow Agreement), and the 1994 Saco River Fish Passage Agreement, which was amended in 2007 with the Saco River Fisheries Assessment Agreement (herein referred to as the 2007 Fisheries Agreement). The 1997 Flow Agreement and the 2007 Fisheries Agreement expire on January 31, 2038 concurrent with the license term of the downstream Bonny Eagle and Skelton projects. White Pine Hydro is not proposing any changes to the Project's operation or facilities at this time. Appendix B of the Proposed Study Plan provides impoundment level and flow information for the period 2014 – 2017.

Figure 1.2-1: Hiram Project Boundary

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Hiram
Baldwin
Oxford
Cumberland
York
Legend
Project Boundary
Town Boundary
County Boundary
Hiram Dam
Hiram Powerhouse
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Miles
Sources: ESRI, USGS, ME OGIS, TRC
Brookfield White Pine Hydro LLC
Hiram Hydroelectric Project
Initial Study Report
FERC Project Boundary
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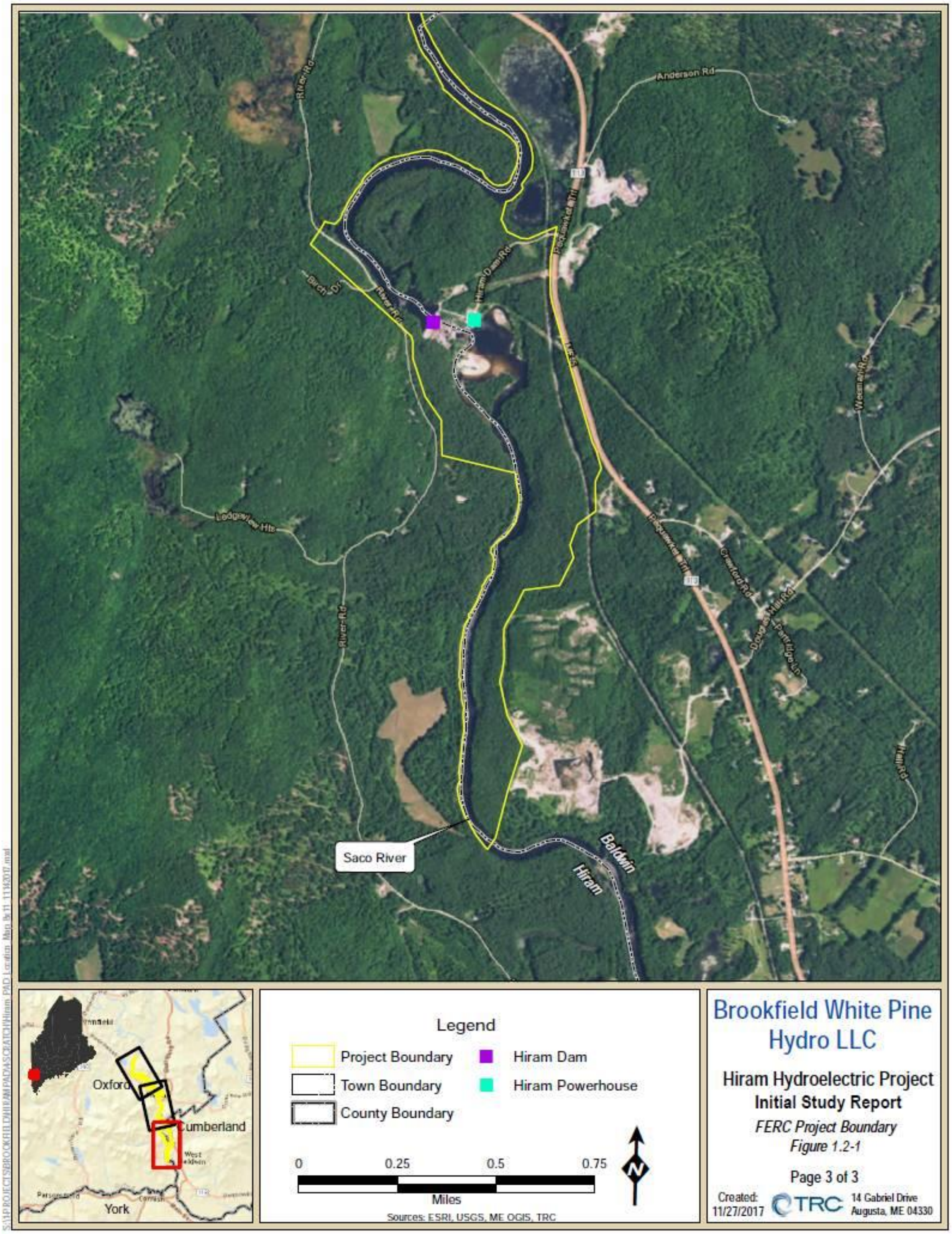
14 Gabriel Drive
Augusta, ME 04330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Birch Dr
Hiram Dam Rd
Pequawket Trl
Ledgeview Hts
Oxford
Cumberland
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Photo 1.2-1: Aerial view of Project facilities, Hiram Hydroelectric Project, Hiram, Maine

1.3 Process and Schedule

1.3.1 Study Plan Modification and FERC Determination

Section 5.15(c) of the Commission's regulations provides a process for determining the need for second-year studies. According to the process plan approved by FERC in a letter dated July 18, 2018, White Pine Hydro is required to file its ISR by February 11, 2019. Within 15 days of filing the report, White Pine Hydro must conduct an ISR meeting with the resource agencies, interested parties, and Commission staff and discuss study results and modifications to the study plan, including the need for second-year studies (section 5.15(c)(2)). White Pine Hydro must file a summary of the ISR meeting within 15 days of the meeting (section 5.15(c)(3)), after which participants may file, within 30 days, any disagreement concerning the ISR meeting summary and Licensee's study proposals, as well as any recommendations for modifications to ongoing studies or requests for new studies. Recommendations for modified or new studies must be accompanied by justification in accordance with FERC's regulations (section 5.15(c)(4)). White Pine Hydro subsequently has 30 days to file any responses to comments and FERC will resolve any disagreements and/or modifications to the study plan within another 30 days. The Licensee has scheduled the ISR meeting for Tuesday, February 26, 2019 at its offices in Lewiston, Maine.

Any request to modify a study or request new studies must demonstrate that the approved study was not conducted as described in the approved Study Plan, was conducted under anomalous environmental conditions, or that environmental conditions have changed in a material way since the Study Plan's approval. The proposal must also explain why the study's objectives cannot be met via the approved study's methods and why the proposal for modification was not made earlier, or that significant new information has become available that affects the study.

1.3.2 Study Reporting Timeline through Updated Study Report Meeting

Relicensing participants have about 60 days from the filing of the ISR to file disagreement concerning the applicant's meeting summary, setting forth the basis for the disagreement and any modifications to ongoing studies or proposed new studies. FERC will resolve any disagreements and amend the approved study plan as appropriate within approximately 120 days of the filing of this ISR, and the Licensee will conduct any second-year studies, or phases of existing studies, as appropriate in 2019.

In accordance with the Process Plan and Schedule proposed by White Pine and approved by FERC, an Updated Study Report (USR), if applicable, must be filed with FERC no later than February 11, 2020, to provide study results from any second-year studies. Within 15 days following the filing of the USR (i.e., by February 26, 2020) the Licensee will meet with relicensing participants and FERC staff to discuss the 2019 study results. Within 15 days following the USR meeting, the Licensee will file a meeting summary with FERC.

1.4 Summary List of Studies

Volume I of the ISR includes the results of four relicensing studies identified in the Study Plan. Results of three cultural resources surveys are provided in Volume II being filed with FERC, the Maine Historic Preservation Commission, and Native American Tribes, as applicable, as "Privileged" to protect sensitive archaeological data and other culturally important information in accordance with FERC regulations.

Table 1.4-1 lists studies as identified in the RSP, the results of which are presented in Volume I and Volume II of the ISR.

Table 1.4-1: List of Relicensing Studies Completed or Being Conducted for Relicensing

Study	Volume
Water Quality Study • Impoundment Trophic State Study • Tailwater Riverine Water Temperature and Dissolved Oxygen Study • Impoundment Aquatic Habitat Study • Tailwater Aquatic Habitat Study • Tailwater Benthic Macroinvertebrate Study	Volume I
Wildlife Reconnaissance Survey	Volume I
Botanical Resource Survey	Volume I
Recreation Facility Inventory	Volume I
Precontact Period Archaeological Survey Phase 1A	Volume II
Historic Period Archaeological Survey Phase 1A	Volume II
Historic and Architectural Survey	Volume II

Each study report in Section 2.0 provides the information specified under FERC's ILP requirements (18 CFR § 5.15) and is organized as follows:

- Introduction
- Study Objectives
- Study Area
- Methods
- Results
- Summary
- Variances from FERC-approved Study Plan and Proposed Modifications
- References (if applicable)

Appendices to the study reports are provided at the end of the document and are organized by major resource area.

1.5 Continuation of Studies

Some studies will continue into 2019. The water quality/aquatic habitat study will continue with collection of limited dissolved oxygen (DO) and temperature data from the Hiram Project bypass reach (Great Falls) ledge pools to document the condition of those small pools.cascade. Based on the results of the Phase 1A Precontact Archaeology Survey, a Phase 1B Precontact Archaeology Study will be performed in 2019. Similarly, a Phase 1B Historic Archaeology Survey will be conducted in 2019. Finally, the Licensee will be conducting a fish assemblage study to assess brook trout use of Project waters. The results of these studies will be reported either in the USR or in the Draft License Application.

2.0 INITIAL STUDY REPORTS

This section presents the results of each of the studies completed in 2018. The study reports have been grouped by major resource areas following FERC's guidelines for Environmental Assessments. Results of the cultural resources surveys are included in a separate volume of this ISR (Volume II) being filed as "Privileged" to protect sensitive archaeological data and other culturally important information in accordance with FERC regulations. Information related to protecting sensitive archaeological data and other culturally important information is also restricted under Section 106 of the NHPA.

2.1 Water Quality

Pursuant to the RSP, the Licensee conducted a water quality study from June to October 2018. The study included five individual study components designed to collect baseline water quality information and to assess whether the Saco River within the Hiram Project boundary attained Maine Department of Environmental Protection's (MDEP) water quality standards and designated use classification as "*habitat for fish and other aquatic life.*" The studies were conducted in accordance with the MDEP's 2017 Sampling Protocol for Hydropower Studies (Appendix C). The five component studies were:

- Impoundment Trophic State Study
- Tailwater Riverine Water Temperature and Dissolved Oxygen Study
- Impoundment Aquatic Habitat Study
- Tailwater Aquatic Habitat Study
- Tailwater Benthic Macroinvertebrate Study

Maine statute 38 Maine Revised Statute (MRS) § 464-470 establishes the state of Maine's classification system for surface waters (MRS 2017). The main stem of the Saco River from the upper limit of the Hiram impoundment to 1,000 feet below the dam is classified as Class A; the Saco River from 1,000 feet below the dam to the end of the Project boundary is Class AA. Class AA waters are the highest classification in the state of Maine and must be of such quality to be suitable for drinking water after disinfection, agriculture, fishing, recreation in and on the water, navigation, and as habitat for fish and other aquatic life; the habitat must be classified as natural and free-flowing (MRS 2017). Class A waters are the second highest classification and must be of such quality that they are suitable for the designated uses of agriculture, fishing, drinking water after disinfection, recreation, industrial process and cooling water supply, hydroelectric power generation, navigation, and as habitat for fish and other aquatic life; the habitat must be classified as natural (MRS 2017). The state of Maine has established Class A and Class AA water quality standards for dissolved oxygen (DO), iron, chloride, and water transparency (i.e., Secchi disk depth); the state of Maine has also developed draft criteria for total phosphorus, chlorophyll-a, pH, , and aluminum (Table 2.1-2).

In addition, for Class A waters, "the aquatic life and bacteria content of Class A waters shall be as naturally occurs." 38 M.R.S. § 465(2)(B). The term "as naturally occurs" is defined to mean "conditions with essentially the same physical, chemical and biological characteristics as found in situations with similar habitats free of measurable effects of human activity." 38 M.R.S. § 466(2).

Table 2.1-2: Established and Proposed Maine Water Quality Standards for Select Parameters

Parameter	Criteria	Water Classification
Dissolved Oxygen[a]	>7 mg/L or 75% saturation	Class A
	As naturally occurs	Class AA
Iron[b]	1,000 µg/L or 1 mg/L	Statewide
Chloride[b]	230,000 µg/L or 230 mg/L	Statewide
Aluminum[b]	87 µg/L or 0.087 mg/L	Statewide
Total Phosphorus[c]	≤ 18 µg/L (0.018 mg/L)	Class AA/A
Water Column Chlorophyll-a[c]	≤ 3.5 µg/L (0.0035 mg/L)	Class AA/A
Secchi Disk Depth[c]	≥ 2.0 m	Class AA/A
pH[c]	6.0 – 8.5	Class AA/A

[a] MRS 2017
[b] MDEP 2012a; values refer to the criterion continuous concentration which is an estimate of the highest concentration of the substance in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect.
[c] MDEP 2012b

The Licensee provides a minimum flow of 300 cubic feet per second (cfs), or inflow, whichever is less, from November 16 to September 30 from the Hiram Project; during normal operation the impoundment may fluctuate two feet from the full pond elevation. From October 1 to November 15, the Licensee operates the Hiram Project as a run-of-river facility with little variation between inflow and outflow and an impoundment fluctuation limited to one foot or less from the normal full pond elevation. Normal full pond elevation of the Hiram Project is elevation 349.0'.[1] These operational limitations were developed and memorialized in the 1997 Instream Flow Agreement for the Saco River for the protection of aquatic resources and habitats in the Saco River. The 1997 Instream Flow Agreement terminates on January 31, 2038 (i.e., upon the expiration of the

[1] All elevations in this report are relative to Mean Sea Level (MSL).

FERC licenses for White Pine Hydro's Skelton and Bonny Eagle Projects, or the subsequent annual licenses, if applicable).

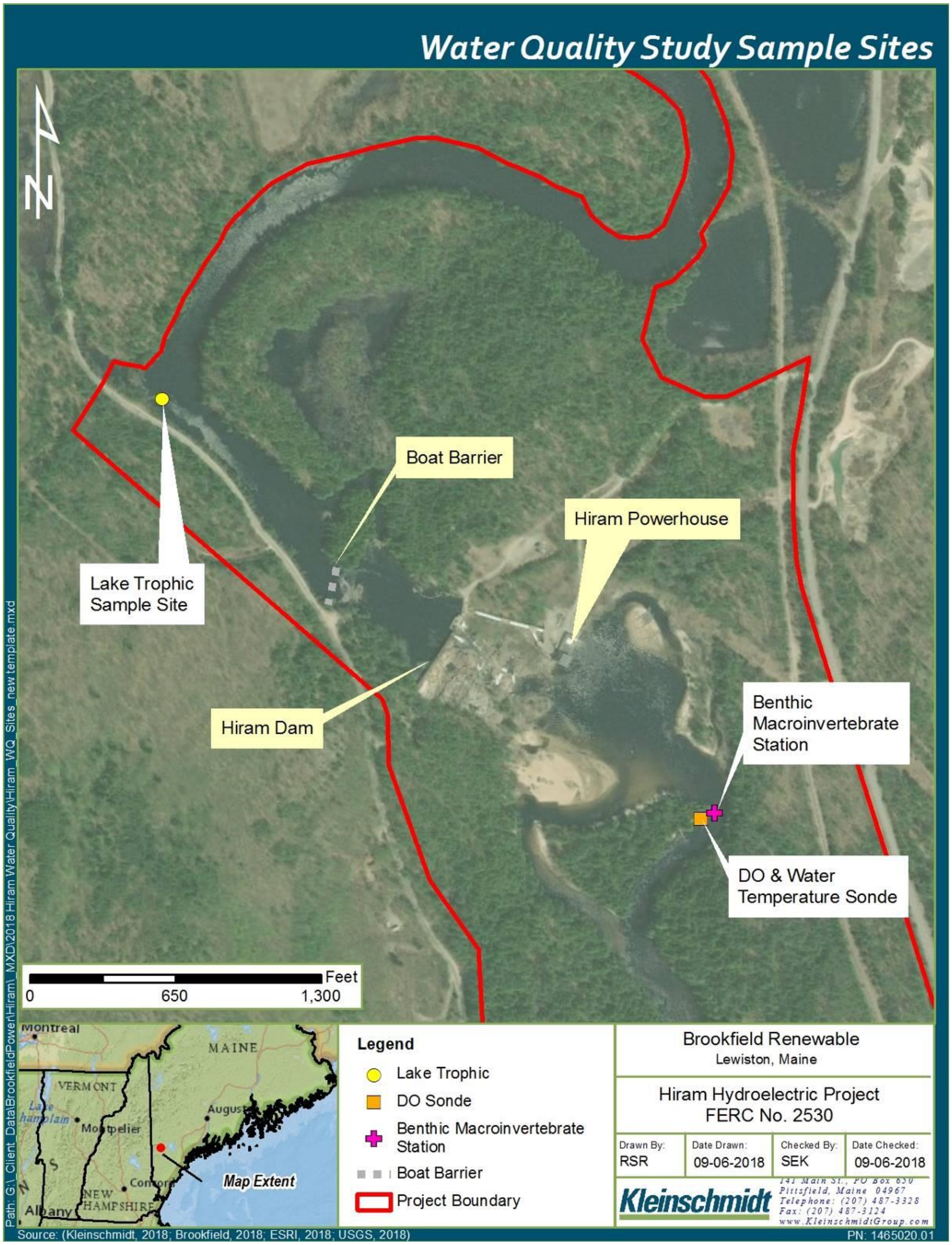
2.1.1 Study Objectives

In accordance with the RSP, the objectives of the water quality, aquatic habitat, and benthic macroinvertebrate studies were to collect contemporary data to determine whether the Hiram Project waters meet MDEP's water quality standards and the designated use classification of "*habitat for fish and other aquatic life.*"

2.1.2 Study Area

The study area included the main stem Saco River from the upper Hiram impoundment, approximately 7.5 river miles upstream of the dam, to approximately 0.5 river miles downstream of the powerhouse. The water quality sampling sites near the Hiram dam are shown in Figure 2.2-1.

Figure 2.2-1: Sample Locations for the 2018 Water Quality Monitoring Study at the Hiram Project



2.1.3 Methods

2.1.3.1 Impoundment Trophic State Study

The Licensee completed a reconnaissance-level bathymetry survey prior to collecting the first lake trophic sample to identify the deepest, safely accessible spot in the lower impoundment (i.e., upstream of the boat barrier). The deepest spot found was approximately 24 feet deep and 1,600 feet upstream of the dam (Figure 2.1-1); MDEP approved of the sampling location via e-mail dated June 29, 2018. The Licensee installed a temporary buoy to mark the sample location (Photo 2.1-1). Lake trophic sampling was conducted twice per month for five consecutive months from June through October 2018 primarily between 11:30 and 13:30.

Sample parameters included Secchi disk transparency, water temperature and DO profiles (1-meter intervals), and epilimnetic core[2] samples of total phosphorus, Chlorophyll-a, color, pH, and total alkalinity. Additional nutrient and dissolved metal samples were collected during the late summer sampling event on August 29, 2018. The additional late summer sample parameters included nitrate, dissolved organic carbon (DOC), total iron, total dissolved aluminum, total calcium, total magnesium, total sodium, total potassium, specific conductance, chloride, and sulfate.[3] The late season sample was collected from an integrated epilimnetic core because the water column was not thermally stratified (i.e., change in water temperature $\geq$ 1°Celsius (C)/meter) (see Section 2.1.4.3).

The Licensee delivered the water samples on ice to the state of Maine's Health and Environmental Testing Lab (HETL) in Augusta within 24 hours of sampling. Appropriate chain-of-custody and sample labeling techniques were followed. HETL's laboratory detection limits differ slightly from the detection limits identified in MDEP's sampling protocol; however, MDEP reviewed and approved the HETL detection limits (MDEP Study Plan Determination Letter, October 25, 2018). Table 2.1-2 provides the HETL detection limits.

[2] The epilimnetic zone is determined by establishing a temperature profile at 1-meter increments to define the epilimnion as the upper layer where the change in temperature per meter of depth is less than 1-degree C ($\Delta T/m<1°C$).
[3] By email dated July 30, 2018, MDEP informed the Licensee that sampling for silica would no longer be required for hydropower projects.

Photo 2.1-1: Lake trophic sample location in the Hiram impoundment

Table 2.1-2. Detection Limits for Parameters Measured During the Lake Trophic Sampling

Parameter	HETL Detection Limit
Total phosphorus	0.002 mg/L
Nitrate	0.05 mg/L
Chlorophyll a	0.001 mg/L
Color	5.0 SPU
DOC	1.0 mg/L
pH	0.1 SU
Total alkalinity	1.0 mg/L
Total iron	0.2 mg/L
Total dissolved aluminum	0.2 mg/L
Total calcium	1.0 mg/L
Total magnesium	1.0 mg/L
Total sodium	1.0 mg/L
Total potassium	1.0 mg/L
Specific conductance	2 ms/cm
Chloride	1.0 mg/L
Sulfate	1.0 mg/L

Water temperature and DO were measured with a handheld YSI Prodo meter. The calibration of the YSI Prodo meter was checked in the field prior to each sampling event. According to the manufacturer's specifications, the accuracy of the YSI ProODO meter is ±0.1 mg/L or ±1% of the reading, whichever is greater, for the DO concentration; ±1% air saturation or ±1% of the reading, whichever is greater, for DO percent saturation; and ±0.2ºC for temperature.

River flow, precipitation, and air temperature data were analyzed to characterize the environmental conditions throughout the monitoring period. River flow data for the Hiram Project were estimated by prorating flow data from United States Geological Survey (USGS) Gage No. 01066000 Saco River at Cornish, Maine (i.e., the gage data was multiplied by a factor of 0.65 to account for the difference in drainage areas between Hiram dam and the gage and to account for inflow from the Ossipee River) (see Hiram PAD for additional information on the proration method). Precipitation and air temperature data were obtained from the weather station at the Eastern Slopes Regional Airport in Fryeburg, Maine, which is approximately 12 miles northwest of the Hiram dam (NRCC 2018).

2.1.3.2 Tailwater Water Temperature and Dissolved Oxygen Study

Water temperature and DO were sampled downstream of the Hiram dam with a submersible Onset Hobo U-26 datasonde in accordance with MDEP's 2017 Sampling Protocol for Hydropower Studies (MDEP 2017). Prior to deploying the datasonde, the Licensee measured water temperature and DO at quarterly increments across a river transect approximately 1,000 feet downstream of the Hiram powerhouse, just downstream of the large tailwater pool (Figure 2.1-1). Per the MDEP's March 28, 2018, letter providing comments on the PAD, if there was no violation of DO criteria and no significant (<0.2 mg/L) difference in concentrations among the quarter points, the datasonde would be deployed at a location representative of the main flow. If there was more than a 0.2 mg/L difference in the DO measurements, the datasonde would be placed in the location of the lowest concentration, which may not be the location of the main flow below the powerhouse. The DO measurements across the transect differed by less than 0.2 mg/L (ranged from 7.78 mg/L to 7.83 mg/L) (Table 2.1-3). The Licensee installed the datasonde on river right[4] approximately 1,000 feet downstream of the powerhouse, just downstream of the large tailwater pool (Figure 2.1-1, Photo 2.1-2).

[4] From the perspective of an observer looking downstream.

Table 2.1-3: Water Temperature and DO Across the Transect Downstream of Hiram Dam on July 12, 2018, at 16:00

Parameter	Site 1 (river left)	Site 2 (center)	Site 3 (river right)
Water Temperature (ºC)	25.7	25.3	25.4
DO (mg/L)	7.78	7.78	7.83
DO (% Saturation)	95.0	94.5	94.5

The datasonde continuously measured water temperature and DO every hour between July 12 and September 13, 2018. The instrument was calibrated at the beginning of the monitoring period according to the manufacturer's recommendations. The datasonde was checked, and the data were downloaded every two weeks. The datasonde was equipped with a bio-fouling guard, enclosed in a 2-inch-diameter perforated PVC pipe, and anchored to a buoy. The water depth at the site was approximately four feet, and the datasonde was approximately two feet below the surface. The accuracy of the DO datasonde is ±0.2 mg/L up to 8 mg/L and ±0.5 mg/L from 8 mg/L to 20 mg/L; the accuracy of the water temperature data is ±0.2ºC. DO percent saturation data were calculated from the DO concentration and from atmospheric pressure data collected with an Onset Hobo U20-001 barologger installed downstream of the Hiram dam.

Photo 2.1-2: Location of datasonde downstream of Hiram Project

2.1.3.3 Impoundment Aquatic Habitat Study

Pursuant to the RSP, the Licensee completed the impoundment habitat study in 2018 to determine whether normal operations of the Hiram Project affect the impoundment's littoral zone and the ability of the impoundment to support habitat for fish and other aquatic life. The littoral zone is typically defined as that portion of the water body in which there is adequate light penetration to stimulate primary productivity on the sediment floor. MDEP's protocol for impoundment habitat studies is as follows:

> *Using a depth of twice the mean summer Secchi disk transparency, determined from the Trophic State Study or historic DEP data, as the bottom of the littoral zone, the volume and surface area dewatered by the drawdown will be calculated to determine if at least 75 percent of the littoral zone remains watered at all times.*

The Licensee's methods included:

- Performing a bathymetric survey of the impoundment at the normal, full head pond elevation; for safety considerations, bathymetry data was not collected downstream of the boat barrier;
- Creating contour maps of the impoundment;
- Using a Geographic Information System (GIS) to calculate the volume and surface area of the impoundment at the full pond elevation of 349.0' and comparing that to the volume and surface area of the impoundment at 347.0' to determine if 75 percent of the littoral zone remains watered, and,
- Collecting information about:
  - the average depth of the Hiram impoundment;
  - the contour/slope of the impoundment's shoreline; and,
  - the type (e.g., submerged aquatic vegetation, wetlands, over-hanging vegetation, undercut banks) and general extent of littoral habitat within the impoundment.

Bathymetry data were collected in August and September 2018 during full pond conditions using a boat mounted Lowrance Elite 7 HDI (Hybrid Dual Imaging) Fishfinder and Chartplotter. The average headpond elevation during the surveys was 349.0'. Bathymetry maps were created using ESRI ArcMap Version 10.5.1; the data were smoothed using an inverse distance weighted method. Appendix D provides figures showing bathymetry data for the impoundment. The surface area and volume of the Hiram impoundment were estimated using the Surface Volume tool in the ESRI ArcMap functional surface toolbox.

2.1.3.4 Tailwater Aquatic Habitat Study

Pursuant to the RSP, the Licensee completed a transect-based study in the tailwater area in 2018. In accordance with MDEP's water quality sampling protocol for hydropower studies (MDEP 2017) and the RSP, the Licensee collected aquatic habitat data across two cross-sectional transects within the first 0.5-miles of the Saco River downstream of Hiram dam during low river flow conditions (Figure 2.1-2). The locations of the transects were selected based on field reconnaissance and approved by the MDEP prior to starting the study; the transects were approximately 420 feet apart (Figure 2.1-2).

Figure 2.1-2: Study Area and Transect Locations for the Tailwater Aquatic Habitat Study

Once the transects were established, the Licensee surveyed the river bed and bank profiles at the transects up to the bankfull elevation to characterize the stream bed cross-sectional profile and water surface elevation (WSEL); all elevations measured during the tailwater study were relative to an assigned, temporary bench mark elevation of 100'. The Licensee also measured water depth at approximately 20 stations across each transect and the river width at each transect. Bankfull elevation was estimated by assessing the active channel based on the extent of undercut banks and distinct slope breaks on the banks (USGS 2004). The Licensee completed the field survey on September 7, 2018. River flow was 383 cfs, based on operational data at the dam.

The field data were incorporated into a HEC-RAS[5] model. The HEC-RAS model was run using steady, subcritical flow computations. The downstream boundary condition was set to normal depth based on the friction slope between the measured transects ($S = 4.7619 \times 10^{-5}$ ft/ft). Manning's roughness coefficients "n" for the channel were selected by examining photographs and descriptive notes taken during the field survey. The values were adjusted within allowable limits until the water surface elevations matched as closely as possible to the surveyed elevations. Typical Manning's roughness values for a river wider than 100 feet at flood stage are between 0.025 and 0.06 (Chow 1959).

A Manning's "n" value of 0.0415 was selected for the channel for both cross sections in the model. Manning's values of 0.041 and 0.043 were calculated for two streams; the first stream had an average width of 118.5 feet at the locations surveyed and a channel bed composed of rocks and coarse gravel with some large diameter boulders (n = 0.041); the second stream had an average width of 76.5 feet and a channel bed composed of coarse sand with a few outcrops (n = 0.043) (Barnes 1987). The selected Manning's roughness coefficient for the channel in the model is reasonable, due to the river's similarity to those described in the USGS's 2004 report and since it falls within the range recommended by Chow (1959). The overbank Manning's values were set to 0.12, which is typical for a forested floodplain with the flood stage reaching the tree branches (Chow 1959). However, in no model simulation did any flow enter the overbank areas.

The bankfull flow for each cross section was determined through an iterative process. For each transect, the flow in the model was increased until the resulting water surface elevation at the

[5] U.S. Army Corps of Engineers - Hydrologic Engineering Center's River Analysis System (HEC-RAS).

transect matched the value measured in the field. The percent of each transect relative to the watered bankfull area provided at the current Project minimum flow of 300 cfs were determined.

2.1.3.5 Benthic Macroinvertebrate Sampling

The objective of the macroinvertebrate sampling study was to determine if the aquatic life, in this case the macroinvertebrate community, attained Class A or AA standards (the biocriteria requirements for Class A and Class AA are the same). MDEP's "Methods for Biological Sampling and Analysis of Maine's Inland Waters" (Davies and Tsomides 2002) were used as the basis of the field and laboratory procedures in the macroinvertebrate sampling study. A summary of these methods is given below.

MDEP standard rock basket samplers were used for this study. These samplers hold approximately 16 pounds of clean, washed, bank-run cobble, graded to uniform diameter range of 1.5 to 3 inches. Moody Mountain Environmental (MME) placed three (3) samplers at the sample site; samplers are left in the river for approximately 28 days (± 4 days) to allow for invertebrate colonization. Retrieval of the samplers was done using an aquatic D-net. The net was placed directly downstream of a sampler, the sampler was then picked up and placed in the net. The contents of each sampler and the net were washed through a sieve bucket and preserved in labeled jars. Habitat measurements including substrate type, depth, current velocity, and temperature were collected at sampler collection placement. Samples were collected, preserved, and transported to the MME laboratory. The three (3) samplers (replicates) were sorted, identified, and enumerated. The benthic macroinvertebrate sampling location was about 975 feet downstream of the Hiram powerhouse (Figure 2.1-3) or approximately 1600 feet from the dam. This area was representative of the river habitat, having good current and hard, eroded substrates (cobble, gravel, and sand). A sample site within 1000 feet of the dam (within the tailrace pool) could not be located that had hard eroded substrates (called for in Davies and Tsomides 2002). The habitat in the pool is characterized by current eddies and sand substrates and is not representative of the river habitat in general.

Figure 2.1-3: Location of Aquatic Macroinvertebrate Sampling in the Tailwater Section Downstream of the Hiram Dam, Saco River, July, August 2018

The MDEP uses a linear discriminant water quality model (LDM) and professional judgment to determine water quality class attainment of aquatic macroinvertebrate communities. The LDM results are percentages indicating the probability of a site attaining water quality classes A and AA (the biocriteria requirements are the same for Class A and Class AA), B, or C. The LDM numeric results can be adjusted by MDEP's professional judgment if conditions warrant.

The Method outlines several conditions that can trigger the use of professional judgment to analyze data. Among these are:

- Minimum Provisions - if the sample Mean Total Abundance is less than 50 individuals or Generic Richness is less than 15 genera.
- Atypical Conditions - where atypical conditions could result in uncharacteristic findings, professional judgment can be used to adjust. Examples of these atypical conditions are:

  a. <u>Habitat Factors</u>

  Lake Outlets
  Impounded Waters

Substrate Characteristics
Tidal Waters

b. Sampling Factors

Disturbed Samples
Unusual Taxa Assemblages
Human Error in Sampling

c. Analytical Factors

Subsample versus Whole Sample analysis
Human Error in Processing

In cases where professional judgment is used the Method outlines a process by which adjustments should occur. These are:

a. **Resample** the site if specific sampling factors may have influenced the results;

b. **Raise the Finding** of the LDM from non-attainment to indeterminant or attainment of class C;

c. **Raise the Finding** of the LDM from one class to the next higher class;

d. **Lower the Finding** of the LDM to indeterminant or the next lower class. This would be based on evidence that the narrative aquatic life criteria for the assigned class are not met;

e. **Determination of Non-Attainment**: Minimum Provisions not met by samples for which no evidence exists of atypical conditions.

f. **Determination of Attainment**: Minimum Provisions not met by samples for which there is evidence of factors that could result in minimum provisions not being met, professional judgment may be used to make a professional finding of attainment of the aquatic life criteria for any class. Such decisions will be provisional until appropriate resampling is carried out.

The samplers were placed in the river on July 18, 2018 at 10:30 AM. Samplers were retrieved on August 15, 2018 at 10:30 AM. Rooted aquatic grasses were present at the sample site and the substrates were covered with filamentous algae. Habitat measurements for both placement and retrieval are shown in . Photos of the general area as well as the substrate and sampler placement are included below (Photos 2.1-3 through 2.1-7).

Table 2.1-4: Habitat Measurements in the Tailwater Section Downstream of Hiram Dam for Aquatic Macroinvertebrate Sampling, Saco River, July-August 2018

Macroinvertebrate Field Data Sheet

Log Number ________	Directions________________	Type of Sampler**RBG**
Station Number 1	________________	Date Deployed **7-18-18**
Waterbody **Saco**	________________	Number Deployed **3**
River Basin **Saco**	Lat-Long Coordinates	Date Retrieved **8-15-18**
Town **Hiram**	Latitude **43º39'52.49""**	Number Retrieved **3**
Stream Order **6**	Longitude **70º 36' 03.27"**	Collector(s) **P Leeper MME**

1. Land Use (surrounding watershed)		2. Terrain	3. Canopy Cover
☐ Urban	**X** Upland conifer	☐ Flat	☐ Dense (75-100% shaded)
☐ Cultivated	☐ Swamp hardwood	**X** Rolling	☐ Partly open (25-75% shaded)
☐ Pasture	☐ Swamp conifer	☐ Hilly	**X** Open (0-25% shaded)
X Upland hardwood	☐ Marsh	☐ Mountains	(% daily direct sun) **80%**

4. Physical Characteristics of Bottom estimate % over 12 m stretch

[ ] Bedrock	**[50**] Cobble (2.5" – 10")	**[30**] Sand (<1/8")	[ ] Clay
[ ] Boulders (>10")	**[20**] Gravel (1/8" – 2.5")	[ ] Silt	[ ] Muck

5. Habitat Characteristics (immediate area)		Temp. Probe #	7. Water Samples
Time **1030h** Wetted Width **145'** Bank Full Width Depth **4.1'** Velocity **1.4fps** Diss. O_2 (ppm)**8.0** Temp (C) **24.2** Turbidity DO Meter #______Cal? **Y** / N?	Time **1100h** Wetted Width (m) Bank Full Width (m) Depth **4.2'** Velocity **1.7fps** Diss. O_2 (ppm)**7.9** Temp (C) **23.0** Turbidity DO Meter #______Cal? **Y** / N	☐ deployed **6. Observations** 7-18-18 – Rooted macros- grass, attached filamentous algae	☐ Standard ☐ Other Lab Number **8. Photograph** Put-In **Yes** Take-Out **Yes**

Photo 2.1-3: View northeast upstream of the macroinvertebrate sample, Saco River 8-15-18

Photo 2.1-4: View northeast upstream of the macroinvertebrate sample, Saco River 8-15-18

Photo 2.1-5: View southwest of the macroinvertebrate sample site downstream of the Hiram Dam, Saco River 8-15-18

Photo 2.1-6: Deployed sampler and substrate conditions at placement at the macroinvertebrate sample site downstream of the Hiram Dam, Saco River 7-18-18

Photo 2.1-7: Deployed sampler and substrate conditions at placement at the macroinvertebrate sample site downstream of the Hiram Dam, Saco River 7-18-18

2.1.4 Results

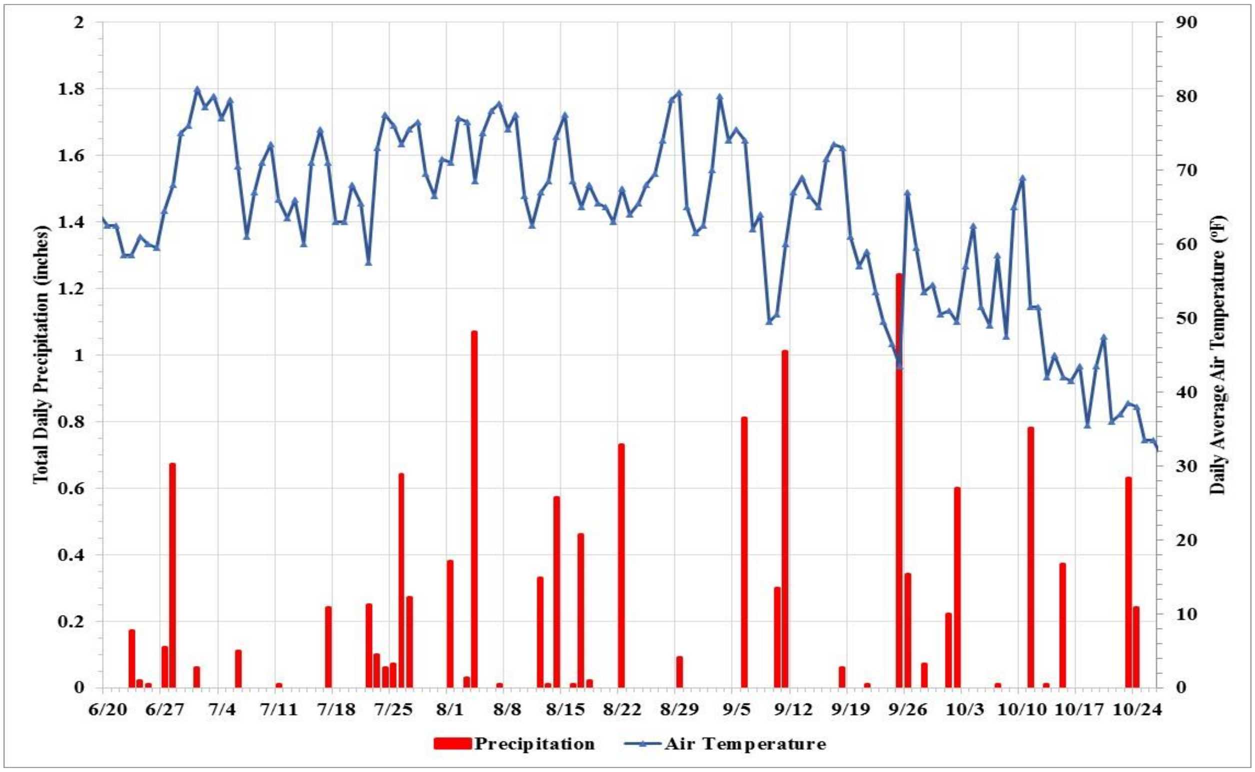
2.1.4.1 Environmental Conditions

River flow at the Hiram Project ranged from 266 cfs to 1,697 cfs during the study period (June 22 to October 26, 2018); the average flow during this period was 663 cfs (Figure 2.1-4). The peak flow occurred on July 28, 2018, following six days of precipitation (Figure 2.1-4). The total precipitation during the study period was 13.2 inches, and the highest daily precipitation amount was 1.2 inches on September 25 (Figure 2.1-5). Monthly precipitation totals for June to October 2018 were approximately two inches below normal in June and July, one inch below normal in October and near normal in August and September (NRCC 2018).[6] Total precipitation for June to October 2018 was 15.2 inches compared to a normal total of 20.5 inches (NRCC 2018). The daily average air temperature ranged from approximately 60º Fahrenheit (ºF) to 80ºF in June through mid-September and decreased to near 35ºF in late October (Figure 2.1-5).

[6] Climate normal are the average three-decade averages of a specific climatological variable and are updated every 10 years. The current climate normal data set covers 1981-2010 (NRCC 2018).

Figure 2.1-4: Hourly Average River Flow at Hiram Dam Prorated from USGS Gage No. 01066000 Saco River at Cornish, June 20 to October 26, 2018

Figure 2.1-5: Total Daily Precipitation and Daily Average Temperature from Eastern Slopes Regional Weather Station in Fryeburg, Maine, June 20 to October 26, 2018



2.1.4.2 Impoundment Epilimnetic Core Samples and Secchi Disk Transparency

A summary of the 2018 lake trophic state sampling results from the Hiram Project impoundment is provided below.

Total Phosphorus

Total phosphorus is an indicator of nutrient levels and is a measurement of both organic and inorganic phosphorus in the water. Phosphorus is an important nutrient required for plant growth and is often a limiting nutrient; however, too much phosphorus can lead to algal blooms (LSM 2018). Total phosphorus ranged from 8 µg/L to 180 µg/L (Table 2.1-5). Total phosphorus was equal to or below the proposed state standard (18 µg/L) in all samples except for the one collected on September 27 where total phosphorus was 180 µg/L. Over 1.5 inches of rain had fallen in the previous two days following passage of a "nor'easter" storm suggesting that surface runoff may have contributed to the high total phosphorus levels. The median and average total phosphorus throughout the monitoring period were 14.5 µg/L and 30.1 µg/L, respectively (Table 2.1-5).

Color

Color is an indicator of water clarity and is a measure of the amount of dissolved organic acids in the water; dissolved and suspended material may contribute to water color. Water with a color value greater than 25 platinum cobalt units (PCU) is considered to be colored and may have a reduced Secchi disk transparency (LSM 2018). Color ranged from 14 PCU to 30 PCU with an average of 19.8 PCU (Table 2.1-5). The highest color level (30 PCU) was observed on August 9 and soon after the highest flows of the monitoring period suggesting that may have contributed to the higher color level. Also, the second lowest (3.6 m) Secchi disk level of the monitoring period was recorded on August 9 which supports that suspended sediment levels may have been higher that day (see below).

Chlorophyll-A

Chlorophyll-a is a photosynthetic pigment found in algae and plants and is an indicator of algal levels and biological productivity in the water (LSM 2018). Large concentrations of chlorophyll-a can be an indication of eutrophication (i.e., excessive nutrient inputs leading to algal blooms) that can adversely affect lacustrine or riverine processes or DO concentrations. Throughout the 2018 sampling, chlorophyll-a ranged from 0.001 mg/L to 0.003 mg/L with an average of 0.002 mg/L (Table 2.1-5). These concentrations are below the proposed state standard (0.0035 mg/L).

Alkalinity

Alkalinity (i.e., buffering capacity) is an indicator of the water's capacity to neutralize acids or buffer against changes in pH; water bodies with alkalinity values less than 10 mg/L are considered poorly buffered (MDEP 2018). Sources of alkalinity include rocks, soil, salts, and algal activity. Total alkalinity in the Hiram impoundment ranged from 5 mg/L to 8 mg/L with an average of 6.6 mg/L (Table 2.1-5).

pH

pH is a measure of the acidity of water and regulates the biological processes that may occur in a water body. pH ranged from 6.3 to 6.7 with an average of 6.5 (Table 2.1-5). All pH values were within the recommended range of 6.0 to 8.5 for Class A waters.

Secchi Disk

Secchi disk transparency is a measure of the clarity of water and is the distance that visible light penetrates through the water column. Transparency in a water column is influenced by suspended particles (e.g., algae, zooplankton, and silt) and water color and is an indirect measure of algal growth (LSM 2018). Secchi disk transparency ranged from 3.5 meters to 6.2 meters (11.5 feet to 20.3 feet) with an average of 5.1 meters (16.7 feet) (Table 2.1-5). The Secchi disk transparency was above the proposed standard of 2.0 m throughout the sampling period.

Table 2.1-5: Epilimnetic Core and Secchi Disk Results for the Hiram Impoundment

Date	Total Phosphorus (µg/l)	Color (PCU)	Chlorophyll-a (mg/l)	Total Alkalinity (mg/l)	pH	Secchi Disk (m)
6/22/18 12:00	18	14	0.003	6	6.4	6.0
6/29/18 9:20	15	18	0.002	7	6.6	5.4
7/12/18 13:25	15	16	0.003	7	6.6	5.5
7/24/18 13:00	12	15	0.002	8	6.5	5.6
8/9/18 12:00	14	30	0.003	5	6.3	3.6
8/29/18 12:30	11	24	0.002	6	6.5	5.4
9/13/18 12:50	8	16	0.001	7	6.7	5.8
9/27/18 13:20	180	16	0.001	8	6.5	6.2
10/9/18 12:45	16	26	0.002	5	6.5	4.0

Date	**Total Phosphorus (µg/l)**	**Color (PCU)**	**Chlorophyll-a (mg/l)**	**Total Alkalinity (mg/l)**	**pH**	**Secchi Disk (m)**
10/25/18 12:55	12	23	0.001	7	6.6	3.5
Average	30.1	19.8	0.002	6.6	6.5	5.1
Median	14.5	17.0	0.002	7.0	6.5	5.5
Minimum	8	14	0.001	5	6.3	3.5
Maximum	180	30	0.003	8	6.7	6.2

Late Summer Sample: Conductivity, Dissolved Metals and Nutrients

Conductivity is a measure of the concentration of dissolved ions in water and is an indicator of the presence of pollutants. Undisturbed rivers have low conductivity values (e.g., 30-50 µS/cm) which will generally increase as pollutant levels in the water increase, whereas more urban streams and rivers can have conductivity values more than 100 µS/cm (MDEP 2018). Nutrients maintain healthy aquatic life and are important for growth and reproduction. Extra nutrient levels can cause excess growth of algae or other aquatic life. Metals are needed for many biochemical processes but can be toxic at high concentrations.

In the late summer sample, conductivity was 53.8 µS/cm which is indicative of a relatively undisturbed river (Table 2.1-6). Iron (<0.38 mg/L) and chloride (9 mg/L) concentrations were below the established state standards (1 mg/L and 230 mg/L, respectively). Aluminum (0.42 mg/L) was below the proposed state standard of 0.087 mg/L. Calcium, magnesium, potassium, and sodium ranged from 0.5 mg/L to 6.5 mg/L (Table 2.1-6). Nitrate and sulfate were 0.07 mg/L and 2 mg/L, respectively.

Table 2.1-6: Conductivity, Dissolved Metals, and Nutrients in the Hiram Impoundment, August 29, 2018 at 12:30

Parameter	Unit	Value
Chloride	mg/L	9.0
Nitrate	mg/L	0.072
Sulfate	mg/L	2.0
Calcium	mg/L	2.8
Iron	mg/L	0.38
Magnesium	mg/L	0.5
Potassium	mg/L	0.94
Sodium	mg/L	6.5
Aluminum	mg/L	0.042
DOC	mg/L	3.1
Conductivity	µS/cm	53.8

2.1.4.3 Impoundment Water Temperature and DO Profiles

The water temperature at the lake trophic sampling station ranged from 21.0ºC to 21.9ºC at the end of June (Table 2.1-7). The water temperature increased to 24.2ºC to 25.6ºC (range of vertical profile throughout the water column) during the next sampling day (July 12, 2018). The highest water temperatures were observed on August 9, 2018, ranging from 26.2ºC to 26.8ºC (Table 2.1-7). The water temperature progressively decreased during the September and October sampling events (Table 2.1-7). The temperature was relatively uniform throughout the water column during each sampling event demonstrating that the impoundment did not stratify. Overall, water temperature varied by less than 2.3ºC throughout the water column during each lake trophic sampling event.

The DO concentration was similar on June 22 and June 29 (ranged from 8.1 mg/L to 8.2 mg/L) at the lake trophic sampling station (Table 2.1-8). The DO concentration decreased and ranged from 7.0 mg/L to 7.7 mg/L in July and August. The lowest DO concentration was observed on August 9 (range 7.0 mg/L to 7.2 mg/L) (Table 2.1-8). The average DO concentration in the water column increased to 8.8 mg/L on September 13 and 9.2 mg/L on September 27 and October 9. The DO concentration ranged from 11.3 mg/L to 11.5 mg/L on October 25. During each lake trophic sample event, the DO concentration was uniform throughout the water column and varied by less than 0.3 mg/L. The DO concentration was above the Maine state standard for Class A waters (7.0 mg/L) waters throughout the monitoring period.

Overall, the DO percent saturation was within a narrow range throughout the entire monitoring period (86.5 percent to 96.7 percent) (Table 2.1-9). The lowest, average DO percent saturation in the water column was 87.9 percent on August 9; the highest average DO percent saturation was 94.1 percent on September 13 (Table 2.1-9). The DO percent saturation was above the Maine state standard for Class A waters (75 percent) throughout the monitoring period.

Table 2.1-7: Water Temperature (ºC) Profiles in the Hiram Impoundment

Depth (m)	June 22 11:45	June 29 9:00	July 12 13:00	July 24 12:30	Aug. 9 11:35	Aug. 29 12:15	Sept. 13 12:30	Sept. 27 13:15	Oct. 9 12:35	Oct. 25 12:40
0.25	21.9	21.4	25.6	24.9	26.8	26.1	19.6	17.6	15.6	7.0
1	21.9	21.2	25.4	24.3	26.5	25.6	18.7	17.0	15.0	6.7
2	21.8	21.2	25.2	23.8	26.3	25.1	18.2	16.2	14.6	6.7
3	21.8	21.1	25.1	23.5	26.3	25.0	18.1	15.9	14.5	6.6
4	21.8	21.1	25.0	23.4	26.3	24.9	18.1	15.8	14.4	6.6
5	21.8	21.1	25.0	23.4	26.3	24.9	18.1	15.8	14.4	6.6
6	21.8	21.1	24.9	23.3	26.3	24.7	18.0	15.8	14.4	6.6
7	-	-	24.2	22.6	26.2	24.2	18.0	15.7	14.3	6.6
Average	21.8	21.2	25.1	23.7	26.4	25.1	18.4	16.2	14.7	6.7
Median	21.8	21.1	25.1	23.5	26.3	25.0	18.1	15.9	14.5	6.6
Minimum	21.7	21.0	24.2	22.6	26.2	24.2	18.0	15.7	14.3	6.6
Maximum	21.9	21.4	25.6	24.9	26.8	26.1	19.6	17.6	15.6	7.0

Table 2.1-8: DO Concentration (mg/L) Profiles in the Hiram Impoundment

Depth (m)	June 22 11:45	June 29 9:00	July 12 13:00	July 24 12:30	Aug. 9 11:35	Aug. 29 12:15	Sept. 13 12:30	Sept. 27 13:15	Oct. 9 12:35	Oct. 25 12:40
0.25	8.19	8.18	7.63	7.74	7.24	7.68	8.86	9.18	9.29	11.52
1	8.16	8.15	7.59	7.72	7.13	7.66	8.83	9.23	9.23	11.42
2	8.15	8.13	7.56	7.68	7.11	7.64	8.88	9.26	9.22	11.36
3	8.13	8.13	7.53	7.68	7.08	7.62	8.87	9.26	9.21	11.32
4	8.11	8.12	7.50	7.65	7.07	7.63	8.85	9.26	9.20	11.33
5	8.10	8.11	7.46	7.65	7.05	7.62	8.83	9.21	9.17	11.32
6	8.09	8.10	7.45	7.65	7.02	7.61	8.82	9.19	9.16	11.29
7	-	-	7.36	7.61	7.00	7.50	8.83	9.21	9.13	11.27
Average	8.1	8.1	7.5	7.7	7.1	7.6	8.8	9.2	9.2	11.4
Median	8.1	8.1	7.5	7.7	7.1	7.6	8.8	9.2	9.2	11.3
Minimum	8.1	8.1	7.4	7.6	7.0	7.5	8.8	9.2	9.1	11.3
Maximum	8.2	8.2	7.6	7.7	7.2	7.7	8.9	9.3	9.3	11.5

Table 2.1-9: DO Percent Saturation (Percent) Profiles in the Hiram Impoundment

Depth (m)	June 22 11:45	June 29 9:00	July 12 13:00	July 24 12:30	Aug. 9 11:35	Aug. 29 12:15	Sept. 13 12:30	Sept. 27 13:15	Oct. 9 12:35	Oct. 25 12:40
0.25	93.5	92.6	93.4	93.4	90.5	94.5	96.7	95.9	93.1	94.2
1	93.1	91.7	92.4	92.2	88.6	93.5	94.5	95.5	91.5	93.3
2	92.8	91.5	91.8	90.8	88.1	92.6	94.1	94.2	90.6	92.9
3	92.6	91.4	91.3	90.4	87.8	92.2	93.8	93.7	90.3	92.6
4	92.4	91.2	90.7	90.0	87.6	92.1	93.6	93.3	90.0	92.4
5	92.3	91.1	90.3	89.8	87.4	92.1	93.4	92.9	89.7	92.2
6	92.1	91.0	90.0	89.7	86.8	91.6	93.3	92.8	89.4	92.1
7	-	-	87.0	87.9	86.5	89.5	93.2	92.6	89.2	91.9
Average	92.6	91.4	90.9	90.5	87.9	92.3	94.1	93.9	90.5	92.7
Median	92.5	91.3	91.0	90.2	87.7	92.2	93.7	93.5	90.2	92.5
Minimum	92.0	90.7	87.0	87.9	86.5	89.5	93.2	92.6	89.2	91.9
Maximum	93.5	92.6	93.4	93.4	90.5	94.5	96.7	95.9	93.1	94.2

2.1.4.4 Tailwater Water Temperature and Dissolved Oxygen

The water temperature downstream of Hiram dam ranged from 21.4ºC to 25.7ºC between July 12 and July 31, from 21.4ºC to 27.2ºC in August, and from 18.2ºC to 25.7ºC between September 1 and September 13 (Table 2.1-10, Figure 2.1-6). The average water temperature was 24.0ºC, 24.3ºC, and 22.7ºC in July, August, and September, respectively (Table 2.1-10). The highest temperature (27.2ºC) occurred on August 10 at 15:00, and the lowest temperature (18.2ºC) was observed on the last day of monitoring.

The DO concentration ranged from 6.7 mg/L to 8.4 mg/L between July 12 and July 31, from 7.1 mg/L to 8.5 mg/L in August, and from 6.4 mg/L to 9.5 mg/L between September 1 and September 13 (Table 2.1-10; Figure 2.1-7). The highest DO concentration (9.5 mg/L) was observed on September 11 at 13:00, and the lowest concentration (6.4 mg/L) occurred on September 2 at 04:00. The DO percent saturation ranged from 78.1 percent to 103.5 percent between July 12-31, from 82.8 percent to 103.4 percent in August, and from 74.7 percent to 103.5 percent between September 1-13 (Table 2.1-10, Figure 2.1-7). The highest DO percent saturation (103.5 percent) was observed on July 26 at 16:00 and on September 11 at 13:00. The lowest DO percent saturation (74.7 percent) occurred at 04:00 on September 2. The DO concentration was above the Maine state standard (7.0 mg/L) for 97.8 percent of the monitoring period; taking into consideration the accuracy of the datasonde (±0.2 mg/L), DO was below 6.8 mg/L for 0.7 percent of the time (11 hours). The DO percent saturation met or exceeded the Maine state standard (75 percent) for Class A waters throughout the entire monitoring period, except for one measurement that was 74.7 percent.

Table 2.1-10: Water Temperature (ºC), DO Concentration (mg/L), and DO Percent Saturation Statistics Downstream of Hiram Project, July 12-September 13, 2018

	July 12-31	August	September 1-13
Water Temperature (ºC)			
Average	24.0	24.3	22.7
Median	24.0	24.4	23.6
Minimum	21.4	21.4	18.2
Maximum	25.7	27.2	25.7
DO (mg/L)			
Average	7.8	7.8	7.6
Median	7.8	7.8	7.5
Minimum	6.7	7.1	6.4
Maximum	8.4	8.5	9.5
DO (% Saturation)			
Average	93.3	94.1	87.8
Median	93.3	94.4	87.9
Minimum	78.1	82.8	74.7
Maximum	103.5	103.4	103.5

Figure 2.1-6: Hourly and Daily Average Water Temperature (ºC and ºF) Downstream of Hiram Project, July 12 to September 13, 2018

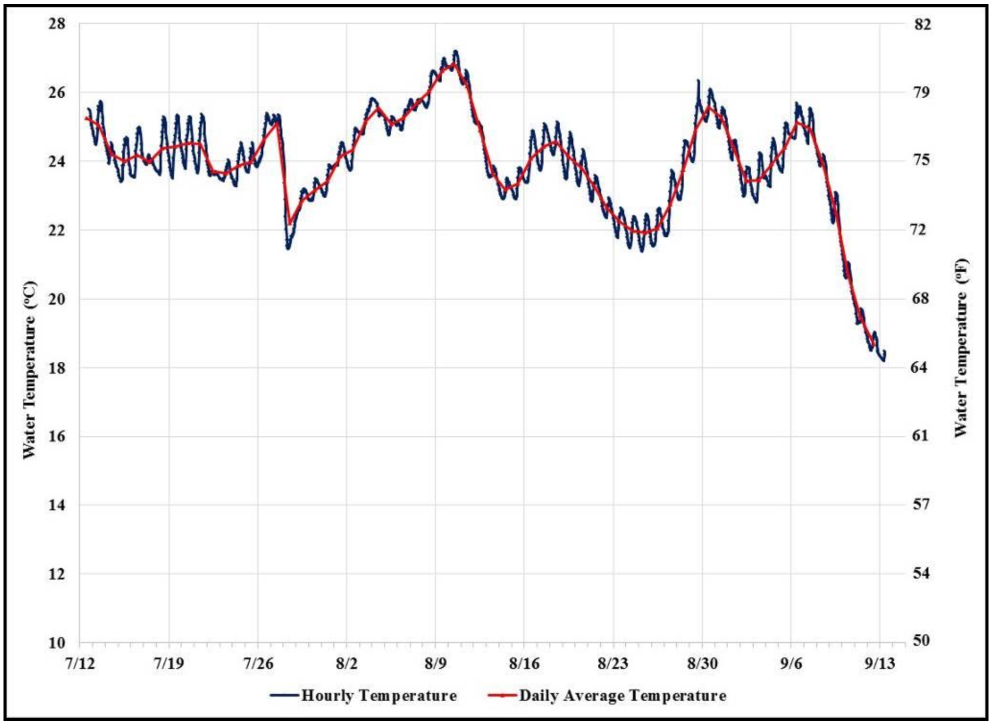
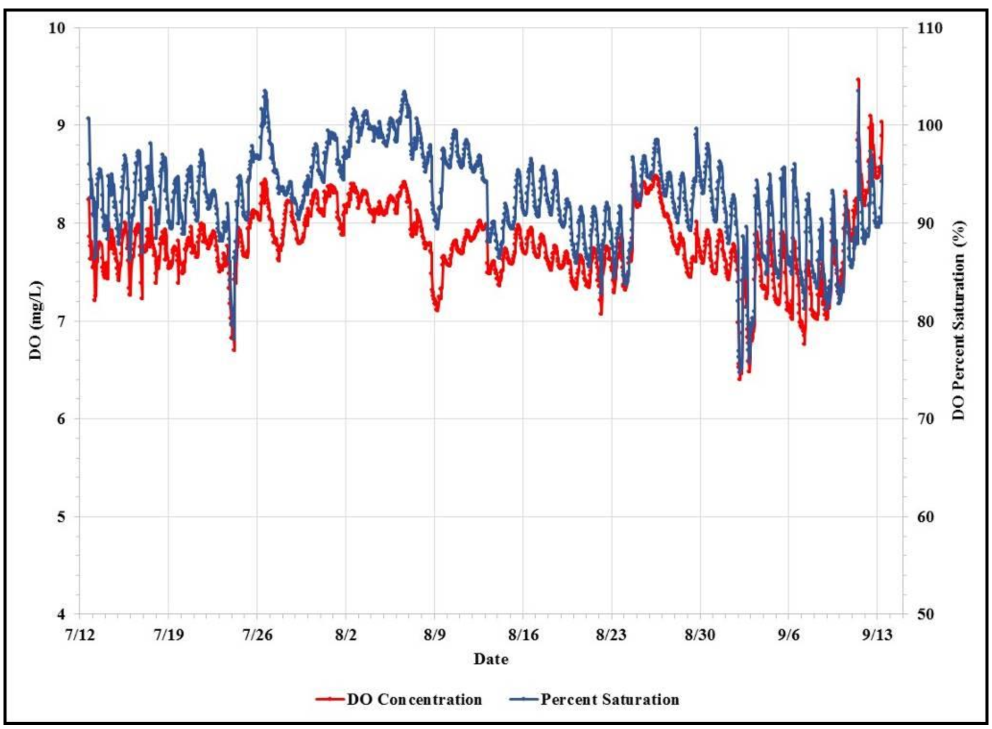


Figure 2.1-7: Hourly DO Concentration (mg/L) and Percent Saturation Downstream of Hiram Project, July 12 to September 13, 2018



2.1.4.5 Impoundment Aquatic Habitat

2.1.4.5.1 Aquatic Habitat

The Hiram Project impoundment is narrow and riverine, extending approximately 7.5 river miles upstream from the dam. The shoreline around the impoundment is steep-sided in many areas, particularly in the upper half of the impoundment (Photo 2.1-8). The dominant substrate is sand – several sand bars occur throughout the impoundment (Photo 2.1-9). There are bands of submerged and emergent aquatic plant beds throughout the impoundment on both shorelines (Photo 2.1-10). Woody debris, undercut banks, and overhanging vegetation are prevalent throughout the impoundment (Photo 2.1-11).

Photo 2.1-8: The Hiram impoundment near the upper terminus of the Project boundary, approximately 7 river miles upstream of the dam

Photo 2.1-9: Sandbar in the Hiram impoundment shoreline approximately 6 river miles upstream of the dam

Photo 2.1-10: Aquatic vegetation along the shoreline of the Hiram impoundment

Photo 2.1-11: Overhanging vegetation and undercut banks along the shoreline of the Hiram impoundment

2.1.4.5.2 Bathymetry and Littoral Zone

The impoundment is relatively narrow and sinuous, widening near the dam. Average water depth during the bathymetry survey was approximately 9 feet and the maximum depth was 31.2 feet; average impoundment width was approximately 200 feet. The average of the summer (i.e., June, July, August, and September[7]) Secchi disk water clarity readings taken during the lake trophic sampling (see Section 2.1.4.2) was 17.5 feet. The littoral zone, defined by MDEP as two times the average summer Secchi disk measurement, would extend to a depth of 35 feet; therefore, the entire impoundment was classified as littoral. Appendix D provides figures showing bathymetry data for the impoundment.

2.1.4.5.3 GIS Impoundment Volume and Surface Area Calculations

The volume and surface area of the impoundment (to the extent included in the bathymetric survey) at the normal full pond elevation of 349.0' is 62,506,726 ft^3 (1,435 acre/feet) and

[7] Includes September 13, 2018, survey only (i.e., summertime measurements only).

7,359,825 ft^2 (169 acres), respectively (Table 2.1-11). The volume and surface area of the impoundment at a headpond elevation of 347.0' is 47,787,525 ft^3 (1,097 acre-feet) and 7,355,343 ft^2 (168.8 acres) respectively (Table 2.1-11). The volume and surface area of the impoundment at 347.0' maintains 76.5 percent of the volume and 99.9 percent of the surface area as compared to the normal headpond elevation of 349.0' (Table 2.1-11).

Table 2.1-11: Comparison of the Surface Area and Volume of the Hiram Impoundment at 349.0 and 347.0 Feet Mean Sea Level

Headpond Elevation	Area (ft^2)	Volume (ft^3)
349.0'	7,359,825	62,506,726
347.0'	7,355,343	47,787,525
Percent Available at 347.0	**99.9**	**76.5**

2.1.4.6 Tailwater Aquatic Habitat

2.1.4.6.1 Aquatic Habitat

The Licensee conducted a transect-based evaluation of tailwater habitat conditions under Project flows with respect to river bank full conditions. Aquatic habitat in the study area is primarily deep run or deep pool with sand, fines (i.e., fine sands or silts), or cobble substrates (Photo 2.1-12 – Photo 2.1-14). The channel is incised, with steep river banks on the river left and river right consisting of fine sediments, undercut banks, and canopy cover. Woody debris was present along both banks (Photo 2.1-12 – Photo 2.1-14).

Photo 2.1-12: The Saco River channel downstream of the Hiram Project at a river flow of 383 cfs

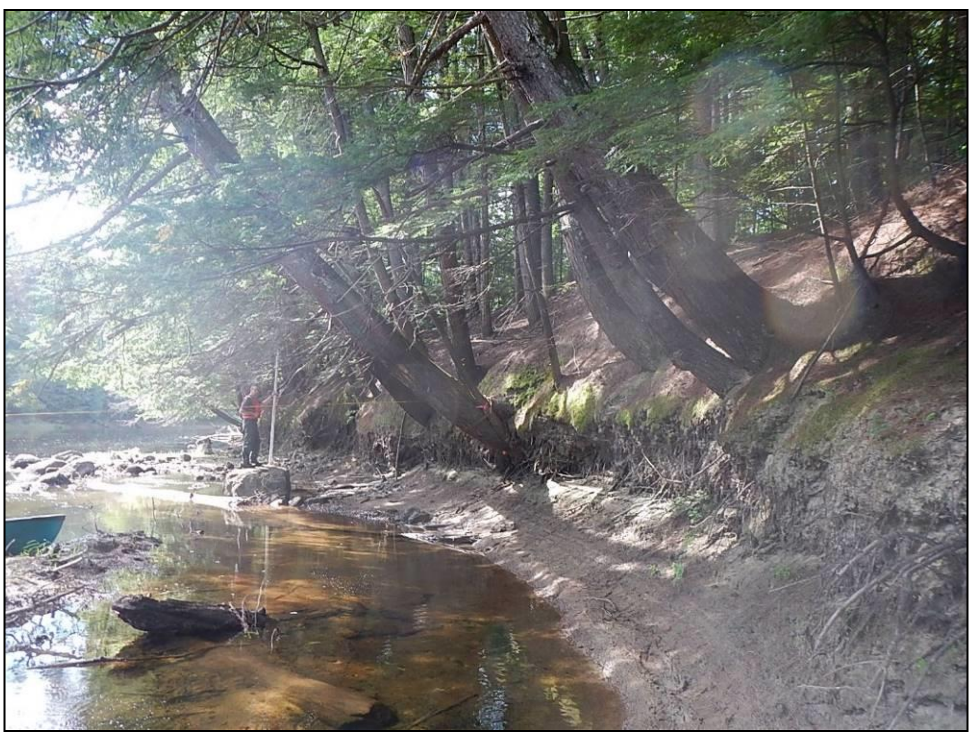


Photo 2.1-13: River right bank of the Saco River near Transect 2 at a river flow of 383 cfs

Photo 2.1-14: River left bank of the Saco River near Transect 2 at a river flow of 383 cfs

2.1.4.6.2 Transect Profiles and Field Measurements

The field survey and transect measurements were made at a flow 383 cfs. Average water depth across the two transects during the field survey was 4.1 feet and 3.3 feet; maximum water depth was 5.3 feet and 5.6 feet (Table 2.1-12). The wetted river width was 182.9 feet at Transect 1 and 205.5 feet at Transect 2. Bankfull width was estimated to be 199.0 feet and 213.5 feet. At 383 cfs, the river wetted 91.9 percent and 96.0 percent of the channel (Table 2.1-12). The river bed cross-sectional profiles at each transect were generally uniform with sandy or cobble substrates, steep-sided banks, and deep pockets of water in the middle of the channel (Photos 2.1-15 and 2.1-16).

Table 2.1-12: Physical River Bed Measurements at Habitat Transects 1 and 2

Transect No.	Average Depth (feet)	Maximum Depth (feet)	Wetted Width (feet)	Bankfull Width (feet)	Dominant Substrates
Transect 1	4.1	5.3	182.9	199.0	sand / cobble
Transect 2	3.3	5.6	205.5	213.5	sand / cobble

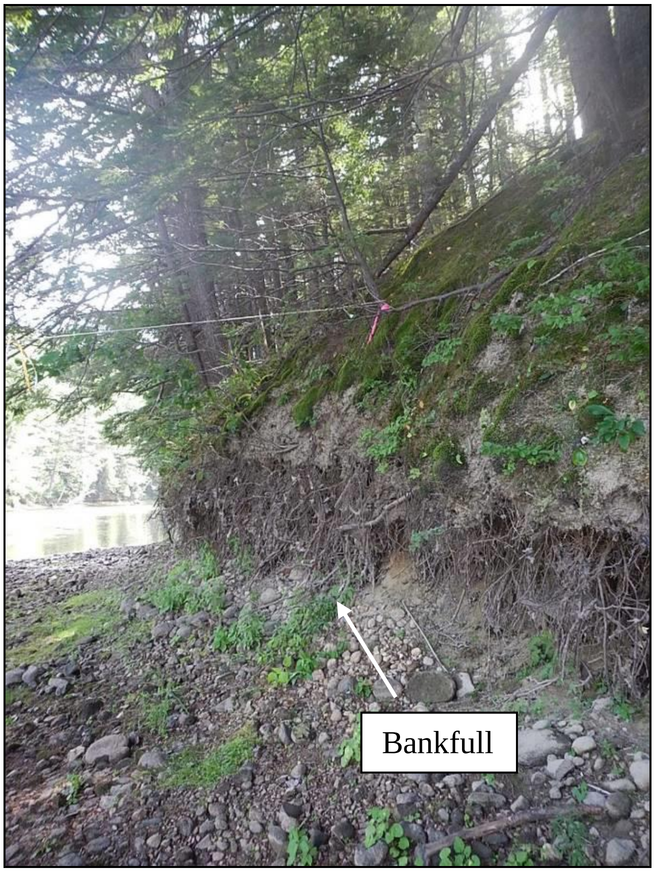


Photo 2.1-15: Bankfull elevation delineation, Transect 1

Photo 2.1-16: Bankfull elevation delineation, Transect 2

2.1.4.6.3 HEC-RAS Modeling of Wetted Width and Cross-Sectional Area

Using HEC-RAS, the bankfull flow was determined to be 722 cfs at Transect 1 and 726 cfs at Transect 2; the average flow for both transects was 724 cfs. HEC-RAS calculated the bank full wetted width to be 199 feet at Transect 1 and 214 feet at Transect 2. HEC-RAS calculated the total cross-sectional flow area for Transect 1 as 1,031 square feet (sq ft) and as 1,033 square feet for Transect 2, with an average of 1,032 sq ft (Table 2.1-13). The existing minimum flow of 300 cfs provides 61 percent of bankfull conditions at Transect 1 and 56 percent of bankfull conditions at Transect 2, with an average value of 58.5 percent (Table 2.1-13). Cross-sectional profiles and WSELs of Transects 1 and 2 are depicted in Figures 2.1-8 and 2.1-9, respectively.

Table 2.1-13: HEC-RAS Model results for Wetted Width and Cross-Sectional Area (ft^2) of Tailwater Habitat

	Modeled Bank Full Flow River Flow ~724 cfs		**Measured Flow 383 cfs**		**Minimum Flow 300 cfs**	
Transect No.	Modeled Bank Full Wetted Width (ft)	Modeled Bank Full Cross Sectional Area (sq ft)	Percent (%) of Bank Full Wetted Width	Percent (%) of Bank Full Cross Sectional Area (sq ft)	Percent (%) of Bank Full Wetted Width	Percent (%) of Bank Full Cross Sectional Area (sq ft)
Transect 1	199 ft	1,031 ft^2	91.9%	70.4%	89.8%	60.6%
Transect 2	214 ft	1,033 ft^2	96.3%	67.0%	89.8%	56.3%

Figure 2.1-8: Cross-sectional Profile and WSELs – Transect 1

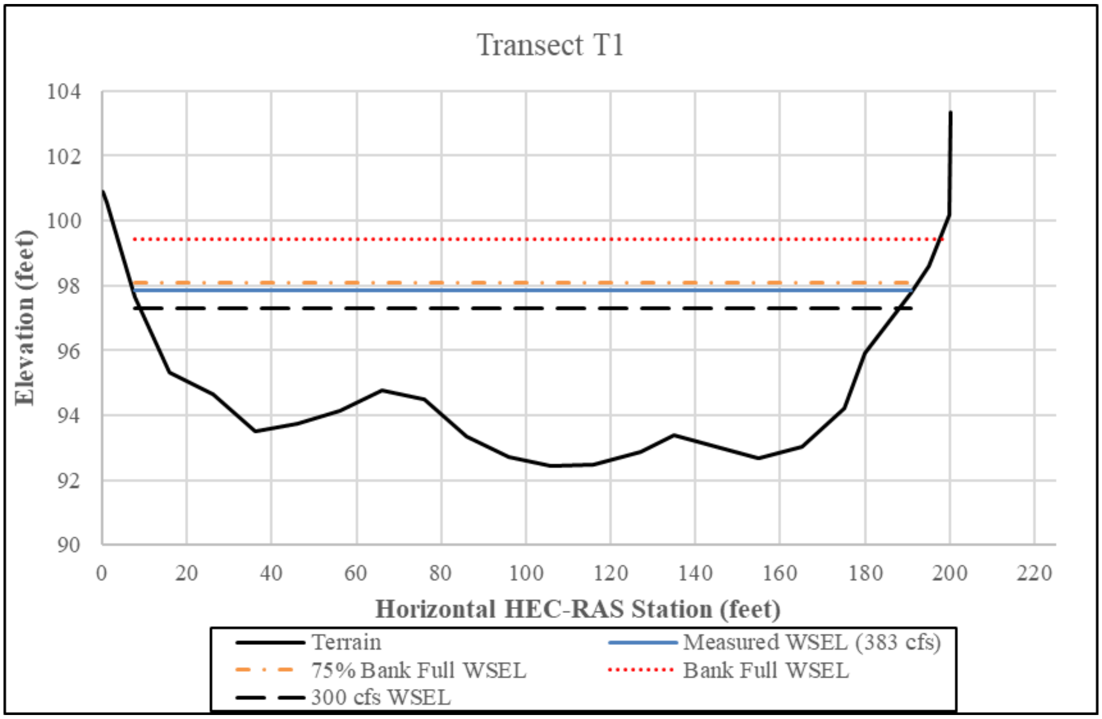


Figure 2.1-9: Cross-sectional Profile and WSELs – Transect 2

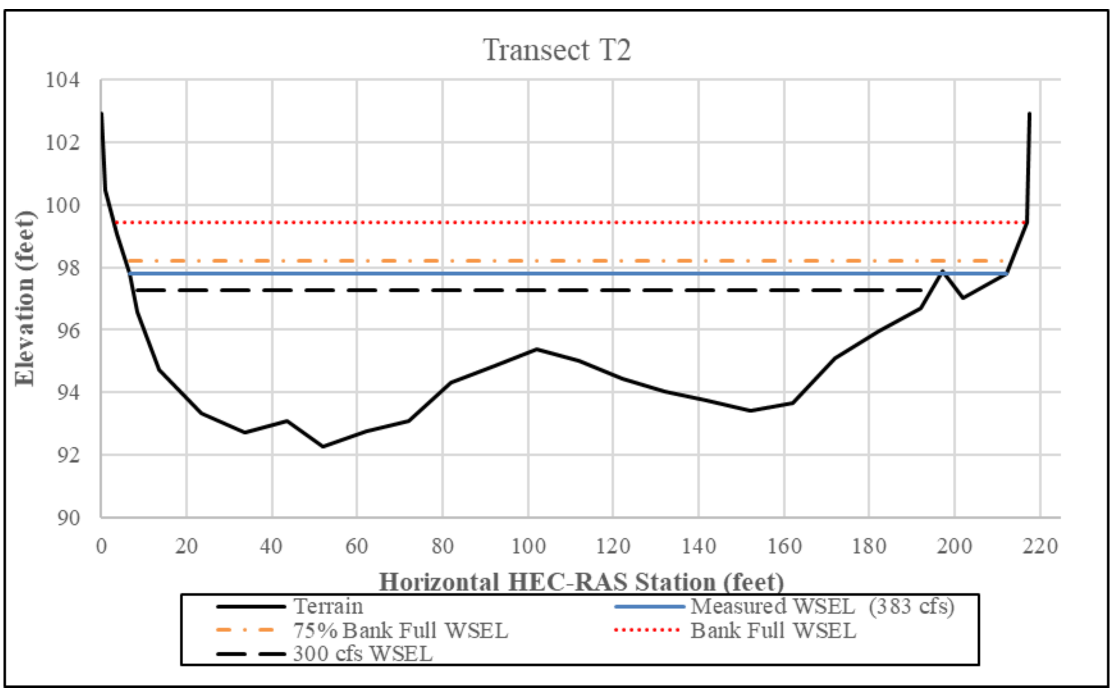


Figure 2.1-8: Cross-sectional Profile and WSELs – Transect 1

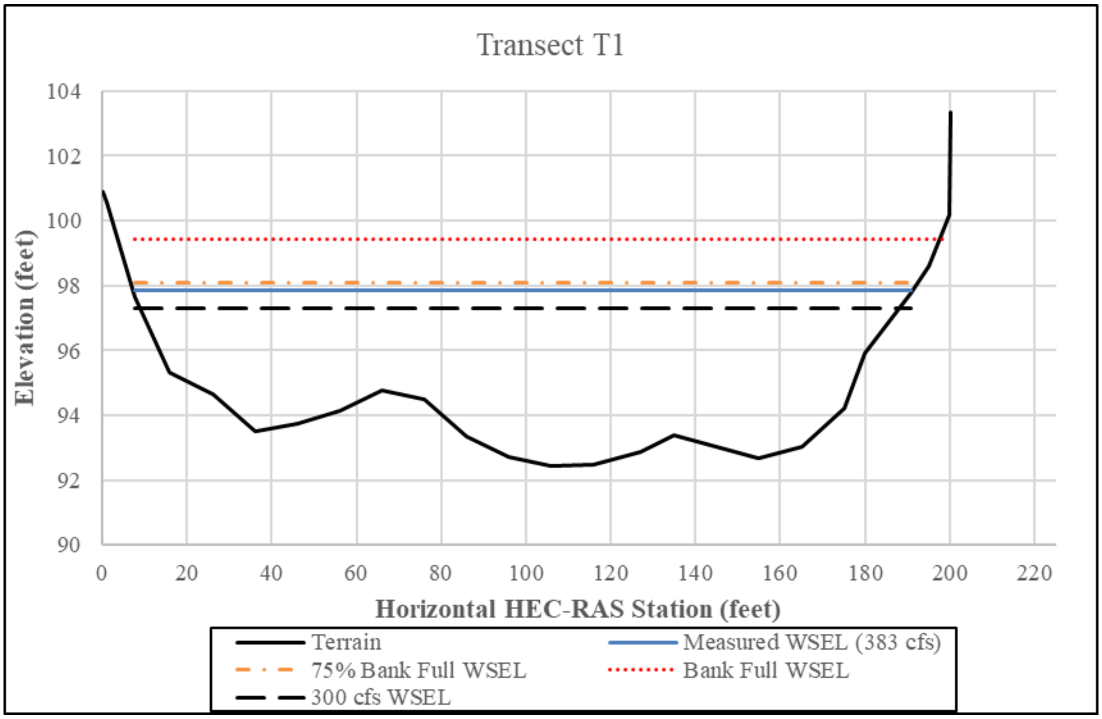
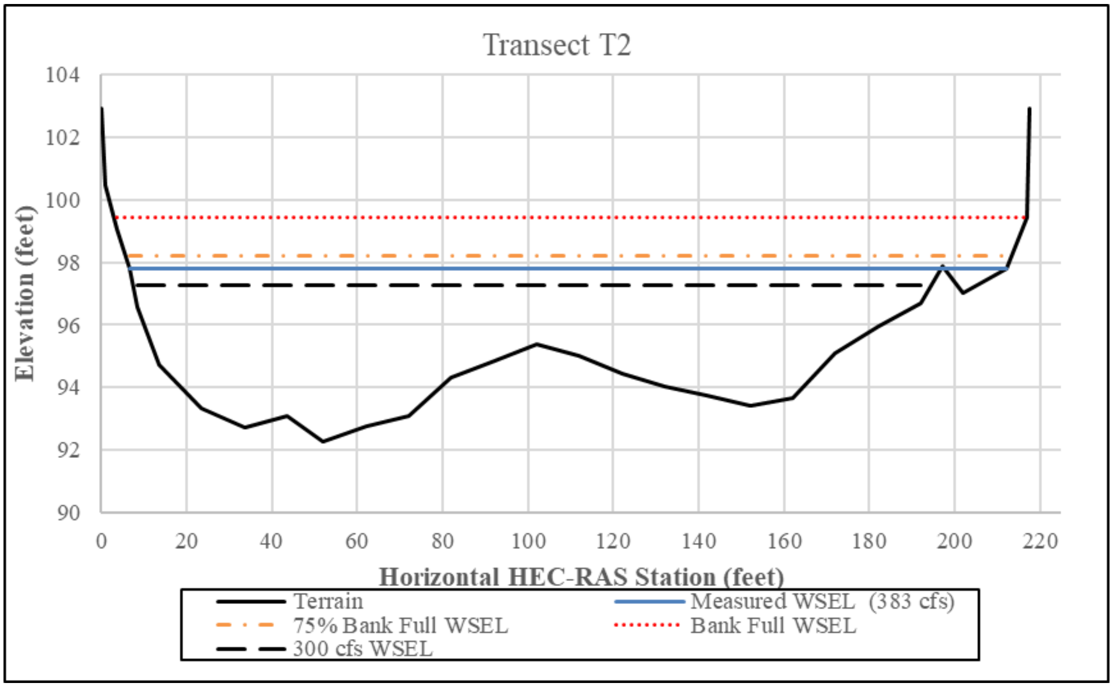


Figure 2.1-9: Cross-sectional Profile and WSELs – Transect 2



2.1.4.7 Benthic Macroinvertebrates

The LDM biocriteria results are shown in Table 2.1-14 and Appendix E. As mentioned previously, to attain to a particular classification a site must have a 60 percent or greater score in the test for that class. The MDEP's model results demonstrate that the community attained Class B Aquatic Life Standards. The make-up of these communities and a discussion of the results are presented below. MDEP used Professional Judgement to make a Final Determination that the community attains Class A aquatic life standards (and therefore, because the standards are the same, it also meets Class AA aquatic life standards). Their reasoning is that lake outlet effects artificially lowered the model results.

Table 2.1-14: Results of the MDEP Linear Discriminant Model (LDM) for a Site on the Saco River in Hiram Maine Downstream of the Hiram Dam.*

Site	Probability of Class A or AA	Probability of Class B	Probability of Class C	Probability of Non-Attainment
1	4%	96%	100%	0%

*** A value of 60 percent or greater is needed to attain a particular class.**

Community Analysis

The macroinvertebrate community sampled below the Hiram dam was abundant and rich in taxa. It was populated with 25 different taxa with a Mean Total Abundance of 812. Structural indices for the sampled community are shown in Table 2.1-15 and Table 2.1-16.

Table 2.1-15: Indices of Community Structure for the Aquatic Invertebrate Community Downstream of the Hiram Dam, Saco River, July - August 2018

Tot. Abund.	Taxa Richness	S-W Div.	Hils. Biotic Index (HBN)	Water Quality Indicatio n from HBN	Mayfly, Stonefly, Caddisfl y (EPT) Richness	Mayfly, Stonefly (EP)		Midge	
						Rich	% Ab	Rich	% Ab
812	25	2.61	5.03	good	16	9	8%	10	10%

Indexes measuring the tolerance to poor water quality conditions revealed that sensitive organisms accounted for a large portion of the community. The EPT richness index showed that sensitive mayfly, stonefly, and caddisfly taxa represented 64% of the taxa identified. Of those 3 orders, the stoneflies and mayflies are generally more sensitive to environmental stressors. The number of taxa from these 2 orders (EP richness) represented 36% of the taxa richness. In terms of numbers (Total Abundance), mayflies and stoneflies made up 8% of the community. Hilsenhoff's Biotic Index value, 5.03, indicated good water quality (Hilsenhoff 1987).

Dominant organisms (representing over 5% of the Total Abundance) in the community are shown in Table 2.1-16, arranged from the most sensitive organisms to the organisms most tolerant of poor water quality conditions. The community was dominated by the filter-feeding caddisfly *Cheumatopsyche* which made up 36% of the total abundance. Other caddisflies, including sensitive filter-feeders *Chimarra* and *Macrostemum* were also dominant.

Table 2.1-16: Dominant Aquatic Invertebrate Organisms Downstream of the Hiram Dam, Saco River, July - August 2018

Sensitivity to Poor Water Quality	Dominant Organism	% of Community
Sensitive	Caddisfly *Chimarra*	16%

	Caddisfly *Macrostemum*	12%
Intermediate	Caddisfly *Cheumatopsyche*	36%
Tolerant	Caddisfly *Oecetis*	6%
	Caddisfly *Neureclipsis*	6%

The community structure and function found downstream of the Hiram dam on the Saco River indicates evidence of organic enrichment and filter-feeder dominance (caddisflies) which is a common phenomenon below lake outlets and impoundments (Hynes 1970, Spence and Hynes 1971, Parker and Voshell 1983). Illes (1956 as discussed in Spence and Hynes 1971) reported an increase in the number of filter-feeding Trichoptera below a lake when compared to upstream communities. He attributed this to an increase in food availability. Filter-feeding organisms, including *Cheumatopsyche* and *Neureclipsis*, are often the dominant organism in streams and rivers (Hynes 1970) and frequently are very abundant at lake outlets (Carlsson et al. 1977; Valett and Stanford 1987). The density or biomass of these filter-feeders typically decline the farther one looks downstream (Osgood 1979). This blossoming and decline of the aquatic community may be in response to a gradient in the quantity and/or quality of the food resources. High quality lake seston (the particulate matter in the water), is processed by the filter-feeders near the outlet and may be transformed to lower quality detritus (Benke and Wallace 1980, Valett and Stanford 1987).

This phenomenon has also been long observed at impoundment outlets. Spence and Hynes (1971) reported increased numbers of Hydropsychidae (*Cheumatopsyche* is a genus in the family Hydropsychidae) and other organisms downstream of an impoundment and stated that the downstream differences were comparable to mild organic enrichment. Parker and Voshell (1983) reported production of filter-feeding Trichoptera to be the highest at a site closest to the dam when compared to sites farther downstream and sites on free-flowing rivers. They concluded that, not only the amount of high quality food, but the specific size of the seston, contributed to the ability of the caddisflies to occupy this niche.

The communities sampled are influenced by the food suspended in the water. This resource allows the aquatic caddisfly filter feeders to flourish. However, the presence of sensitive mayflies and the overall richness of the community, indicates little, if any, change to the resident biological community. The community downstream of the dam is responding as expected within their habitats.

Finally, the MDEP has concluded that the aquatic community below Hiram dam attains Class A standards. LDM results indicate the community attains at least Class Band MDEP used Professional Judgement to make the Final Determination that the aquatic community attains Class A. MDEP's reasoning is that lake outlet effects artificially lowered the model results. It is the professional opinion of MME that the macroinvertebrate community in the tailwater section of Hiram dam on the Saco River is naturally occurring, does not show excessive stress because of the project operation, and attains both Class A and AA aquatic life standards.

2.1.5 Summary

Lake trophic sampling demonstrated that water quality in the Hiram impoundment meets Maine state standards for Class A waters. Chlorophyll-a, pH, Secchi disk transparency, iron, chloride, and aluminum were below the established or proposed standards for these parameters. Total phosphorus was also below the proposed standard except for the sample collected on September 27. The highest water temperatures were observed in July and August (range 22.6ºC to 26.8ºC). The DO concentration and percent saturation ranged between 7.0 mg/L to 11.5 mg/L and 86.5 percent to 96.7 percent, respectively, throughout the entire monitoring period. Both the DO concentration and percent saturation were above the Maine state standards for Class A waters (7 mg/L and 75 percent saturation).

Downstream of Hiram dam, the water temperature ranged from 18.2ºC to 27.2ºC, the DO concentration ranged from 6.4 mg/L to 9.5 mg/L, and the DO percent saturation ranged from 74.7 percent to 103.5 percent throughout the July 12 to September 13 monitoring period. The DO concentration and the percent saturation were above the Maine state standards for Class A waters (7 mg/L and 75 percent saturation) approximately 98 and 99.9 percent of the time, respectively.

The impoundment aquatic habitat study demonstrated that normal operations of the Hiram Project for hydropower generation (i.e., maintaining the head pond elevation between 347.0’ and 349.0’) maintains the littoral zone such that it provides habitat for fish and other aquatic life. The overall surface area of the impoundment changed very little between 349.0’ and 347.0’. The volume of water in the impoundment was reduced by approximately 14.7 million cubic feet at 347.0’; however, more than 75 percent of the littoral zone is still available to support habitat for fish and other aquatic life. Aquatic habitat in the impoundment provides cover in the form of woody debris, aquatic vegetation, undercut banks, and deep pools. There is a considerable amount of shoreline vegetation that provides rearing habitat for juvenile fishes and other aquatic organisms; overhanging vegetation provides areas of shade. No coldwater tributaries were observed in the impoundment. Additional information about the wildlife and botanical resources along the impoundment shoreline are provided in Section 2.2.

Aquatic habitat in the 0.5-mile-long study reach of the Saco River downstream of the Hiram dam is composed of deep, wide pools and deep, slow runs, with a few small, transitional, deep riffles where the bed elevation drops slightly.

The invertebrate community sampled below the Hiram dam was abundant, rich, diverse and populated with stress sensitive taxa. It was dominated by filter-feeding caddisflies. The community structure and function found below the Hiram dam indicates a healthy, natural community that does not show excessive stress because of the Project operation, and attains Class A and AA aquatic life standards, as confirmed by MDEP’s analysis.

2.1.6 Variances from the FERC-approved Study Plan and Proposed Modifications

There were no variances from the FERC-approved RSP.

2.1.7 References

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2.2 Wildlife and Botanical Resources

From August 20-24, 2018, White Pine Hydro conducted reconnaissance surveys to document wildlife and botanical resources, including rare, threatened, and endangered (RTE) species that occur in the Project area. These surveys were identified in the RSP as submitted by Brookfield White Pine Hydro LLC on September 11, 2018 and approved by the FERC in its study plan determination dated October 11, 2018. Each survey is described, respectively, in the following subsections.

2.2.1 Wildlife Reconnaissance Survey

2.2.1.1 Study Objectives

In accordance with the RSP, a wildlife reconnaissance survey of the Hiram Project was performed. The survey was designed to provide information pertinent to:

- Existing wildlife (bird, mammal, and herptile) representative habitats in riparian, wetland, and upland areas along the Project impoundment and downstream reach;
- The presence of wildlife species at the Project; and
- The presence of RTE species or associated habitats.

According to the RSP, the results of this survey are also intended to provide the information necessary to:

- Delineate, describe, and map habitat types within the Project boundary; and
- Identify and map occurrences or likely habitat for RTE species, including the state and federally-listed wildlife species.

An additional component of this effort, as it relates to wildlife habitat, included an assessment of all of the public recreation sites and recreation access areas at the Project to determine if there are any effects on wildlife or wildlife habitats associated with recreation site access and use. Recreation sites assessed included (1) Canoe Portage Trail and Parking, (2) Downstream Access (Fisherman's) Trail, Parking and Sandbar, and (3) Overlook. The objectives of this assessment were to:

- Determine potential Project-related effects on wildlife species (including any proposed tree-removal activities;
- Describe existing wildlife (bird, mammal, and herptile) representative habitats in or immediately adjacent to the existing formal and informal Project facilities;
- Describe the presence of wildlife species; and

- Identify and map occurrences or likely habitat for RTE species.

2.2.1.2 Study Area

The study area for the wildlife reconnaissance survey included the area that is encompassed by the Hiram Project boundary.

2.2.1.3 Methods

The reconnaissance level survey was performed in the summer season and consisted of navigating the study area by boat and on foot, as appropriate. Circumnavigation of the entire impoundment and downstream area, as well as observations within the three recreation areas was completed for general survey purposes. Observations were made both directly (e.g., walking of shoreline to observe tracks) and with binoculars (e.g., to scan water and survey areas for wildlife).

During the survey work, biologists made observations to identify any RTE species that may be present. Observations collected during other studies being performed in accordance with the RSP for the Hiram Project have also been considered.

2.2.1.4 Results

In general, wildlife habitat within the Project boundary includes terrestrial and aquatic habitats. These areas may be further defined as riverine, wetland, maintained electric utility right-of-way, evergreen forest, mixed forest, developed, and riverine sand beach habitats. Because these wildlife habitats are largely described by their respective cover types, wildlife habitats that occur within the Project boundary are described in detail in Section 2.3.2 Botanical Reconnaissance Survey.

Many of the species occurring in the vicinity of the Project are seasonal migrants that travel substantial distances between breeding and wintering areas. Examples of these species include avian species that breed in the area, but winter elsewhere. Other species may have life history and habitat requirements that result in seasonal shifts of habitat usage within the Project area or region. An example of this is the movement of deer to preferred wintering habitats. Finally, certain other species will simply remain in the immediate area of the Project year round, or make only very limited movements between closely associated habitats, as dictated by their life history, overall mobility, and occurrence of acceptable habitat conditions within a relatively small area.

Wildlife species (birds, mammals, and herptiles) that may be expected to be found in the Project area are those typical for the southern region of Maine. Table 2.2-1 lists common wildlife species found in southern Maine. Species that were documented during the wildlife reconnaissance survey performed in accordance with the RSP are indicated with an asterisk (*).

Table 2.2-1: Wildlife Species (Birds, Mammals, Herptiles), Likely to Inhabit the Hiram Project Vicinity, Oxford and Cumberland Counties, Maine

Common Name	Scientific Name
Mammals	
Beaver*	*Castor canadensis*
Eastern coyote*	*Canis latrans*
Eastern chipmunk*	*Tamias striatus*
Gray fox	*Urocyon cinereoargenteus*
Gray squirrel*	*Sciurus carolinensis*
Little brown bat	*Myotis lucifugus*
Long-tailed weasel	*Mustela frenata*
Masked shrew	*Sorex cinerus*
Meadow jumping mouse	*Zapus hudsonius*
Meadow vole	*Microtus pennslyvanicus*
Mink	*Mustela vison*
Muskrat	*Ondrata zibethicus*
Northern short-tailed shrew	*Blarina brevicauda*
Northern flying squirrel	*Glaucomys sabrinus*
Porcupine*	*Erethizon dorsatum*
Raccoon*	*Procyon lotor*
Red fox*	*Vulpes vulpes*
Red squirrel*	*Tamiaciurus hudsonicus*
River otter	*Lontra canadnesis*
Short-tailed weasel (Ermine)	*Mustela erminea*
Snowshoe hare	*Lepus americanus*
Southern bog lemming	*Synaptomys cooperi*
Southern red-backed vole	*Clethrionomys gapperi*
Star-nosed mole	*Condylura cristata*
Striped skunk*	*Mephitis mephitis*
Virginia opossum*	*Didelphis virginiana*

Common Name	**Scientific Name**
Water shrew	*Sorex palustris*
White-tailed deer*	*Odocoileus virginianus*
Woodchuck*	*Marmota monax*
Birds	
Alder flycatcher	*Empidonax alnorum*
American crow*	*Corvus brachyrhynchos*
American kestrel	*Flaco sparverius*
American robin*	*Turdus migratorius*
American woodcock	*Scolopax minor*
Bald eagle* **	*Haliaeetus leucocephalus*
Bank swallow	*Riparia riparia*
Barn swallow*	*Hirundo rustica*
Belted kingfisher*	*Megaceryle alcyon*
Black duck*	*Anas rubripes*
Black-capped chickadee*	*Parus atricapillus*
Black-crowned night-heron	*Nycticorax nyticorax*
Blue jay*	*Cyanocitta cristata*
Brown-headed cowbird	*Molothrus ater*
Canada goose*	*Branta canadensis*
Cedar waxwing	*Bombycilla cedrorum*
Chimney swift	*Chaetura pelagica*
Common goldeneye	*Buchephala clangula*
Common grackle	*Quiscalus quiscula*
Common merganser*	*Mergus merganser*
Common nighthawk	*Chordeiles minor*
Common raven*	*Corvus corax*
Common redpoll	*Carduelis flammea*
Common snipe	*Gallinago gallinago*
Double-crested cormorant	*Phalacrocorax auritus*
Downy woodpecker*	*Picoides pubescens*
Eastern bluebird	*Siala sialis*
Eastern kingbird*	*Tryannus tyrannus*
Eastern phoebe*	*Sayornis phoebe*
European starling	*Sturnus vulgaris*
Evening grosbeak	*Hesperiphona verspertina*
Goshawk	*Accipiter gentilis*
Great-blue heron*	*Ardea herodias*

Common Name	**Scientific Name**
Green-backed heron	*Butorides striatus*
Hairy woodpecker	*Picoides villosus*
Hermit thrush*	*Catharus guttatus*
Herring gull	*Larus argentatus*
Hooded merganser	*Lophodytes cucullatus*
Killdeer	*Charadrius vociferus*
Least flycatcher	*Epidonax minimus*
Mallard*	*Anas platyrhynchos*
Mourning dove*	*Zenaida macroura*
Northern flicker*	*Colaptes auratus*
Northern oriole	*Icterus galbula*
Osprey*	*Pandion haliaetus*
Ovenbird*	*Seiurus aurocapillus*
Pied-billed grebe	*Podilymbus podiceps*
Pileated woodpecker	*Dryocopus pileatus*
Pine warbler	*Dendroica pinus*
Red breasted merganser	*Mergus serrator*
Red-breasted Nuthatch	*Sitta canadensis*
Red-eyed vireo	*Vireo olivaceus*
Red-tailed hawk*	*Buteo jamaicensis*
Red-winged blackbird	*Agelaius phoeniceus*
Ring-billed gull	*Larus delawarensis*
Ring-necked duck	*Aytha collaris*
Rock dove	*Columba livia*
Rose-breasted grosbeak	*Pheucticus ludovicianus*
Ruby-throated hummingbird	*Archilochus colubris*
Ruffed grouse*	*Bonasa umbellus*
Sharp-shinned Hawk	*Accipiter striatus*
Song sparrow*	*Melospiza melodia*
Spotted sandpiper*	*Actitis macularia*
Tree swallow	*Tachycineta bicolor*
Turkey, wild*	*Meleagris gallopavo*
Veery	*Catharus fuscescens*
White-breasted nuthatch*	*Sitta carolinensis*
Wood duck	*Aix sponsa*

Common Name	Scientific Name
Amphibians	
American toad*	*Anaxyrus americanus*
Blue spotted salamander	*Ambystoma laterale*
Bullfrog*	*Lithobates catesbeianus*
Eastern newt	*Notophthalmus viridescens*
Green frog*	*Lithobates clamitans*
Grey tree frog*	*Hyla versicolor*
Northern leopard frog	*Lithobates pipiens*
Pickerel frog*	*Lithobates palustris*
Spring peeper*	*Pseudacris crucifer*
Two-lined salamander	*Eurycea bislineata*
Wood frog*	*Lithobates sylvaticus*
Yellow spotted salamander	*Ambystoma maculatum*
Reptiles	
Blanding turtle	*Emydoidea blandingii*
Common musk turtle	*Sternotherus odoratus*
Eastern box turtle	*Terrapene carolina*
Garter snake*	*Thamnophis sirtalis*
Milk snake	*Lampropeltis triangulum*
Northern water snake	*Nerodia sipedon*
Painted turtle*	*Chrysemys picta*
Redbelly snake	*Storeria occipitomaculata*
Ribbon snake	*Thamnophis sauritus*
Ringneck snake	*Diadophis punctatus*
Snapping turtle	*Chelydra serpentina*
Spotted Turtle	*Clemmys guttata*
Wood turtle	*Glyptemys insculpta*

Source: DeGraaf and Yamaski 2001
* Observed during field surveys.
** Species of state special concern.

Wildlife species and sign observed during the field surveys were typical of common species found in this region of Maine. One RTE species (i.e., bald eagle [*Haliaeetus leucocephalus*]) was observed in the Project boundary in the vicinity of the impoundment (near Bryant Pond) on two separate occasions during the field surveys.

Based on the assessment of the conditions of the recreation sites and the surrounding vegetation (see Section 2.3), public recreation sites and recreation access areas at the Project, effects on wildlife or wildlife habitats associated with recreation site access and use at the Project is considered to be minimal.

2.2.1.5 Summary

A wildlife reconnaissance survey of the area within the Hiram Project boundary was performed from August 20-24, 2018. This survey was conducted by boat and on foot, as appropriate, to investigate all areas within the Project boundary. All observations regarding wildlife habitats, species, and sign were documented. Information from other studies being performed in accordance with the RSP was also taken into account.

Wildlife habitat within the Project boundary includes riverine, wetland, maintained electric utility right-of-way, evergreen forest, mixed forest, developed, and riverine sand beach.

Wildlife species and sign documented during the wildlife reconnaissance survey are typical of common species found in this region of Maine. One RTE species (i.e., bald eagle) was observed during the field surveys.

2.2.1.6 Variances from the FERC-approved Study Plan and Proposed Modifications

There was no variance from the FERC-approved RSP.

2.2.1.7 References

DeGraaf, R. M. and M. Yamasaki. 2001. New England Wildlife: Habitat, Natural History, and Distribution. University Press of New England. Lebanon, NH.

2.2.2 Botanical Reconnaissance Survey

White Pine Hydro conducted a reconnaissance level botanical survey within the Project boundary.

2.2.2.1 Study Objectives

In accordance with the RSP, a botanical reconnaissance survey of the Hiram Project was performed. The survey was designed to provide information pertinent to:

- The nature and extent of riparian and adjacent botanical resources; and
- The presence or absence of RTE botanical species or associated habitats within the Project area.

According to the RSP, the results of this survey are also intended to provide the information necessary to:

- Delineate, describe, and map vegetation cover types within the Project boundary;
- Identify the nature and extent of invasive plant species within the Project boundary; and
- Identify and map occurrences or likely habitat for RTE species, including the state and federally-listed threatened plant, the small whorled pogonia (*Isotria medeoloides*).

An additional component of this effort, as it relates to botanical resources, included an assessment of all of the public recreation sites and recreation access areas at the Project to determine if there are any effects on botanical resources associated with recreation site access and use. Recreation sites assessed included (1) Canoe Portage Trail and Parking, (2) Downstream Access (Fisherman's) Trail, Parking and Sandbar, and (3) Overlook. The objectives of this assessment were to:

- Determine potential Project-related effects on botanical species (including proposed tree-removal activities;
- Identify the nature and extent of invasive plant species within or immediately adjacent to the existing formal and informal Project facilities; and
- Identify and map occurrences or likely habitat for RTE species.

2.2.2.2 Study Area

The study area for the botanical reconnaissance survey included the area that is encompassed by the Hiram Project boundary.

2.2.2.3 Methods

Vegetation mapping involved three phases of work. The first two phases used photo interpretation, and then field verification to identify general cover types within the study area. The third phase was the production of a cover type map. Based on the results of photo interpretation and field verification, vegetation types and land use classifications were assigned. Additional data collected during the field verification helped describe the characteristics of each mapped cover type including species composition, stand structure, habitat quality, and land use. Information collected during the desktop analysis and field surveys included:

- Plant species composition, including the dominate and more prominent associated species in each vegetation layer (tree, shrub and herbaceous layers);
- Structure data, including estimates of aerial cover of the dominant cover types;
- Predominant land use(s) associated with each cover type;
- Rare, unique, and particularly high quality habitat; and
- Occurrence of invasive species.

During the survey work, biologists searched for RTE species, with particular focus on the small whorled pogonia and any potential habitat for this species (Maine Natural Areas Program [MNAP] 2013a). Significant communities of noxious and invasive plant species were also sought.

All RTE species observed, and/or suitable habitats identified, were located with a global positioning system (GPS) unit. Significant habitats within 200 feet of the Project shoreline were also surveyed, quantified and identified via GPS.

Other studies being performed as part of the Hiram Hydroelectric Project relicensing were also considered, and any applicable information was incorporated into this assessment.

2.2.2.4 Results

The study area generally contains two habitat types: terrestrial and aquatic. Terrestrial habitat within the Project boundary is made up of upland areas located above the high water line of the Saco River. Aquatic habitat within the Project boundary is made up of wetlands and the area found within the impoundment, and areas in the downstream reach located below Hiram Dam.

Upland Habitat Communities and Species - Desktop review of aerial photography indicated that the predominant plant community on lands within the Project boundary is forest, with a mix of hardwood and softwood species. There are also several wetland complexes found within the Project boundary, and islands also have some wetland area. There are some relatively small areas of developed lands within the Project boundary and Project electric transmission line corridor. Areas utilized in connection with the operation of the Project and Project-related recreation facilities are comprised of gravel surfaces, paved surfaces, mowed grass, maintained electric transmission line corridor, and unvegetated surfaces. See Figure 2.2-1 for maps of vegetative cover types found within the Project boundary and see Appendix A for representative photographs of the typical communities.

Field surveys confirmed that upland plant communities within the Project area are predominantly variations of the Northern Hardwood Forest Community and the Hemlock Forest Community. The Northern Hardwood Forest Community type is typically made up of sugar maple (*Acer saccharum*), paper birch (*Betula papyrifera*), yellow birch (*Betula alleghaniensis*), American beech (*Fagus grandifolia*), eastern hemlock (*Tsuga canadensis*), and red oak (*Quercus rubra*). Northern Hardwood Forest is the dominant hardwood type in Maine (Gawler and Cutko 2010). Within the Project boundary, the forest exhibits a variation of species composition with some areas showing a mix of other tree species typical of an earlier age of succession, including red maple (*Acer rubrum*), eastern white pine (*Pinus strobus*), red oak, gray birch (*Betula populifolia*), and big-tooth aspen (*Populus grandidentata*). This composition is likely the result of a long history of land settlement in this area.

There are distinct forested areas within the Project boundary that have relatively large components of red oak, eastern white pine, and red maple. These areas may more closely fit the characteristics of the Oak-Northern Hardwood Forest and Oak-Northern Hardwood-White Pine Forest Communities (Gawler and Cutko 2010). The Oak-Northern Hardwood Forest and Oak-Northern Hardwood-White Pine Forest community types within the Project area intergrade gradually, and Northern Hardwood Forest can be considered the matrix forest cover. Aerial coverage of the over story in these forested communities is greater than 65%. The sapling/shrub layer in these communities is made up of young overstory species, yellow birch, eastern white pine, red oak, paper birch, gray birch, hawthorn (*Crataegus* spp.), highbush and late lowbush blueberry (*Vaccinium corymbosum* and *angustifolium*), common witchhazel (*Hamamelis virginiana*), striped maple (*Acer pensylvanicum*), and sweet fern (*Comptonia peregrina*). The herbaceous layer is vegetated with wild sarsaparilla (*Aralia nudicaulis*), New York fern (*Parathelypteris noveboracensis*), bluebead-lily (*Clintonia borealis*), eastern hay-scented fern (*Dennstaedtia punctilobula*), Canada mayflower (*Mauanthemum canadense*), and starflower (*Trientalis borealis*).

Some of the forested areas downstream of the Hiram dam can be described as Oak-Northern Hardwood and Oak-Northern Hardwood-White Pine communities, with some areas of early successional forest cover, as well as areas of Hemlock Forest. The hemlock forest areas are generally found on moderate to steep slopes and are generally a closed canopy forest type dominated by hemlock (> 50% cover) or, less often, hemlock is co-dominant with red oak, yellow birch, red maple, or sugar maple (Gawler and Cutko 2010). The canopy allows little light to reach the forest floor, and the shrub, herb, and bryoid layers are sparse. Small conifers are present in the herb layer, as well as scattered individuals of typical upland conifer forest plants such as Canada mayflower, starflower, partridgeberry (*Mitchella repens*), and wild sarsaparilla. The ground layer was dominated by conifer litter.

Silver maple (*Acer saccharinum*) are located along portions of low river banks within the Project boundary. The silver maple occurs in the overstory and is mixed in with red maple, red oak, and white pine. There is a shrub layer and an herbaceous layer comprising the understory within these low areas. The shrub layer includes silky dogwood (*Cornus amomum*) and speckled alder (*Alnus incana* spp. *rugosa*); the herbaceous layer includes raspberries (*Rubus* spp.), bracken fern (*Pteridium aquilinum*), ostrich fern (*Matteucia struthiopteris*), sensitive fern (*Onoclea sensibilis*), and poison ivy (*Toxicodendron radicans*). These areas do not clearly fit into a larger community type description, and are small inclusions of variation in the Northern Hardwoods Forest matrix. Some of the low river bank areas are upland that are periodically but infrequently flooded during high river flows.

Wetland Habitat Communities and Species - There are wetland areas found along some of the low river banks and on the islands within the Project boundary. Most of these are small in extent. There are several larger wetland complexes found within the Project boundary that are made up of several wetland types. The Cowardin (1979) classification system provides guidance on identification of different wetland types. Wetland types found within the Project boundary include Riverine, Palustrine Unconsolidated Bottom (PUB), Palustrine Open Water (POW), Palustrine Emergent (PEM), Palustrine Scrub-Shrub (PSS), and Palustrine Forested (PFO). These types are found together as wetland complexes in several areas within the Project boundary. Riverine classified areas of the impoundment and downstream reach are comprised of stream channels and river bed area. Much of the riverine area within the Project area is not vegetated and has primarily a sand, gravel or cobble/small boulder substrate, while some of the fringes of the impoundment, backwater areas, and low velocity shallow areas have a silty substrate. Silty areas and areas which have low water velocities are generally sparsely vegetated with wild celery (*Vallisneria americana)*, pondweeds (*Potomogeton* spp.), and waterweeds (*Elodea* spp.), and some of the sandy and gravelly shallow areas which have low water velocities are similarly vegetated. There are several backwater areas and old river oxbows that are connected to the Saco River within the impoundment. The majority of these areas consist of mostly deep water (> 3 feet in depth) with areas of shallower PEM vegetation. Within these areas, there are submerged aquatic plants including pondweeds, waterweeds, bladderworts (*Utricularia* spp.), fragrant water lily (*Nymphaea odorata*), little floating heart (*Nymphoides cordata*), and Farwell's water-milfoil (*Myriophyllum farwellii*), a native milfoil species in Maine. Emergent vegetation found growing in these areas bordering the deeper water areas include bulrush species (*Schoenoplectus* spp.), pickerelweed (*Pontederia cordata*), arrowhead (*Sagittaria* spp.), water star-wort (*Callitriche* spp.), three-way sedge (*Dulichium arundinaceum*), broadleaf cattail (*Typha latifolia*), northern blue flag (*Iris versicolor*), and various sedge species (*Carex* spp.). The PEM wetland type is found along the edges of the impoundment shoreline as well as in scattered locations in the downstream reach. Vegetation in the PEM areas includes woolgrass (*Scirpus cyperinus*), Canada bluejoint (*Calamagrostis canadensis*), three-way sedge, fringed sedge (*Carex crinita*), tussock sedge (*Carex stricta*), St. John's wort (*Hypericum* spp.), pickerelweed, arrowhead, joe-pye weed (*Eupatorium* spp.), and northern blue flag. The PSS wetland types are found higher along the margins of the shoreline and on some of the islands. These scrub-shrub areas are vegetated with speckled alder, various willow species (*Salix* spp.), dogwoods (*Cornus* spp.), winterberry (*Ilex verticillata*), viburnums (*Viburnum* spp.), buttonbush (*Cephalanthus occidentalis*), broadleaf meadowsweet (*Spiraea latifolia*), steeplebush (*S. tomentosa*), sweetgale (*Myrica gale*), Canada bluejoint, bulrush, sedges, and woolgrass.

Palustrine forested wetlands are located in the impoundment and were generally found in medium to large tracts in backwaters, along large river meanders, and in the lower reaches of some tributary streams. These areas are often inundated during the spring by high water. This cover type was characteristic of the floodplain forest communities that are found along large northeastern rivers. Dominant overstory species include red maple, silver maple, American elm (*Ulmus americana*), and green ash (*Fraxinus pennsylvanica*). The shrub layer in these systems is limited, but occasional overstory species, alders, and dogwoods occur. Herbaceous vegetation includes sensitive fern, ostrich fern, northern blue flag iris, clearweed (*Pilea pumila*), false nettle (*Boehmeria cylindrica*), and poison ivy.

The palustrine forested wetlands are at an early to mid-successional stage. Canopy species reached heights of 50 to 80 feet and canopy closures ranged widely from 40 to 80%. Structural diversity is generally moderate and patchiness was generally low with few large snags. Most of this cover type appeared to be periodically flooded as indicated by alluvial soil that had been deposited at some sites by a high water event. However, some of these wetlands are located at higher elevations and are less likely to be frequently flooded.

Other Habitat Communities and Species - Other habitat communities within the Project boundary include electric transmission line corridor, developed areas, and riverine sand beach areas. Typical species found in electric transmission line corridor are white oak (*Quercus alba*), white pine, deer tongue grass (*Dichanthelium clandestinum*), goldenrods (*Solidago canadensis* and *S. rugosa*), sweet fern (*Comptonia peregrina*), and raspberries. Developed areas have similar vegetation in addition to broadleaf plantain (*Plantago major*), dandelion (*Taraxacum officinale*), little bluestem (*Schizachyrium scoparium*), and other common weedy species.

Riverine sand beach areas are located in a few places around the impoundment and below Hiram dam and generally consist of relatively small to moderately sized areas found along large river meanders, and along the fringes of some islands. Vegetation in these areas is patchy and other areas consist of sand or gravel. Substrates in these areas are frequently reworked by floods. Typical species found in or growing along the boundaries of riverine sand beach areas consist of speckled alder, various sedge species, patches of little bluestem, and various other graminoid species. See Figure 2.2-1 for a map of vegetative communities found within the Project boundary.

The field survey identified three noxious and invasive species (MNAP 2013b) occurring within the Project boundary. These are Japanese knotweed (*Fallopia japonica*), bush honeysuckles (*Lonicera morrowii/tartarica),* and black locust (*Robinia pseudoacacia*). None of the observed invasive species form significant communities within the Project boundary. A few small stands of bush honeysuckles were mapped along the access road to the Hiram dam. An approximately 60-foot long stand of Japanese knotweed was observed growing within riprap on the western bank of the Saco River at the southern side of the Route 5/113/117 bridge crossing in Hiram.

The majority of this mapped occurrence is located outside of the Project boundary. Additionally, scattered clumps of black locust are located along the forested edges near the sand bar located at the base of the Hiram dam. See Figure 2.2-1 for a map of the locations of invasive species occurrences and distribution within the study area.

Based on the assessment of the public recreation sites and recreation access areas at the Project (see Section 2.3), effects on botanical resources associated with recreation site access and use at the Project is considered to be minimal. However, as part of the assessment, several trees along the shoreline within the downstream sandbar area were observed to have been damaged by people carving, burning, or cutting them down. Several trees were observed cut down with a chainsaw at the site. Section 2.3 the Recreation and Land Use Resources report provides additional details regarding recreation at the Project, as well as provides representative photographic documentation of the tree damage observed at the downstream sandbar area.

2.2.2.5 Summary

In accordance with RSP, White Pine Hydro conducted a reconnaissance level botanical survey within the Project boundary. This effort included a mapping component as well as field reconnaissance surveys.

Cover types within the Project boundary are primarily comprised of forested communities. The predominant community is the Northern Hardwoods Forest. Along some locations of low-banked shoreline areas within the Project boundary, silver maples occur. These areas of silver maple, however, are not significant enough in extent to warrant classification as another community type. Wetland areas are found along the shoreline of the impoundment and the downstream reach within the Project boundary. Wetland types are typical of those found in the region and are made up of Riverine, Palustrine Unconsolidated Bottom, Palustrine Open Water, Palustine Emergent, Palustrine Scrub-Shrub, and Palustrine Forested wetland types (Cowardin et al. 1979). Other cover types found within the Project boundary include developed, electric transmission line corridor, and bedrock.

Non-native plants do occur within the Project boundary, however, invasive species are generally not found in significant communities. No occurrences of RTE plant species or unique natural communities were observed within the Project boundary as part of this study. Based on the assessment of the public recreation sites and recreation access areas at the Project, effects on botanical resources associated with recreation site access and use at the Project is considered to be minimal.

2.2.2.6 Variances from the FERC-approved Study Plan and Proposed Modifications

There was no variance from the FERC-approved RSP.

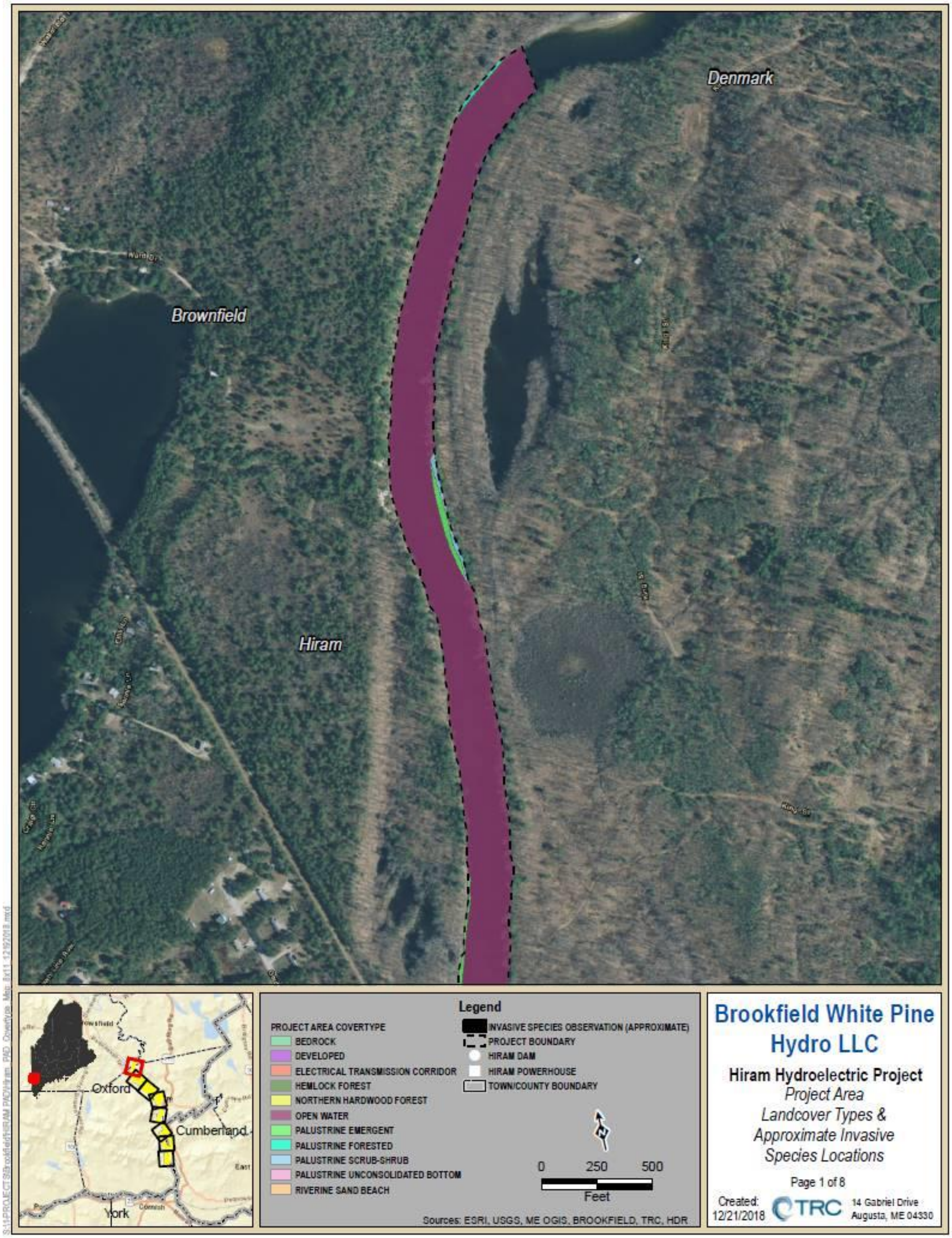
2.2.3 References

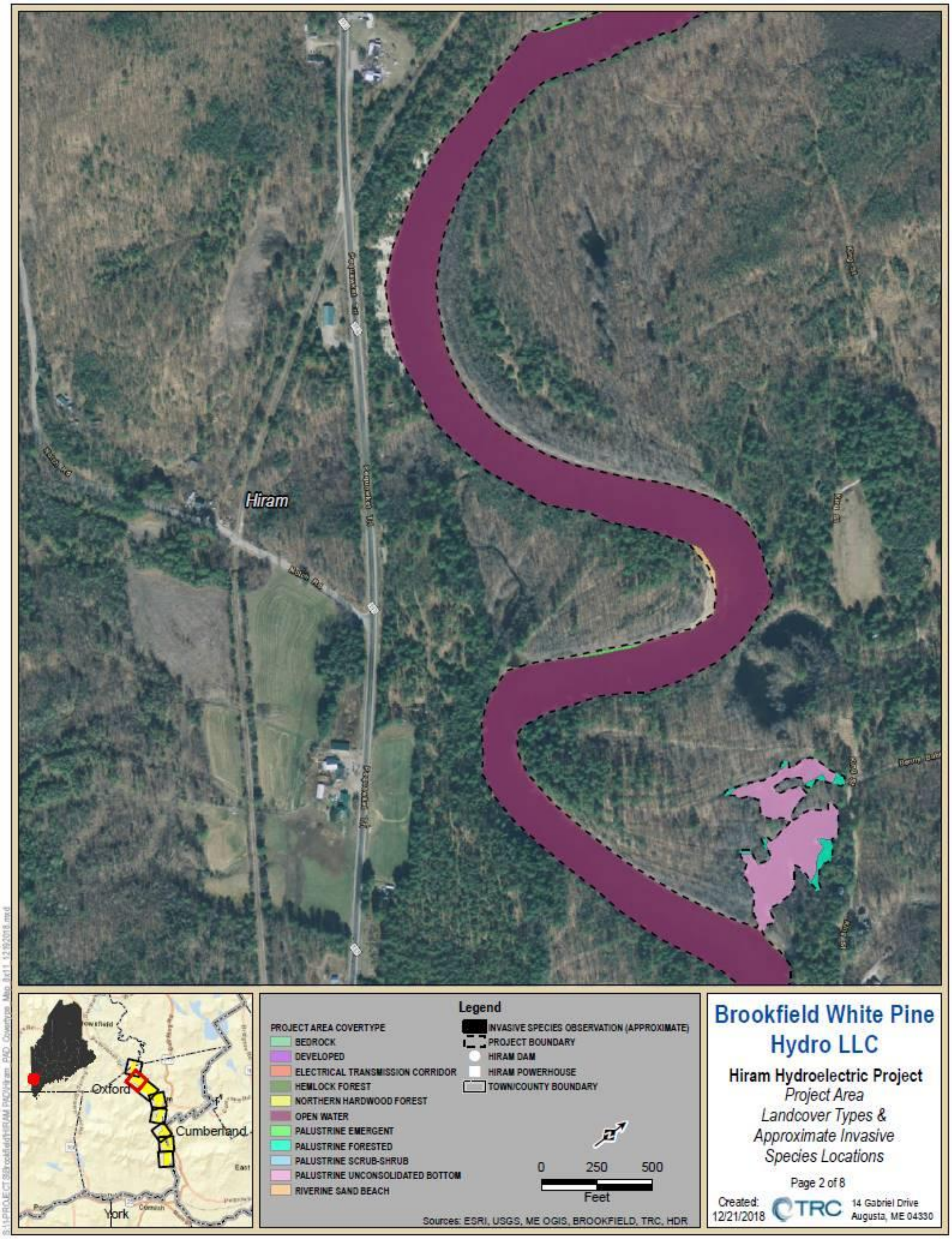
Brookfield White Pine Hydro LLC (White Pine Hydro). 2017. Notice of Intent to File License Application, and Pre-Application Document, Hiram Hydroelectric Project (FERC No. 2530). Brookfield White Pine Hydro LLC, Lewiston, ME. Submitted to FERC November 30, 2017.

Maine Natural Areas Program (MNAP). 2013a. Rare Plants. [Online] https://www.maine.gov/dacf/mnap/features/rare_plants/index.htm.

_____.2013b. Invasive Plants. [Online]: https://www.maine.gov/dacf/mnap/features/invasive_plants/invasives.htm.

Figure 2.2-1: Hiram Project Cover Type Maps

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PALUSTRINE SCRUB-SHRUB
PALUSTRINE UNCONSOLIDATED BOTTOM
RIVERINE SAND BEACH
INVASIVE SPECIES OBSERVATION (APPROXIMATE)
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HIRAM POWERHOUSE
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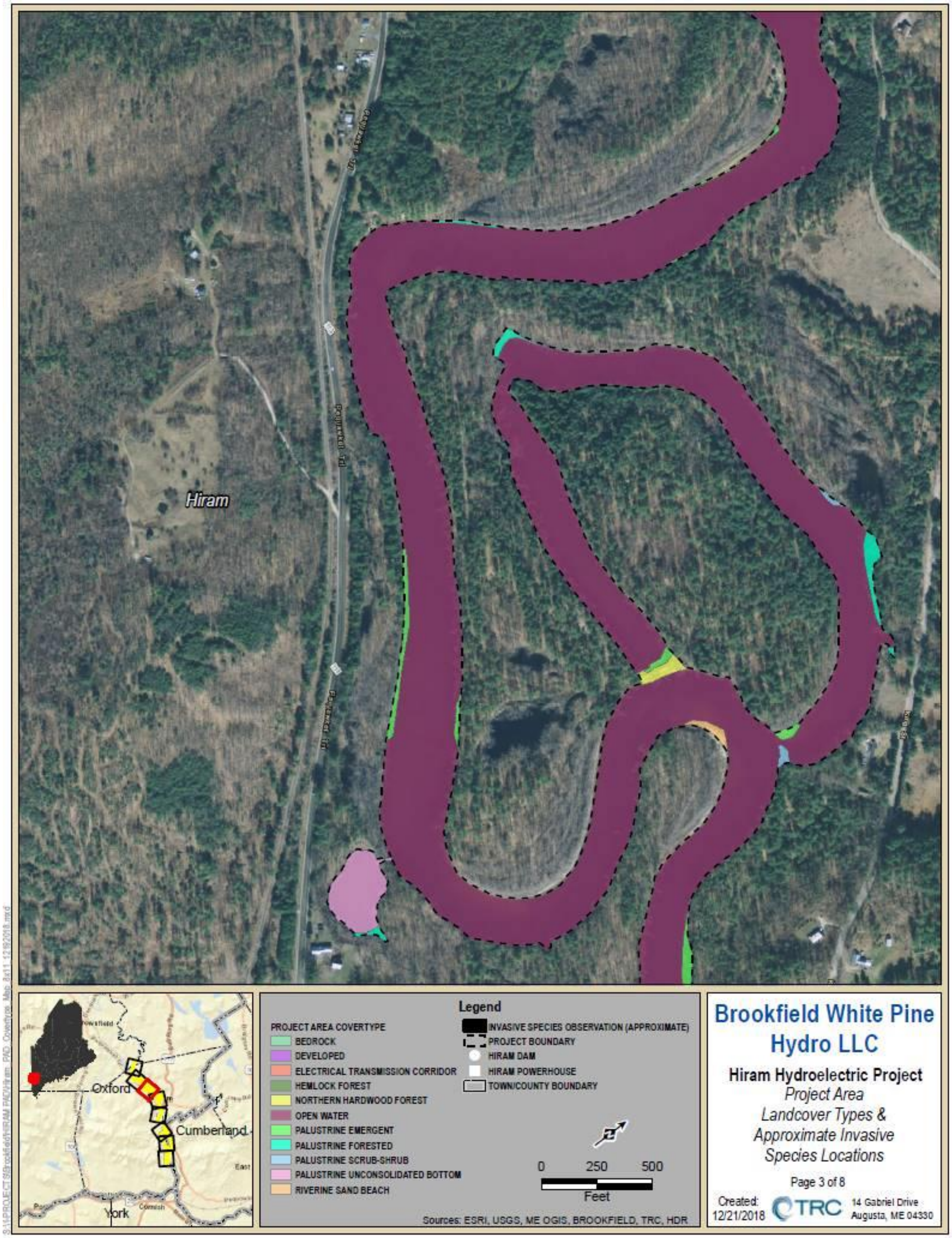
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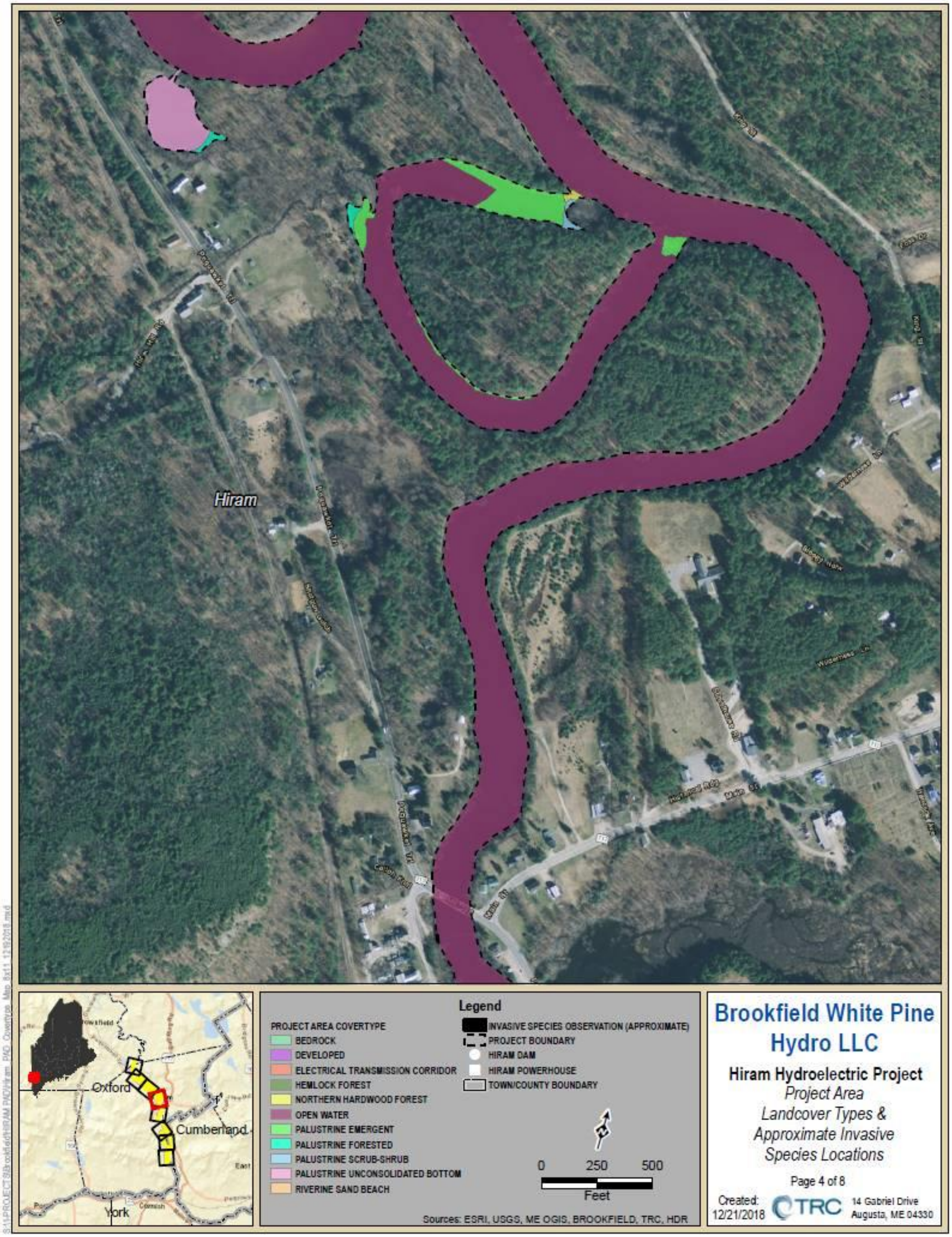
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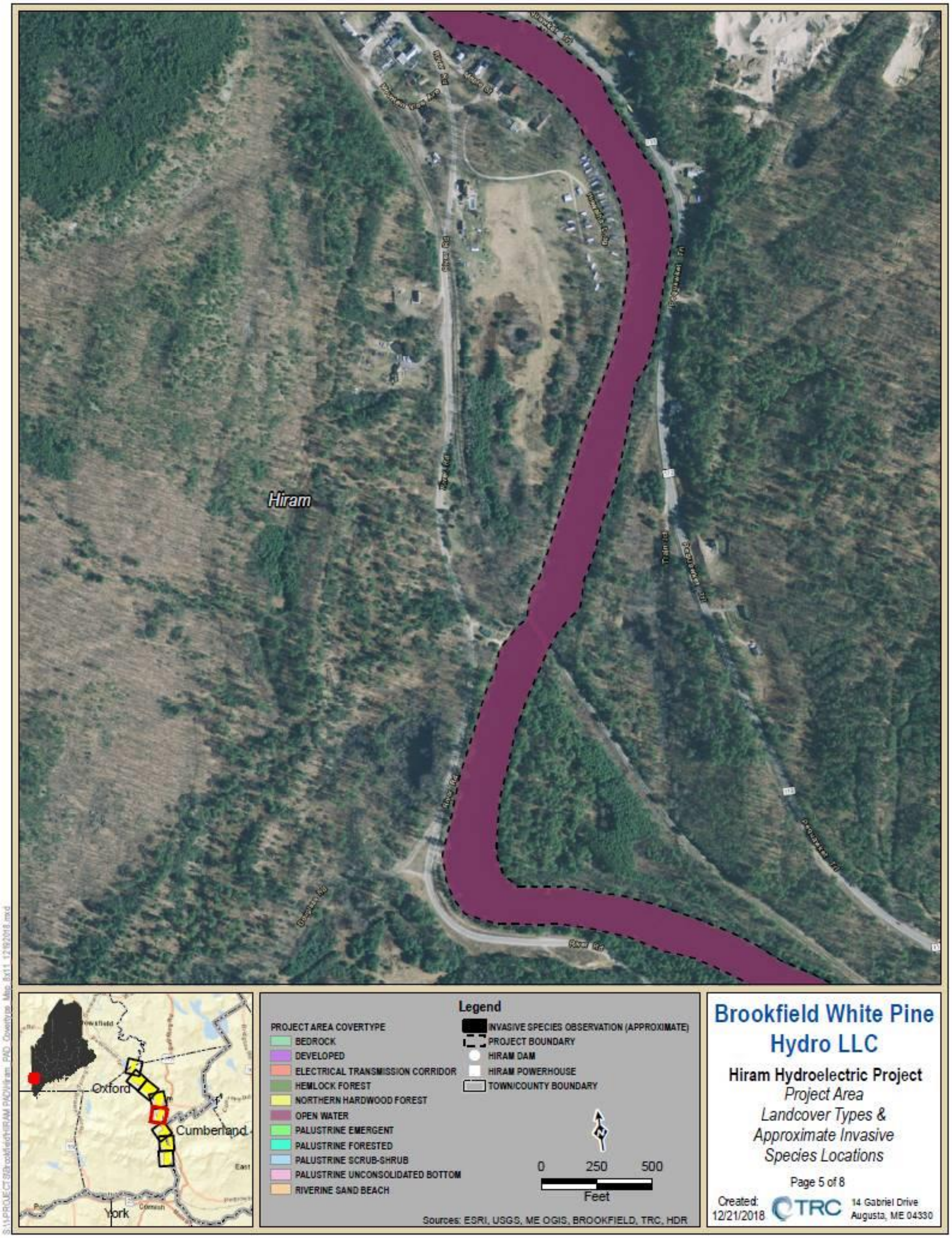
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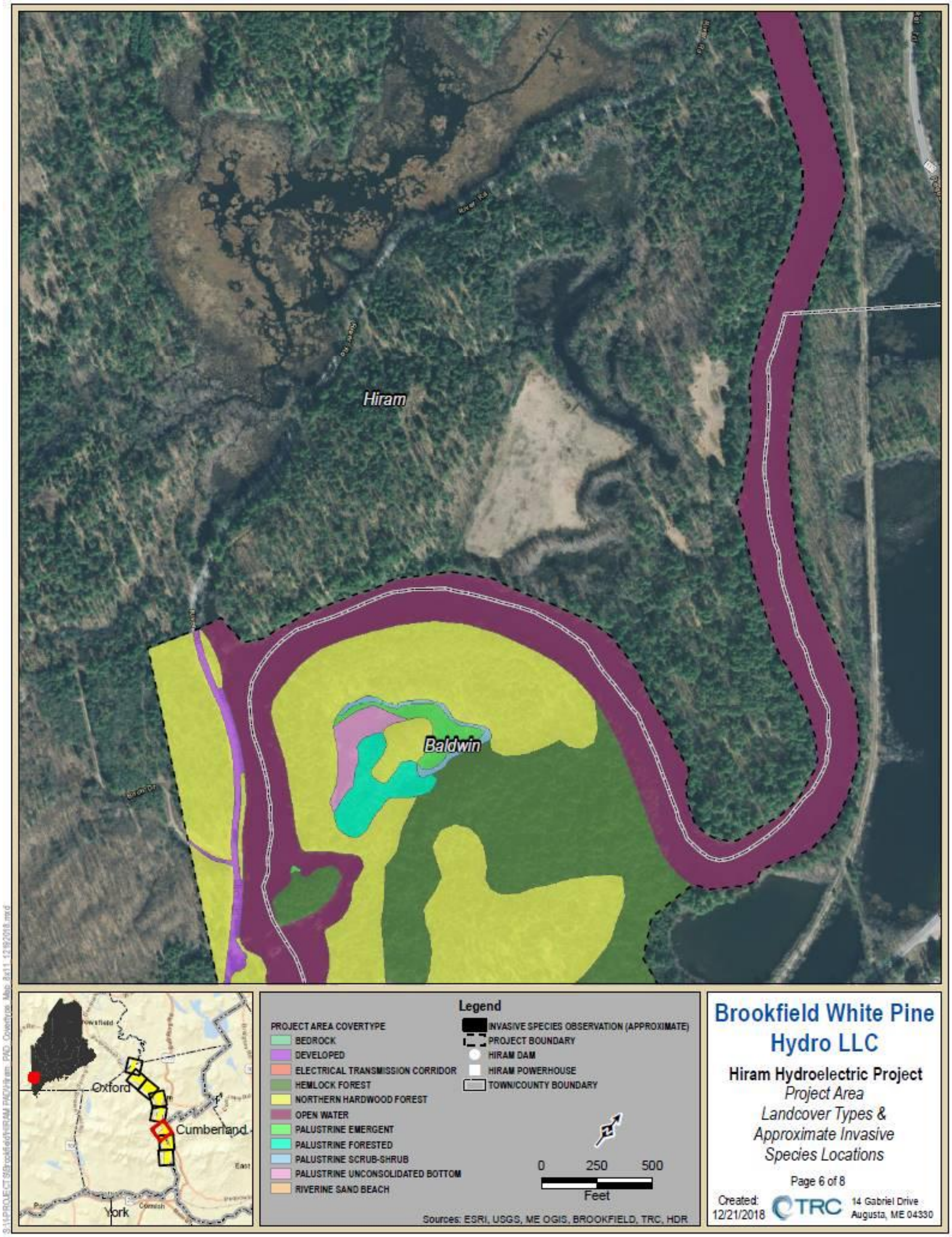
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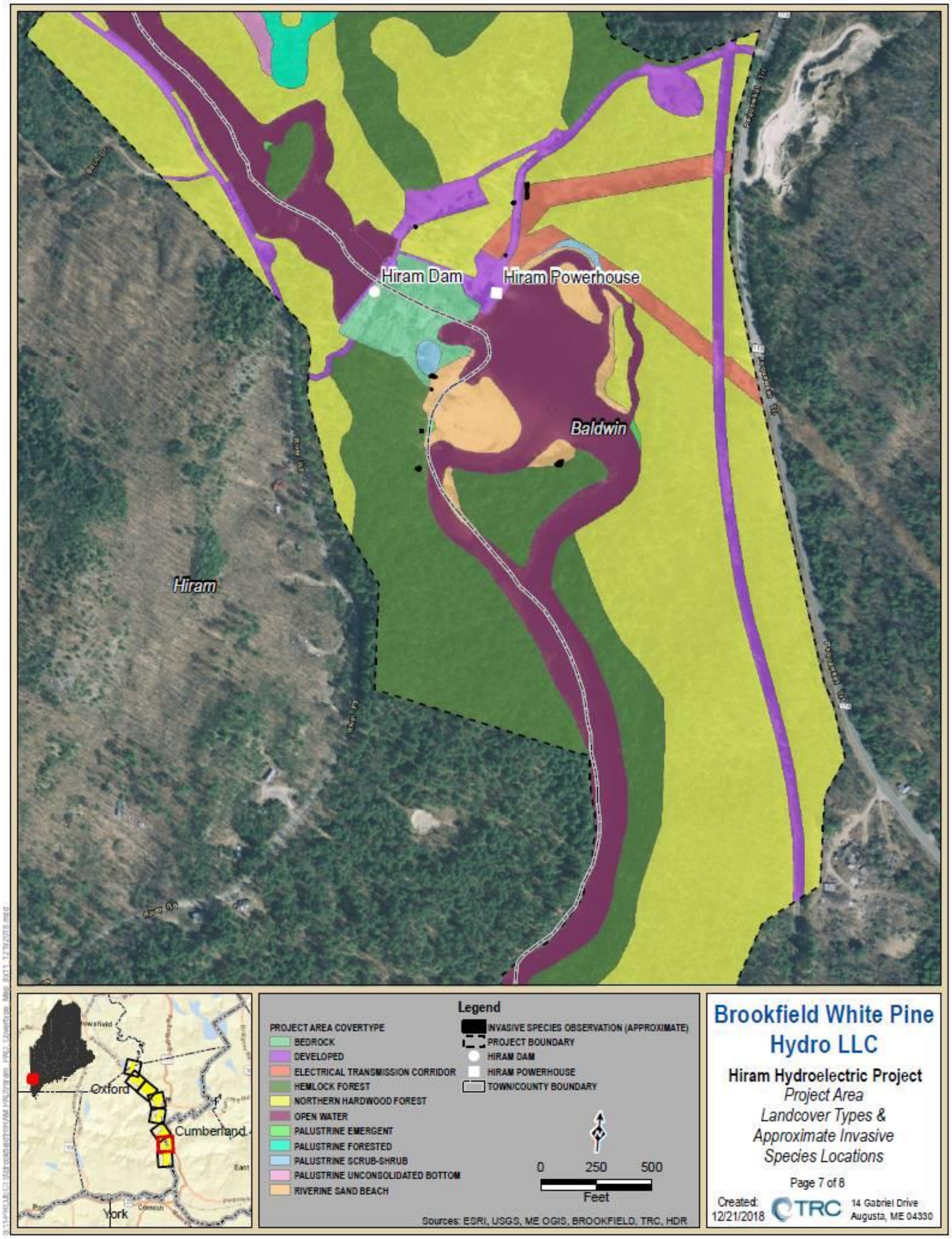
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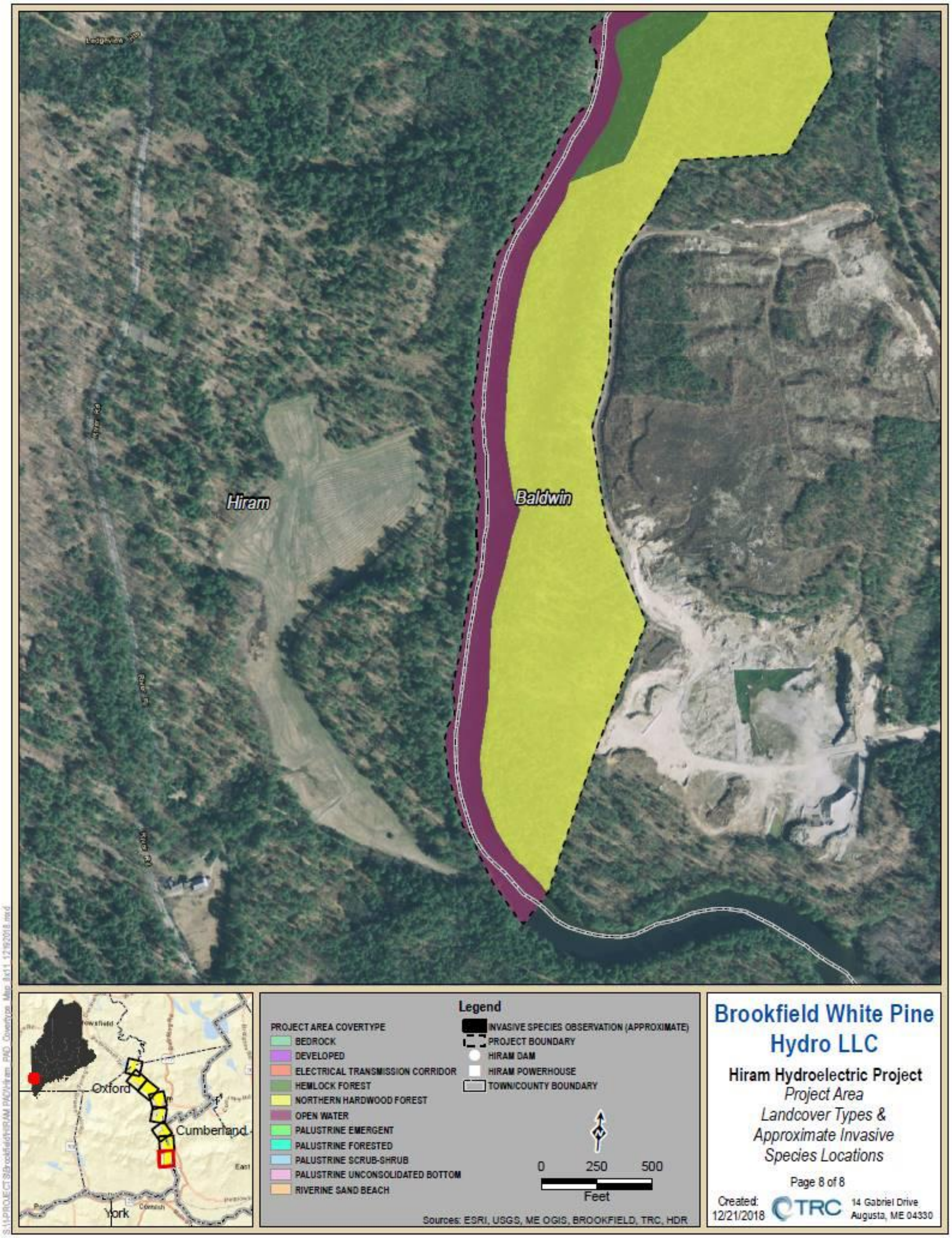
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APPENDIX A

HIRAM PROJECT
BOTANICAL RECONNAISSANCE SURVEY
HABITAT COMMUNITY PHOTOGRAPHS

Photo 2.2-1: Northern Hardwood Forest located along slope near lower end of Project boundary

Photo 2.2-2: Northern Hardwood Forest located along the shore of the Saco River near lower end of Project boundary

Photo 2.2-3: Hemlock Forest located along slope near the lower end of the impoundment

Photo 2.2-4: Typical Palustrine Forested Wetland in background of photograph bordering the impoundment

Photo 2.2-5: Typical Palustrine Forested Wetland bordering the Project boundary in the impoundment

Photo 2.2-6: Typical Palustrine Emergent Wetland bordering the Saco River in the impoundment

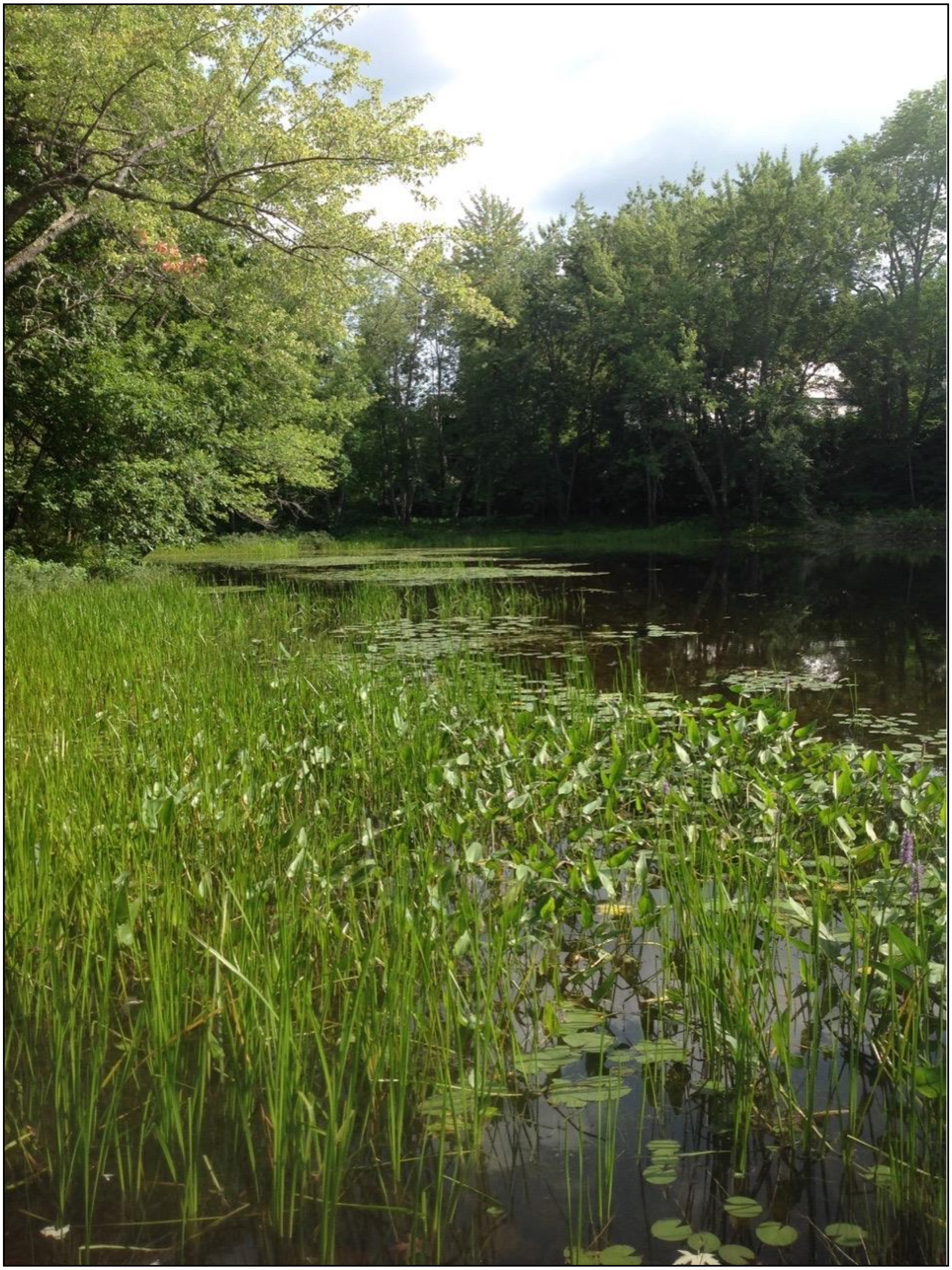


Photo 2.2-7: Typical Palustrine Emergent Wetland bordering the Saco River in backwater area of the impoundment

Photo 2.2-8: Typical Palustrine Emergent Wetland bordering the Saco River in backwater area of the impoundment

Photo 2.2-9: Palustrine Scrub-Shrub Wetland bordering Bryant Pond

Photo 2.2-10: Palustrine Scrub-Shrub wetland on small island near backwater area of the impoundment

Photo 2.2-11: Wetland complex located in the Project boundary bordering the impoundment

Photo 2.2-12: Typical electrical transmission right-of-way in the Project boundary

Photo 2.2-13: Canoe Portage Trail and Parking Area above Hiram dam

2.3 Recreation and Land Use Resources

2.3.1 Introduction

A recreation facilities inventory and condition assessment were conducted in August 2018. Results of the recreation facilities inventory are included herein.

2.3.2 Study Objectives

In accordance with Section 7.4.2 of the RSP as it relates to Project recreation use, the objectives of the Recreation Facilities Inventory were to:

- Identify and assess existing recreational public recreation sites, facilities, locations, amenities, general conditions, and ownership at the Project.
- Document both vegetation removal and any damages to trees and other vegetation that could be related to recreation use at the sandbar access area.
- Examine a potential location for a hard-surface impoundment boat ramp and parking area.
- Include in the study report an assessment of how any proposed changes to the Project boundary would affect recreation access and use at the Project.[8]

2.3.3 Background and Existing Information

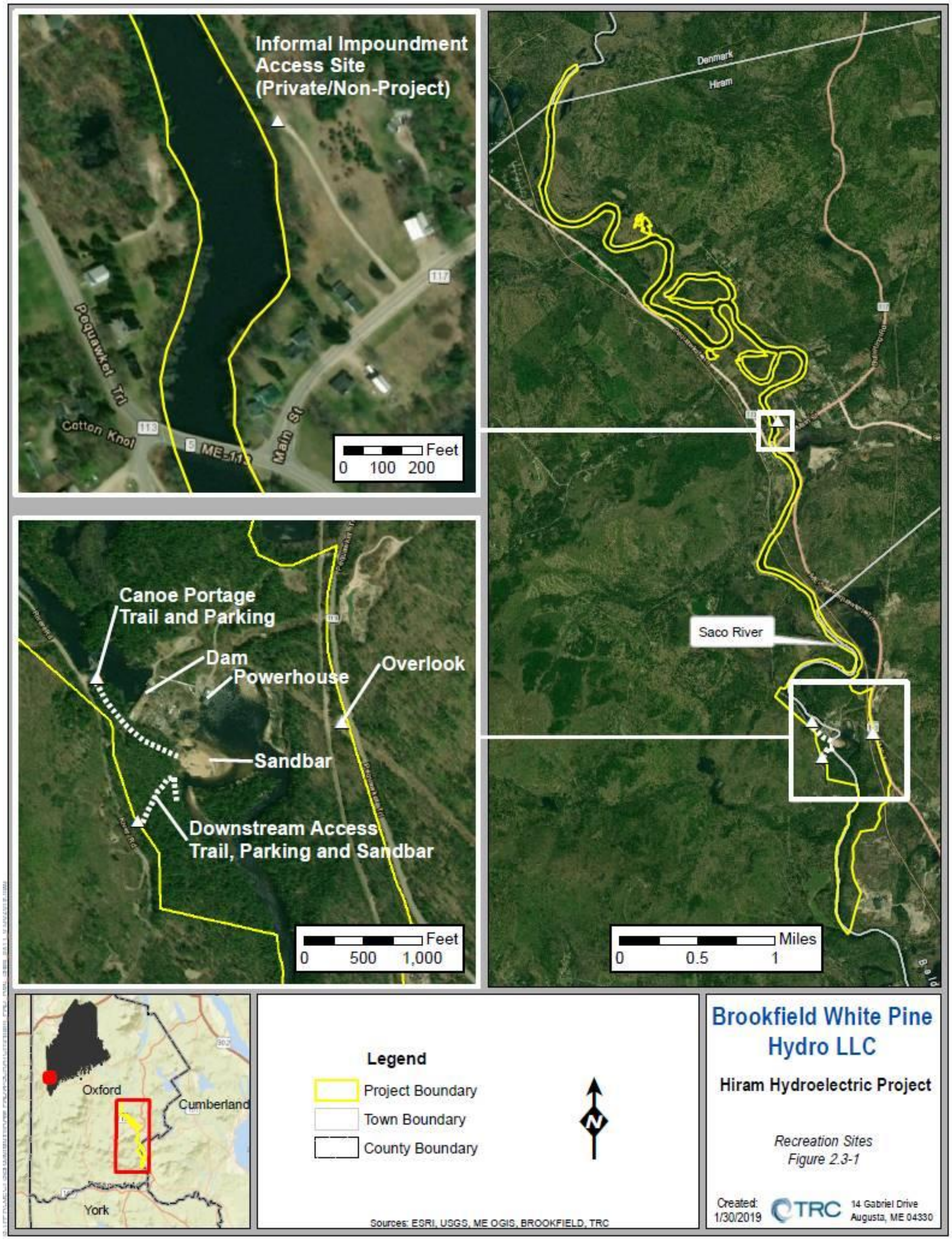
The Hiram Project facilities are located on the Saco River in Oxford and Cumberland Counties, Maine in the towns of Hiram and Baldwin. The Saco River upstream and downstream of the Project offers opportunities for camping, hiking, biking, picnicking, canoeing, and kayaking. Additional recreation opportunities in the Project area include Shawnee Peak Ski Area. State parks and lands in the region include Sebago Lake State Park and Swans Falls Campground (Delorme 2015; Camp Maine 2017). With few exceptions, the lands immediately adjacent to the Project area are primarily undeveloped woodlands. Recreation within the Project boundary typically includes boating (non-motorized and motorized), fishing, and sightseeing. Project lands are generally available for public recreation use.

[8] White Pine anticipates that the effects of any proposed changes to the Project boundary would be assessed in the Draft License Application.

2.3.4 Study Area

The study area for this assessment includes Project lands and waters within the FERC Project boundary and the existing formal FERC-approved Project recreation sites that provide access to Project lands and waters. The formal public recreation sites assessed for this study include: (1) Canoe Portage Trail and Parking, (2) Downstream Parking, Access (Fisherman's) Trail, and Sandbar, and (3) Overlook. Figure 2.3-1 depicts the locations of the sites assessed for this study. In addition, for the portion of the study that examined the potential location for an impoundment boat launch, an existing non-Project, informal boat launch site was evaluated.

Figure 2.3-1: Recreation Sites Assessed at Hiram Project



2.3.5 Study Methods

2.3.5.1 Recreation Facilities Inventory and Condition Assessment

On August 23, 2018, a site inventory and assessment were conducted at each of the recreation sites identified in the RSP and listed above using a standardized inventory form (Appendix F). The assessment included a brief description of the site or access area, an inventory of any facilities, amenities, or improvements provided at the site, photographs of the site, an estimate of parking capacity provided at the site, an assessment of the overall condition of the site using a standardized condition rating scale, and observations on site use, vegetation impacts, condition, and accessibility.

As part of the inventory, the functional and physical condition of each recreation site was evaluated. The general condition of the site was observed by determining the need for major repairs to existing amenities and whether any potential safety concerns were noted. The survey utilized a numeric rating scale to assess the condition of the facilities at the formal recreation sites, as follows:

- Category 1: needs replacement, the items are non-functional, missing pieces or beyond repair;
- Category 2: needs repair, damaged or in a state of disrepair but can be restored;
- Category 3: needs maintenance, functional but may be more frequently used if receive maintenance such as repainting or cleaning; and
- Category 4: good condition and functioning as intended.

Also as part of the inventory, at the request of the FERC, notes were made about observed impacts to site vegetation that were occurring as a result of the public's site use. In particular, observations of vegetation removal and damage to trees and other vegetation that is related to recreation use at the sandbar access area were made.

2.3.5.1.1 Potential Location for Impoundment Boat Ramp

On August 23, 2018 a potential location for a hard-surface impoundment boat ramp was evaluated. Based on the Licensee's knowledge of the impoundment and potential access sites, the evaluation was limited to a single site (Impoundment Access Site) that currently provides informal boat launching access to the impoundment. The existing informal launch site is located partially within the Project boundary, but access to the site is across non-Project lands owned by others. The assessment included a description of the site or access area, an inventory of existing facilities, amenities, or improvements provided at the site, photographs of the site, an estimate of the existing parking capacity provided at the site, an assessment of the overall condition of the existing site using a standardized condition rating scale, and general observations on site use, vegetation impacts, condition, and accessibility. To help assess the potential of the site as the location for a hardened boat launch facility, the depth and velocity of the impoundment (river) mid-channel in front of the existing launch area, was also measured and documented.

2.3.6 Results

2.3.6.1 Recreation Facilities Inventory and Condition Assessment

A recreation facility inventory was conducted for the Project recreation sites: 1) Canoe Portage Trail and Parking; 2) Downstream Access Area; and 3) Overlook. In addition, an inventory of existing conditions was made at one informal, non-Project site, the Impoundment Access Area. Results of the recreation facilities inventory are summarized below for each site and access area (Appendix G contains the field inventory sheets for each site and access area).

2.3.6.2 Formal FERC-Approved Project Recreation Sites

2.3.6.2.1 Canoe Portage Trail and Parking

The Canoe Portage Trail and Parking is located on the west side of the Hiram dam on River Road. The canoe takeout and parking are located within the Project boundary, about 540 feet above the dam, just above the boat barrier (Photo 2.3-1). The canoe portage is accessible via a two lane paved road. White Pine Hydro owns and manages the site. The site consists of a parking area, hand boat launch, and trail that runs through the woods to about 700 feet below the dam to the canoe put-in area. There is parking for approximately six (6) vehicles without trailers. The trail is between 3-10 feet wide and approximately 1,130 feet long (Photo 2.3-2). The canoe portage trail also connects to the Downstream Access (Fisherman's) Trail. There are signs marking the canoe take-out and the portage trail. At the time of survey, the area around the take-out was mowed, but no other vegetation impacts were observed. A small amount of erosion was observed running off of the parking lot to the take-out area. The bank around the take-out area had been stabilized with erosion control mulch and was in good shape otherwise. Overall, the site is in good condition and functioning as intended. A location at the downstream canoe put-in area is shown in Photo 2.3-3, however there is no designated put-in site since a canoe or kayak could be launched from much of the shoreline.

Photo 2.3-1: Canoe Portage Trail and Parking

Photo 2.3-2: Canoe Portage Trail

Photo 2.3-3: Canoe Portage Put-in

2.3.6.3 Downstream Access Trail, Parking and Sandbar

The Downstream Access Area is located on the west side of the Project tailwater, approximately 700 feet downstream of the Hiram dam off of River Road. White Pine Hydro owns and manages the site. The Downstream Access Area is accessible from a two lane paved road and there is parking for approximately eight (8) vehicles (Photo 2.3-9). The trail from the parking area to the shoreline is approximately 10 feet wide and 560 feet long, shown in Photo 2.3-10. There are very slight signs of erosion down this trail. At the shoreline there is a large sandbar, the canoe portage put-in, and bank fishing access. A view of the dam from the sandbar is shown in Photo 2.3-11. During the inventory, a group of three people were observed driving a radio-controlled car on the sandbar (Photo 2.3-12). Photo 2.3-13 shows the sandbar from downstream. There are three user created camping areas accessible from a user created trail along the shoreline of the river south of the dam. Photos 2.3-6 through 2.3-8 show one of the campsites with a clothesline, tent, fire pit, a bag of garbage left hanging from a tree, and burned trash left on the ground. There are several trees along the shoreline that have been damaged by people carving, burning, or cutting them down. Photo 2.3-4 shows an example of trees that were cut down with a chainsaw at the site. Photo 2.3-5 shows an example of a tree that has been carved by people at the site. Otherwise, the site was observed to be in good condition and functioning as intended.

Photo 2.3-4: Trees cut along informal trail along river

Photo 2.3-5: Tree with tool marks

Photo 2.3-6: Camping area with trash

Photo 2.3-7: Burned trash and tent at camping area

Photo 2.3-8: Trash and fire pit at camping area

Photo 2.3-9: Parking area

Photo 2.3-10: Trail to shoreline

Photo 2.3-11: Downstream access area – sandbar

Photo 2.3-12: Group driving radio-controlled car on sandbar

Photo 2.3-13: Looking back toward sandbar from shoreline

Overlook

The Overlook is owned by White Pine Hydro but managed by the Maine Department of Transportation. The Overlook is a pull-off that is accessible from a two lane paved road and is located on the east side of the Project. Any view of the falls and Project powerhouse are obscured by trees (Photo 2.3-14). There is a transmission corridor and railroad tracks that are visible to the west of the Overlook. There is space for approximately six (6) vehicles in the parking area for the Overlook. There was some erosion along the bank of the Overlook headed down toward the railroad tracks, and another spot where water was running off the parking lot and over the bank at the time of survey. The only evidence of vegetation impacts at the site were trees that had been cut along the transmission corridor. Large pot holes at the entrance and exits of the pull-off made accessing the Overlook a challenge. Overall, the site was observed to be in good condition, however there is no view of the Project, nor is there any access to the Project from this roadside site.

Photo 2.3-14: Overlook

2.3.6.4 Potential Location for Boat Ramp Assessment

2.3.6.4.1 Informal Impoundment Access

The Informal Impoundment Access Area is located about 3 miles upstream of the Hiram dam. The site is mostly located outside the Project boundary on a 12.9-acre parcel of privately owned property. A portion of the existing informal boat launch facility lies within the Project boundary. Although it is on private property, this access area has been used by the public to access the Hiram impoundment. Currently, the site provides access to the impoundment with an unimproved one lane gravel boat launch. The launch is located down a one lane dirt driveway that is approximately 525 feet long off of Main Street. There are no formal parking areas at the site. The area used for parking allows for approximately fifteen (15) vehicles with trailers. The grass around the parking area, access road, and launch is mowed.

The river bank at this site is suitable for boat launching, as are the river/impoundment conditions immediately adjacent to the shoreline. As part of the assessment, measurements of river current and depth were made in the vicinity of the informal boat launch site. The velocities of the river measured in the center of the channel at the launch were 0.31 feet per second (ft/sec), 0.48 ft/sec, and 0.39 ft/sec on August 20, 2018. The measured water depth was approximately 6 feet.

The access area site is the only boat launch providing public access to the impoundment. There are no other formal trailer boat launches upstream of this on the Saco River, and no other sites within the Project boundary that the Licensee is aware of that would be suitable for a boat launch. The closest formal hand boat launch is located about 14 miles upstream of the site.

Photo 2.3-15: Informal Impoundment Access Area

Photo 2.3-16: Informal Impoundment Access Parking Area

Photo 2.3-17: Driveway into Informal Impoundment Access Site

2.3.6.5 Variances from the FERC-approved Study Plan and Proposed Modifications

There were no variances from the FERC-approved RSP and no modifications to the study plan area being proposed.

2.3.7 Summary

A recreation facility inventory was conducted for both formal and informal public recreation sites that provide access to the Project as identified in the RSP including the Canoe Portage Trail and Parking, Downstream Access Area, Overlook, and a non-Project, informal, unimproved access area: Informal Impoundment Access Area. Generally, the formal sites were in good condition and meeting their intended function. The informal, unimproved access area consisted of an unimproved boat launch providing access to the Project impoundment.

A summary of the FERC-approved recreation facilities and amenities are included in Tables 2.3-1 and 2.3-2.

Table 2.3-1: Commission Approved Recreation Facilities at the Hiram Project (FERC No. 2530)

Recreation Site Name	Recreation Facilities
Canoe Portage Trail and Parking	Canoe take-out with parking for six (6) vehicles; portage path between take-out and put-in area is a dirt path that is approximately a quarter mile long
Downstream Access Trail, Parking and Sandbar	Bank fishing access with parking for eight (8) vehicles, path between parking area and shoreline is a dirt pathway that is approximately 560-feet long
Overlook	Pull-off with parking for approximately six (6) vehicles

Table 2.3-2: Commission Approved Recreation Amenities for the Hiram Project (FERC No. 2530)

Recreation Amenity Name	Recreation Amenity Type	Amenity Status	Latitude	Longitude	FERC Citation & Date	Notes
Canoe Portage	Take-out	Constructed	43°51'10.60"N	70°47'55.90"W	January 18, 2002 FERC Order Approving As-Built Exhibits 98 FERC ¶62,027	Put-in and take-out with path between that is approximately a quarter of a mile long
Canoe Portage	Put-in	Constructed	44°37'46.68"N	69°35'7.65"W	January 18, 2002 FERC Order Approving As-Built Exhibits 98 FERC ¶62,027	Put-in and take-out with path between that is approximately a quarter of a mile long

2.3.8 References

Brookfield White Pine Hydro LLC (White Pine Hydro). 2018. Hiram Hydroelectric Project Revised Study Plan (FERC No. 2530). Brookfield White Pine Hydro LLC, Lewiston, Maine.

CampMaine. 2017. [Online] https://campmaine.com/our_regions/western-lakes-mountains/ Accessed November 8, 2017.

DeLorme. 2015. The Maine Atlas and Gazeteer. Thirty-fourth Edition. DeLorme, Yarmouth,Maine.

Federal Energy Regulatory Commission (FERC). 2002. Order Approving As-Built Exhibits. 98 FERC ¶62,027. (FERC No. 2530). Issued January 18, 2002.

APPENDIX A

FERC STUDY PLAN DETERMINATION LETTER

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426
October 11, 2018

OFFICE OF ENERGY PROJECTS

Project No. 2530-054 – Maine
Hiram Hydroelectric Project
Brookfield White Pine Hydro LLC

Mr. Frank Dunlap, Licensing Specialist
Brookfield White Pine Hydro LLC
150 Main Street
Lewiston, ME 04240

Reference: Study Plan Determination for the Hiram Hydroelectric Project

Dear Mr. Dunlap:

Pursuant to 18 C.F.R. § 5.13(c) of the Commission's regulations, this letter contains the study plan determination for the Hiram Hydroelectric Project No. 2530 (Hiram Project, or project). The project is located on the Saco River in Oxford and Cumberland Counties in the towns of Hiram, Baldwin, Brownfield, and Denmark, Maine. The determination is based on the study criteria set forth in section 5.9(b) of the Commission's regulations, applicable law, Commission policy and practice, and the record of information.

Background

On May 14, 2018, Brookfield White Pine Hydro LLC (White Pine Hydro) filed its Proposed Study Plan (PSP) for seven studies on: water quality; wildlife and botanical surveys, including rare, threatened, and endangered species; recreation resources; and cultural resources in support of its intent to relicense the Hiram Project.

White Pine Hydro held an Initial Study Plan Meeting on June 13, 2018. Comments on the PSP were filed by Commission staff, the Maine Historic Preservation Commission, the Sebago Chapter of Trout Unlimited (Sebago TU; represented by Mr. Stephen G. Heinz), the Maine Department of Inland Fisheries & Wildlife (Maine Fisheries and Wildlife), and Mr. Robert Scott Cotliaux.[1]

[1] The Maine Department of Environmental Protection (Maine DEP) commented on the PSP, via email correspondence. This correspondence is included in Appendix A of the Revised Study Plan.

On September 11, 2018, White Pine Hydro filed a Revised Study Plan (RSP) that includes eight studies, including a fish assemblage study that was not included in the PSP. Sebago TU, Maine Fisheries and Wildlife, and the U.S. Fish and Wildlife Service (FWS) filed comments on the RSP.

Study Plan Determination

White Pine Hydro's RSP is approved, with the exception of one proposed study that is approved with modifications (*see* Appendix A). This determination requires no additional studies.[2] In Appendix B, we discuss: (a) modifications to the study plan; (b) the basis for modifying the study plan; and (c) our rationale for not adopting additional studies. Although Commission staff considered all study plan criteria in section 5.9 of the Commission's regulations, we only reference the specific study criteria that are particularly relevant to the determination in Appendix B. Studies for which no issues were raised in comments on the RSP are not discussed in this determination.

Unless otherwise indicated, White Pine Hydro must complete all components of the approved studies, not modified in this determination, as described in White Pine Hydro's RSP. Pursuant to section 5.15(c)(1) of the Commission's regulations and the process plan and schedule approved by Commission staff on July 18, 2018, the Initial Study Report for seven of the eight studies must be filed by February 11, 2019.[3] The study report for the eighth study, the fish assemblage study, which will be conducted in the summer and fall of 2019, must be included in the Updated Study Report to be filed by February 11, 2020, pursuant to section 5.15(f) of the Commission's regulations and the staff-approved process plan and schedule.

Nothing in this study plan determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies. In addition, White Pine Hydro may choose to conduct any study not specifically required herein that it feels would add pertinent information to the record.

[2] Sebago TU submitted three studies (Review of Scientific Literature on Brook Trout Movement, PIT Tag Study, and Desktop Fish Impingement and Entrainment Study) as alternatives to its submitted Brook Trout Radio-Telemetry Study. The three study alternatives are treated as components of the Brook Trout Radio-Telemetry Study in this Study Plan Determination.

[3] In order to take advantage of the full 2018 study season, White Pine Hydro anticipates that the Initial Study Report will be available, and the Initial Study Report Meeting held, in February 2019. The Updated Study Report will be available, and the Updated Study Report Meeting held, in February 2020. *See* RSP at 4-1 and 4-2.

If you have any qu
allan.creamer@ferc.gov.

Enclosure: Appendix A
Appendix B

APPENDIX A

SUMMARY OF DETERMINATIONS ON PROPOSED AND REQUESTED STUDIES

Study	Recommending Entity	Approved	Approved with Modification	Not Required
1. Water Quality Study • Impoundment trophic state • Tailwater water quality • Impoundment aquatic habitat • Tailwater aquatic habitat • Downstream macroinvertebrate	White Pine Hydro	X		
2. Fish Assemblage Study	White Pine Hydro		X	
3. Brook Trout Radio-Telemetry Study, or alternatively: • Review of Scientific Literature on Brook Trout Movement • PIT Tag Study • Desktop Fish Impingement and Entrainment Study	Sebago TU			X
7. Wildlife Resources Survey	White Pine Hydro	X		
8. Botanical Resources Survey	White Pine Hydro	X		
9. Recreational Facilities Inventory	White Pine Hydro	X		
10. Phase 1A Pre-Contact Archaeology Survey	White Pine Hydro	X		
11. Phase 1 Historic Period Archaeological Survey	White Pine Hydro	X		
12. Historic Architectural Resources Survey	White Pine Hydro	X		

APPENDIX B

STAFF RECOMMENDATIONS ON PROPOSED AND REQUESTED STUDIES

The following discussion includes staff's recommendations on studies proposed by Brookfield White Pine Hydro LLC (White Pine Hydro) and participants' requests for additional studies. We base our recommendations on the study criteria outlined in the Commission's regulations [18 C.F.R. § 5.9(b)(1)-(7)]. Except as explained below, the Revised Study Plan (RSP), filed on September 11, 2018, adequately addresses all study needs at this time.

Study 2: Fish Assemblage Study

Applicant's Proposed Study

White Pine Hydro proposes to conduct a baseline *Fish Assemblage Study* to: (a) document the fishery assemblage in project waters; and (b) understand the seasonal distribution and abundance of brook trout in project waters. White Pine Hydro proposes to document the relative abundance and distribution of the cold and warm-water fish species present in the project area, evaluate size class information, and estimate species diversity.[1] White Pine Hydro also proposes to collect water temperature data to: (a) document the water temperatures in the main stem of the Saco River at the confluences of the Tenmile and Shepards Rivers upstream of the project's impoundment; and (b) determine whether conditions are suitable for brook trout to use the mainstem of the Saco River upstream of the project's impoundment.

White Pine Hydro proposes to sample three, 1-kilometer-long reaches of the shoreline (0.61 to 1.8 meters of water) in the impoundment and downstream of the project during the fall (once the water temperature declines to 18°C to 20°C) using a boat-mounted electrofishing unit.

Comments on the Study

The Sebago Chapter of Trout Unlimited (Sebago TU) states that it makes little sense to use White Pine Hydro's proposed methodology, including the use of temperature loggers, when brook trout movement can be directly determined by tracking fish

[1] The sampling would replicate efforts conducted in 2006 by the Midwest Biodiversity Institute (MBI); the results of the two surveys would be compared as appropriate.

movements using radio-telemetry or Passive Integrated Transponder (PIT) tagging. (We discuss the merits of Sebago TU's tracking studies in our review of Study 3, below.) The Maine Department of Inland Fisheries and Wildlife (Maine Fisheries and Wildlife) states that because of limitations associated with White Pine Hydro's proposed *Fish Assemblage Study*, on which Maine Fisheries and Wildlife did not elaborate, the study is unlikely to address the questions of concern, and would not accurately reflect brook trout use of the mainstem of the Saco River. Maine Fisheries and Wildlife concludes that the proposed study may result in a false negative[2] for brook trout utilization of the mainstem.

Discussion and Staff Recommendation

Applicability of Proposed Fish Assemblage Study

A fish survey has not been conducted at the project in over 12 years and would indicate whether there are fish species at the project in sizes and numbers that exhibit behaviors, habitat needs, or life history patterns that could be impacted by project operation.

The characteristics of the fish community, combined with the specifications of the project's intake and turbines can determine the species, size, and numbers of fish that could be impinged or entrained at the project, resulting in injury or mortality. This information could be used to inform license articles designed to minimize project effects, if needed (section 5.9(b)(5)).

Because brook trout are a potential species in the impoundment and an important gamefish in the area, they should be sought in the study and their abundance, size, and life stage recorded. Because the brook trout is a cold-water species, methods beyond what would be necessary for warm-water species alone would be needed.

Proposed Fish Assemblage Study Methods

Boat-mounted electrofishing is a scientifically acceptable method for sampling fish along shorelines (section 5.9(b)(6)). Sampling in the reaches immediately upstream and downstream of the project would provide information on the fish species that could be affected by project operation, as discussed above. Further, conducting the survey in the fall, when water temperatures are suitable for brook trout, would help determine whether brook trout are present and potentially affected by project operations (section

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[2] False negative refers to incorrectly determining that something is absent, when it is present.

5.9(b)(5)). These proposed methods are approved. The need to expand these methods is discussed immediately below.

Modifications to the Proposed Fish Assemblage Study – Seasonal Timing

Conducting a *Fish Assemblage Study* in the fall, as proposed, and additionally in the spring would increase the probability of collecting all species that have the potential to exist near the project and be affected by its operation. Mature brook trout may not be abundant in the mainstem of the Saco River during the fall, because mature individuals generally move to streams to spawn over gravelly substrate located above upwelling groundwater (Bonney, 2009). Because they are not mature enough to spawn, juvenile brook trout may be present in the impoundment during the fall. Adult brook trout are more likely to be observed in the impoundment in spring when water temperatures are cool and adults are not spawning. Sampling in spring and fall would help determine the relative abundance of juvenile and mature fish at the project, which could inform license conditions (e.g., reduced trash rack bar spacing, minimum flow requirements, and release locations), if necessary (section 5.9(b)(6)). Thus, in addition to the fall survey, we recommend conducting a survey in the spring that would begin prior to the water temperature reaching 18°C to 20°C, with the specific survey dates determined in consultation with the resource agencies.

Modifications to the Proposed Fish Assemblage Study – Sampling Methods

White Pine Hydro proposes to use boat electrofishing to sample fish, but additional methods would be necessary to sample a greater diversity of habitats in project waters to ensure a more representative sample of the species composition, increase the probability of collecting brook trout, and reduce the probability of a false negative result in one year of sampling. Additional sampling methods that would be appropriate, but are not proposed, include netting methods (e.g., gill-nets or fyke nets) for collecting fish in deeper waters (greater than 1.8 meters) of the impoundment (section 5.9(b)(6)). Thus, we recommend that White Pine Hydro add a deep-water netting method, determined in consultation with the resource agencies, for sampling the impoundment (but not downstream) near the same sampling reaches proposed for boat electrofishing.

White Pine Hydro proposes to use boat electrofishing to sample fish in water that is 0.61 to 1.8 meters deep, but brook trout and other species may also be present in water less than 0.61 meters deep. Although no boat electrofishing is proposed in water less than 0.61 meters in depth, it may be possible to sample shallow water depending on boat draft and safety considerations. Other sampling methods that could be used to sample water less than 0.61 meters include backpack electrofishing and netting (e.g., small seines). We recommend that White Pine Hydro add a shallow-water sampling methodology, determined in consultation with the resource agencies, in order to sample shallow, shoreline habitat near the same reaches as proposed for boat-mounted electrofishing.

Modifications to the Proposed Fish Assemblage Study – Continuous Temperature Monitoring

Tenmile River and Shepard River are located 12.3 river miles and 19.4 river miles upstream of the project-affected area (i.e., near Hiram Dam), respectively. Therefore, the project would not affect water temperatures at these locations, and the proposed temperature monitoring data from those locations would not inform the development of license conditions (section 5.9(b)(5)). As a result, we do not recommend installing temperature loggers at the mouths of Tenmile River and Shepard River.

White Pine Hydro proposes to locate two temperature loggers in unspecified locations of the project impoundment from September 1 to November 1, but does not propose to place any loggers downstream of the project. Locating temperature loggers in the impoundment (as proposed) and downstream of the project, where White Pine Hydro would conduct the *Fish Assemblage Study*, would be needed to ensure that water temperature conditions are suitable for brook trout at the time the survey is conducted (section 5.9(b)(6)). In other words, temperature data would help to determine whether the fish surveys were conducted at an appropriate time with respect to brook trout water temperature preferences. Therefore, we recommend that White Pine Hydro install one temperature logger at each of the three proposed fish survey sites (two in the impoundment, one downstream of the project) to collect continuous water temperature data during the weeks before the fish surveys are conducted through the completion of the fish surveys. The specific location and timing of temperature logger installation and removal should be determined in consultation with the resource agencies.

Study 3: Brook Trout Radio-Telemetry Study

Study Request

Sebago TU states that little is known about the movements of native brook trout within the Saco River watershed. Sebago TU recommends that White Pine Hydro study brook trout migration using radio-telemetry (Appendix E to Sebago TU's RSP comments). The objectives of Sebago TU's study are to: (1) track and document brook trout migration to and from tributary waters and the main stem of the Saco River; (2) document the timing of such movement (seasonal assessment); (3) document whether brook trout congregate above or below Hiram Dam; and (4) document whether brook trout originating from upstream of Hiram Dam are swept downstream during high flow conditions and subsequently hold below the dam.

In the event that the radio-telemetry study is not included in the approved study plan, Sebago TU requests that the following three alternative studies[3] be included in the approved study plan, as a tiered approach.

1. *Review of Scientific Literature on Brook Trout Movement* (Appendix A to Sebago TU's RSP comments) – This study would involve a review of (a) studies cited in previous Sebago TU filings,[4] (b) studies in the western U.S. involving trout movement and hydroelectric operations, (c) Canadian studies such as Curry *et al*. (2002),[5] and (d) the unpublished studies conducted by New Hampshire Fish and Game Fisheries Biologist Dianne Timmons.

2. *Brook Trout Migration Using PIT Tags* (Appendix B to Sebago TU's RSP comments) – This study would involve capturing 10 to 20 brook trout, each from Tenmile River and Shepards River using electrofishing. Tagging would occur in June, with tracking of these fish commencing thereafter and continuing until Tenmile River and Shepards River ice over. The mainstem of the Saco River is

[3] For purposes of this Study Plan Determination, we treat Sebago TU's alternative study approach as an alternative methodology for assessing brook trout movement in the Saco River, and the effects of project operation on brook trout.

[4] Boucher, D.P. and D. Timmins. 2008. Seasonal movements and habitat use of brook trout in the Magalloway River; and the Indian Pond Project Relicensing FERC No. 2142 Radio Telemetry Study. *See* Attachment 6 of Sebago TU's September 25, 2018, filing.

[5] Curry, R. A., D. Sparks, and J. van de Sande. 2002. Spatial and temporal movements of a riverine brook trout population. Transactions of the American Fisheries Society, 131:551-560.

expected to ice-over later in the season; thus, electrofishing on the Saco would be possible (presumably to retrieve tagged fish). According to the proposed study, if no fish are detected leaving the two tributaries, then no electrofishing of the Saco River would occur. If brook trout are detected leaving the tributaries, but none are caught during electrofishing, then the area sampled would be expanded until brook trout are collected. If brook trout are detected leaving the two tributaries and collected during electrofishing, then Sebago TU requests that White Pine Hydro conduct the study in item 3, below.

3. *Desktop Fish Impingement and Entrainment Study* (Appendix C to Sebago TU's RSP comments) – The purpose of this study is to assess the effects of project operation on downstream migrating species, including brook trout and American eel. The study's objectives are to estimate the potential for impingement and entrainment at the Hiram Project's intakes, and the potential level of project-related mortality of downstream migrating brook trout and American eel.

White Pine Hydro did not propose to conduct a radio-telemetry study of brook trout movement in the Saco River watershed. Rather, White Pine Hydro tailored a portion of its proposed Fish Assemblage Study (discussed above as Study 2) to determine whether brook trout use waters in the mainstem of the Saco River, including the project area (*see* above discussion).

Maine Fisheries and Wildlife asks that White Pine Hydro reconsider Sebago TU's requested brook trout telemetry study. FWS provided information in support of Sebago TU's requested *Brook Trout Telemetry Study* and supports the requested *Desktop Fish Impingement and Entrainment Study*.

Discussion and Staff Recommendation

Information on the movement of brook trout throughout the Saco River basin is not needed for our environmental analysis of the project's potential effects on brook trout. The information provided would not be specific to the project and would not inform the development of license conditions (section 5.9(b)(5)). The same conclusion applies to two of Sebago TU's alternatives to the *Brook Trout Radio-Telemetry Study* (i.e., *Review of Scientific Literature on Brook Trout Movement* and *Brook Trout Migration Using PIT Tags*), which seek the same information as the *Brook Trout Radio-Telemetry Study* using different methods. Instead, White Pine Hydro's proposed *Fish Assemblage Study*, approved with the aforementioned modifications, would provide sufficient information regarding the presence of brook trout in the project impoundment and tailrace.

Sebago TU's *Desktop Fish Impingement and Entrainment Study* (a third alternative to the *Brook Trout Radio-Telemetry Study*) could provide site specific information relevant to effects of project operations. However, if brook trout do not use the impoundment, the *Desktop Fish Impingement and Entrainment Study* would not need to include brook trout. Until it is shown that brook trout use the impoundment and could make their way to the turbine intakes to be entrained or impinged, including brook trout in a *Desktop Fish Impingement and Entrainment Study* would have little value (section 5.9(b)(4)).

Regarding the need for a *Desktop Fish Impingement and Entrainment Study* for American eel, White Pine Hydro recently completed 2018 monitoring for the presence of American eel under the *2007 Saco River Fisheries Assessment Agreement (2007 Agreement).* The results of that study will be provided in the Initial Study Report due to be filed in February 2019. Like the case with brook trout discussed above, obtaining the results of White Pine Hydro's 2018 monitoring for the presence of American eel under the *2007 Agreement* could inform the need for an entrainment and impingement study for the American eel at the project. Revisiting a *Desktop Fish Impingement and Entrainment Study* as a possible second year study would allow White Pine Hydro to make use of more information and, if appropriate, design the study to address all potentially affected fish species at once. Therefore we do not recommend a *Desktop Fish Impingement and Entrainment Study* at this time.

Document Content(s)

APPENDIX B

STUDY CONSULTATION RECORD

Meeting Summary
Hiram Project (2530) Proposed Study Plan Meeting
June 13, 2018, 9:00 AM

Meeting Location: Sportsman's Alliance of Maine, Augusta, Maine

Attendees:

Allan Creamer, FERC	Dustin Wilson, FERC
Kathy Howatt, Maine Dept. of Env. Protection	Steve Heinz, Sebago Chapter Trout Unlimited
Frank Dunlap, Brookfield	Kelly Maloney, Brookfield
Mike Swett, Brookfield	Matt LeBlanc, Brookfield
Sarah Verville, TRC	Wendy Bley, TRC
Meg Dood, TRC	Andy Qua, Kleinschmidt
Brandon Kulik, Kleinschmidt	Dawn Cousens, HDR

Sarah Verville, TRC, and Frank Dunlap, Brookfield, opened the meeting with introductions and a brief overview of the agenda. Sarah then provide attendees with a review of the ILP schedule for the Hiram Project. She described that the PowerPoint presentation included both the current schedule and a proposed schedule. She explained that Brookfield was requesting that FERC consider a proposed revised ILP schedule that would essentially move the study and reporting phases up about 8 months, and allow Brookfield to take advantage of the 2018 study season, and if needed conduct second year studies in 2019. This would allow all studies and study reports to be completed before the draft and final license applications were due at FERC. She noted that there would be no change to the schedule for the draft and final license applications.

Sarah then asked if there were any questions or comments about project operations or the operational headpond and flow plots provided in the PowerPoint. There were none.

Sarah next reviewed a slide showing a portion of the Hiram Project boundary. She noted that a full Project boundary figure was available in the PAD. She noted that the Hiram Project boundary extends further downstream than is typical of Brookfield's other Saco River projects. While Brookfield did not propose a change in the Project boundary in the PAD, she explained that they would be reviewing the boundary during the relicensing process to determine if all of the lands and waters currently included are necessary for Project purposes. If it is determined that they are not, Brookfield may propose a change in the Project boundary in its license application. Frank and Sarah also noted that some of the proposed study scopes may not include all of the lands currently in the Project boundary, if it is not necessary or if there is no Project nexus.

Andy Qua, Kleinschmidt, then gave an overview of the water quality (WQ) studies proposed for the Project and included in the PSP. He explained that the standard suite of water quality studies required by MDEP would be conducted at the Project including both the impoundment and tailwater, and that field work was expected to commence this week (the week of June 11). In the impoundment, standard

DO, temperature and water chemistry sampling would be conducted in a “deep hole” location. He noted that the deepest spot in the impoundment is inside the boat barrier in an area that is close to the dam and unsafe for sampling. As a result, he noted that some bathymetry measurements would be made just upstream of the boat barrier to find the deepest impoundment location that could be safely sampled. Kathy Howatt, MDEP concurred with this approach. She later noted that MDEP would like to review the impoundment bathymetry results before a final impoundment sampling location is chosen.

Andy also described that standard water quality sampling would be conducted in the tailwater area, at a location downstream of the powerhouse. He noted that as is typical procedure that the sampling location would be selected based on preliminary DO measurements taken along a transect, which will allow them to locate any potential low DO spot to use for the sampling location. Otherwise an average DO location would be selected. Kathy Howatt agreed that this was an appropriate approach.

Andy next described that macroinvertebrates would be sampled following MDEP’s standard rock basket sampling protocol, at a location approximately 1,000 ft downstream of the dam, where there is appropriate substrate conditions. Frank explained to Kathy that they would confer with MDEP on the final selection of macroinvertebrate sampling location. Later, as a result of Brookfield’s statement that it would be reviewing whether to propose a change in the Project boundary, Kathy reminded Brookfield that all WQ sampling locations would need to be within the proposed Project boundary, and to keep that in mind when selecting the locations.

Finally, Andy noted that the WQ study would include measurements of wetted width downstream of the dam under varying flow conditions that would allow assessment of whether the reach and the resulting Project flows would meet MDEP’s ¾ width rule. Frank noted that MDEP had requested a similar ¾ width evaluation in the “bypass reach”. He noted that the bypass reach at Hiram is not a typical riverine bypass reach, but rather a set of cascades comprised of solid rock ledge. He noted that there is no river channel through the falls, no real habitat other than some large pools and connecting channels, and no way to measure and/or apply the ¾ wetted width criteria. Kathy Howatt agreed. She explained that while MDEP’s comment letter on PAD had suggested evaluation of ¾ wetted width in the bypass reach, rather MDEP would be looking for an evaluation of minimum flow needs for the bypass. She noted that fish stranding potential was probably the primary concern, but that MDEP would confer with MDIFW regarding what other concerns might need to be examined as part of evaluating minimum flow needs for the bypass reach. Allan Creamer, FERC noted that he had seen the Hiram Falls at leakage flows and had observed 2 large connected pools, and not much other fish habitat. He also noted that it would take a lot of flow to cover all of the ledges. Kathy reiterated that MDEP’s primary concern for the falls would be assessing minimum flow needs with a focus on pool connectivity and stranding potential. Matt LeBlanc, Brookfield, noted that Brookfield staff have never observed any stranding issues at Hiram Falls. Frank summarized, saying that based on the discussion, the study plan would not include a ¾ width analysis for the bypass (falls) reach, but that there would be some evaluation of minimum flow needs for pool connectivity and prevention of stranding.

Dawn Cousens, HDR briefly outlined the wildlife and botanical resource surveys that were planned for the Project, including documentation of observed wildlife and botanical resources and habitats; RTE species habitats, and non-native invasive botanical species. She noted that the surveys would be done by boat, car, or on foot, as needed. Survey results would include a general cover type map of the Project. Dawn indicated this study would be done in 2018. There were no questions of Dawn about this study.

Sarah Verville outlined that TRC would be responsible for conducing the cultural resource and recreation studies planned for the Project. Regarding cultural resources she noted that there would be three separate studies conducted, as normally required by the Maine SHPO: Precontact archaeology; Postcontact archaeology; and historic structures. She provided a brief explanation of each, noting that both of the archaeology studies would be done using the phased approach preferred by the Maine SHPO, and that Phase 1a for Precontact archaeology and Phase 0/1 for postcontact archaeology would be initiated in 2018. Sarah also noted that the first step for all three studies would be to establish the area of potential effects (APE) with the Maine SHPO. Frank noted that typically the APE at hydropower projects in Maine is the FERC Project boundary or within 50 feet of the shoreline, whichever is greater. Sarah noted that consultation with the SHPO on the APE is ongoing and that Brookfield would provide written concurrence on the APE from the Maine SHPO in the revised study plan. Allan Creamer noted that FERC expected such concurrence.

Sarah also reviewed plans for a Recreation inventory and condition assessment study. She noted that this study would be done in 2018, and that the inventory would cover three Project recreation sites: Canoe portage trail and parking area; Downstream access area including the fisherman's trail and parking area; and the overlook. She noted that the overlook was really more like a roadside pull-off and that it provided no views of the Project, or Project waters. When FERC asked why the overlook was considered a Project recreation site, Frank noted that it was developed at the time the Project was redeveloped by Central Maine Power in the 1980s, and that over the years the vegetation had grown up and blocked the scenic view. At some point, the Maine DOT took over maintenance of the site, since its primary function was as a roadside pull-off. Dustin noted that the overlook had a Part 12 Project sign, but he and Allan said that they didn't see any evidence that the site provided any kind of access, even informal trail access, to the Project.

Dustin Wilson, FERC, asked some questions about use at the downstream access area site. He and Allan noted that the site seems to get quite a bit of use for a variety of recreation activities, including fishing, camping, campfires, sunbathing, and swimming. They noted that they had observed a well-used campsite at the site, and also that the beach was receiving a great deal of use, even on a weekday (they visited the site on a Tuesday). Dustin explained that FERC would want to make sure that the inventory and condition assessment also included an assessment of the types of recreation use the site receives. Sarah noted that it would. Frank explained that in the past some of the site "use" had been problematic including vandalism, and that for a while Brookfield had closed the site because users were engaging in inappropriate activities. Mike Swett, Brookfield explained that most of the use is local use, and that the site had been problematic for quite some time. Dustin reiterated that FERC would still like the study to document the types of use the site receives. Dustin also suggested that the beach area at the downstream access area should stay in the Project boundary. Allan noted also that there is no signage on the main road that marks the entrance to the parking area and fisherman's trail. Mike Swett reiterated that Brookfield did not want to advertise the site and attract more use, given its history of vandalism and other problems. Allan asked also that the study consider what management activities Brookfield undertakes at the site, including the potential need for additional management such as trash removal and site maintenance or enforcement of the dawn to dusk use limits.

Finally, Dustin asked about the “Nature Study Area” he had seen just past the gate on the Hiram Dam Road. Frank explained that that was another holdover from when the site was redeveloped in the 1980s, but that use of the area had declined over the years, and that today the nature area no longer receives any use. Mike Swett concurred that no school groups have utilized the site in over 10 years.

The discussion then turned to fisheries. Brandon Kulik, Kleinschmidt, explained that the only fisheries study requested was a brook trout telemetry study that had been requested by Trout Unlimited (TU). He noted that in the PSP there was a discussion of why Brookfield did not propose such a study. He explained that the primary basis for the decision to not do the study was because MDIFW manages brook trout on the Saco River in the Project area as a stocked, put-grow-take fishery, and this is necessary to sustain angler exploitation. He noted that brook trout are likely in the mainstem of the river in the spring, and then as river temperatures rise during the summer, the fish seek thermal refuges in the tributaries. He noted that there are a number of tributaries both upstream and downstream of the dam that would provide such thermal refuge. In the fall the fish move again and then seek warmer water refuges during the winter. He noted that while brook trout do move around they generally don’t move any farther than necessary to find suitable habitat, and those that move do so as individuals rather than “migrating” at a population level the way diadromous fish do. Brandon concluded that because brook trout use of Project waters is probably limited to brief periods of seasonal use, and because there are tributaries that may provide thermal refugia both upstream and downstream of the Project, the need for a telemetry study to demonstrate possible fish passage needs for brook trout seems unwarranted.

Sarah then asked Steve Heinz, TU, if he could further explain TU’s interests. Steve described that TU has a strong interest in understanding brook trout movements in the Project area so as to determine if there is a need for fish passage at Hiram Dam for resident brook trout. He noted that the focus on the Saco River has long been anadromous fish, and that resident fish have been neglected. He explained that while MDIFW does stock some brook and brown trout in the basin, that brook trout are the only native trout species in Maine, and the fish and their habitat needs should be evaluated and addressed. He also noted that MIDFW’s interest is providing recreational use for fishermen; TU’s interest is trying to take care of the fish. He noted that brook trout telemetry studies have been done elsewhere in Maine and have demonstrated that the fish do move around quite a bit. He provided a copy of a study done on the Magalloway River (in the Upper Androscoggin River basin), that was included in their latest written comments. Frank noted that the Magalloway system is a much different river system than the Saco and that he thought there was a lot more natural reproduction and prime brook trout habitat provided in that system than is available on the Saco. Steve acknowledged that the systems are different but noted that in order for MDIFW to understand the Saco brook trout fishery, they need more information on how the fish are using the river and tributaries. Steve explained that there are tributaries both upstream and downstream of Hiram that brook trout are known to use including Ten Mile, Shephard, Barnes, Pease Brook, and Ossippee River. He explained that while they know that brook trout use these tributaries a telemetry study would provide a lot more information about what is going on with the fish, where they move and how they are using the mainstem and tributaries.

Following additional discussion about the interest in and need for a brook trout study, Frank suggested that Brookfield sit down with TU and MDIFW to discuss the issue further. It was noted that there may be more existing information about brook trout than was included in the PAD that could be gathered up and reviewed and that would better inform the need for additional study of brook trout. Allan asked if brook trout have been found in Project waters. Brandon indicated that the no recent sampling of Hiram Project waters had been conducted, but that previous sampling (mid 2000's) of the Saco River had found no trout in the mainstem, which was not surprising given that it was conducted during the summer season. Allan noted that there needs to be a nexus to the Hiram project, and suggested that perhaps doing some seasonal electrofishing of Project waters might be a better way to determine how and when brook trout may be using the Project. Allan asked if anyone thought brook trout could have ascended the natural Hiram Falls. He noted that while FERC cannot go back and look at pre-project conditions, it is possible that the falls were always a natural barrier to brook trout upstream movement anyway. Either way, Allan noted that it was not clear to him what a telemetry study would achieve relative to the Project relicensing.

Frank reiterated his offer to sit down with TU and discuss their interests further, but clarified that there would be no brook trout telemetry study done in 2018. Steve agreed that a meeting to further discuss the brook trout issue would be good.

Sarah concluded the meeting by reiterating the next steps in the ILP process and schedule. She noted that written comments from stakeholders on the PSP are due 8/12/18. After that, Brookfield needs to file a revised study plan by 9/11/2018, and then 15 days after that (9/26/2018) stakeholders have to provide their final comments on the revised study plan to FERC. FERC will then issue their study plan determination (SPD) by 10/11/2018. In response to a question from Frank, Allan said that he was not sure when FERC would address the proposed changes to the ILP schedule. Perhaps in the SDP letter, or perhaps separately. Sarah asked Allan if he knew whether FERC was planning to file their own comments in response to the PSP. Allan wasn't sure, but suggested they may do a comment letter.

Sarah and Frank thanked everyone for coming. The meeting adjourned at 11:20 AM.

From: Howatt, Kathy [mailto:Kathy.Howatt@maine.gov]
Sent: Friday, June 29, 2018 7:24 AM
To: Jesse Wechsler <Jesse.Wechsler@KleinschmidtGroup.com>
Subject: RE: depth data and sample sire follow up for Hiram lake trophic

Hi Jesse,
The Department's DEA has reviewed the proposed sampling locations and agree that they are sufficiently representative to stand in for the deepest location in the impoundment and are adequate for the Trophic State Study.
Kathy

Kathy Davis Howatt
Hydropower Coordinator, Bureau of Land Resources
Maine Department of Environmental Protection
Phone: 207-446-2642
www.maine.gov/dep

From: Jesse Wechsler [mailto:Jesse.Wechsler@KleinschmidtGroup.com]
Sent: Wednesday, June 27, 2018 9:35 AM
To: Howatt, Kathy <Kathy.Howatt@maine.gov>; Dunlap, Frank <Frank.Dunlap@brookfieldrenewable.com>
Cc: Rachel Russo <Rachel.Russo@KleinschmidtGroup.com>; Andy Qua <Andy.Qua@KleinschmidtGroup.com>
Subject: depth data and sample sire follow up for Hiram lake trophic

Hi Kathy,

I've attached a map showing water depth information in the Hiram impoundment. We collected this data last Friday (6/22). The impoundment was deep in places upstream of the boat barrier with a max depth of 24 feet. We did not collect depth data below the boat barrier (blue line on map) but estimate the maximum depth in a deep spot closer to the dam is 25-28 feet based on a rough 1940s contour maps of the area.

We collected lake trophic sample 1 from the area labeled "Sample Site 21-24 ft." We'll plan to continue to sample from here going forward as this location allows us to collect water from an area that is representative of the lower impoundment. If you could let me know if this location will suffice from your perspective, I'd be obliged.

Thank you for your guidance to date!

Jesse

Jesse Wechsler
Senior Fisheries Scientist and Project Manager
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www.KleinschmidtGroup.com
Providing **practical** *solutions to* **complex** *problems affecting energy, water, and the environment*

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
July 18, 2018

OFFICE OF ENERGY PROJECTS

Project No. 2530-054 – Maine
Hiram Hydroelectric Project
Brookfield White Pine Hydro LLC

Frank Dunlap, Licensing Specialist
Brookfield Renewable
Brookfield White Pine Hydro LLC
150 Main Street
Lewiston, ME 04240

Reference: Staff Comments on the Proposed Study Plan for the Hiram Hydroelectric Project

Dear Mr. Dunlap:

We have reviewed Brookfield White Pine Hydro LLC's (White Pine Hydro) proposed study plan (PSP) for the Hiram Hydroelectric Project (Hiram Project) filed on May 14, 2018, and attended the study plan meeting in Augusta, Maine on June 13, 2018. Pursuant to 18 C.F.R. § 5.12 of the Commission's regulations, we provide our comments in the enclosed schedule A.

White Pine Hydro proposes to begin implementing the field work for studies proposed in the PSP starting in the summer of 2018 to take advantage of the 2018 study season. You anticipate completing many of the year 1 studies in 2018, and request that the Process Plan and Schedule be adjusted such that the Initial Study Report (ISR) would be filed by February 11, 2019, and the Updated Study Report (USR) would be filed by February 11, 2020. This schedule modification was discussed at the June 13, 2018, PSP meeting, and there were no objections. Adjusting the schedule, as you propose, would allow you to complete the studies and develop a licensing proposal prior to the Preliminary Licensing Proposal deadline. For the above reasons, I am approving the requested schedule adjustment. The ISR is due by February 11, 2019, and the USR is due by February 11, 2020.

We appreciate the opportunity to comment on your proposed study plan for the Hiram Project. If you have any questions, please contact Allan Creamer at (202) 502-8365, or at allan.creamer@ferc.gov.

Sincerely,

Stephen Bowler, Chief
South Branch
Division of Hydropower Licensing

Enclosures: Schedule A

SCHEDULE A
COMMENTS ON THE PROPOSED STUDY PLAN

Tailwater Aquatic Habitat Study

1. In section 7.1.5.4 of the Proposed Study Plan (PSP),[1] White Pine Hydro proposes to conduct a transect-based habitat study, in combination with HEC-RAS[2] modeling, to determine whether Hiram Project operation meets the Maine Department of Environmental Protection's (Maine DEP) guideline of maintaining 75 percent of bank full cross-sectional area.[3] Maine DEP recommended this study be extended to include the bypassed reach (*i.e.*, Great Falls/Hiram Falls). In Scoping Document 2 (SD2), issued on May 11, 2018, we indicated that the effects of continued project operation on fish and aquatic habitat in the bypassed reach would be part of our environmental review. As discussed at the June 13, 2018, PSP meeting, we clarified that our focus will be on maintaining dissolved oxygen and water temperature in the bypassed reach's two pools,[4] and what, if any, flow releases are necessary to ensure water quality is sufficient to maintain aquatic life in the pools.

Brook Trout Movement Study

2. The issue of brook trout movement, and the need for a telemetry study to document such movement, was discussed at length during the June 13, 2018, PSP meeting. As

[1] Reference to the Proposed Study Plan throughout this Schedule A is to White Pine Hydro's Proposed Study Plan filed on May 14, 2018.

[2] U.S. Army Corps of Engineers' Hydrologic Engineering Center's River Analysis System (HEC-RAS).

[3] The proposed methods include: (a) establishing transects in the Saco River within the first 0.45 mile downstream from Hiram Dam; (b) performing river bed and bank profile surveys at the transects up to the bank full elevation; (c) measuring river width and water depth across each transect at about 20 stations at a low flow release from the dam (*e.g.*, 300 cubic feet per second, or less) to characterize the stream bed cross-sectional profile and water surface elevation; (d) gauging river flow to determine the amount of water released from the dam during the study; (e) estimating bank full conditions, based on physical stream bank characteristics; and (f) using a HEC-RAS model to determine at which flow 75 percent of the bank full cross-sectional area of the river is continuously watered.

[4] We visited the project on June 12, 2018, and observed that the bypassed reach is composed entirely of ledge/bedrock, with only two pools providing aquatic habitat.

part of the discussion we identified a possible alternative to a brook trout telemetry study that could be much less expensive, but potentially could answer the question of whether the native brook trout that inhabit the tributaries, use habitat in the Saco River, or otherwise move through the project area. The study described is a fish assemblage study that would be conducted seasonally (*i.e.*, multiple times a year, based on known brook trout behavior). In addition, temperature loggers could be employed at strategic locations (*e.g.*, tributary mouths) as part of the study to document seasonal changes in water temperature that might act as barriers to brook trout movement in the Saco River. If designed correctly, the fish assemblage study could help address the issue of brook trout presence and movement in the Saco River, as well as serve to update 12-year-old fish data for the project area,[5] including the river's IBI score(s) in the project area.

Wildlife and Botanical Resources/T&E Species Surveys

3. As described in sections 7.2.7 and 7.3.7 of the PSP, the wildlife and botanical resource report(s) will: (a) summarize the wildlife and botanical species, including rare, threatened, and endangered (RTE) species, and habitats encountered within the impoundment and downstream reach of the project; and (b) include general habitat mapping and descriptions. To support our analysis of wildlife and botanical resources, the survey report(s) should include an assessment of project-related effects on wildlife and botanical resources, including RTE species. The assessment should look at effects on these resources within the project boundary, including at existing formal and informal project facilities (*e.g.*, the existing sand bar), as well as areas under consideration for potential development as part of the licensing proposal.[6] In addition, the report(s) should describe proposed tree-removal[7] activities, and include a completed Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form, which is available on the U.S. Fish and Wildlife Service's (FWS) website at https://www.fws.gov/midwest/endangered/mammals/nleb/s7.html.

[5] In August 2006, the Midwest Biodiversity Institute completed fish surveys in the Saco River near the Hiram Project, as part of an Index of Biotic Integrity (IBI) model for large Maine rivers. *See* White Pine Hydro's Preliminary Application Document at 5-28.

[6] *See* Commission staff's March 29, 2018, Comments at 7-8.

[7] FWS defines tree removal as cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by northern long-eared bats.

4. Section 7.2.1 of the PSP states that the wildlife survey is designed to provide information on: (a) existing, representative wildlife (*bird and mammal*)[8] habitats in riparian, wetland, and upland areas along the project impoundment and downstream reach; (b) the presence of wildlife species at the project; and (c) the presence of RTE species or associated habitats. It appears that the proposed survey would focus exclusively on bird and mammal representative habitats. However, the Preliminary Application Document (PAD) identifies many herptiles that may be found in the project vicinity, as well (*see* Tables 5.3.6-1, 5.4.2-1, and 5.7.1-1). We recommend that the wildlife resource survey include birds, mammals, and herptile species.

5. In sections 7.2.5 and 7.3.5 of the PSP, White Pine Hydro proposes to collect data in the field using global positioning system (GPS) units[9] to facilitate mapping observed resources. To facilitate our analysis of potential project effects on wildlife and botanical resources, including RTE species, we recommend that the habitat and occurrence maps, as well as the Geographic Information System (GIS) source data be filed with the study report(s). The GIS data should be filed in a georeferenced electronic file format (such as ArcView shape files, or a similar GIS format).

Recreation Facilities Inventory

6. In section 6.3 of the PSP, White Pine Hydro discusses the potential for project boundary modifications at the Hiram Project. The potential for such changes was also discussed at the June 13, 2018, PSP meeting. As described, White Pine Hydro plans to review all land and waters within the existing project boundary to determine whether they serve a project purpose. Please include in the study report an assessment of how any proposed changes in the project boundary may affect access to, and use of, existing recreation features within the project boundary.

7. In section 7.4 of the PSP, White Pine Hydro proposes to conduct a recreation facilities inventory at the Hiram Project. The goals and objectives of the inventory are to identify and assess existing recreational facilities within the project boundary, which provide access to the project impoundment and waters downstream from Hiram Dam, along with their locations, amenities, general conditions, and ownership.

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[8] Emphasis added.

[9] GPS units are navigation devices that receive information from satellites and then calculate the device's geographical position.

On June 12, 2018, we visited the project area to see recreation sites and amenities not observed during the March 1, 2018, Environmental Site Review.[10] During our June 12 visit, we noted that the sand bar, while described as ephemeral (or temporary) in the PAD, is extensive and appears to be a permanent feature of the area that is used regularly. We witnessed multiple groups of people recreating on the sand bar. We also observed multiple campfire rings and numerous trash items spread out among the various areas of the sand bar. Given our observations, assessing the potential for providing trash receptacles and a portable toilet in the study report would be helpful. Possible locations for the facilities could be near the Fisherman's Trail parking area and along the shoreline, where the trail opens onto the sand bar.

In addition, we observed trees close to the informal campfire rings that appear to have severely damaged bark. The proposed site inventory form for the recreation facilities inventory (Figure 7.4-2 in the PSP) includes a section to document site aesthetics and evidence of use of each site with an option to document vegetation removal. To facilitate our review of recreation on project resources, we suggest that the form be modified to document both vegetation removal and any damages to trees and other vegetation that could be related to recreation uses.

8. The 2015 Form 80 in Appendix C of the PSP states that there are 2 miles of trails in the project area. The 2009 Form 80 states that there are 1.5 miles of trails in the project area. Though included on the Form 80s, trails of this length were not described in the PAD. Please include these trails among the existing recreation sites at the project to be described and mapped as part of the Revised Study Plan.

Cultural Resources Surveys

9. On June 11, 2018, the Maine Historic Preservation Commission (SHPO) filed its comments on White Pine Hydro's proposed study plan for archaeological and architectural resources. The SHPO indicated that it concurred with the scope of the proposed archaeological and architectural studies, but stated that consultation regarding the Area of Potential Effects (APE) has not been initiated. The SHPO requests that White Pine Hydro identify the proposed boundaries for the APE. As discussed at the June 13, 2018, PSP meeting, White Pine Hydro will need to consult with the Maine SHPO to define the APE prior to conducting any cultural resources studies.

---

[10] The sites visited primarily included the canoe take-out and portage trail, as well as the Fisherman's Access Trail, parking area, and the large sand bar located on the western side of the Saco River downstream from Hiram Dam.

From:	Jesse Wechsler
To:	Howatt, Kathy; Dunlap, Frank
Cc:	Andy Qua; Bley, Wendy; Rachel Russo
Subject:	Potential transects for tailwater habitat study at the Hiram Project
Date:	Friday, July 20, 2018 11:07:15 AM
Attachments:	Hiram_Proposed Tailwater Transects.pdf

Hi Kathy,

Kleinschmidt will be performing the tailwater habitat study at the Hiram Project this summer. We did a site reconnaissance tour of the reach last week while on site for lake trophic sampling. The reach is predominantly pool and deep run habitat (see photos in the attachment). Based on the reconnaissance, we are planning to establish 2 transects in the approximate representative locations shown in the attached file.

Do these look ok/adequate to you for the study? Please let me know if you need additional information. We are planning to do the study in the next few weeks. Hoping you could provide input / approve these proposed locations at your next opportunity.

Here is the planned methodology (from the Hiram Project Proposed Study Plan):

The Licensee proposes to complete a transect-based habitat study in combination with HECRAS modeling to determine whether operations meet the MDEP guideline (i.e., maintain 75 percent of bank full cross-sectional area). The proposed methods include:

- *Establishing transects in the Saco River within the first 0.45 miles downstream of Hiram dam (Figure 7.1-1) – transects will be selected in consultation with the MDEP;*
- *Performing river bed and bank profile surveys at the transects up to the bank full elevation;*
- *Measuring river width and water depth across each transect at approximately 20 stations at a low flow release from the dam (e.g., minimum flow release of 300 cubic feet per second (cfs) or less) to characterize the stream bed cross-sectional profile and water surface elevation;*
- *Gauging river flow to determine the amount of water released from the dam during the study;*
- *Estimating bank full conditions based on physical stream bank characteristics (e.g., top of flat depositional benches; lower extent of persistent woody debris) – bank full conditions will be determined in consultation with the MDEP; and*
- *Using a HECRAS model to determine at which flow 75 percent of the bank full cross-sectional area of the river is continuously watered.*

Thank you and hope you are having a great summer!
Jesse

Jesse Wechsler
Senior Fisheries Scientist and Project Manager
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Providing **practical** *solutions to* **complex** *problems affecting energy, water, and the environment*

MAINE HISTORIC PRESERVATION COMMISSION
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65 STATE HOUSE STATION
AUGUSTA, MAINE
04333

PAUL R. LEPAGE
GOVERNOR

KIRK F. MOHNEY
DIRECTOR

July 26, 2018

Ms. Wendy Bley
TRC
16 Gabriel Dr
Augusta, ME 04330

Project: MHPC # 1552-17 Hiram Hydroelectric Project; FERC 2530 on the Saco River Study Plan

Town: Hiram, ME

Dear Ms.Bley:

In response to your recent request, we have reviewed the information received June 29, 2018 to continue consultation on the above referenced project in accordance with Section 106 of the National Historic Preservation Act, as amended.

As stated in our letter from May 29, 2018, our office reviewed the proposed study plan for the Hiram Hydroelectric Project dated May 2018 and concurred with the scopes for archaeological and architectural study.

With regards to the APE definition language, the proposed definition as found in Sections 7.5 and 7.6 of the study plan is acceptable to our office. Please note that this APE should also be used for the architectural survey (Section 7.7).

We look forward to continuing consultation on this project. Please contact Megan M. Hopkin of our office if we can be of further assistance in this matter.

Sincerely,

Kirk F. Mohney

Kirk F. Mohney
State Historic Preservation Officer

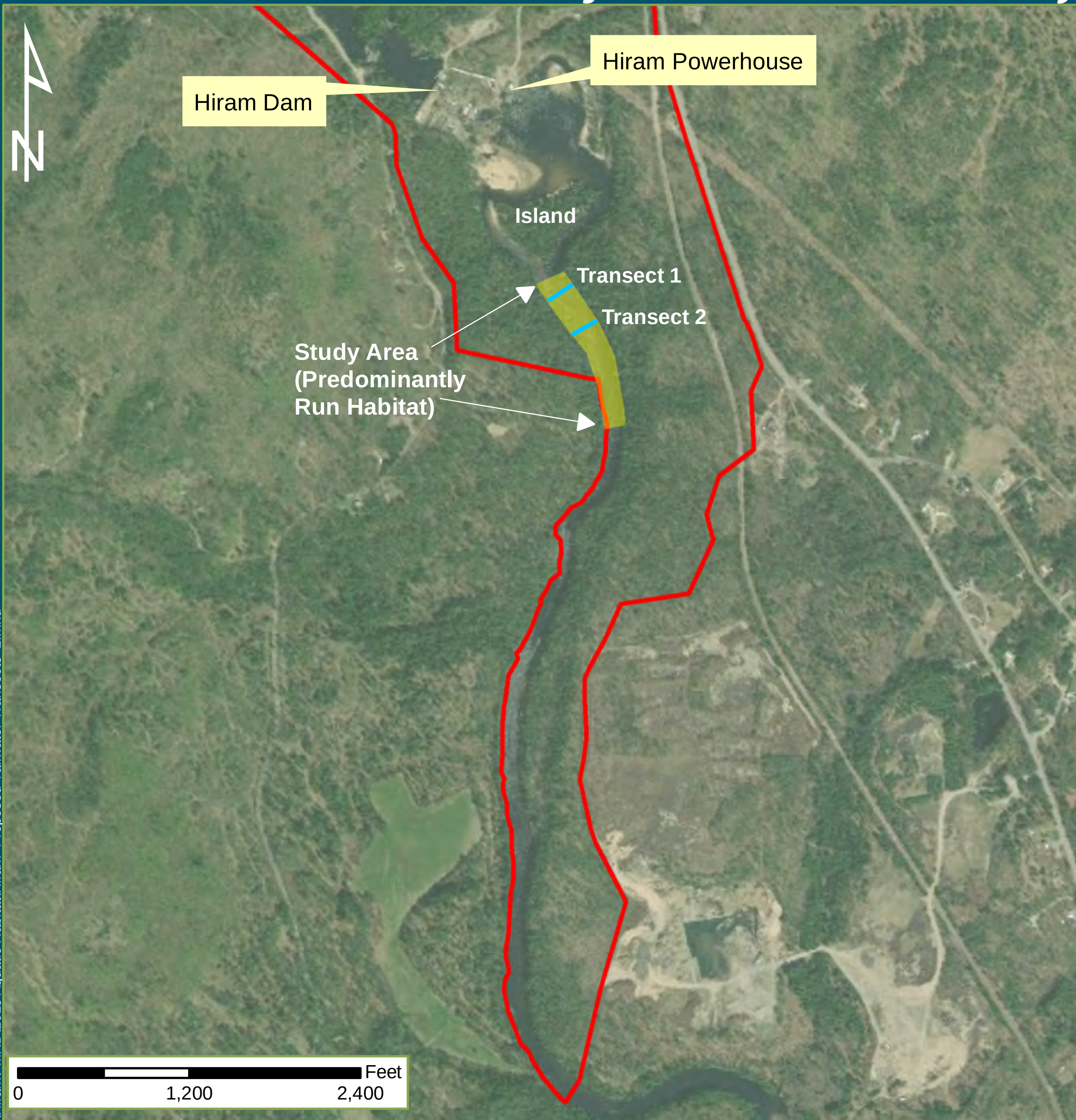
PHONE: (207) 287-2132 FAX: (207) 287-2335

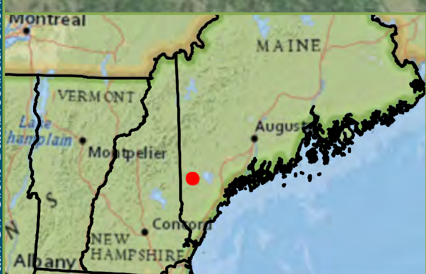
From: Howatt, Kathy <Kathy.Howatt@maine.gov>
Sent: Friday, July 27, 2018 8:22 AM
To: Jesse Wechsler <Jesse.Wechsler@KleinschmidtGroup.com>
Subject: Hiram

Good morning Jesse,
I asked the Department's DEA to review the proposed sampling locations for the Hiram project, everyone's good with your choices. Please let me know if you have further questions,
Kathy

Kathy Davis Howatt
Hydropower Coordinator, Bureau of Land Resources
Maine Department of Environmental Protection
Phone: 207-446-2642
www.maine.gov/dep

Potential Transects for Tailwater Habitat Study





Legend

- Potential Area for Transects
- Potential Transects
- Project Boundary

Brookfield Renewable Lewiston, Maine			
Hiram Hydroelectric Project FERC No. 2530			
Drawn By: RSR	Date Drawn: 07-18-2018	Checked By:	Date Checked:

Kleinschmidt
141 Main St., PO Box 650
Pittsfield, Maine 04967
Telephone: (207) 487-3328
Fax: (207) 487-3124
www.KleinschmidtGroup.com

Path: G:\ Client Data\Brookfield\Power\Hiram\ MXD\2018 Aquatic Habitat\Hiram Proposed Tailwater Transects 2.mxd

Source: (Kleinschmidt, 2018; PSNH, 2018; ESRI, 2018; USGS, 2018)

PN: 1203103.01


DEPARTMENT OF ENVIRONMENTAL PROTECTION
STATE OF MAINE
Approximate WQ sample 6-22
Hiram Dam Rd
River Rd
© 2018 Google
Google Earth
1998
Imagery Date: 9/18/2013 43°51'15.76" N 70°48'01.26" W elev 382 ft eye alt 4118 ft

From: Howatt, Kathy <Kathy.Howatt@maine.gov>
Sent: Monday, July 30, 2018 2:55 PM
To: Ian Kiraly <ikiraly@gomezandsullivan.com>; Ian Clark <ianc@dichotomycapital.com>; Jesse Wechsler <Jesse.Wechsler@KleinschmidtGroup.com>; Dorman, Randy <Randy.Dorman@brookfieldrenewable.com>; Kirk Smith <ksmith@gomezandsullivan.com>; Dunlap,Frank (Frank.Dunlap@brookfieldrenewable.com) <Frank.Dunlap@brookfieldrenewable.com>
Subject: Hydropower Sampling Protocol

Good afternoon,
I wanted to inform you all that the Department is making an adjustment to the Hydropower Sampling Protocol. Late summer samples for Trophic State sampling of impoundment have required a test for silica; this parameter is being removed from the protocol. No test for silica or for silicon (silica bonded to oxygen) will be required at this time. Please pass this note along as appropriate to colleagues I may have missed, and, as always, let me know if you have questions.
Kathy

Kathy Davis Howatt
Hydropower Coordinator, Bureau of Land Resources
Maine Department of Environmental Protection
Phone: 207-446-2642
www.maine.gov/dep

STATE OF MAINE
DEPARTMENT OF
INLAND FISHERIES & WILDLIFE
284 STATE STREET
41 STATE HOUSE STATION
AUGUSTA ME 04333-0041

PAUL R. LEPAGE
GOVERNOR

CHANDLER E. WOODCOCK
COMMISSIONER

VIA ELECTRONIC FILING

August 10, 2018

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

Subject: **MDIFW Comments on Brookfield White Pine Hydro LLC (White Pine Hydro) Proposed Study Plan for the Hiram Hydroelectric Project (FERC No. 2530)**

Dear Secretary Bose:

The Maine Department of Inland Fisheries and Wildlife (MDIFW) reviewed the Brookfield White Pine Hydro LLC (White Pine Hydro) Proposed Study Plan for the Hiram Hydroelectric Project (FERC No. 2530). Subsequently, on June 13, 2018, White Pine Hydro held a study plan meeting. Due to scheduling conflicts, MDIFW staff were unable to attend the study plan meeting; however, it is our understanding that some studies have been or will be undertaken during the 2018 field season.

Recreation Facilities Inventory

The Licensee has proposed to conduct a recreation facilities inventory at the Hiram Hydroelectric Project during the summer of 2018, with the results of the recreational facilities inventory to be provided in the Initial Study Report, which will be filed with FERC by February 11, 2019.

As part of the inventory survey, MDIFW requests that the Project area also be assessed for the installation of a hard-surfaced boat ramp and parking to allow suitable motorized boating access to the impoundment. The Hiram impoundment offers recreational boating and angling opportunities for several species of warmwater and coldwater fish species.

Access to surface waters of the State and their fishery resources are an important State and Department goal. As development and the human population increase, public access opportunities to water resources diminishes, while the demand for water based, outdoor activities climb. This scenario is particularly prevalent in southern Maine, and the Hiram impoundment offers good boating and angling opportunites. MDIFW will be seeking appropriate public access to the impoundment as part of the licensing process.

PHONE:
(207) 287-5254

FISH AND WILDLIFE ON THE WEB:
www.maine.gov/ifw

EMAIL ADDRESS:
IFWEnvironmentalreview@maine.gov

If you have any specific questions, please feel free to contact me directly by phone at 207-287-5254 or by email at john.perry@maine.gov.

Best regards,

John Perry
Environmental Review Coordinator

Cc: Francis Brautigam, Joe Overlock--MDIFW Augusta Headquarters
James Pellerin, Nicholas Kalejs--MDIFW Region A
Gail Wippelhauser--MDMR
Kathy Howatt--MDEP
Steven Shepard, Antonio Bentivoglio--USFWS
Sean McDermott, William McDavitt--NMFS

Document Content(s)

STATE OF MAINE
DEPARTMENT OF
INLAND FISHERIES & WILDLIFE
284 STATE STREET
41 STATE HOUSE STATION
AUGUSTA ME 04333-0041

PAUL R. LEPAGE
GOVERNOR

CHANDLER E. WOODCOCK
COMMISSIONER

September 25, 2018

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

RE: Comments on Brookfield White Pine Hydro Revised Study Plan for the Hiram Hydroelectric Project (FERC Project 2530)

Dear Secretary Bose:

On September 11, 2018, Brookfield White Pine Hydro (Licensee) issued the Revised Study Plan for the Hiram Hydroelectric Project (FERC No. 2530) on the Saco River, Maine. The Maine Department of Inland Fisheries and Wildlife (MDIFW) offers the following for consideration.

Most of the tributaries to the upper Saco River, including both above and below the Project site, support populations of wild brook trout. Two tributaries in particular--Tenmile and Shepards Rivers, which are located upstream of the Project site--have been extensively sampled by MDIFW and are known to support robust populations of native brook trout. In fact, these two populations likely provide some of the best stream angling opportunities for wild brook trout in southern Maine. Based on the literature, as well as local studies and studies conducted elsewhere in Maine on wild brook trout, it would not be unreasonable to expect brook trout in these and other drainages utilizing the mainstem of the Saco River on a seasonal basis.

The Sebago Chapter of Trout Unlimited had requested a radio telemetry study to explore the seasonal use of the mainstem of the Saco River by brook trout, their use of the Project area, and potential impacts of the Project on this species, if any. The Licensee rejected the initial study request, but has proposed some fish community sampling of the impoundment and some temperature monitoring at the mouths of some of the tributaries. We appreciate the Licensee's willingness to better understand these important coldwater fishery resources. However, limitations associated with the Licensee’s proposed studies are unlikely to address the questions of concern and would not accurately reflect brook trout use of the Saco River mainstem, and may result in a false negative for brook trout utilization of the mainstem. MDIFW would encourage further consultation to continue to explore studies that will provide meaningful results and more meaningful information to assess project fishery resources operational impacts.

PHONE: (207) 287-5254

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IFWEnvironmentalreview@maine.gov

Please feel free to contact my office if you have any questions regarding this information, or if I can be of any further assistance.

Best regards,

John Perry
Environmental Review Coordinator

Cc: Tim Peabody, Deputy Commissioner MDIFW
Francis Brautigam, Joe Overlock--MDIFW Fisheries Division, Augusta Headquarters
James Pellerin--MDIFW Region A
Gail Wippelhauser--MDMR
Kathy Howatt, Eric Sroka--MDEP
Steven Shepard--USFWS
Sean McDermott, William McDavitt--NMFS

TROUT UNLIMITED
Sebago Chapter

September 25, 2018

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

Via online submission to: http://www/ferc.gov

Subject: **Comments of Trout Unlimited, Sebago Chapter, on Brookfield White Pine Hydro Revised Study Plan For The Hiram Hydroelectric Project (FERC Project 2530-054)**

Dear Secretary Bose:

This provides Sebago Chapter of Trout Unlimited comments on the Brookfield Renewable Hiram Hydroelectric Project (FERC No. 2530) – Revised Study Plan dated September 11, 2018.

While no study of Brook Trout Migration Using Radio Tags was included in the Revised Study Plan, inclusion of a Baseline Fisheries Assemblage Study with specific emphasis on brook trout acknowledges the importance of native brook trout to the ecosystem and the recreational angler.

Sebago Chapter continues to urge the inclusion of our proposed study of Brook Trout Migration Using Radio Tags for the reasons cited in our comments on the Proposed Study Plan[1]. If it is not included, then we request an alternative study that reviews the literature on brook trout movement be completed before a final determination of studies to be conducted is made. This would include such studies as those cited in our previous filings[2], studies in the western U.S. involving trout movement and hydro operations, Canadian studies such as R. CURRY et al. Spatial and Temporal Movements of a Riverine Brook Trout Population,[3] and the unpublished studies conducted by New Hampshire Fish and Game Fisheries Biologist Dianne Timmons. The Applicant's study plan submissions to date often reference Forrest Bonney,[4] there is much more study data on brook trout behavior utilizing newer technologies such as PIT tags and radio telemetry tags that bear on Hiram Dam relicensing that should be fully considered in the relicensing process. We have included a Review of Scientific Literature on Brook Trout Movement as an Alternative Study Request: Appendix A.

Additionally, the included Baseline Fisheries Assemblage Study[5] includes "continuous water temperature monitoring' near the confluences of the Saco River and the Tenmile and Shepards

[1] Comments of Trout Unlimited, Sebago Chapter, on Brookfield White Pine Hydro Proposed Study Plan For The Hiram

[2] Boucher, D.P. and D. Timmins. 2008. Seasonal movements and habitat use of brook trout in the Magalloway River, and Indian Pond Project Relicensing FERC No. 2142 Radio Telemetry Study

[3] Spatial and Temporal Movements of a Riverine Brook Trout Population,[3] R. CURRY et al., '*Transactions of the American Fisheries Society,* 131:551-560, 2002

[4] Bonney, F.R. 2009. Brook Trout Management Plan for the State of Maine

[5] Hiram Hydroelectric Project Revised Study Plan, FERC Project No. 2530. Page 7-52

Rivers from September 1 – November 1 (2019). This is to provide information on timing the electrofishing to coincide when brook trout might use the main stem of the Saco River and be collected through electrofishing. It makes little sense to use this methodology when we can directly determine whether brook trout have left the feeder rivers using PIT tag study methodology. Locating salmonids in non-wadeable rivers is problematic, and this is reflected in the fact that none were collected by the last study conducted,[6] the Midwest Biodiversity Institute (MBI) completed using boat electrofishing in August 2006 as part of an Index of Biotic Integrity (IBI) model for large Maine rivers by Yoder at al. Accordingly, should our proposed study of Brook Trout Migration Using Radio Tags NOT be adopted, we propose that a PIT Tag study be conducted to ascertain brook trout movement that we have included as an Alternative Study Request: Appendix B. Tagging[7] would be accomplished in June and receiver monitoring commenced in each river when tagging had been completed that would continue until the Tenmile and Shepards Rivers ice over, and brook trout have surely completed their spawning activities and are seeking winter holding areas. Indeed, a Canadian study reports that brook trout travel distances are often underestimated because they continue to move after iceout.[8] Brook trout would be captured by electrofishing in known areas of the Shepards and Ten Mile Rivers, 10 to 20 fish from each. Use of larger tags on larger fish results in improved study continuity resulting from longer battery life. Larger fish would be more likely to access the main stem of the Saco River to seek more abundant food sources than the feeder rivers. The main stem of the Saco will freeze later than the feeders, so the electrofishing portion would still be possible. We are considerate of the costs to Brookfield Energy involved with these studies. Should no tagged brook trout be detected leaving the feeder rivers, we do NOT see the need to continue further with the electrofishing studies.

Should brook trout exit the feeder rivers and not be sampled in the proposed electrofishing areas, then we propose expanding the electrofishing areas until they are discovered and collected.

Should brook trout be detected leaving the feeder rivers and collected through electrofishing, then we proposed a third study: Desktop Fish Impingement and Entrainment Study. This would assess the effects of dam operations on brook trout in the system. We have included this as Alternative Study Request: Appendix C.

We would like to comment on the proposed Recreational Site Inventory. The project has turned Hiram Falls from one that should be one of the most scenic extended cascades in southwestern Maine into an eyesore. There is no longer a “scenic view”, the nature study area is not functional, and the security fencing turn what should be a scenic area into an industrial site - a poorly maintained one with accumulated driftwood and refuse. The facility is unmanned, like many of Brookfield Energy’s facilities have become in the last few years, making them more vulnerable to neglect and vandalism. There is no signage on the main roads on either bank directing the public to what is accessible. We trust that the study will find ways to correct what we found when we took photos in August of this year that are included as Appendix D.

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[6] Hiram Hydroelectric Project Pre-Application Document, FERC Project No. 2530, pages 5-30 & 5-31, tables 5.3.2-2 & 5.3.2-3

[7] Details of PIT tagging methods available at https://www.oregonrfid.com/new-to-rfid/

[8] R. A. Curry et al., Spatial and Temporal Movements of a Riverine Brook Trout Population. page 1

Lastly, we would like to ask that the study of Precontact Period Archaeological Resources be especially alert for middens that may contain evidence of anadromous fish besides Atlantic salmon and American eels. This has the potential to cast new light on fish passage at the cascade that would affect the assumptions driving provisions of the 2007 Agreement.

Again, we continue to urge the adoption of our proposed study of Brook Trout Migration Using Radio Tags and believe that the review of scientific literature on brook trout movement will show it to be the best methodology available to locate and study brook trout in the main stem of the Saco River. For convenience, we have included it as Appendix E, and the rationale supporting it submitted as a response to the Proposed Study Plan: Appendix F. We ask that if it is not adopted that the alternative course of studies that we have proposed be undertaken. This graduated approach with subsequent studies contingent on earlier ones is very considerate of Brookfield Energy resources.

Ultimately, we continue to believe that Hiram Dam license surrender and dam removal are the best choice for both the ecology and aesthetics of the Saco River. As the study cited by the Applicant[9] classifies the upper Saco River as Biological Condition Gradient (BCG) 5: *"Native diadromous species are absent or if present by interventions; some native cyprinids are absent, replaced by tolerant and moderately tolerant species; brook trout are absent; non-native salmonids are non-reproducing; non-native eurytherms usually predominate; anomalies present."* BCG 5 indicates a high degree of disturbance to the habitat, the worst score on this scale is a 6. If the project is relicensed and allowed to continue to operate, the next best option is provision --WITHOUT PRECONDITONS-- of upstream and downstream fish passage designed to accommodate the natural movements of brook trout that are known to be present in the watershed, and also Atlantic salmon and eels as provided for in the 2007 Agreement.

Thank you for the opportunity to comment on the Hiram Project. Sebago Chapter appreciates the quality and timeliness of project documentation provided by Brookfield Energy and looks forward to working with all concerned in the coming months to restore the balance between project benefits and harms that the relicensing process exists to provide.

[9] Yoder. C.O., R.F. Thoma, L.E. Hersha, E.T. Rankin, B.H. Kulik, and B.R. Apell. 2009. Maine Rivers Fish Assemblage Assessment: Development of an Index of Biotic Integrity for Non-wadeable Rivers. (Addendum December 31, 2015). MBI Technical Report MBI/2008-11-2. Submitted to U.S. EPA, Region I, Boston, MA. 55 pp. + appendices , especially pages 12 and 40

If you have any specific questions, please feel free to contact me directly by phone at 207-781-4762 or by email at heinz@maine.rr.com

Sincerely and respectfully,

Stephen G. Heinz
Sebago TU Hiram Dam Relicensing Response Coordinator

Reply to: Stephen G. Heinz, 3 Spruce Lane, Cumberland Foreside ME 04110

References

Alice Elliott, Sophia K. Paul, J. Garrett Powers, and Kaitlyn Pritchard. Possibilities for Collaboration in the Saco River Watershed: An Assessment. March 2018. Prepared for the Wells National Estuarine Research Reserve and residents of the Saco River watershed.

Bonney, F.R. 2009. Brook Trout Management Plan for the State of Maine. Accessed April 17, 2018. [Online] https://www.maine.gov/ifw/docs/strategic-managementplans/ brooktrout.pdf

Boucher, D.P. and D. Timmins. 2008. Seasonal movements and habitat use of brook trout in the Magalloway River, Maine. Fishery Final Report Series No. 1. Maine Department of Inland Fisheries and Wildlife. Augusta, Maine.

Franke, G. F., and nine co-authors. 1997. Development of Environmentally Advanced Hydropower Turbine System Design Concepts. Prepared by Voith Hydro, Inc. (Report No. 2677-0141) for the U.S. Department of Energy (Contract No. DE-AC07- 941D13223)

New Hampshire Fish and Game Department Federal Aid in Sportfish Restoration F-50-R-27 Performance Report Summary (2010-2011) - reports on one of a series of telemetry studies undertaken in 2008 and still ongoing (unpublished)

R. Allen Curry, David Sparks, And Jacob Yan De Sande 2002. Spatial and Temporal Movements of a Riverine Brook Trout Population. Transactions of the American Fisheries Society, 131:551-560.

Pracheil, B. M., DeRolph, C. R., Schramm, M. P., and Bevelhimer, M. S. 2016. A fisheye view of riverine hydropower systems: the current understanding of the biological response to turbine passage [online]. Rev. Fish Biol. Fisheries., 1-15. DOI: 10.1007/s11160-015-9416-8.

Radio Telemetry Study On Flow-Related Movements, Spawning, And Seasonal Movements of Salmonids Below Harris Station on the Kennebec River, Maine For The Indian Pond Project Relicensing FERC No. 2142 (1999)

Trina Rytwinski, Dirk A. Algera, Jessica J. Taylor, Karen E. Smokorowski, Joseph R. Bennett, Philip M. Harrison and Steven J. Cooke. 3 April 2017. What are the consequences of fish entrainment and impingement associated with hydroelectric dams on fish productivity? A systematic review protocol.

Yoder. C.O., R.F. Thoma, L.E. Hersha, E.T. Rankin, B.H. Kulik, and B.R. Apell. 2009. Maine Rivers Fish Assemblage Assessment: Development of an Index of Biotic Integrity for Non-wadeable Rivers. (Addendum December 31, 2015). MBI Technical Report MBI/2008-11-2. Submitted to U.S. EPA, Region I, Boston, MA. 55 pp. + appendices. *Note: Does NOT contain detailed information on Upper Saco River data collection.*

Appendices

A. Alternative Study Request: Review of Scientific Literature on Brook Trout Movement

B. Alternative Study Request: Brook Trout Migration Using PIT Tags

C. Alternative Study Request: Desktop Fish Impingement and Entrainment Study

D. Photos of taken in the project area August 2018

E. Proposed Study Request: Brook Trout Migration Using Radio Tags with methodology

F. Comments of Trout Unlimited, Sebago Chapter, on Brookfield White Pine Hydro Proposed Study Plan For The Hiram Hydroelectric Project (FERC Project 2530-054).

APPENDIX A

Alternative Study Request: Review of Scientific Literature on Brook Trout Movement

1. Study goals and objectives.
This study will review scientific literature on brook trout movement. This would include the studies cited in our previous filings, studies in the western U.S. involving trout movement and hydro operations, Canadian studies, and the unpublished studies conducted by New Hampshire Fish and Game Fisheries Biologist Dianne Timmons - Dianne.Timmins@wildlife.nh.gov (603) 788-3164. To prepare the environmental assessment (EA) required by the National Environmental Policy Act, the Applicant should be using the latest science available.

2. Relevant resource management goals. (Under §5.9(b)(3) If the requester is a not a resource agency, explain any relevant public Interest.)
Maine's rivers and wildlife are, by law, public resources. When stakeholders of the Saco River Watershed were recently queried about specific aspects they valued in the Saco River Watershed, the responses indicated that some 58% respondents valued recreation - more than any other response [cite] Both State and Federal agencies have habitat restoration programs in place to reconnect waters lacking fish passage connectivity. Hiram Dam prevents fish passage in the Saco River. It is incongruous for parts of the government to fund habitat reconnection projects, while others work to support the status quo.
MDIFW is a cabinet level agency of the State of Maine, and under Maine State Law (12 MRSA, §10051) MDIFW's mandate is "…to preserve, protect, and enhance the inland fisheries and wildlife resources of the State; to encourage the wise use of these resources; to ensure coordinated planning for the future use and preservation of these resources; and to provide for effective management of these resources." It is evident from the PAD that the information on the Saco River is dated and extremely lacking in information on brook trout. This lack of information marginalizes MDIFW's capability to manage the resource or to assess the existing/future impacts associated with the Hiram Dam Project, and the hydro operator's ability to operate the project in the best interests of the affected resources.
PAD Section 5.3.3 quotes Forrest Bonney: "Brook trout may spend part or all their lives in small brooks, streams, rivers or large lakes, provided that the habitat is suitable and competition from other fish is not excessive..." This and other references are based on studies that are now ten to twenty years old. In the interim, much has been learned about brook trout needs to move to access critical habitat using PIT tags and radio tags. All involved in the process need to be aware of this information to deal competently with the issues involved.

3. The requestor, Sebago TU, is a non-governmental organization (NGO).

4. Existing information concerning the subject of the study proposal, and the need for additional information.
Scientific literature cited by the Applicant in the filings submitted has been limited. Up to date information is needed.

5. Nexus between Project operation and effects on the resource to be studied.
The operation of the Hiram Dam Project has a direct impact on the fish populations in the Saco

River. The presence of the dam is key to its operation. Operating parameters for the dam should be based on the best science available.

6. Explain how the proposed study is consistent with generally accepted practice in the scientific community.
Periodic review of scientific literature on any subject is a well-established practice.

7. Describe considerations of level of effort and cost, as applicable, and why proposed study alternatives would not be sufficient to meet the stated information needs.
This is a relatively low-cost effort that is easily commensurate with a project the size and the likely license term. Given the cultural importance placed on recreational fisheries by the Saco Watershed stakeholders, this study is necessary for the Applicant to meet the requirements of the National Environmental Policy Act competently and for fishery managers to make better-informed management decisions to support the recreational fishery, especially regarding brook trout, a much sought-after species. None of the studies called for in the Revised Study Plan resemble this one.

APPENDIX B

Alternative Study Request: Brook Trout Migration Using PIT Tags

1. Study goals and objectives.
This study will track and document the movement of brook trout implanted with PIT tags in the Tenmile and Shepards Rivers to determine if and when they travel from these feeder rivers to the main stem of the Saco River and if and when they return.

2. Relevant resource management goals. (Under §5.9(b)(3) If the requester is a not a resource agency, explain any relevant public Interest.)
Maine's rivers and wildlife are, by law, public resources. When stakeholders of the Saco River Watershed were recently queried about specific aspects they valued in the Saco River Watershed, the responses indicated that some 58% respondents valued recreation - more than any other response (Source: Possibilities for Collaboration in the Saco River Watershed: An Assessment, Alice Elliott, Sophia K. Paul, J. Garrett Powers, and Kaitlyn Pritchard, Prepared for the Wells National Estuarine Research Reserve and residents of the Saco River watershed March 2018.) Both State and Federal agencies have habitat restoration programs in place to reconnect waters lacking fish passage connectivity. Hiram Dam prevents fish passage in the Saco River. It is incongruous for parts of the government to fund habitat reconnection projects, while others work to support the status quo.
MDIFW is a cabinet level agency of the State of Maine, and under Maine State Law (12 MRSA, §10051) MDIFW's mandate is "…to preserve, protect, and enhance the inland fisheries and wildlife resources of the State; to encourage the wise use of these resources; to ensure coordinated planning for the future use and preservation of these resources; and to provide for effective management of these resources." It is evident from the PAD that the information on the Saco River is dated and extremely lacking in information on brook trout. This lack of information marginalizes MDIFW's capability to manage the resource or to assess the existing/future impacts associated with the Hiram Dam Project.
Atlantic salmon are the driver for fish passage per the 2007 Agreement. PAD Section 5.3.3 quotes Forrest Bonney: "Brook trout may spend part or all their lives in small brooks, streams, rivers or large lakes, provided that the habitat is suitable and competition from other fish is not excessive... Brook trout normally spawn in brooks or streams in late September to November." This study is necessary for the Applicant to meet the requirements of the National Environmental Policy Act competently and for fishery managers to make better-informed management decisions to support the recreational fishery, especially regarding brook trout, a much sought-after species.

3. The requestor, Sebago TU, is a non-governmental organization (NGO).

4. Existing information concerning the subject of the study proposal, and the need for additional information.
MDIFW has little specific knowledge of the movements of brook trout within this watershed. The presence of brook trout in feeder brooks is well known, especially the Shepards and Tenmile Rivers above Hiram Dam; and Breakneck and Pease Brooks below Hiram Dam. Of note: "MDIFW has previously monitored that reach of the Shepards River just upstream of the road crossing proposed to be rehabilitated. Three run depletion electrofishing surveys were

conducted annually in this reach between 1999 and 2004 to estimate the abundance of brook trout and other resident fish. An additional sampling event was also conducted in 2010. This historical information documents the presence of a well-established population of brook trout that provides a high quality fishery."[10]

Brook trout seasonal movement to and from the Shepards River and other tributaries into the main stem of the Saco in the fall and their return to smaller waters the following spring has not been studied thus far. Tagging would be accomplished in June and receiver monitoring commenced just above the feeders' confluence with the Saco River when tagging had been completed that would continue until the Tenmile and Shepards Rivers ice over, and brook trout have surely completed their spawning activities and are seeking winter holding areas. The main stem of the Saco will freeze later than the feeders, so the electrofishing portion would still be possible in the proposed areas. Brook trout would be captured by electrofishing in areas of the Shepards and Ten Mile Rivers that have been identified by MDIFW in prior studies, 10 to 20 fish from each. Size of fish captured could prove problematic, but latest telemetry tags enable adult brook trout as small as 9 grams to be safely tagged, typically fish of about 6-7 inches in length. Use of larger tags on larger fish results in improved study continuity resulting from longer battery life. Larger fish would be more likely to access the main stem of the Saco River to seek more abundant food sources than those present in the feeder rivers. At least 5 fish 12 inches or larger would be needed from each feeder river, and if these could not be captured by electrofishing, then hatchery fish that size or larger should be tagged and released in the feeder rivers. Monitoring would resume from ice out to the following June to see if and when brook trout returned to their natal streams. **Number and size of the tagged brook trout and timing are the keys to the study.**

5. Nexus between Project operation and effects on the resource to be studied.
The Hiram Project includes lacustrine and riverine fish habitats that support fish populations, which may be affected by operations. Collection of baseline fisheries information will provide a better understanding of the potential effects of continued operation on resident fish species, including brook trout.

6. Explain how the proposed study is consistent with generally accepted practice in the scientific community.
Techniques for PIT studies are well established and have been used for years to successfully track fish movements with low resultant mortality, quite recently on the Williams Project on the Kennebec River in Maine. PIT tags may be obtained from Oregon RFID or BioMark companies. Details on their use may be obtained on their websites. MDIFW Region A has recently acquired the equipment necessary to monitor PIT tags for tracking landlocked Atlantic salmon on the Crooked River in southwestern Maine.

7. Describe considerations of level of effort and cost, as applicable, and why proposed study alternatives would not be sufficient to meet the stated information needs.
The level of effort and cost is commensurate with a project the size and the likely license term. Given the cultural importance placed on recreational fisheries by the Saco Watershed stakeholders, this study is necessary for fishery managers to make better-informed

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[10] MDIFW-NFWF letter dated April 28, 2016

management decisions to support the recreational fishery, especially regarding brook trout, a much sought-after species. Use of PIT tags to determine if and when brook trout have entered the main stem of the Saco River where they can be sampled by electrofishing is a much better method than monitoring water temperatures and inferring when then fish are likely to enter. If brook trout do not exit the feeder rivers, additional studies will not be required.

APPENDIX C

Alternative Study Request: Desktop Fish Impingement and Entrainment Study

1. Study goals and objectives.

The goal of this study is to assess project related impacts on downstream migrating species. The objectives of this study are to estimate the potential for impingement and entrainment at the facility and the potential level of project related mortality of downstream migrating species. Total project survival will be characterized for brook trout and American eel.

2. Relevant resource management goals. (Under §5.9(b)(3) If the requester is a not a resource agency, explain any relevant public Interest.)

Maine's rivers and wildlife are, by law, public resources. When stakeholders of the Saco River Watershed were recently queried about specific aspects they valued in the Saco River Watershed, the responses indicated that some 58% respondents valued recreation - more than any other response [11]

Both State and Federal agencies have habitat restoration programs in place to reconnect waters lacking fish passage connectivity. Hiram Dam prevents fish passage in the Saco River. It is incongruous for parts of the government to fund habitat reconnection projects, while others work to support the status quo.

MDIFW is a cabinet level agency of the State of Maine, and under Maine State Law (12 MRSA, §10051) MDIFW's mandate is "…to preserve, protect, and enhance the inland fisheries and wildlife resources of the State; to encourage the wise use of these resources; to ensure coordinated planning for the future use and preservation of these resources; and to provide for effective management of these resources." It is evident from the PAD that the information on the Saco River is dated and extremely lacking in information on brook trout. This lack of information marginalizes MDIFW's capability to manage the resource or to assess the existing/future impacts associated with the Hiram Dam Project.

PAD Section 5.3.3 quotes Forrest Bonney: "Brook trout may spend part or all their lives in small brooks, streams, rivers or large lakes, provided that the habitat is suitable and competition from other fish is not excessive... Brook trout normally spawn in brooks or streams in late September to November."

Recent telemetry studies conducted by the New Hampshire Department of Fish and Game[12] have gone on to show that resident brook trout move farther within watersheds than was previously thought with one individual documented moving over 70 river miles, even navigating Hellgate Gorge and a series of bedrock cascades that were once thought to be impassable. These resemble the extended cascade we call Hiram Falls. Little is known about use of the main stem Saco River by resident brook trout making efficient management of the resource by MDIFW problematic.

3. The requestor, Sebago TU, is a non-governmental organization (NGO).

4. Existing information concerning the subject of the study proposal, and the need for

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[11] Possibilities for Collaboration in the Saco River Watershed: An Assessment, Alice Elliott et al. March 2018

[12] Unpublished studies by new Hampshire Fish and Game Fisheries Biologist Dianne Timmons dianne.timmins@wildlife.nh.gov (603) 568-9393

additional information.
Most hydroelectric projects use trash racks upstream of hydraulic structures to prevent debris from interfering with the mechanical parts of the facility. These trash racks may be a source of injury or mortality for emigrating species. Injury or death occurs when fish, attracted to the hydraulic structure by flow, become overwhelmed by the hydraulic conditions causing impingement on the trash rack. Evaluation of each powerhouse intake is necessary to determine the potential for impingement for all life stages of species managed at the Project. Entrainment and subsequent turbine mortality/injury may occur as fish move through hydroelectric units; death/injury to emigrants are due to blade strike, shear forces, and/or pressure changes (Pracheil et al. 2016). Turbine passage survival studies have been independently performed at numerous hydroelectric projects throughout the country (Franke et al. 1997). These studies resulted in the derivation of strike probability equations based on the design characteristics of Project turbines that estimate turbine mortality. The PAD does not state the specific type of turbine that is at each dam. Each dam in the Project provides two possible routes out of the headpond, spill or through the units. Estimating project survival for downstream migrants is necessary information to determine Project effects on migratory species. We currently do not have estimates for downstream survival for any species within the Project boundary.

5. Nexus between Project operation and effects on the resource to be studied.
Any downstream migrating brook trout should encounter the project as part of their seasonal migration and American eel encounter this project as part of their emigration to the Atlantic Ocean. High mortality estimates will have a significant effect on the number of returning adults. Data from this study will provide valuable information to support the decision process for this licensing action and in developing the administrative record for potential Section 18 fishway prescriptions and/or other action.

6. Explain how the proposed study is consistent with generally accepted practice in the scientific community.
A desktop analysis of impingement and entrainment is common practice for facilities where downstream movement of migratory species is expected. It has been utilized extensively in the western U. S. to help limit salmonid mortality.[13]
Entrainment survival estimates should be determined using data from other hydroelectric facilities with similar characteristics in the database following standard guidance (EPRI 1992). A blade strike probability and mortality assessment should be completed using the Franke equation (Franke et al. 1997). The assumption that fish migrate proportionally with the flow distribution will determine the routing unless precluded by physical constraints (e.g. depth of flow, rack exclusion).

7. Describe considerations of level of effort and cost, as applicable, and why proposed study alternatives would not be sufficient to meet the stated information needs.
The level of effort and cost is commensurate with a project the size and the likely license term.

[13] Trina Rytwinski et al. 2017 What are the consequences of fish entrainment and impingement associated with hydroelectric dams on fish productivity? A systematic review protocol

APPENDIX D

Photos taken in the project area August 2018


ONLY
FAST MOVING
AND CHANGING
WATER LEVELS

APPENDIX E

Additional Study Request: Brook Trout Migration Using Radio Tags

1. *Study goals and objectives.*

This study will track and document the movement of brook trout implanted with radio tags in the project impoundment and all connected flowing waters of the Saco River Watershed including its tributaries from Hiram Dam upstream to the Swan Falls Dam and downstream to Bonny Eagle Dam - see attached maps. A multi-year study would be optimal, a year-long study running from June to May would collect valuable data. Specific goals and objectives include:

- Track and document any brook trout migration to and from tributary waters and the main stem of the Saco River
- Document the timing of such movement (seasonal assessment)
- Document any pooling of brook trout above or below Hiram Dam
- Document any brook trout coming from upstream of the Hiram Dam that are swept downstream in high flow conditions, and subsequently hold below the dam

2. *Relevant resource management goals. (Under §5.9(b)(3) If the requester is a not a resource agency, explain any relevant public Interest.*)

Maine's rivers and wildlife are, by law, public resources. When stakeholders of the Saco River Watershed were recently queried about specific aspects they valued in the Saco River Watershed, the responses indicated that some 58% respondents valued recreation - more than any other response (Source: Possibilities for Collaboration in the Saco River Watershed: An Assessment, Alice Elliott, Sophia K. Paul, J. Garrett Powers, and Kaitlyn Pritchard, Prepared for the Wells National Estuarine Research Reserve and residents of the Saco River watershed March 2018.) Both State and Federal agencies have habitat restoration programs in place to reconnect waters lacking fish passage connectivity. Hiram Dam prevents fish passage in the Saco River. It is incongruous for parts of the government to fund habitat reconnection projects, while others work to support the status quo.

MDIFW is a cabinet level agency of the State of Maine, and under Maine State Law (12 MRSA, §10051) MDIFW's mandate is "*…to preserve, protect, and enhance the inland fisheries and wildlife resources of the State; to encourage the wise use of these resources; to ensure coordinated planning for the future use and preservation of these resources; and to provide for effective management of these resources.*" It is evident from the PAD that the information on the Saco River is dated and extremely lacking in information on brook trout. This lack of information marginalizes MDIFW's capability to manage the resource or to assess the existing/future impacts associated with the Hiram Dam Project.
Atlantic salmon are the driver for fish passage per the 2007 Agreement. PAD Section 5.3.3 quotes Forrest Bonney: *"Brook trout may spend part or all their lives in small brooks, streams, rivers or large lakes, provided that the habitat is suitable and competition from other fish is not excessive... Brook trout normally spawn in brooks or streams in late September to November."* Recent telemetry studies conducted by the New Hampshire Department of Fish and Game have gone on to show that resident brook trout move farther within watersheds than was previously thought with one individual documented moving over 70 river miles, even navigating Hellgate Gorge and a series of bedrock cascades that were once thought to be impassable - see attached map. This study is part of a series of similar studies that began in 2005 and are still ongoing in some capacity. Sebago TU reasons that this salmonid species should receive equivalent consideration to Atlantic salmon due to its historical importance and desirability as a sport fish.

3. *The requestor, Sebago TU, is a non-governmental organization (NGO).*

4. *Existing information concerning the subject of the study proposal, and the need for additional information.*

MDIFW has little specific knowledge of the movements of brook trout within this watershed. The presence of brook trout in feeder brooks is well known, especially the Shepards and Tenmile Rivers above Hiram Dam; and Breakneck and Pease Brooks below Hiram Dam. Of note: *"MDIFW has previously monitored that reach of the Shepards River just upstream of the road crossing proposed to be rehabilitated. Three run depletion electrofishing surveys were conducted annually in this reach between 1999 and 2004 to estimate the abundance of brook trout and other resident fish. An additional sampling event was also conducted in 2010. This historical information documents the presence of a well-established population of brook trout that provides a high quality fishery."* Source: MDIFW-NFWF letter dated April 28, 2016. Brook trout seasonal movement to and from from the Shepards River and other tributaries into the main stem of the Saco in the fall and their return to smaller waters the following spring has not been studied thus far.

5. *Nexus between Project operation and effects on the resource to be studied.*

The operation of the Hiram Dam Project has a direct impact on the fish populations in the Saco River. The presence of the dam is key to its operation. It precludes movement of fish upstream (with the possible exception of American eels) and severely limits the downstream movement of all fish (with the possible exception of American eels) and causes some mortality due to fish being ingested into the hydro turbines. High flows below the dam may attract fish seeking upstream passage that the dam renders impossible. The impounded area created by the dam creates habitat that is more or less suitable to different species, and operations including flow modifications and impoundment water levels likely effect their growth, survival, and reproductive success. Riverine fish populations often exhibit frequent year class failures, and poor size quality that has in some cases been attributed to hydroelectric operations.

6. *Explain how the proposed study is consistent with generally accepted practice in the scientific community.*

Techniques for fish telemetry studies are well established and have been used for years to successfully track fish movements with low resultant mortality on Nash Stream, the Dead Diamond and Swift Diamond Rivers in New Hampshire and the Magalloway River in Maine. More specifics associated with the requested study are attached. Final methodology would be developed through TU and MDIFW consultation.
Additional information on telemetry studies is available from Dianne Timmins, New Hampshire Fish and Game Fisheries Biologist: Dianne.Timmins@wildlife.nh.gov (603) 788-3164. A report of her 2010-2011 work is attached as well as that of a telemetry study conducted in 1999 coincident with the Indian Pond Project Relicensing.

7. *Describe considerations of level of effort and cost, as applicable, and why proposed study alternatives would not be sufficient to meet the stated information needs.*

The level of effort and cost is commensurate with a project the size and the likely license term. Given the cultural importance placed on recreational fisheries by the Saco Watershed stakeholders, this study is necessary for fishery managers to make better-informed management decisions to support the recreational fishery, especially regarding brook trout, a much sought-after species. None of the studies called for in the PAD resemble this one or collect similar data.

Brook Trout Migration Using Radio Tags Methodology

The following is provided as an example of methodology successfully used to conduct a brook trout migration study:

"In 2011, a total of nineteen wild adult brook trout (Salvelinus fontinalis) caught in the Dead and Swift Diamond Rivers were radio tagged using both Advanced Telemetry Solutions (ATS) and Lotek© radio transmitters... Fifteen fish were tagged in the Dead Diamond and four in the Swift Diamond River. This was the second year of assessment on seasonal migration and habitat preferences by wild brook trout in the Swift Diamond watershed and the fifth year of assessment on stocked trout in the Dead Diamond River. Brook trout were tagged during the months of May and June using either ATS or Lotek transmitters depending on the weight of the fish captured. Tagging of these fish was performed by NH Fish and Game personnel. All fish were captured by angling, anesthetized, surgically implanted with transmitters, and when they recovered, released. Fish were anesthetized using MS-222. The incision was made on the stomach and the transmitter was inserted into the intraperitoneal cavity. The antenna of the transmitter was fed into a one and a half inch, 16-gauge catheter that was used to pierce through the skin by the pectoral fin to provide a separate hole for the antenna. The catheter went from the inside out as to not puncture the internal organs. The incision was stitched using Ethicon© Monocryl Y923 absorbable sutures. The fish were held in aerated recovery tubs until they exhibited normal swimming behavior. Tracking events will occur weekly through October. Post-spawn events will reduce to monthly because once the fish reach their wintering areas their movement is minimal. All tracking events are currently being funded by Dartmouth College Grant. This study will continue through 2012. Migration results will be reported at that time. "

Similar procedures would be used in the Saco River Watershed, adjusted for study goals:

- Brook trout would be tagged in June, early September, and March (as soon as fish could be relocated following ice-out). In areas where brook trout congregate, additional fish could be captured and telemetry tags installed if needed. Small-sized transmitters are limited by battery size and usually operate for two to three months. Larger fish can withstand larger tags with proportionately longer battery life.
- Upstream of Hiram Dam: Brook trout would be captured by electrofishing in known areas of the Shepards and Ten Mile Rivers, 10 to 20 fish from each. Size of fish captured could prove problematic, but latest telemetry tags enable adult brook trout as small as 9 grams to be safely tagged, typically fish of about 6-7 inches in length. Use of larger tags on larger fish results in improved study continuity resulting from longer battery life.
- 20 hatchery brook trout of a range of sizes (9 inches to 14 inches) would be implanted and released in multiple locations along the main stem, except immediately below Hiram Dam where there is some likelihood that they would remain for the life of the study.
- Monitoring will be conducted from a variety of platforms: foot, vehicle, boat and/or plane consistent with tracking success.
- Tacking would be once a week, derived from their surgery date during important periods of the year until December when fish would be assumed to have reached their overwintering locations, and monthly until ice over conditions preclude tracking. Weekly monitoring will resume from ice out through May when the fish pursue their summer forage areas.

Saco River Priority Brook Trout Areas Swans Falls to Hiram Falls

Priority Catchment

0 1 2
Miles

N

Maine
Area of detail

Map created by A. Abbott 3/28/18

Saco River Priority Brook Trout Areas Hiram Falls to Bonny Eagle

Priority Catchment

0 1 2 Miles

N

U.S. FISH & WILDLIFE SERVICE

DEPARTMENT OF THE INTERIOR

Maine

Area of detail

Map created by A. Abbott 3/28/18

Appendix F

June 12, 2018

TROUT UNLIMITED
Sebago Chapter

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

Via online submission to: http://www/ferc.gov

Subject: **Comments of Trout Unlimited, Sebago Chapter, on Brookfield White Pine Hydro Proposed Study Plan For The Hiram Hydroelectric Project (FERC Project 2530-054).**

Dear Secretary Bose:

On behalf of its members, the Sebago Chapter of Trout Unlimited ("TU") submits these comments on the Brookfield White Pine Hydro Proposed Study Plan ("PSP") for the Hiram Hydroelectric Project (FERC Project 2530-054) dated May 14, 2018 ("Project"). TU is submitting these comments in advance of the June 13, 2018 PSP meeting to facilitate discussion about TU's proposed study of Brook Trout movement in connection with the Project ("Proposed Study"). This submission is also well in advance of the August 12, 2018 PSP comment deadline and TU reserves the right to file additional comments on or before that time.

TU submitted comments on the Pre-Application Document ("PAD") for this Project and submitted a FERC Study Request by letter dated March 29, 2018.[1] TU has also reviewed Applicant's PSP. Brookfield White Pine Hydro ("BWPH" or "Applicant") did not incorporate TU's Proposed Study into the PSP. As justification for failing to include TU's proposed study Applicant stated the following:

> *"White Pine Hydro Response: White Pine Hydro is not proposing a brook trout movement study documenting the movement of brook trout in the Saco River and its tributaries from Bonny Eagle Project, downstream of the Hiram Project, to the Swan's Falls Project, upstream of the Hiram Project, a stretch of approximately 39 miles.*
>
> *Brook trout are a resident coldwater species, preferring lakes and streams that stay cool throughout the summer; optimal water temperature for brook trout is 68°F or cooler (Bonney 2009). While tributaries to the Saco River may provide coldwater habitat, the water temperature in the main stem of the Saco River regularly exceeds 77°F in the summer (BWPH 2014; SRCC 2017), which likely limits the distribution of brook trout in the main stem of the Saco River. The Maine Department of Inland Fisheries and Wildlife (MDIFW) manages the Saco River in Maine as a self-sustaining warm-water fishery and a put-and-take trout fishery i.e., through annual stocking to support recreational fishery demand (see e.g., MDIFW March 28, 2018, letter providing comments on the Notice of Intent to File License Application and Pre-Application Document). Further, MDIFW stated that these put-and-take brook trout stockings provide anglers with the opportunity to harvest native trout that are easier to catch than brown trout (MDIFW 2016). As such, brook trout abundance needed to satisfy angler exploitation*

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[1] TU hereby incorporates by reference all of its study request, past correspondence, and statements of record and asks that these comments be placed in the record of the proceeding.

goals in the Project area is a function of stocking intervention rather than recruitment via fish movements and/or natural reproduction. In other words, MIDFW has not identified brook trout movement in the Saco River as a management objective for the Project area or the Saco River. Consequently, a brook trout movement study will not produce data needed to inform the development of license requirements (see Study Criteria No. 5, 18 C.F.R. §5.9(b)).”[2]

TU believes Applicant’s rationale for omitting the Proposed Study is unsupported by data, a MDIFW PAD comment request, and current law and policy and is therefore incorrect. TU further submits that its Proposed Study easily meets the specific Study Criteria No. 5 of 18 C.F.R 5.9(b) cited by the Applicant. Accordingly, TU responds with the following comments:

1. Background.

a. TU believes that the Project’s fish passage and management provisions are generally incomplete and appear flawed:

At present, the Project’s fish passage requirements are subject to a July 18, 2007 FERC Order[3] (“2007 Order”) that was the result of a 2007 Settlement and Assessment filed on March 27, 2007 (“2007 Settlement Agreement”). The 2007 Order provides in part that the status of Atlantic salmon below Hiram Dam on or before 2025 keys the Applicant’s requirements for fish passage. TU was not an intervenor in the FERC proceeding nor a party to the 2007 Settlement Agreement, but notes that Attachment 1, a USGS analysis of the BWPH Saco River Diadromous Fish Passage Report, indicates flawed methodology is being used to assess fish passage. TU acknowledges that this coupled with recent weak Atlantic salmon returns put Atlantic salmon restoration efforts in the watershed in doubt. However, these efforts are still ongoing and the species has not yet been deemed to be unrecoverable for the Saco River watershed. TU believes it is premature to imply that because the species numbers are down (or even non-existent in certain locations for the time being) that planned fish passage governed by the 2007 FERC Order for the Hiram Dam will be unnecessary or not required. It is self evident that the purpose of fish passage is to allow for species access to spawning or other habitat that would have existed but for the dam. Fish passage is essential to anadromous fish runs and their potential restoration and TU believes adequate fish passage may also be essential to the movement required for the restoration and preservation of native species such as the Brook Trout (*Salvelinus fontinalis*).

Importantly, TU notes that there is no mention of Brook Trout habitat or movement in either the 2007 FERC Order or the 2007 Settlement Agreement. Whether this omission was intentional or by oversight, there is no apparent rationale or justification for the omission of such an iconic native species of major importance to the State of Maine and other stakeholders.

Here, even assuming Applicant proceeds with fish passage construction as planned, there are no data or studies that exist that demonstrate such passage can be used by Brook Trout to facilitate their movement either to critical spawning areas or to escape the high temperature regimes (created in part by the dam itself) and acknowledged by the Applicant in its PSP. It is therefore critical to first establish with data obtained from

[2] Applicant’s PSP at 5-4, 5-5.
[3] *See* Order Modifying and Approving Fish Passage Assessment Report and Recommendations for Fish Passage and Fisheries Management (120 FERC ¶ 62,050).

TU's Proposed Study that: (1) the movement of Brook Trout present in the Project Area (through stocking efforts or otherwise) is affected by the Project and the Project Area's temperature regime; and (2) if the data suggest that in fact this is the case, whether existing fish passage provisions provide sufficient remedial measures to allow for Brook Trout movement for survival and spawning.

b. The State of Maine and MDIFW have clearly prioritized the protection and preservation of Brook Trout:

The presence of Brook Trout habitat constitutes a significant and valuable fishery resource of great importance to TU, the State of Maine and other stakeholders and is thus a matter of vital public interest. It is well established that in addition to recreational angling, Brook Trout provide a significant forage feed for other fresh water fish as well as for avian predators such as Bald Eagles, Ospreys, Kingfishers and Herons. Brook Trout are an iconic and historically significant native species. As an example of the State of Maine's recognition of the importance of this species, in 2006 Legislative protection was extended to native brook trout populations.[4]

In July of 2009, two years following the issuance of the 2007 FERC Order, the Maine Department of Inland Fisheries and Wildlife ("MDIFW") issued its Brook Trout Management Plan ("2009 Plan") which clearly indicated that the preservation and restoration of Brook Trout had become a priority for the MDIFW. The 2009 Plan confirmed that "[n]early all of the State's inland waters were originally suited for brook trout. This situation began to change as increases in human population growth, industrialization (*including the construction of power-generating dams*), agriculture, and timber harvesting became increasingly widespread in the 1800's."[5] It has also been noted that *"[e]ven at existing dams, brook trout habitat can be impacted by hydropower project operations that modify flow, or that result in changes in water quality and temperature either upstream or downstream of the dam*."[6] The prioritization by MDIFW, and the detrimental changes and ongoing affects of hydropower operations in proximity to Brook Trout habitat are among the specific reasons some have concluded that Brook Trout habitat "….*has the potential to affect hydropower development potential by increasing project costs to address brook trout habitat protection and management needs*."[7]

In connection with the Project specifically, MDIFW further stated in its In Hiram PAD comments:

> "Based on information in the PAD for the Hiram Project, and preliminary staff analysis, we have identified migratory fish (i.e., Atlantic salmon and American eel) as resources that could be cumulatively affected by the continued operation and maintenance of the Hiram Project, in combination with other hydroelectric projects and activities in the Saco River Basin." *MDIFW requests the statement be corrected to include both resident and migratory fish*.[8]

Brook Trout are a resident and migratory fish, and Applicant's statement that MDIFW has not identified Brook Trout as a Project management objective appears to be inconsistent with MDIFW's specific request to do so in its Hiram PAD comments. Further, to conclude that angler exploitation goals are satisfied with current stocking misses the broader benefits and public interest in Brook Trout preservation evidenced by, among other things:

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[4] See LD 1131, An Act to Recognize and Protect the Native Eastern Brook Trout as one of Maine's Heritage Fish.
[5] 2009 Plan at 3 (emphasis supplied).
[6] Maine Hydropower Study prepared for the Maine Governor's Energy Office by Klienschmidt, February 2015 ("Kleinschmidt Hydropower Report") at 2-13 (emphasis supplied).
[7] Kleinschmidt Hydropower Report at 2-13 (emphasis supplied).
[8] SD1 Section 4.1.1, Resources that could be Cumulatively Affected, MDIFW PAD Comments at 13 (emphasis supplied).

1. The MDIFW prioritization of the species
2. Explicit regulations that seek to protect Brook Trout
3. The State's demonstrated public interest in the preservation and restoration of Brook Trout.

2. Why the Proposed Brook Trout Movement Study is needed in the PSP.

Brook trout are a native species to the Saco River. Attachments 2, 3 and 4 to these comments show the overall historic range of the fish, a detailed breakdown by subwatershed, and the current occurrence of wild fish. These attachments clearly demonstrate that brook trout were a major component in the natural ecology of the Saco River watershed.

In our Study Request, we cited study data showing that *brook trout have been observed moving nearly 75 (seventy-five) miles* within the Swift/Dead Diamond - Magalloway River system in the upper Androscoggin Watershed, the next major watershed north of the Saco. For convenience, we have attached a map showing those brook trout movements (see Attachment 5).

Our native brook trout are indeed a coldwater species. However, the temperatures cited by Applicant occur during the hottest summer months in the Saco and also occur in many waters that are productive trout fisheries*. The point of TU's Proposed Study is that brook trout need to move to access colder waters within watersheds to avoid these lethal temperatures with their accompanying low oxygen levels.* TU believes Hiram Dam may be preventing native brook trout from accessing these refugia and the other critical habitats that they require to feed, breed and winter over. Attachment 6 documents and describes brook trout movements within the Rapid River where the travel distances required to reach critical habitats are less, but still significant. TU also believes that the section of the Saco River that included the Shepards River, Tenmile River, Hiram Dam, Breakneck Brook and Pease Brook was likely once the center of a robust native brook trout population that is being degraded by the presence of Hiram Dam. The proposed radio tracking study could confirm that. Without tracking study data, no one knows what habitat the brook trout in the upper Saco are trying to access and/or whether that access has been impeded. There is less suitable habitat upstream where the river has been channelized and downstream where lower gradients and impoundments make for a more lake-like habitat. However, it remains unclear whether other habitat access, particularly that which can provide cooler water, is accessible.

The use of radio-telemetry tags to track fish movements is a relatively recent innovation. The study cited in the PSP by the Applicant took place during hot summer months, did not use this technology, and did not detect the presence of brook trout. That finding is unsurprising and does not speak to Brook Trout movement away from warmer temperatures to habitats of cooler water; it only confirms that Brook Trout do not like warmer temperatures in the summer. This has been known for some time. Brook trout are typically suited to water temperatures that range from 34 to 72 °F (1 to 22 °C) and they're most active and actively feeding is 50 to 56 °F. Warm summer temperatures and low flow rates are stressful on brook trout populations - especially larger fish and favor warmer water species such as smallmouth bass which are active when the water temperature is between 65 and 75 °F. However, despite the potential for displacement or competition for food resources, there are numerous examples where both species have some degree of coexistence and are managed by MDIFW where impoundments make for warmer water temperatures. For example, Attachment 6 shows that in the Rapid River there are sections where, although managed for trout, both species are present in fishable abundance. The same is true in the middle Kennebec and other waters and it is common knowledge that in these waters the trout will move to cooler water when it gets warm.

The fact that MDIFW currently stocks brook trout in the Project Area only further confirms that the species is a prime concern to the department. As such, the species' ability to access critical habitat must be a concern to MDIFW, as would their movements to access this habitat since both would affect local abundance and size quality. Since providing brook trout abundance is clearly a concern to MDIFW, so should their movements relative to the dam, particularly if it is preventing them from reaching critical habitat. To conclude otherwise is inconsistent with the vast body of state law, regulation and policy that currently exists to protect Brook Trout.

Furthermore, evidence of MDIFW's concerns to preserve and protect Brook Trout in the Project Area can be found in even a cursory review of the State's fishing regulations pertaining to the Project Area. For example, there is a two brook trout limit on the Saco River and no restrictive catch limits on bass or other species.[9] Below the dam in Porter, the laws appear to encourage killing bass,[10] while Wedgewood Brook, a known coldwater refugia for salmonids, is closed to all fishing.[11] This type of selective species regulation is clearly designed to help preserve existing or introduced stocked Brook Trout and their coldwater habitat, while at the same time allowing for the unrestricted harvest of predator game fish. They underscore MDIFW's attempt to preserve and protect salmonids including Brook Trout in the Project Area.

In light of the above, the requested study will provide overdue data that will enable a detailed evaluation of how the watershed is best managed based on newer, more accurate and reliable technology as well as a more complete and representative seasonal and Project Area temperature regime.

3. The Proposed Study easily meets the 18 CFR § 5.9 (b) Study Criteria cited by Applicant:

First, MDIFW does not have, and has not had, comprehensive data with respect to Brook Trout movement to make the determination whether or not to identify Brook Trout movement as a management objective for the Project Area or the Saco River. All that is known at present is that there is an ongoing put and take seasonal stocking program for Brook Trout. The determination of whether Brook Trout should be a Project management objective is, in part, the objective of the Proposed Study. To TU's knowledge the Proposed Study is the first of its kind and nothing even remotely similar was conducted in connection with the 2007 Settlement or in subsequent years regarding the Project Area or Saco River watershed. TU believes this is largely due to the unexplained omission from the 2007 Settlement Agreement of studies regarding Brook

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[9] The 2018 Maine Open Water and Ice Fishing Laws, Maine Department of Inland Fisheries and Wildlife ("2018 MDIFW Fishing Laws") state: "Saco River**,** Fryeburg to Saco. General fishing laws apply, except: From the Maine/New Hampshire border in Fryeburg to Cataract Dam in Saco: Open to open water and ice fishing from January 1 - December 31, S-19. The use of all legal forms of bait, artificial lures, and artificial flies is permitted." and "S-19**:** Daily limit on brook trout (includes splake and Arctic char): 2 fish." 2018 MDIFW Fishing Laws at 43, iii (Season and Special Codes).

[10] "Ossipee River, Parsonsfield, Porter, Cornish, Hiram. General fishing laws apply, except: S-13. From Kezar Fall's Dam (Porter/ Parsonsfield) to Warren's Bridge (Cornish): ALO, S-19. That portion of the Ossipee River between the red markers located approximately 100 yards upstream and 100 yards downstream from the confluence of Wedgewood Brook: Closed to all fishing. (See listing for Wedgewood Brook)." "S-13: No size or bag limit on bass." 2018 MDIFW Fishing Laws at 36, iii.

[11] "Wedgewood Brook, Cornish, Parsonfield. General Fishing laws apply except: From Route 25 downstream to the confluence of the Ossipee River: closed to all fishing." 2018 MDIFW Fishing Laws at 52, iii.

trout spawning and movement behavior. This omission continues today despite the 2009 MIDFW Management Plan for Brook Trout, and State legislative declarations that clearly prioritize the preservation and protection of the species.

Further, the law, regulatory requirements and guidance are clear. The Federal Power Act ("FPA") requires FERC to fully consider all evidence and arguments presented in the relicensing proceeding and it is well settled that the "purpose of relicensing is to examine the public interest with respect to an existing project in light of *currently* applicable laws and policies."[12] Applicant appears to be relying on outdated studies and agency policy to support its conclusions regarding TU's Proposed Study. As stated in the FPA, FERC relicensing proceedings are governed by current laws and policies, not assumptions concerning past agency actions which may or may not have been fully informed.

Finally, it is indisputable that dam impoundments affect not only anadromous fish species migration, but by their very design impair or impede all fish movement in the absence of adequate fish passage. It is also well established that dam impoundments affect fish habitat, by altering instream flows, streambed habitat and temperature regimes both upstream and downstream of the dam. By Applicant's own cited studies, summer water temperatures are warm and TU and Applicant both agree Brook Trout are a cold water species. However, *TU believes that it is this precise seasonal temperature regime, in part due to the existence of the Project itself that contributes to seasonal Brook Trout movement within the Project Area to colder water at depth or in tributaries when the water warms up.* This type of fish movement is common knowledge among the angling community which finds success fishing for Brook Trout during the summer months upstream or in deeper water where the water is cooler. TU submits that rather than concluding that warm water in the summer means brook trout cannot survive, or that MDIFW has solved the problem with seasonal stocking, *it is equally likely that the fish merely move to cooler water, either at depth or to a cooler tributary to survive or spawn*. TU has shown that in some cases, what data does exist indicate this movement may be on the order of many miles. A dam such as the Hiram Project, without adequate fish passage will prevent such movement. Thus, the nexus of the Proposed Study to the Project is undeniably clear.

TU believes that by impairing or impeding Brook Trout movement, the Project operations have a direct, and possibly indirect and cumulative effect on the Brook Trout resource. TU's Proposed Study is one step toward understanding whether or not TU will use the data obtained from its Proposed Study to "develop protection, mitigation, and enhancement measures"[13] such as ensuring that Applicant has adequate fish passage provisions to allow Brook Trout access to critical spawning and survival habitat, which includes cooler water, upstream or downstream of the dam, particularly during the summer months. As such, TU's Proposed Study will inform the development of the Applicant's license requirements and easily satisfies the requirements of Study Criteria No. 5 of 18 C.F.R 5.9(b).

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[12] Confederated Tribes and Bands of Yakima Indian Nation v. FERC, 746 F.2d 466, 470-71 (9th Cir. 1984), cert. denied, 471 U.S. 1116 (1985) (emphasis supplied).

[13] *See* Understanding the Study Criteria, Integrated Licensing Process FERC Office of Energy Projects, April 6, 2005 at 6 which, in reference to Study Criteria 5, states: "This discussion should clearly draw the connection between project operations and the effects (direct, indirect, and/or cumulative) on the applicable resource. Just as important, this discussion should explain how the requester will use the information to develop protection, mitigation, and enhancement measures, including those related to an agency's mandatory conditioning authority under 401 of the Clean Water Act or sections 4(e) and 18 of the Federal Power Act."

Sebago TU appreciates the opportunity to comment on this vital public interest issue and looks forward to resolution of its Proposed Study in the ILP process.

Respectfully,

Stephen G. Heinz
Sebago TU Hiram Dam Relicensing Response Coordinator

Attachments:

1. USGS letter dated June 11, 2018
2. Map of Historical Brook Trout Range. Source: Hudy et al 2008
3. Map of Distribution of brook trout status classifications in subwatersheds. Source: Eastern Brook Trout Joint Venture 2007
4. Map of Saco River Watershed Wild Brook Trout Catchments. Source: Eastern Brook Trout Joint Venture 2018
5. Map from Fish Migration Study Second College Grant Maximum Home Range, New Hampshire Fish and Game 2012
6. Boucher, D.P. and D. Timmins. 2008. Seasonal movements and habitat use of brook trout in the Magalloway River, Maine. Fishery Final Report Series No. 1. Maine Department of Inland Fisheries and Wildlife. Augusta, Maine

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Stephen G. Heinz
Conservation Committee Chair,
Sebago Chapter of Trout Unlimited

June 11, 2018

Mr. Heinz:

Thank you for your recent request for review of the 2017 Saco River Diadromous Fish Passage Report, prepared by Brookfield White Pine Hydro LLC. I understand that your particular focus of interest has to do with Atlantic salmon and passage provisions for this species, but your letter also included text asking about overall passage performance of the system. I was happy to review this report, in part because we deal with related issues throughout the native range of American shad and River herring and it is helpful to see how various groups are approaching management of these resources. In particular, my area of expertise and interest has to do with fishway evaluations and passage performance, I therefore offer my comments in hopes that they may be of some interest to you and others who are working on management of Saco River fisheries resources.

Your specific request had to do with passage performance of Atlantic salmon. Unfortunately, I cannot offer much insight on this, owing to the sparse data that are provided. The report does provide information on numbers of salmon passed at the first dam(s) ('Cataract'), both for 2017 in particular and also over time (Text and Tables 3 & 6). However there is almost no additional information provided upstream of this site, with the exception of one salmon that was observed passing Skelton Falls. Moreover, there is no information on delay below Cataract, proportions passing the first dam, and no information on movements and passage behaviors upstream beyond that one observation at Skelton. Therefore it is not possible to comment on the effectiveness of any of these structures, except to note that during 2017 only 11% of released salmon passed upstream of Skelton, which suggests that in at least this one year of reporting there were serious barriers to movement. It appears that management protocls require that passage be prevented for salmon to avoid warm waters in the impoundment…it is possible that this practice is contributing to the overall poor passage success.

While reviewing the document I did notice what appeared to be a general lack of data that could be used to accurately assess the effectiveness of the passage structures. Below I offer some comments that may help to guide future studies.

General comments on the report as an assessment tool for fish passage performance

Overall, the information provided in this report is not sufficient to assess the passage performance of any of the species mentioned, and it is possible that that was not the primary intent of the report. Passage performance is not a simple matter of numbers of fish passed (which is reported here, at least for some sites), but instead is properly quantified as the rate of passage (percent of available population passing per unit time). Very fast rates (say, 80%/day) indicate good passage for many species, notably the shad and river herring described here. Where passage fails to meet this standard it becomes necessary to perform telemetry studies to determine the causes of poor passage. These studies must be designed in such a way as to differentiate among the three key phases of fish passage: Approach (or 'Discovery'), Entry, and Passage. Fishways that are sited poorly may never be discovered by the fish, and so they never get a chance to enter and pass. Poor entrance conditions have low entry rates for fish that do discover them, and poor internal design can impede passage. Likewise, fish may reject each of these phases—this can be for reasons having to do with structural design, but may also be the consequence of biological factors outside the control of dam operators (spawning behavior, motivation, homing, etc.). A properly designed

Attachment 1

telemetry study that employs multi-state time-to-event analysis to differentiate among the various rates of passage and rejection will help isolate the various components and address several issues that are alluded to in this report, but never rigorously quantified.

Although some telemetry work has been done, the results of this work are not presented, and the reader is given no reason to believe that the analysis was performed in a way that would support the conclusions described above. Instead we are offered assertions that one fishway was ‘deemed effective’, and others ‘intractable’.

Where fishways are deemed effective, operators have used this as a justification for not continuing to monitor. In my experience this is a mistake. Fishways can vary dramatically year-to-year in performance, and poor numbers in one year may help operators identify a cause that can be addressed within the season itself. These data can also inform longer-term goals, and routine monitoring is required for effective fishway management.

Low passage numbers of shad and herring at Skelton are attributed to spawning downstream. This is an example of an unsubstantiated claim, and it is at least as likely that the low numbers result from either poor transport conditions and/or ineffective fishway design and operation. The fact that spawning occurs downstream of the project does not indicate that passage is not required or desired by the fish—these species will spawn below a barrier quite willingly, as has been shown by their very persistence in East Coast rivers that have been dammed since colonial times, and also by their subsequent recolonization once effective passage is provided.

Downstream passage: It seems that provision for downstream passage is often predicated on visual observations by hydropower plant personnel. This is probably inadequate, since many species migrate low in the water column, at night, and also following rain events when turbidity may impede visibility. It is not possible to assess the effectiveness of downstream passage from the information provided, but given the operational protocols there is significant cause for concern that adequate passage may not be being provided. At the upstream projects (Bar Mills, West Buxton, etc.) it seems that visual observations are the only evaluation methods being used. This seems insufficient—are there any data with more rigorous methods that could be used to compare these observations with? If not then the absence of observed passage should be assumed to indicate poor effectiveness, although in reality passage may be much better than is reported here. Appropriate studies would be useful here as well, assessing both timeliness and survival of passage through all available routes.

I hope some of this feedback is of use.

Sincerely,

Theodore Castro-Santos, PhD

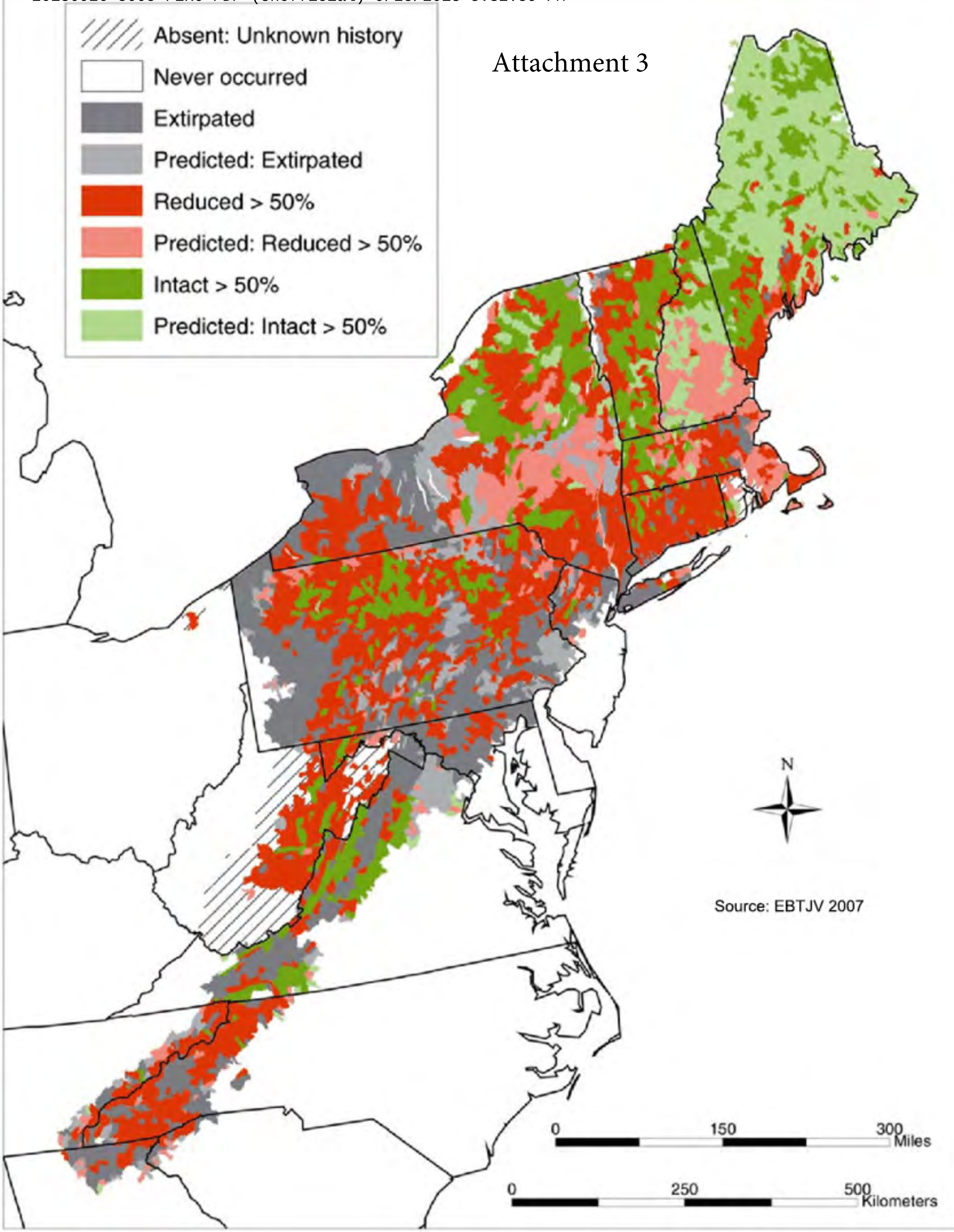
Research Ecologist

Attachment 2

Historical Brook Trout Range

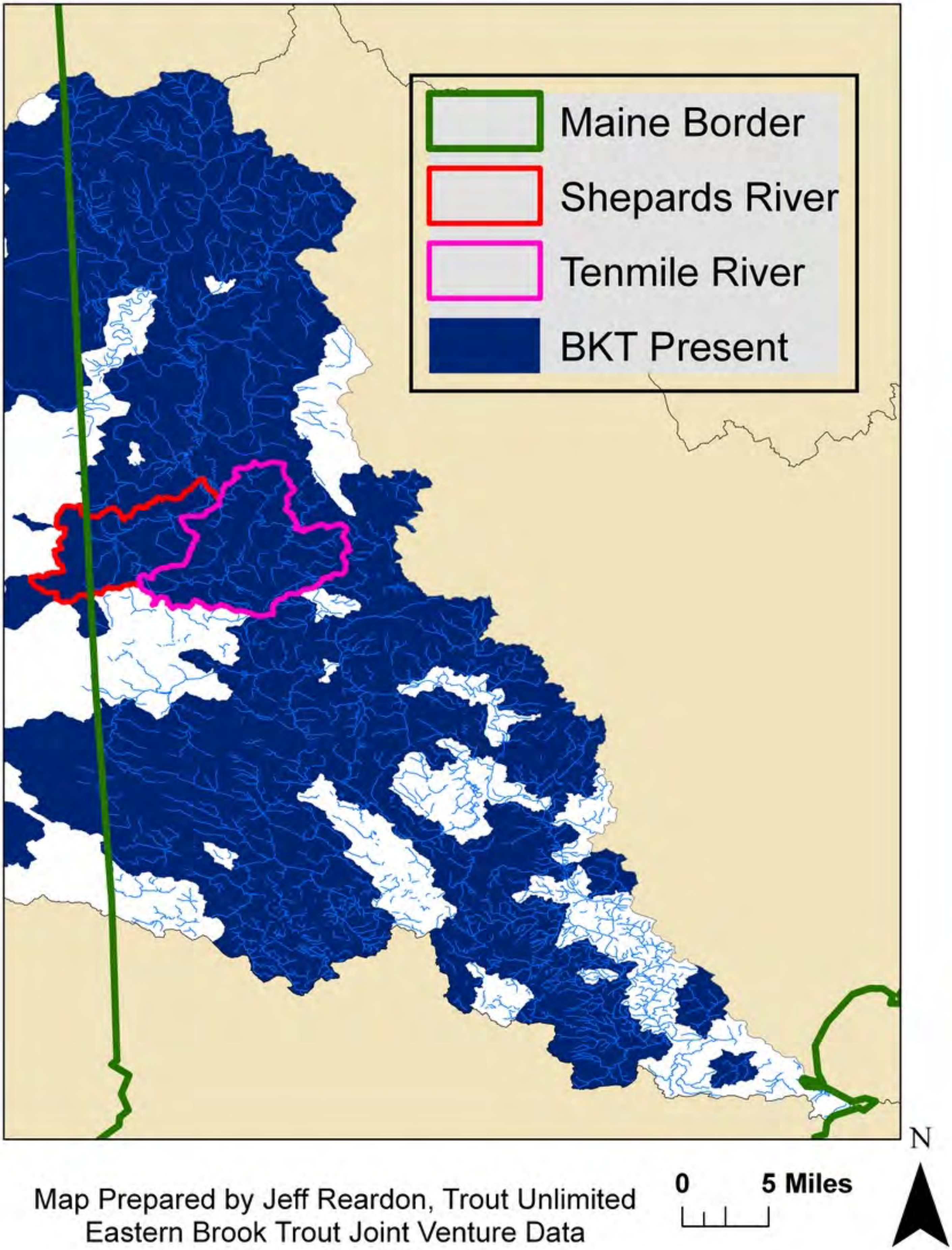
Source: Hudy et al 2008

Attachment 3

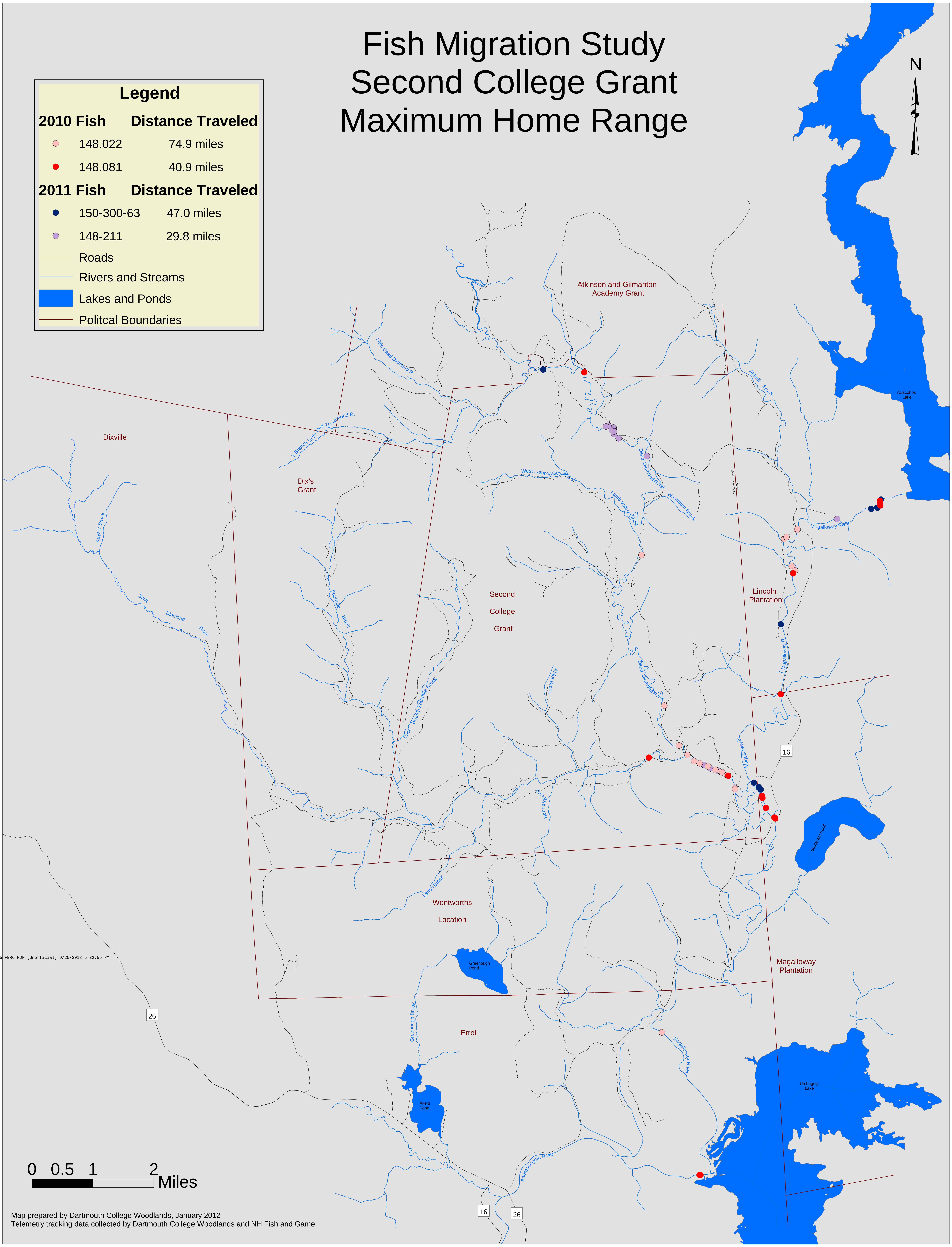


Saco River Wild Brook Trout

Attachment 4



Map Prepared by Jeff Reardon, Trout Unlimited
Eastern Brook Trout Joint Venture Data


Fish Migration Study
Second College Grant
Maximum Home Range
Legend
2010 Fish Distance Traveled
148.022 74.9 miles
148.081 40.9 miles
2011 Fish Distance Traveled
150-300-63 47.0 miles
148-211 29.8 miles
Roads
Rivers and Streams
Lakes and Ponds
Politcal Boundaries
N
Atkinson and Gilmanton
Academy Grant
Dixville
Dix's
Grant
Second
College
Grant
Lincoln
Plantation
Wentworths
Location
Magalloway
Plantation
Errol
Little Dead Diamond R.
S Branch Little Dead Diamond R.
Abbott Brook
Dead Diamond River
West Lamb Valley Brook
Lamb Valley Brook
Washburn Brook
Magalloway River
Keyser Brook
Swift Diamond River
Fourmile Brook
Magalloway R
Alder Brook
East Branch Fourmile Brook
Larrys Brook
Greenough Brook
Androscoggin River
Aziscohos
Lake
Sturtevant Pond
Greenough
Pond
Akers
Pond
Umbagog
Lake
16
26
0 0.5 1 2
Miles
Map prepared by Dartmouth College Woodlands, January 2012
Telemetry tracking data collected by Dartmouth College Woodlands and NH Fish and Game

Attachment 6

FISHERY FINAL REPORT SERIES NO. 08-01
SEASONAL MOVEMENTS AND HABITAT USE OF BROOK TROUT IN THE MAGALLOWAY RIVER, MAINE

BY
DAVID P. BOUCHER[1]
DIANNE TIMMINS[2]

JANUARY 2008

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JOB F-028
FINAL REPORT NO.1
SEASONAL MOVEMENTS AND HABITAT USE OF BROOK TROUT IN THE MAGALLOWAY RIVER, MAINE

ABSTRACT

A radio telemetry study was conducted on the Magalloway River below Aziscohos Lake in Oxford County, Maine to describe the timing of movements and identify important seasonal habitats for brook trout (*Salvelinus fontinalis*). Tagged brook trout moved only short distances, or not at all, from their original tagging locations during the summer and early autumn months. They moved primarily downstream short distances (1.6-2.4 km or 1-1.5 mi) to reach a major spawning site. Post-spawning dispersal occurred rapidly and in a downstream direction, with some tagged trout traveling up to 37 km (23 mi) to reach overwintering areas in deeper reaches of the Magalloway and Androscoggin Rivers, and in Umbagog Lake. Movement of trout from overwintering areas toward summer habitat occurred from late March to late April, invariably in an upstream direction. Returning tagged fish took positions in close proximity to their original tagging sites from previous year. Tagged brook trout traveled least during the summer period (mean movement of 0.48 km or 0.30 mi). Greatest movements occurred in the fall (mean of 10.5 km or 6.5 mi) to reach overwintering habitat, and in the spring (mean of 18.8 km or 11.7 mi) upon return to their summer range. Greatest distances traveled by individual trout ranged from 56 km (35 mi) to 116 km (72 miles). Telemetry data from this study and from two nearby rivers indicated the importance of Umbagog Lake as overwintering habitat for all three populations. These studies also confirmed the need to maintain the connectivity of all waters in this portion of the upper Androscoggin River drainage in order to assure the long-term sustainability of wild brook trout.

KEYWORDS:BKT,BEHAVIOR,MIGRATION,MOVEMENT,TELEMETRY

JOB F-028
FINAL REPORT NO.1
SEASONAL MOVEMENTS AND HABITAT USE OF BROOK TROUT IN THE MAGALLOWAY RIVER, MAINE

SUMMARY

Brook trout are native to waters of the Upper Androscoggin River drainage in western Maine, where they are highly valued for their ecological, cultural, and recreational attributes. The species is sensitive to impacts associated with human activities such as logging, dams, and urban or agricultural development. Brook trout are especially sensitive to competition from other fish species, and they are easily over-exploited by sport anglers because even novices readily catch them.

Brook trout have become the focus of intense investigation in western Maine in response to the recent establishment of smallmouth bass through an unauthorized introduction. Smallmouth bass are severe competitors with brook trout and they can reduce brook trout production in waters where the two species co-occur. The principal goal of this study was to provide information to guide management and maximize the protection of wild brook trout in the Magalloway River in Oxford County. We used radio telemetry techniques to define seasonal movements of brook trout within the Magalloway River and connecting waters in Maine and New Hampshire. Specific objectives were to describe the timing of movements, and to determine the locations of key seasonal habitats, such as summer foraging, temperature refuges, prespawning and spawning, and overwintering areas.

The Magalloway River is a major tributary to the upper Androscoggin River, originating near the Canadian border in western Maine and eastern New Hampshire. Aziscohos Dam, located 17.7 miles above its confluence with Umbagog Lake and the Androscoggin River, impounds a portion of the river. This study was conducted in this lowest reach below Aziscohos Dam.

Twenty-three brook trout from the Magalloway River were radio-tagged in June 2005 and tracked until mid-July 2006 by foot, small watercraft, aircraft, and snowmobile. Tagged brook trout moved only short distances, or not at all, from their tagging locations during the July-August 2005 period. By mid to late October, the height of the spawning period for most Maine brook trout populations, five tagged trout moved a short distance downstream to the confluence of Abbott Brook, or ascended the brook a short distance. Several other tagged fish took positions either near the mouth of Clark Brook, located a short distance below the lowermost tag site, or in discrete areas about one mile below Abbott Brook. Most movements of brook trout during the autumn period were in a downstream direction.

Post-spawning dispersal occurred rapidly and generally in a downstream direction. Tagged trout overwintered in upstream areas of the Magalloway River in deep, slow moving reaches, in the lower Magalloway River, in the Androscoggin River above Errol Dam, or in Umbagog Lake. Movement of trout from overwintering areas toward summer habitat occurred principally from late March to late April, invariably in an upstream

direction. By late May 2006, the remaining tagged fish took positions in close proximity to locations from which they were originally captured and tagged during the previous June. Two tagged fish traveled upstream 24.6 and 25.1 miles to reach summer range in an approximate 30-day period.

Brook trout traveled least during the summer period (average of 0.30 miles), then generally moved short distances (average of 0.72 miles) to spawning areas. Greatest movements occurred in the fall to reach overwintering habitat (average of 6.5 miles) and in the spring (average of 11.7 miles) as they returned to their summer range. The greatest distances traveled by individual trout during the entire study period (late June 2005 to mid July 2006) ranged from 35 to 72 miles.

There were no recorded movements of Magalloway River fish into either the Dead Diamond or Rapid Rivers, and neither adult nor juvenile trout from the Rapid River migrated to the Magalloway or Dead Diamond Rivers. Two tagged brook trout from the Dead Diamond River moved to the upper Magalloway River during the 2005 summer period, presumably to seek temperature refuge. This behavior was less apparent in 2006, probably because temperatures and flows in the Dead Diamond were more suitable than in 2005. These same trout remained in the Magalloway River during the 2005 and 2006 fall seasons, but it could not be determined if they spawned in the same locations as the Magalloway fish. Tagged brook trout from all three rivers overwintered in the north basin of Umbagog Lake.

This study provided information on seasonal habitat use, and identified critical habitat features that support Magalloway River wild brook trout. Our telemetry data and similar work conducted on the nearby Rapid and Dead Diamond Rivers clearly indicate the importance of Umbagog Lake to brook trout in the upper Androscoggin River drainage. These studies also confirmed the need to maintain free passage of brook trout throughout this subdrainage, because fish from all three populations travel long distances to reach habitat critical to their life history.

INTRODUCTION

Brook trout (*Salvelinus fontinalis*) are native to waters of the Upper Androscoggin River drainage in western Maine (Figure 1), where they are highly valued for their ecological, cultural, and recreational attributes. The species is well adapted to live in the varied habitats provided by this large water system, including the Magalloway River, but they are sensitive to impacts associated with human activities such as logging, dams, and urban or agricultural development. Brook trout are especially sensitive to competition from other fish species, and they are easily over-exploited by anglers because even novices readily catch them.

Brook trout have become the focus of intense investigation in western Maine (Castric et al. 2001, FPLE 2004, Fraser et al. 2004, Boucher 2005a and 2005b, Danner and Boucher 2005, Kleinschmidt Assoc. 2007, and Jackson and Zydlewski 2007). Much of this work has been in response to the recent establishment of smallmouth bass (*Micropterus dolomieu*) through unauthorized introduction. Smallmouth bass are severe competitors with brook trout, and they can reduce brook trout production in waters where the two species co-occur (Bonney 2006). The principal goal of the aforementioned studies was to provide information to guide management and maximize the protection of wild brook trout in the presence of well-established smallmouth bass populations.

The goal of this project was to define seasonal movements of brook trout within the Magalloway River and connecting waters in Maine and New Hampshire. Specific objectives were to describe the timing of movements and to determine the locations of critical seasonal habitats, such as summer foraging, temperature refuges, prespawning and spawning, and overwintering.

STUDY AREA

The Magalloway River is a major tributary to the upper Androscoggin River, originating near the Canadian border in western Maine and eastern New Hampshire (Figure 1). Aziscohos Dam, located 17.7 miles above its confluence with Umbagog Lake and the Androscoggin River, impounds a portion of the river. The study was conducted in the reach below Aziscohos Dam, which is not passable to fish moving upstream.

Aziscohos Dam, constructed in 1910, forms Aziscohos Lake and regulates flow to the lower Magalloway River. Total drainage area at the dam is 214 square miles. Federal licensing requires that minimum flows be maintained at 130 cfs from the start of the refill of Aziscohos Lake to September 15, then a minimum of 214 cfs is maintained from September 16 to the beginning of the next refill period. Cool hypolimnetic water is discharged from the dam and from a 2,000-foot long penstock. Consequently, summer water temperatures in this reach of the Magalloway rarely exceed 68°F (Figure 2).

The uppermost 1.7 miles below the dam flows through a spectacular steep-sided valley, dropping about 200 feet over that distance. The channel in this reach averages about 60 feet wide, and forms a series of riffles (60.1%), runs (18.6%), and pools (21.3%) falling over substrates that are primarily large boulders and bedrock (Union Water Power Co. 1997). Below this reach the river slows, forming a meandering channel that deepens and widens before entering the Androscoggin River near the outlet of Umbagog Lake. Umbagog Lake, 7,850 acres in size, is impounded by Errol Dam in New Hampshire. Mean and maximum depths in Umbagog Lake at full pond are 14 and 48 feet, respectively.

Several tributaries enter the Magalloway River below Aziscohos Dam, the largest of which include Clark Brook, Abbott Brook, Meadow Brook, Diamond River, and Sturtevant Stream.

Brook trout and landlocked salmon (*Salmo salar*) provide the principal sport fisheries in the Magalloway River. Rainbow smelts (*Osmerus mordax*) occur as drift from Aziscohos Lake, and appear to be an important food item for both brook trout and salmon (MDIFW, unpublished data). Other fish known to be present in the river include smallmouth bass (*Micropterus dolomieu)*, chain pickerel (*Esox niger*), yellow perch (*Perca flavescens*), brown bullhead (*Ameiurus nebulosus*), slimy sculpin (*Cottus cognatus*), white sucker (*Catastomus commersoni*), fallfish (*Semotilus corporalis*) golden shiner (*Notemigonus crysoleucas),* common shiner *(Luxilus cornutus),* and lake chub (*Couesius plumbeus*).

The brook trout fishery in the Maine reach is regulated with a 6 to 12-inch harvest slot (8-12 inches from 1998 to 2005), with one trout permitted in this size range. Landlocked salmon have a 14-inch minimum length limit and one fish per day bag limit, and unlimited harvest of smallmouth bass is permitted. Fishing is restricted to fly fishing during the period from April 1 to September 30. All brook trout and salmon must be released after August 15.

Prior to 2006, the brook trout fishery in the New Hampshire segment of the Magalloway River was regulated with a 10-inch minimum length limit and two fish per day bag limit, with no gear restrictions. Since 2006, brook trout in the New Hampshire reach have been regulated with an 18-inch minimum length limit and a one fish per day bag limit. These same rules currently apply to Umbagog Lake and the Androscoggin River upstream of Errol Dam. During the study period Umbagog Lake was open to ice fishing from January 1 to March 31, except the eastern portion of the north basin was closed.

The Magalloway River below Aziscohos Lake can be accessed easily from several road crossings, roadside turnouts, and footpaths

METHODS

Fish tagging:

All tagged fish were captured by angling with light spinning gear from two large pools located about 0.7 and 1.2 miles below Aziscohos Dam (Figure 3). The fish were anesthetized and a small incision was made into the abdominal cavity between the pelvic and pectoral girdles. Radio transmitters were inserted through the incision, and the transmitter antenna was fed into a 16-gauge opening made posterior to the pelvic fins. Incisions were stitched using absorbable monofilament material, then measured, weighed and sampled for scales. The fish recovered in aerated tubs prior to release at the capture sites. Radio-tagged brook trout were 2 and 3 years of age, ranged in length from 11.9 to 19.1 inches, and averaged 14.3 inches long (Tables 1 and 2).

Radio transmitters were manufactured by Lotek (Model MCFT-3BM), and were 43 mm long with a 300mm external antenna. The tags weighed 3.7 grams in water and featured a 12-hour on/off cycle with a 376-day battery life.

Tracking:

Tagged brook trout were tracked with a Lotek SRX-400 receiver and Yagi directional antennae. Fish were relocated using a combination of foot, boat, fixed-wing aircraft, and snowmobile surveys. Tracking surveys began within 7 days after the tags were implanted, then occurred every two weeks until the spawning season approached. Surveys occurred weekly during the pre-spawning and spawning periods (September-October), then monthly during the post-spawning and winter periods. Tagged fish locations were identified by a written description and geospacial coordinates determined with handheld GPS units.

Data analysis:

Geographical analysis of fish movements was completed using ESRI ArcMap 9.0 software. Spatially referenced fish locations were snapped to the nearest proximity to the NHDplus stream network (http://erg.usgs.gov/isb/pubs/factsheets/fs10699.html). NHDplus line features were then split at the fish point locations with SplitLinesAtPoints 1.0 utility (ESRI-Charlotte 2007). Distances traveled by each fish between observations were calculated by summing the line features within each travel path Location and path data were separated into four time periods thought to coincide with major life history events: summer foraging (June 1 to August 31); pre-spawning and spawning (September 1 to October 31); post-spawning dispersal and overwintering (November 1 to March 31); and post-wintering dispersal (April 1 to May 31).

RESULTS

Fate of tagged brook trout:

Twenty-three brook trout from the Magalloway River were radio-tagged in June 2005. Two tags appeared to malfunction immediately, as these fish were never located again (Table 3). Two tagged fish apparently succumbed to the surgical procedure; radio signals were located at sites slightly downstream of the tagging sites and never moved. Two tagged fish appeared to be victims of avian predators because signals were detected adjacent to or in bald eagle and osprey nests located near Umbagog Lake. An ice angler from Umbagog Lake harvested one tagged fish in January 2006 (tag recovered). Four additional mortalities were recorded that were likely angling related. Their signals became suddenly stationary in the Magalloway River at positions downstream of heavily fished reaches at random times during the open water fishing season. One tag was found on the stream bank adjacent to a known spawning site, so it’s likely that the fish succumbed to a predator. Signals from five tagged fish became stationary at positions downstream of likely spawning areas and may have been post-spawning mortalities. A total of 14 surviving tagged trout were available to estimate summer range and locate spawning habitat. Nine tags remained viable long enough to locate winter habitat and to determine the time of return to summer habitat (Table 3).

Seasonal movements:

Tagged brook trout moved only short distances, or not at all, from their tagging locations during the July-August 2005 period (Figure 4). Ten trout made minor movements, generally less 0.5 miles, to locations upstream or downstream of their tag sites. Two of these fish moved into and out of Abbott Brook, located about 1 mile below the tag sites, then returned to their pools of original capture. Six fish remained in the pools where they were tagged during the entire two-month period. Only one trout made an extensive migration during the summer months. This fish was located about 9 miles below the capture site less than two weeks after it was tagged. Two days later it had descended downstream another 3.5 miles; that same day, about 6 hours later, the fish had moved upstream 3.6 miles. Two weeks later this fish had moved upstream 9 miles to its original tagging site and remained there until late September.

Tagged trout continued to remain near the original tagging sites through mid-September 2005. By the end of September most began to move towards suspected spawning sites, but five fish remained near their capture locations through the end of October. By mid to late October, the height of the spawning for most Maine brook trout populations (Bonney 2006), five tagged trout moved a short distance downstream to the confluence of Abbott Brook (Figure 5), or ascended the brook a short distance. Brook trout redds were identified in the lower reaches of Abbott Brook, confirming this site as a spawning area for Magalloway River brook trout. Several other tagged fish took positions either near the mouth of Clark Brook, located a short distance below the lowermost tag site, or in discrete areas about one mile below Abbott Brook. We were unable to survey these sites for the presence of brook trout redds, but the timing of the fishes' presence (mid-late October) suggests spawning may have occurred here as well. Most movements of brook trout during this period were in a downstream direction.

Post-spawning dispersal occurred rapidly and generally in a downstream direction (Figure 6). For example, during a two-week period from late October to mid-November, one trout traveled nearly 18 miles from the upper river to a position in the Androscoggin River just above Errol Dam. Another fish moved 12.7 miles downstream during a one-week period in early November, then moved upstream 9.2 miles. Two months later this same fish was located in Sturtevant Cove of Umbagog Lake, 23 miles downstream from its previous location. Tagged trout overwintered in upstream areas of the Magalloway River in deep, slow moving reaches, in the lower Magalloway, in the Androscoggin River above Errol Dam, or in Umbagog Lake (Figure 7).

Movement of trout from overwintering areas toward summer habitat occurred principally from late March to late April, invariably in an upstream direction. By late May 2006, the remaining tagged fish took positions in close proximity to locations from which they were originally captured and tagged during the previous June (Figures 4 and 8). Two tagged fish traveled upstream 24.6 and 25.1 miles to reach summer range in an approximate 30-day period.

Distances traveled by tagged trout during the four seasonal periods are summarized in Table 4. Brook trout traveled least during the summer period (mean movement=0.30 miles), then generally moved short distances (mean=0.72 miles) to spawning areas. Greatest movements occurred in the fall to reach overwintering habitat (mean=6.5 miles) and in the spring (mean=11.7 miles) as they returned to their summer territory. The greatest distances traveled by individual trout during the entire study period (late June 2005 to mid July 2006) ranged from 35 to 72 miles.

Inter-river migration:

Figure 9 summarizes habitat use of radio-tagged brook trout from three sub-drainages of the upper Androscoggin River basin – the Magalloway River, the Dead Diamond River, and the Rapid River. There were no recorded movements of Magalloway River fish into either the Dead Diamond or Rapid Rivers, although one tagged Magalloway River trout was located within 1.3 miles of the Rapid River in Umbagog Lake in March 2006. This same fish was located 25.1 miles upstream in the Magalloway one month later. Neither adult (FPLE 2004) nor juvenile trout (Jackson and Zydlewski 2007) from the Rapid River migrated to the Magalloway or Dead Diamond Rivers

Two tagged brook trout from the Dead Diamond River moved to the upper Magalloway River during the 2005 summer period, presumably to seek temperature refuge. This behavior was less apparent in 2006, probably because temperatures and flows in the Dead Diamond were more suitable than in 2005 (D. Timmins, NHFG, unpublished data). These same trout remained in the Magalloway River during the 2005 and 2006 fall seasons, but it could not be determined if they spawned in the same locations as the Magalloway fish.

Tagged brook from all three rivers overwintered in the north basin of Umbagog Lake (Figure 10). Rapid River fish also utilized Umbagog Lake during portions of the spring and summer seasons, but only transiently (FPLE 2004, Jackson and Zydlewski 2007).

DISCUSSION

Radio tag malfunction and mortality associated with the tagging procedure (17%) were probably within the range observed during other local telemetry studies (FPLE 2004 and NH Fish and Game, unpublished data).

This study provided estimates of both natural and fishing mortality for wild riverine brook trout. Annual mortalities attributed to raptors and other predators (11%), the stresses of spawning (32%), and angling (26%) were rough estimations because few of the moribund tags were actually recovered. Angler mortality rates from this study were similar to estimates made for adult brook trout from the Rapid River (FPLE 2004) and Chamberlain Lake in north-central Maine (T. Obrey, MDIFW, unpublished data).

Although radio tag failures, natural mortality, and anglers substantially reduced the number of study fish, we believe sufficient data were obtained from the remaining tags to adequately describe the adult behavior of this trout population. Future telemetry studies conducted under similar conditions should consider our tag failure and mortality rates when setting study objectives and sampling requirements.

This study provided information on seasonal habitat use, and identified critical habitat features that support Magalloway River wild brook trout. As discussed below, these data have already been applied by fishery managers to maximize the protection of these important fish.

The sedentary movement patterns observed from July to mid-September 2005 were likely related to the presence of good instream cover, ideal thermal conditions, and excellent food resources. During the summer period, all Magalloway River tagged fish were positioned in one of several large pools, or in deep runs and riffles located just upstream or downstream of the pools. While the depth of the pools is unknown, they clearly provide excellent cover in the form of large boulders. Summer water temperatures are highly suited to brook trout in this reach because of the hypolimnetic discharge from Aziscohos Lake (Figure 2). Cursory inspections of brook trout stomach contents confirmed that smelts are a predominant food item, at least during the period we sampled (mid-late June). The robust condition of the trout is also suggestive of a diet consisting of smelts.

Confinement of trout to this short river segment during the summer months is clearly recognized by recreational anglers - recent creel surveys indicate from 77 to 100 percent of annual angler use occurs in this reach (Boucher 2005b). Restrictive fishing regulations, imposed in 1996 and revised in 2006, provide adequate protection to juvenile and adult trout and minimize impacts from intensive angling.

Tagged brook trout moved only short distances (1-1.5 mi), mostly downstream, to reach a major spawning site in the lower reaches of Abbott Brook (Figure 5). This site is vulnerable to disturbance from existing cultural developments (major roads, permanent homes, logging, etc.) and high angler use. Future developments should be closely monitored, and existing fishing regulations for Abbott Brook are under review to assure pre-spawning and spawning brook trout receive adequate protection.

Molecular genetic analysis of brook trout from the Magalloway (Castric et al. 2001) and Rapid Rivers (Fraser et al. 2004) suggested that the two populations were not reproductively isolated. We did not observe movements of Magalloway fish into the Rapid River during the October spawning season, nor have radio-tagged Rapid River fish been observed to ascend the Magalloway to spawn (FPLE 2004), so the genetic assessment has not been confirmed. Several years of telemetry studies may be necessary to establish the occurrence and degree of spawning overlap between these two populations. There were no recorded movements of Magalloway River fish into the Dead Diamond River. Two tagged brook trout from the Dead Diamond River remained in the Magalloway River during the 2005 and 2006 fall seasons (D. Timmins, NHFG, unpublished data), but it could not be determined if they spawned in the same locations as the Magalloway fish.

Magalloway River brook trout dispersed downstream quickly after spawning and overwintered in deep, slow moving reaches of the Magalloway and Androscoggin Rivers, or in Umbagog Lake (Figures 6 and 7). These migrations ranged from about 2 to 25 miles. Selection of these habitat types for overwintering has been observed for other Maine brook trout populations in Maine (EPRO 1999, FPLE 2004, and T. Obrey, MDIFW, unpublished data). These deep-water habitats likely reduce the physiological stress on trout because stream velocities are less and temperatures may be slightly higher (Cunjak 1988).

Umbagog Lake was also used by wintering brook trout originating from the Rapid River (FPLE 2004) and the Dead Diamond River (D. Timmins, NHFG, unpublished data). All tagged trout from the three river systems seemed confined to the lake's north basin (Figure 8). Closure to ice fishing of a portion of the lake's north basin in 1998, and expanded in 2008, eliminated some winter fishing mortality. Likewise, highly restrictive fishing rules imposed in 2006 protect brook trout that migrate between Umbagog Lake and the Magalloway and Dead Diamond Rivers.

Migration of tagged brook trout from overwintering areas to the upper Magalloway River occurred from late March to late April, with all fish returning to their original tagging sites by late May 2006. This spring migration occurred during the open fishing seasons in both New Hampshire and Maine. Restrictive regulations recently imposed in New Hampshire provide additional protection to these fish during this important life history event.

Telemetry data from this study, the Dead Diamond River (D. Timmins, NHFG, unpublished), and the Rapid River (FPLE 2004, Jackson and Zydlewski 2007) clearly indicate the importance of Umbagog Lake to brook trout in the upper Androscoggin River drainage. These studies also confirm the need to maintain free passage of brook trout throughout this subdrainage, because fish from all three populations travel long distances to reach habitat critical to their life history.

Acknowledgements

We gratefully acknowledge Dartmouth College and New Hampshire chapters of Trout Unlimited for funding this project. Maine fishery biologist Merry Gallagher deserves special thanks for assisting us with tagging and tracking logistics, and for her help with GIS analysis. We also thank the following individuals for their participation in various phases of the project. From the Maine Department of Inland Fisheries and Wildlife: Gene Arsenault, Forrest Bonney, Keith Carpenter, Joe Dembeck, Dr. Russ Danner, Dan Dufault, Dave Howatt, Charlie Later, Dennis McNeish, Tim Obrey, Steve Raye (retired), and Chip Wick. From the New Hampshire Department of Fish and Game: Andy Schafermeyer, Bryan Comeau, Jaclcyn Comeau, Benjamin Nugent, and Cory Vander-Hayden. From FPL Energy Maine Hydro: Bill Hanson and Kyle Murphy. From Trout Unlimited: Dan Hall and Jeff Reardon. Steve Kasprzak, Jack Noon, and Roger Verrill (deceased) provided outstanding voluntary assistance.

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Figure 1. The upper Androscoggin River drainage, showing the lower reach of the Magalloway River below Aziscohos Lake.

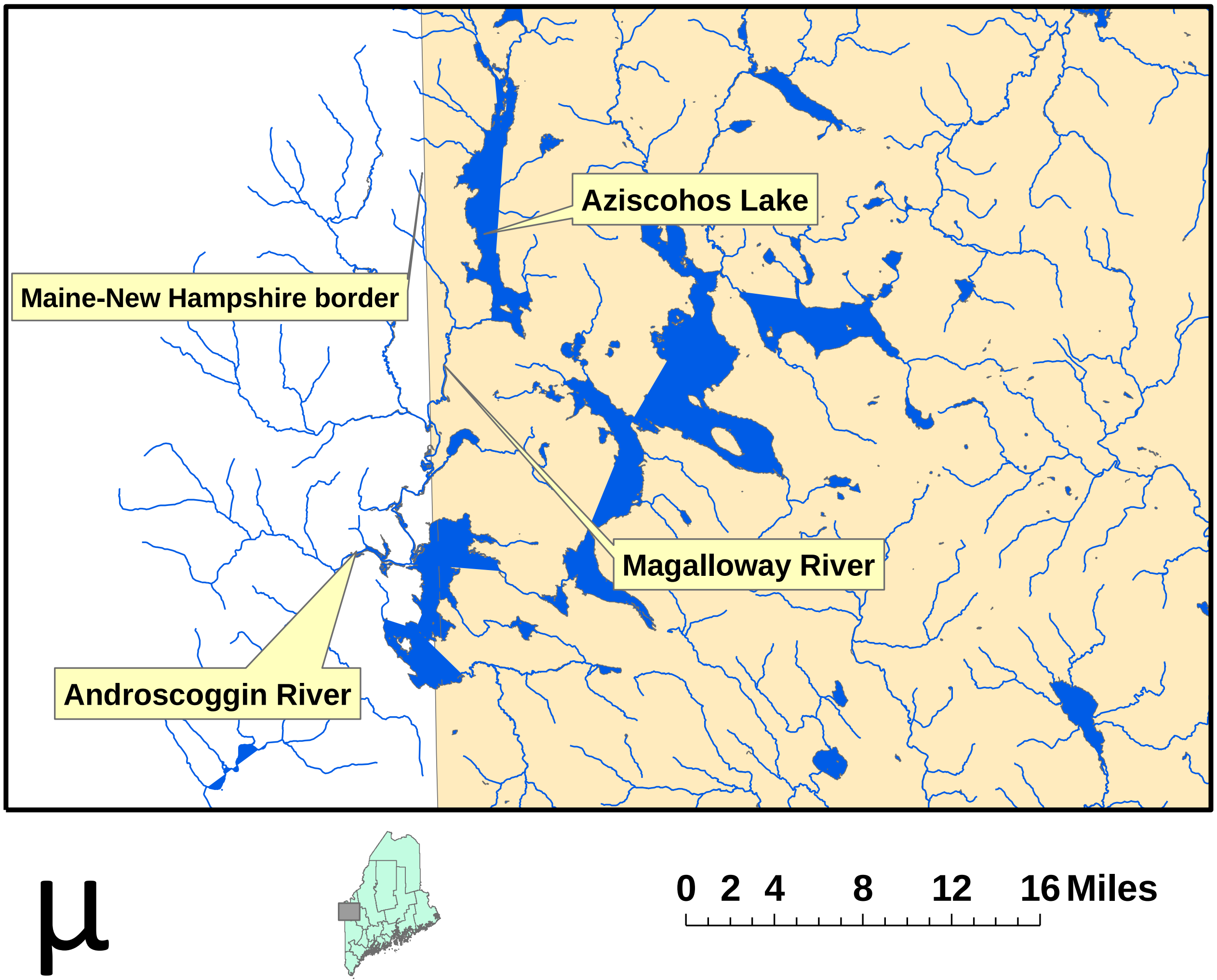


Figure 2. Water temperature in the Magalloway River below Aziscohos Dam, 2004.

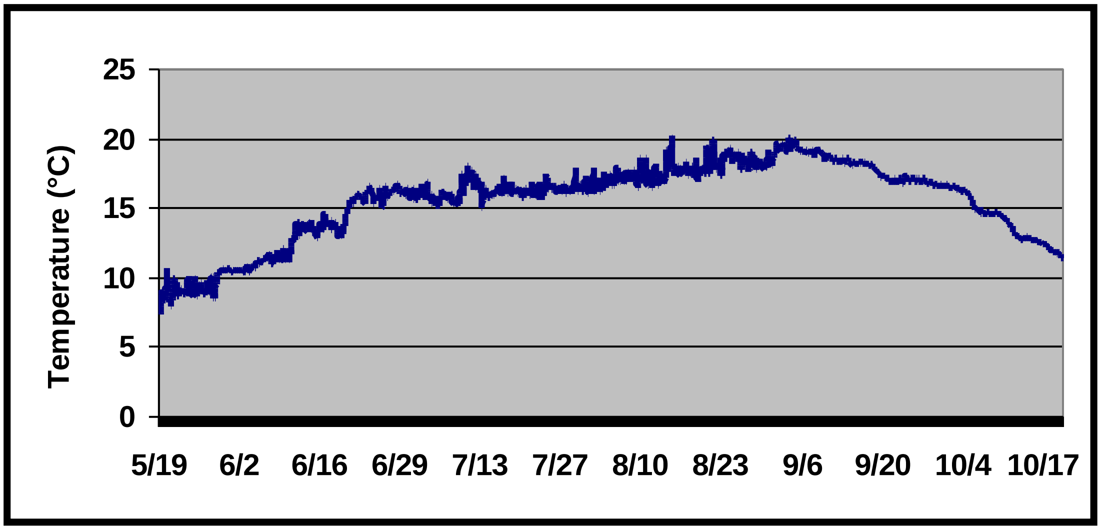


Figure 3. Capture sites of radio-tagged brook trout, 2005.

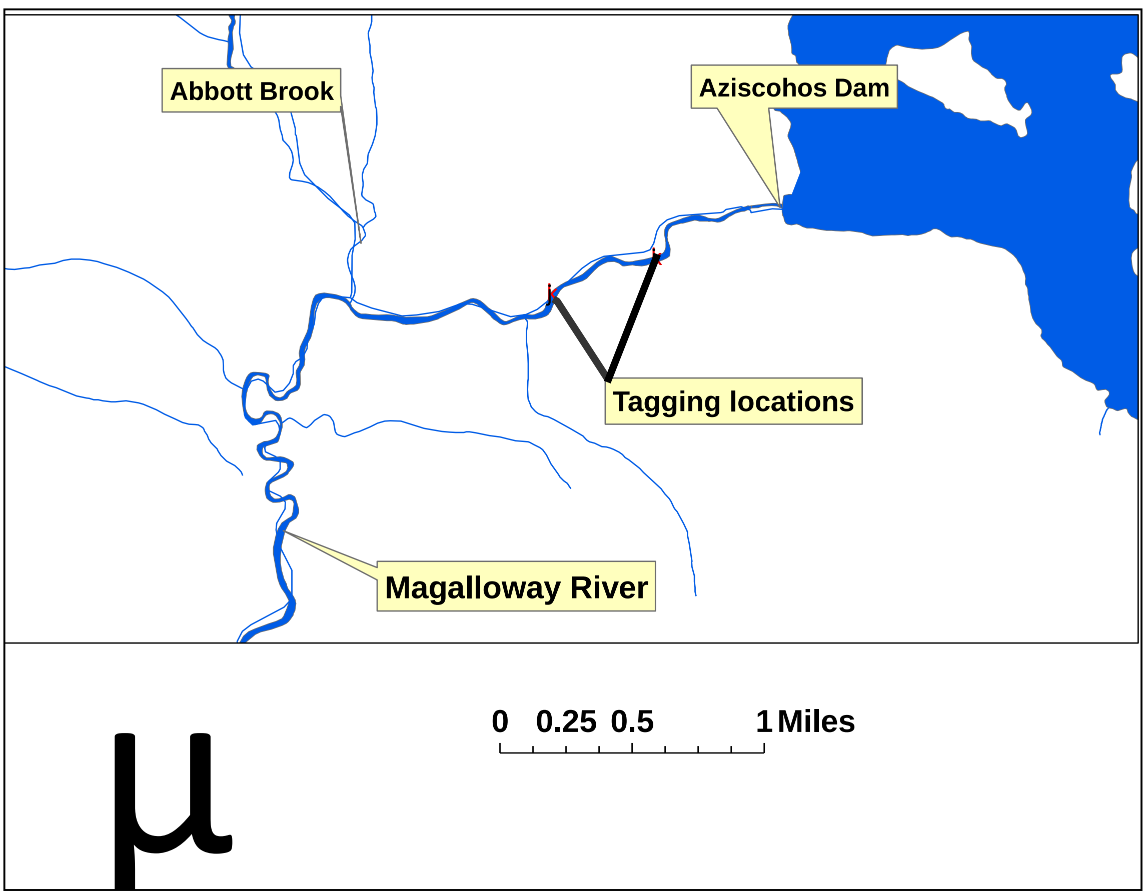


Table 1. Radio tagging summary for Magalloway River brook trout study, 2005-2006.

					Tagging location (UTM)		
Tag frequency/code	**Length (mm)**	**Weight (g)**	**Age**	**Date tagged**	**Easting**	**Northing**	**Location description**
149.320.21	413	908	III+	6/16/05	341077	4978199	Mailbox (Warden's) Pool
149.320.22	364	690	III+	6/16/05	341077	4978199	Mailbox (Warden's) Pool
149.320.36	342	500	II+	6/28/05	341525	4978332	Split Rock Pool
149.360.21	351	579	III+	6/16/05	341077	4978199	Mailbox (Warden's) Pool
149.360.22	485	1555	III+	6/16/05	341077	4978199	Mailbox (Warden's) Pool
149.360.29	440	1300	III+	6/17/05	341525	4978332	Split Rock Pool
149.360.32	422	1050	III+	6/17/05	341077	4978199	Mailbox (Warden's) Pool
149.360.33	319	431	II+	6/28/05	341077	4978199	Mailbox (Warden's) Pool
149.360.34	427	935	Unknown	6/28/05	341525	4978332	Split Rock Pool
149.360.35	310	305	II+	6/28/05	341077	4978199	Mailbox (Warden's) Pool
149.360.36	339	478	II+	6/28/05	341077	4978199	Mailbox (Warden's) Pool
149.380.21	392	1010	Unknown	6/16/05	341077	4978199	Mailbox (Warden's) Pool
149.380.22	311	317	II+	6/16/05	341077	4978199	Mailbox (Warden's) Pool
149.380.23	340	543	III+	6/16/05	341077	4978199	Mailbox (Warden's) Pool
149.380.29	301	325	II+	6/30/05	341077	4978199	Mailbox (Warden's) Pool
149.380.30	391	875	III+	6/17/05	341077	4978199	Mailbox (Warden's) Pool
149.380.31	327	400	II+	6/17/05	341077	4978199	Mailbox (Warden's) Pool
149.380.32	308	420	II+	6/17/05	341077	4978199	Mailbox (Warden's) Pool
149.380.33	356	491	III+	6/28/05	341525	4978332	Split Rock Pool
149.380.34	304	341	Unknown	6/28/05	341077	4978199	Mailbox (Warden's) Pool
149.380.35	357	551	Unknown	6/28/05	341525	4978332	Split Rock Pool
149.380.36	303	320	II+	6/17/05	341525	4978332	Split Rock Pool
149.380.37	338	425	II+	6/17/05	341077	4978199	Mailbox (Warden's) Pool

Table 2. Size and age summary of Magalloway River radio-tagged brook trout.

Age	Number of fish	Mean length±SE (mm)	Mean weight±SE (g)
II+	10	320±5	392±23
III+	9	396±16	888±121
Unknown	4	370±26	709±159
All fish	**23**	**358±11**	**641±72**

Table 3. Fate of Magalloway River radio-tagged brook trout, 2005,2006.

Number tagged:	**23**
Tag failures:	**2**
Mortality likely associated with tagging:	**2**
Mortality associated with raptors:[1]	**2**
Harvested by anglers:[2]	**1**
Other possible angling mortalities:[3]	**4**
Probable post-spawning mortalities:[4]	**6**
Reported caught and released by anglers:	**3**
No. tagged fish available to estimate summer range and locations of spawning habitat:	**14**
No. tagged fish available to estimate over-wintering range and/or time of return to summer habitat:	**9**

[1] Signals detected in or near Bald Eagle and Osprey nests.
[2] Harvested by winter angler from Umbagog Lake (tag recovered).
[3] Signals either stopped entirely, or signals were stationary at positions downstream of most heavily fished reaches at random times during the open angling season.
[4] Signals either stopped entirely, or signals were stationary at positions downstream of likely spawning areas after late October 2005 (one tag recovered).

Figure 4. Summer habitat use of radio-tagged brook trout in the Magalloway River.

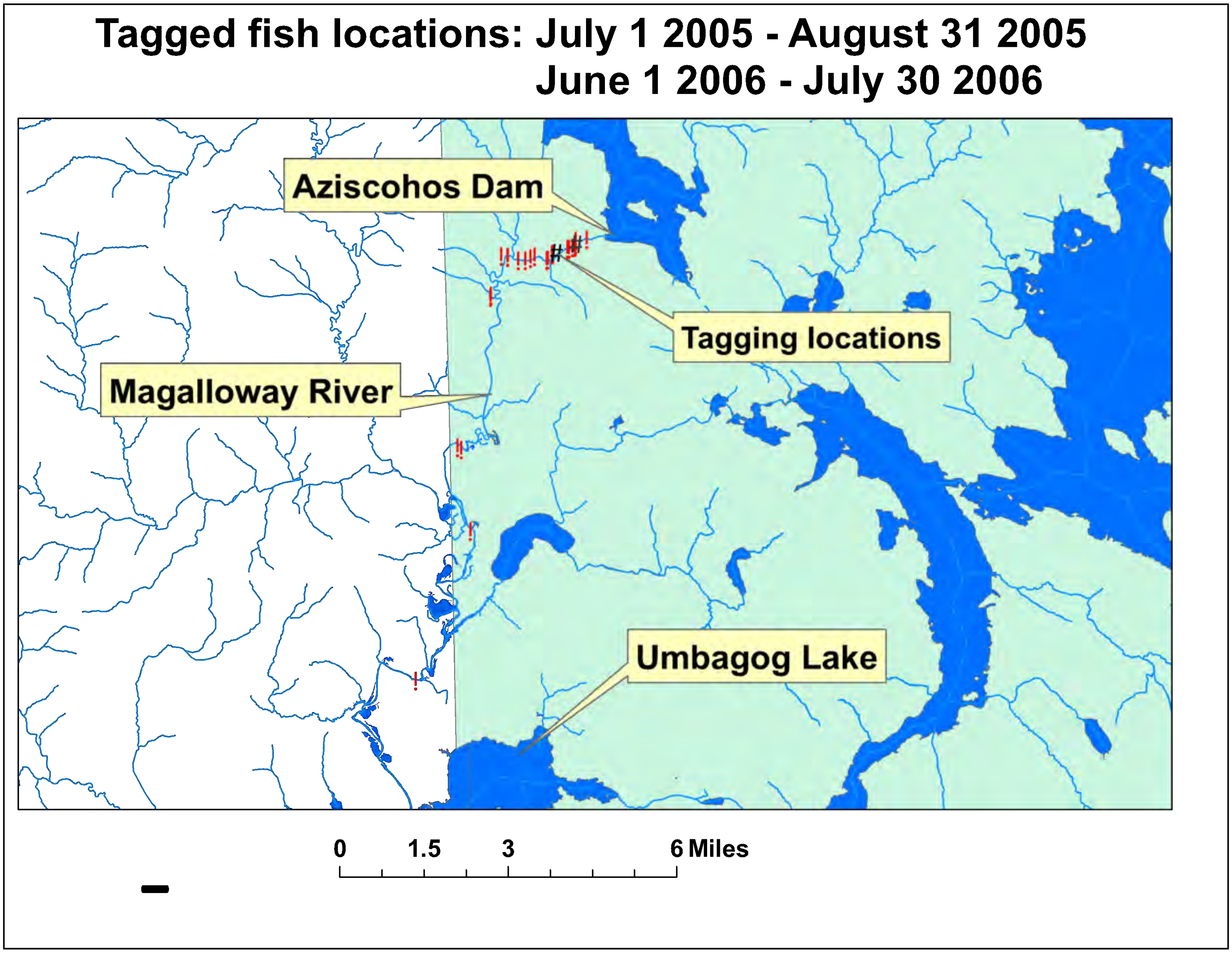


Figure 5. Locations of radio-tagged brook trout in the Magalloway River during the pre-spawning and spawning periods.

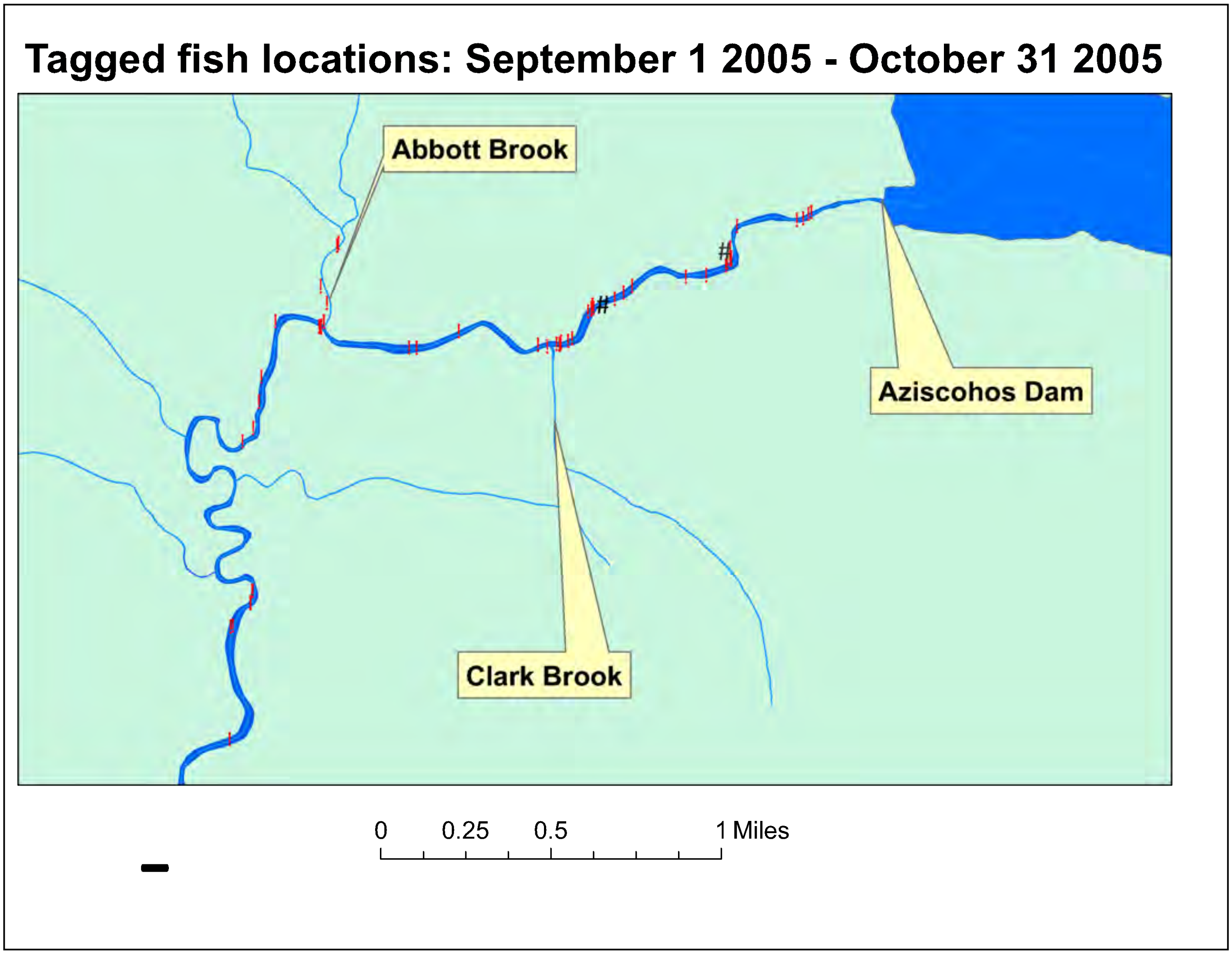


Figure 6. Post-spawning dispersal of radio-tagged brook trout in the Magalloway River.

Tagged fish locations: November 1, 2005 to December 31, 2005

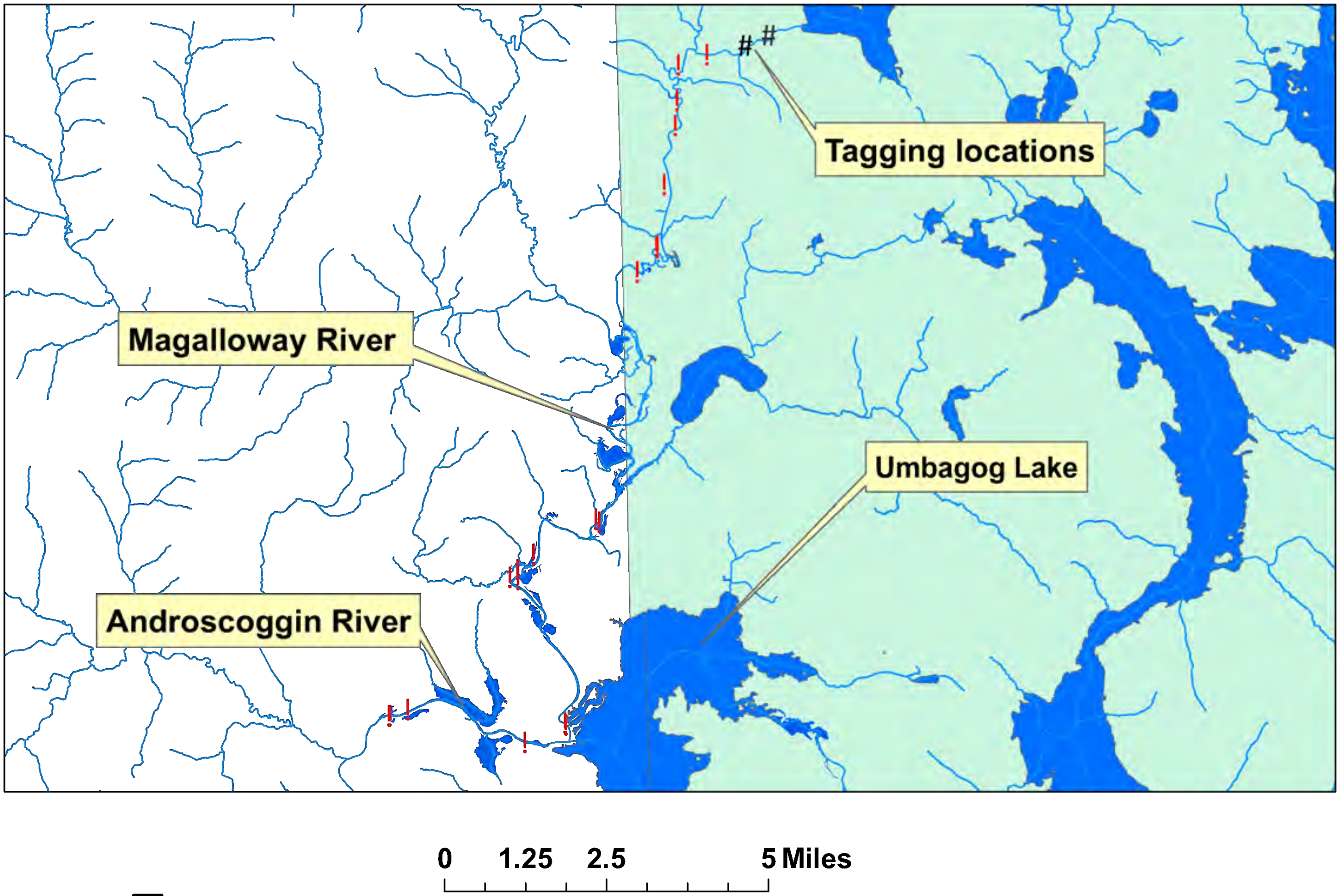


Figure 7. Overwintering habitats utilized by radio-tagged brook trout in the Magalloway River.

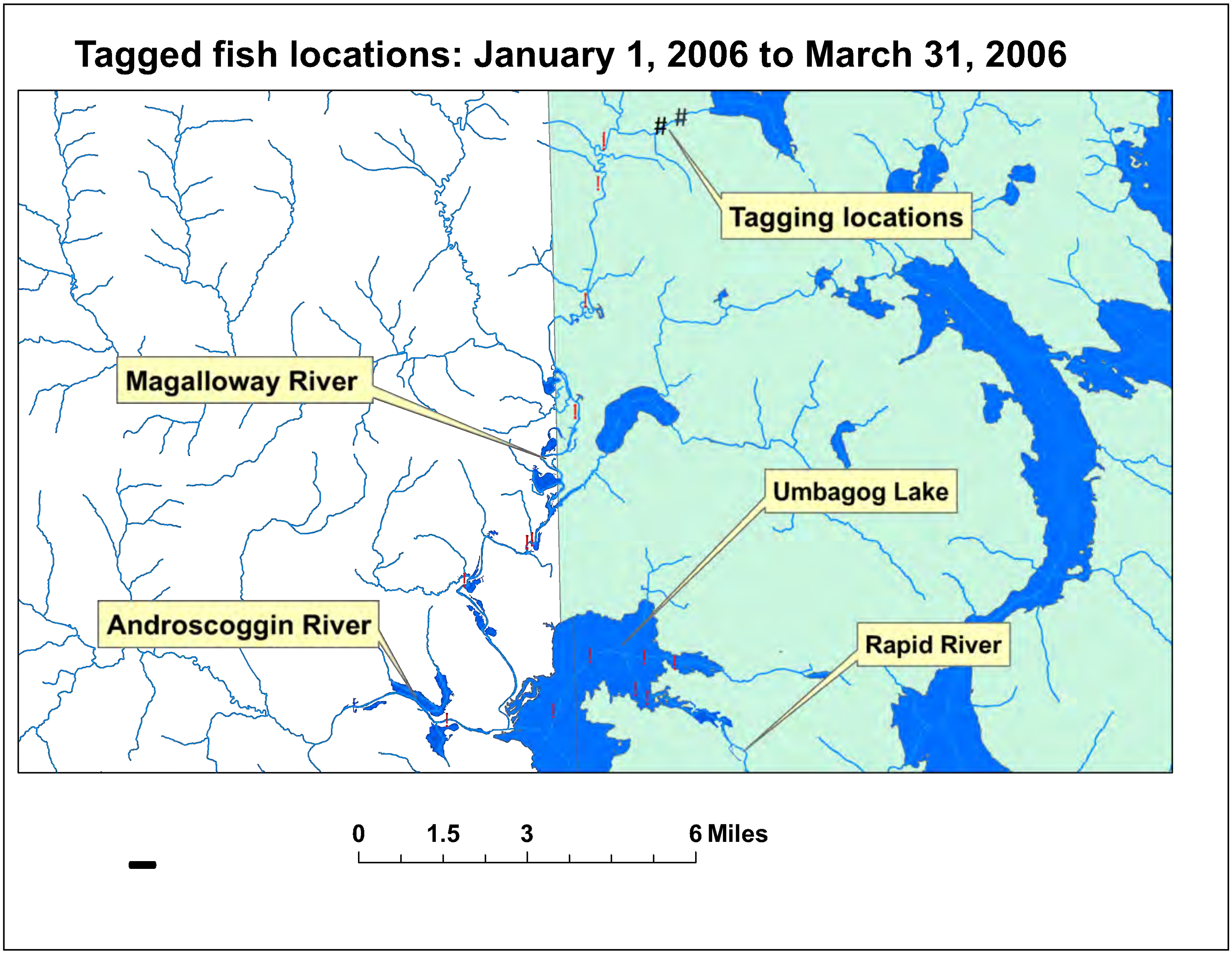


Figure 8. Post-winter dispersal of radio-tagged brook trout in the Magalloway River.

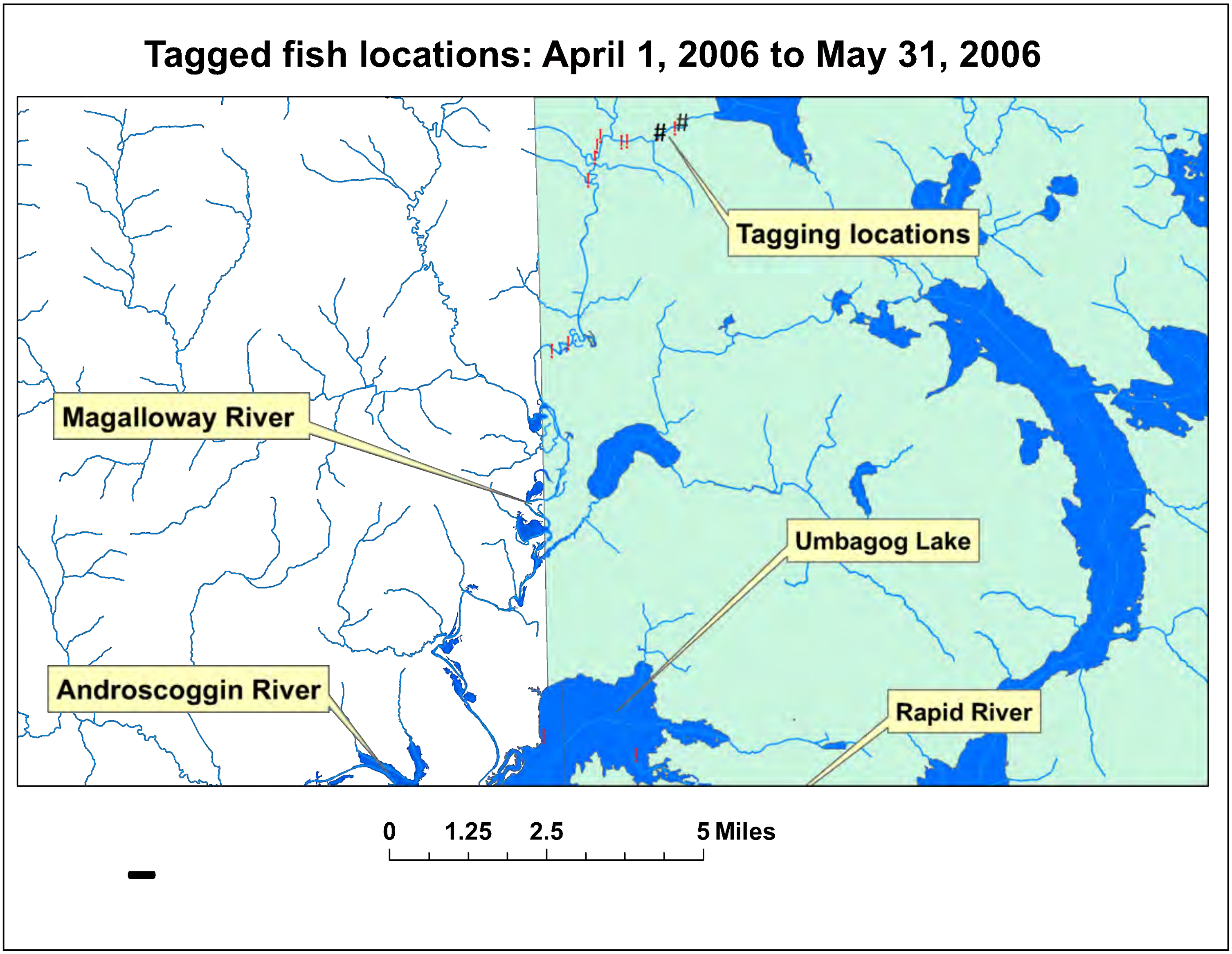
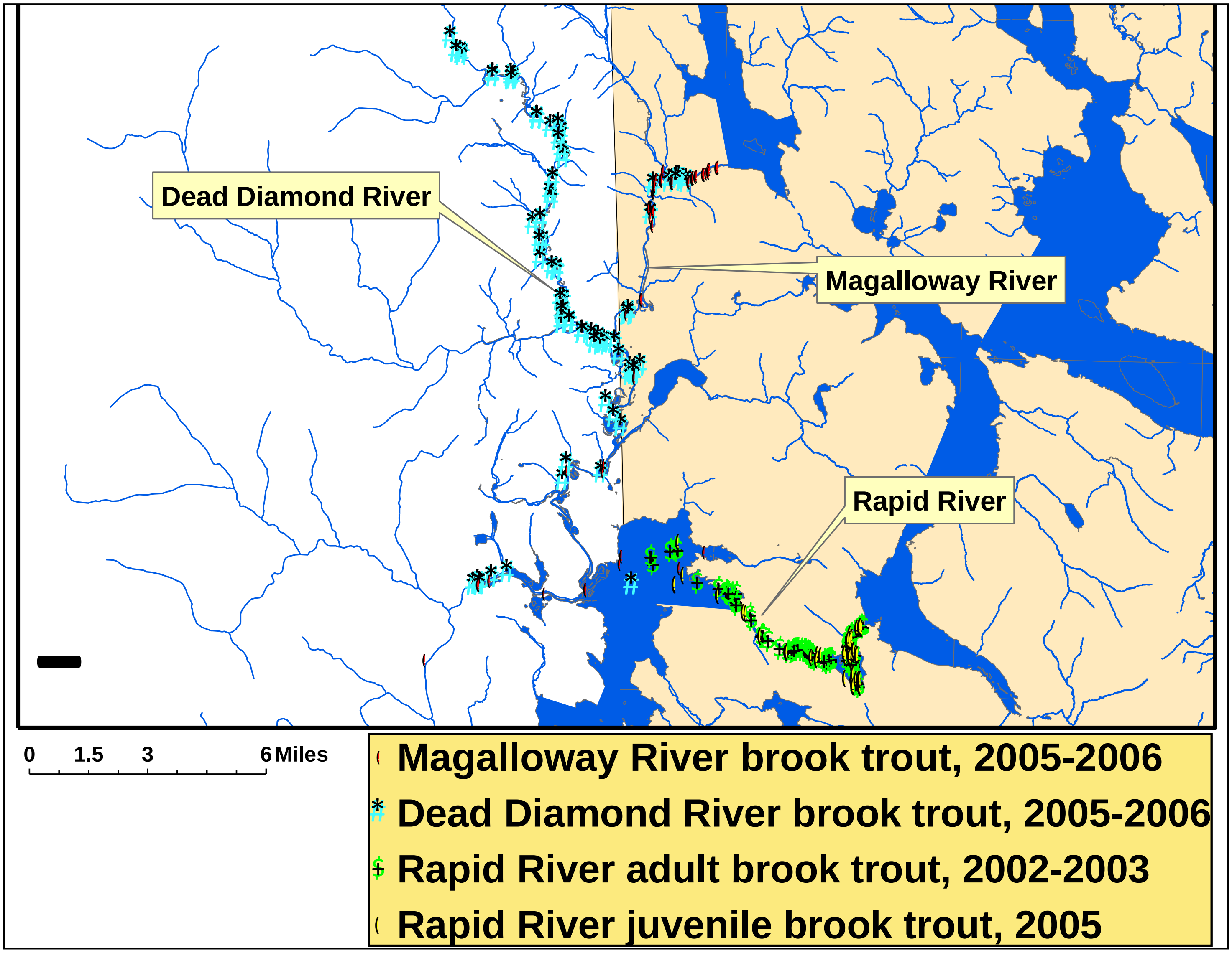


Table 4. Mean seasonal movements (miles) of Magalloway River radio-tagged brook trout, 2005-2006.

			Distance (mi) moved from previous location			
Season	No. fish tracked	No. tracking observations	Mean	SD	Minimum	Maximum
Summer[1]	19	94	0.30	0.68	0	8.9
Autumn[2]	18	108	0.72	1.2	0	10.6
Winter[3]	12	51	6.5	7.8	0	13.3
Spring[4]	8	15	11.7	9.7	0.17	28.5

[1] Summer: June 16, 2005 to August 31, 2005, and June 1, 2006 to July 31, 2006.
[2] Autumn: September 1, 2005 to October 30, 2005.
[3] Winter: November 1, 2005 to March 31, 2006.
[4] Spring: April 1, 2006 to May 31, 2006.

Figure 8. Locations of radio-tagged brook trout in the Magalloway, Rapid, and Dead Diamond Rivers, 2002-2006.



Document Content(s)

United States Department of the Interior

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September 26, 2018

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

REF: Comments on Brookfield White Pine Hydro Revised Study Plan for the Hiram Hydroelectric Project (FERC No. 2530)

Dear Secretary Bose:

On September 11, 2018, Brookfield White Pine Hydro (Licensee) issued the Revised Study Plan for the Hiram Hydroelectric Project (Project) (FERC No. 2530) on the Saco River, Maine. The U.S. Fish and Wildlife Service (Service) offers the following for consideration.

As identified in the Maine Department of Inland Fisheries and Wildlife's (MDIFW) letter on September 25, 2018, most of the tributaries to the upper Saco River, including both above and below the Project site, support populations of wild brook trout *(Salvelinus fontinalis)*. Two tributaries in particular the Tenmile and the Shepards rivers, which are located upstream of the Project site, have been extensively sampled by the MDIFW and are known to support robust populations of native brook trout. In fact, these two populations likely provide some of the best stream angling opportunities for wild brook trout in southern Maine. Based on the literature, as well as local studies and studies conducted elsewhere in Maine on wild brook trout, it is likely that brook trout in these and other drainages utilize the mainstem of the Saco River on a seasonal basis and could pass downstream through the Project.

In addition, American eel *(Anguilla rostrata)* are also present in the Project area. The Joint Fisheries Management Plan for the Saco River (USFWS et al. 1987[1]) specifically identifies sustained production of American eel and increased recreational utilization as a management objective for the reach below the Project and increased recreational utilization as a management objective for the reach above the project. These management objectives reinforced the Service's request for an eelway location study, which will be completed soon and will inform the site selection for an upstream eelway.

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[1] Service, Maine Atlantic Sea Run Salmon Commission, and Maine Department of Marine Resources. 1987. Saco River Strategic Plan for Fisheries Management. January 1987.

On September 25, 2018, the Sebago Chapter of Trout Unlimited filed comments and requested a Desktop Fish Impingement and Entrainment Study focused on brook trout and American eel. Since the only current routes for downstream migration past the dam are either over the spillway or through the turbines, a desktop study on impingement and entrainment mortalities would provide information on a key variable (passage survival) which relates back to the Services management objective of sustained production and increased recreational utilization for these two species. The Service encourages the adoption of this study request.

Thank you for your time reviewing these important issues. If you have any questions please contact Antonio Bentivoglio by email at *Antonio_Bentivoglio@fws.gov* or by telephone at 207/781-8364 extension 18.

Sincerely,

Patrick Dockens, acting for:
Anna Harris
Project Leader
Maine Fish and Wildlife Service Complex
Maine Field Office

cc: John Perry, Francis Brautigam, and Jim Pellerin; MDIFW
Gail Wippelhauser, Maine Department of Marine Resources
Kathy Howatt, Eric Sroka; Maine Department of Environmental Protection
Sean McDermott and William McDavitt; National Marine Fisheries Service

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426
October 11, 2018

OFFICE OF ENERGY PROJECTS

Project No. 2530-054 – Maine
Hiram Hydroelectric Project
Brookfield White Pine Hydro LLC

Mr. Frank Dunlap, Licensing Specialist
Brookfield White Pine Hydro LLC
150 Main Street
Lewiston, ME 04240

Reference: Study Plan Determination for the Hiram Hydroelectric Project

Dear Mr. Dunlap:

Pursuant to 18 C.F.R. § 5.13(c) of the Commission's regulations, this letter contains the study plan determination for the Hiram Hydroelectric Project No. 2530 (Hiram Project, or project). The project is located on the Saco River in Oxford and Cumberland Counties in the towns of Hiram, Baldwin, Brownfield, and Denmark, Maine. The determination is based on the study criteria set forth in section 5.9(b) of the Commission's regulations, applicable law, Commission policy and practice, and the record of information.

Background

On May 14, 2018, Brookfield White Pine Hydro LLC (White Pine Hydro) filed its Proposed Study Plan (PSP) for seven studies on: water quality; wildlife and botanical surveys, including rare, threatened, and endangered species; recreation resources; and cultural resources in support of its intent to relicense the Hiram Project.

White Pine Hydro held an Initial Study Plan Meeting on June 13, 2018. Comments on the PSP were filed by Commission staff, the Maine Historic Preservation Commission, the Sebago Chapter of Trout Unlimited (Sebago TU; represented by Mr. Stephen G. Heinz), the Maine Department of Inland Fisheries & Wildlife (Maine Fisheries and Wildlife), and Mr. Robert Scott Cotliaux.[1]

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[1] The Maine Department of Environmental Protection (Maine DEP) commented on the PSP, via email correspondence. This correspondence is included in Appendix A of the Revised Study Plan.

On September 11, 2018, White Pine Hydro filed a Revised Study Plan (RSP) that includes eight studies, including a fish assemblage study that was not included in the PSP. Sebago TU, Maine Fisheries and Wildlife, and the U.S. Fish and Wildlife Service (FWS) filed comments on the RSP.

Study Plan Determination

White Pine Hydro's RSP is approved, with the exception of one proposed study that is approved with modifications (*see* Appendix A). This determination requires no additional studies.[2] In Appendix B, we discuss: (a) modifications to the study plan; (b) the basis for modifying the study plan; and (c) our rationale for not adopting additional studies. Although Commission staff considered all study plan criteria in section 5.9 of the Commission's regulations, we only reference the specific study criteria that are particularly relevant to the determination in Appendix B. Studies for which no issues were raised in comments on the RSP are not discussed in this determination.

Unless otherwise indicated, White Pine Hydro must complete all components of the approved studies, not modified in this determination, as described in White Pine Hydro's RSP. Pursuant to section 5.15(c)(1) of the Commission's regulations and the process plan and schedule approved by Commission staff on July 18, 2018, the Initial Study Report for seven of the eight studies must be filed by February 11, 2019.[3] The study report for the eighth study, the fish assemblage study, which will be conducted in the summer and fall of 2019, must be included in the Updated Study Report to be filed by February 11, 2020, pursuant to section 5.15(f) of the Commission's regulations and the staff-approved process plan and schedule.

Nothing in this study plan determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies. In addition, White Pine Hydro may choose to conduct any study not specifically required herein that it feels would add pertinent information to the record.

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[2] Sebago TU submitted three studies (Review of Scientific Literature on Brook Trout Movement, PIT Tag Study, and Desktop Fish Impingement and Entrainment Study) as alternatives to its submitted Brook Trout Radio-Telemetry Study. The three study alternatives are treated as components of the Brook Trout Radio-Telemetry Study in this Study Plan Determination.

[3] In order to take advantage of the full 2018 study season, White Pine Hydro anticipates that the Initial Study Report will be available, and the Initial Study Report Meeting held, in February 2019. The Updated Study Report will be available, and the Updated Study Report Meeting held, in February 2020. *See* RSP at 4-1 and 4-2.

If you have any questions, please contact Allan Creamer at (202) 502-8365, or at allan.creamer@ferc.gov.

Sincerely,

Terry L. Turpin
Director
Office of Energy Projects

Enclosure: Appendix A – Summary of studies subject to this determination
Appendix B – Staff's recommendations on proposed and requested studies

APPENDIX A

SUMMARY OF DETERMINATIONS ON PROPOSED AND REQUESTED STUDIES

Study	Recommending Entity	Approved	Approved with Modification	Not Required
1. Water Quality Study • Impoundment trophic state • Tailwater water quality • Impoundment aquatic habitat • Tailwater aquatic habitat • Downstream macroinvertebrate	White Pine Hydro	X		
2. Fish Assemblage Study	White Pine Hydro		X	
3. Brook Trout Radio-Telemetry Study, or alternatively: • Review of Scientific Literature on Brook Trout Movement • PIT Tag Study • Desktop Fish Impingement and Entrainment Study	Sebago TU			X
7. Wildlife Resources Survey	White Pine Hydro	X		
8. Botanical Resources Survey	White Pine Hydro	X		
9. Recreational Facilities Inventory	White Pine Hydro	X		
10. Phase 1A Pre-Contact Archaeology Survey	White Pine Hydro	X		
11. Phase 1 Historic Period Archaeological Survey	White Pine Hydro	X		
12. Historic Architectural Resources Survey	White Pine Hydro	X		

APPENDIX B

STAFF RECOMMENDATIONS ON PROPOSED AND REQUESTED STUDIES

The following discussion includes staff's recommendations on studies proposed by Brookfield White Pine Hydro LLC (White Pine Hydro) and participants' requests for additional studies. We base our recommendations on the study criteria outlined in the Commission's regulations [18 C.F.R. § 5.9(b)(1)-(7)]. Except as explained below, the Revised Study Plan (RSP), filed on September 11, 2018, adequately addresses all study needs at this time.

Study 2: Fish Assemblage Study

Applicant's Proposed Study

White Pine Hydro proposes to conduct a baseline *Fish Assemblage Study* to: (a) document the fishery assemblage in project waters; and (b) understand the seasonal distribution and abundance of brook trout in project waters. White Pine Hydro proposes to document the relative abundance and distribution of the cold and warm-water fish species present in the project area, evaluate size class information, and estimate species diversity.[1] White Pine Hydro also proposes to collect water temperature data to: (a) document the water temperatures in the main stem of the Saco River at the confluences of the Tenmile and Shepards Rivers upstream of the project's impoundment; and (b) determine whether conditions are suitable for brook trout to use the mainstem of the Saco River upstream of the project's impoundment.

White Pine Hydro proposes to sample three, 1-kilometer-long reaches of the shoreline (0.61 to 1.8 meters of water) in the impoundment and downstream of the project during the fall (once the water temperature declines to 18°C to 20°C) using a boat-mounted electrofishing unit.

Comments on the Study

The Sebago Chapter of Trout Unlimited (Sebago TU) states that it makes little sense to use White Pine Hydro's proposed methodology, including the use of temperature loggers, when brook trout movement can be directly determined by tracking fish

[1] The sampling would replicate efforts conducted in 2006 by the Midwest Biodiversity Institute (MBI); the results of the two surveys would be compared as appropriate.

movements using radio-telemetry or Passive Integrated Transponder (PIT) tagging. (We discuss the merits of Sebago TU's tracking studies in our review of Study 3, below.) The Maine Department of Inland Fisheries and Wildlife (Maine Fisheries and Wildlife) states that because of limitations associated with White Pine Hydro's proposed *Fish Assemblage Study*, on which Maine Fisheries and Wildlife did not elaborate, the study is unlikely to address the questions of concern, and would not accurately reflect brook trout use of the mainstem of the Saco River. Maine Fisheries and Wildlife concludes that the proposed study may result in a false negative[2] for brook trout utilization of the mainstem.

Discussion and Staff Recommendation

Applicability of Proposed Fish Assemblage Study

A fish survey has not been conducted at the project in over 12 years and would indicate whether there are fish species at the project in sizes and numbers that exhibit behaviors, habitat needs, or life history patterns that could be impacted by project operation.

The characteristics of the fish community, combined with the specifications of the project's intake and turbines can determine the species, size, and numbers of fish that could be impinged or entrained at the project, resulting in injury or mortality. This information could be used to inform license articles designed to minimize project effects, if needed (section 5.9(b)(5)).

Because brook trout are a potential species in the impoundment and an important gamefish in the area, they should be sought in the study and their abundance, size, and life stage recorded. Because the brook trout is a cold-water species, methods beyond what would be necessary for warm-water species alone would be needed.

Proposed Fish Assemblage Study Methods

Boat-mounted electrofishing is a scientifically acceptable method for sampling fish along shorelines (section 5.9(b)(6)). Sampling in the reaches immediately upstream and downstream of the project would provide information on the fish species that could be affected by project operation, as discussed above. Further, conducting the survey in the fall, when water temperatures are suitable for brook trout, would help determine whether brook trout are present and potentially affected by project operations (section

[2] False negative refers to incorrectly determining that something is absent, when it is present.

5.9(b)(5)). These proposed methods are approved. The need to expand these methods is discussed immediately below.

Modifications to the Proposed Fish Assemblage Study – Seasonal Timing

Conducting a *Fish Assemblage Study* in the fall, as proposed, and additionally in the spring would increase the probability of collecting all species that have the potential to exist near the project and be affected by its operation. Mature brook trout may not be abundant in the mainstem of the Saco River during the fall, because mature individuals generally move to streams to spawn over gravelly substrate located above upwelling groundwater (Bonney, 2009). Because they are not mature enough to spawn, juvenile brook trout may be present in the impoundment during the fall. Adult brook trout are more likely to be observed in the impoundment in spring when water temperatures are cool and adults are not spawning. Sampling in spring and fall would help determine the relative abundance of juvenile and mature fish at the project, which could inform license conditions (e.g., reduced trash rack bar spacing, minimum flow requirements, and release locations), if necessary (section 5.9(b)(6)). Thus, in addition to the fall survey, we recommend conducting a survey in the spring that would begin prior to the water temperature reaching 18°C to 20°C, with the specific survey dates determined in consultation with the resource agencies.

Modifications to the Proposed Fish Assemblage Study – Sampling Methods

White Pine Hydro proposes to use boat electrofishing to sample fish, but additional methods would be necessary to sample a greater diversity of habitats in project waters to ensure a more representative sample of the species composition, increase the probability of collecting brook trout, and reduce the probability of a false negative result in one year of sampling. Additional sampling methods that would be appropriate, but are not proposed, include netting methods (e.g., gill-nets or fyke nets) for collecting fish in deeper waters (greater than 1.8 meters) of the impoundment (section 5.9(b)(6)). Thus, we recommend that White Pine Hydro add a deep-water netting method, determined in consultation with the resource agencies, for sampling the impoundment (but not downstream) near the same sampling reaches proposed for boat electrofishing.

White Pine Hydro proposes to use boat electrofishing to sample fish in water that is 0.61 to 1.8 meters deep, but brook trout and other species may also be present in water less than 0.61 meters deep. Although no boat electrofishing is proposed in water less than 0.61 meters in depth, it may be possible to sample shallow water depending on boat draft and safety considerations. Other sampling methods that could be used to sample water less than 0.61 meters include backpack electrofishing and netting (e.g., small seines). We recommend that White Pine Hydro add a shallow-water sampling methodology, determined in consultation with the resource agencies, in order to sample shallow, shoreline habitat near the same reaches as proposed for boat-mounted electrofishing.

Modifications to the Proposed Fish Assemblage Study – Continuous Temperature Monitoring

Tenmile River and Shepard River are located 12.3 river miles and 19.4 river miles upstream of the project-affected area (i.e., near Hiram Dam), respectively. Therefore, the project would not affect water temperatures at these locations, and the proposed temperature monitoring data from those locations would not inform the development of license conditions (section 5.9(b)(5)). As a result, we do not recommend installing temperature loggers at the mouths of Tenmile River and Shepard River.

White Pine Hydro proposes to locate two temperature loggers in unspecified locations of the project impoundment from September 1 to November 1, but does not propose to place any loggers downstream of the project. Locating temperature loggers in the impoundment (as proposed) and downstream of the project, where White Pine Hydro would conduct the *Fish Assemblage Study*, would be needed to ensure that water temperature conditions are suitable for brook trout at the time the survey is conducted (section 5.9(b)(6)). In other words, temperature data would help to determine whether the fish surveys were conducted at an appropriate time with respect to brook trout water temperature preferences. Therefore, we recommend that White Pine Hydro install one temperature logger at each of the three proposed fish survey sites (two in the impoundment, one downstream of the project) to collect continuous water temperature data during the weeks before the fish surveys are conducted through the completion of the fish surveys. The specific location and timing of temperature logger installation and removal should be determined in consultation with the resource agencies.

Study 3: Brook Trout Radio-Telemetry Study

Study Request

Sebago TU states that little is known about the movements of native brook trout within the Saco River watershed. Sebago TU recommends that White Pine Hydro study brook trout migration using radio-telemetry (Appendix E to Sebago TU's RSP comments). The objectives of Sebago TU's study are to: (1) track and document brook trout migration to and from tributary waters and the main stem of the Saco River; (2) document the timing of such movement (seasonal assessment); (3) document whether brook trout congregate above or below Hiram Dam; and (4) document whether brook trout originating from upstream of Hiram Dam are swept downstream during high flow conditions and subsequently hold below the dam.

In the event that the radio-telemetry study is not included in the approved study plan, Sebago TU requests that the following three alternative studies[3] be included in the approved study plan, as a tiered approach.

1. *Review of Scientific Literature on Brook Trout Movement* (Appendix A to Sebago TU's RSP comments) – This study would involve a review of (a) studies cited in previous Sebago TU filings,[4] (b) studies in the western U.S. involving trout movement and hydroelectric operations, (c) Canadian studies such as Curry *et al*. (2002),[5] and (d) the unpublished studies conducted by New Hampshire Fish and Game Fisheries Biologist Dianne Timmons.

2. *Brook Trout Migration Using PIT Tags* (Appendix B to Sebago TU's RSP comments) – This study would involve capturing 10 to 20 brook trout, each from Tenmile River and Shepards River using electrofishing. Tagging would occur in June, with tracking of these fish commencing thereafter and continuing until Tenmile River and Shepards River ice over. The mainstem of the Saco River is

[3] For purposes of this Study Plan Determination, we treat Sebago TU's alternative study approach as an alternative methodology for assessing brook trout movement in the Saco River, and the effects of project operation on brook trout.

[4] Boucher, D.P. and D. Timmins. 2008. Seasonal movements and habitat use of brook trout in the Magalloway River; and the Indian Pond Project Relicensing FERC No. 2142 Radio Telemetry Study. *See* Attachment 6 of Sebago TU's September 25, 2018, filing.

[5] Curry, R. A., D. Sparks, and J. van de Sande. 2002. Spatial and temporal movements of a riverine brook trout population. Transactions of the American Fisheries Society, 131:551-560.

expected to ice-over later in the season; thus, electrofishing on the Saco would be possible (presumably to retrieve tagged fish). According to the proposed study, if no fish are detected leaving the two tributaries, then no electrofishing of the Saco River would occur. If brook trout are detected leaving the tributaries, but none are caught during electrofishing, then the area sampled would be expanded until brook trout are collected. If brook trout are detected leaving the two tributaries and collected during electrofishing, then Sebago TU requests that White Pine Hydro conduct the study in item 3, below.

3. *Desktop Fish Impingement and Entrainment Study* (Appendix C to Sebago TU's RSP comments) – The purpose of this study is to assess the effects of project operation on downstream migrating species, including brook trout and American eel. The study's objectives are to estimate the potential for impingement and entrainment at the Hiram Project's intakes, and the potential level of project-related mortality of downstream migrating brook trout and American eel.

White Pine Hydro did not propose to conduct a radio-telemetry study of brook trout movement in the Saco River watershed. Rather, White Pine Hydro tailored a portion of its proposed Fish Assemblage Study (discussed above as Study 2) to determine whether brook trout use waters in the mainstem of the Saco River, including the project area (*see* above discussion).

Maine Fisheries and Wildlife asks that White Pine Hydro reconsider Sebago TU's requested brook trout telemetry study. FWS provided information in support of Sebago TU's requested *Brook Trout Telemetry Study* and supports the requested *Desktop Fish Impingement and Entrainment Study*.

Discussion and Staff Recommendation

Information on the movement of brook trout throughout the Saco River basin is not needed for our environmental analysis of the project's potential effects on brook trout. The information provided would not be specific to the project and would not inform the development of license conditions (section 5.9(b)(5)). The same conclusion applies to two of Sebago TU's alternatives to the *Brook Trout Radio-Telemetry Study* (i.e., *Review of Scientific Literature on Brook Trout Movement* and *Brook Trout Migration Using PIT Tags*), which seek the same information as the *Brook Trout Radio-Telemetry Study* using different methods. Instead, White Pine Hydro's proposed *Fish Assemblage Study*, approved with the aforementioned modifications, would provide sufficient information regarding the presence of brook trout in the project impoundment and tailrace.

Sebago TU's *Desktop Fish Impingement and Entrainment Study* (a third alternative to the *Brook Trout Radio-Telemetry Study*) could provide site specific information relevant to effects of project operations. However, if brook trout do not use the impoundment, the *Desktop Fish Impingement and Entrainment Study* would not need to include brook trout. Until it is shown that brook trout use the impoundment and could make their way to the turbine intakes to be entrained or impinged, including brook trout in a *Desktop Fish Impingement and Entrainment Study* would have little value (section 5.9(b)(4)).

Regarding the need for a *Desktop Fish Impingement and Entrainment Study* for American eel, White Pine Hydro recently completed 2018 monitoring for the presence of American eel under the *2007 Saco River Fisheries Assessment Agreement (2007 Agreement).* The results of that study will be provided in the Initial Study Report due to be filed in February 2019. Like the case with brook trout discussed above, obtaining the results of White Pine Hydro's 2018 monitoring for the presence of American eel under the *2007 Agreement* could inform the need for an entrainment and impingement study for the American eel at the project. Revisiting a *Desktop Fish Impingement and Entrainment Study* as a possible second year study would allow White Pine Hydro to make use of more information and, if appropriate, design the study to address all potentially affected fish species at once. Therefore we do not recommend a *Desktop Fish Impingement and Entrainment Study* at this time.

APPENDIX C

MDEP SAMPLING PROTOCOL FOR HYDROPOWER STUDIES

LAKES, PONDS, AND IMPOUNDMENTS

Trophic State Study

Sampling personnel must be certified annually for this sampling protocol by DEP's Division of Environmental Assessment Lakes Section.

Each basin shall be sampled at the deepest location twice each month for at least five consecutive months during one open water season as follows.

Parameter	Sampling method	Detection limits
Secchi disk transparency	water scope	0.1 meter
Temperature	profile*	0.1 C
Dissolved oxygen	profile*	0.1 mg/l
Total phosphorus	epilimnetic core	0.001 mg/L
Chlorophyll a	epilimnetic core	0.001 mg/L (trichromatic)
Color	epilimnetic core	1.0 SPU
pH	epilimnetic core	0.1 SU
Total alkalinity	epilimnetic core	1.0 mg/l

*Profiles shall consist of temperature and dissolved oxygen measurements taken every meter up to 15 meters, every other meter to 25 meters, then every 5 meters thereafter.

In addition, during late summer (mid to late August depending on latitude and weather conditions), water samples shall be collected and analyzed from up to three depths in the water column for the parameters below except Chlorophyll *a*. If the waterbody is thermally stratified ($\Delta T \geq 1°C/m$ at any depth below the top 3 m depth), samples will be collected from an epilimnetic core, at the top of the hypolimnion, and at one meter above the sediment. If the waterbody is not thermally stratified, only one sample is needed, that being from an integrated core from the surface to two times the Secchi disk depth or within 1 m of the bottom whichever is less.

Parameter	Detection limit
Total phosphorus	0.001 mg/l
Nitrate	0.01 mg/l
Chlorophyll a (uncorrected)	0.001 mg/l (trichromatic determination)
Color	1.0 SPU
DOC	0.25 mg/l
pH	0.1 SU
Total alkalinity	1.0 mg/l
Total iron `	0.005 mg/l
Total dissolved aluminum	0.010 mg/l
Total calcium	1.0 mg/l
Total magnesium	0.1 mg/l
Total sodium	0.05 mg/l
Total potassium	0.05 mg/l
Total silica	0.05 mg/l
Specific conductance	1 ms/cm
Chloride	1.0 mg/l
Sulfate	0.5 mg/l

Additional sampling may be required due to the hydraulic or physical characteristics of a given waterbody or to the presence of significant water quality problems.

Habitat Study

For lakes, ponds, and riverine impoundments, determination of attainment of the designated use ‘habitat for fish and other aquatic life’ will be determined as follows. Using a depth of twice the mean summer Secchi disk transparency, determined from the Trophic State Study or historic DEP data, as the bottom of the littoral zone, the volume and surface area dewatered by the drawdown will be calculated to determine if at least 75% of the littoral zone remains watered at all times. Alternatively, studies of fish and other aquatic life communities, including freshwater mussels, may be conducted to demonstrate that the project maintains ‘structure and function of the resident biological community’ despite a drawdown that results in less than 75% of the littoral zone remaining watered at all times.

Fishing (Mercury Contamination) Study

To ensure that the project does not contribute to the Statewide Fish Consumption Advisory due to mercury, projects with excessive drawdowns (generally >10 feet) may be required to analyze sport fish from the project waterbody and one or more reference waters for mercury.   Contact DEP for specific requirements for each project.

RIVERS AND STREAMS

Temperature and Dissolved Oxygen Study

Applicability

This rivers and streams sampling protocol shall apply to tailwater areas that are not impoundments where existing data are insufficient to determine existing and future water quality.

Sampling Stations

Sampling shall occur in the tailwater downstream from the turbine/gate outlet or dam at a location representative of downstream flow as agreed by DEP on a case by case basis. Initially, measurements of temperature and dissolved oxygen should be made along a transect across the stream at the first, second and third quarter points across the width. If there is no violation of dissolved oxygen criteria and no significant (<0.4 mg/l) difference in concentrations among the quarter points, subsequent measurements may be made at the location shown to be representative of the main flow. Otherwise, measurements should be made at the location of the lowest concentration and the location of the main flow. Sampling should also occur in any bypassed segment of the river created by the project. Additional sampling stations may be required in the upstream or downstream areas where significant point or nonpoint sources exist or where slow moving or deep water occurs. The number and spacing of any additional stations will be determined by DEP on a case-by-case basis.

Parameters

Temperature and dissolved oxygen shall be sampled at mid-depth in rivers less than 2 m deep or in a profile of 1 meter increments of depth in rivers greater than 2 m deep. In rivers where it is already known that attainment of required statutory dissolved oxygen criteria is questionable, sampling for additional parameters (e.g. BOD, nitrogen, phosphorus) may be necessary.

Frequency and Timing

Sampling should be conducted during the summer low flow high temperature period, with the ideal conditions being the 7Q10 flow (the 7 day average low flow with a 10 year recurrence interval) combined with daily average water temperatures exceeding 24 ^{o}C. Measurements of temperature and dissolved oxygen shall be made every hour with a datasonde in remote unattended mode continuously during July and August, unless high flows well above seasonal median flows occur.

Alternatively, with concurrence by DEP, sampling could be undertaken one day per week for a minimum of ten weeks throughout the summer low flow, high temperature period. Each discrete grab sampling event for temperature and dissolved oxygen would consist of a minimum of two daily runs, the first of which should occur before 7 AM and the second of which should occur after 2 PM. Sampling results will not be considered complete unless a minimum of 5 sampling days meets the following conditions: The product of the water temperature (^{o}C) and the flow duration (the percentage of the time a given flow is statistically exceeded) at the time of sampling exceeds 1500. For cycling hydropower projects, in addition to twice daily monitoring, continuous monitoring may be required at some locations for a duration equivalent to the period of one cycle of the storage and the release of flow.

For either method, a summer in which low flows and high temperatures are not experienced may result in additional sampling requirements for the next summer. Low flow conditions may occur naturally, as an unregulated river or may be artificially induced, as in the case of upstream flow regulation or flows downstream from a cycling or peaking power project or in the case of a bypassed segment which receives flow only by spillage, leakage or specific releases.

Available Data

The use of data already available is encouraged provided that adequate QA/QC procedures have been followed. Old data may not be acceptable for considerations of meeting minimum sampling requirements, but could still provide useful information. Acceptance/rejection of data will be determined on a case by case basis, but generally data more than 10 years old may be rejected.

Habitat and Aquatic Life Studies

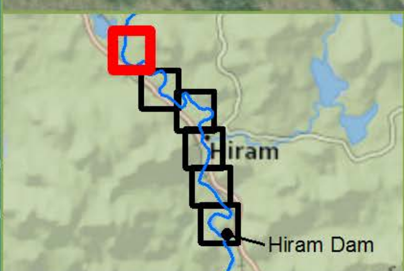
For rivers and streams, determination of attainment of the designated use 'habitat for fish and other aquatic life' will be determined as follows. A Cross-Section Flow Study is required that measures width and depth at various flows to determine the flow at which at least 75% of the bank full cross-sectional area of the river or stream is continuously watered. At least three cross-sections representative of the river or stream must be measured. Alternately, a combination of ambient measurements in one cross-section, flow data from existing flow gages, and/or modelling may be approved by DEP.

In addition, to determine if the project 'attains the aquatic life criteria, i.e. 'maintains the structure and function of the resident biological community', biological monitoring of the benthic macroinvertebrate community must be conducted following DEP's standard protocol in Methods for Biological Sampling and Analysis of Maine's Rivers and Streams, DEP LW0387-B2002.
A copy can be found at www.maine.gov/dep/water/monitoring/biomonitoring/material.html

APPENDIX D

HIRAM IMPOUNDMENT BATHYMETRY FIGURES

Hiram Impoundment Bathymetry



Water Depth (ft)

<4	16 - 20
4 - 8	20 - 24
8 - 12	24 - 28
12 - 16	28 - 32

Brookfield Renewable
Hiram, Maine

Hiram Hydroelectric Project
FERC No. 2530

Drawn By:	Date Drawn:	Checked By:	Date Checked:
RSR	10-23-2018	KPN	10-24-2018

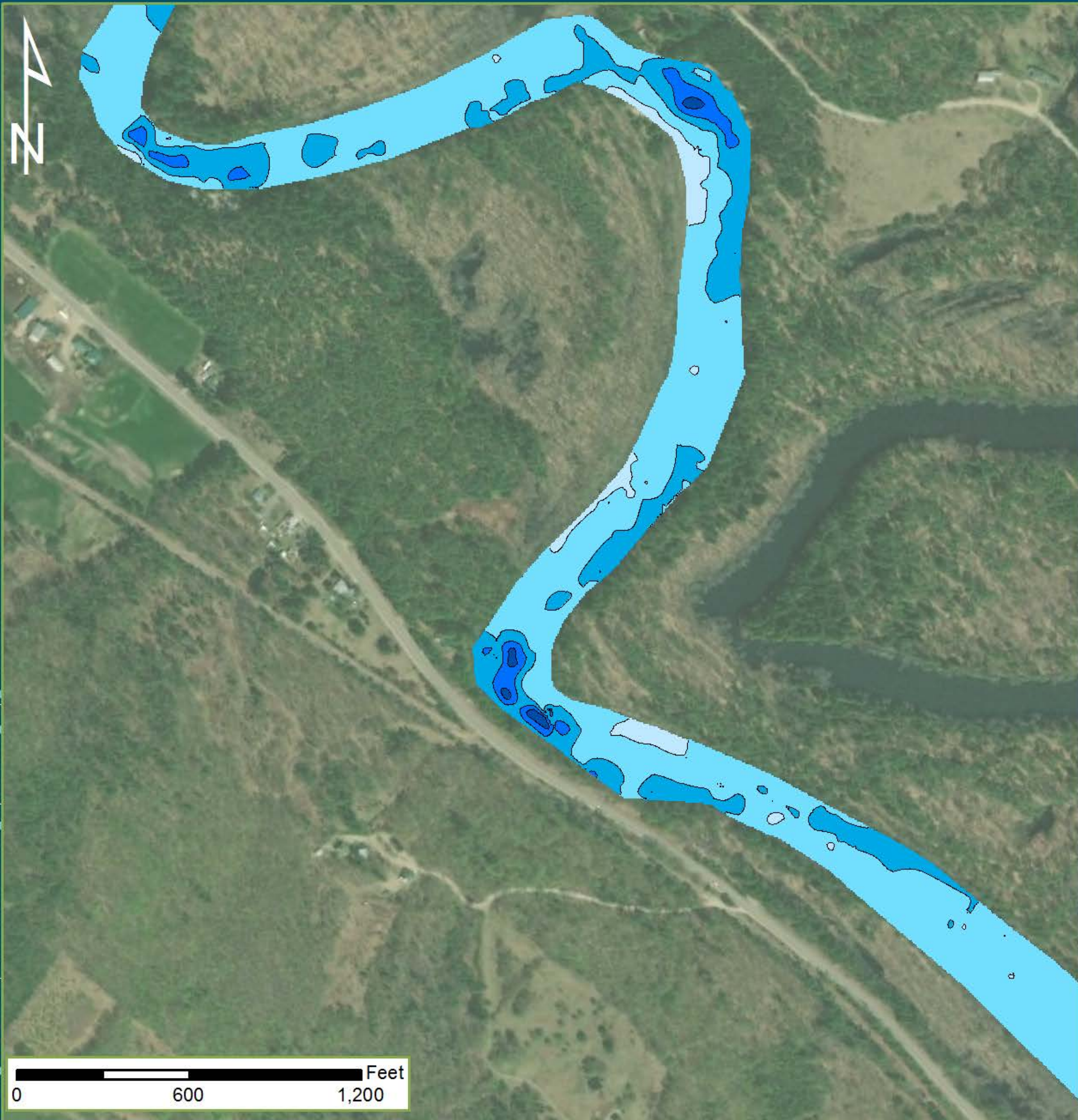
Kleinschmidt
141 Main St., PO Box 650
Pittsfield, Maine 04967
Telephone: (207) 487-3328
Fax: (207) 487-3124
www.KleinschmidtGroup.com

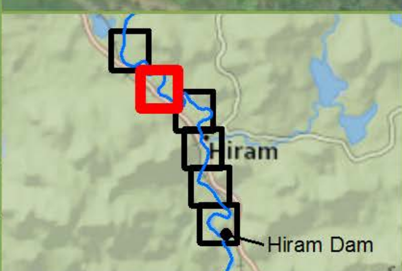
Path: G:_Client_Data\BrookfieldPower\Hiram_MXD\2018 Impoundment Work\Hiram_Impoundment_map_volume.mxd

Source: (Kleinschmidt, 2018; Brookfield, 2018; ESRI, 2018; USGS, 2018)

PN: 1465020.01

Hiram Impoundment Bathymetry





Water Depth (ft)

<4	16 - 20
4 - 8	20 - 24
8 - 12	24 - 28
12 - 16	28 - 32

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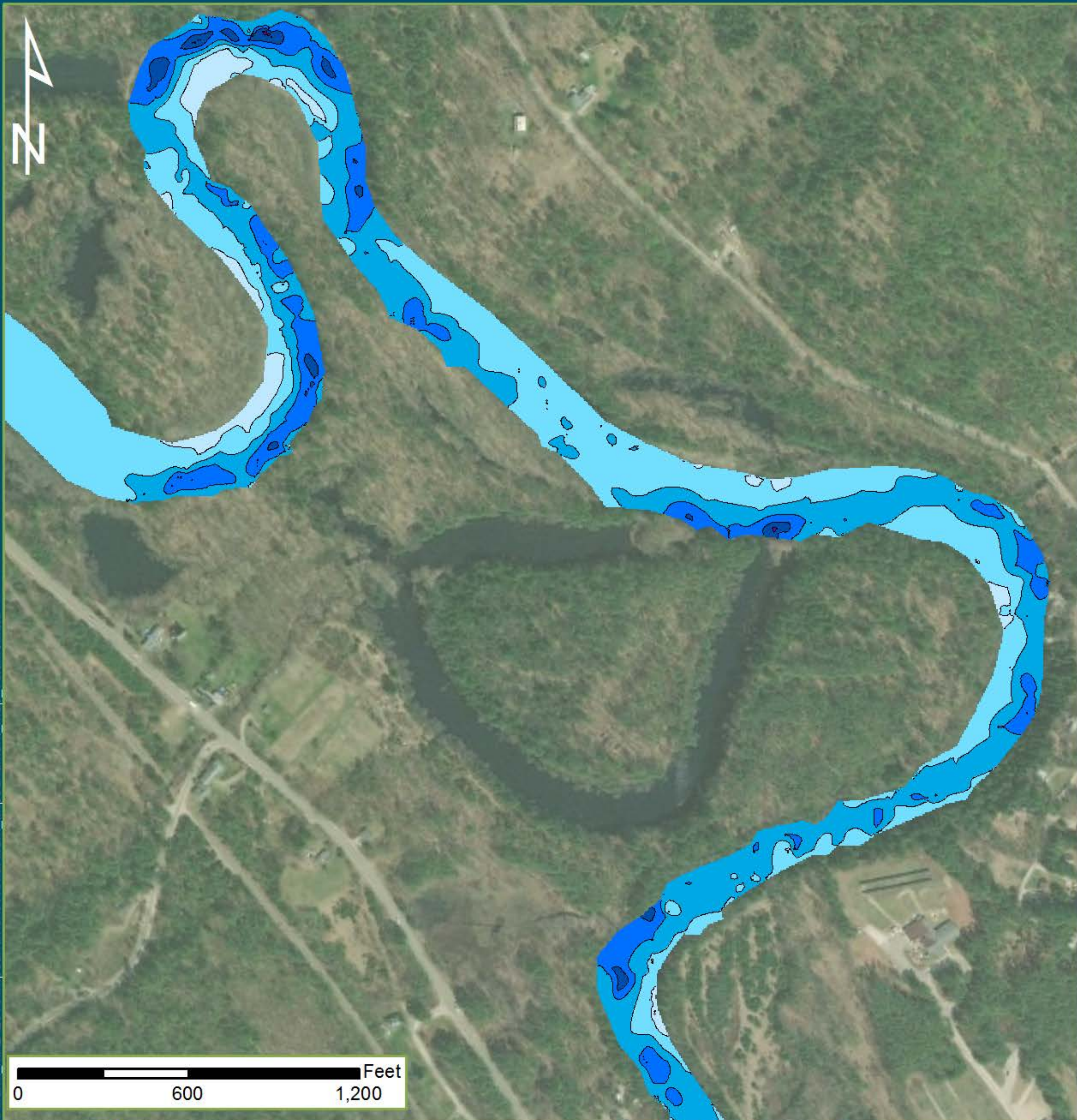
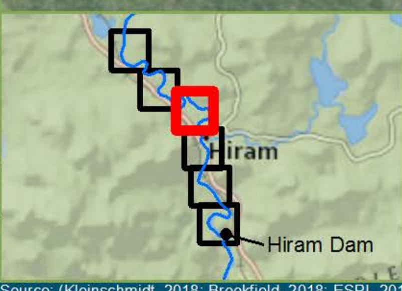
PN: 1465020.01

Hiram Impoundment Bathymetry





Water Depth (ft)

- <4
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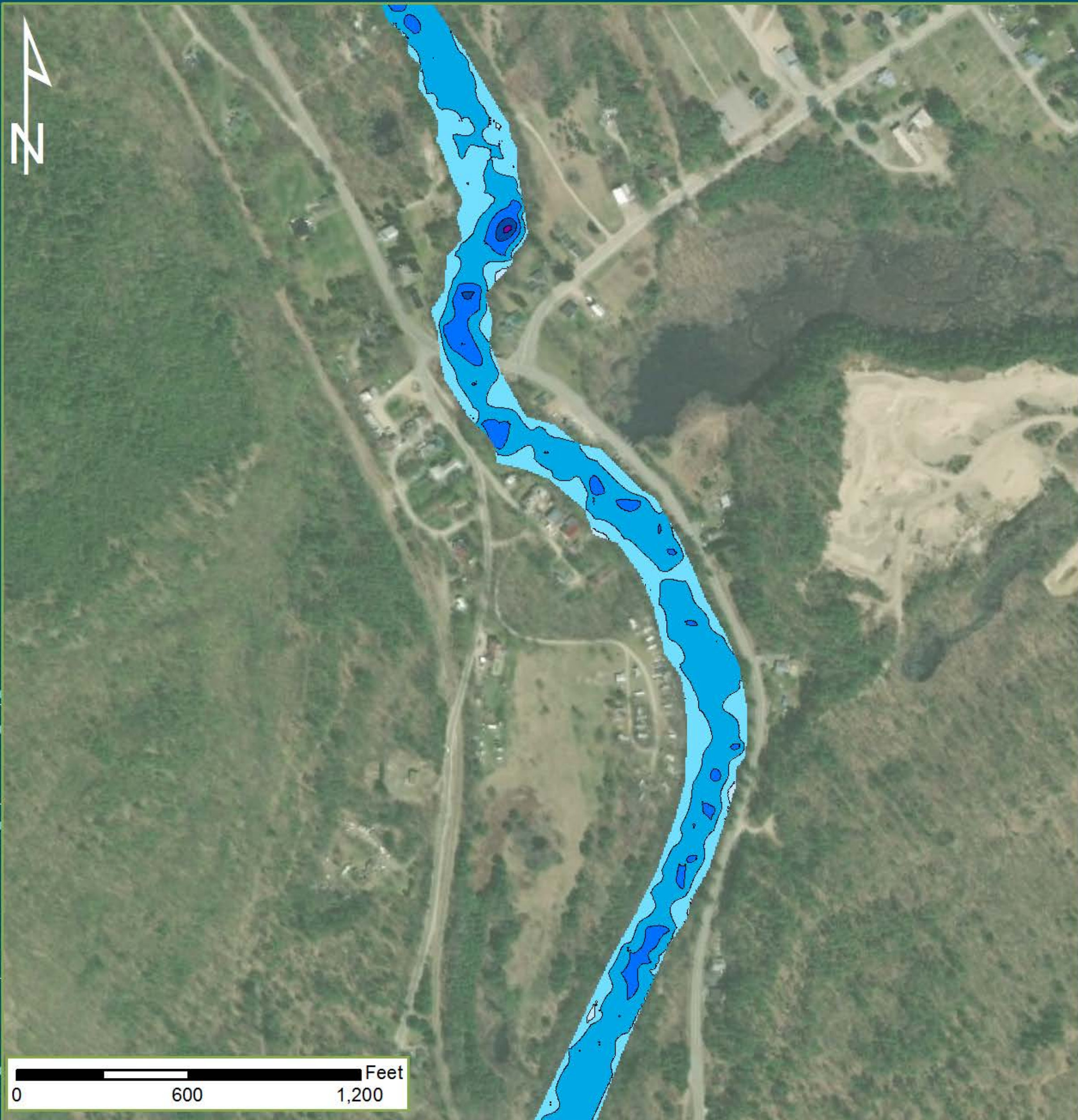

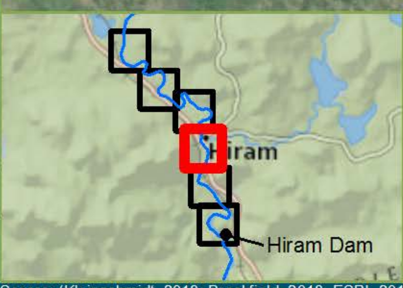

Water Depth (ft)

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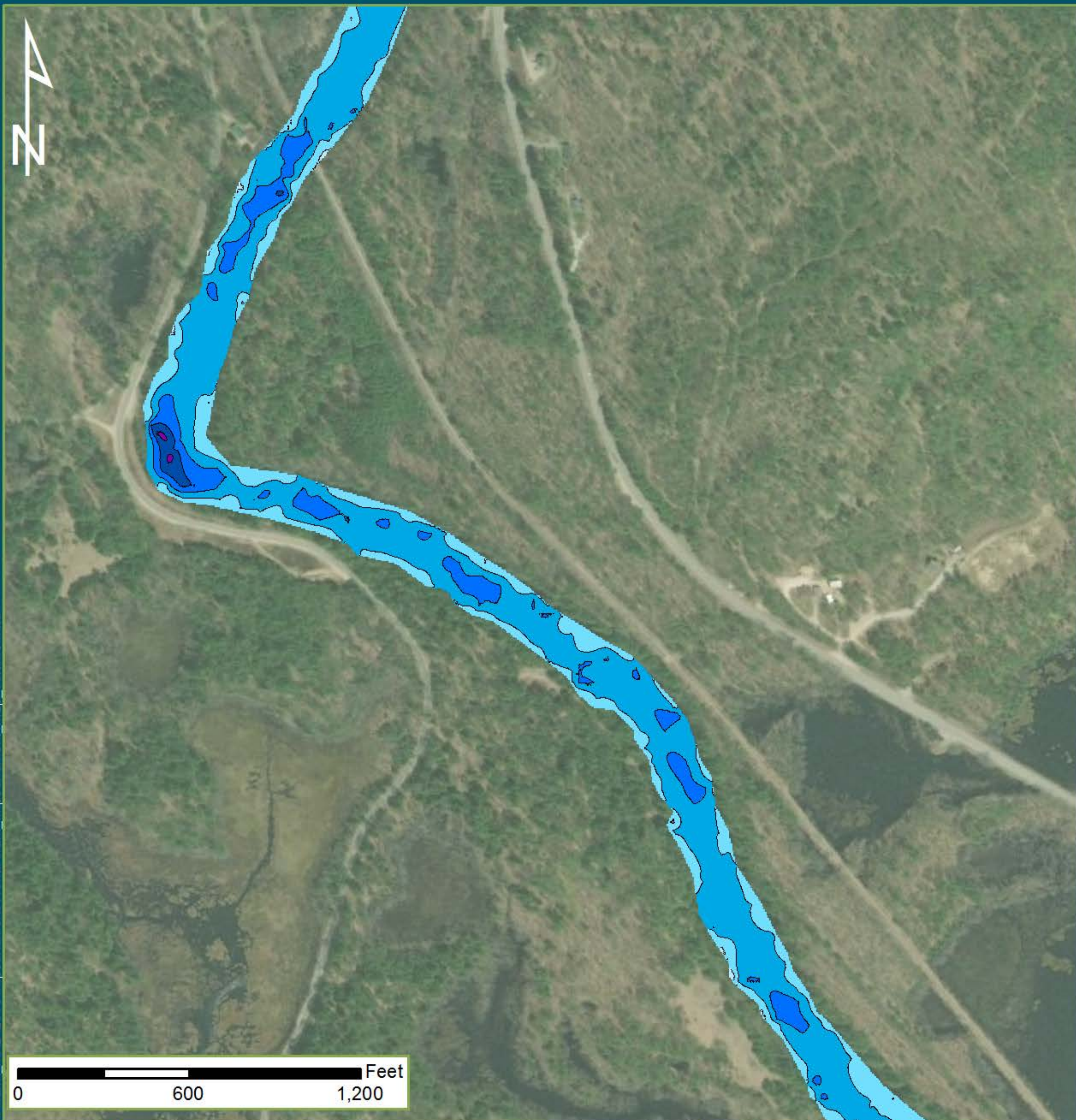
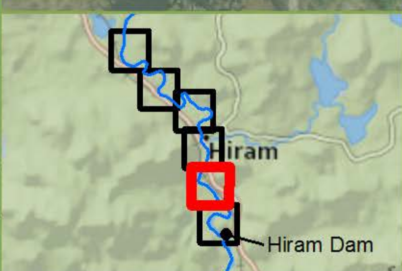
Hiram Impoundment Bathymetry





Water Depth (ft)

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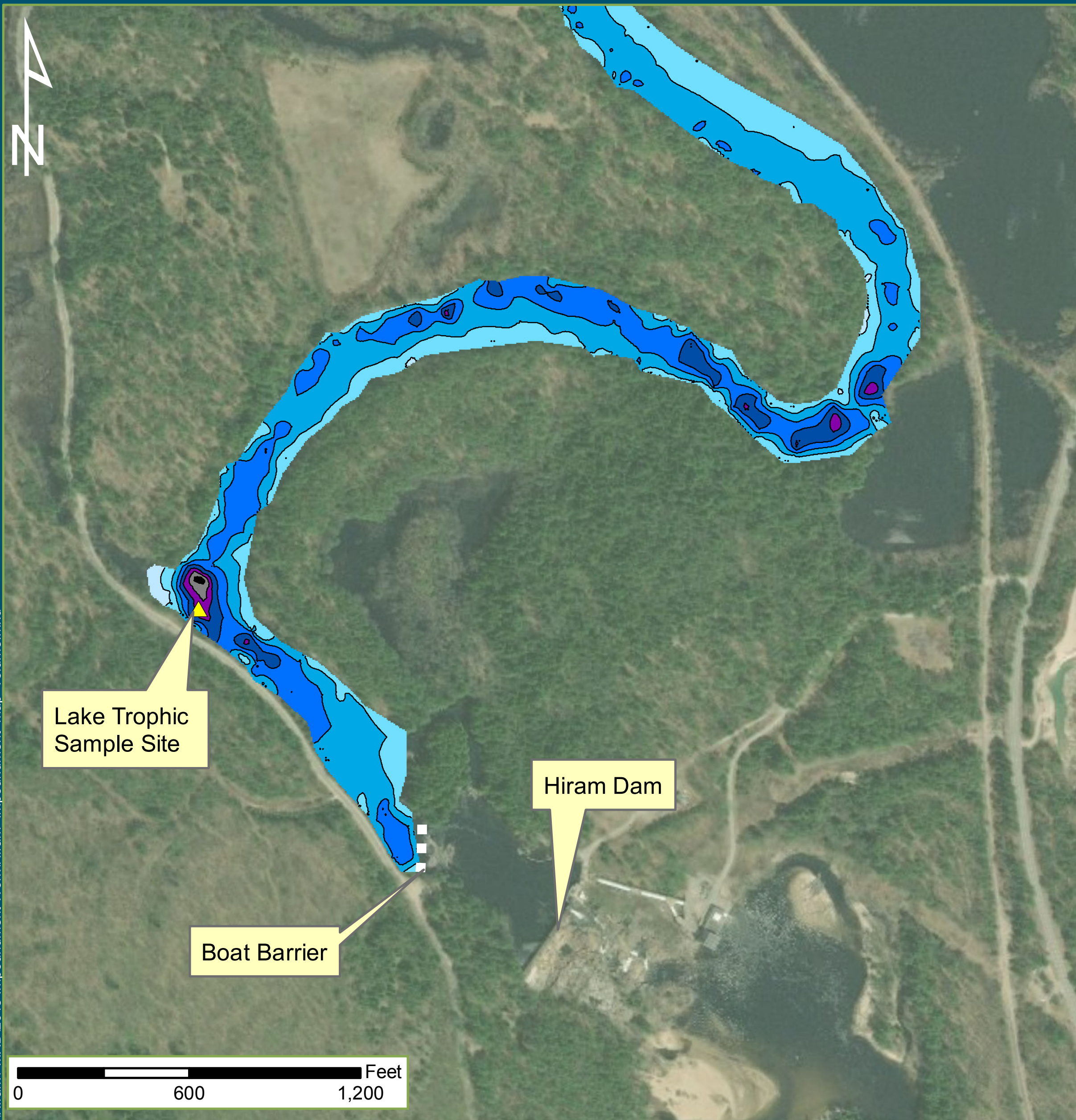

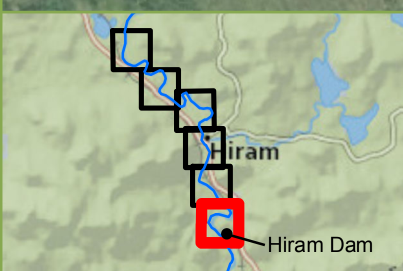

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Path: G:\ Client Data\BrookfieldPower\Hiram\ MXD\2018 Impoundment Work\Hiram Impoundment map volume.mxd

Source: (Kleinschmidt, 2018; Brookfield, 2018; ESRI, 2018; USGS, 2018)

PN: 1465020.01

APPENDIX E

MDEP BENTHIC INVERTEBRATE MODEL RESULTS

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report

Station Information

Station Number:	**S-1151**	River Basin:	Saco
Waterbody:	Saco River - Station 1151	HUC8 Name:	Saco
Town:	Baldwin	Latitude:	43 51 1.04 N
Directions:	BELOW HIRAM (GREAT) FALLS DAM, AT END OF TAILRACE POOL	Longitude:	70 47 33.66 W
		Stream Order:	4

Sample Information

Log Number:	**2717**	Type of Sample:	ROCK BAG	Date Deployed:	7/18/2018
Subsample Factor:	X1	Replicates:	3	Date Retrieved:	8/15/2018

Classification Attainment

Statutory Class: **AA**
Final Determination: **A**
Date: 2/1/2019
Model Result with P≥0.6: B
Reason for Determination: Best Professional Judgement
Date Last Calculated: 1/31/2019
Comments: Lake Outlet Effect. Raised Finding from Class B to Class A.

Model Probabilities

First Stage Model

Class A	0.35	Class C	0.04
Class B	0.62	NA	0.00

C or Better Model

Class A, B, or C	1.00
Non-Attainment	0.00

B or Better Model

Class A or B	0.96
Class C or Non-Attainment	0.04

A Model

Class A	0.04
Class B or C or Non-Attainment	0.96

Model Variables

01 Total Mean Abundance	812.33
02 Generic Richness	35.00
03 Plecoptera Mean Abundance	12.33
04 Ephemeroptera Mean Abundance	53.33
05 Shannon-Wiener Generic Diversity	3.38
06 Hilsenhoff Biotic Index	4.48
07 Relative Abundance - Chironomidae	0.10
08 Relative Generic Richness Diptera	0.37
09 *Hydropsyche* Abundance	16.33
11 *Cheumatopsyche* Abundance	289.00
12 EPT Generic Richness/ Diptera Generic Richness	1.15
13 Relative Abundance - Oligochaeta	0.00
15 Perlidae Mean Abundance (Family Functional Group)	12.33
16 Tanypodinae Mean Abundance (Family Functional Group)	24.00
17 Chironomini Abundance (Family Functional Group)	10.67
18 Relative Abundance Ephemeroptera	0.07
19 EPT Generic Richness	15.00
21 Sum of Abundances: *Dicrotendipes, Micropsectra, Parachironomus, Helobdella*	8.00
23 Relative Generic Richness- Plecoptera	0.06
25 Sum of Abundances: *Cheumatopsyche, Cricotopus, Tanytarsus, Ablabesmyia*	308.33
26 Sum of Abundances: *Acroneuria, Maccaffertium, Stenonema*	34.33
28 EP Generic Richness/14	0.57
30 Presence of Class A Indicator Taxa/7	0.00

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	*Cheumatopsyche*	35.58
2	*Chimarra*	15.88
3	*Macrostemum*	12.15
4	*Oecetis*	6.40
5	*Neureclipsis*	5.62

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report

Station Number: **S-1151**	Town: Baldwin		Date Deployed: 7/18/2018
Log Number: **2717**	Waterbody: Saco River - Station 1151		Date Retrieved: 8/15/2018

Sample Collection and Processing Information

Sampling Organization: MOODY MOUNTAIN ENVIRONMENTAL

Taxonomist: PAUL LEEPER (MOODY MOUNTAIN ENVIRONMENTAL)

Waterbody Information - Deployment		Waterbody Information - Retrieval	
Temperature:	24.2 deg C	Temperature:	23 deg C
Dissolved Oxygen:	8 mg/l	Dissolved Oxygen:	7.9 mg/l
Dissolved Oxygen Saturation:		Dissolved Oxygen Saturation:	
Specific Conductance:		Specific Conductance:	
Velocity:	43 cm/s	Velocity:	50 cm/s
pH:		pH:	
Wetted Width:	44 m	Wetted Width:	44 m
Bankfull Width:		Bankfull Width:	
Depth:	125 cm	Depth:	128 cm

Water Chemistry

Summary of Habitat Characteristics

Landuse Name	Canopy Cover	Terrain	
Upland Conifer	Open	Rolling	
Upland Hardwood			

Potential Stressor	Location	Substrate	
Regulated Flows	Below Dam	Gravel	20 %
		Rubble/Cobble	50 %
		Sand	30 %

Landcover Summary - 2004 Data

Sample Comments

7/18/18: FILAMENTOUS ALGAE COVER BOTTOM.

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Taxonomic Inventory Report

Station Number: S-1151 Waterbody: Saco River - Station 1151 Town: Baldwin

Log Number: 2717 Subsample Factor: X1 Replicates: 3 Calculated: 1/31/2019

Taxon	Maine Taxonomic Code	Count (Mean of Samplers) Actual	Count (Mean of Samplers) Adjusted	Hilsenhoff Biotic Index	Functional Feeding Group	Relative Abundance % Actual	Relative Abundance % Adjusted
Planariidae	03010101	1.00	1.00		--	0.1	0.1
Oligochaeta	0802	0.33	0.33		--	0.0	0.0
Hyalella	09010203006	1.33	1.33	8	CG	0.2	0.2
Acroneuria	09020209042	9.67	9.67	0	PR	1.2	1.2
Agnetina	09020209050	2.67	2.67	2	PR	0.3	0.3
Coenagrionidae	09020309	2.67	2.67		--	0.3	0.3
Centroptilum	09020401003	6.67	6.67	2	CG	0.8	0.8
Plauditus	09020401012	11.33	11.33		CG	1.4	1.4
Maccaffertium	09020402015	16.67	16.67	4	SC	2.1	2.1
Stenonema	09020402016	8.00	8.00	4	SC	1.0	1.0
Isonychia	09020404018	9.00	9.00	2	CF	1.1	1.1
Tricorythodes	09020411038	1.67	1.67	4	CG	0.2	0.2
Chimarra	09020601003	129.00	129.00	2	CF	15.9	15.9
Neureclipsis	09020603008	45.67	45.67	7	CF	5.6	5.6
Polycentropus	09020603010	0.33	0.33	6	PR	0.0	0.0
Cheumatopsyche	09020604015	289.00	289.00	5	CF	35.6	35.6
Hydropsyche	09020604016	16.33	16.33	4	CF	2.0	2.0
Macrostemum	09020604018	98.67	98.67	3	CF	12.1	12.1
Oecetis	09020618078	52.00	52.00	8	PR	6.4	6.4
Corydalus	09020701002		2.33	6	PR		0.3
Corydalus cornutus	09020701002002	2.33			--	0.3	
Bezzia/palpomyia	09021010043	1.33	1.33	6	PR	0.2	0.2
Pentaneura	09021011014	16.67	16.67	6	PR	2.1	2.1
Procladius	09021011015	1.33	1.33	9	PR	0.2	0.2
Thienemannimyia	09021011020		6.00	3	PR		0.7
Thienemannimyia group	09021011020041	6.00			--	0.7	
Cricotopus	09021011037	11.33	11.33	7	SH	1.4	1.4
Eukiefferiella	09021011041	10.67	10.67	8	CG	1.3	1.3
Nanocladius	09021011049	8.00	8.00	3	CG	1.0	1.0
Synorthocladius	09021011061	2.00	2.00	2	CG	0.2	0.2
Micropsectra	09021011070	8.00	8.00	7	CG	1.0	1.0
Tanytarsus	09021011076	8.00	8.00	6	CF	1.0	1.0
Microtendipes	09021011094	2.67	2.67	6	CF	0.3	0.3
Polypedilum	09021011102	8.00	8.00	6	SH	1.0	1.0
Simulium	09021012047	15.00	15.00	4	CF	1.8	1.8
Coleoptera	090211	0.33	0.33		--	0.0	0.0
Sphaeriidae	10020201	8.67	8.67		CF	1.1	1.1

APPENDIX F

STANDARDIZED RECREATION SITE INVENTORY FORM

Site Inventory Form

Inspector:______________________ Date: ____________ Time: ___________ Photo No: __________

Project:_______________ Reservoir:_________________Site Name/Code: ________________________

Owner:____GPS Coordinates: ________________________

Weather: _________________

Recreation Amenity Type:

Boat Launch	Reservoir Fishing	Picnic Area	
Marina	Swim Area	Overlook/Vista	Informal Use Area
Portage	Trails	Interpretive Display	Access Point
Tailwater Fishing	Active Recreation Area	Hunting Area	

Access:

_____	Water access	
_____	Paved access	______ # of lanes
_____	Unpaved access (conventional motor vehicle)	______# of lanes
_____	Unpaved access (4WD vehicle)	______# of lanes
_____	ORV access (ATV)	______width
_____	Foot access	______width

Ownership/Management

	Licensee	Federal	State	County	Local	Private	Other
Ownership	_____	_____	_____	_____	_____	_____	______________
Management	_____	_____	_____	_____	_____	_____	______________

Operations:

Staffed ____ Commercial_____ Fee_____ Open to public______________
Operating Schedule: ____

General Area:
Is the area associated with other facilities or activities?______________________________
General Topography:__________________________ Erosion/Soils: _________________________
Compaction: _________________________ Approximate Shoreline Footage: ___________
Bank Fishing (Yes/No):______________

Sanitation Facilities: (Yes/No)

Type:	Unisex	# of Units Women	# of Units Men	**ADA Accommodations**
Flush	______	________	________	________________________
Composting	______	________	________	________________________
Vault	______	________	________	________________________
Pit	______	________	________	________________________
Portable	______	________	________	________________________
Wilderness	______	________	________	________________________

Site Facilities:

#	Type	Condition (Good, Adequate, Poor)	GPS Coordinates	ADA Accommodations
_____	Picnic Tables	________	_______	______________________________
_____	Grills	________	_______	______________________________
_____	Firepit/ring	________	_______	______________________________
	Trails (specify use and length)	________	_______	______________________________
_____	Shelter	________	_______	______________________________
_____	Potable Water	________	_______	______________________________
_____	Boat Ramp	________	_______	______________________________
_____	Launching Lanes	________	_______	______________________________
_____	Playground	________	_______	______________________________
_____	Benches	________	_______	______________________________
_____	Interpretive Displays	________	_______	______________________________
_____	Part 8 Sign	________	_______	______________________________
_____	Other Signage at Site	________	_______	______________________________
_____	Other: _________	________	_______	______________________________
_____	Other: _________	________	_______	______________________________
_____	Other: _________	________	_______	______________________________
_____	Other: _________	________	_______	______________________________

Activities occurring:	# of Adults	# of Minors	Total # of users
Picnicking	_________	_________	_____________
Camping	_________	_________	_____________
Walking/hiking	_________	_________	_____________
Swimming	_________	_________	_____________
Beach Activities	_________	_________	_____________
Launching boats	_________	_________	_____________
Fishing	_________	_________	_____________
Hunting	_________	_________	_____________
________________	_________	_________	_____________

Parking Areas:		Surface Code	Dimensions
# ADA spaces	_________	_________	_________
# Regular spaces	_________	_________	_________
# Vehicle & trailer spaces	_________	_________	_________
# of vehicles parked	_________	Space delineated_________	Curbs_________

Boat Launch Facilities:

Hard surface _____ Gravel _____ Unimproved _____ Carry In __________

Docks/Piers/Floats Total Docks____________ Total Slips _____________

Material code:	#1______	#2______	#3______	#4______	#5______
Dimensions:	#1______	#2______	#3______	#4______	#5______
# of slips:	#1______	#2______	#3______	#4______	#5______
ADA accommodations:	#1______	#2______	#3______	#4______	#5______

Vegetation and Erosion:

_____ Cut trees for fires
_____ Trampled vegetation
_____ Mowed areas
_____ Trees damaged by people
_____ Trees damaged by environment

Observations/Evidence of Vegetation Impacts: ______________________________

____
____
____

Observations/Evidence of Erosion: ______________________________

____
____
____

Site Aesthetics:

Viewshed from site: ____________

1 - No noticeable development
2 - Very limited primitive development
3 - Five (5) or less buildings in view

Viewshed from shoreline: _______________

4 - Five (5) or less buildings in view
5 - Ten (10) or more buildings in view
6 - Highly developed

Nature of abutting development/land use: ______________________________

Evidence of use at site: ______________________________

*(C) Compaction, (E) Erosion, (G) Garbage, (GD) Ground disturbance, (HW) Human waste, (UI) Unauthorized improvements, (V) Vandalism, (VR) Vegetation removal, (O) Other (Specify)

Evidence of Overcrowding: ______________________________

*(A) Anecdotal information, (FA) facility/amenity @ capacity, (I) Improper parking, (S) Signage, (SD) site degradation, (U) Unauthorized sites, (W) Waiting lines, (O) Other (Specify)

Notes: ______________________________

____
____

Sketch:

APPENDIX G

FIELD INVENTORY FORMS FOR THE RECREATION SITES AND ACCESS AREAS

Site Inventory Form

Inspector: MD + MB Date: 8/23/18 Time: 13:30 Photo No: ____
Project: Brookfield Reservoir: Hiram Site Name/Code: Fishing area
Owner: Brookfield GPS Coordinates: 43.849489, -70.797039
Weather: Sunny - 75°F

Recreation Amenity Type:

Boat Launch	Reservoir Fishing	Picnic Area	
Marina	Swim Area	Overlook/Vista	Informal Use Area
Portage	Trails	Interpretive Display	Access Point
Tailwater Fishing	Active Recreation Area	Hunting Area	

Access:

✓ Water access
✓ Paved access — 2 # of lanes
___ Unpaved access (conventional motor vehicle) ___ # of lanes
___ Unpaved access (4WD vehicle) ___ # of lanes
___ ORV access (ATV) ___ width
✓ Foot access — 10' width

Ownership/Management

	Licensee	Federal	State	County	Local	Private	Other
Ownership	✓						
Management	✓						

Operations:

Staffed N Commercial N Fee N Open to public yes
Operating Schedule: Dawn - Dusk

General Area:

Is the area associated with other facilities or activities? Portage
General Topography: Sloping to water Erosion/Soils: yes - Parking, trail
Compaction: yes Approximate Shoreline Footage: 1400' including Sandbar
Bank Fishing (Yes/No): Yes

Sanitation Facilities: (Yes/No) No

Type:	Unisex	# of Units Women	# of Units Men	ADA Accommodations
Flush				
Composting				
Vault				
Pit				
Portable				
Wilderness				

Site Facilities:

#	Type	Condition (Good, Adequate, Poor)	GPS Coordinates	ADA Accommodations
	Picnic Tables			
	Grills			
	Firepit/ring			
	Trails (specify use and length)	Good 560'		from parking to fishing area
		Good 500'		from fishing area along shore
	Shelter			
	Potable Water			
	Boat Ramp			
	Launching Lanes			
	Playground			
	Benches			
	Interpretive Displays			
	Part 8 Sign			
	Other Signage at Site			
	Other:			
	Other:			
	Other:			
	Other:			

See attached list of Signs

Activities occurring:	# of Adults	# of Minors	Total # of users
Picnicking			
Camping			
Walking/hiking			
Swimming	1	3	4
Beach Activities	3		3
Launching boats			
Fishing			
Hunting			
Picking up trash	2		2

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Parking Areas:		Surface Code	Dimensions
# ADA spaces			
# Regular spaces	8	Gravel	85x10
# Vehicle & trailer spaces			
# of vehicles parked	5	Space delineated 0	Curbs 0

Boat Launch Facilities:

Hard surface ______ Gravel ______ Unimproved ______ Carry In ✓

Docks/Piers/Floats Total Docks 0 Total Slips 0

Material code:	#1	#2	#3	#4	#5
Dimensions:	#1	#2	#3	#4	#5
# of slips:	#1	#2	#3	#4	#5
ADA accommodations:	#1	#2	#3	#4	#5

Vegetation and Erosion:

__✓__ Cut trees for fires
_____ Trampled vegetation
_____ Mowed areas

__✓__ Trees damaged by people
__✓__ Trees damaged by environment

Observations/Evidence of Vegetation Impacts: Snags on trail to site. Multiple Trees/Stumps visible with tool marks, burnt trees.

Observations/Evidence of Erosion: Little erosion down trail to site from rain water running down trail.

Site Aesthetics:

Viewshed from site: 1

1 - No noticeable development
2 - Very limited primitive development
3 - Five (5) or less buildings in view

Viewshed from shoreline: 6 - Powerhouse/Dam visible

4 - Five (5) or less buildings in view
5 - Ten (10) or more buildings in view
6 - Highly developed

Nature of abutting development/land use: Residential/wooded

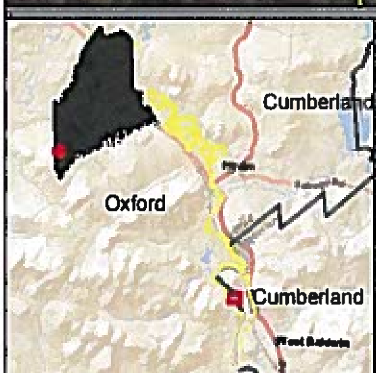
Evidence of use at site: C

*(C) Compaction, (E) Erosion, (G) Garbage, (GD) Ground disturbance, (HW) Human waste, (UI) Unauthorized improvements, (V) Vandalism, (VR) Vegetation removal, (O) Other (Specify)

Evidence of Overcrowding: U

*(A) Anecdotal information, (FA) facility/amenity @ capacity, (I) Improper parking, (S) Signage, (SD) site degradation, (U) Unauthorized sites, (W) Waiting lines, (O) Other (Specify)

Notes: Ladies working to remove garbage that has been left at site over summer. Evidence of fires and tents left at site. Trail to site is a gated access road - wide sloping to water.



Legend

- Project Boundary
- Town Boundary
- County Boundary

Sources: ESRI, USGS, ME OGIS, BROOKFIELD, TRC

Brookfield White Pine Hydro LLC

Hiram Hydroelectric Project
Proposed Study Plan

Recreation Sites
Downstream Access
Trail, Parking and Sandbar

Created:
12/18/2018

TRC
14 Gabriel Drive
Augusta, ME 04330

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Description	Condition	latitude	longitude	Notes
Safety	Good	43.848618	-70.797035	
Warning 1	Good	43.849588	-70.797048	
Fire	Good	43.849668	-70.797164	
Fire 2	Good	43.849956	-70.796970	
Fire 3	Good	43.850296	-70.796806	
Fire 4	Good	43.850809	-70.796343	
Warning 2	Good	43.850279	-70.796562	

Site Inventory Form

Inspector: MD, MB Date: 8/23/18 Time: 11:40 Photo No: ______

Project: Hiram Reservoir: Hiram Site Name/Code: Overlook

Owner: Brookfield GPS Coordinates: 43.852062, -70.790514

Weather: Sunny -75

Recreation Amenity Type:

Boat Launch	Reservoir Fishing	Picnic Area	
Marina	Swim Area	Overlook/Vista	Informal Use Area
Portage	Trails	Interpretive Display	Access Point
Tailwater Fishing	Active Recreation Area	Hunting Area	

Access:

✓ Water access
✓ Paved access — 2 # of lanes
____ Unpaved access (conventional motor vehicle) — ____ # of lanes
____ Unpaved access (4WD vehicle) — ____ # of lanes
____ ORV access (ATV) — ____ width
____ Foot access — ____ width

Ownership/Management

	Licensee	Federal	State	County	Local	Private	Other
Ownership	✓						
Management			✓ DOT				

Operations:

Staffed N Commercial N Fee N Open to public yes
Operating Schedule: No posted Schedule

General Area:

Is the area associated with other facilities or activities? NO
General Topography: flat Erosion/Soils: yes
Compaction: NO Approximate Shoreline Footage: N/A
Bank Fishing (Yes/No): No

Sanitation Facilities: (Yes/No) No

Type:	Unisex	# of Units Women	# of Units Men	ADA Accommodations
Flush				
Composting				
Vault				
Pit				
Portable				
Wilderness				

Site Facilities:

#	Type	Condition (Good, Adequate, Poor)	GPS Coordinates	ADA Accommodations
	Picnic Tables			
	Grills			
	Firepit/ring			
	Trails (specify use and length)			
	Shelter			
	Potable Water			
	Boat Ramp			
	Launching Lanes			
	Playground			
	Benches			
	Interpretive Displays			
1	Part 8 Sign	Adequate	43.8520876, -70.7903828	- Address on sign out of date
	Other Signage at Site			
	Other:			
	Other:			
	Other:			
	Other:			

Activities occurring:	# of Adults	# of Minors	Total # of users
Picnicking			
Camping			
Walking/hiking			
Swimming			
Beach Activities			
Launching boats			
Fishing			
Hunting			

Parking Areas:		Surface Code	Dimensions
# ADA spaces			
# Regular spaces	6	Gravel	6 Scattered over Site
# Vehicle & trailer spaces			
# of vehicles parked	1	Space delineated 0	Curbs 0

Boat Launch Facilities:

Hard surface 0 Gravel 0 Unimproved 0 Carry In 0

Docks/Piers/Floats Total Docks______ Total Slips ______

Material code:	#1	#2	#3	#4	#5
Dimensions:	#1	#2	#3	#4	#5
# of slips:	#1	#2	#3	#4	#5
ADA accommodations:	#1	#2	#3	#4	#5

Vegetation and Erosion: N/A

_____ Cut trees for fires
_____ Trampled vegetation
_____ Mowed areas
_____ Trees damaged by people
_____ Trees damaged by environment

Observations/Evidence of Vegetation Impacts: Some cut trees / Branches on Bank - cleared for transmission right

Observations/Evidence of Erosion: Erosion on Bank going toward RR - Sandy soil. Drainage from parkinglot puddle made to drain over bank, no signs of erosion on bank in that area

Site Aesthetics:

Viewshed from site: 3

1 - No noticeable development
2 - Very limited primitive development
3 - Five (5) or less buildings in view

Viewshed from shoreline: N/A

4 - Five (5) or less buildings in view
5 - Ten (10) or more buildings in view
6 - Highly developed

Nature of abutting development/land use: Transmission lines to East, R+S to West

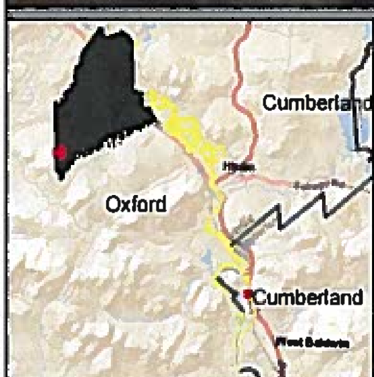
Evidence of use at site: E, G, GD

*(C) Compaction, (E) Erosion, (G) Garbage, (GD) Ground disturbance, (HW) Human waste, (UI) Unauthorized improvements, (V) Vandalism, (VR) Vegetation removal, (O) Other (Specify)

Evidence of Overcrowding: N/A

*(A) Anecdotal information, (FA) facility/amenity @ capacity, (I) Improper parking, (S) Signage, (SD) site degradation, (U) Unauthorized sites, (W) Waiting lines, (O) Other (Specify)

Notes: Entrance / Exits have large puddles - rough transition from pavement. Part 8 sign has incorrect address.



Legend

- Project Boundary
- Town Boundary
- County Boundary

N

Sources: ESRI, USGS, ME OGIS, BROOKFIELD, TRC

Brookfield White Pine Hydro LLC

Hiram Hydroelectric Project
Proposed Study Plan

Recreation Sites
Overlook

Created: 12/18/2018

TRC

14 Gabriel Drive
Augusta, ME 04330

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Site Inventory Form

Inspector: MD, MB Date: 8/23/18 Time: 12:40 Photo No: ______

Project: Hiram Reservoir: Hiram Site Name/Code: Portage

Owner: Brookfield GPS Coordinates: 43.852858, -70.798938

Weather: Sunny-75

Recreation Amenity Type:

Boat Launch	Reservoir Fishing	Picnic Area	
Marina	Swim Area	Overlook/Vista	Informal Use Area
Portage	Trails	Interpretive Display	Access Point
Tailwater Fishing	Active Recreation Area	Hunting Area	

Access:

✓ Water access
✓ Paved access — 2 # of lanes
____ Unpaved access (conventional motor vehicle) ____ # of lanes
____ Unpaved access (4WD vehicle) ____ # of lanes
✓ ORV access (ATV) ____ width
✓ Foot access 3'-10' width

Ownership/Management

	Licensee	Federal	State	County	Local	Private	Other
Ownership	✓						
Management	✓						

Operations:

Staffed N Commercial N Fee N Open to public yes
Operating Schedule: dawn - dusk

General Area:

Is the area associated with other facilities oractivities? Fishermans Access
General Topography: Flat Erosion/Soils: yes
Compaction: yes Approximate Shoreline Footage: N/A
Bank Fishing (Yes/No): At Site, informal Covered with Fishermans Access
Sanitation Facilities: (Yes/No)

Type:	Unisex	# of Units Women	# of Units Men	ADA Accommodations
Flush				
Composting				
Vault				
Pit				
Portable				
Wilderness				

Site Facilities:

#	Type	Condition (Good, Adequate, Poor)	GPS Coordinates	ADA Accommodations
	Picnic Tables			
	Grills			
	Firepit/ring			
1	Trails (specify use and length)	Adequate	1,130	GPS locations taken to document trail 43.852852, -70.798734
	Shelter			
	Potable Water			
	Boat Ramp			
	Launching Lanes			
	Playground			
	Benches			
	Interpretive Displays			
1	Part 8 Sign			
	Other Signage at Site			
1	Other: Portage			
1	Other: Kindleno			
1	Other: Usage			
	Other:			

See attached Sheet for list of All Signs associated w/ Site

Activities occurring:	# of Adults	# of Minors	Total # of users
Picnicking			
Camping			
Walking/hiking			
Swimming			
Beach Activities			
Launching boats			
Fishing			
Hunting			

Parking Areas:		Surface Code	Dimensions
# ADA spaces			
# Regular spaces	6	gravel	40×10 + 20×10
# Vehicle & trailer spaces			
# of vehicles parked		Space delineated_____	Curbs_____

Boat Launch Facilities:

Hard surface _____ Gravel _____ Unimproved _____ Carry In ✓

Docks/Piers/Floats Total Docks__________ Total Slips __________

	#1	#2	#3	#4	#5
Material code:					
Dimensions:					
# of slips:					
ADA accommodations:					

Vegetation and Erosion:

_____ Cut trees for fires
_____ Trampled vegetation
__✓__ Mowed areas

_____ Trees damaged by people
_____ Trees damaged by environment

Observations/Evidence of Vegetation Impacts: Area around take-out mowed.

Observations/Evidence of Erosion: Little - woodchips along bank for stabilization - some sand washing down bank from parking area.

Site Aesthetics:

Viewshed from site: 1

1 - No noticeable development
2 - Very limited primitive development
3 - Five (5) or less buildings in view

Viewshed from shoreline: 1 - Just road

4 - Five (5) or less buildings in view
5 - Ten (10) or more buildings in view
6 - Highly developed

Nature of abutting development/land use: Wooded / residential

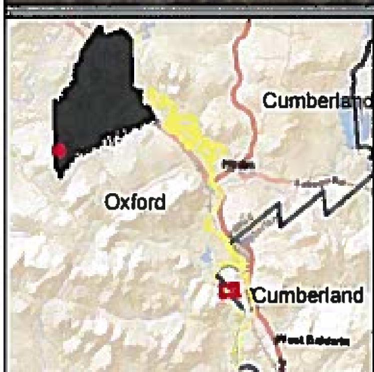
Evidence of use at site: G, HW

*(C) Compaction, (E) Erosion, (G) Garbage, (GD) Ground disturbance, (HW) Human waste, (UI) Unauthorized improvements, (V) Vandalism, (VR) Vegetation removal, (O) Other (Specify)

Evidence of Overcrowding: N/A

*(A) Anecdotal information, (FA) facility/amenity @ capacity, (I) Improper parking, (S) Signage, (SD) site degradation, (U) Unauthorized sites, (W) Waiting lines, (O) Other (Specify)

Notes: Trail is in relatively good condition with few rocks + roots. Take out is a short, steep bank.



Legend

- Project Boundary
- Town Boundary
- County Boundary

N

Sources: ESRI, USGS, ME OGIS, BROOKFIELD, TRC

Brookfield White Pine Hydro LLC

Hiram Hydroelectric Project Proposed Study Plan

Recreation Sites
Canoe Portage Trail and Parking

Created: 12/18/2018

TRC 14 Gabriel Drive Augusta, ME 04330

S:\1-PROJECTS\Brookfield\HIRAM PAD\4-SCRATCH\Hiram_PAD_Rec_Sites_individual_8x11_12172018.mxd

Description	Condition	latitude	longitude	Notes
Usage	Good	43.852950	-70.798848	
Part. 8	Adequate	43.852857	-70.798752	Some fading on sign
Kindle no fires	Good	43.852808	-70.798825	
Security sign	Good	43.852857	-70.798496	
Fast water	Good	43.852692	-70.798379	
Canoe portage	Good	43.852426	-70.797978	
Portage	Good	43.852334	-70.797963	
Warning	Good	43.852117	-70.797619	
Canoe	Adequate	43.851617	-70.797080	
Main Canoe Portage Sign	Good	43.852992	-70.798856	

Site Inventory Form

Inspector: MD, MB Date: 8/23/18 Time: 12:15 Photo No: ______

Project: Hiram Reservoir: Hiram Site Name/Code: Unimproved Launch

Owner: Private GPS Coordinates: 43.880986, -70.803623

Weather: Sunny -72°

Recreation Amenity Type:

Boat Launch	Reservoir Fishing	Picnic Area	
Marina	Swim Area	Overlook/Vista	Informal Use Area
Portage	Trails	Interpretive Display	Access Point
Tailwater Fishing	Active Recreation Area	Hunting Area	

Access:

✓	Water access		
✓	Paved access	2	# of lanes
____	Unpaved access (conventional motor vehicle)	____	# of lanes
____	Unpaved access (4WD vehicle)	____	# of lanes
____	ORV access (ATV)	____	width
____	Foot access	____	width

Ownership/Management

	Licensee	Federal	State	County	Local	Private	Other
Ownership						✓	
Management						✓	

Operations:

Staffed N Commercial N Fee N Open to public Yes

Operating Schedule: no posted Schedule

General Area:

Is the area associated with other facilities oractivities? No

General Topography: Flat Erosion/Soils: N

Compaction: Yes Approximate Shoreline Footage: only launch

Bank Fishing (Yes/No): Could fish off launch area

Sanitation Facilities: (Yes/No)

Type:	Unisex	# of Units Women	# of Units Men	ADA Accommodations
Flush				
Composting				
Vault				
Pit				
Portable				
Wilderness				

Site Facilities:

#	Type	Condition (Good, Adequate, Poor)	GPS Coordinates	ADA Accommodations
	Picnic Tables			
	Grills			
	Firepit/ring			
	Trails (specify use and length)			
	Shelter			
	Potable Water			
1	Boat Ramp	Good	43.8810096 -70.8036422	
	Launching Lanes			
	Playground			
	Benches			
	Interpretive Displays			
	Part 8 Sign			
	Other Signage at Site			
1	Other: Sign from water/Good		43.880855 -70.803785	"River rm 111 Hiram canoe Access"
	Other:			
	Other:			
	Other:			

Activities occurring:	# of Adults	# of Minors	Total # of users
Picnicking			
Camping			
Walking/hiking			
Swimming			
Beach Activities			
Launching boats	2	0	2
Fishing			
Hunting			

Parking Areas:		Surface Code	Dimensions
# ADA spaces			
# Regular spaces			
# Vehicle & trailer spaces	16 w/trailer	grass	120x50

\# of vehicles parked 2/2 trailers Space delineated ______ Curbs ______

Boat Launch Facilities:

Hard surface ______ Gravel ______ Unimproved 1 Carry In ______

Docks/Piers/Floats Total Docks 0 Total Slips ______

Material code:	#1	#2	#3	#4	#5
Dimensions:	#1	#2	#3	#4	#5
# of slips:	#1	#2	#3	#4	#5
ADA accommodations:	#1	#2	#3	#4	#5

Vegetation and Erosion:

_____ Cut trees for fires
_____ Trampled vegetation
__√__ Mowed areas
_____ Trees damaged by people
_____ Trees damaged by environment

Observations/Evidence of Vegetation Impacts: Grass mowed around boat launch, parking and along access road.

Observations/Evidence of Erosion: None

Site Aesthetics:

Viewshed from site: 3

1 - No noticeable development
2 - Very limited primitive development
3 - Five (5) or less buildings in view

Viewshed from shoreline: 3

4 - Five (5) or less buildings in view
5 - Ten (10) or more buildings in view
6 - Highly developed

Nature of abutting development/land use: Residential

Evidence of use at site: Garbage

*(C) Compaction, (E) Erosion, (G) Garbage, (GD) Ground disturbance, (HW) Human waste, (UI) Unauthorized improvements, (V) Vandalism, (VR) Vegetation removal, (O) Other (Specify)

Evidence of Overcrowding: None

*(A) Anecdotal information, (FA) facility/amenity @ capacity, (I) Improper parking, (S) Signage, (SD) site degradation, (U) Unauthorized sites, (W) Waiting lines, (O) Other (Specify)

Notes: Trash dumped near ramp. Nice local spot for river access

Velocities at launch documented 8/20 by HDR - 0.31, 0.48, 0.38, 0.39 ft/sec


Parking
117
Main St
© 2018 Google
Google Earth
1998
Imagery Date: 9/18/2013 lat 43.880774° lon -70.802485° elev 354 ft eye alt 1281 ft

Exhibit C

SACO RIVER FISH PASSAGE AGREEMENT

May 24, 1994

BACKGROUND AND PARTIES

Beginning on July 21, 1993, Central Maine Power Company hosted a series of meetings to negotiate a consensus plan for fish passage facilities at dams on the main stem of the Saco River for the purpose of assisting in restoring populations of anadromous fish, including Atlantic salmon, American shad, and river herring. The participants in the meetings included Central Maine Power Company (CMP); Swans Falls Corporation; the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the Maine Atlantic Sea Run Salmon Commission, the Maine Department of Marine Resources, the Maine Department of Inland Fisheries and Wildlife (collectively herein "Fisheries Agencies"); the Maine Department of Environmental Protection (DEP); the Maine State Planning Office; the cities of Saco and Biddeford (Cities); a coalition of non-governmental conservation organizations including the Saco River Salmon Club, Trout Unlimited, the Maine Council of Trout Unlimited, the Atlantic Salmon Federation, the Maine Council of the Atlantic Salmon Federation, and American Rivers, Inc. (the Coalition); the New Hampshire Department of Fish and Game; the Biddeford-Saco Water Company; and the Maine Energy Recovery Co.

The parties to this agreement include all those listed above as participants, except for the Maine Department of Environmental Protection, Swans Falls Corp., Biddeford-Saco Water District and Maine Energy Recovery Company.

This is a settlement agreement for issues regarding the construction of fish passage facilities at projects currently undergoing licensing proceedings before the Federal Energy Regulatory Commission (FERC), including a license amendment for the Cataract Project (FERC No. 2528), and relicensing of the Skelton (FERC No. 2527) and the Bonny Eagle (FERC No. 2529) projects. In addition, Central Maine Power agrees that it will petition the FERC within 12 months of the effective date of this agreement to amend existing licenses at Bar Mills (FERC No. 2194), West Buxton (FERC No. 2531), and Hiram (FERC No. 2530) to incorporate into the licenses for those projects the applicable terms of this agreement.

On December 7, 1993 the parties agreed to the objectives, principles and specific provisions for each project set forth below. Final acceptance of this agreement is indicated by the signature of the official representative from each party.

The parties agree to the following objectives, principles, terms and provisions for restoring anadromous fish populations and providing fish passage at dams on the Saco River.

OBJECTIVES

Agreement on the following objectives does not mean that all parties agree that achieving all objectives is feasible under all circumstances.

1. There is general agreement that the objective of restoring anadromous fish populations on the Saco River is the establishment of viable, self-sustaining runs of Atlantic salmon, shad and river herring, with optimum utilization of suitable habitat, where possible. Providing passage for salmon above Swans Falls is a long term goal. For shad and river herring, the goal is to provide passage on the main stem of the Saco River only to above Bonny Eagle, and to tributaries below the Hiram Project.[1] The ultimate size of the populations will depend on, among other things, the interaction among species, including wildlife species, and must take into consideration the natural fluctuations in populations from year to year. Other objectives of anadromous fish restoration on the Saco River are to provide for fishing/angling opportunities within the constraints of the resource; to provide other wildlife and ecosystem benefits for predator species; and to provide other non-consumptive benefits.

GENERAL PRINCIPLES

2. For the Fisheries Agencies and the Coalition, permanent trap and truck is not a viable long term management strategy. These groups see trap and truck as a short term means to accommodate upstream migrating fish prior to constructing upstream passage facilities. CMP's position is that long term trap and truck may be the most biologically sound method of providing upstream passage at specific Saco River dams in order to achieve the goal of restoring anadromous fish populations.

3. There is some uncertainty regarding shad's ability to pass multiple barriers. This may affect the ability to restore shad to certain portions of the Saco River, and could affect the timing and design of fishways constructed at Bar Mills, West Buxton and Bonny Eagle.

4. Downstream passage is needed at all dams above which anadromous fish have passed, or have been stocked or trucked. Schedules for constructing permanent downstream passage facilities are specified below for each dam. CMP agrees to provide interim downstream passage (e.g. controlled spills during downstream migration periods, installation of temporary downstream fish passage facilities or other feasible measures) necessary to allow downstream fish passage at each dam above which anadromous fish have been stocked or trucked. Such efforts shall continue until permanent downstream fish passage facilities are installed and operational in accordance with this agreement.

5. A comprehensive fish passage plan should be biologically defensible and, from CMP's perspective, be more cost effective than constructing upstream passage facilities in the order of relicensing.

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[1] Restoration goals also include providing upstream passage at dams on tributaries that flow into the Saco River above Bonny Eagle, such as the Ossippee and Little Ossippee Rivers, but those dams are not within the scope of this agreement.

6. The rate of growth of anadromous fish populations above Skelton is somewhat uncertain, making it necessary to conduct periodic assessments to determine the need for, design and schedule for implementing fish passage measures at Bar Mills, West Buxton, Bonny Eagle, Hiram and Swans Falls. Assessment criteria ("Criteria") will be established in advance as outlined below. Criteria may address the following factors, among others: spawning escapement, trap and truck capacity and mortality, habitat utilization, size of runs, fallback below one or more dams, rate of increase in populations, stock origin of run, etc.

The parties agree that the state and federal Fisheries Agencies will develop by January 1, 1995 the Criteria to be used in future assessments to determine the need for, timing and design of interim and permanent upstream passage facilities at Bar Mills, West Buxton, Bonny Eagle, Hiram and Swans Falls. The Criteria will be developed in consultation with the parties to this agreement, using a consensus process to endeavor to achieve acceptance by all parties. If, after meetings between the parties with a facilitator, a consensus can not be achieved, the Fisheries Agencies' Criteria shall be used to determine the schedule for construction of upstream fish passage facilities above Skelton.

7. A final design of any permanent upstream or downstream fish passage facility must be approved in writing by an authorized official of the Department of the Interior (U.S. Fish and Wildlife Service) and/or the Department of Commerce (National Marine Fisheries Service) pursuant to Section 18 of the Federal Power Act, as amended, before the dam owner is obligated to construct that facility at its project site. Additionally, CMP will consult with the Maine Department of Marine Resources, Maine Atlantic Sea Run Salmon Commission, Maine Department of Inland Fisheries and Wildlife, and the Maine Department of Environmental Protection regarding the final design of fish passage facilities, as may be necessary under applicable state law.

CMP will conduct effectiveness studies of all newly constructed upstream and downstream fish passage facilities at its project sites in accordance with a study plan to be developed in consultation with the state and federal Fisheries Agencies listed above.

8. Complete restoration of Atlantic salmon to the Saco River watershed would require stocking of juvenile fish above Hiram and Swans Falls dams (in New Hampshire). Stocking of salmon in New Hampshire is dependent on, among other things, an inter-agency agreement on stocking between the relevant state and federal Fisheries Agencies, and an adequate supply of suitable Atlantic salmon stocks. All parties will use their best efforts to expedite such agreements as are necessary for restoring Atlantic salmon to the New Hampshire portion of the Saco River basin.

CATARACT PROJECT

9. The parties agree that the numbers of shad and river herring that passed at Cataract East and West Channel in 1993 exceeded expectations. The size of the stock below the dam was

also higher in 1993 than expected. Salmon were also passed successfully in 1993, with numbers consistent with expectations. The facilities at East and West Channel were well built.

10. All parties agree that the fish lift/lock concept proposed by CMP is an acceptable alternative for upstream fish passage at the Springs and Bradbury Dams. CMP and the Cities believe that the fish lift/lock concept is the preferred alternative to dam removal (which is politically difficult and has uncertain mitigation costs) and Denil fishways (which are more expensive to construct). The Cities believe that removal or lowering of the dams at Springs and Bradbury is not an acceptable fish passage option. Should CMP seek to remove or lower the dams at Springs and Bradbury, the Cities may pursue any available legal rights they may have.

Assuming that the lift/lock concept proves to be feasible and less expensive than Denil fishways, all parties agree to the following schedule for construction. The 1994 season will be used for telemetry, engineering, and flow studies. Construction of upstream passage facilities at Springs or Bradbury would begin in 1995 with passage facilities to be operational by May 1, 1996. Construction of the upstream facility at the other dam will be completed and operational by May 1, 1997, or sooner.

Because there are no generation facilities at Springs and Bradbury dams, the Fisheries Agencies agree that there is no foreseeable need to construct permanent downstream fish passage facilities at those dams.

11. CMP agrees to trap and truck (or arrange for the trapping and trucking) of Atlantic salmon, shad and river herring from the East Channel fish lift in accordance with the specifications of the state and federal Fisheries Agencies. Depending on the numbers of returning fish, some salmon may be trucked around Bonny Eagle from East Channel as early as 1994.

SKELTON PROJECT

12. CMP agrees that full, permanent upstream and downstream fish passage facilities at Skelton will be designed to pass salmon, shad and river herring, and will be operational by May 1, 1998, or within three years of receipt of a new license for Skelton, whichever occurs later. The returning run of shad and river herring from the 1993 spawning season is expected in 1998.

13. All parties agree that a fish lift with trap and truck facilities is the current favored design for Skelton. Once the Skelton facilities are operational and fish are present at Skelton in sufficient numbers, trapping and trucking of salmon, shad, and river herring is expected to move to Skelton from Cataract East Channel. The trap and truck program will be paid for by CMP, but decisions on the number of fish to be trucked and the destinations in Maine and New Hampshire will be made by the appropriate state and federal Fisheries Agencies.

BAR MILLS, WEST BUXTON, BONNY EAGLE, HIRAM AND SWANS FALLS PROJECTS

14. CMP agrees to construct interim, permanent or, under appropriate circumstances, both interim and permanent upstream passage facilities, at Bar Mills, West Buxton, Bonny Eagle and Hiram according to the schedule and conditions below.

a) The state and federal Fisheries Agencies will conduct the first assessment in 1999 according to the Criteria described in paragraph 6 above to determine the identity of, the need for, the design and the timing of the first upstream fish passage facility to be constructed. The assessment will be conducted in consultation with the parties to this agreement using a consensus process (which shall include meetings between the parties with a facilitator) to endeavor to achieve acceptance by all parties. Subsequent, similar assessments will also be conducted under these same guidelines in 2003, 2007 and 2011.

b) The Fisheries Agencies will use the assessments in their determination of anadromous fish restoration needs, including such fishways as may be prescribed by the Department of Interior (U.S. Fish and Wildlife Service) and/or Department of Commerce (National Marine Fisheries Service) pursuant to Section 18 of the Federal Power Act, as amended, and such other measures as may be necessary under applicable state law.

c) The first upstream passage facility will be required to be operational no earlier than May 1, 2005. Construction and operation of the first facility may occur later than May 1, 2005 if an assessment determines that the facility is not needed until a later date.

d) The identity of, need, design and schedule for any additional upstream passage facilities will be determined by the assessments, but in no event will upstream passage facilities at or above the Bar Mills project be required to be completed less than two years apart, except for Swans Falls which may be scheduled for simultaneous completion with Hiram.

15. CMP agrees to construct permanent downstream passage facilities at Bonny Eagle within 2 years of receipt of the Bonny Eagle license, and at Bar Mills and West Buxton within 2 years of receipt of the license amendment for downstream passage at each facility. CMP will apply to the FERC for the license amendments at Bar Mills and West Buxton, if necessary, within 12 months of execution of this agreement by all parties.

16. The need for permanent downstream passage for salmon at Hiram and Swans Falls hinges on the presence of juvenile or adult fish. This could result from the annual production stocking* of juvenile salmon or trucking of adults and their subsequent natural reproduction. Either event (stocking or trucking) is dependent on the participation of appropriate state and federal Fisheries Agencies in Maine and New Hampshire including the New Hampshire Fish

and Game Department and the U.S. Forest Service. Permanent downstream passage will be provided at each of the two dams no more than two years from commencement of annual production stocking of salmon above such dam.

* "annual production stocking" is defined as scheduled annual stocking based on an inter-agency agreement and a written management plan by the Fisheries Agencies with the specific objective of establishing a continuous run of returning fish. It does not include intermittent, unplanned or one time stockings, including, for example, stocking for studies of habitat utilization, growth rates, etc.

17. The current license exemption application for Swans Falls calls for upstream passage facilities to be completed no later than 2011. This schedule could be modified according to the terms and conditions in Swans Falls' license exemption to require passage at Swans Falls sooner, or to allow a delay if, among other things, passage facilities are not constructed at Hiram before 2011.

ADDITIONAL CONSIDERATIONS

18. This agreement shall be effective when signed by the appropriate authorities representing Central Maine Power Company, the Maine Department of Inland Fisheries and Wildlife, the Maine Department of Marine Resources, the Maine Atlantic Sea Run Salmon Commission,the Maine State Planning Office, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the New Hampshire Department of Fish and Game, Saco River Salmon Club, Trout Unlimited, Maine Council of Trout Unlimited, Atlantic Salmon Federation, Maine Council of the Atlantic Salmon Federation, American Rivers, Inc., the City of Saco, the City of Biddeford, and when reviewed and acknowledged without objection by the Maine Department of Environmental Protection.

19. This agreement shall terminate, unless extended by the parties, on December 31, 2022 or upon the expiration of the renewed licenses of the Skelton or Bonny Eagle projects, whichever is later.

20. This agreement shall bind and inure to the benefit of the successors and assigns of the signing parties.

21. The parties will endeavor to resolve in good faith any dispute that may arise in carrying out this agreement, using a consensus process which shall include meetings between the parties with a facilitator. The intent of the parties is to maintain the spirit of cooperation and understanding that led to this agreement, even as circumstances change (including changes in applicable law) or new information is acquired.

22. Nothing in this agreement shall be construed as obligating the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the U.S. Forest Service, the State of Maine, or the State of New Hampshire, their officers, agents or employees, to expend any funds in

excess of appropriations or other amounts authorized by law.

We, the undersigned, having the authority to bind our respective parties, agree to the terms of this agreement, and will represent and support this agreement in applicable proceedings before the Federal Energy Regulatory Commission and other regulatory bodies:

Central Maine Power Co.

June 28 1994

Its President/CEO Date

Maine Atlantic Sea Run Salmon Commission

June 28 1994

Its Commissioner Date

Maine Department of Inland Fisheries and Wildlife

June 28 1994

Its Director Date

Maine Department of Marine Resources

6.28.94

Its Commissioner Date

U.S. Fish and Wildlife Service

Gordon E. Beckett 6/28/94

Its Supervisor, New England Field Offices Date

Maine State Planning Office

6/28/94

Its Director Date

National Marine Fisheries Service

6/28/94

Its Acting Division Chief, Date

Saco River Salmon Club

6/28/94

Its Vice President Date

Trout Unlimited

Charles F. Gauvin 6/28/94

Its President CEO - Date

Atlantic Salmon Federation

Its Acting U.S. Director   6/28/94 Date

American Rivers, Inc.

Kevin J. Coyle

Its President   7-28-94 Date

Maine Council, Atlantic Salmon Federation

Its Pres.   6/28/94 Date

Maine Council, Trout Unlimited

Its Chairman   6/28/94 Date

City of Saco

Mayor

Mark D. Johnston

Its   6/28/94 Date

City of Biddeford Mayor

Its   6/28/94 Date

New Hampshire Department of Fish and Game

John I. Nelson Jr.

Its Acting Executive Director   10/6/94 Date

Swan Falls

Saco River Fish Passage Agreement
ANNEX 1: ASSESSMENT PROCESS AND CRITERIA

January 20, 1995

INTRODUCTION

The Saco River Fish Passage Agreement, dated May 24, 1994 (the Agreement), was signed by Central Maine Power Company (CMP), Swans Falls Corporation and 15 other parties, including state and federal fisheries agencies, the Cities of Saco and Biddeford, and a coalition of conservation organizations to settle licensing issues relating to fish passage at seven hydroelectric projects on the main stem of the Saco River. The purpose of the Agreement was to assist with restoring populations of anadromous fish, including Atlantic salmon, American shad, and river herring. The projects covered in the Agreement include the following: the Cataract Project (FERC No. 2528), the Skelton Project (FERC No. 2527), the Bonny Eagle Project (FERC No. 2529), the Bar Mills Project (FERC No. 2194), the West Buxton Project (FERC No. 2531), the Hiram Project (FERC No. 2530) and the Swans Falls Project (FERC No. 11365). The Agreement includes specific deadlines and criteria for constructing upstream fish passage facilities at Cataract and Skelton, and provides conditions for scheduling construction of upstream fish passage at Bar Mills, West Buxton, Bonny Eagle, Hiram and Swans Falls.

The Agreement requires the state and federal Fisheries Agencies to develop by January 1, 1995 "assessment criteria" (herein called Assessment Criteria) to be used in future assessments "to determine the need for, timing and design of interim and permanent upstream fish passage facilities at Bar Mills, West Buxton, Bonny Eagle, Hiram and Swans Falls" (Paragraph 6 of the Agreement). As stated in the Agreement, the Assessment Criteria must be determined "in advance" and "in consultation with the parties to the agreement, using a consensus process to endeavor to achieve acceptance by all parties."

This Annex to the Agreement represents the fulfillment of the above stated requirement to develop Assessment Criteria as described in Sections 6 and 14 in the Agreement. Meetings to develop the Assessment Criteria began on September 1, 1994 and included representatives from the state and federal Fisheries Agencies, Central Maine Power Company, Swans Falls Corp., and the coalition of conservation organizations. Although the ultimate authority for developing the Assessment Criteria rests with the Fisheries Agencies, a consensus process was used, led by a neutral facilitator, as called for in the Agreement. This Annex describes an "Assessment Process", "Assessment Criteria", and an "Assessment Report" as agreed to by the parties.

This Annex is intended to address only upstream fish passage facilities or measures. The parties acknowledge that the Agreement provides adequate criteria under which permanent downstream fish passage will be provided.

SUMMARY OF ASSESSMENT PROCESS

The Assessment Process is designed around a four-year planning/data collection/assessment cycle. The purpose of the four-year cycle is to plan for and collect appropriate data to prepare an Assessment Report in the fourth year based on defined Assessment Criteria, as defined in Task 3 below. The first cycle begins in 1996 and ends with an Assessment Report in 1999. The second cycle begins in 2000 and ends with an Assessment Report in 2003. Additional cycles will be completed in 2007 and 2011. The Assessment Reports will be used to determine actions to be taken under Section 14 of the Agreement.

In short, the Assessment Report must answer the following five questions:

- Are the management goals and objectives stated at the beginning of the four year Assessment cycle still current?
- What is the present status of anadromous fish populations on the Saco River?
- Is progress toward the management goals and objectives being made?
- Is the rate of progress as expected?
- What conclusions can be drawn regarding the need, timing and design for constructing new upstream fish passage facilities at the Bar Mills, West Buxton, Bonny Eagle, Hiram and Swans Falls projects?

The conclusions contained in the Assessment Report shall reflect the consensus of the parties or the conclusions by the Fisheries Agencies if the parties can not reach consensus. Task 7 below describes the content of the Assessment Report in more detail.

A summary of the Assessment Process tasks for each cycle is in Table 1. A more detailed description of each task follows the table.

ORGANIZATION AND RESPONSIBILITIES

A Coordinating Committee, comprised of representatives of all the parties to the Agreement, will have responsibility for implementing the Assessment Process described in this Annex. In addition, a Fisheries Agency Assessment Committee (FAAC) will be comprised of the Maine Atlantic Sea Run Salmon Commission, the Maine Department of Marine Resources, the Maine Department of Inland Fisheries and Wildlife, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the U.S. Forest Service and the New Hampshire Fish and Game Department. The FAAC will function as the Executive Committee for the full Coordinating Committee. Typically, the FAAC will prepare recommendations for the Coordinating Committee to review, revise and accept by consensus. The Coordinating Committee will endeavor to achieve consensus on all plans, analyses and reports. If consensus can not be achieved, the FAAC's decisions and findings regarding the Assessment will prevail.

The Coordinating Committee will meet in March 1995 to plan for the first Assessment cycle that will begin in 1996. The Committee will review on-going management activities, plans and goals that affect anadromous fish restoration on the Saco River. At that meeting, the FAAC will select a chair for the first Assessment cycle, who will chair both the FAAC and the Coordinating Committee. The chair, with the assistance of CMP and the other parties, will be responsible for calling meetings, for ensuring completion of study plans, for issuing an interim report at the end of each year, and for ensuring completion of the final Assessment Reports at the end of each cycle. The agenda for each Coordinating Committee meeting will generally include the tasks listed in Table 1 by year below. In addition to the meetings defined herein, any party may request a meeting of the Coordinating Committee at any time.

TABLE 1: SUMMARY OF ASSESSMENT PROCESS TASKS				
FA AC	**CC**	**Assessment Cycles: 1996-1999 2000-2003 2004-2007 2008-2011**		
		YEAR 1 Coordinating Committee meeting will be held in January of Year 1, with the following agenda:		
✓	✓	Task 1.	Review current management goals and objectives, and the status of anadromous fish populations and existing management plans, as presented by the FAAC.	
	✓✓	Task 2.	Define key problems or issues affecting successful restoration.	
	✓	Task 3.	Define the Assessment Criteria	
	✓	Task 4.	Develop a four year study plan, indicating specific data needs, responsibilities, and work products to be used in the Assessment in Year 4.	
		YEARS 2 & 3 Coordinating Committee meetings will be held in January of Year 2, with the following agenda:		
✓	✓	Task 5.	Conduct studies according to study plan and meet annually to coordinate studies, share interim results and update plans as necessary.	
		YEARS 3 & 4:		
	✓	Task 6.	FAAC will review data and outline the Assessment Report (November of Year 3).	
	✓	Task 7.	FAAC conducts Assessment (Winter of Year 3/4) and prepares a draft "Assessment Report" for distribution by February 1 of Year 4.	
✓		Task 8.	Coordinating Committee meetings begin in April of Year 4 (with a facilitator) to develop to a consensus Assessment Report.	
✓	✓	Task 9.	Consensus Report (or FAAC and comments by parties if no consensus) will be filed with FERC by December 1 of Year 4.	

FAAC = Fisheries Agencies Assessment Committee
CC = Coordinating Committee

DESCRIPTION OF ASSESSMENT TASKS

Task 1. Review Management Goals and Objectives, and the Status of Populations and Existing Management Plans.

At the first meeting of the Assessment cycle, the FAAC will present the current management goals and objectives for anadromous fish restoration on the Saco River to the full Coordinating Committee for its review as a basis for completing the remaining tasks below. The FAAC will also prepare and present a concise review of the status of anadromous fish populations and existing restoration and management plans.

For the first Assessment cycle (1996 to 1999) the management objectives are those contained in the 1987 Strategic Plan for the Saco River.

Task 2. Define Key Problems and Issues Affecting Successful Restoration

At the Year 1 Coordinating Committee meeting in January, the Committee representatives will define or revise by consensus the key impediments to achieving the management goals and objectives defined in Task 1 above, including problems and issues confronting the restoration of anadromous fish. This exercise is intended to allow strategies and plans to be developed to address specific problems or issues.

At a minimum, the Assessment Process will address the following restoration issues:

A) Cumulative impact of dams, including impacts from turbine mortality, upstream and downstream passage efficiency, etc.

B) Availability of wild and hatchery stocks (fish, fry or eggs), both river-specific and generally.

C) Availability of staff and resources.

D) State of knowledge or uncertainty regarding biological parameters in the river.

E) Impacts of other sources of mortality, including marine losses, angling, predation.

F) Amount, quality and location of habitat.

Other issues may be defined to assist in preparing study plans for data collection, and for conducting the Assessment.

Task 3. Define Assessment Criteria

The Assessment Criteria defined below will be reviewed and may be revised by the Coordinating Committee using a consensus process, incorporating the latest knowledge and circumstances. If no consensus can be achieved, the FAAC will determine the Assessment Criteria for the upcoming cycle.

Assessment Criteria will include but not be limited to the following:

A) Trends in population size over time.
- by species
- using appropriate time periods for analysis
- using both past data and projections of future levels

B) Level of recent stocking effort and plans for future stocking
- number
- species and life stage
- locations

C) Passage efficiency of existing fishways.
- by species
- upstream and downstream passage

D) Degree of turbine mortality by species.

E) Degree of attrition due to multiple barriers.

F) Relative suitability of habitat in each river reach, comparing habitat and utilization below the barrier to habitat above the barrier.

G) Production estimates and spawning escapement for each river reach (revise existing figures as necessary).

H) Degree and location of salmon fallback.

I) Comparison of Saco River anadromous fish restoration performance relative to other East Coast rivers.

J) Evidence of limiting factors (predation, ocean losses, angling, water quality, etc)

K) Effectiveness of interim trap and truck operations.

- capacity vs. size of runs
- mortality
- sorting and fallback

L) Biological characteristics of runs, including stock origin.

Task 4. Determine Data Needs and Develop Study Plans

In Year 1 of each Assessment cycle, the Coordinating Committee will consider the data needs and develop study plans for collecting the necessary data to address the Assessment Criteria defined in Task 3 above. These plans must be sufficiently detailed to indicate:

- the specific data needs including a priority listing,
- the specific methods to be used to collect the data,
- the parties responsible for data collection and analysis,
- the schedule for data collection and reporting, and
- the expected format of the work product.

The parties to the Agreement recognize that financial and staff resources for data collection are likely to be limited, making it necessary to determine data collection priorities to address the Assessment Criteria in Task 3 above. This Annex does not require any specific level of data collection for all the Assessment Criteria. The Coordinating Committee will develop study plans that make the best use of available resources, and will consider ways to make use of pertinent data being collected for other purposes.

Generally, CMP (or Swans Falls Corp. in the case of the Swans Fall Project) will be responsible for studies and data related to fish passage measures (e.g. effectiveness), as well as studies required as part of FERC licenses and/or exemptions. Agencies generally will be responsible for studies related to habitat, riverine populations, fisheries management, etc.

Task 5. Conduct Studies and Meet Annually to Review Results and Update Study Plans

During Years 1, 2 and 3 of each Assessment cycle, each party responsible for conducting studies will complete its work as scheduled, while keeping other parties apprised of interim findings, as called for in the study plans. At a minimum, the Coordinating Committee will meet annually in January to review study results and update plans, as necessary. The plans will be revised as needed to respond to lessons learned, new methods available, changing field conditions, or resource constraints.

Task 6. Review Data and Outline the Assessment

In November of Year 3, the FAAC will review available data and make assignments to conduct the Assessment and prepare the draft Report by February 1 of Year 4.

Task 7. Conduct Assessment and Prepare Draft "Assessment Report"

The FAAC will prepare a Draft Assessment Report , and provide a copy of the report to the other parties by February 1 of Year 4. Other parties will assist the FAAC as appropriate in preparing the Draft Report.

The Assessment Report will specifically answer the following five questions:

- Are the management goals and objectives stated at the beginning of the four year Assessment cycle still current?
- What is the present status of anadromous fish populations on the Saco River?
- Is progress toward the management goals and objectives being made?
- Is the rate of progress as expected?
- What conclusions can be drawn regarding the need, timing and design for constructing new upstream fish passage facilities at the Bar Mills, West Buxton, Bonny Eagle, Hiram and Swans Falls projects?

Furthermore, the Report must include the following elements:

A) Consider the availability and accuracy of necessary data to respond to the Assessment Criteria and support conclusions in the Report using the best available data. The final report will utilize to the extent possible data collected in Year 4.

B) Demonstrate that all the Assessment Criteria defined in Task 3 have been addressed to the fullest extent practicable. In the Assessment process, the Criteria will be applied in combination to develop biologically defensible conclusions and plans. Furthermore, the Assessment should clearly explain the relative importance assigned to the various Criteria.

C) Develop specific conclusions regarding the need for and timing of upstream fish passage facilities.

D) Develop as part of the Report, specific plans for future fish passage measures. If there are plans for installation of upstream fish passage facilities, these plans should indicate whether fish passage operational dates are "firm" or "tentative pending further

Assessment." Fish passage plans included in the Report should allow at least two years prior to the operational dates for design, permitting and construction of the facilities. The Report should also specify obligations of the parties for the next four year cycle, including the need for further studies and the anticipated timing of future decisions regarding fish passage facility construction.

E) Demonstrate that the conclusions and plans will contribute to achieving the management goals and objectives identified in Task 1.

F) Consider cost effective means of achieving the management goals and objectives

G) Identify the administrative procedures required for each party to adopt and implement the conclusions and plans.

Task 8. Develop a Consensus Assessment Report

In early April of Year 4, the Coordinating Committee will meet with the assistance of a neutral facilitator to review the data, analyses, draft report and conclusions. The Committee will endeavor to reach consensus on a final Assessment Report by September 1 of Year 4.

Section 21 of the Saco River Fish Passage Agreement states the following:

> 21. The parties will endeavor to resolve in good faith any dispute that may arise in carrying out this agreement, using a consensus process which shall include meetings between the parties with a facilitator. The intent of the parties is to maintain the spirit of cooperation and understanding that led to this agreement, even as circumstances change (including changes in applicable law) or new information is acquired.

Whether or not a consensus can be reached, the FAAC will prepare a final Assessment Report that is consistent with the terms agreed to herein and distribute it to the Coordinating Committee by October 1 of Year 4. The parties may accept the Report in whole or in part, and, if necessary, prepare and file comments on areas of disagreement. Each party will distribute copies of their acceptance and/or comments to all other parties by November 1.

Task 9. Filing With FERC

The Licensee or Exemptee will file a copy of the final Assessment Report with the Federal Energy Regulatory Commission by December 31 as evidence of compliance with the Agreement and this Annex. At the same time, the Licensee or Exemptee will file any notices, petitions, schedules or comments as necessary to amend or attach conditions to the affected Projects' licenses or exemptions.

The Fisheries Agencies may also file individually a copy of the Assessment Report with FERC in a timely fashion, along with any other notices, petitions, schedules or comments necessary to pursue implementation of the Report's conclusions and plans. As stated in Section 14 of the Agreement, the Fisheries Agencies will use the Assessment Report in their determination of anadromous fish restoration needs, including such fishways as may be prescribed by the Department of Interior (U.S. Fish and Wildlife Service) and/or Department of Commerce (National Marine Fisheries Service) pursuant to Section 18 of the Federal Power Act, as amended, and such other measures as may be necessary under applicable state law. If the parties have not reached a consensus Assessment Report, the Fisheries Agencies' conclusions will prevail.

To expedite FERC's review of the Assessment results, parties will coordinate or combine their filings, as appropriate and practical. Other parties may file comments on the Assessment Report, notices or petitions, as desired.

CLOSURE

By signing below, the parties adopt this Annex as a part of the Saco River Fish Passage Agreement, dated May 24, 1994.

Nothing in this agreement shall be construed as obligating the U.S. Fish and Wildlife Service, The National Marine Fisheries Service, the U.S. Forest Service, the State of Maine, or the State of New Hampshire, their officers, agents or employees, to expend any funds in excess of appropriations or other amounts authorized by law.

This agreement shall bind and inure to the benefit of the successors and assigns of the signing parties. This agreement shall terminate, unless extended by the parties, on December 31, 2022 or upon expiration of the renewed licenses of the Skelton and Bonny Eagle projects, whichever is later.

We, the undersigned, having the authority to bind our respective parties, agree to represent and support this Agreement Annex in applicable proceedings before the Federal Energy Regulatory Commission and other regulatory bodies:

Central Maine Power Co.

Its ______________________ Date 14 April 1995

Maine Atlantic Sea Run Salmon
~~Commission~~ Authority

Its Chair Date 1/24/96

Maine Department of Inland
Fisheries and Wildlife

Its Commissioner Date 1/24/96

Maine Department of Marine Resources

Its Date 1/30/96

Maine State Planning Office

Its Director Date 2/15/96

Saco River Salmon Club

Its Director Date 3/13/96

Maine Council, Trout Unlimited

Its Chairman Date 1/20/96

Maine Council, Atlantic Salmon Federation

Its Date 1/26/96

Swans Falls Corporation

Its President Date Jan 22 1996

City of Saco

Its Mayor Date 2/27/96

City of Biddeford

Its City Manager Date 1-26-96

Atlantic Salmon Federation

Its Dir., U.S. Operations Date Feb 6, 1996

American Rivers, Inc.

Its Director, Hydropower Programs Date 2/2/96

New Hampshire Fish and Game Department

James J. DiStefano

Its Exec. Director Date 3/19/96

Trout Unlimited

Its Conservation Counsel Date Jan 26, 1996

U.S. Fish and Wildlife Service

Its New England Field Office Supervisor (Michael J. Bartlett) Date 1/23/96

National Marine Fisheries Service

Its Habitat & Protected Resources Division Chief Date 1/30/96

SACO RIVER
FISHERIES ASSESSMENT AGREEMENT

FPL Energy Maine Hydro LLC

Cataract Project (No. 2528)
Skelton Project (No. 2527)
Bar Mills Project (No. 2194)
West Buxton Project (No. 2531)
Bonny Eagle Project (No. 2529)
Hiram Project (No. 2530)

FEBRUARY 2007

SACO RIVER

FISHERIES ASSESSMENT AGREEMENT

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SACO RIVER
FISHERIES ASSESSMENT AGREEMENT

1.0 INTRODUCTION

The *Saco River Fish Passage Agreement* dated May 24, 1994 and *Annex 1: Assessment Process and Criteria* dated January 20, 1995 (collectively, the "1994 Agreement") settled licensing issues relating to anadromous fish passage at seven hydroelectric projects on the main stem of the Saco River.

In consideration of, and consistent with, the 1994 Agreement, the Parties have herein agreed upon a schedule for installing upstream and downstream anadromous fish passage measures at the FPL Energy Maine Hydro LLC ("FPL Energy") Saco River hydroelectric projects.

The 1994 Agreement did not require measures to be developed for passage of American eel along the Saco River, nonetheless, the Parties have agreed upon upstream and downstream eel passage measures to be incorporated into this Agreement for the FPL Energy Saco River hydroelectric projects.

The measures detailed in Section 4 of this Agreement are "off-license" agreements and are not being submitted to FERC for inclusion as License Conditions.

The measures detailed in Section 5 of this Agreement shall be submitted to FERC for inclusion as License Conditions for the respective projects.

The Parties agree that the measures contained in Section 5 of this Agreement conclude the assessment process under the 1994 Agreement.

The Parties agree that this settlement agreement is supported by substantial evidence in the record of the proceeding, and that this settlement is in the public interest.

The Parties agree that this settlement satisfies Licensee's fish passage and fish management obligations at Licensee's Saco River hydroelectric projects for the term of this Agreement as stated in Section 1.3 herein.

The USFWS and NMFS believe that the protective fish measures in this settlement are an exercise of their authorities under the Federal Power Act, and further explain that they enter into this settlement expressly stating that they have statutory obligations to act on behalf of agency trust resources that cannot be circumscribed or bargained away in a settlement.

The Parties agree that this settlement agreement constitutes an integrated set of bargained-for terms, and that the Agreement therefore stands as a whole as further explained in Section 2.6 herein.

1.1 Parties

This Saco River Fisheries Assessment Agreement ("Agreement") dated as of February, 2007, is made and entered into by and among the following entities who shall, except as otherwise noted, be referred to hereafter as a "Party" and collectively as "Parties":

- FPL Energy Maine Hydro LLC ("FPL Energy" or "Licensee");
- U.S. Fish and Wildlife Service ("USFWS") exercising the delegated authority of the Secretary of the U.S. Department of the Interior under the FPA;
- National Marine Fisheries Service ("NMFS") exercising the delegated authority of the Secretary of the U.S. Department of Commerce under the FPA;
- Maine Atlantic Salmon Commission ("MASC");
- Maine Department of Marine Resources ("MDMR");
- Maine Department of Inland Fisheries and Wildlife ("MDIFW");
- Saco River Salmon Club ("SRSC");
- Atlantic Salmon Federation ("ASF");
- Maine Council of the Atlantic Salmon Federation ("MC-ASF"):
- Saco River Hydro LLC; and,

- New Hampshire Fish and Game Department.

1.2 Terms of Agreement

This Agreement shall become effective upon execution by all of the Parties except that Sections 4 and 5 of this Agreement shall be implemented and binding upon all the Parties only after the Federal Energy Regulatory Commission ("FERC") issues a Final FERC Order approving, in all material respects, the terms and provisions of Section 5 of this Agreement and such order becomes effective.

The Agreement shall terminate, unless extended by the Parties, on January 31, 2038.

1.3 Purpose and Scope of Agreement

This Agreement relates to six FERC-licensed hydroelectric projects owned by FPL Energy on the Saco River: the Cataract Project (No. 2528); the Skelton Project (No. 2527); the Bar Mills Project (No. 2194); the West Buxton Project (No. 2531); the Bonny Eagle Project (No. 2529); and the Hiram Project (No. 2530) ("Projects"). The scope of this Agreement does not include the Saco River upstream of the Hiram Project impoundment, excluding specifically the Saco River in New Hampshire.

The purpose and objectives of this Agreement are threefold:

- To establish the timing and the nature of fish passage measures to be taken at the Projects for anadromous fish (excepting those measures already implemented under the 1994 Agreement);
- To establish the timing and the nature of fish passage measures to be taken at the Projects for catadromous fish; and,
- To establish other measures to enhance the restoration of fish populations in the Saco River.

The Parties agree that implementing the measures in Sections 4 and 5 herein will satisfy Licensee's fish passage and fish management obligations at the Projects for the term of this Agreement, except where action by the USFWS or NMFS is necessitated by:

a. A substantive change in statute or regulation;
b. The listing of an applicable species under the Endangered Species Act ("ESA"), except to the extent addressed in Section 2.4 (Measures Relating to Potential Listing of American Eel Under the Endangered Species Act);
c. A change in Project operation or works that will have a material adverse effect on the effectiveness of a fishway required under this Agreement; or
d. A determination by either USFWS or NMFS that, based upon the best scientific and commercial data available and after considering economic impacts to the Project(s), the failure to take a particular action will result in that service's inability to fulfill a statutory or regulatory obligation.

Any action taken by the USFWS or NMFS under a) through d) above shall preserve the letter, spirit, implementation, and schedules of this Agreement to the greatest extent possible. The Parties will negotiate in good faith under Section 2.9, Dispute Resolution, to resolve, prior to implementation whenever practicable, any disagreement regarding any such proposed fisheries agency action.

1.4 <u>Effect on Future Relicensing</u>

In addition to the Bar Mills Project currently undergoing relicensing, the Hiram, West Buxton, and Cataract Projects will undergo relicensing during the term of this Agreement. This Agreement will continue to be in effect in those proceedings, and the Parties agree not to take any position therein inconsistent with this Agreement. Reservations of authority by the U.S. Departments of Interior or Commerce to prescribe fishways under Section 18 of the Federal Power Act during the relicensing of these projects shall not be considered inconsistent with this Agreement, nor shall the prescription or requirement by either Interior or Commerce of the measures and schedules contained in Section 5 of this Agreement.

1.5 Conventions and Definitions

The Parties agree that the following conventions and definitions shall have the meanings so noted throughout this Agreement.

- "Assessment Report" shall mean an Assessment Report, Saco River Fish Passage Assessment Plan as described in Task 8 of Annex 1 of the 1994 Agreement.
- "Endangered Species Act" or "ESA" shall mean the federal Endangered Species Act of 1973, 16 U.S.C. 1531 et. seq.
- "Energy Policy Act of 2005" shall mean Public Law 109-58.
- "FERC" or "the Commission" shall mean the Federal Energy Regulatory Commission or its successor.
- "Final FERC Order" shall mean the issuance of a FERC order, including any subsequent orders by FERC on rehearing or the courts on administrative appeal, that approves and does not materially change or modify the measures in Section 5 of this Agreement. For the purposes of this Agreement, a Final FERC Order is effective upon expiration of the period legally allowed for filing for rehearing or appeal, or upon resolution of such rehearing or appeal, whichever is later.
- "Final Prescription(s)" shall mean the filing of final prescriptions for the Bar Mills Hydroelectric Project No. 2194 by USFWS and NMFS which conform to the applicable terms and provisions of Section 5 of this Agreement.
- "Fish passage facility" shall mean a single device or structure that serves as a Fishway. Examples of a fish passage facility include, but are not limited to, a Denil fishway, a steeppass fishway, a fish lift, a downstream bypass sluiceway, and an upstream eelway.
- "Fish passage measure" shall mean any action or system that is intended to provide for or improve fish passage at a Project, including but not limited to a fish passage facility or project operational procedures.

- "Fishway" shall have the meaning assigned to it by Congress in the Energy Policy Act of 1992, Section 1701(b).
- "FPA" shall mean the Federal Power Act, 16 U.S.C. § 791 *et seq*.
- "License Conditions" shall mean enforceable conditions of a FERC license or related FERC order.
- "Licensee" shall mean FPL Energy Maine Hydro LLC or any successor to the licenses of any of the Projects.

2.0 GENERAL AGREEMENTS OF THE PARTIES

2.1 Parties to Support Agreement and Regulatory Processes

The Parties agree to support this Agreement, and the *2000 – 2005 Assessment Report, Saco River Fish Passage Assessment Plan* (see Attachment A), in any proceedings before the FERC or other regulatory bodies related to the matters addressed herein. Such support shall include, but not be limited to: a) submittal of this Agreement to FERC by FPL Energy as an Offer of Settlement under 18 CFR §385.602 (Rule 602) in the Bar Mills relicensing proceeding; b) submittal of this Agreement to FERC by FPL Energy to effectuate the license changes contemplated at the other Projects by this Agreement; c) filing of Final Prescriptions for the Bar Mills Hydroelectric Project No. 2194 by USFWS and NMFS which conform to the applicable terms and provisions of Section 5 of this Agreement; d) modification of fish passage recommendations for the Bar Mills Project by the MDMR, MDIFW and MASC to conform to the applicable terms and provisions of this Agreement; and e) submittal of a request by FPL Energy to withdraw without prejudice the January 11, 2006 *Requests for Trial-Type Hearing and Proposals for Alternative Conditions Bar Mills Project; FERC Project No. 2194.*

Such support by the Parties shall include good faith efforts by each Party to expedite any National Environmental Policy Act (“NEPA”) activities that may be undertaken by the FERC, as well as any other regulatory approvals that may be needed to implement the terms and provisions of Section 5 of this Agreement. With respect to the obligations addressed herein, the Parties agree not to propose or otherwise communicate, encourage or assist others to propose or communicate to the FERC or to any other federal or state regulatory or resource agency with jurisdiction directly related to the regulatory processes contemplated herein, any comments, recommendations, certification, or license conditions other than those consistent with the terms of this Agreement.

2.2 Filing Schedule

FPL Energy will, within 30 days of execution of this Agreement by all Parties, submit the Agreement to FERC as an Offer of Settlement under Rule 602 for the Bar Mills Project fish passage issues. At all of the other Projects FPL Energy will submit the Agreement and request that the FERC issue an order or orders integrating the terms and provisions of Section 5 of this Agreement as License Conditions for each applicable Project. FPL Energy will concurrently file with FERC the *2000 – 2005 Assessment Report, Saco River Fish Passage Assessment Plan*, due under the 1994 Agreement and included herewith as Attachment A.

The USFWS and NMFS will, within 30 days of execution of this Agreement by all Parties, replace their modified prescriptions and submit to FERC Final Modified Prescriptions for the Bar Mills Hydroelectric Project, included herewith as Attachment B.

The MDMR, MASC and MDIFW will, within 30 days of execution of this Agreement by all Parties, submit to the FERC and Maine Department of Environmental Protection if applicable, letters supporting this Agreement and withdrawing any prior fish passage recommendations for the Bar Mills Project relicensing that are not consistent with this Agreement.

Each Party will, within 45 days of execution of this Agreement by all Parties, submit to FERC letters of full support for the Offer of Settlement.

2.3 Measures Relating to the Energy Policy Act of 2005

FPL Energy agrees that it will, contemporaneously with the submittal of Final Prescriptions for the Bar Mills Project by USFWS and NMFS, withdraw without prejudice the *Requests for Trial-Type Hearings and Proposals for Alternative Conditions for the Bar Mills Project; FERC No. 2194*, submitted to the U. S. Departments of Commerce and Interior on January 11, 2006. Nothing in this Agreement shall be construed to limit the ability of FPL Energy to seek an agency hearing or to propose alternatives, as provided for under the Energy Policy Act of 2005 and its regulations, to prescriptions filed by Interior or Commerce that are not consistent with, or are beyond the scope of, Section 5 of this Agreement.

2.4 Measures Relating to Potential Listing of American Eel Under the Endangered Species Act

The Parties understand that the Federal Government is reviewing the status of the American eel (*Anguilla rostrata*) pursuant to its responsibilities under the ESA. As of the date of this Agreement, the American Eel is not listed as threatened or endangered under the ESA. All Parties agree that this Agreement offers cognizable benefits to American eel. Accordingly, the USFWS and NMFS agree that, at the request of Licensee, they will use good faith efforts to assist Licensee to obtain appropriate documents under the ESA, such as a Candidate Conservation Agreement with Assurances, or a permit issued under the ESA. In the event that Licensee applies for instruments to provide for the lawful incidental take of American eel, the USFWS and NMFS agree to fully acknowledge and recognize in those instruments the benefits of the protective measures for American eel set forth in this Agreement.

2.5 Rehearing and Judicial Review

The Parties agree that none of them will file or support a request for rehearing or reconsideration of any FERC order issued in response to the filing(s) to be made under this Agreement, unless said order contains conditions that materially alter, condition, omit, or add to the terms of Section 5 of this Agreement, except for requests for clarification of unclear language or for correction of simple and apparent error, or requests concerning matters outside the scope of this Agreement.

In the event that any Party decides to file a request for rehearing or reconsideration in accordance with the terms of this provision, it will, at the earliest practicable time, provide written notice of its intention to do so to all the other Parties. If the request concerns matters within the scope of this Agreement, the other parties will then support the request to the extent reasonably possible. Thereafter, if any Party, following the issuance of a FERC order on rehearing that does not correct the deficiencies of the initial order or otherwise materially alters, conditions, omits, or adds to the terms of Section 5 of this Agreement, elects to file a petition for judicial review with respect to matters within the scope of this Agreement, the other Parties will support such a petition to the extent reasonably possible. The Parties recognize that participation by USFWS and NMFS in such judicial review is dependent on approval by the U.S. Department of Justice, and participation by State agencies is dependent on approval by the Attorney General of their State.

2.6 Enforceability and Withdrawal Rights

The Parties have entered into this Agreement with the express expectation that FERC will not contravene the provisions of Section 5 herein and will issue one or more Final FERC Orders that integrate the terms and provisions of Section 5 of this Agreement into the License Conditions for the applicable Projects. If, in making its decisions, the Commission determines that any of the provisions contained in Section 5 are not within its jurisdiction to enforce, the Parties request that the Commission expressly and clearly notify the Parties of this in its order. If the Commission does not expressly identify any of the provisions contained in Section 5 as outside its jurisdiction, in reliance thereon, the Parties will proceed as though each of the provisions in Section 5 are enforceable by the Commission.

The agreement of the Parties depends upon the Commission, and, to the extent required, the Maine Department of Environmental Protection (MDEP), issuing an order(s) that does not materially modify, condition, omit or add to any of the measures identified in Section 5.

A Party that considers itself to have been materially and adversely affected by any change made to the provisions of Section 5 of this Agreement by the Commission and / or MDEP shall provide written notice of this to the other parties within 30 days and shall therein state whether it intends to withdraw from this Agreement. For a period of forty-five days from the date of a Party's notice of intent to withdraw from this Agreement, the Parties will use a dispute resolution process and make a good faith effort to resolve any materially adverse issues arising from the FERC and / or MDEP order. During this process the other Parties must provide timely written notification to all other Parties whether the withdrawal of the affected Party would cause them to withdraw as well.

A Party may seek rehearing or reconsideration on the FERC action to meet the FERC procedural time limits, however, any request for rehearing, reconsideration, or judicial review under this section 2.6 shall be withdrawn if agreement is reached on modifying the Agreement to be consistent with the FERC order.

If the Parties do not reach agreement on resolving the issues or modifying the Agreement to be consistent with the Final FERC Order and / or MDEP order, and the affected Party has sought administrative relief through a rehearing of the FERC order and / or MDEP order, without success, then it may withdraw from the Agreement, and shall not be bound thereafter. Other parties may also choose to withdraw if they have timely notified all other Parties that withdrawal of the affected Party will necessitate their doing so.

If Licensee, USFWS or NMFS withdraws from this Agreement, the Agreement shall immediately become null and void. If the Agreement is rendered void in this manner, thereafter this Agreement shall have no force and effect and the Parties shall in any subsequent administrative or judicial proceedings take the position that this Agreement is not available to support the Commission's or MDEP orders.

2.7 License Amendments

Licensee may not seek any amendment of any Project license that would, if granted, be materially inconsistent with the terms of this Agreement, unless the Parties have previously agreed to amend this Agreement, pursuant to the procedures of Section 2.8, Fisheries Assessment Agreement Amendments.

2.8 Fisheries Assessment Agreement Amendments

The Parties agree that nothing in this Agreement is intended to limit or restrict the ability of any Party to seek an amendment to this Agreement. Any Party proposing an amendment to this Agreement shall provide all Parties with written notice of the proposed amendment. The other Parties shall then have 60 days to respond with objections, approvals, or requests for further discussion and consultation. After such notice and consultation, if all Parties either concur with or do not object to the proposed amendment, the Party making the proposal shall secure the agreement, in writing, of all Parties, except as described below. No amendment shall be effective that is not reduced to writing and signed by the Parties, except as described below. Licensee shall file any amendment to Section 5 of this Agreement with the FERC.

The failure to obtain the signature to an amendment of any Party that is no longer in existence at the time of a proposed amendment, or that declines to answer a proposal in any way within 60 days of written notice, shall not prevent the other Parties from amending this Agreement.

2.9 Dispute Resolution

The Parties will endeavor to resolve in good faith any dispute that may arise in carrying out this Agreement, using a consensus process which may include meetings between the Parties with a facilitator. The intent of the Parties is to maintain the spirit of cooperation and understanding that led to this Agreement and the 1994 Agreement.

2.10 Successors and Assigns

This Agreement shall be binding on the Parties and on their successors and assigns.

2.11 Agency Appropriations

Nothing in this Agreement shall be construed as obligating any federal, state, or local government to expend in any fiscal year any sum in excess of appropriations made by Congress, state or local legislatures or administratively allocated for the purpose of this Agreement for the fiscal year or to involve the USFWS, NMFS, or any state agency in any contract or obligation for the future expenditure of money in excess of such appropriations or allocations.

2.12 Establishes No Precedents

The Parties have entered into this Agreement with the explicit understanding that all offers of settlement and the discussions relating thereto are privileged, shall not prejudice the position of any Party or entity that took part in such discussions and negotiations, and are not to be otherwise used in any manner in connection with any other proceedings. The Parties understand and agree that this Agreement establishes no principles or precedents with regard to any issue addressed herein or with regard to any Party's participation in future relicensing proceedings of projects that are outside the scope of this Agreement.

2.13 Incorporation of Attachments

The 1994 Agreement and this Agreement, including its Attachments, constitute the entire agreement between the Parties with respect to their subject matter.

2.14 Governing Law

This Agreement shall be construed and governed in accordance with the Federal Power Act and Federal Law, for those portions of the Agreement within the jurisdiction of FERC. The remainder shall be construed and governed by the laws of the State of Maine, without regard to Maine's conflict of law principles. This does not imply that any of the Federal agencies are hereby consenting to state court jurisdiction, or waiving hereby any defense of sovereign immunity not already waived by statute.

2.15 Multiple Counterparts

This Agreement may be executed in two or more counterparts, each of which is deemed an original but all constitute one and the same instrument.

2.16 Compliance with Law

The performance by the Parties of this Agreement will be subject to all applicable statutes and regulations.

2.17 No Waiver

No failure by a Party, at any time, to enforce any right of remedy available to it under this Agreement shall be construed to be a waiver of such Party's right to enforce each and every provision of this Agreement in the future. Any waiver of any rights under this Agreement must be provided in writing.

2.18 Authority

By executing this Agreement, each Party makes the following representations, warranties and covenants:

a. Good Standing. With regard to the non-governmental Parties, such Party is duly organized, validly existing and in good standing under the laws of the state or in which it is organized, formed, or incorporated, as applicable; that it is qualified to do business in the state or states in which the Party is located; and that it has the corporate power and authority to own its properties and to carry on its business as now being conducted;
b. Authority. Such Party has the right, power and authority to enter into this Agreement, to become a Party hereto and to perform its obligations hereunder; and that this Agreement is a legal, valid and binding obligation of such Party, enforceable against such Party in accordance with its terms;
c. No Conflict. The execution, delivery and performance of this Agreement does not violate or conflict with the organizational or formation documents, or bylaws or operating agreement, of such Party, or any judgment, license, permit, order, material agreement or instrument applicable to or binding upon such Party or any of its assets.

2.19 Adjustment of Financial Amounts

Except where otherwise specified herein, all financial amounts committed to in Section 4 of this Agreement are in 2006 dollars, and shall be adjusted in later years according to the Gross Domestic Product: Implicit Price Deflator as published by the U.S. Department of Commerce.

3.0 MEASURES WITH RESPECT TO THE 1994 FISH PASSAGE AGREEMENT

This Agreement is complementary to, and serves to clarify and supplement the roles of certain Parties who are involved in, the 1994 Agreement. Further, this Agreement addresses some issues with respect to the Projects that were not addressed in the 1994 Agreement. To the extent that this Agreement affirmatively amends portions of the 1994 Agreement, the Parties hereby agree to those amendments. The portions of the 1994 Agreement not amended by this Agreement remain in full force and effect.

3.1 Fisheries Assessment Report

The Parties agree that the diadromous fish passage measures and studies set forth in Section 5 of this Agreement are consistent with the recommendations set forth in the *2000 – 2005 Assessment Report, Saco River Fish Passage Assessment Plan*. *See* Attachment A.

3.2 Fisheries Assessment Process

The Parties agree that the Assessment Process and Assessment Reports under Annex 1 to the 1994 Agreement are concluded and that no further Assessments or Assessment Reports are required. Nonetheless, Licensee and USFWS, NMFS, MDMR, MASC and MDIFW agree that there will be a meeting in March annually to review fish passage operational data from the previous year, draft an annual report, and develop an operational plan for the upcoming year. The fish passage operational data should include the number of fish passed daily (by species), the number and timing of lifts made each day, daily water and air temperature data, and other related fishway operational information.

3.3 Interim Downstream Passage of Anadromous Fish at Hiram

The Parties agree that the interim downstream passage requirements for anadromous fish at the Hiram Project under Paragraph 4 of the 1994 Agreement are hereby amended in their entirety by Section 5.3.a.1. of this Agreement.

3.4 Permanent Downstream Passage of Anadromous Fish at Hiram

The Parties agree that the permanent downstream passage requirements for anadromous fish at the Hiram Project under Paragraph 16 of the 1994 Agreement are hereby amended in their entirety by Section 5.3.a.2. of this Agreement.

4.0 MEASURES NOT REQUIRING FILINGS WITH THE COMMISSION

The initial payments of funds agreed to under this section will be made after the Final FERC Order materially approving the terms and provisions of Section 5 of this Agreement becomes effective. The initial payments will be made within 60 days of the effectiveness of the Final FERC Order, including any subsequent rehearing or administrative appeals. Unless otherwise stated below, the remaining annual payments will be made by February 28 in each applicable year. In case of transfer of any of the Projects' license, Licensee may assign a pro rata share of these obligations to the new licensee.

4.1 Funds to Support Fisheries Management and Restoration

Licensee agrees to support various Saco River Basin fisheries management and restoration activities which may include, but are not limited to: developing or populating a database system to track annual fisheries research and management information; surveying and enhancing fisheries habitat and fish access to habitat; assessing fisheries populations; developing and implementing a geographic-referenced database of sampling locations and their associated data; and/or other fisheries management activities. Licensee agrees to fund such activities by up to an aggregate of $10,000[1] per year for ten years, according to the schedule below.

The MDIFW and Licensee shall, in consultation with MDMR and MASC, develop and agree upon a plan for the implementation of fisheries management and restoration activities under this section. Such agreement shall not be unreasonably withheld. The plan will be developed by January 2009. Unless the plan includes an alternative schedule of activities and funding, Licensee will fund the plan activities by up to $40,000 in 2010. Thereafter, Licensee will fund plan activities by up to $10,000 per year for six years. In no case shall such schedule or plan advance the funding schedule or

[1] Funding may be by in-kind contributions of services by Licensee if approved by MDIFW.

require the total funding by Licensee under this section to be increased beyond that anticipated above.

4.2 Funds to Support the Saco River Salmon Club

Licensee agrees to pay a one time grant of $25,000 to the Saco River Salmon Club. Such funds will be expended by the SRSC for annual rearing and stocking of Atlantic Salmon fry at its hatchery as part of the overall restoration goals for the Saco River.

4.3 Saco River Salmon Enhancement Fund

Licensee agrees to establish a Salmon Enhancement Fund (“Fund”) for the Saco River. This Fund shall be established as an account at an accredited financial institution to the joint credit of the MASC and Licensee. If this account bears interest, that interest shall be part of the Fund and treated no differently than funds deposited by Licensee. Licensee agrees to contribute $50,000 annually to this fund until permanent upstream passage measures for anadromous species are provided and operational up to and through the Bonny Eagle Project (see Section 5.3.b.1 of this Agreement for operational dates).

Monies in the Fund may be expended only upon joint approval of the USFWS, MASC and Licensee, which approvals shall not be unreasonably withheld. Expenditure for the raising and stocking of Atlantic salmon parr or smolt requires approval by no less than two of the three entities. Expenditure for other measures requires the approval of the three entities. The Fund may only be used to enhance, through various measures, the production and return of Atlantic salmon to the Saco River. The USFWS, MASC and Licensee shall consult annually with the Parties regarding measures to be undertaken with the Fund but the approval of the other Parties is not required.

Those monies in the Fund that are not expended annually for salmon enhancement measures will remain with the Fund to be used for future salmon enhancement measures on the Saco River. Notwithstanding the above, monies remaining in the Fund 24 months after the date that permanent upstream fish passage facilities/measures for anadromous species are provided and operational at the Bonny Eagle Project shall become available for use by Licensee at its sole discretion.

4.4 Funds to Support Public Education

Licensee agrees to provide five payments of up to $5,000 per year to develop and implement a public education program promoting the cooperative fisheries management and fisheries restoration efforts on the Saco River. The Parties agree that the funding does not necessarily need to be provided in consecutive years and will jointly determine in which years the expenditures will be made. Exceptions to the above schedule to delay a single year's funding by up to one year or combine it with the funds for the following year may be requested by consensus of the Parties, which request will not be unreasonably denied by Licensee, however, in no case shall such request require the total funding by Licensee under this section to be increased beyond that anticipated above. Notwithstanding the above, Licensee will not be required to expend funds under this section beyond the year 2016. The Parties agree that the development and implementation of the public education program will be a cooperative joint effort by the Parties.

4.5 Reporting Requirements

Each Party receiving or directing the expenditure of funds for projects associated with this Section 4 shall provide a written status report at the annual SRCC meeting. The status report shall include the project(s) undertaken, total funds expended for that year, full reports of data gathered and analyses conducted, results and recommendations as appropriate and conceptual plans for future project funding as appropriate.

5.0 FISHERIES MANAGEMENT MEASURES

5.1 Provisions Relating to All Fish Passage Facilities Agreed to Herein

a. Design Review – Plans and designs for each permanent fish passage facility agreed to herein will be reviewed in accordance with Section 7 of the 1994 Agreement and the current FERC license requirements for each applicable Project.

b. Shakedown Period – Once each new fish passage facility is constructed under this Agreement, Licensee will operate each fish passage facility for a one-season "shakedown" period to ensure that it is generally operating as designed and to make minor adjustment to the facilities and operation. At the end of the shakedown period, Licensee shall have a licensed engineer certify that the facility is constructed and operating as designed in all material respects. Licensee will provide the USFWS, NMFS, MDMR and MASC as appropriate with a copy of the as-built fishway drawings as submitted to FERC, along with the licensed engineer's letter of certification. All design drawings or as-built drawings determined to be Critical Energy Infrastructure Information under FERC guidelines shall, if retained by the USFWS, NMFS, MDMR or MASC, be held as confidential files that are not available to the public without prior written authorization from Licensee, unless required to be released by operation of law.

c. Effectiveness Studies - Licensee agrees to conduct effectiveness studies following the shakedown period of all newly constructed or significantly modified permanent upstream and downstream fish passage facilities or measures required under this Agreement. In the event that the facilities or measures as initially implemented are not effectively passing the target species, Licensee agrees to make, in consultation with the USFWS, NMFS, MDMR and MASC, reasonable, cost-effective, adjustments to the facilities or measures in an effort to improve fish passage effectiveness. "Reasonable, cost-effective, adjustments" shall mean such adjustments to the facilities or measures, as initially implemented, to improve the fish passage effectiveness towards desired levels, but in no event shall the aggregate cost of such adjustments exceed 5% of the initial capital cost of that fish passage facility or measure, or of the significant modification of an existing fish passage facility, as applicable. The "initial capital cost" will include capital costs expended on the fish passage facility or measure up to the date of certification. This provision shall not apply to the Springs and Bradbury fish passage facilities or measures, which are addressed separately herein.

All effectiveness studies of upstream fish passage facilities conducted pursuant to this Section shall use the following criteria:

- Study goals: Document upstream passage effectiveness of all newly constructed fishways at the Bar Mills, West Buxton, Bonny Eagle, and Hiram projects as applicable.
- Study initiation and duration: Studies will be initiated during the passage season following the facility shakedown period**,** and carried out for up to three years for each species. Initiation of studies for each species will depend in large part on the availability of suitable numbers and types of fish (i.e. that have been imprinted to move upstream of the project being studied).
- Study design: Details on the design of upstream passage effectiveness studies are to be determined through consultation between Licensee and the USFWS, NMFS, MDMR or MASC as appropriate.

d. Fishway Operating Procedures - Licensee will, in consultation with the USFWS, NMFS, MDMR and MASC, draft and maintain a standard set of written Fishway Operating Procedures for each of its Projects on the Saco River. These Fishway Operating Procedures will include general schedules for routine maintenance, procedures for routine operation, procedures for monitoring and reporting on the operation of each fish passage facility or measure, procedures for annual start-up and shut-down, and procedures for emergencies and Project outages significantly affecting fishway operations. Copies of these Fishway Operating Procedures, and any revisions made during the term of this Agreement, will be sent to the USFWS, NMFS, MDMR and MASC.

5.2 American Eel Management Measures

Licensee will provide permanent eel passage measures at its Saco River Projects according to the following schedule. The schedules set forth in this section for the development and implementation of upstream and downstream eel passage measures may be delayed following consultation with and agreement by the USFWS, NMFS, and MDMR that eels are not yet sufficiently abundant to require passage or to provide enough data to allow for a determination of the type or location of eel passage measures.

PROJECT	UPSTREAM EEL PASSAGE OPERATIONAL DATE[2]	DOWNSTREAM EEL PASSAGE OPERATIONAL DATE
Cataract – East and West Channel Dams	June 1, 2008	September 1, 2011
Cataract – Springs or Bradbury Dam	June 1, 2010	n/a
Skelton	June 1, 2012	September 1, 2024
Bar Mills	June 1, 2014	September 1, 2026
West Buxton	June 1, 2016	September 1, 2028
Bonny Eagle	June 1, 2018	September 1, 2030
Hiram	June 1, 2020	September 1, 2032

a. Upstream Eel Passage Measures

1. The Parties agree that an upstream eel passage facility will be required at only one location at each of the Projects, except at the Cataract Project where a facility may be required at both the West Channel Dam and East Channel Dam.
2. Licensee agrees to provide an upstream eel passage facility at either the Springs or Bradbury dam. Licensee may elect to either i) study, in consultation with the applicable Fishery Agencies, which dam is the most appropriate location for a facility, or ii) install an upstream facility at both dams.

[2] Annual installation and operation dates may be modified by Licensee based on river flows and the ability to safely access the site.

3. In the year before initiation of an upstream eel passage facility at a Project, Licensee will conduct a study to establish where at the Project the passage should be located. Licensee will present the results of this study to USFWS, NMFS and MDMR and obtain their concurrence with the choice of location, which concurrence shall not be unreasonably withheld. If it is the consensus of USFWS, NMFS, and MDMR that insufficient numbers of eels are present to require a fishway or to determine the location of an upstream eel fishway, those agencies may elect to delay the requirement to install passage facilities until adequate numbers of eels are present or a fishway location can be determined.

b. Downstream Eel Passage Measures

1. Licensee will provide engineering and /or operational plans for permanent downstream eel passage measures to MDMR, USFWS and NMFS for consultation by February 28 of the year in which downstream eel passage measures are scheduled at a given Project.
2. An efficiency goal of 90% has been targeted at each Project for permanent downstream eel passage measures, subject to confirmation through testing or other appropriate measures, that the goal is reasonably achievable and scientifically valid. This goal may be revised following consultation with and consensus by and between Licensee and the USFWS, NMFS and MDMR.
3. Interim Downstream Eel Passage Measures. If, in the interim period prior to implementing permanent downstream eel passage measures at the various projects, downstream eel passage measures are needed under certain circumstances at a specific Project to reduce significant adult eel mortality from downstream turbine passage, Licensee agrees to undertake the following measures during the passage season for that year, 1) open an existing fish sluice or other gate at the Project to provide an unimpeded passage route, and 2) reduce generation if necessary to reduce the

calculated hydraulic approach velocity to the turbine intake(s), thereby reducing the potential for impingement or entrainment of eels. The implementation of these measures will be initiated as described below by the confirmed observation[3] of more than 50 adult eel mortalities per night at a given Project ("trigger number"). Subject to any license conditions, these measures will be implemented as follows:

A. Licensee will routinely monitor the tailrace of one project from September 15 through November 15 annually for adult eel mortalities. The Skelton Project will initially serve as the indicator site for the Projects; routine monitoring will be instituted at Bar Mills and each subsequent upstream Project the 10th year after upstream eel passage has been installed at the subject Project.

B. Routine monitoring will occur once per week at the applicable Project. The monitoring will consist of visual observations of the tailrace area conducted from the shore or from watercraft.

C. Licensee will report any observed eel mortalities greater than the trigger number to the MDMR within 24 hours of the observation, or, if on a weekend, by the next business day. Licensee will clear dead eels from the tailrace when practical and safe to do so.

D. If observed mortalities during the routine monitoring are greater than the trigger number, then the monitoring frequency at the affected Project tailrace will be increased to once per weekday and once per weekday monitoring will be initiated at the next upstream Project.

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[3] If eel mortalities in excess of 50 per night at a Project are reported by others, then that observation must be confirmed by either MDMR or Licensee personnel before measures under the interim downstream passage protocol are required.

E. Subsequently, if additional observed eel mortalities at the Project:

i. are less than the trigger number for 5 days, then routine weekly monitoring may resume.

ii. continue to be greater than the trigger number, Licensee will implement controlled spillage at the subject Project by the 3rd night following the observation of the trigger number. Controlled spillage will consist of opening a gate to pass approximately 4% of actual turbine flow for up to eight hours per night (a lesser quantity or duration of spillage may be allowed based upon studies or a demonstration of effectiveness). The controlled spillage and weekday monitoring for the Project will continue for 5 nights.

F. If additional observed eel mortalities during the above 5-night spillage period:

i. are less than the trigger number, then normal operation and weekly monitoring may be resumed on the 6th day.

ii. continue to be greater than the trigger number, Licensee will continue the controlled spillage and will, by the 3rd night following the observation of the trigger number, implement reduced nighttime generation at the affected Project such that the calculated hydraulic approach velocity to the turbine intake(s) is approximately 2 feet per second (fps) or less during the controlled spillage hours. The controlled spillage, reduced generation and once per weekday monitoring for the Project will continue for 5 nights.

G. Subsequently, if daily monitoring continues to show eel mortalities greater than the trigger number at a Project, Licensee, USFWS, NMFS or MDMR may initiate discussions to define further cost effective interim measures for reducing adult eel mortality at that

Project. These measures may include additional spillage or generation reductions. If the USFWS, NMFS or MDMR and Licensee cannot agree upon the implementation of additional interim measures, then they will follow the dispute resolution process of Section 2.9 of this Agreement.

H. In no case shall interim downstream passage measures be required at a particular Project for more than eight hours per night for more than two weeks per season.

I. The need for interim downstream monitoring and passage measures will cease at a given Project once permanent downstream eel passage is implemented at that Project.

J. The MDMR, USFWS, NMFS and Licensee may, by consensus, agree to modify the above interim protocol or measures.

4. Notwithstanding the above, the Parties agree that the only downstream eel passage measures required at Springs and Bradbury dams will be via routine gate operation or spillage.

5.3 Anadromous Fish Management Measures

In addition to the general requirements set forth in Section 5.1 above, the following are requirements specific to Atlantic salmon, American shad, alewife, and blueback herring.

a. Downstream Passage Measures at Hiram

1. Licensee shall not be required to institute any additional downstream fish passage measures at the Hiram Project until permanent downstream fish passage measures are operational at Hiram pursuant to this section.

2. Permanent downstream fish passage measures for Atlantic salmon (the only anadromous species needing downstream passage at the Hiram Project) shall be operational by the earlier of:

   A. April 15 following two (2) years after Licensee receives written notification of the commencement of scheduled annual stocking of juvenile Atlantic salmon in the Saco River watershed above the Hiram Dam pursuant to a written agency-approved Atlantic salmon stocking program to be developed by USFWS, NMFS, MASC or New Hampshire Fish and Game Department, which establishes a stocking program to develop a permanent run of Atlantic salmon above Hiram, but in no case earlier than April 15, 2017; or

   B. The operation of permanent upstream fish passage facilities for Atlantic salmon at the Hiram Project.

b. Permanent Upstream Passage Facilities

1. Licensee will provide a single permanent upstream anadromous fish passage facility at each of the Projects according to the following schedule. The schedules set forth in this section for the development and installation of upstream anadromous fish passage facilities may be delayed contingent upon the returning numbers of the target species, and following consultation with and agreement by the USFWS, NMFS, MASC and MDMR as appropriate.

PROJECT	OPERATIONAL DATE
Bar Mills	May 1, 2016
West Buxton	May 1, 2019
Bonny Eagle	May 1, 2022
Hiram	May 1, 2025[4]

[4] Provided that such facility is necessary based upon the status of salmon restoration at that time.

2. Licensee will, 18 months prior to the planned construction of each upstream passage facility, submit conceptual designs for approval by the USFWS, NMFS, MASC and MDMR, and will subsequently file functional design drawings with the Commission for approval. The Parties agree that the design goal for each of these facilities is that they be as effective at passing sufficient escapement numbers of the target species as a single standard Denil-type fishway. The approval by the USFWS, NMFS, MDMR and MASC of conceptual designs that meet this goal will not be unduly withheld. Any disputes over the conceptual designs will be resolved through the Section 2.9 dispute resolution process.
3. The Parties agree that Licensee will not be required to install more than one upstream fish passage facility at each of the Bar Mills, West Buxton, Bonny Eagle or Hiram Projects during the term of this Agreement.

c. Atlantic Salmon Management Measures

Licensee agrees to continue to trap adult Atlantic salmon at either the Cataract or Skelton fishway, and truck these fish to release sites in the Maine portion of the Saco River basin until such time as permanent upstream fish passage measures are operational at each of Licensee's Saco River projects (see Section 5.3.b.1. of this Agreement for operational dates). The release (location and numbers of fish) will be carried out in accordance with the annual operations plan developed through the SRCC planning process.

d. Alewife and Blueback Herring Management Measures

Licensee agrees to continue to trap adult alewife and blueback herring at either the Cataract or Skelton fishways, and truck these fish to release sites in river reaches below the Hiram Project until such time as permanent upstream passage measures are operational at the Bar Mills, West Buxton and Bonny Eagle projects (see Section 5.3.b.1. of this Agreement for operational dates). The release (location and numbers of fish) will be carried out in accordance with the annual operations plan developed through the SRCC planning process.

e. American Shad Management Measures

1. Licensee will attempt to improve American shad passage at the Springs Island Dam according to the following:

A. When adult shad returns at the Cataract fish passage facilities (East and West channels combined) reach 3,000 fish per year for two consecutive years, then Licensee will perform an engineering study / design for facility and / or operational modifications to improve shad passage at Springs Island Dam.

B. When adult shad returns at the Cataract fish passage facilities (East and West channels combined) subsequently reach 5,000 fish per year for two consecutive years, then Licensee will implement the modifications within 2 years, or will implement the modifications in 2014 (to be operational in 2015), whichever is sooner. (In the latter case, the above study / design would be conducted in 2012.)

C. The modifications considered and agreed upon to attain effective passage for American shad may include facility modifications of the existing Springs / Bradbury Dam lock and lift systems and / or operational modifications.

2. If Licensee and the USFWS, NMFS and MDMR cannot agree by June 1, 2012 that the above measures provide effective[5] upstream passage for American shad, then Licensee agrees to install a single Denil-type fishway at the location of the Springs Island Dam fish lock and lift according to the

[5] For purposes of this Agreement, effective upstream passage is defined as allowing for sufficient upstream spawning escapement.

schedule in 5.3.e.1., above, and in general accordance with the attached concept plan. *See* Attachment C.

3. The Parties agree that no additional anadromous fish passage facility or operational modifications beyond those agreed to above will be required at the Springs / Bradbury dams during the term of the this Agreement. If effectiveness testing of the Denil fishway demonstrates that the Springs Island dam is not passing shad effectively, then Licensee and the Parties agree that trap and truck operations will be used to supplement the above measures to pass additional shad past the Springs / Bradbury dams.

4. Licensee agrees to continue to trap adult American shad at either the Cataract or Skelton fishways, and truck these fish to release sites in river reaches below the Hiram Project until such time as permanent upstream passage measures are operational at the Bar Mills, West Buxton and Bonny Eagle projects (see Section 5.3.b.1. of this Agreement for operational dates). The release (location and numbers of fish) will be carried out in accordance with the annual operations plan developed through the SRCC planning process.

5.4 Studies

a. Licensee agrees to conduct a three-year study of Atlantic salmon kelts to determine/examine downstream passage routes at select Saco River sites.

- Phase one will be a desktop study to determine which Projects have the most potential to delay/affect kelt passage.
- Phase two will be to study the passage routes at no more than two selected Projects.
- The study will be conducted in the spring (3 months) using 20 to 30 fish per year and yield the equivalent information of a radio-telemetry study. The salmon kelts will be supplied by a federal hatchery at no cost to Licensee. If sufficient numbers of salmon kelt are not timely provided to

Licensee at no cost, Licensee shall have no further obligation to undertake a kelt passage study until such time as a sufficient number of kelt are made available.

Licensee agrees to submit a draft study plan to the USFWS, NMFS, and MASC by April 2009, and to begin the study by spring 2010.

b. Licensee agrees to conduct a two-year semi-quantitative study of downstream passage effectiveness for clupeids (using, for example, standardized observations, video cameras and rotary screw traps, or similar methods) at the Cataract Dam, during the summers of 2007 and 2008. In the event of unusual environmental conditions, the USFWS, NMFS and MDMR in consultation with Licensee may agree to delay the study.[6]

c. Licensee agrees to conduct a two-year semi-quantitative study of downstream passage effectiveness for clupeids (using, for example, standardized observations, video cameras and rotary screw traps, or similar methods) at the Skelton Dam, during the summers of 2009 and 2010. In the event of unusual environmental conditions, the USFWS, NMFS and MDMR in consultation with Licensee may agree to delay the study.

d. Licensee agrees to conduct a two-year semi-quantitative study of downstream passage effectiveness for clupeids (using, for example, standardized observations, video cameras and rotary screw traps, or similar methods) sequentially at the Bar Mills, West Buxton and Bonny Eagle projects beginning the year after 6 adult clupeids per acre of impoundment (approximately 1,580 fish at Bar Mills; 790 fish at West Buxton; and 2,080 fish at Bonny Eagle) are passed or stocked above the specific project. If the USFWS, NMFS and MDMR determine that the numbers of clupeids returning to the lower Saco River (Cataract and Skelton impoundments) during the planned study year are insufficient to stock those lower

[6] The purpose of the semi-quantitative studies of clupeid passage under this Agreement will be to document the general effectiveness of the fish passage measures but will not necessarily quantitatively measure the percentage or total numbers of fish passed. The studies will consider clupeids as a group of similar species.

impoundments, then the studies anticipated in this section may be postponed upon mutual agreement between Licensee and the USFWS, NMFS and MDMR.

e. Licensee agrees to compile the existing studies of downstream anadromous fish passage effectiveness at each of the Projects into one compendium or summary report for submittal to the FAAC within two years of a Final FERC Order approving this Agreement becoming effective.

f. Licensee will conduct a three-year study of downstream eel migration timing and routes at the Cataract Project from 2008 through 2010.

g. All studies contemplated herein will be developed in consultation with NMFS, USFWS, MASC, MDIFW, or MDMR as applicable. Results will be submitted to FERC by Licensee after study completion; NMFS, USFWS, MASC, MDIFW, or MDMR as applicable will be asked for comment on the results, which comments will be submitted to FERC with the study results.

h. Licensee agrees to conduct an electro-fishing survey of smallmouth and largemouth bass populations in the West Buxton impoundment in 2007 and to provide standard bass population data to the MDIFW by March 31, 2008 before introduction of alewife into the impoundment or upstream waters occurs.[7]

i. Licensee agrees to conduct an electro-fishing survey of smallmouth and largemouth bass populations in the Bonny Eagle impoundment in 2008 and to provide standard bass population data to the MDIFW by March 31, 2009 before introduction of alewife into the impoundment or upstream waters occurs.

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[7] The sample data provided for each bass survey will include sample date and location, habitat type, sampling depth, gear type, time and duration of the sample and prevailing weather conditions. The standard bass population data (population descriptive metrics) reported will include number of bass collected during the sampling, species (largemouth or smallmouth), catch per unit effort, weight and length, condition factor, and population age structure and growth rates using scale samples for all Age 1+ bass. Licensee will provide the USFWS, NMFS, MDMR, MASC and MDIFW with numeric abundance data for other species collected during the above bass population survey.

j. Licensee agrees to conduct an electro-fishing survey of smallmouth and largemouth bass populations in the Lake Arrowhead impoundment in 2009 and to provide standard bass population data to the MDIFW by March 31, 2010 before introduction of alewife into the impoundment occurs.

Signatures on following page(s)

6.0 SIGNATURES

We, the undersigned, having the authority to bind our respective Parties, agree to the terms and provisions of this Agreement, and will represent and support this Agreement in applicable proceedings before the FERC and other regulatory bodies:

FPL Energy Maine Hydro LLC

3-15-07

Its T.J. Tuscai Senior V.P. FPL Energy Business Mgmt. Date

U.S. Fish and Wildlife Service

Its Date

National Marine Fisheries Service

Its Date

Maine Atlantic Salmon Commission

Its Date

Maine Department of Inland Fisheries & Wildlife

Its Date

Maine Department of Marine Resources

Its Date

Saco River Salmon Club

Its Date

Atlantic Salmon Federation

Its Date

Maine Council of the Atlantic Salmon Federation

Its Date

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FPL Energy Maine Hydro LLC

Its Date

U.S. Fish and Wildlife Service

3/12/07

Its MICHAEL J. BARTLETT Date
SUPERVISOR
NEW ENGLAND FIELD OFFICE

National Marine Fisheries Service

Its Date

Maine Atlantic Salmon Commission

Its Date

Maine Department of Inland Fisheries & Wildlife

Its Date

Maine Department of Marine Resources

Its Date

Saco River Salmon Club

Its Date

Atlantic Salmon Federation

Its Date

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Its Date

U.S. Fish and Wildlife Service

Its Date

National Marine Fisheries Service

3/12/07

Its Reg. Administrator NER Date

Maine Atlantic Salmon Commission

Its Date

Maine Department of Inland Fisheries & Wildlife

Its Date

Maine Department of Marine Resources

Its Date

Saco River Salmon Club

Its Date

Atlantic Salmon Federation

Its Date

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Its Date

U.S. Fish and Wildlife Service

Its Date

National Marine Fisheries Service

Its Date

Maine Atlantic Salmon Commission

2/09/07

Its Executive Director Date
Patrick Keliher

Maine Department of Inland Fisheries & Wildlife

Its Date

Maine Department of Marine Resources

Its Date

Saco River Salmon Club

Its Date

Atlantic Salmon Federation

Its Date

Maine Council of the Atlantic Salmon Federation

Its Date

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Its Date

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Its Date

National Marine Fisheries Service

Its Date

Maine Atlantic Salmon Commission

Its Date

Maine Department of Inland Fisheries & Wildlife

Roland D. Martin February 12, 2007

Its Commissioner Date

Maine Department of Marine Resources

Its Date

Saco River Salmon Club

Its Date

Atlantic Salmon Federation

Its Date

Maine Council of the Atlantic Salmon Federation

Its Date

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Its Date

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Its Date

National Marine Fisheries Service

__________________ ____________

Its Date

Maine Atlantic Salmon Commission

__________________ ____________

Its Date

Maine Department of Inland Fisheries & Wildlife

__________________ ____________

Its Date

Maine Department of Marine Resources

[signature] 9 Feb 2007

Its Commissioner Date

Saco River Salmon Club

__________________ ____________

Its Date

Atlantic Salmon Federation

__________________ ____________

Its Date

Maine Council of the Atlantic Salmon Federation

__________________ ____________

Its Date

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FPL Energy Maine Hydro LLC

Its Date

U.S. Fish and Wildlife Service

Its Date

National Marine Fisheries Service

Its Date

Maine Atlantic Salmon Commission

Its Date

Maine Department of Inland Fisheries & Wildlife

Its Date

Maine Department of Marine Resources

Its Date

Saco River Salmon Club

Mark R. Woodruff 2/12/2007

Its Vice-President Date

Atlantic Salmon Federation

Its Date

Maine Council of the Atlantic Salmon Federation

Its Date

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Its Date

U.S. Fish and Wildlife Service

Its Date

National Marine Fisheries Service

Its Date

Maine Atlantic Salmon Commission

Its Date

Maine Department of Inland Fisheries & Wildlife

Its Date

Maine Department of Marine Resources

Its Date

Saco River Salmon Club

Its Date

Atlantic Salmon Federation

3/6/07

Its Vice President Date

Maine Council of the Atlantic Salmon Federation

John Burrows 3-6-07

Its Maine Coordinator Date

Saco River Hydro LLC

John N. Webster 2/9/07

Its MANAGING PARTNER Date

New Hampshire Fish and Game Department

Its Date

Saco River Hydro LLC		New Hampshire Fish and Game Department	
____________________	____________	____________________	2-9-07
Its	Date	Its Executive Director	Date

ATTACHMENT A

2000 – 2005 ASSESSMENT REPORT, SACO RIVER FISH PASSAGE ASSESSMENT PLAN

FINAL ASSESSMENT REPORT

SACO RIVER FISH PASSAGE ASSESSMENT PLAN

2000 - 2005

prepared in accordance with the:

1994 SACO RIVER FISH PASSAGE AGREEMENT

and the

1995 ANNEX 1: ASSESSMENT CRITERIA

by

FISHERIES AGENCY ADVISORY COMMITTEE

on behalf of

SACO RIVER COORDINATING COMMITTEE

December 2006

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Table of Contents

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List of Acronyms

ASMFC	Atlantic States Marine Fisheries Commission
CFS	Cubic Feet per Second
CMP	Central Maine Power Company
ESA	Endangered Species Act
FAAC	Fisheries Agency Assessment Committee
FERC	Federal Energy Regulatory Commission
FMP	Fishery Management Plan
FPL Energy	FPL Energy Maine Hydro LLC
GLNFH	Green Lake National Fish Hatchery
GOM DPS	Gulf of Maine Distinct Population Segment
MASC	Maine Atlantic Salmon Commission
MASRSC	Maine Atlantic Sea Run Salmon Commission
MDIFW	Maine Department of Inland Fisheries and Wildlife
MDMR	Maine Department of Marine Resources
NASCO	North Atlantic Salmon Conservation Organization
NGOs	non-governmental organizations
NHDFG	New Hampshire Department of Fish and Game
NMFS	National Marine Fisheries Service
SRCC	Saco River Coordinating Committee
SRSC	Saco River Salmon Club
TAC	Technical Advisory Committee
USEPA	US Environmental Protection Agency
USFS	US Forest Service
USFWS	US Fish and Wildlife Service

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2000 – 2005 Final Assessment Report – Saco River Fish Passage

1.0 Program Overview

The *Saco River Fish Passage Agreement* dated May 24, 1994 (1994 Agreement) was signed by 17 parties[1] to settle licensing issues relating to fish passage at seven hydroelectric projects on the main stem of the Saco River. The Agreement included specific deadlines and design criteria for upstream and downstream fish passage facilities at the Cataract (including the east and west channels and the Springs and Bradbury dams) and Skelton Projects. It also required the development of assessment criteria to be used in future assessments to determine the need for timing and design of interim and permanent upstream fish passage facilities at the Bar Mills, West Buxton, Bonny Eagle, Hiram, and Swans Falls projects[2].

The state and federal agencies developed, in consultation with the other signatories, assessment criteria which are contained in *Annex 1: Assessment Criteria of the Saco Fish Passage Agreement* (Annex), dated January 20, 1995. The Annex also outlines an assessment process based on a four-year cycle of planning, data collection, and evaluation. An assessment plan is prepared at the beginning of the cycle, annual reports are prepared each year of the cycle, and an assessment report is completed at the end of the cycle. Typically, the Fisheries Agency Assessment Committee (FAAC)[3] prepares the 4-year assessment report and plan, and makes recommendations for the Saco River Coordinating Committee (SRCC)[4] to review, revise and accept by consensus. The first cycle began in 1996, and ended with the first assessment report in 1999. The second cycle began in 2000 and ends with this present assessment report. The extended time frame of this cycle is directly a result of facilitated discussions per the process outlined in the Annex.

As described in the Annex, this assessment report is designed to answer the following questions:

1. Are the management goals and objectives stated at the beginning of the four-year assessment cycle still current?
2. What is the present status of anadromous fish populations on the Saco River?

[1] American Rivers Inc.; Atlantic Salmon Federation; Central Maine Power Company (CMP); City of Biddeford; City of Saco; Maine Atlantic Sea Run Salmon Commission (MASRSC); Maine Council of the Atlantic Salmon Federation; Maine Council of Trout Unlimited; Maine Department of Inland Fisheries and Wildlife (MDIFW); Maine Department of Marine Resources (MDMR); Maine State Planning Office; National Marine Fisheries Service (NMFS); New Hampshire Department of Fish and Game (NHDFG); Saco River Salmon Club (SRSC); Swans Falls Corporation; Trout Unlimited ; U.S. Fish and Wildlife Service (USFWS).

[2] Permanent upstream "fish passage facility", as used in this report, shall mean a single device or structure that serves as a fishway. Examples of a fish passage facility include, but are not limited to, a Denil fishway, a steeppass fishway, or a fish lift.

[3] Per the 1995 Annex to the 1994 Agreement, the FAAC comprised of representatives of the Maine Atlantic Salmon Commission (MASC, formerly Maine Atlantic Sea Run Salmon Commission), MDMR, MDIFW, USFWS, NMFS, U.S. Forest Service, and NHDFG.

[4] The SRCC is comprised of the signatories to the 1994 Agreement. CMP is replaced by FPL Energy Maine Hydro LLC (FPL Energy), the current owner of six of the seven hydroelectric projects, and the MASRSC is now the MASC.

3. Is progress toward the management goals and objectives being made?
4. Is the rate of progress as expected?
5. What conclusions can be drawn regarding the need, timing and design for constructing new upstream fish passage facilities at the Bar Mills, West Buxton, Bonny Eagle, Hiram and Swans Falls projects?

Furthermore, the assessment report also:

1. Considers the availability and accuracy of necessary data to respond to the assessment criteria and support conclusions in the report using the best available data to the greatest extent possible.
2. Demonstrates that all the assessment criteria, defined in year one of the assessment cycle, have been addressed to the fullest extent practicable.
3. Develops specific conclusions regarding the need for and timing of upstream fish passage facilities.
4. Develops as part of the report, specific plans for future upstream fish passage measures.

In addition, this report serves to provide supporting documentation for a broader range of issues relating to upstream and downstream fish passage and fisheries management on the Saco River that are not part of the assessment process required in Annex 1 to the 1994 Agreement.

2.0 Saco River Coordinating Committee Meetings

During the second assessment cycle the annual meetings of the SRCC were held on May 2, 2000; March 21, 2001; March 20, 2002; and March 25, 2003 at the Department of Marine Resources office in Hallowell, Maine. Objectives of the meetings were to:

1. Review the current program goal and objectives
2. Identify key problems
3. Define assessment criteria
4. Review study results from the previous calendar year
5. Develop a work plan for the current calendar year
6. Develop format, process, and content of annual reports
7. Develop format, process, and content for final assessment report

On February 23, 2004, the FAAC issued a draft 2000 – 2003 Final Assessment Report which included recommendations for permanent upstream passage at Bar Mills, the consideration of eel passage in future assessments, and measures to address other management needs. At the April 2004 annual Saco River Coordinating Committee meeting, FPL Energy Maine Hydro, LLC (FPL Energy) indicated they wanted to initiate facilitated discussions to begin the next phase of the assessment cycle. Facilitated discussions, as part of the process outlined in the 1995 Annex, were intended to help the parties come to consensus on the recommendations in the draft Final Assessment Report. The facilitated discussions for this assessment report did not include all signatories to the 1994 Agreement. Although invited, representatives from the U.S. Forest Service, State of New Hampshire, local municipalities, and some non-governmental organizations (NGOs) were not involved in the facilitated discussions. (All parties that did participate in the facilitated discussions were signatories to the 1994 Agreement.) Facilitated discussions held in June 2004 led to the identification of fisheries management issues on the Saco River. This step effectively initiated separate but parallel negotiations to improve overall fish passage in the Saco River basin. Between September 2004 and October 2006, the parties held numerous facilitated meetings to develop a comprehensive strategy for addressing both short-term and long-term fish passage and fisheries management measures. Although the US Forest Service and the State of New Hampshire did not participate in the facilitated discussions, they did, as members of the FAAC, participate in the preparation of this assessment report.

3.0 Applicability of Current Management Goals and Objectives

During the January 20, 2000 meeting the SRCC reviewed the management goals and objectives in the 1987 *Saco River Strategic Plan for Fisheries Management* (1987 Management Plan), which had been adopted for the 1996-1999 cycle. The SRCC determined that the goals and objectives remained valid for the 2000-2003 cycle. No changes to the goals and objectives occurred during the facilitated discussions, except that American eel passage issues were discussed at length among the parties.

3.1 Management Goals

Manage all sport and commercial fish species of the Saco River for optimum habitat utilization, abundance, and public benefit. Objectives are listed by designated river reaches (Figure 1).

3.2 Management Objectives

Reach I. River mouth to Upper York (West Channel) Dam, Saco-Biddeford, Maine.

1. Manage Reach I as a migratory pathway for Atlantic sea-run salmon, American shad, sea-run alewives, blueback herring[5], and American eels.
2. Re-establish a spawning population of rainbow smelt.
3. Manage the striped bass resource in accordance with the Atlantic States Marine Fisheries Commission's *Interstate Fisheries Management Plan for Atlantic Striped Bass*.

[5] Blueback herring were not listed under the Management Objectives for Reaches I, II, III, and IV in the 1987 Management Plan and specific suitable habitat was not evaluated in the Saco River watershed. However, the 1987 Management Plan does note the historic presence of blueback herring in the Saco (p. 2-4).

4. Promote existing and potential commercial fisheries for alewives, American shad, and American eels.
5. Promote existing and potential recreational fisheries for American shad, Atlantic salmon, rainbow smelt and striped bass.

Reach II. Upper York (West Channel) Dam, Saco-Biddeford to Skelton Dam, Union Falls, Maine.

1. Manage Reach II as a migratory pathway for Atlantic sea-run salmon, American shad, sea-run alewives, blueback herring, and American eels.
2. Manage Reach II for sustained production of Atlantic salmon, shad, alewives, and eels consistent with habitat capabilities.
3. Establish a recreational fishery for salmon and trout consistent with habitat capabilities.
4. Increase recreational utilization of all warmwater fish populations and commercial utilization of American eels.

Reach III. Skelton Dam, Union Falls to the confluence of the Little Ossipee River, East Limington, Maine.

1. Manage Reach III as a migratory pathway for Atlantic sea-run salmon, American shad, sea-run alewives[6], blueback herring, and American eels.
2. Manage this reach for sustained production of trout, Atlantic salmon, American shad, alewives, and eels consistent with habitat capabilities.
3. Establish recreational fisheries for trout and Atlantic salmon consistent with habitat capabilities.
4. Increase recreational utilization of all warmwater fish populations and commercial utilization of American eels.

Reach IV. Confluence of the Little Ossipee River, East Limington to Hiram Dam, Hiram, Maine (includes Little Ossipee River).

1. Manage Reach IV, including the major tributaries (Little Ossipee and Ossipee Rivers), for sustained production of Atlantic sea-run salmon, trout, American shad[7], sea-run alewives, blueback herring, and American eel consistent with habitat capabilities.
2. Manage Reach IV as a migratory pathway for Atlantic salmon.

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[6] Sea-run alewives were inadvertently omitted from the Management Goals and Objectives for Reach III (page 5-2) in the *1987 Saco River Strategic Plan for Fisheries Management*. The Reach Description (beginning on page III-1) and Table 2-5 do, however, include production estimates for American shad for Reach III.

[7] American shad were inadvertently omitted from the Management Goals and Objectives for Reach IV (page 5-2) in the *1987 Saco River Strategic Plan for Fisheries Management*. The Reach Description (beginning on page IV-1) and Table 2-5 do, however, include production estimates for American shad for Reach IV.

3. Establish fisheries for trout and salmon in key high-use areas of the Saco and Ossipee Rivers.
4. Increase recreational utilization of all warmwater fish populations and commercial utilization of American eels.

Reach V. Hiram Dam, Hiram to Swans Falls Dam, Fryeburg, Maine.

1. Establish a recreational fishery for trout in the Fryeburg area.
2. Increase recreational utilization of all warmwater fish populations and commercial utilization of American eels.
3. Manage Reach V as a migratory pathway for and production by Atlantic salmon.

Reach VI and VII. Swans Falls Dam, Fryeburg, Maine to the confluence of the Ellis River, Bartlett, New Hampshire.

1. Consult with the New Hampshire Department of Fish and Game (NHDFG) and the U.S. Forest Service (USFS) to participate in inter-agency compacts to develop an interstate Atlantic salmon restoration program.
2. Continue interstate agency cooperation to prevent introductions of undesirable species.

4.0 Key Problems and Issues

During the January 20, 2000 meeting the SRCC reviewed the key problems and issues identified during the first assessment cycle. From the original list, three items were deleted and one item added. The new list includes (not in order of priority):

1. Cumulative impacts of dams, including those from turbine mortality, upstream and downstream passage efficiency.
2. Availability of wild and hatchery stocks (fish, fry, or eggs), both river specific and generally.
3. Availability of staff and resources (e.g., inadequate evaluation, monitoring, and program coordination).
4. Inadequate knowledge or uncertainty regarding physical and biological parameters in the river.
5. Impacts of other sources of mortality, including marine losses, angling, predation, etc.
6. Insufficient spawning escapement.
7. Low marine survival.
8. Land use and development practices, point and non-point source pollution.
9. Conflicts with other fishery programs.

10. Periodic low flows and high temperatures.
11. Commercial exploitation of fish stocks in Maine.
12. Lack of an interstate Atlantic salmon restoration program.
13. Upstream passage for American eel.

"Inadequate minimum flows or excessive high flows" was deleted because it had been addressed during the first assessment cycle. Also deleted were "Control of in-river exploitation of fish stocks" because a recreational fishery for Atlantic salmon has been prohibited in the Saco River since 1999 under MASC Board rules[8] and "Need for a permanent location for the Saco River Salmon Club Hatchery" because a location was acquired.

In the 1999 Assessment Report, the FAAC recommended that upstream passage for American eel be added to the list. Although upstream passage for eels was not specifically addressed in the 1994 Agreement, eels were included as a species to be considered for management and restoration in the 1987 Management Plan. The SRCC, with the exception of FPL Energy, was in favor of including "Upstream passage for American eel" to the list of key problems and issues.

5.0 Assessment Criteria

During the January 20, 2000 meeting the SRCC decided to maintain the assessment criteria that were used in the first assessment cycle. However, three criteria indicated by asterisks in the list below were not addressed in this Assessment cycle. The criteria are:

1. Trends in population size and biological characteristics
2. Level of recent releases and future plans
3. Fish passage efficiency
4. Turbine mortality
5. Degree of attrition due to multiple barriers (upstream and downstream)
6. Habitat suitability and production estimates
7. Degree and location of salmon fallback*
8. Comparison of Saco River with other rivers
9. Evidence of limiting factors (deferred)*
10. Effectiveness of trap and truck
11. Availability of staff*
12. Interagency coordination

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[8] Maine Revised Statutes Annotated: Title 12, Chapter 11, §9902

6.0 Fishes of the Saco River

6.1 Resident Species

The Saco River watershed supports a diverse array of warmwater and coldwater resident fish species (Table 1). Of these species, several are managed for recreational fisheries. The Maine Department of Inland Fisheries and Wildlife (MDIFW) stocks brook trout, brown trout, lake trout, and landlocked Atlantic salmon in the Saco River watershed. Many of the colder streams have native populations of brook trout and naturally reproducing populations of brown trout. The 1987 Management Plan for the Saco River outlines the habitat suitability throughout the drainage for brown trout and brook trout. Between the Cataract Project and the New Hampshire border, an estimated 149,136 units of brown trout habitat and 15,038 habitat units of brook trout habitat have been identified. The NHDFG stocks brook trout, brown trout, and rainbow trout in lakes, rivers, and streams of the Saco River watershed. The NHDFG also stocks landlocked Atlantic salmon in several major lakes. Habitat units for these species have not been mapped in New Hampshire.

The Saco River drainage contains many cold-water tributaries suitable for salmonid management; however, until recently much of this habitat had not been assessed to determine the quality or quantity of these areas. In response to this need for information, MDIFW undertook a comprehensive review of existing inventory information to identify Saco River tributaries that support important trout fisheries. MDIFW developed a computerized database of available resident stream fishery data in support of this effort.

Stocking of trout in Maine has increased recently, largely in response to new, expanded year-round fishing initiatives. A year-round open water fishing season was established in 2002 on the Saco River in an effort to provide expanded fishing opportunities in more heavily populated southern Maine. Additional stockings of brook and brown trout throughout the drainage have been undertaken to support this initiative; however, the following four areas have been a focus of recent increased stocking: below Skelton and Hiram dams, Limington Rapids, and the Bonny Eagle bypass channel.

Historically, Atlantic salmon and brook trout co-existed within the Saco River watershed. However, the potential interactions between Atlantic salmon and brook trout within the Saco River drainage are not thoroughly understood. Previous research by others investigating interactions between these co-occurring indigenous salmonids suggests inter-specific competition for habitat may be limited in some systems due to habitat partitioning, although juvenile salmon may displace brook trout in certain habitats[9]. The MDIFW has, however, observed considerable habitat overlap between stocked juvenile salmon and wild brook trout in smaller tributaries within the Saco River drainage, suggesting a lower incidence of habitat partitioning than reported elsewhere[10]. Therefore, MDIFW initiated a small study to evaluate potential interactions and effects of stocking Atlantic salmon fry into two brook trout streams. The project was implemented and required considerable investment of resources,

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[9] Gibson et al 1993, Sayers 1990, Dickson and MacCrimmon 1982, Bult et al 1999.
[10] F. Brautigam, MDIFW, personal observations

and for a number of reasons, the project was not finished. Recent progress with MASC in resolving these interaction issues has eliminated the need for study continuation.

The overall goal for the Saco River Restoration Program is to manage all sport and commercial fish species of the Saco River for optimum habitat utilization, abundance, and public benefit. To successfully accomplish this goal, continued interagency coordination is essential to minimize potential conflicts among fishery programs.

6.2 Diadromous Species

The Saco River in southern Maine supports a number of diadromous[11] fish species, including Atlantic salmon, American eel, American shad, alewife, and blueback herring. All diadromous species would benefit from effective upstream and downstream fish passage to reach suitable habitat and avoid impacts associated with turbine entrainment during out migration.

The installation of upstream fishways at the Cataract Project (the Springs and Bradbury dams) and the Skelton Project in accordance with the 1994 Agreement has provided anadromous fish volitional access to riverine habitat up to the Bar Mills dam. The availability and use of a trap and transport program has also provided access to the river reaches above Bar Mills. Re-colonization and utilization of the formerly inaccessible habitat by anadromous species has progressed, as demonstrated by information in the 1999 Assessment Report and the data in this assessment report, showing that the populations returning to the Saco River have increased or become established since 1993[12]. Permanent fish passage facilities providing access to habitat upstream of the Bar Mills, West Buxton, and Bonny Eagle hydropower projects will further the restoration progress being made.

The restoration of diadromous species provides wide ranging ecological benefits for an array of aquatic, terrestrial, and avian species. Various life stages of alewife, blueback herring[13], shad, and salmon feed on smaller organisms (plankton, zooplankton, small fish, etc.); conversely, various life stages of these species are forage for numerous larger species (cormorants, marine mammals, predatory fish, etc.). As such, these species also play a role in transferring nutrients through the food web and among freshwater, marine, and terrestrial ecosystems[14].

The presence of a small number of American eels has been documented above each of the main stem dams[15]. Currently, specific passage measures are not required along the Saco River for safe, timely, and effective passage of eels, and the provision of passage measures to

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[11] The term *anadromous* refers to fish which migrate from the sea to freshwater to spawn, such as Atlantic salmon. The term *catadromous* refers to fish which migrate from freshwater to the sea to spawn, such as American eel. The term *diadromous* covers both anadromous and catadromous and simply refers to fish that migrate between the sea and freshwater for spawning and development.

[12] 1996-1999 Final Assessment Report, Saco River Fish Passage Assessment Plan. December 1999. Fig. 2, p. 10

[13] Alewife and blueback herring often are collectively referred to as “river herring,” because they are difficult to distinguish from each other during fish passage. Typically alewives are numerically dominant in Maine waters.

[14] Amendment 1 to the Fishery Management Plan for Shad and River Herring. 1999; Facey and Van Den Avyle 1987, Mullen et al. 1986, Weiss-Glanz et al. 1986, Daine et al. 1984

[15] Chris Yoder, Midwest Biodiversity Institute, personal communication.

move juveniles upstream and adults downstream would benefit the restoration of this catadromous species to the river.

6.2.1 Atlantic salmon

The anadromous Atlantic salmon has a relatively complex life history which includes: upstream migration of adults to spawn in natal rivers; various stages of juvenile development in freshwater and estuarine systems (eggs, fry, parr, smolts); extended residence of some post spawn adults (kelts) in natal streams; and out-migration into the open ocean by both sub-adult and adult individuals[16]. The run timing and biological characteristics of adult salmon returns to the Saco River are typical of most of Maine's salmon rivers. Returning adults are primarily early-run from May to July (Table 2) and most (76%) have spent two or more winters at sea (Table 3). Smolts generally out-migrate from the drainage between mid-April and mid- June. Kelts typically migrate out of the system in the late fall/winter or during the following spring freshet.

The 1987 Management Plan for the Saco River outlines the habitat suitability and production estimates throughout the drainage for Atlantic salmon. The MASC has estimated that there is a total of 14,665 units of Atlantic salmon habitat within the Saco River for the State of Maine; a partial habitat survey has identified an additional 10,269 habitat units in New Hampshire[17,18]. The majority of quality salmon habitat (>98%) in the Saco River Basin is upstream of the Bonny Eagle Project (Figure 1), with approximately 50% of the habitat between the Little Ossipee River confluence with the mainstem Saco and the Hiram Dam[19]. Above the Hiram Dam, approximately 90% of the mainstem habitat suitable for spawning and rearing of Atlantic salmon is located in New Hampshire.

During the course of this assessment cycle (2000-2005), three life stages (fry, parr, and smolts) were released into various parts of the Saco River watershed within the state boundaries of Maine (Tables 4 and 5a-f). Smolts were generally released in the mainstem portion of the river below the Skelton Project. Parr have been released in several locations including the mainstem above Bonny Eagle and within the Big Ossipee River. Fry releases occurred primarily in small tributaries with some releases in the mainstem and larger tributaries such as the Big Ossipee River.

Each year since it’s inception in 1980, the Saco River Salmon Club (SRSC), a volunteer organization, has been actively involved in the restoration of Atlantic salmon on the Saco River. The SRSC is the primary organization raising and releasing salmon fry into the Saco River watershed. The SRSC receives up to 700,000 Penobscot F_2 origin eyed eggs annually from the Green Lake National Fish Hatchery (GLNFH). The eggs are incubated at the SRSC hatchery until mid-May when river and hatchery temperatures are similar enough to allow for release. The MASC develops the stocking recommendations and, in cooperation with the SRSC, releases each cohort into appropriate habitat in Maine. The SRSC has conducted

[16] Daine et al. 1984. See also Maine Atlantic Salmon Restoration and Management Plan, 1995-2000. Atlantic Sea Run Salmon Commission, Bangor, Maine. August 1995. 55 p.

[17] One habitat unit = 100 square yards of habitat

[18] 1987 Management Plan.

[19] 1987 Management Plan. Table 2-5. Page 2-15.

habitat surveys with technical assistance from the MASC. Data has been utilized by the MASC to adjust Atlantic salmon stocking rates in the surveyed streams. The U.S. Fish and Wildlife Service (USFWS) coordinates with the MASC to stock other juvenile life stages (parr, smolts) into the mainstem Saco. In some years up to 35,000 smolts have been stocked (Table 4). Smaller groups of smolts (≤ 400) have been released by the hydroelectric operators while testing efficiencies of downstream bypass passage facilities. MASC currently does not fully stock all available Atlantic salmon habitat in Maine above Hiram Dam. To date, the NHDFG has not initiated a salmon stocking program in the available Atlantic salmon habitat in New Hampshire upstream of Swans Falls.

Between 1997 and 2005, the MASC, USFWS, the licensee, and SRSC members conducted assessments of juvenile survival in selected tributaries stocked with Atlantic salmon fry reared at the SRSC Hatchery. In addition, MASC staff, in cooperation with the MDIFW, collected information on potential salmon and brook trout interactions on Ten Mile Stream between 2000 and 2004, and Shepards River between 1998 and 2003; both sites are large tributaries to the Saco River above the Hiram dam. (As mentioned above in Section 6.1, Resident Species, this specific study was not completed.) All sites were sampled using standard electrofishing gear and techniques, and numbers of all salmonids present were estimated[20].

6.2.2 American Shad

American shad is a highly migratory coastal species that returns to natal rivers for spawning. The spawning migration begins at the end of May, peaks in June, and declines in early July (Table 6). There does not appear to be a specific distance upstream that adults must migrate before spawning. However, a number of studies have shown that, in large river systems, spawning adult shad prefer upstream spawning sites, their eggs and fry are subjected to net downstream transport by the river flow, and juvenile fish tend to grow older and larger before they reach the estuary[21]. Post-spawn adults return to sea immediately, generally from late June through August. Juveniles migrate downstream in the fall.

The 1987 Management Plan for the Saco River outlines the habitat suitability and production estimates throughout the drainage for American shad. All the approximately 90,868 units of suitable habitat are in Maine waters. The reach from the Cataract dam to the Bar Mills dam contains 46% of this habitat. The reach from the Bar Mills dam to the Bonny Eagle dam contains 19% of this habitat. The reach above the Bonny Eagle dam is approximately 34% of the suitable shad habitat.

6.2.3 River Herring (alewife and blueback herring)

Similar to American shad, alewife and blueback herring spend much of their lives at sea, returning to natal rivers to spawn. The spawning migration occurs primarily in May (Table 7), similar to other Maine rivers. While overlap in the timing of migration between alewives and bluebacks can be considerable, alewives generally return to the rivers first. Alewives spawn in lakes, ponds, and backwaters while blueback herring prefer rivers and streams.

[20] Zippin 1958.
[21] Chittenden 1969; Marcy 1976; Limberg 1996; Bilkovic et al. 2002.

Adults emigrate in June and July after spawning, and juveniles emigrate from July to November. Alewife and blueback herring provide numerous ecological benefits for the river, estuary, and nearshore ecosystem. Alewife and blueback herring are a forage species for many important larger predatory fish, including Atlantic salmon, Atlantic cod, bluefish, striped bass, American eel, and large and smallmouth bass[22].

The 1987 Management Plan for the Saco River outlines the habitat suitability and production estimates throughout the drainage for alewives. Of the 6,134 acres of suitable spawning habitat, 77% is above the Bonny Eagle Project (Table 15; Fig. 1). The majority of the alewife habitat, 3,700 acres or 60% of the total, is located in Ossipee Lake in New Hampshire which is not currently available due to management constraints and lack of access past the outlet dam.

6.2.4 American Eel

The catadromousAmerican eel is panmictic (single spawning site and complete mixing of the gene pool at each spawning), with all adults spawning in the Sargasso Sea[23]**.** American eel eggs hatch into a transparent, protracted larval stage, called "leptocephali." Leptocephali drift and swim with the ocean currents for several months before changing shape to resemble miniature, transparent eels. These "glass eels" or "elvers" enter Atlantic coast waterways beginning in January in Florida and late March in Maine. Some eels remain in saline or estuarine waters for all or part of their lives, while others migrate into freshwater and take up residence in rivers, streams, lakes, and ponds. Migration into freshwater may continue for many months or years[24]. Elvers and small juvenile eels have been documented migrating upstream past obstacles, such as dams, by clinging to rough wetted surfaces and wiggling up and over the obstacle[25]. Colonization of the upper reaches of a river may continue by the older, but still juvenile, individuals called "yellow eels." However, as juvenile eels grow to a larger size, they lose their ability to successfully climb the wetted surface of obstacles to access upstream habitat[26].

American eels are long lived and can remain in freshwater for more than 24 years before reaching sexual maturity, with some remaining as long as 40 years. As sexual maturity begins, yellow eels metamorphose into the sub-adult "silver eel" and begin the out-migration back to the Sargasso Sea where maturity is attained prior to spawning and subsequent death. Downstream movement generally starts for the silver eels with the onset of the fall rainy season and escalates until colder temperatures begin. In a study of four Maine rivers, American eels were found to migrate between ages 8 – 27 years, with the majority outmigrating at age 9-15 years for males and 12 – 20 years for females[27].

Suitable habitat for eels has been identified throughout reaches II – VI of the Saco River drainage, as identified in the 1987 Management Plan. Declines in the catches of American eel in the United States since the 1980s and in some fisheries independent assessments

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[22] Collette and Klien-MacPhee 2002, Creaser and Perkins 1994, Ross 1991, Loesch 1987
[23] ASMFC 2000(a). Interstate Fishery Management Plan for American Eel.
[24] American eel (*Anguilla rostrata*) Species Management Plan. November 1996.
[25] American Eel Migration Study, Final Report. FPL Energy December 2004
[26] Facey and Van Den Avyle 1987
[27] Oliveira and McCleave 2000

prompted the Atlantic States Marine Fisheries Commission (ASMFC) to adopt the Interstate Fishery Management Plan for American Eel (eel FMP) in April of 2000. The eel FMP recognizes that declines in the American eel stock along the northeastern U.S. Atlantic coast are attributed to a combination of causes including commercial harvest, pollution, changes in oceanic currents, and the effects of dams and hydropower facilities[28]. Consequently, one objective of the eel FMP is to protect and enhance American eel abundance in all watersheds where they occur by providing access to inland waters for the juvenile glass eel, elvers, and yellow eel, along with adequate escapement to the ocean for pre-spawning adults.

Recent declines in American eel also prompted a petition to the National Marine Fisheries Service (NMFS) and the USFWS pursuant to provisions of the Endangered Species Act, asserting that the status of the American eel is in need of federal protection. The USFWS published in the Federal Register their preliminary 90-day finding that the petition presented substantial scientific and commercial information, indicating that listing the American eel may be warranted[29]. Following publication of the finding, the federal government initiated a formal status review to determine if listing the species is warranted and whether significant remedial measures are necessary. This status review is currently ongoing. Therefore, based upon the concern for American eel stocks along the east coast and the stock status in the Saco River, conservation measures are considered in this report.

7.0 Existing Upstream Passage of Diadromous Fish Species

7.1 Upstream Passage for Anadromous Species

To date, five upstream fish passage facilities for anadromous species have been installed on the lower Saco River. FPL Energy currently owns and operates the facilities, which includes facilities for identifying, enumerating, and transporting upstream migrants. In 1993, fishways became operational at the lower two Cataract Project dams - a Denil fishway with a counting window at the west channel dam (henceforth “west channel fishway”) and a fish lift with a counting window and trapping facility on the east channel dam (henceforth “east channel fish lift”). Fish that use the west channel fishway can only be passed into the Cataract headpond, but fish that use the east channel fish lift can be passed into the Cataract headpond or trapped and transported upstream for release. In 1997, a fish lock was installed at each of the two upper Cataract Project dams (henceforth “Springs/Bradbury fish locks”). Fish using the Springs/Bradbury fish locks are passed into the impoundment. Neither fish lock is equipped with a counting window or trapping facility. The fish lift at the Skelton Project dam (henceforth “Skelton fish lift”) became operational in late summer 2001[30,31]. It is equipped with a counting window and trapping facility, so fish either can be passed into the Skelton headpond or trapped and transported upstream.

Starting in 2002, the MASC and FPLE implemented Atlantic Salmon Trap Operating and Fish Handling Protocols at the Cataract and Skelton projects to prevent handling stress for adult Atlantic salmon at fish handling facilities during elevated river temperatures (> 22 ^{o}C)

[28] ASMFC 2000(a). See also EPRI 2001, Haro et. al. 2000.
[29] 70 Fed.Reg. 38849 (July 6, 2005)
[30] 2001 Springs and Bradbury Fish Locks Report.
[31] 2002 Skelton Fishway Report

[32]. In 2003, the protocols resulted in the cessation of the Skelton fish lift operations on June 24. That year, the upstream migration of American shad was delayed compared to previous years, and began 17 days later than average (50% of the run passed eight days later than average, and 75% of the run passed four days later than average) based on 11 years of passage data at the Cataract Project. Therefore, the cessation of lift operations based on the Protocols precluded American shad from accessing available habitat upstream of the Skelton Project[33]. In 2004, in an effort to minimize potential fish passage issues, FPL Energy placed a camera above the Skelton fish lift that would allow operators to view fish entering the fish lift hopper[34]. Subsequently, the Protocol was revised and, at elevated river temperatures the operators can pass American shad upstream and release Atlantic salmon back into the tailrace without handling.

FPL Energy staff conducts all fish passage and fish counting operations. A description of the fish passage facilities and operations can be found in FPL Energy's 2005 fish passage reports[35].

7.2 Upstream Passage for Catadromous Species

Currently, there are no specific eel passage measures required or implemented at any of the projects along the Saco River.

8.0 Monitoring Results

Fish passage data for each of the species were collected by the licensee and reported annually to the SRCC. Analysis of the data for the assessment report was conducted by the FAAC. The data (non-transformed and log-transformed) were analyzed for normality using a Shapiro-Wilk Goodness-of-Fit test. Both data sets had significant values indicating some degree of normality. The log-transformed data had more normally distributed histograms, more randomly distributed residual plots and smaller standard deviations. Therefore, the log-transformed data were used in the final statistical test. Long-term trends in population changes were evaluated statistically using a linear regression (SYSTAT 7.0.1: GLM) of the log transformed data. A linear regression is a statistical technique for finding the best linear relationship between two variables; in this case, log of population versus time. For these data, a regression slope significantly different from zero indicates that the population is increasing if the slope is positive and decreasing if the slope is negative; a slope that is not significantly different from zero means that there is no detectable change in the population.

8.1 Atlantic salmon

8.1.1 <u>Upstream Passage</u>

A total of 535 adult Atlantic salmon have passed the two lower Cataract Project fishways since 1993 (Table 2; Figure 2). Returns range from a low of 19 in 2004 to a high of 69 in 2001, with a median return of 39 fish. The majority (74%) of fish return in June and July,

[32] 2003 Skelton Fishway Report
[33] 2003 Skelton Fishway Report
[34] 2004 Skelton Fishway Report
[35] 2005 Springs and Bradbury Fish Locks Report; 2005 Skelton Fishway Report

and 75% have spent two or more years at sea (Table 3). Approximately 41% of returning salmon at the Cataract Project use the west channel fishway, and 59% use the east channel fish lift. Based on scale samples and dorsal fin scores collected since 1993, the majority of returning salmon are from smolt releases (82%); the remaining 18% of adult returns have originated from fry stocking or natural spawning. However, due to recent changes in smolt stocking, the FAAC anticipates the proportion of returning adults that originate from fry stocking will increase. Since returning adults generally spend two or more years at sea, a significant increase in the proportion of wild origin returns from increased fry stocking and/or natural spawning occurring after 1999 would not be expected until 2003 and beyond. The proportion of returns of fry stocking or wild origin for 2002 was 10.6%. Between 2003 - 2005, the proportion of returning salmon from fry stocking or wild origin ranged from 32% to 46.2%.

The disposition of returning Atlantic salmon has changed as fish passage in the drainage has become operational. Between 1993 and 2000, salmon either passed upstream into the Cataract headpond (73%) or were trapped and trucked to the Big Ossipee River (27%). All fish had the opportunity to spawn naturally. Beginning in 2001, all Atlantic salmon passed into the Cataract headpond are allowed volitional access to the Skelton dam. Those that use the Skelton fish lift are trapped and trucked to the Big Ossipee River (Table 8); to date 55% of all salmon counted at the lower Cataract fishways have volitionally used the Skelton fish lift. In recent years, a small number of redds – depressions in gravel where spawning occurs - have been observed in the lower mainstem (below Skelton), Swan Pond Brook, and in the Big Ossipee River, presumably indicating that salmon have spawned in several areas of the Saco drainage.

Linear regression was used to determine the slope of the regression of the number of returning adult salmon on year of return. The linear regression analysis indicated the slope was not significantly different from zero (logsalmon= -0.016(year) + 36.016; N=13; F-ratio 0.253; P=0.625) indicating the salmon population has not significantly increased or decreased since 1993 (Figure 3).

8.1.2 Downstream Passage

FPL Energy operates permanent downstream fish passage facilities at Bonny Eagle, West Buxton, Bar Mills, Skelton, and Cataract hydroelectric projects. Downstream passage route studies utilizing Atlantic salmon smolts were conducted at Cataract in 1994, at Skelton and Bonny Eagle in 1997, at West Buxton in 1997 and 1999, and Bar Mills during 1997, 2001, and 2003[36]. At most of the projects FPL Energy modified an existing sluice to provide a bypass conduit as permanent downstream passage.

Studies were conducted at each hydro station to evaluate bypass facility utilization by smolts and overall downstream passage efficiency[37]. In general, studies were conducted under

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[36] RMC Environmental Services March 1995; Normandeau Associates, Inc. August 1998; Normandeau Associates, Inc. December 1999; Normandeau Associates, Inc. January 2000; Normandeau Associates, Inc. and FPL Energy Maine Hydro, LLC. May 2002; Normandeau Associates, Inc. and FPL Energy Maine Hydro, LLC. March 2004.

[37] Downstream bypass fish passage efficiency is defined as the proportion of fish passing by means other than the

various operating and spill conditions. Bypass facility efficiency was variable depending on site-specific conditions at the time of the smolt migration. For the Cataract Project, downstream passage efficiency ranged from 29% under no spill conditions to 88% under spill conditions (7% through the East Channel bypass sluice and 81% via the West Channel spillway).[38] At the Skelton Project, 64% and 100% of the smolts utilized the bypass facility under no spill conditions (two tests) and 97% bypassed the powerhouse under spill conditions (11% via the bypass facility, 86% via the spillway). Bypass efficiency was 64% at the West Buxton Project under no spill conditions with 200 cfs of water routed through the bypass facility and flow induction devices operating at the surface along the upstream face of the forebay curtain wall. At the Bonny Eagle Project, 91% and 93% of the test smolts utilized the bypass facility (200 cfs) under no spill conditions. At Bar Mills, several tests were conducted under various station operating scenarios, river conditions, and with and without a floating trash boom guidance device. With a bypass facility flow of 120 cfs and a guidance device installed, use of the bypass sluice was 62% and 79%, respectively, under spill and no spill conditions.

Smolt survival studies were conducted at Bar Mills and West Buxton in conjunction with the efficiency studies. Studies at Bar Mills indicate immediate survival through the turbines of up to 88%[39]. The licensee calculated the Bar Mills project downstream passage survival rate at 95% for the 2003 study conditions. Similarly, immediate survival through the turbines at West Buxton was observed at 85% – 97%[40]. The licensee calculated the West Buxton project downstream passage survival rate at 96% for the 1999 study conditions.

An important Atlantic salmon life stage for which the effectiveness of downstream passage facilities has not been evaluated is kelts. Adult salmon trapped at the Skelton fishway are transported to upriver release sites in the Big Ossipee River - above five mainstem hydro projects – for spawning. After spawning, kelts typically migrate out of the system in the late fall/winter or during the following spring's freshet. Those that overwinter reside in larger mainstem habitat (e.g., deadwaters). It is important that kelts have a safe, timely, and effective downstream passage route past these hydro projects. Kelts that do return to the river as repeat spawners are predominantly females with a higher fecundity than maiden spawners[41].

While no empirical downstream passage studies have been conducted yet at Hiram, several analyses have been performed. Based on the flow data for Hiram, USFWS engineers estimated that achieving smolt passage efficiency in the range of 50% to 60% via project spillways during the emigration period requires flows in the range of 4,800 cfs, which is approximately twice the turbine hydraulic capacity. This is based upon an assumption that smolt are distributed directly proportional to the amount of flow going over/through the various passage routes. This method has been used and accepted for this type of preliminary

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turbines (e.g. spill or a bypass facility).

[38] Licensee currently opens a spillway gate during the migration season to pass salmon smolts.

[39] For specific test conditions see studies cited in footnote #38

[40] For specific test conditions see studies cited in footnote #38

[41] Baum, E. 1997

analysis at other hydropower projects. On average, flows greater than or equal to 4,800 cfs will occur 40% of the time in April, 30% of the time in May, and about 5% of the time during the first two weeks of June (Table 9). At the request of the SRCC, FPL Energy conducted a desktop turbine entrainment evaluation based on field studies conducted at projects with turbine specifications similar to Hiram. This evaluation, and a separate analysis by the resource agencies, estimated that, of the fish that travel through turbines, the average rate of immediate survival ranged between 74 - 87% for projects with turbine specifications similar to Hiram.

8.1.3 Level of Historic and Recent Hatchery Releases

Stocking of hatchery Atlantic salmon fry, parr, and smolts in the Saco River drainage has been highly variable due to a number of factors (Table 4). During this time, the MASC and SRSC have made requests to the Maine Atlantic Salmon Technical Advisory Committee (TAC) for hatchery fish to be released into the Saco River[42]. In years when there was sufficient hatchery production, the TAC approved the request and fish were stocked. For many years (1975-1991) the Saco River received fry, parr, and smolts (totaling 626,900) from the USFWS hatcheries in support of this restoration effort[43]. Beginning in 1992, the USFWS committed to stocking approximately 20,000 smolts into the Saco River annually. The average annual smolt stocking between 1993 and 2000 was 18,189 fish (range 5,100-35,200). After 2000, the TAC reduced the number of Penobscot River smolts that could be stocked outside the Penobscot drainage due mainly to declining returns of adult salmon to the Penobscot River. Smolt stocking on the Saco River has since declined to an average of 2,960 fish (range 400-5400) over the last five years.

In 1990 the SRSC started construction on their first salmon hatchery in Bar Mills. After completion in 1991, the SRSC began requesting F_2 generation eggs, which members could raise to the fry stage at the club's hatchery and then release into appropriate habitat. In 1997, the SRSC completed construction of their new hatchery presently located at the Marblehead boat launch in Biddeford, Maine. Additional modifications to the new hatchery building were completed in 1999, increasing egg incubation capacity up to 1.2 million. In order to compensate for decreased smolts from the USFWS, the SRSC began requesting more eyed eggs, up to 750,000 in recent years. Eyed-eggs obtained from the GLNFH are hatched and reared to the fry stage at the SRSC Hatchery.

Between 2000 and 2005, a total of 2,638,705 Atlantic salmon fry were stocked throughout the drainage (Tables 4 and 5 a-f). Annual fry stocking by the SRSC, which began in 1991, generally increased until 1999 then began to level off between 2000 and 2004 with a slight decrease in 2005 due to mortalities that occurred at the SRSC hatchery prior to stocking (Table 4). After 2005, a shift in eyed-egg allocations from the GLNFH F_2 domestic broodstock production led to decreased availability for other programs outside of the

[42] The TAC provides technical advice and guidance for the Maine Atlantic salmon program; it operates under a cooperative agreement between several agencies: MASC, USFWS, NMFS, Penobscot Indian Nation, MDIFW, and the University of Maine.

[43] U.S. Atlantic Salmon Assessment Committee. Annual Report of the U.S. Atlantic Salmon Assessment Committee. Report No. 18 – 2005 Activities. Gloucester, Massachusetts. February 27 – March 2, 2006. Prepared for U.S. Section to NASCO.

Penobscot River. Overall, the Saco River restoration effort has received fewer fish due to broader programmatic changes in the distribution of Penobscot River origin juveniles.

In general, hatchery-reared salmon smolts are stocked in the mainstem of the Saco River, while parr and fry are stocked in tributaries. No life stages are stocked below the Cataract Project or in the mainstem between West Buxton and Bonny Eagle because of lack of nursery and rearing habitat (Tables 5 a-f). In recent years, smolts have primarily been stocked in the mainstem between the Cataract Project and the Skelton Project to minimize passage at dams (Tables 5 a-f). Fry are stocked in several areas, but most are released in nursery/rearing habitat in tributaries located between the Cataract Project and the Skelton Project, between the Bonny Eagle Project and Hiram Project, and above the Hiram project (Tables 5 a-f). Recently, more effort has been placed on identifying suitable juvenile rearing habitat in the lower tributaries below the Skelton project to increase fry stocking in the lower portions of the drainage.

8.1.4 Habitat Suitability and Production Estimates

Densities of parr and fry were surveyed between 1997 and 2005 using standard electrofishing techniques over the entire Saco drainage where salmon fry are released (Table 10a). In 2001 and 2002, the MASC sampled at least once in each tributary or stream reach where releases took place to document survival and production. In some years, fewer sites have been sampled, but at a minimum standard sites are surveyed in order to maintain consistency. The data indicate almost all release sites and streams support juveniles. When water conditions permitted, spawning surveys were conducted to document wild Atlantic salmon spawning. Spawning surveys over the past several years have found redds in the Big Ossipee River where adults were released and in the mainstem and tributaries downstream of the Skelton Project. Spawning occurring below the Skelton Project is by adults that were passed at the Cataract fishways and have volitionally migrated only to the upper end of the Springs/Bradbury impoundment to habitat below Skelton. Given the size of the Saco River drainage, it is also possible that wild spawning is occurring in areas not surveyed.

8.2 American shad

8.2.1 Upstream Passage

A total of 18,719 adult American shad have been passed at the Cataract Project from 1993 to 2005 (Table 6). Annual returns for the first generation (1993-1997) ranged from 399 to 1,104 fish, while returns for the second generation (1998-2002) generally increased, ranging from 1,014 to 4,994 fish (Table 6; Figure 4). American shad return to the Saco River from late May to early August, but the majority migrate upstream in June and use the east channel fish lift (Table 6). In 2005, the lack of generation at the Cataract Project and very high river flows (Table 11) likely contributed to the low shad returns. Because the Cataract unit was out of service, all water was passed through spill gates or over the spillway, resulting in flows that did not attract fish to the entrance of the fish lift. In addition, fishways were shut down when stream flows exceeded those for which the fishway was designed (river flows above 11,000 cfs). As a result, the east channel fish lift and the fish locks at the Spring Island and Bradbury dams were shut down from May 1-May 6 and from May 26-June 2; the Skelton fish lift was shut down from May 1-May13 and from May 26-June 2[44].

American shad that pass the lower Cataract dams were either passed upstream into the Cataract impoundment, trucked upstream and released into the Springs/Bradbury impoundment due to low passage efficiency for this species at the locks, or transported to the Waldoboro hatchery for use as broodstock (Table 12). From 1993-1996, approximately 15% of the returning shad were passed into the Cataract impoundment and 85% were trucked upstream and released in the Springs/Bradbury impoundment. Between 1997 and 2001, 31% of the returning shad were passed into the Cataract impoundment in order to assess the efficiency of the fish locks at the Springs and Bradbury dams, and 9% were used for broodstock.

The number of American shad that use the Springs and Bradbury fish locks has remained very low despite numerous studies conducted between 1997 and 2002 to improve passage[45]. Underwater video cameras were used annually from 1997-2002 to monitor the locks, a shad fallback study was conducted in 1999, a radio-telemetry study was conducted in 2000, various operational measures were tested in 2001 (deep gate flow adjustments, lighting), and structural modifications were made in 2002. Despite these studies, combined passage efficacy at Springs and Bradbury dams is less than 5% (<5% of the shad passed into waters above the Cataract East and West Channel dams passed through the fish locks at the Springs and Bradbury dams) [46]. The reason for low shad passage efficiency remains unknown; therefore, American shad captured at the east channel fish lift continue to be trucked around the Springs and Bradbury dams as an interim measure.

A total of 75 American shad have been passed at the Skelton fish lift since its first full operational year: none in 2002, three in 2003, 72 in 2004, and none in 2005. In 2003, American shad were starting to move upstream when the fish lift was shut down to prevent the handling of Atlantic salmon at high temperatures; a protocol was subsequently developed by FPL Energy and the agencies to avoid a similar situation in the future. Low passage numbers in 2005 are probably a reflection of high flows and low passage numbers at the Cataract east channel fish lift.

Linear regression was used to determine the slope of the regression of the number of returning adult shad on year of return. For the analysis, shad returns were log-transformed. One outlier was removed (4,994 shad in 1999) to eliminate extreme variability, thereby allowing a better analysis of the long-term trend. The linear regression analysis indicated the slope (logshad=0.063(year) – 119.371) was not significantly different from zero (N=12; F-ratio =3.772; P=0.081). The shad population has not significantly increased nor decreased since 1993 (Figure 5).

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[44] The 2005 upstream fish passage season was poor in most Maine rivers due to extended periods of very high flows and cool water brought about by unusually high precipitation during May and June.

[45] See the annual Springs and Bradbury Fish Locks Reports for the years 1997 – 2003.

[46] Fish passage <u>efficiency</u> studies are those in which the number of tagged fish successfully passing through a fishway is compared to the number of tagged fish released at the entrance. We define passage <u>efficacy</u> as the number passing at a fishway compared to the number passing at the previous fishway.

8.2.2 Downstream Passage

Downstream passage studies have not been conducted for American shad, alewife, or blueback herring (collectively “alosines”).

8.2.3 Level of Recent Stocking Releases

Shad restoration on the Saco River is primarily passive, and relies on safe, timely, and effective upstream and downstream fish passage for adults and juveniles. Stocking of pre-spawned adults into suitable habitat is sometimes used to establish a population that is imprinted on a body of water prior to installation of fish passage. Stocking of fry into the Saco River has not been an intended part of the restoration effort on the Saco River. However, from 1997-2001 a total of 1,059 adult American shad were collected from the Cataract Project by the licensee and transferred by the Maine Department of Marine Resources (MDMR) to the Waldoboro shad hatchery for use as broodstock for the restoration program in the Kennebec River (Table 12), which is funded by the Kennebec Hydro-Developers Group. Most of the resulting fry were stocked in the Kennebec River basin, but some were stocked in the Saco River to compensate for the removal of adult spawners (Table 13). Use of Saco River fish as broodstock for the Kennebec River was discontinued when other sources of broodstock became available for the Kennebec River and the fishery agencies could no longer fund the stocking of shad in the Saco River.

8.3 River herring (alewife and blueback herring)

8.3.1 Upstream Passage

A total of 243,597 alewives and blueback herring have been passed at the Cataract Project between 1993 and 2005 (Table 7). Annual returns for the first generation (1993-1996) ranged from 831 to 9,820 fish; returns for the second generation (1997-2000) ranged from 2,137 to 31,070 fish; and for the third generation (2001-2004) from 20,198 to 66,890 fish (Figure 6). River herring generally returned to the Cataract Project between May and July, with the greatest number arriving in May (Table 7); returns in May are primarily alewife and those in June are primarily blueback herring. Low returns in 2005 may be attributable to the fact that the Cataract Project turbine was out of service and there were very high river flows that cause the fishways to shut down (see discussion under Section 8.2.1 for American shad).

Disposition of returning adult river herring in the Saco River has varied over the years. Between 1993 and 2001, 42% of the adults were passed upstream into the Cataract impoundment, 6% were transported one mile to the Springs/Bradbury impoundment, and 52% were transported nine miles upstream to the Skelton impoundment. After the Springs and Bradbury fish locks were demonstrated to be effective for passing alewife, returning adults have been passed into the Cataract impoundment and allowed to migrate upstream volitionally as far as the Skelton dam. Since the Skelton fish lift became fully operational in 2002, river herring have been allowed to migrate upstream using the Cataract, Springs and Bradbury, and Skelton fishways.

A total of 50,040 river herring have used the Skelton fish lift since its first full year of operation: none in 2001; 11,582 in 2002; 14,411 in 2003; 24,047 in 2004; and none in 2005. Of the river herring passed at Cataract East and West Channel fishways in 2002, 2003, and

2004, approximately 57%, 53%, and 76%, respectively, were passed at the Skelton fish lift (Tables 14 and 15).

Linear regression was used to determine the slope of the regression of the number of returning adult river herring on year of return. River herring returns were log-transformed, and one outlier was removed (390 in 2005). The resulting regression (logriverherring=0.298(year) – 585.613) was significantly different from zero (N=12; F-ratio = 19.660; P=0.001), indicating that river herring populations have significantly increased since 1993 (Figure 7).

8.3.2 Downstream Passage

Downstream passage studies have not been conducted for alosines.

8.3.3 Level of Recent Stocking Releases

The restoration of river herring is primarily passive, and relies on safe, timely and effective upstream and downstream fish passage for adults and juveniles. However, sometimes stocking of adults is used to create a population that is imprinted on a body of water prior to installation of fish passage. For instance, river herring were stocked above the Skelton Project between 1995 and 2001, prior to operation of the fish lift at the Skelton Project. Trap and truck operations to stock river herring in upstream habitat is available at the FPL Energy Cataract and Skelton Projects. Its use for transporting herring has been limited to date.

8.4 American eel

8.4.1 Trends in Population Size

Passage of American eels at each project on the Saco River is an issue of concern. American eels are included in the 1987 Management Plan. State and federal resource agencies recognized the importance of eels in the ecosystem and acknowledged the need for attention to the population by including American eel in the first Assessment Report[47]. Objectives of that assessment plan included managing river reaches I, II, and III (encompassing the Cataract, Skelton, Bar Mills, West Buxton, and Bonny Eagle projects) as a migratory pathway for American eels.

Abundance data for eels in the Saco River watershed is limited. A survey conducted as part of the Bar Mills Project relicensing (Eel Survey) indicates few eels are present above the Bar Mills Project[48]. Also noted in the Eel Survey was evidence of upstream movement of juvenile eels. Monitoring documented that small numbers of juvenile eels were leaving the aquatic environment to pass through areas of leakage or ascend the face of the dam during their upstream migration in the summer. In addition, a small number of adult eels were documented migrating downstream in the fall. A 2006 river-wide survey conducted for the U.S. Environmental Protection Agency (USEPA) indicated that there are eels present in relatively low numbers above all of the main stem dams on the Saco River, and that more

[47] 1996-1999 Final Assessment Report, Saco River Fish Passage Assessment Plan. December 1999. p. 15

[48] American Eel Migration Study, Final Report. December 2004

eels were collected in the lower reaches of the river than farther upstream[49].

8.4.2 Management of American Eel

Management of American eels is guided by the ASMFC Interstate Fisheries Management Plan for *American Eel Fisheries Management Plan* (2000). Goals of the Eel Management Plan are to maintain and enhance the abundance of American eels in inland and coastal waters, and contribute to the viability of the American eel spawning population. One objective is to provide adequate upstream passage and escapement to inland waters for elvers and older juvenile eels, as well as ensure adequate downstream passage and escapement to the ocean of pre-spawning adult eels.

9.0 Evaluation of Data under the Assessment Criteria

During the January 20, 2000 meeting, the SRCC decided to maintain the 12 assessment criteria used in the first assessment cycle. Trends in population size, level of releases and future plans, fish passage efficiency, habitat suitability and production estimates, comparison of the Saco River with other river systems, degree of attrition due to multiple barriers, effectiveness of trap and truck, and turbine mortality are the criteria addressed in this assessment. Biological characteristics are discussed by species in Section 6.0, *Fisheries of the Saco River*, and are not repeated here. Degree and location of salmon fallback, evidence of limiting factors, availability of staff, and interagency coordination have not been specifically addressed in this cycle.

9.1 Trends in Population Size

9.1.1 Atlantic salmon

Homewater returns of Atlantic salmon to the Saco River have fluctuated since 1993, but exhibited no overall trend. As stated in section 8.1.1, increases in the proportion of adult returns from stocked fry or natural reproduction were not expected to occur until 2003 or beyond. Historically, less than 18% of adult returns have originated from Saco River fry stocking and/or natural spawning. During this assessment cycle, the proportion of returns of wild origin salmon ranged from a low of 7.2% in 2001 to a high 46.2% in 2003. It is encouraging to note that over the last three years (2003-2005), 32% to 46.2% of the adult returns were from Saco River fry stocking and/or natural spawning. Also encouraging was the observation of a small number of Atlantic salmon redds in both the lower mainstem Saco River below the Skelton facility and in the Big Ossipee River, indicating that some adults are spawning. No data are available to indicate successful production of fry at these sites. Additional monitoring is needed to determine the extent of spawning and level of success for Atlantic salmon in these and other reaches of the Saco drainage. Given similar stocking rates, Atlantic salmon returns to the Saco River are expected to be similar in magnitude to those observed in recent years.

9.1.2 American shad

American shad have experienced modest, though not statistically significant, gains in the

[49] Chris Yoder, Midwest Biodiversity Institute, personal communication.

population since fishways became operational at the Cataract Project in 1993. This is indicated by the positive slope of the regression equation of returning adults by year (Table 6; Figure 4). Assessment of passage efficiency at the Springs/Bradbury fish locks from 1998 to 2001, when 23-57% of the returning adults were passed into the Cataract headpond, probably contributed to the low rate of increase. These fish did not use the fish locks, and were confined in 3% of the impoundment spawning habitat. As a potential result, survival of juvenile shad during the study may have been reduced because of competition for resources. Subsequent returns for this generation may have been affected. Although shad utilizing the east channel fish lift currently are trucked above the Springs/Bradbury fish locks, those that ascend the west channel fishway are restricted to the small amount of spawning habitat below the Springs and Bradbury dams. This passage problem may be one factor limiting shad restoration efforts.

9.1.3 River herring

River herring have experienced the greatest returns of the target species, with an average overall rate of increase at 29% since 1993. With the exception of 2005, a year when extreme high water flows occurred during the upstream migration season, river herring populations have generally increased since 1993 (Table 7; Figure 6).

9.2 Level of Recent Releases and Future Restoration Plans for Diadromous Species

Two species of migratory fish have been stocked in the Saco River, Atlantic salmon and American shad. Salmon have been stocked annually since 1982 with the most intense stocking occurring in the 1990's. Since 2000, the level of releases for a variety of salmon life stages has fluctuated. Among the life stages stocked, fry and smolts have been utilized most regularly (Table 4). The majority of habitat accessible for stocking throughout the drainage in Maine, as designated in the 1987 Management Plan, is stocked by the MASC and the SRSC. Observed increases in the proportion of wild origin adult salmon returning to the Saco River likely are due to increased fry stocking. Based upon results to date, the Saco River FAAC has determined that the management goals and objectives of the Atlantic salmon restoration program for the Saco River are valid. It is anticipated that salmon stocking will continue and that future releases of the various Atlantic salmon life stages into Maine waters will be similar to or increase in numbers compared with stockings undertaken in recent years.

Shad were stocked in the Saco River to a limited degree during the 1990's. MDMR collected shad from the Saco River for broodstock primarily to supplement restoration efforts on the Kennebec River that are funded by a group of hydropower owners. Some of the fry produced from this effort were stocked into the Saco to compensate for the removal of adults. This practice was discontinued after the 2001 season because broodstock are currently available from other river systems. The MDMR has no plans to continue releases of shad fry in the Saco River due to lack of funds. All returning adult shad on the Saco River will be allowed passage to available upstream habitat for natural spawning.

9.3 Habitat Suitability and Production Estimates

The location of suitable habitat for various life stages and production estimates for Atlantic salmon, American shad, and river herring are identified in the 1987 Management Plan (see

Section 3.0). The habitat characterizations and production estimates in this plan remain the basis for the restoration goals and objectives.

Assessment of juvenile densities in three tributaries stocked with Atlantic salmon fry suggest that densities of fry and parr and the growth and survival of Atlantic salmon in the Saco River appear to be comparable to or higher than many other Atlantic salmon rivers in Maine, including many of Gulf of Maine Distinct Population Segment rivers[50] (Table 10b).

Approximately 97% of the American shad spawning habitat between the Cataract Project and the Skelton project is above the Springs and Bradbury dams; the remaining 3% is between the Cataract dams (East Channel Dam and West Channel Dam) and Springs and Bradbury. While the existing trap and truck program provides adequate interim passage past these dams for shad, the MDMR, USFWS, and NMFS conclude that the rate of restoring the American shad population could be enhanced by improving access to upstream spawning and nursery habitat, specifically by addressing ineffective upstream passage at Springs and Bradbury for shad.

Between 1999 and 2004, the number of river herring passed at the lower Cataract dams has approached or exceeded 34,000 fish, which is the spawning escapement needed to sustain production in the Cataract and Skelton impoundments (Table 7; Table 15) corrected for passage efficiency, which is assumed to be 90%. Therefore, the FAAC has determined that sufficient numbers of river herring are being passed at the Cataract East Channel and West Channel dams for sustained production of river herring in the Cataract and Skelton impoundments consistent with habitat capabilities.

9.4 Fish Passage Efficiency

Downstream passage bypass efficiency for smolts has been evaluated at Cataract, Skelton, Bonny Eagle, West Buxton, and Bar Mills (see section 8.1.2). Bypass efficiencies were variable depending on the project and test conditions. Downstream bypass passage efficiency at hydroelectric projects on the mainstem Saco River have not been tested for the kelt life stage of Atlantic salmon or for juvenile and post-spawned river herring and American shad.

As discussed in Section 8.2.1, the efficiency of shad passage at the existing fishway locks at the Springs and Bradbury dams remains low despite the efforts to identify problems and implement remedial measures. Evaluation of potential passage impediments should be continued and corrections implemented.

[50] The Gulf of Maine Distinct Population Segment (GOM DPS) of Atlantic salmon was listed as endangered under the Endangered Species Act (ESA) in 2000. The GOM DPS includes all naturally reproducing wild populations and those river-specific hatchery populations of Atlantic salmon having historical river- specific characteristics found north of and including tributaries of the lower Kennebec River to, but not including, the mouth of the St. Croix River at the U.S.-Canada border (50 CFR Part 17.11(h) and 50 CFR Part 224.101). The current GOM DPS for Atlantic salmon includes the following rivers: Dennys, East Machias, Machias, Pleasant, Narraguagus, Ducktrap, and Sheepscot rivers, and Cove Brook. Atlantic salmon, including captive populations at Craig Brook National Fish Hatchery and GLNFH, having historic river-specific characteristics derived from these eight rivers are fully protected under the ESA.

9.5 Turbine Mortality

All of the licensee's projects below Hiram have downstream passage measures which provide a bypass around the turbine units. These measures were designed in consultation with the fisheries agencies and have been field tested for Atlantic salmon smolts (see Sections 8.1.2 and 9.4). Most of these consist of gates and bypass sluices that route downstream migrants past the powerhouse. Additionally, depending on river conditions at the time, migrants also pass on spillage over the dams and through the spillway gates. Some percent of smolts was observed to pass through the turbines. Therefore, the licensee conducted turbine survival studies. Smolt survival studies conducted on Saco River projects indicate immediate survival through the turbines were as high as 88% at Bar Mills and 85% and 97% for West Buxton[51]. In response to these results, the USFWS noted that survival rates at West Buxton declined as gate setting increased, and that the studies were not conducted at the highest gate setting. The USFWS further stated that higher mortality might be observed under normal flow conditions and with a greater number of fish passing the project. The USFWS further commented that, for the Bar Mills study, delayed mortality and long-term effects beyond the holding period used were not considered in the evaluation.

Recent studies and turbine passage models developed by the Department of Energy (Franke et al., 1997) have been reviewed by the SRCC. A review of this material estimates that, of the fish that travel through turbines, the average rate of immediate survival ranged between 74 - 87% for projects with turbine specifications similar to Hiram. (see discussion in section 8.1.2).

9.6 Effectiveness of Trap and Truck Operations

In conjunction with the installation of a new fish lift at the Cataract Project in 1993, trap and truck was initiated to provide access to and utilization of upstream habitat before permanent fish passage facilities were constructed at upstream hydropower projects. The Skelton fish lift was installed in 2001 and allowed fish to either be trapped at Cataract, or passed through to Skelton where they could be trapped and transported, if desired. Trap and truck operations have been a necessary part of the restoration effort to date in maintaining anadromous populations in the Saco River, and will remain so until permanent fish passage facilities are in place through the Bonny Eagle Project. In its 13 years of operation, the trap and truck operations have transported 200 adult salmon (Table 8) and 12,981 adult shad (Table 12) into the Saco River system. River herring access suitable spawning habitat by utilizing existing fish passage through the Skelton Project. To date, the fisheries agencies have determined that annual trucking of river herring above the Bar Mills Project has not been needed. However, based on the rate of recent returns, the need to utilize trap and truck for passage of river herring above Bar Mills may be necessary in future years to allow herring to exploit additional river reaches that provide suitable nursery habitat (Tables 14 and 15).

Trap and truck operations have been useful as an interim passage measure in developing and maintaining the returning runs that now exist. However, studies and assessments conducted on other river systems have identified limiting factors to this method of fish passage that

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[51] Normandeau Associates, Inc. and FPL Energy Maine Hydro, LLC. May 2002; Normandeau Associates, Inc. January 2000.

make it less desirable to the FAAC than permanent fish passage facilities. During trap and truck operations, handling of fish could result in migration delay, stress, dropdowns, and post release mortality[52]. While these factors have not been studied specifically on the Saco River, the FAAC considers that these factors may occur to some extent. Therefore, based upon what the FAAC considers best available information, the FAAC has concluded that trap and truck as a long-term fish passage measure may be less desirable and potentially less effective than permanent fish passage facilities. Nonetheless, trap and truck operations are a necessary and adequate interim upstream passage measure prior to operation of permanent fish passage facilities.

9.7 Degree of Attrition Due to Multiple Barriers

9.7.1 Atlantic salmon

The degree of attrition due to multiple barriers encountered by downstream migrating Atlantic salmon has not been fully ascertained at this time but based upon previous studies and literature, some level of attrition is expected to occur on the Saco (see Section 8.1.2)[53]. Downstream bypass and survival studies have been completed for Atlantic salmon smolts at several projects below Hiram. Compiling the information and results from these previous downstream efficiency studies into a single document would provide a comprehensive summary of effectiveness and efficiency throughout the system.

No evaluation of upstream passage above Skelton has been conducted because all salmon captured at the Skelton Project are currently trucked to the Big Ossipee River. Downstream studies for kelts have not been conducted.

9.7.2 American shad and river herring

The presence of multiple barriers on a river system has a potential cumulative effect on migration efficiency. Current data for alosines are limited for the Saco River, and the full extent of attrition is not known for downstream migration through all the mainstem projects below Hiram. Studies evaluating movement and behavior of shad and river herring were conducted at the Cataract Project. No studies have been conducted on the downstream migration of juvenile shad or river herring on the Saco. Likewise, no studies have been conducted or required of the licensee to evaluate attrition of American shad or river herring passing upstream through the Cataract, Springs Bradbury, and Skelton fishways. Therefore, the degree of attrition due to multiple barriers encountered by upstream and downstream migrating American shad and river herring on the Saco River cannot be fully ascertained at this time.

It is worth noting that annually increasing returns of river herring indicate sufficient downstream alewife escapement is occurring to promote continued increases in this stock. Therefore, attrition that may occur does not appear to negatively affect the river herring restoration efforts to date.

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[52] Bernard et. al. 1999; Marshall et. al. 1994; Susquehanna River Anadromous Fish Restoration Committee January1983, February 1987, and February 1988.

[53] Ferguson et al. 2005; Larinier 2001; New England Fisheries Management Council 1998; Parrish et al. 1998

9.7.3 American eel

Low numbers of eels were observed in the USEPA funded Index of Biological Integrity fish assemblage survey[54] and the 2002 Eel Survey on the Saco River. Contributing factors for low abundances in general may include limited recruitment, predation, restricted access to suitable growth habitat, mortality resulting from turbine entrainment, and alterations in habitat and water quality. These factors have not been studies on the Saco River. Fulfillment of the objectives of recent state and federal management plans for American eels will require safe, timely, and effective upstream and downstream passage at each project in order to successfully complete their life cycle[55]. Due to the lack of information pertaining to the American eel stock in the Saco River, the degree of attrition due to multiple barriers encountered by upstream and downstream migrants cannot be evaluated at this time.

9.8 Comparison of the Saco River with Other Rivers

It is difficult to compare fish abundances and rates of increase in the Saco River to other rivers on the east coast because each restoration program varies in longevity, management methods, limiting factors, bio-productivity, and habitat area. For instance, the Susquehanna River program annually stocks millions of American shad fry, while other large river systems (e.g., the Connecticut River) do not stock shad, and the Penobscot River program has been stocking approximately 500,000 – 750,000 Atlantic salmon fry, parr, and smolts from the mid-1970's to the 1990's, and more than 1,000,000 of the various juvenile Atlantic salmon life stages since 2000. Stocking rates of juvenile salmon to the Saco have been on the order of 300,000 - 400,000 in recent years. Returns of Atlantic salmon to the Saco River have been lower than expected and variable, similar to what other systems of various sizes have experienced (Table 16), but also higher than many other Maine salmon rivers. As discussed above (Section 9.3), juvenile salmon density in the Saco River appears to be similar to that of other Maine rivers for which monitoring data exist.

American shad returns on the Saco River and elsewhere are variable, but have not been consistently supported by stocking efforts such as on the Susquehanna River. The number of river herring returning to the Saco River appears to be proportionally better than other larger systems such as the Connecticut River, which has experienced drastic reductions in the river herring population between 1993 and 2003. River herring adult abundance trends on the Saco appear to qualitatively mirror those from the Androscoggin and Kennebec rivers, two other Gulf of Maine rivers for which some data are available.

10.0 Status of Diadromous Fish Populations in the Saco River

The current status of diadromous populations is mixed. River herring populations are increasing annually. Aside from anomalous weather years and the anticipated returns from those year classes, it may be reasonable to assume that river herring populations will continue to increase until all accessible habitat managed in the Saco River watershed for this species is utilized. American shad populations had initial gains from 399 in 1994 to 1,374 in

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[54] C. Yoder, MBI, Columbus, Ohio, personal communication.

[55] American Eel (*Anguilla rostrata*) Species Management Plan. November 1996; ASMFC 2000(a); See also ASMFC 2000(b), (2001), (2002), (2004).

1998 (returns of 4,994 were observed in 1999 and have not approached this number since) and annual adult numbers have generally fluctuated broadly around 1,300 individuals since 2000; however, the shad population has, overall, experienced moderate, though not significant, increases over the years. Atlantic salmon have experienced the least gains. Atlantic salmon returns continue to be low in number and continue to fluctuate greatly (Table 2), exhibiting a slight, though not significant, decreasing trend (Figure 3). The current restoration efforts (e.g., stocking efforts and targeted release of returning adults in the Big Ossipee River) are necessary for maintaining the population. Further gains in restoration of the salmon population will rely on increased stocking efforts and access to suitable habitat.

American eel were not considered in the 1994 Agreement and, therefore, restoration efforts in the Saco River drainage have been negligible for this species up to this point in time. Although no time series is available to measure changes in recruitment or abundance, limited data indicate few adults are in the system. Improving access to growth habitat could facilitate restoration of this species to the river and realizing the ecological benefits of this species.

11.0 Progress Towards Goals and Objectives

The FAAC has determined that, while the 1987 management goals have not been achieved, progress toward goals and objectives is being made in several river reaches (Table 17). Permanent fish passage facilities at Cataract and Skelton Projects were installed in support of managing Reach II (including Cataract East Channel Dam, Cataract West Channel Dam, Springs Island Dam, and Bradbury Dam) as a migratory pathway and for sustained production of anadromous species. Total river herring returns exceeded their estimated escapement numbers for the Cataract impoundment from 2002 – 2004 (Tables 14 and 15). American shad returns have been slowly increasing. Upstream passage continues to be problematic for shad at the Springs and Bradbury fish lock facilities. Trap and truck operations remain a necessary interim passage measure until permanent improvements are instituted at the locks. Upstream passage effectiveness for American eels at the Saco River dams is unknown. Downstream passage efficiency of juvenile alosines and adult eels at the Cataract dams has not been studied.

Installation of a fish lift at the Skelton Project in 2001 was implemented in support of managing Reach III (including Skelton, Bar Mills, West Buxton, and Bonny Eagle dams) as a migratory corridor and for sustained production of anadromous species. Total river herring returns in 2004 exceeded estimated escapement for both the Cataract and Skelton impoundments (Tables 14 and 15). However, upstream passage effectiveness for American eels at all four dams is unknown. Downstream passage efficiency of juvenile alosines at the Skelton Dam and adult eels at all four dams has not been studied.

Activities to address the management objectives for Reach IV and Reach V remained unchanged for this assessment cycle. Juvenile Atlantic salmon are stocked through much of the Maine portion of the watershed and adult salmon continue to be trucked to the Big Ossipee River for spawning in support of maintaining a sustainable population. Changes to these activities are dependent on achieving management goals in Reaches II and III.

No restoration activities have taken place in Reach VI or VII. The current license exemption for Swans Falls (which demarks the beginning of Reach VI) calls for upstream passage facilities to be completed no sooner than 2011. Given the lack of restoration efforts in this reach, this schedule could be modified according to the terms and conditions of the Swans Falls' license exemption if, among other circumstances, upstream passage facilities at Hiram are not constructed before 2011. The 1994 Agreement indicates that the need, design, and schedule for upstream passage at Swans Falls will be determined by the assessment process and further stipulates that upstream passage at Swans Falls may be scheduled for simultaneous completion with Hiram. Downstream passage for Atlantic salmon at Swans Falls (and Hiram) hinges on the presence of juvenile or adult fish via annual production stocking (as defined in the 1994 Agreement), trucking, or volitional passage, and subsequent natural reproduction[56]. The 1994 Agreement contemplates interim and/or permanent downstream passage at all dams above which anadromous fish have passed or have been stocked or trucked. Further, the 1994 Agreement stipulates permanent downstream passage at Swans Falls will be provided no more than two years from the commencement of annual production stocking above the dam.

12.0 Rate of Progress and Conclusions

The overall rate of progress towards reaching restoration goals, as indicated by population gains towards target escapement numbers, is relatively slow but positive.

12.1 Atlantic salmon

The annual returning adult Saco River salmon stock has remained relatively small and unchanged since 1993. The number of salmon fry, parr, and smolt stocked annually has varied significantly. Historically, approximately 82% of the net 1993-2000 returning adults were derived from smolts of hatchery origin, while over the last three years, 2003-2005, 32% to 46.2% of the adult returns were attributed to fry stocking and/or natural reproduction. Based on available MASC survey information, there is evidence of limited in-river spawning, but stocking is currently relied upon to maintain or enhance the smolt output required to increase adult returns. MASC nursery habitat surveys indicate that the density of juvenile salmon (specifically parr) is consistent with that of other similar Maine rivers, suggesting that survivorship of hatchery reared fry stocked into available nursery habitat is comparable to other stocking efforts statewide. Although there are out-of-basin influences on salmon returns, it is likely that continued stocking and natural reproduction will contribute significantly to improving adult returns on the Saco River.

The FAAC has concluded that: 1) increasing juvenile salmon stocking, 2) sequentially implementing permanent upstream fish passage from Bar Mills through Swans Falls, and 3) downstream passage at Hiram and Swans Falls will help reach management goals.

Data that would be helpful in evaluating future progress and needs specific to salmon include quantifying natural reproduction of Atlantic salmon, determining juvenile Atlantic salmon habitat utilization, and determining the extent of inter-specific competition with resident

[56] Per the 1994 Agreement, stocking or trucking are dependent on the participation of appropriate state and federal Fisheries Agencies in Maine and New Hampshire including the NHDFG and the USFS.

salmonids (i.e., indigenous brook trout and the ecologically similar exotic brown trout).

12.2 American shad

The annual size of the returning adult American shad stock has increased, though not significantly, since 1993. This population relies on natural reproduction of returning fish, with no hatchery-supplemented fry stocking. Existing upstream fish passage conditions at Springs-Bradbury are not optimal, and improvements to an existing fishway may enhance the ability of the population to exploit spawning and nursery habitat above the Springs Bradbury dams.

The FAAC has concluded that actions improving access to spawning and nursery habitat would benefit stock management goals. This includes: 1) improving upstream American shad passage at the Springs dam fish lock, 2) trapping and trucking American shad into the upper reaches of the Springs Bradbury impoundment until permanent shad passage improvements are instituted at the Springs dam fish lock, 3) sequentially implementing permanent upstream fish passage from Bar Mills through Bonny Eagle to promote further adult access to spawning and nursery habitat, and 4) assessing downstream passage at all applicable sites.

12.3 River herring

River herring stock abundance has generally experienced net increases annually such that target escapement numbers were reached for the Cataract and Skelton impoundments in 2004. Recruitment to the population is from natural reproduction of adults. Further increases in river herring stock can be achieved by providing access to river reaches upstream from Bar Mills. However, the most significant potential additional rearing habitat exists in Lake Arrowhead, Maine, and Ossipee Lake, New Hampshire. Fishery management and interagency data review must occur prior to stocking these lakes.

The FAAC has concluded that the river herring stock appears to be capable of expanding. Actions that promote access to additional spawning and nursery habitat would benefit stock management goals in those reaches where there are no unresolved fishery management conflicts. In the interim, some additional upstream mainstem habitat can and should be exploited in the future. During annual review meetings, the FAAC will determine 1) the need for trucking river herring into upstream habitat until permanent passage is implemented through Bonny Eagle, and 2) assessing downstream passage at all applicable sites.

Data concerning smallmouth bass populations in certain water bodies slated for future alewife introduction would also inform inter-specific management decisions. A database combining the body of studies and monitoring data produced by fishery agencies and licensee during the life of the 1994 Agreement would also assist fishery managers by providing a concise and readily accessible source of data.

12.4 American eel

American eel is a panmictic migratory species that has come under increased fishery management interest in recent years. Recruitment to the watershed is dependent on elvers arriving in the estuary and ascending to freshwater habitat. Although American eel stock abundance and migration in the Saco River is not monitored, available data documents the following: (1) a small number of juvenile eel migrate upstream at least as far as Bar Mills, (2) a limited number of adult eels emigrate in the fall, and (3) eels exist throughout the river but in decreasing upstream abundance.

The FAAC has concluded that enhanced access to upstream rearing habitat should benefit eel stock abundance in the Saco River. The FAAC recommends providing upstream passage at each dam sequentially. To allow adult eels to contribute spawners to the panmictic population, the FAAC recommendation is to subsequently provide sequential downstream passage at each dam once sufficient time has elapsed for newly recruited eels to grow to maturity.

13.0 Recommendations

Based on the analysis of monitoring results from 2000 – 2005, an evaluation of these data under the assessment criteria and in the context of data from the previous assessment cycle, the FAAC offers the following recommendations for upstream fish passage, and concludes that the results of implementing the recommendations will adequately protect the resources:

1. The lack of effective upstream passage for American shad at the Springs and Bradbury fish locks should to be addressed before the population exceeds capacity to trap-and-truck. The licensee should perform a study evaluating potential passage improvements at the Springs Island dam and fish lock and implement modifications, as appropriate, to be operational no later than 2015.

2. Trap and truck operations for American shad and river herring should be employed on an interim basis, as necessary, until permanent upstream fish passage is operational through the Bonny Eagle Project. Once permanent fish passage is operational at Bonny Eagle, shad and river herring will have access to all mainstem habitat below Hiram. Trap and truck operations for Atlantic salmon should continue on an interim basis until permanent upstream fish passage is operational through Hiram.

3. Based on the existing fisheries management activities and fish passage measures in the lower Saco, specifically the upstream passage issues at the Springs and Bradbury dams for shad, the availability of trap and truck as an interim management strategy, the safe handling protocols for Atlantic salmon, and implementation of recommended management and restoration activities throughout the watershed, operation of permanent upstream passage for anadromous species at Bar Mills can be delayed until no sooner than 2016.

4. Once permanent upstream fish passage at Bar Mills is operational, installation of permanent upstream fish passage for anadromous species should occur sequentially at each of the upstream dams and be operational within three (3) years of passage at the downstream project - the approximate generation time for river herring. (West Buxton – 2019, Bonny Eagle – 2022, and Hiram – 2025). These dates may be delayed following consultation with and agreement by the USFWS, NMFS, MASC, and MDMR, as appropriate.

5. The *Atlantic Salmon Trap Operating and Fish Handling Protocols* have been modified to adapt to observed conditions for shad. However, the agencies and licensee need to maintain operational flexibility, particularly for shad passage. The practice of interagency and licensee communication and coordination to modify operational procedures at the Skelton fish lift to accommodate late shad runs (see Section 7.1 for background), and other fish passage concerns, should be continued.

6. Upstream passage at Swans Falls should occur concurrent with upstream passage implementation at the Hiram Project.

The four-year assessment process was specifically designed to develop consensus on the need, timing, and design for new upstream fish passage facilities at the Bar Mills, West Buxton, Bonny Eagle, Hiram, and Swan Falls projects. Additionally, the FAAC recommends the following fisheries management measures and concludes that their implementation, combined with the preceding recommendations, will further the Saco River restoration goals and enhance the fishery resources of the watershed:

(a) Based on the observed increases in the proportion of adult Atlantic salmon returns from stocked fry or natural reproduction, stocking of various juvenile life stages of Atlantic salmon is recommended.

(b) Upstream passage measures for American eel should be implemented at each facility in two-year intervals beginning with the Cataract Project and extending sequentially up to the Hiram Project. This is intended to enhance access to available rearing habitat for juvenile eels.

(c) Downstream passage measures for American eel should be implemented at each project beginning with the Cataract Project. The Cataract Project should implement downstream passage three years after upstream passage is operational. This phased approach provides time to study the timing and duration of the downstream migration season. Downstream passage at projects upstream of Cataract may be delayed 12 years after installation of upstream passage, as it represents the duration it takes female American eels to start to mature and out-migrate in Maine waters. Interim downstream measures, including monitoring and use of protective measures if mortality above a predetermined level be observed, should be implemented during this 12 year period.

(d) Given current management practices upstream of Hiram and based on the best available information concerning the risks to salmon smolts passing downstream, additional downstream passage measures at the Hiram project are not currently needed. Based upon the schedule set forth in recommendation #4 above, permanent upstream passage at Hiram will be operational by 2025, provided it is necessary, based upon the status of salmon restoration at that time. Permanent downstream passage must be operational coincident with the operation of permanent upstream fish passage facilities at the Hiram site. However, smolts derived from future stocking efforts above Hiram will benefit from the implementation of permanent downstream fish passage measures prior to 2025. Given that it will take a number of years to develop and implement an expanded agency approved stocking program, it is reasonable and beneficial to schedule implementation of permanent downstream fish passage measures no sooner than 2017. If fish are not being stocked above Hiram pursuant to a written, agency approved Atlantic salmon stocking program by 2017, permanent downstream fish passage measures may be delayed until two years after the program is implemented, or until permanent upstream passage is operational at Hiram (whichever is earlier).

(e) Permanent upstream passage at the Swans Falls Project should be implemented concurrent with construction of upstream passage at the Hiram Project.

(f) A three-year study to determine downstream passage routes of salmon kelts at selected FPL Energy hydroelectric projects should be conducted to complement the previously completed downstream passage studies for smolts.

(g) Semi-quantitative downstream passage effectiveness studies should be implemented or completed for alosines, as needed, at each project.

(h) Results from all previously conducted downstream bypass efficiency studies should be compiled into a single set of documents for review.

(i) Information on the timing and environmental triggers for out-migration of American eel should be collected for the lower basin.

(j) The fishery agencies should maintain a sub-committee including MDIFW, MDMR, and MASC to address the issue of species interaction and conflict as restoration of anadromous species progresses. While progress has been made among the agencies to resolve conflicts, the issue of potential species interactions remains unresolved. This committee should consider the existing agreement between the MDIFW and MASC[57].

14.0 Plan for Future Fish Passage

Plans for future fish passage and management measures were contemplated during the facilitated discussions that occurred between 2004 and 2006. Specific fish passage and management measures agreed upon by the SRCC, based on the data and recommendations outlined above, are contained within the 2007 Saco River Fisheries Assessment Settlement Agreement (2007 Agreement). In general, the plans for future passage propose an orderly and logical approach to the restoration efforts that will continue the existing interim trap and truck measures for anadromous species while fisheries management issues are addressed, followed by permanent passage measures for the migratory runs. For the anadromous species (salmon, shad, and river herring) permanent upstream fish passage facilities are scheduled to be installed sequentially at Bar Mills, West Buxton, Bonny Eagle, and Hiram starting in 2015. Passage for shad at the Springs and Bradbury locks will be addressed. Permanent downstream passage facilities for anadromous species exist at all of the projects

[57] MASC – MDIFW Interaction Issue Resolution Annual Work Plan for the Saco River Watershed. August 2006

below Hiram and have been tested for juvenile salmon passage effectiveness. The 2007 Agreement schedules downstream efficiency studies for the other species and life stages sequentially. Permanent downstream passage facilities for salmon are scheduled at the Hiram Project for no sooner than 2017 while the appropriate fisheries agencies develop a stocking plan.

The 2007 Agreement provides for mainstem passage for the catadromous American eel up through the Hiram project. Upstream passage facilities will be provided at each project sequentially beginning in 2008. Downstream passage measures will be provided at the lowermost project, Cataract, in 2011 and then sequentially at the other projects based on maturation rates for eels in Maine waters[58].

Fish passage data collected in 2004 and 2005 are added in this final report and further supports the provisions of the 2007 Agreement. The 2007 Agreement will be filed with the Federal Energy Regulatory Commission (FERC) as an Offer of Settlement on the Bar Mills relicensing proceedings and for inclusion as license conditions for the Cataract, Skelton, West Buxton, Bonny Eagle, and Hiram projects. The 2007 Agreement also outlines additional fisheries management activities addressing the above listed management recommendations for the Saco River watershed within the state of Maine.

The SRCC believes the recommendations provided above and the provisions of the 2007 Agreement meet the goals of the Assessment Process and Assessment Reports under Annex 1 of the 1994 Agreement. Therefore, no further Assessment Reports are required. Nonetheless, the SRCC agrees to continue annual meetings in March to review fish passage operational data from the previous year, draft an annual report, develop an operational plan for the upcoming year, and evaluate the progress toward the restoration and management goals.

15.0 Availability and Accuracy of Data to Support Conclusions

All fish passage data were collected by FPL Energy at their facilities. The protocol for handling and counting fish collected at the fish lifts is described in the Springs and Bradbury and Skelton annual reports. Changes to these protocols were made in consultation with the FAAC. Fish counts were made readily available to the SRCC and are considered accurate by the FAAC.

Conclusions for Atlantic salmon are based on: 1) counts made by FPL Energy at the Cataract and Skelton fish passage facilities; 2) juvenile salmon population abundance estimates obtained through standard electrofishing catch multi-pass depletion population estimation metrics; 3) redd counts from visual observations undertaken by MASC, USFWS, and FPL Energy of salmon spawning activity; and 4) stocking data provided to the agencies by the SRSC.

Conclusions for American shad and alewife are based on counts made by FPL Energy at the Cataract and Skelton projects, and on estimates of productivity and spawning escapement

[58] Oliveira and McCleave 2000

made by MDMR using habitat area. Productivity and escapement estimates are based on long-term harvest records on several Maine river systems (for river herring, primarily alewife), on a 20-year record of fish passage on the Connecticut River (for American shad), and on mapped habitat area. MDMR routinely makes productivity and escapement estimates for river systems with restoration programs.

Tables

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Table 1. Freshwater fishes as reported in the 1987 Saco River Strategic Plan for Fisheries Management.

Common Name	Scientific Name
Banded killifish	*Fundulus diaphanous*
Black crappie	*Pomoxis nigromaculatus*
Blacknose dace	*Rhinichtys atratulus*
Blacknose shiner	*Notropis heterolepis*
Bridle shiner	*Notropis bifrenatus*
Brook stickleback	*Culaea inconstans*
Brook trout	*Salvelinus fontinalis*
Brown bullhead	*Ictalurus nebulosis*
Brown trout	*Salmo trutta*
Burbot	*Lota lota*
Chain pickerel	*Esox niger*
Common shiner	*Notropis cornutus*
Creek chub	*Semotilus atromaculatus*
Creek chubsucker	*Erimyzon oblongus*
Fallfish	*Semotilus corporalis*
Finescale dace	*Phoxinus neogaeus*
Golden shiner	*Notemigonus crysoleucas*
Lake chub	*Couesius plumbeus*
Lake trout	*Salvelinus namaycush*
Lake whitefish	*Coregonus clupeaformis*
Landlocked salmon	*Salmo salar*
Largemouth bass	*Micropterus salmoides*
Longnose sucker	*Catastomus catastomus*
Ninespine stickleback	*Pungitius pungitius*
Northern redbelly dace	*Phoxinus eos*
Pumpkinseed	*Lepomis gibbossus*
Rainbow trout	*Salmo gairdneri*
Slimy sculpin	*Cottus cognatus*
Smallmouth bass	*Micropterus dolomieui*
Threespine stickleback	*Gasterosteus aculeatus*
White perch	*Morone Americana*
White sucker	*Catostomus commersoni*
Yellow perch	*Perca flavescens*

Table 2. Monthly trap catches of Atlantic salmon at the Cataract Project, Saco River, Maine between 1993 – 2005.

Year	May	June	July	August	Sept.	Oct.	Nov.	Total
				East Channel Fish Lift				
1993	0	9	6	0	0	0	0	15
1994	0	5	0	0	0	0	0	5
1995	3	8	0	0	5	2	0	18
1996	0	23	8	1	0	1	0	33
1997	1	10	4	0	1	0	0	16
1998	0	6	5	0	0	0	0	11
1999	1	22	0	1	0	0	0	24
2000	1	21	7	0	1	0	0	30
2001	7	18	4	2	1	0	0	32
2002	0	10	1	0	0	0	0	11
2003	2	10	0	0	0	0	0	12
2004	1	5	1	1	0	0	0	8
2005	0	5	0	0	0	0	0	5
Subtotal:	16	152	36	5	8	3	0	220
				West Channel Fishway				
1993	0	5	7	1	14	11	0	38
1994	0	5	1	6	6	0	0	18
1995	1	10	1	0	3	1	0	16
1996	2	14	2	2	0	1	0	21
1997	0	6	3	1	1	1	0	12
1998	0	5	10	0	2	0	0	17
1999	6	23	3	4	2	4	0	42
2000	2	10	2	3	1	2	0	20
2001	1	13	15	0	7	1	0	37
2002	4	25	0	0	2	5	0	36
2003	0	21	1	0	5	0	0	27
2004	1	1	8	0	1	0	0	11
2005	2	7	10	0	1	0	0	20
Subtotal:	19	145	63	17	45	26	0	315
				Total (Both Fish Passageways)				
1993	0	14	13	1	14	11	0	53
1994	0	10	1	6	6	0	0	23
1995	4	18	1	0	8	3	0	34
1996	2	37	10	3	0	2	0	54
1997	1	16	7	1	2	1	0	28
1998	0	11	15	0	2	0	0	28
1999	7	45	3	5	2	4	0	66
2000	3	31	9	3	2	2	0	50
2001	8	31	19	2	8	1	0	69
2002	4	35	1	0	2	5	0	47
2003	2	31	1	0	5	0	0	39
2004	2	6	9	1	1	0	0	19
2005	2	12	10	0	1	0	0	25
Grand Total:	**35**	**297**	**99**	**22**	**53**	**29**	**0**	**535**

Table 3. Sea age at maturity of Atlantic salmon returns to the Saco River, Maine between 1993 - 2005. (SW = sea winter; RS = repeat spawner)

	Hatchery Origin				Wild Origin				Total				Grand
Year	**1SW**	**2SW**	**3SW**	**RS**	**1SW**	**2SW**	**3SW**	**RS**	**1SW**	**2SW**	**3SW**	**RS**	**Total**
1993	4	48	0	1	0	0	0	0	4	48	0	1	53
1994	6	17	0	0	0	0	0	0	6	17	0	0	23
1995	0	34	0	0	0	0	0	0	0	34	0	0	34
1996	11	39	1	3	0	0	0	0	11	39	1	3	54
1997	5	23	0	0	0	0	0	0	5	23	0	0	28
1998	9	7	0	0	4	7	1	0	13	14	1	0	28
1999	10	11	0	0	12	31	2	0	22	42	2	0	66
2000	31	15	0	0	0	4	0	0	31	19	0	0	50
2001	15	49	0	0	0	5	0	0	15	54	0	0	69
2002	3	37	0	2	3	2	0	0	6	39	0	2	47
2003	2	19	0	0	2	16	0	0	4	35	0	0	39
2004	3	10	0	0	4	4	0	0	5	14	0	0	19
2005	5	12	0	0	1	7	0	0	6	19	0	0	25
Total:	**104**	**321**	**1**	**6**	**24**	**76**	**3**	**0**	**128**	**397**	**4**	**6**	**535**
%	19.4	60.0	0.2	1.1	4.5	14.2	0.6	0.0	23.9	74.2	0.7	1.1	100.0

Table 4. Releases of hatchery-reared Atlantic salmon in the Saco River drainage, Maine between 1982 and 2005.

YEAR	Number of Salmon Stocked				GRAND
	FRY	PARR (0+)	PARR (1+)	SMOLT	TOTAL
1982	-	47,100	-	-	47,100
1983	-	-	-	20,300	20,300
1984	-	-	-	5,100	5,100
1985	-	-	23,600	5,100	28,700
1986	-	-	10,000	35,200	45,200
1987	-	-	69,800	22,000	91,800
1988	47,000	-	-	25,100	72,100
1989	-	37,800	49,600	9,900	97,300
1990	-	30,100	47,800	10,600	88,500
1991	111,000	-	-	10,300	121,300
1992	154,000	50,200	400	19,800	224,400
1993	167,000	-	-	20,100	187,100
1994	190,000	-	400	20,000	210,400
1995	376,000	-	-	19,700	395,700
1996	-	45,000	-	20,000	65,000
1997	97,000	63,300	-	20,200	180,500
1998	431,000	50,000	-	21,300	502,300
1999	688,000	47,000	-	20,100	755,100
2000	516,020	48,200	-	22,600	586,820
2001	371,000	-	-	400	371,400
2002	532,000	-	-	4,100	536,100
2003	500,790	20,000	-	3,572	524,362
2004	402,050	-	-	5,400	407,450
2005	316,845	-	18,000	1,700	336,545
Total	4,899,705	438,700	219,600	342,200	5,900,577

Table 5a. Atlantic salmon stocking by management reach of the Saco River drainage, Maine, during 2000.

Management Reach	Reach Description	Location	Life Stage Fry	Life Stage Parr	Life Stage Smolts
I	River mouth to Cataract Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
II	Cataract Dam to Skelton Dam	Mainstem	0	0	0
		Tributaries (7)	54,600	0	0
		Reach Subtotal:	54,600	0	0
III	Skelton Dam to Bar Mills Dam	Mainstem	0	0	0
		Tributaries (3)	15,400	0	0
		Reach Subtotal:	15,400	0	0
III	Bar Mills Dam to West Buxton Dam	Mainstem	0	0	22,600
		Tributaries (2)	0	0	0
		Reach Subtotal:	0	0	22,600
III	West Buxton Dam to Bonny Eagle Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
IV	Bonny Eagle Dam to Hiram Dam	Mainstem	0	0	0
		Tributaries (16)	185,675	48,200	0
		Reach Subtotal:	185,675	48,200	0
V	Hiram Dam to Swan Falls Dam	Mainstem	0	0	0
		Tributaries (3)	260,345	0	0
		Reach Subtotal:	260,345	0	0
	Subtotals	Mainstem	0	0	22,600
		Tributaries	516,020	48,200	0
		Grand Totals:	516,020	48,200	22,600

Table 5b. Atlantic salmon stocking by management reach of the Saco River drainage, Maine, during 2001.

Management Reach	Reach Description	Location	Life Stage Fry	Parr	Smolts
I	River mouth to Cataract Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
II	Cataract Dam to Skelton Dam	Mainstem	0	0	0
		Tributaries (7)	7,210	0	0
		Reach Subtotal:	7,210	0	0
III	Skelton Dam to Bar Mills Dam	Mainstem	0	0	0
		Tributaries (3)	2,800	0	0
		Reach Subtotal:	2,800	0	0
III	Bar Mills Dam to West Buxton Dam	Mainstem	0	0	400
		Tributaries (2)	0	0	0
		Reach Subtotal:	0	0	400
III	West Buxton Dam to Bonny Eagle Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
IV	Bonny Eagle Dam to Hiram Dam	Mainstem	0	0	0
		Tributaries (16)	45,800	0	0
		Reach Subtotal:	45,800	0	0
V	Hiram Dam to Swan Falls Dam	Mainstem	0	0	0
		Tributaries (3)	85,500	0	0
		Reach Subtotal:	85,500	0	0
	Subtotals	Mainstem	0	0	400
		Tributaries	141,310	0	0
		Grand Totals:	141,310*	0	400

* Additional fry were stocked; incomplete data due to loss of stocking trip data sheets.

Table 5c. Atlantic salmon stocking by management reach of the Saco River drainage, Maine, during 2002.

Management Reach	Reach Description	Location	Life Stage Fry	Parr	Smolts
I	River mouth to Cataract Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
II	Cataract Dam to Skelton Dam	Mainstem	0	0	4,100
		Tributaries (7)	14,200	0	0
		Reach Subtotal:	14,200	0	4,100
III	Skelton Dam to Bar Mills Dam	Mainstem	0	0	0
		Tributaries (3)	8,200	0	0
		Reach Subtotal:	8,200	0	0
III	Bar Mills Dam to West Buxton Dam	Mainstem	0	0	0
		Tributaries (2)	0	0	0
		Reach Subtotal:	0	0	0
III	West Buxton Dam to Bonny Eagle Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
IV	Bonny Eagle Dam to Hiram Dam	Mainstem	0	0	0
		Tributaries (16)	165,410	0	0
		Reach Subtotal:	165,410	0	0
V	Hiram Dam to Swan Falls Dam	Mainstem	0	0	0
		Tributaries (3)	344,190	0	0
		Reach Subtotal:	344,190	0	0
	Subtotals	Mainstem	0	0	4,100
		Tributaries	532,000	0	0
		Grand Totals:	532,000	0	4,100

Table 5d. Atlantic salmon stocking by management reach of the Saco River drainage, Maine during 2003.

Management Reach	Reach Description	Location	Life Stage Fry	Parr	Smolts
I	River mouth to Cataract Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
II	Cataract Dam to Skelton Dam	Mainstem	4,100	0	3,233
		Tributaries (7)	96,900	0	0
		Reach Subtotal:	101,000	0	3,233
III	Skelton Dam to Bar Mills Dam	Mainstem	0	0	0
		Tributaries (3)	44,700	0	0
		Reach Subtotal:	44,700	0	0
III	Bar Mills Dam to West Buxton Dam	Mainstem	0	0	339
		Tributaries (2)	9,200	0	0
		Reach Subtotal:	9,200	0	339
III	West Buxton Dam to Bonny Eagle Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
IV	Bonny Eagle Dam to Hiram Dam	Mainstem	0	0	0
		Tributaries (16)	300,070	20,000	0
		Reach Subtotal:	300,070	20,000	0
V	Hiram Dam to Swan Falls Dam	Mainstem	0	0	0
		Tributaries (3)	45,820	0	0
		Reach Subtotal:	45,820	0	0
	Subtotals	Mainstem	4,100	0	3,572
		Tributaries	496,690	20,000	0
		Grand Totals:	500,790	20,000	3,572

Table 5e. Atlantic salmon stocking by management reach of the Saco River drainage, Maine during 2004.

Management Reach	Reach Description	Location	Life Stage Fry	Parr	Smolts
I	River mouth to Cataract Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
II	Cataract Dam to Skelton Dam	Mainstem	0	0	5,400
		Tributaries (7)	65,200	0	0
		Reach Subtotal:	65,200	0	5,400
III	Skelton Dam to Bar Mills Dam	Mainstem	0	0	0
		Tributaries (3)	27,200	0	0
		Reach Subtotal:	27,200	0	0
III	Bar Mills Dam to West Buxton Dam	Mainstem	0	0	0
		Tributaries (2)	7,500	0	0
		Reach Subtotal:	7,500	0	0
III	West Buxton Dam to Bonny Eagle Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
IV	Bonny Eagle Dam to Hiram Dam	Mainstem	0	0	0
		Tributaries (16)	251,600	0	0
		Reach Subtotal:	251,600	0	0
V	Hiram Dam to Swan Falls Dam	Mainstem	0	0	0
		Tributaries (3)	50,550	0	0
		Reach Subtotal:	50,550	0	0
	Subtotals	Mainstem		0	5,400
		Tributaries	402,050	0	0
		Grand Totals:	402,050	0	5,400

Table 5f. Atlantic salmon stocking by management reach of the Saco River drainage, Maine during 2005.

Management Reach	Reach Description	Location	Life Stage: Fry	Parr	Smolts
I	River mouth to Cataract Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
II	Cataract Dam to Skelton Dam	Mainstem	0	0	1,700
		Tributaries (7)	67,000	0	0
		Reach Subtotal:	67,000	0	1,700
III	Skelton Dam to Bar Mills Dam	Mainstem	0	0	0
		Tributaries (3)	48,200	0	0
		Reach Subtotal:	48,200	0	0
III	Bar Mills Dam to West Buxton Dam	Mainstem	0	0	0
		Tributaries (2)	7,300	0	0
		Reach Subtotal:	7,300	0	0
III	West Buxton Dam to Bonny Eagle Dam	Mainstem	0	0	0
		Tributaries (0)	0	0	0
		Reach Subtotal:	0	0	0
IV	Bonny Eagle Dam to Hiram Dam	Mainstem	0	18,000	0
		Tributaries (16)	162,645	0	0
		Reach Subtotal:	162,645	18,000	0
V	Hiram Dam to Swan Falls Dam	Mainstem	0	0	0
		Tributaries (3)	31,700	0	0
		Reach Subtotal:	31,700	0	0
	Subtotals	Mainstem	0	18,000	1,700
		Tributaries	316,845	0	0
		Grand Totals:	316,845	18,000	1,700

Table 6. The number of American shad counted passing upstream at the Cataract Project, Saco River, Maine between 1993 - 2005.

Year	Total	East Channel Fish lift						West Channel Fishway				
		May	June	July	August	Subtotal	%	May	June	July	Subtotal	%
1993	882	0	731	144	1	876	99.3	0	3	3	6	0.7
1994	399	0	297	98	0	395	99	0	2	2	4	1
1995	580	79	437	55	0	571	98.4	1	8	0	9	1.6
1996	837	2	446	351	11	810	96.8	0	22	5	27	3.2
1997	1,104	0	740	277	52	1,069	96.8	0	34	1	35	3.2
1998	1,374	575	668	127	0	1,370	99.7	2	2	0	4	0.3
1999	4,994	682	3,489	363	0	4,534	90.8	439	21	0	460	9.2
2000	1,326	0	871	178	3	1,049	79.3	0	271	3	274	20.7
2001	2,570	1089	772	115	0	1,976	76.9	189	402	3	594	23.1
2002	1,014	74	455	278	0	807	79.6	1	203	3	207	20.4
2003	1,227	0	933	166	0	1,099	89.6	7	121	0	128	10.4
2004	1,668	3	1,510	126	0	1,639	98.3	0	15	14	29	1.7
2005	744	0	738	0	0	738	99.2	1	2	3	6	0.8
Total	18,719	2,504	12,087	2,278	67	16,933		640	1,106	37	1,783	

Table 7. The number of river herring (alewife and blueback herring) counted passing upstream at the Cataract Project, Saco River, Maine between 1993 - 2005

Year	Total	East Channel Fish lift					West Channel Fishway				
		May	June	July	Subtotal	% of Total	May	June	July	Subtotal	% of Total
1993	831	0	778	52	830	99.9	0	1	0	1	0.1
1994	2,240	1,647	313	0	1,960	87.5	89	191	0	280	12.5
1995	9,820	5,021	1,883	0	6,904	70.3	2,867	49	0	2,916	29.7
1996	9,162	3,514	5,501	0	9,015	98.4	69	78	0	147	1.6
1997	2,137	1,114	734	4	1,852	86.7	0	285	0	285	13.3
1998	16,078	14,705	104	0	14,809	92.1	208	1,061	0	1,269	7.9
1999	31,070	17,991	1,166	0	19,157	61.7	10,950	963	0	11,913	38.3
2000	25,136	4,008	19,104	0	23,112	91.9	519	1,505	0	2,024	8.1
2001	66,890	31,772	10,144	0	41,916	62.7	23,300	1,674	0	24,974	37.3
2002	20,198	1,727	17,622	0	19,349	95.8	382	467	0	849	4.2
2003	26,772	22,536	0	0	22,536	84.2	4,202	22	0	4,224	15.8
2004	32,823	31,904	391	0	32,295	98.4	528	0	0	528	1.6
2005	390	229	154	2	385	98.7	5	0	0	5	1.3
Total	243,597	136,168	57,894	58	194,120		43,004	6,417	56	49,477	

Table 8. Number of adult Atlantic salmon captured and transported to the Big Ossipee River, Maine, by month, year, and fish passage trap location.

Cataract Project (East Channel Fish Lift)							
Year	**May**	**June**	**July**	**August**	**September**	**October**	***Total***
1993	0	0	0	0	0	6	6
1994	0	4	0	0	0	0	4
1995	3	8	0	0	5	1	17
1996	0	16	7	0	0	1	24
1997	1	10	0	0	0	0	11
1998	0	4	4	1	0	0	9
1999	1	5	0	0	0	0	6
2000	2	11	0	0	1	0	14
Subtotal:	**7**	**58**	**11**	**1**	**6**	**8**	**91**
Skelton Project							
Year	**May**	**June**	**July**	**August**	**September**	**October**	**Total**
2001*	0	0	0	0	13	18	31
2002	0	13	0	0	6	7	26
2003	0	12	0	0	12	0	24
2004	0	5	0	0	12	0	16
2005	0	6	0	0	5	0	11
Subtotal:	**0**	**36**	**0**	**0**	**48**	**25**	**109**
Grand Total:	**7**	**94**	**11**	**1**	**54**	**33**	**200**
%	**3.5**	**47.0**	**5.5**	**0.5**	**27.0**	**16.5**	**100.0**

* Skelton fishway operational September 2001

Table 9. Pro-rated mean of mean daily flow (cfs) values for each day during the months of April, May, and June at the Hiram Project*.

Day of Month	April	May	June
1	3723	4880	2283
2	3942	4765	2263
3	4122	4662	2212
4	4199	4604	2141
5	4244	4552	2038
6	4437	4475	1974
7	4495	4360	1890
8	4552	4205	1807
9	4540	4096	1743
10	4507	3967	1723
11	4533	3845	1710
12	4552	3800	1678
13	4610	3710	1678
14	4662	3646	1704
15	4681	3562	1710
16	4713	3479	1704
17	4797	3376	1723
18	4861	3266	1743
19	4970	3176	1710
20	5067	3061	1659
21	5112	2977	1601
22	5125	2926	1530
23	5163	2861	1466
24	5208	2810	1415
25	5266	2771	1382
26	5221	2688	1357
27	5157	2604	1325
28	5048	2527	1273
29	5009	2450	1247
30	4958	2392	1241
31		2328	

*Drainage area at the Hiram Project is 832 sq. mi. and hydraulic capacity of the Project's turbines is 2,380 cfs. Hiram Project flows are based on pro-ration of flows measured at USGS gage 01066000, Saco River at Cornish, Maine; period of record is 90 years (06/04/1916-09/30/2005); drainage area is 1,293 sq. mi. To determine flows at the Hiram Project, flows measured at the Cornish gage were adjusted by a factor of 0.643.

Table 10a. Densities of juvenile Atlantic salmon per habitat unit (1 unit = 100 m^2) in the Saco River drainage observed during stream sampling between 1997 – 2005.

	Young-of-Year				Parr			
Year	Minimum	Median	Maximum	Sites	Minimum	Median	Maximum	Sites
1997	5	11	17	3	-	-	-	-
1999*	8	96	197	5	1	2	3	5
2000	7	57	141	7	0	18	49	7
2001	1	31.2	118	15	2	20	54	15
2002	0.0	11.3	78.7	9	0.0	3.5	14.5	9
2003	2.1	21.5	35.2	2	6.0	8.8	11.6	2
2004	0	2.2	7.35	4	1	4.3	11.8	4
2005	0	0	2.1	4	0	0	11.2	4

* Environmental conditions did not allow for electro-fishing in 1998.

Table 10b. Juvenile Atlantic salmon population densities (fish/100 square meters) based on multiple electrofishing estimates in Maine rivers for 2005.

River System	Young-of-Year				Parr			
	Minimum	Median	Maximum	Sites	Minimum	Median	Maximum	Sites
Dennys	0.0	5.5	20.7	23	0.0	2.4	10.6	25
East Machias	0.0	6.0	28.6	6	0.0	8.4	20.1	7
Machias	0.0	2.8	30.3	9	0.0	5.7	22.3	10
Pleasant River	1.5	24.8	29.6	3	0.7	5.0	18.6	3
Narraguagus	0.0	3.2	26.4	38	0.0	2.5	15.3	36
Cove Brook	0.0	0.0	0.0	3	0.0	0.0	0.0	3
Ducktrap	0.2	5.1	30.8	4	2.0	6.5	12.6	4
Sheepscot	0.0	2.3	46.7	28	0.0	2.7	23.6	25
Mooseleuk Stream (Aroostoock)	0.3	0.3	3.2	3	7.8	2.8	5.3	2
Piscataquis River (Penobscot)	9.4	10.5	17.9	4	0.1	8.1	13.5	4
West Branch Piscataquis River (Penobscot)	45.6	45.6	45.6	1	0.4	7.8	7.8	1
Pleasant River (Penobscot)	0.3	0.3	0.3	1	0.0	0.1	0.1	1
West Branch Pleasant River (Penobscot)	0.2	0.2	0.2	1	0.0	0.4	0.4	1
Souadabscook Stream (Penobscot)	0.0	0.0	0.1	3	0.0	0.0	0.0	3
West Branch Souadabscook Stream (Penobscot)	0.0	0.0	0.0	3	0.0	0.0	0.0	3
Kenduskeag Stream (Penobscot)	0.0	0.0	0.0	31	0.0	0.2	11.4	30
Marsh Stream (Penobscot)	0.0	0.0	0.0	3	0.0	0.0	0.0	3
South Branch Marsh Stream (Penobscot)	0.0	0.0	0.0	3	0.0	0.7	1.5	2
Felts Brook (Penobscot)	0.0	0.0	0.0	1	0.0	0.0	0.0	1
Pierre Paul Brook (Penobscot)	0.0	0.0	0.0	1	0.0	0.0	0.0	1
Sedgeunkedunk Stream (Penobscot)	0.0	0.0	0.0	1				0
Passagassawakeag River	0.0	0.0	0.0	3				0
Sandy River (Kennebec)	0.0	4.3	30.6	13	0.6	3.5	6.7	11
Bond Brook (Kennebec)	0.0	0.0	0.0	1	0.0	0.0	0.0	1
Avon Valley Brook (Kennebec)	10.9	10.9	10.9	1	0.0	0.0	0.0	1
Saco River	**0.0**	**1.0**	**2.1**	**2**	**3.7**	**4.9**	**6.2**	**2**

Table 11. Surface water discharge measured at USGS gage 01066000 located on the Saco River at Cornish, ME, and estimated at the Skelton Project by FPL Energy. The US Geological Survey gage is located above the Bonny Eagle Project, and normal range is based on 88 years of record.

Year	Location	Discharge (CFS)	
		May	June
2000	Cornish	4,593	1,901
2001	Cornish	4,381	2,475
2002	Cornish	4,254	2,614
2003	Cornish	4,090	2,001
2004	Cornish	3,457	1,825
2005	Cornish	7,720	4,650
2005	Skelton Project	9,069	5,528
Normal Range	Cornish	3,540-6,960	1,520-3,100

Table 12. Allocation of adult American shad captured at the Cataract Project's East Channel fishway in the Saco River, Maine between 1993 and 2005.

Year	Cataract impoundment	Bradbury/Springs impoundment	Waldoboro Shad hatchery	Total
1993	35	849	0	884
1994	216	173	10	399
1995	68	507	0	575
1996	73	761	0	834
1997	210	834	60	1,104
1998	518	678	178	1,374
1999	1,071	3,522	401	4,994
2000	410	769	144	1,323
2001	1,327	967	276	2,570
2002	557	457	0	1,014
2003	128	1,099	0	1,227
2004	0	1,627	0	1,627
2005	0	738	0	738

Table 13. American shad broodstock collection and fry stocking in the Saco River, Maine between 1997 and 2001.

Year	Number of broodstock collected	Number fry released	Release location
1997	60	-	-
1998	178	503,730	below Bar Mills
1999	401	151,774	below Bar Mills
2000	144	259,090	below Bar Mills
2001	276	313,560	below Bar Mills
Total	1,059	1,228,154	

Table 14. Comparison of the number of river herring (alewife and blueback herring) passing upstream at the Cataract and Skelton projects, Saco River, Maine between 2002 - 2005.

Year	Total herring passed at Cataract Project	Total herring passed at Skelton Project	% of herring entering Skelton impoundment
2002	20,198	11,528	57.1
2003	26,760	14,411	53.8
2004	32,801	25,047	76.4
2005	388	0	0

Table 15. River herring production and escapement estimates by reach for Saco River, Maine.

Habitat	Surface area (acres)	Production at 235/acre	Spawning escapement at 35/acre	Surface as % of total	Reach
Ossipee Lake	3,700	869,500	129,500	0.60	4
Arrowhead Lake	1,005	236,175	35,175	0.16	4
Bonny Eagle Impoundment	252	59,220	8,820	0.04	3
West Buxton Impoundment	125	29,375	4,375	0.02	3
Bar Mills Impoundment	215	50,525	7,525	0.04	3
Skelton Impoundment	417	97,995	14,595	0.07	3
Cataract Impoundment	420	98,700	14,700	0.07	2
TOTAL	6,134	1,441,490	214,690		

Table 16. Atlantic salmon, American shad, and river herring passage in east coast rivers, 1983-2005.

	Susquehanna River, PA Conowingo Dam		Connecticut River, MA Holyoke Dam			Merrimack River, MA Lawrence Dam			Saco River, ME Cataract Dam			Androscoggin River, ME Brunswick Dam			Penobscot River, ME Veazie Dam		
Year	Shad	River herring	Shad	River herring	Salmon	Shad	River herring	Salmon	Shad	River herring	Salmon	Shad	River herring	Salmon	Shad	River herring	Salmon
1983	413	567	528,185	454,242	25	5,629	4,700	114	--	--	1	2	601	20	--	--	799
1984	167	337	500,000	480,000	66	5,497	1,800	115	--	--	2	1	2,650	94	--	--	1,451
1985	1,546	7,142	480,000	630,000	285	12,793	23,000	213	--	--	60	0	23,895	25	--	--	3,020
1986	5,195	9,149	350,000	520,000	280	18,173	16,000	103	--	--	37	0	35,471	80	--	--	4,125
1987	7,667	6,218	280,000	360,000	208	16,909	77,000	139	--	--	40	0	63,523	27	--	--	2,341
1988	5,146	15,244	200,000	340,000	72	12,359	361,000	65	--	--	38	0	74,341	14	--	--	2,688
1989	8,218	5,500	350,000	290,000	80	7,875	388,000	84	--	--	19	0	100,895	19	--	--	2,752
1990	15,719	10,083	360,000	390,000	188	6,013	254,000	248	--	--	73	0	95,574	185	--	--	2,953
1991	27,229	31,737	520,000	410,000	152	16,098	379,000	332	--	--	4	0	77,511	21	--	--	1,578
1992	25,721	38,509	720,000	310,000	370	20,796	102,000	199	--	--	--	0	45,050	15	--	--	2,233
1993	13,546	9,198	340,000	103,000	169	8,599	14,000	61	877	831	53	0	5,202	44	--	--	1,650
1994	32,330	2,926	180,800	31,766	263	4,349	89,000	21	399	2,224	21	1	19,190	25	--	--	1,042
1995	61,650	103,438	190,295	112,136	151	13,857	33,425	34	587	9,820	34	3	31,329	16	--	--	1,342
1996	37,100	3,000	276,289	56,300	260	11,322	51	76	837	9,163	54	2	10,198	38	--	--	2,045
1997	103,870	376,146	299,448	63,945	199	22,586	403	71	1,104	2,130	28	2	5,540	1	--	--	1,355
1998	46,481	6,248	311,704	11,170	298	27,891	1,632	123	1,374	15,581	28	5	25,177	5	--	--	1,210
1999	69,712	140,980	196,549	2,760	154	56,465	7,898	185	4,994	31,070	66	88	8,909	6	--	--	969
2000	153,546	38,517	228,859	10,593	77	72,800	23,585	82	1,323	25,136	50	88	9,551	4	--	--	532
2001	193,574	316,523	281,299	10,628	40	76,717	1,550	83	2,570	66,890	69	26	18,196	5	--	--	787
2002	108,001	2,111	374,548	1,939	34	54,586	526	56	1,014	20,198	47	11	104,520	2	--	--	780
2003	125,135	551	288,623	1,552	43	55,620	10,607	147	1,227	26,762	39	7	53,732	3	--	--	1,114
2004	112,786	191	191,555	151	51	--	15,051	129	1,627	32,801	19	--	113,868	12	--	--	1,320
2005	72,822	4	116,511	534	147	--	99	34	738	388	25	--	25,846	10	--	--	985

Table 17. Activities implemented between 1993 and 2005 addressing the goals and objectives of the 1987 Management Plan.

River Reach	Restoration Goals	Activities Toward Management Objectives	Species of Benefit	Management Objectives Achieved	Remaining Issues
Reach II - Upper York (West Channel) Dam, Saco-Biddeford to Skelton Dam, Union Falls, ME.	Migratory path and sustained production of salmon, shad, river herring, and eels; establish a commercial and recreational utilization of select species.	Installation and operation of fishways at the Cataract East and West Channel Dams and the Springs and Bradbury Dams (1993 - 1997)	Atlantic salmon, American shad, river herring	Migratory path established to the Skelton Dam for salmon, shad and herring. Escapement returns of river herring observed in 2002 – 2004.	American shad continue to have problems passing the Springs and Bradbury Dams; passage for American eels.
Reach III - Skelton Dam, Union Falls to the confluence of the Little Ossipee River, East Limington, ME.	Migratory path and sustained production of salmon, shad, river herring, and eels; sustained production of trout; establish a commercial and recreational utilization of select species.	Installation and operation of a fish lift at the Skelton Project (2001).	Atlantic salmon, American shad, river herring	Migratory path established to the Bar Mills Dam for shad and herring; downstream path for all anadromous species; escapement returns of river herring observed in 2004 for Reaches II and III.	Permanent upstream passage facilities at the Bar Mills, West Buxton, and Bonny Eagle projects; evaluation of downstream passage effectiveness for clupeids at each project; passage for American eels.
Reach IV - Confluence of the Little Ossipee River, East Limington to Hiram Dam, Hiram, ME (includes Little Ossipee River).	Migratory pathway for salmon; sustained production of salmon, trout, shad, river herring, and eels; establish a commercial and recreational utilization of select species.	Stocking of juvenile and adult Atlantic salmon.	Atlantic salmon	Annual stocking of juvenile and adult salmon; downstream path for salmon.	
Reach V - Hiram Dam, Hiram to Swans Falls Dam, Fryeburg, ME.	Migratory pathway and sustained production of salmon; establish recreational trout fishery in the Fryeburg area; establish a commercial and recreational utilization of select species.	Stocking of juvenile Atlantic salmon.	Atlantic salmon	Annual stocking of juvenile salmon.	Permanent upstream fish passage facilities at the Hiram Dam; evaluation of downstream passage efficiency at Hiram; passage for American eels.
Reach VI and VII - Swans Falls Dam, Fryeburg, ME to the confluence of the Ellis River, Bartlett, NH.	Consult with the NHDFG and USFS to develop an interstate Atlantic salmon restoration program; continue interstate agency cooperation preventing introductions of undesirable species.	No activity during this or previous assessment periods.			

Figures

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Figure 1. Map of Saco River watershed and hydropower projects.

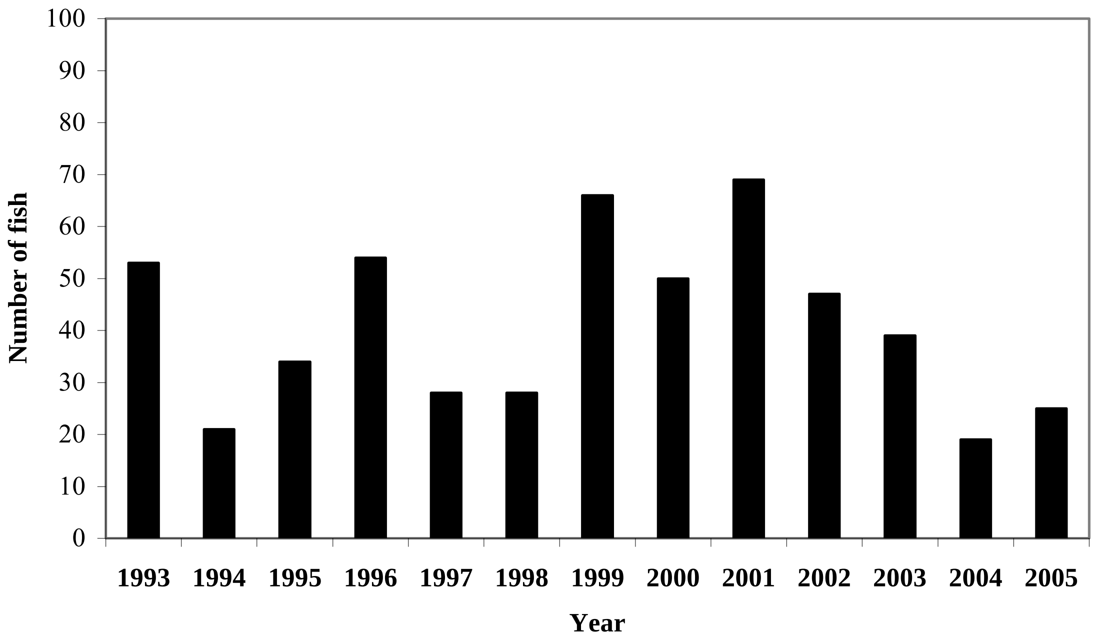

Figure 2. Annual passage of Atlantic salmon at the Cataract Project from 1993 - 2005.

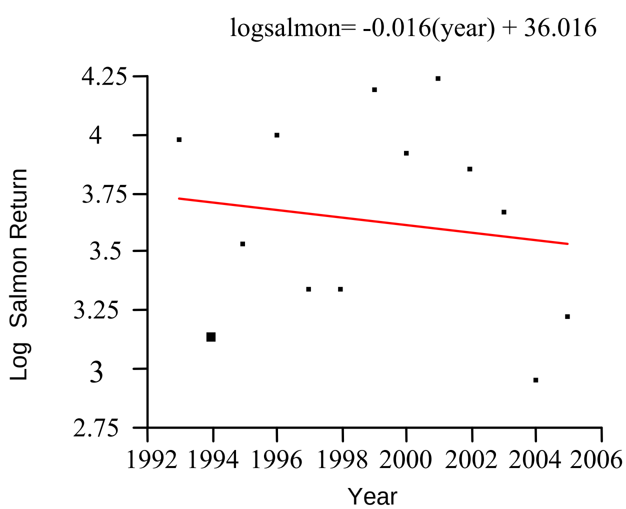

Figure 3. Scatter plot for the linear regression analysis of Atlantic salmon returns at the Cataract Project from 1993 - 2005.

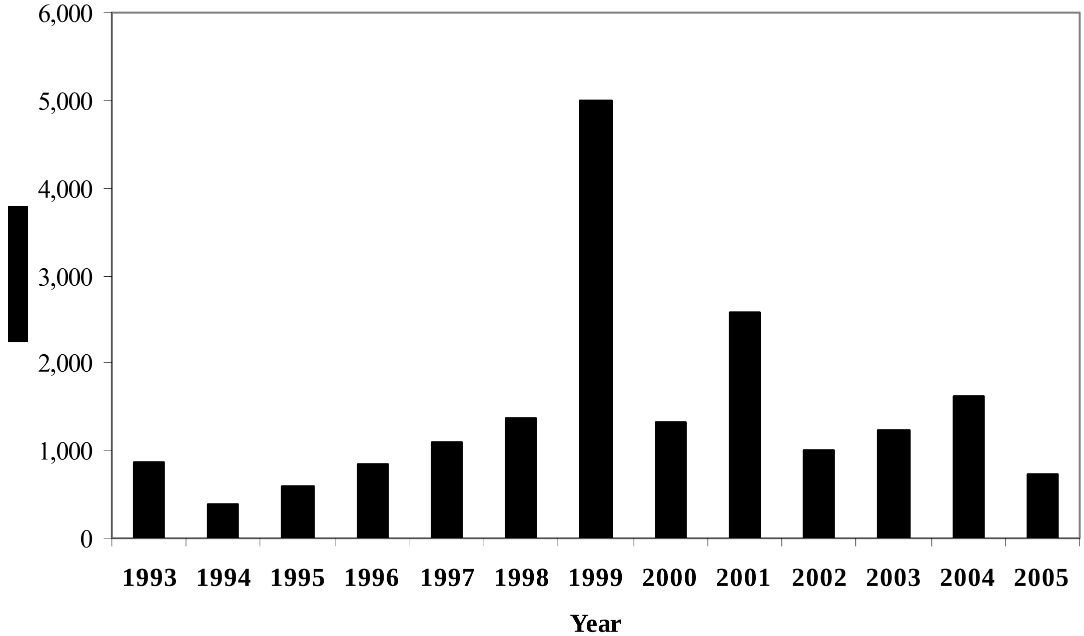

Figure 4. Annual passage of American shad at the Cataract Project from 1993 - 2005.

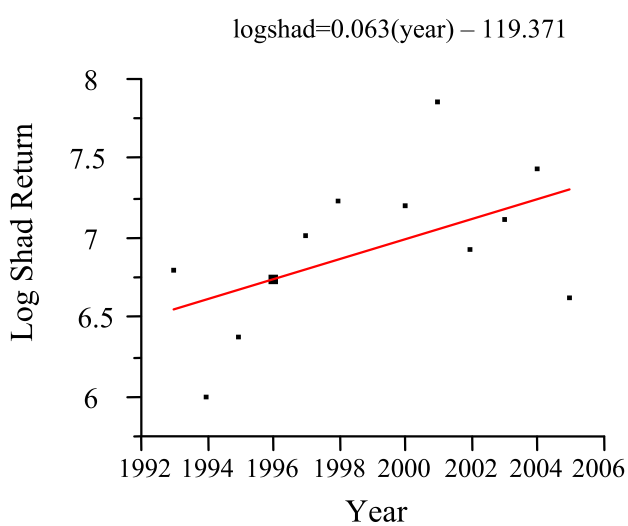

Figure 5. Scatter plot for the linear regression analysis of American shad returns at the Cataract Project from 1993 – 2005, excluding 1999.

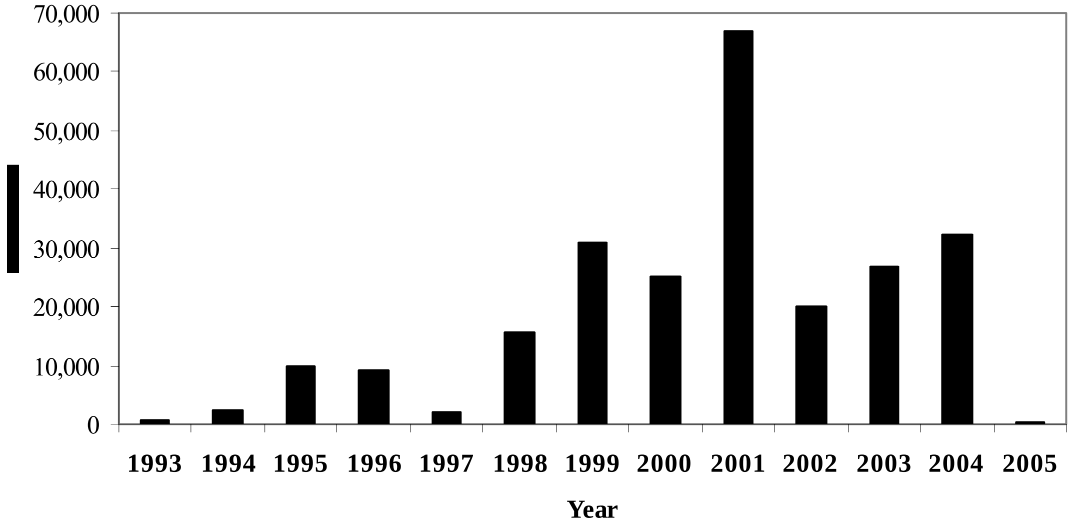

Figure 6. Annual passage of river herring at the Cataract Project from 1993 - 2005.

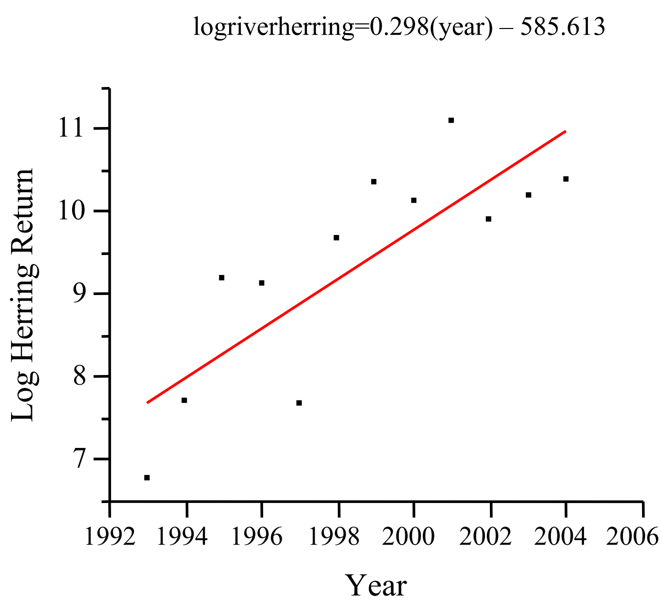

Figure 7. Scatter plot for the linear regression analysis of river herring returns at the Cataract Project from 1993 - 2004.

Management Plans and Reports

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Saco River

2005 Springs and Bradbury Fish Locks Report: A Report on the Operation of FPL Energy's Springs and Bradbury Fish Locks, Saco River, Maine. FERC No. 2528. FPL Energy Maine Hydro LLC. March 2006.

2005 Skelton Fishway Report: A Report on the Operation of FPL Energy's Skelton Fishway, Saco River, Maine. FERC No. 2527. FPL Energy Maine Hydro LLC. March 2006.

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ATTACHMENT B

DRAFT FINAL MODIFIED PRESCRIPTIONS FOR THE BAR MILLS HYDROELECTRIC PROJECT

Reservation of Authority to Prescribe Fishways

In order to allow for the timely implementation of fishways, including effectiveness measures, NOAA Fisheries/USFWS requests that the Commission include the following condition in any license it may issue for the Bar Mills Project:

> Authority is reserved by the Commission to require the licensee to construct, operate, and maintain, or provide for construction, operation or maintenance of, such fishways as may be prescribed during the term of this license by the Secretary of the Interior/Commerce under Section 18 of the Federal Power Act.

Prescription for Fishways

Pursuant to Section 18 of the Federal Power Act, as amended, the Secretary of the Department of Commerce/the Department of Interior, as delegated to NOAA Fisheries/USFWS, exercises his authority to prescribe the construction, operation and maintenance of such fishways as deemed necessary for the Bar Mills Project.

To ensure the timely contribution of the fishways to the ongoing and planned anadromous and catadromous fish restoration and enhancement program in the Saco River, the following are included and shall be incorporated by the Commission into any license issued for this project pursuant to Section 1701(b) of the 1992 National Energy Policy Act (Pub. L. 102-486, Title XVII, 106 Stat. 3008), and the Energy Policy Act of 2005 (Pub. L. 109-58).

A. Fishways and/or fish passage measures shall be implemented, constructed, operated, and/or maintained by the Licensee, or provided for by the Licensee, to provide safe, timely and effective passage for Atlantic salmon, American shad, blueback herring, alewife and American eels as summarized below and as detailed in the 2007 Agreement..

B. General Provisions for New Fish Passage Facilities or Measures

1. Design Review

   Plans and designs for each permanent fish passage facility shall be reviewed by USFWS/NOAA Fisheries in accordance with Section 7 of the 1994 Agreement and Section 5.1.a of the 2007 Agreement.

2. Shakedown Period

   Once each new fish passage facility is constructed, the Licensee will operate each fish passage facility for a one-season “shakedown” period to ensure that it is generally operating as designed and to make minor adjustments to the facilities and operation. At the end of the shakedown period, the Licensee shall have a licensed engineer certify that the facility is constructed and operating as designed in all material respects. The Licensee will provide USFWS, NOAA Fisheries, MDMR, and MASC as appropriate with a copy of the as-built fishway drawings as submitted to FERC, along with the licensed engineer's letter of certification[1].

3. Effectiveness Studies

The Licensee shall conduct effectiveness studies of all newly constructed or significantly modified permanent upstream and downstream fish passage facilities or measures. In the event that these facilities or measures as initially implemented are not effectively passing the target species[2], the Licensee shall make, in consultation with the USFWS/NOAA Fisheries MDMR and MASC as appropriate, reasonable, cost-effective adjustments to the facilities or measures in an effort to improve fish passage effectiveness[3]. Studies shall be initiated during the passage season following the facility shakedown period, and carried out for up to three years for each species. Initiation of studies for each species will depend in large part on the availability of suitable numbers and types of fish. Details on the design of upstream passage effectiveness studies shall be determined after consultation between the Licensee and the above agencies as appropriate.

4. Fishway Operating Procedures

The Licensee shall, consistent with safe working practices, keep the fishways in proper working order and shall maintain fishway areas clear of trash, logs, and material that would hinder passage. Routine maintenance shall be performed sufficiently before a migratory period such that fishways can be tested and inspected, and will be operational during the migratory periods.

In consultation with the USFWS/NOAA Fisheries, MDMR and MASC, the Licensee shall draft and maintain written Fishway Operating Procedures (FOPs) for the Bar Mills Project. These FOPs will include general schedules of routine maintenance, procedures for routine operation, procedures for monitoring and reporting on the operation of each fish passage facility or measure, and schedules for procedures for annual start-up and shut-down, and procedures for emergencies and Project outages significantly affecting fishway operations. Copies of these Fishway Operating Procedures, and any revisions made during the term of the license, will be sent to the USFWS, NOAA Fisheries, MDMR and MASC.

The Licensee shall meet with USFWS/NOAA Fisheries, MDMR and MASC in March annually to review fish passage operational data from the previous year, draft an annual report, and develop an operational plan for the upcoming year. The fish passage operational data should include the number of fish passed daily (by species), daily water and air temperature data, and other related fishway operational information.

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1 See the 2007 Agreement for further details.

2 Atlantic salmon, American shad, blueback herring, alewife, and American eel.

3 See the 2007 Agreement for further details.

5. Timing of Seasonal Fishway Operations:

   Once installed, permanent fishways shall be maintained and operated by the Licensee to maintain fish passage during the upstream and downstream migration periods for Atlantic salmon, American shad, blueback herring, alewife, and American eel (Table 1)[4].

Table 1. Upstream and downstream migration periods for species covered in this Prescription for Fishways.

Species	Upstream Migration Period	Downstream Migration Period
Atlantic salmon	May 1 – October 31	April 1 – June 30 (smolts and kelts) October 15 – December 31 (kelts)
American shad	May 15 – July 31	July 15 – November 15 (juv.) June 1 – July 31 (adult)
Alewife and Blueback herring	May 1 – July 1	July 15 – November 15 (juv.) June 1 – July 31 (adult)
American eel	May 15 – September 15	September 15 – November 15 (at night)

6. Project Access

   The Licensee shall, upon prior written notice by the USFWS/NOAA Fisheries, provide authorized personnel of the USFWS/NOAA Fisheries and other agency-designated representatives, reasonable access to the project site and pertinent project records for the purpose of inspecting the fishways.

7. Filing Consultation

   The Licensee shall include with filings to the Commission associated with fishway designs and effectiveness study plans and reports, the following documentation of consultation: (1) copies of agency comments and recommendations on the completed plan or report after it has been prepared and provided to the agencies, and (2) specific descriptions of how these comments and recommendations are accommodated by the plan or report. The

4 The specified migration dates are based on known information regarding run timing on the Saco and other Maine rivers. Any of the operating schedules during these migration periods may be modified during the term of the license based on migration data, new information, and in consultation with the USFWS/NOAA Fisheries, MDMR, MASC and the Licensee. Upon request of Licensee, the actual dates of operation may be varied somewhat in any given year in response to river conditions, maintenance requirements, or annual variability in fish migration patterns, with the approval of USFWS, NOAA Fisheries, MDMR and MASC as appropriate.

Licensee shall allow a minimum of 30 days for the USFWS/NOAA Fisheries, MDMR and MASC as appropriate, to comment and to make recommendations before filing the plan or report with the Commission. If the Licensee does not adopt a recommendation, the filing shall include the Licensee's reasons for not accepting the recommendation as well as including any available supporting information.

C. American Eel Passage Measures

1. Permanent Upstream Eel Passage Measures

The Licensee shall provide an upstream eel passage facility in one location at the Bar Mills Project by June 1, 2014[5]. Prior to initiation of an upstream eel passage facility at Bar Mills, the Licensee shall conduct a study to establish where at the Project the eel fishway should be located[6]. The Licensee shall present the results of the study to NOAA Fisheries, the USFWS and MDMR and obtain their concurrence with the choice of location. Development and implementation of upstream eel passage measures may be delayed following consultation with and agreement by NOAA Fisheries, the USFWS, and MDMR that eels are not yet sufficiently abundant to require passage or to provide enough data to allow for a determination of the type and location of upstream eel passage measures.

2. Permanent Downstream Eel Passage Measures

The Licensee shall provide permanent downstream passage measures for American eel by September 1, 2026[7]. The Licensee shall provide engineering and/or operational plans for permanent downstream eel passage measures to the NOAA Fisheries, USFWS and MDMR for consultation by February 28, 2026. Development and implementation of downstream eel passage measures may be delayed following consultation with and agreement by NOAA Fisheries, USFWS, and MDMR that eels are not yet sufficiently abundant to require passage or to provide enough data to allow for a determination of the type and location of downstream eel passage measures.

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5 Recent surveys have documented the presence of eel above and below the Bar Mills dam in low numbers. As part of the 2007 Agreement, the Licensee will install and operate eelways at downstream dams beginning in 2008. Implementing upstream passage at Bar Mills in 2014 will allow time for the eel stock to increase, thereby increasing the potential utilization of the eelway once installed.

6 Juvenile eels migrating upstream could be concentrated in any number of locations within the project area below the dam. Conducting a study to determine the area of heaviest concentration will allow placement of the eel fishway in a location that maximizes its utilization.

7 The timing for implementing permanent downstream eel passage measures at Bar Mills is appropriate based on the following factors: (1) few eels were observed in the river upstream of Bar Mills at present, (2) upstream passage will be operational by 2014, increasing recruitment of juvenile eels upstream of the dam, and (3) initiating permanent downstream passage 12 years after upstream eel passage becomes operational should coincide with the expected start of maturation and out migration of those eels first recruited in 2014.

3. Interim Downstream Eel Passage Measures

Beginning the tenth year after permanent upstream eel passage has been installed at Bar Mills, the Licensee shall monitor for eel mortality below the dam weekly from September 15 through November 15 as explained in the 2007 Agreement[8]. If a confirmed observation of greater than 50 eel mortalities per night occurs at the Project, then the Licensee shall initiate the interim downstream eel passage protocol provided in Section 5.2.b.3. of the 2007 Agreement[9].

D. Permanent Upstream Anadromous Fish Passage Facilities

1. Design Criteria

The license shall provide a single[10] permanent upstream anadromous fish passage facility at the Bar Mills Dam to be operational by May 1, 2016[11]. This schedule may be delayed contingent upon the returning numbers of the target species, and following consultation with and agreement by NOAA Fisheries, USFWS, MDMR and MASC. The permanent upstream fishway at Bar Mills shall be designed to be as effective at passing sufficient escapement numbers of the target species as a single standard (4-ft. wide) Denil-type fishway designed to be operational at river flows up to 9,000cfs.

2. Design Review

The Licensee shall, 18 months prior to the planned construction of the upstream fish passage facility, submit conceptual designs for approval by the NOAA Fisheries, USFWS, MASC and MDMR, and shall subsequently file functional design drawings with the Commission for approval.

8 Interim downstream passage monitoring is necessary because (1) eels were collected in the Saco River at sites above the Project and (2) there is variability in maturation age of eels. Therefore, monitoring for eel mortality below the Bar Mills dam and instituting interim measures if necessary would reduce mortality of those eels migrating downstream prior to 2026.

9 This measure is part of a watershed-wide approach to address interim downstream passage of American eels. As such, monitoring for eel mortalities prior to implementation of permanent passage measures will be used to implement interim protective measures at Bar Mills and elsewhere if necessary.

10 Given site configuration, the Department of Commerce and the Department of the Interior originally prescribed a tailrace fishway and a spillway fishway. However, attraction of salmon, shad and herring to the tailrace is most likely and would likely provide more consistent attraction to fish.

11 See Sections 8 and 9 of the 2000-2005 Assessment Report for monitoring data and a discussion supporting the timing for installing and operating a permanent upstream fish passage facility for anadromous species.

E. Downstream Anadromous Fish Passage Facilities

1. The Licensee shall evaluate the effectiveness of the existing downstream passage facility for passing American shad and river herring[12]. The Licensee shall conduct a two-year semi-quantitative study of downstream passage effectiveness for clupeids (using, for example, standardized observations, video cameras, and rotary screw traps, or similar methods) beginning the year after 6 (six) adult clupeids per acre of impoundment (approximately 1,580 fish)[13] are passed or stocked upstream of the Bar Mills Project. If the NOAA Fisheries, USFWS and MDMR determine that the numbers of clupeids returning to the lower Saco River (Cataract and Skelton impoundments) during the planned study year are insufficient to stock those lower impoundments, then the studies may be postponed upon mutual agreement between the Licensee and the USFWS/ NOAA Fisheries and MDMR.

   The Licensee shall develop the effectiveness study plans in consultation with the USFWS/NOAA Fisheries and MDMR. Results will be submitted to the USFWS/NOAA Fisheries and MDMR for review and comment, and the Licensee shall include any comments received with the results filed with the Commission.

2. The Licensee shall conduct a kelt study at Bar Mills if Phase I of the study stipulated under Section 5.4(a) of the 2007 Agreement determines that the Bar Mills Project has a high potential to delay/affect kelt passage. If Bar Mills is identified as one of the two selected projects, the Licensee shall conduct a three-year study to examine downstream passage routes of salmon kelts. If Bar Mills is chosen as a study site, the Licensee shall submit a draft study plan to the NOAA Fisheries, USFWS and MASC by April 2009, and begin the study by spring of 2010.

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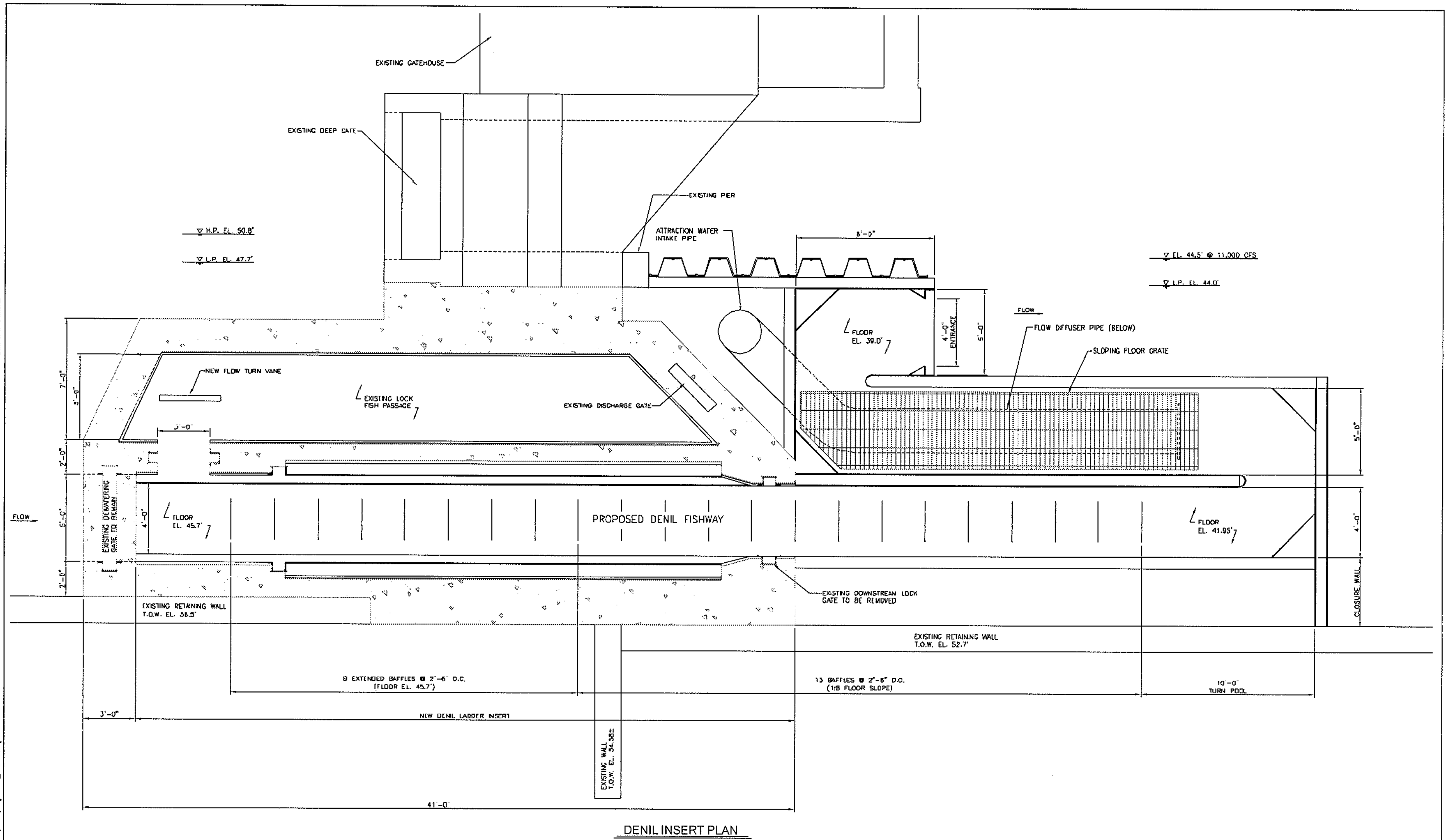
12 To date, effectiveness studies of the existing downstream passage facility at the Bar Mills Project have been conducted for salmon smolts only. See the Downstream Passage data and discussion in Sections 8 and 9 of the 2000-2005 Assessment Report.

13 Due to their small size, and vulnerability to handling, juvenile clupeids are more difficult to quantitatively assess than salmon smolts. Using six clupeids per acre of impoundment as a trigger to initiate studies should ensure adequate production to make it practical to provide an acceptable number of fish for evaluation for purposes of this type of study.

ATTACHMENT C

CONCEPTUAL DESIGN – DENIL FISHWAY – SPRINGS ISLAND DAM



DENIL INSERT PLAN

3/8"= 1'-0"

No.	Revision	Date		
			[redacted] AS SHOWN	FPL ENERGY MAINE HYDRO, LLC AUGUSTA, MAINE
			[redacted] 835-012	
			[redacted] 2005	SPRINGS ISLAND DAM FERC NO. 2528
			[redacted]	
			[redacted] AJN	CONCEPT PLAN SPRING ISLAND DAM - DENIL FISHWAY
			[redacted] AJN	
			[redacted] BR	Kleinschmidt Energy & Water Resource Consultants
			[redacted] 11-08-06	

F1-A

ATTACHMENT A - DECEMBER 2006

J:\835\012\Docs\Fish Pass Alternatives\835 Springs Den-I_110806.dwg

SACO RIVER
FISHERIES ASSESSMENT AGREEMENT
AMENDMENT No. 1

FPL Energy Maine Hydro LLC

Cataract Project (No. 2528)
Skelton Project (No. 2527)
Bar Mills Project (No. 2194)
West Buxton Project (No. 2531)
Bonny Eagle Project (No. 2529)
Hiram Project (No. 2530)

May, 2009

May, 2009

Amendment 1 to the Agreement – Section 2.8 of the SRFAA is amended as follows:

2.8 Fisheries Assessment Agreement Amendments

The Parties agree that nothing in this Agreement is intended to limit or restrict the ability of any Party to seek an amendment to this Agreement. Except as described below relating to Section 4, any ~~Any~~ Party proposing an amendment to this Agreement shall provide all Parties with written notice of the proposed amendment. The other Parties shall then have 60 days to respond with objections, approvals, or requests for further discussion and consultation. After such notice and consultation, if all Parties either concur with or do not object to the proposed amendment, the Party making the proposal shall secure the agreement, in writing, of all Parties, except as described below. No amendment shall be effective that is not reduced to writing and signed by the Parties, except as described below. Licensee shall file any amendment to Section 5 of this Agreement with the FERC.

The failure to obtain the signature to an amendment of any Party that is no longer in existence at the time of a proposed amendment, or that declines to answer a proposal in any way within 60 days of written notice, shall not prevent the other Parties from amending this Agreement.

Notwithstanding the above, Parties may make minor administrative changes relating to or contained within Section 4 of this Agreement with the written consent of the Licensee, all Parties who are beneficiaries, and all Parties who have express approval authority for expenditures of any funds affected by the amendment. Any amendment which seeks to change the funding amounts expressly stated in Section 4 is not a "minor administrative change" for the purpose of this paragraph.

May, 2009

Amendment 1 to the Agreement - Section 4.3 of the SRFAA is amended as follows;

4.3 Saco River Salmon Enhancement Fund

Licensee agrees to establish a Salmon Enhancement Fund (“Fund”) for the Saco River. This Fund shall be established as an account at an accredited financial institution ~~to the joint credit of the MASC and Licensee~~. If this account bears interest, that interest shall be part of the Fund and treated no differently than funds deposited by Licensee. Licensee agrees to contribute $50,000 annually to this fund until permanent upstream passage measures for anadromous species are provided and operational up to and through the Bonny Eagle Project (see Section 5.3.b.1 of this Agreement for operational dates).

Monies in the Fund may be expended only upon joint approval of the USFWS, MASC and Licensee, which approvals shall not be unreasonably withheld. Expenditure for the raising and stocking of Atlantic salmon parr or smolt requires approval by no less than two of the three entities. Expenditure for other measures requires the approval of the three entities. The Fund may only be used to enhance, through various measures, the production and return of Atlantic salmon to the Saco River. The USFWS, MASC and Licensee shall consult annually with the Parties regarding measures to be undertaken with the Fund but the approval of the other Parties is not required.

Those monies in the Fund that are not expended annually for salmon enhancement measures will remain with the Fund to be used for future salmon enhancement measures on the Saco River. Notwithstanding the above, monies remaining in the Fund 24 months after the date that permanent upstream fish passage facilities/measures for anadromous species are provided and operational at the Bonny Eagle Project shall become available for use by Licensee at its sole discretion.

Amendment 1 to the Saco River Fisheries Assessment Agreement

In accordance with Section 2.8 of the Agreement, we, the undersigned, having the authority to bind our respective Parties, agree to the attached amendments to Section 2.8 and Section 4.3 of the Agreement:

FPL Energy Maine Hydro LLC

Its Vice President — Date 7/27/09

U.S. Fish and Wildlife Service

Its — Date

National Marine Fisheries Service

Its — Date

Maine Atlantic Salmon Commission

It Executive Director — Date

Maine Department of Inland Fisheries and Wildlife

Its Commissioner — Date

Maine Department of Marine Resources

Its Commissioner — Date

Saco River Salmon Club

Its Vice President — Date

Atlantic Salmon Federation

Its President — Date

Maine Council of the Atlantic Salmon Federation

Its Maine Coordinator — Date

Saco River Hydro, LLC

Its Managing Partner — Date

New Hampshire Fish and Game Department

Its Executive Director — Date

Amendment 1 to the Saco River Fisheries Assessment Agreement

In accordance with Section 2.8 of the Agreement, we, the undersigned, having the authority to bind our respective Parties, agree to the attached amendments to Section 2.8 and Section 4.3 of the Agreement:

FPL Energy Maine Hydro LLC

____________________ __________
Its Vice President — Date

U.S. Fish and Wildlife Service

Lori H. Nordstrom 8/7/09
Its Field Supervisor, Maine Field Office — Date

National Marine Fisheries Service

____________________ __________
Its — Date

Maine Atlantic Salmon Commission

____________________ __________
It Executive Director — Date

Maine Department of Inland Fisheries and Wildlife

____________________ __________
Its Commissioner — Date

Maine Department of Marine Resources

____________________ __________
Its Commissioner — Date

Saco River Salmon Club

____________________ __________
Its Vice President — Date

Atlantic Salmon Federation

____________________ __________
Its President — Date

Maine Council of the Atlantic Salmon Federation

____________________ __________
Its Maine Coordinator — Date

Saco River Hydro, LLC

____________________ __________
Its Managing Partner — Date

New Hampshire Fish and Game Department

____________________ __________
Its Executive Director — Date

Amendment 1 to the Saco River Fisheries Assessment Agreement

In accordance with Section 2.8 of the Agreement, we, the undersigned, having the authority to bind our respective Parties, agree to the attached amendments to Section 2.8 and Section 4.3 of the Agreement:

FPL Energy Maine Hydro LLC

Its Vice President — Date

U.S. Fish and Wildlife Service

Its — Date

National Marine Fisheries Service

Its — Date May 29, 2009

Maine Atlantic Salmon Commission

It Executive Director — Date

Maine Department of Inland Fisheries and Wildlife

Its Commissioner — Date

Maine Department of Marine Resources

Its Commissioner — Date

Saco River Salmon Club

Its Vice President — Date

Atlantic Salmon Federation

Its President — Date

Maine Council of the Atlantic Salmon Federation

Its Maine Coordinator — Date

Saco River Hydro, LLC

Its Managing Partner — Date

New Hampshire Fish and Game Department

Its Executive Director — Date

Amendment 1 to the Saco River Fisheries Assessment Agreement

In accordance with Section 2.8 of the Agreement, we, the undersigned, having the authority to bind our respective Parties, agree to the attached amendments to Section 2.8 and Section 4.3 of the Agreement:

FPL Energy Maine Hydro LLC

Its Vice President | Date

U.S. Fish and Wildlife Service

Its | Date

National Marine Fisheries Service

Its | Date

Maine Atlantic Salmon Commission

7/15/09

It Executive Director | Date

Maine Department of Inland Fisheries and Wildlife

Its Commissioner | Date

Maine Department of Marine Resources

17 July 2009

Its Commissioner | Date

Saco River Salmon Club

Its Vice President | Date

Atlantic Salmon Federation

Its President | Date

Maine Council of the Atlantic Salmon Federation

Its Maine Coordinator | Date

Saco River Hydro, LLC

Its Managing Partner | Date

New Hampshire Fish and Game Department

Its Executive Director | Date

Amendment 1 to the Saco River Fisheries Assessment Agreement

In accordance with Section 2.8 of the Agreement, we, the undersigned, having the authority to bind our respective Parties, agree to the attached amendments to Section 2.8 and Section 4.3 of the Agreement:

FPL Energy Maine Hydro LLC

Its Vice President Date

U.S. Fish and Wildlife Service

Its Date

National Marine Fisheries Service

Its Date

Maine Atlantic Salmon Commission

It Executive Director Date

Maine Department of Inland Fisheries and Wildlife

Its Commissioner Date 7/15/09

Maine Department of Marine Resources

Its Commissioner Date

Saco River Salmon Club

Its Vice President Date

Atlantic Salmon Federation

Its President Date

Maine Council of the Atlantic Salmon Federation

Its Maine Coordinator Date

Saco River Hydro, LLC

Its Managing Partner Date

New Hampshire Fish and Game Department

Its Executive Director Date

Amendment 1 to the Saco River Fisheries Assessment Agreement

In accordance with Section 2.8 of the Agreement, we, the undersigned, having the authority to bind our respective Parties, agree to the attached amendments to Section 2.8 and Section 4.3 of the Agreement:

FPL Energy Maine Hydro LLC

Its Vice President	Date

U.S. Fish and Wildlife Service		National Marine Fisheries Service	
Its	Date	Its	Date
Maine Atlantic Salmon Commission		Maine Department of Inland Fisheries and Wildlife	
It Executive Director	Date	Its Commissioner	Date
Maine Department of Marine Resources		Saco River Salmon Club	
		Mark R. Woodruff	8/5/2009
Its Commissioner	Date	Its ~~Vice President~~ Director	Date
Atlantic Salmon Federation		Maine Council of the Atlantic Salmon Federation	
Its President	Date	Its Maine Coordinator	Date
Saco River Hydro, LLC		New Hampshire Fish and Game Department	
Its Managing Partner	Date	Its Executive Director	Date

Amendment 1 to the Saco River Fisheries Assessment Agreement

In accordance with Section 2.8 of the Agreement, we, the undersigned, having the authority to bind our respective Parties, agree to the attached amendments to Section 2.8 and Section 4.3 of the Agreement:

FPL Energy Maine Hydro LLC

____________________ __________
Its Vice President Date

U.S. Fish and Wildlife Service

____________________ __________
Its Date

National Marine Fisheries Service

____________________ __________
Its Date

Maine Atlantic Salmon Commission

____________________ __________
It Executive Director Date

Maine Department of Inland Fisheries and Wildlife

____________________ __________
Its Commissioner Date

Maine Department of Marine Resources

____________________ __________
Its Commissioner Date

Saco River Salmon Club

____________________ __________
Its Vice President Date

Atlantic Salmon Federation

[signature] 7/25/09
Its VP US Program Date

Maine Council of the Atlantic Salmon Federation

John Burrows 07/27/09
Its Maine Coordinator Date

Saco River Hydro, LLC

____________________ __________
Its Managing Partner Date

New Hampshire Fish and Game Department

____________________ __________
Its Executive Director Date

Amendment 1 to the Saco River Fisheries Assessment Agreement

In accordance with Section 2.8 of the Agreement, we, the undersigned, having the authority to bind our respective Parties, agree to the attached amendments to Section 2.8 and Section 4.3 of the Agreement:

FPL Energy Maine Hydro LLC

Its Vice President — Date

U.S. Fish and Wildlife Service

Its — Date

National Marine Fisheries Service

Its — Date

Maine Atlantic Salmon Commission

It Executive Director — Date

Maine Department of Inland Fisheries and Wildlife

Its Commissioner — Date

Maine Department of Marine Resources

Its Commissioner — Date

Saco River Salmon Club

Its Vice President — Date

Atlantic Salmon Federation

Its President — Date

Maine Council of the Atlantic Salmon Federation

Its Maine Coordinator — Date

Saco River Hydro, LLC

John N. Webster — 7/25/09

Its Managing Partner — Date

New Hampshire Fish and Game Department

Its Executive Director — Date

Amendment 1 to the Saco River Fisheries Assessment Agreement

In accordance with Section 2.8 of the Agreement, we, the undersigned, having the authority to bind our respective Parties, agree to the attached amendments to Section 2.8 and Section 4.3 of the Agreement:

FPL Energy Maine Hydro LLC

Its Vice President   Date

U.S. Fish and Wildlife Service

Its   Date

National Marine Fisheries Service

Its   Date

Maine Atlantic Salmon Commission

It Executive Director   Date

Maine Department of Inland Fisheries and Wildlife

Its Commissioner   Date

Maine Department of Marine Resources

Its Commissioner   Date

Saco River Salmon Club

Its Vice President   Date

Atlantic Salmon Federation

Its President   Date

Maine Council of the Atlantic Salmon Federation

Its Maine Coordinator   Date

Saco River Hydro, LLC

Its Managing Partner   Date

New Hampshire Fish and Game Department

Its Executive Director   5/26/09 Date

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May 8, 2019

Cataract Project (No. 2528)
Skelton Project (No. 2527)
Bar Mills Project (No. 2194)
West Buxton Project (No. 2531)
Bonny Eagle Project (No. 2529)
Hiram Project (No. 2530)

Kimberly Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

Subject: **Saco River Fish Passage Assessment Agreement Amendment for Brookfield White Pine Hydro LLC's Cataract Project (No. 2528), Skelton Project (No. 2527), Bar Mills Project (No. 2194), West Buxton Project (No. 2531), Bonny Eagle Project (No. 2529), Hiram Project (No. 2530).**

Dear Secretary Bose:

On behalf of Brookfield White Pine Hydro LLC (BWPH), licensee for the Cataract Project (No. 2528), Skelton Project (No. 2527), Bar Mills Project (No. 2194), West Buxton Project (No. 2531), Bonny Eagle Project (No. 2529), and Hiram Project (No. 2530), attached for filing is the *Amendment No. 2 to Saco River Fisheries Assessment Agreement* (Amendment) dated February 2019.

On March 26, 2007, FPL Energy Maine Hydro LLC, the previous licensee for the aforementioned assets, filed the *Saco River Fisheries Assessment Agreement* (SRFAA) dated February 2007, concerning fish passage and fisheries management at the above referenced projects on the Saco River in southern Maine. The 2007 Settlement incorporated fish passage recommendations and other fisheries management measures agreed to by the Parties and based upon the findings and conclusions of the 2000 – 2005 fish passage assessment report, prepared pursuant to the requirements of the original 1994 Saco River Fish Passage Agreement. Parties to the 2007 SRFAA include BWPH, the National Marine Fisheries Service (NMFS), US Fish and Wildlife Service (USFWS), Maine Department of Marine Resources (MDMR), Maine Department of Inland Fisheries and Wildlife (MDIFW), Saco Salmon Restoration Alliance (SSRA, formerly the Saco River Salmon Club); Atlantic Salmon Federation (ASF); and the Maine Council of the Atlantic Salmon Federation (MC-ASF).

After nearly 22 total years of studies, data gathering, and advancements, the Parties now agree that implementation of the 2019 Amendment will better help to advance fisheries management and fish passage requirements while still satisfying the Licensee's obligations at the referenced projects for the term of the 2007 SRFAA.

With this letter, the Amendment is being submitted to the Commission for approval. All Parties to the SRFAA agree that the Amendment is fair and reasonable, is supported by substantial evidence, and is in the public interest. The Parties agree that implementing the amended

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measures to the 2007 SRFAA will satisfy Licensee's fish management and fish passage requirements.

Background

On March 27, 2007, the Licensee filed its 2000-2005 fish passage assessment report and recommendations, as part of a 1994 settlement offer for fish passage and fisheries management. This filing accompanied a comprehensive settlement agreement, the SRFAA, that incorporated the fish passage recommendations and management measures agreed to by the Parties, including state and federal fisheries resource management agencies and NGOs, and consistent with the Section 18 fish passage prescriptions filed as part of the Bar Mills relicensing.

On July 18, 2007, the FERC issued an order (120 FERC ¶1162,050) modifying and approving the Saco River Fish Passage Assessment Report and recommendations for fish passage and fisheries management by incorporating part of the SRFAA into the respective project licenses. To that end, FERC approved the applicable provisions of Section 5 of the 2007 SRFAA as an offer of settlement for the new Bar Mills Project license and incorporated these provisions as enforceable license conditions for each of the other Saco River projects, as applicable. With the new license issued for the West Buxton Project on February 15, 2018, several continuing measures of the 2007 SRFAA were incorporated as license articles and terms and conditions of the requisite Section 401 Water Quality Certification and Section 18 fish passage prescriptions as discussed in greater detail below.

<u>Bar Mills Project</u>

The applicable provisions of the 2007 SRFAA are incorporated into the August 26, 2008 Bar Mills Project license, as follows:

> <u>License Article 401</u> – consistent with the conditions of the Section 401 water quality certification and Section 18 fish passage prescriptions, Article 401 requires the filing of the plans and documentation for upstream and downstream eel and fish passage facilities and effectiveness evaluations. The schedule for submitting the required fish passage plans and documentation was filed with the FERC on March 26, 2009 wherein the 2007 SRFAA is referenced as the source document for the required schedules for fish passage plans and documentation.
>
> <u>Section 401 Water Quality Certification</u> – incorporated by reference into the Project license, the Section 401 Water Quality Certification includes the provisions of the 2007 SRFAA. Condition 4 requires upstream eel passage installed and operational at the Bar Mills Project by June 1, 2014. Downstream eel passage is required to be operational by September 1, 2026 under Condition 5. Condition 6 requires upstream anadromous fish passage facilities to be installed and operational by May 1, 2016 and Condition 7 requires the licensee continue to operate and maintain downstream passage facilities at the Project.

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Section 18 Fish Passage Prescriptions – Ordering Paragraph E of the License incorporates the conditions submitted by the NMFS and the USFWS under section 18 of the FPA. NMFS April 13, 2007 and USFWS April 13, 2007 Section 18 fish passage prescriptions dictate that: "fishways and/or fish passage measures shall be implemented, constructed, operated, and/or maintained by the Licensee, or provided for by the Licensee, to provide safe, timely and effective passage for Atlantic salmon, American shad, blueback herring, alewife, and American eels as…detailed in the 2007 Agreement". Upstream eel passage is required by June 1, 2014 (NMFS Prescription 6.C.1; USFWS Prescription 11.C.1), downstream eel passage is required by September 1, 2026 (NMFS Prescription 6.C.2; USFWS Prescription 11.C.2); a "single permanent upstream anadromous fish passage facility" is required to be operational by May 1, 2016 (NMFS Prescription 6.D.1; USFWS Prescription 11.D.1) and the existing downstream fish passage facilities are required to continue to be operated and tested (NMFS Prescription 6.E; USFWS Prescription 11.E).

West Buxton Project

BWPH proposed to continue its obligations for fish passage as outlined in the 2007 SRFAA as part of its new license for the West Buxton Project, issued by FERC on February 15, 2018. Consistent with the 2007 SRFAA, the 2018 West Buxton Project license has the following obligations for fish passage:

License Article 401 – consistent with the conditions of the Section 401 water quality certification and Section 18 fish passage prescriptions, Article 401 requires the filing of the plans and documentation for upstream and downstream eel and fish passage facilities and effectiveness evaluations. In accordance with Article 401, upstream anadromous fishway designs were required to be filed by January 31, 2019, for facilities operational by May 1, 2020. A request for a one year extension of time to file fishway designs to accommodate discussions leading to the filing of this 2019 Amendment was submitted on January 25, 2019. Downstream eel passage designs are due to be filed by March 31, 2028.

Section 401 Water Quality Certification – incorporated by reference into the Project license, the Section 401 Water Quality Certification includes the provisions of the 2007 SRFAA. Condition 3 requires upstream anadromous fish passage facilities to be installed and operational by May 1, 2020 or otherwise in accordance with the 2007 SRFAA. Downstream eel passage is required to be operational by September 1, 2028 or otherwise in accordance with the 2007 SRFAA under Condition 4.

Section 18 Fish Passage Prescriptions – USFWS December 19, 2016 Section 18 fish passage prescriptions and NMFS October 5, 2017 modified Section 18 fish passage prescriptions dictate that: "Licensee shall install permanent upstream and downstream fishways and/or fish passage measures at this project. These fishways and measures shall be designed, constructed, operated, maintained, and monitored by the Licensee, or provided for by the Licensee. Those fishways shall provide safe, timely, and effective passage for the target species: Atlantic salmon, American shad, blueback herring,

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alewife, and American eels during their migration periods. Provisions of this fishway prescription are consistent with the 1994 Saco River Fish Passage Agreement, the 1997 Saco River Instream Flow Agreement, and the 2007 Agreement". Downstream eel passage is required by September 1, 2028 (NMFS Prescription VII.1.b; USFWS Prescription V.A.1.b); a "single permanent upstream anadromous fish passage facility" is required to be operational by May 1, 2018 (USFWS Prescription V.A.2) and by May 1, 2020 (NMFS Prescription VII.2); and the existing downstream fish passage facilities are required to continue to be operated and tested (NMFS Prescription VII.3; USFWS Prescription V.A.3).

<u>Cataract, Skelton, and Hiram Projects</u>

The July 2007 FERC Order incorporates aspects of the 2007 SRFAA into the remaining projects' licenses, as follows:

(A) The licensee's March 27, 2007 filing of the 2000-2005 final assessment report – Saco River fish passage adequately fulfills the reporting requirements under the licenses for the Cataract Project, Skelton Project, Bar Mills Project, West Buxton Project, Bonny Eagle Project, and Hiram Project and is approved. The licensee shall no longer file assessment reports on the need for upstream fish passage.

(B) The licensee's recommendations for fish passage and fisheries management at the Skelton Project (FERC No. 2527), Cataract Project (FERC No. 2528), Bonny Eagle Project (FERC No. 2529), Hiram Project (FERC No. 2530), and West Buxton Project (FERC No. 2531), as modified by paragraphs (D) through (F) below, is approved.

(C) The licensee shall have both upstream and downstream eel passage operational at the projects by the following dates:

PROJECT	UPSTREAM EEL PASSAGE OPERATIONAL DATE	DOWNSTREAM EEL PASSAGE OPERATIONAL DATE
Cataract-East and West Channel Dams	June 1, 2008	September 1, 2011
Cataract-Springs/Bradbury Dam	June 1, 2010	n/a
Skelton	June 1, 2012	September 1, 2024
West Buxton	June 1, 2016	September 1, 2028
Bonny Eagle	June 1, 2018	September 1, 2030
Hiram	June 1, 2020	September 1, 2032

The licensee shall provide a single permanent upstream anadromous fish passage facility at each of the projects according to the following schedule:

PROJECT	OPERATIONAL DATE
West Buxton	May 1, 2019

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Bonny Eagle	May 1, 2022
Hiram	May 1, 2025

The licensee shall notify the Commission within 30 days of each facility being completed and operational. Revised Exhibit F drawings showing each facility as-built shall be filed, for Commission approval, within 180 days of completion of each facility.

(D) The licensee shall develop, in consultation with the U.S. Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), and Maine Atlantic Salmon Commission (MASC), a plan for a three-year study of Atlantic salmon kelts to determine/examine downstream passage routes at select Saco River sites. The plan shall include, at a minimum, the following: (1) a phase one desktop study to determine which project have the most potential to delay/affect kelt passage; (2) a phase two study which focuses on the passage routes at no more than two selected project; (3) conducting the study in the spring (3 months) using 20 to 30 fish per year and yield the equivalent information of a radio-telemetry study. The plan shall include a description of the goals and objectives that are to be met, results to be reported, as well as a schedule for implementing the study. The licensee shall submit the plan to the FWS, NMFS, and MASC by April 1, 2009, and allow the agencies at least 30 days to comment and provide recommendations on the plan. By July 1, 2009, the licensee shall file its proposed plan with the Commission, for approval, and include all agency comments and recommendations and any response comments by the licensee. The Commission reserves the right to require changes to the plan.

(E) The licensee shall conduct a two-year semi-quantitative study of downstream passage effectiveness for clupeids (using, for example, standardized observations, video cameras, and rotary screw traps, or similar methods) at the Cataract Project during the summers of 2007 and 2008; at the Skelton Project during the summers of 2009 and 2010; and sequentially at the West Buxton Project and Bonny Eagle Project beginning the year after 6 adult clupeids per acre of impoundment (approximately 790 fish at West Buxton and 2,080 fish at Bonny Eagle) are passed or stocked above the specific project. Prior to conducting the studies, the licensee shall file a study plan which describes the goals of the study and expectation of results, as well as a description of what is to be included in the summary report to be prepared upon completion of each study. Each study plan shall include a schedule for implementing the study and filing each summary report. The study plan shall be prepared in consultation with the U.S. Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), and Maine Department of Marine Resources (Maine DMR). The licensee shall allow the agencies 30 days to make comments and recommendations before filing the study plan with the Commission for approval. The licensee's filing shall include any comments or recommendations on the plan and the licensee's response to any comments or recommendations received. The Commission reserves the right to require changes to the plan.

(F) The licensee shall conduct an electro-fishing survey of smallmouth and largemouth bass populations in the West Buxton Project impoundment in 2007, in the Bonny Eagle impoundment in 2008, and in the Lake Arrowhead impoundment in 2009, and provide

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standard bass population data to the Maine Department of Inland Fisheries and Wildlife and the Commission by March 31, 2008, March 31, 2009, and March 31, 2010, respectively, before introduction of alewife into the impoundment or upstream waters occurs. The sample data provided for each bass survey shall include sample dates and location, habitat type, sampling depth, gear type, time and duration of the sample and prevailing weather conditions. The standard bass population data (population descriptive metrics) reported shall include number of bass collected during the sampling, species (largemouth or smallmouth), catch per unit effort, weight and length, condition factor, and population age structure and growth rates using scale samples for all Age 1+ bass. The licensee shall provide the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Maine Department of Marine Resources, Maine Atlantic Salmon Commission, and MDIFW with numeric abundance data for other species collected during the bass population survey.

Since 2007, the licensee has remained consistent with the Agreement conditions by conducting the various studies outlined in Section 5 of the SRFAA and as required by ordering paragraphs D, E, and F above and by providing funding to various agencies and organizations as described in other provisions within the SRFAA. With respect to the requirements of Ordering Paragraphs D, E, and F of the 2007 FERC Order, the following studies have been completed at the Projects:

<u>Ordering Paragraph D – Atlantic Salmon Kelt Study</u>

On July 2, 2009, NextEra Energy Maine Operating Services, LLC, the previous licensee for the projects, filed its Saco River Kelt Passage Plan, which was approved by FERC on August 18, 2009. The Phase I Study, which discussed the five relevant projects (Cataract, Skelton, Bar Mills, West Buxton, and Bonny Eagle) with regard to their potential for affecting kelt passage considering such variables as location, intake depths, trashrack configurations and dimensions, capacity and operations, was filed with the FERC on January 27, 2011. The goal of the Phase I study was to identify, through site ranking, the most limiting project to be recommended as a field study site, with the assumption that if kelts can pass the most limiting project, passage at other projects would be more successful. The Skelton Project ranked highest among the five candidate study sites, primarily due to lack of spillway passage potential, dam height and the depth of gates.

On July 26, 2011, the licensee filed the Saco River Phase 2 Kelt Passage Evaluation Plan which was acknowledged by FERC by letter dated November 3, 2011. The plan outlined measures for a Phase 2 radio telemetry study of kelt passage routes at the Skelton and Bar Mills Projects to be conducted in 2012. However, due to recurring low returns of adult Atlantic salmon, kelt studies have been indefinitely postponed.

<u>Ordering Paragraph E – Downstream Clupeid Passage</u>

On February 20, 2008, the licensee submitted the 2007 Downstream Passage of Juvenile Clupeids Report at the Cataract Project. Downstream passage of clupeids using underwater video imagery was monitored via the five possible downstream passage

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routes at the Cataract Project in 2007 using marked juvenile clupeids. The results indicated that downstream passage for alosine was effective at the Skelton Project and an additional juvenile clupeid downstream passage study at the Cataract Project was proposed. On June 19, 2008, the licensee filed its Juvenile Clupeid Downstream Passage Study Plan with the FERC, which was approved on September 9, 2008, which intended to replicate the video monitoring efforts of 2007 with proposed modifications to the downstream fish passage facility. However, the proposed modifications to the downstream passage facility could not be completed in time for the study and, coupled with high flows, the licensee, in consultation with the agencies, proposed to instead conduct quantitative downstream passage studies at the Cataract Project, the report for which was to be submitted to the FERC on April 29, 2010. This study was attempted in 2010, 2011 and 2012 with various reasons for incompletion including lack of available prototype tags, extreme meteorological events, and high flows. On March 29, 2013, the licensee filed an update of the requirements of Ordering Paragraph E wherein “the fragile nature of tagging and handling juvenile clupeids combined with site specific challenges at the Cataract Project have provided multiple impediments to the successful completion of the project”. Based on this and “strong suggestive evidence that there is no issue that the Project”, a request to defer further studies was submitted. By letter dated May 13, 2013, FERC acknowledged the repeated attempts at completion and indicated that “despite the fact that you were unable to obtain conclusive data regarding downstream juvenile clupeid passage at the project, you have fulfilled all of the abovementioned (Ordering Paragraph E) requirements”.

Ordering Paragraph F – Bass Population Study

The studies at the West Buxton and Bonney Eagle Projects were conducted in compliance with and conformity to Maine Department of Inland Fisheries and Wildlife sampling and collection protocols and consisted of a habitat survey and an electrofishing survey. The study was undertaken for the West Buxton impoundment in 2007 and at the Bonney Eagle Project in 2008. The West Buxton study report was filed with the FERC on February 12, 2008 and FERC acknowledged that the report fulfills the requirements of Ordering Paragraph F on June 30, 2008. The Bonney Eagle study report was filed with the FERC on December 9, 2008 and FERC acknowledged that the report fulfills the requirements of Ordering Paragraph F on February 12, 2009.

The implementation of upstream and downstream fish passage facilities has been conducted consistent with the provisions of the Agreement and as required by the 2008 Bar Mills License, 2018 West Buxton License, and Ordering Paragraph C for the remaining projects, in consultation with the agencies, allowing for deferral as appropriate and as discussed below.

Upstream Eel Passage

Upstream eel passage facilities are in place and operational at the following Projects: Cataract-East and West Channel Dams; Cataract-Springs/Bradbury Dam; Skelton; Bar Mills West Buxton and Bonny Eagle. On April 23, 2019, BWPH, submitted the 2018 Upstream Eel Passage Monitoring Report for the Hiram Project. As a result of the findings of the study, which resulted in low numbers of eel observed, BWPH also requested to delay upstream American eel passage construction and operation at the Hiram Project from June 1, 2020, as required by Ordering Paragraph B, until June 1, 2025. That request, supported by the NMFS, USFWS and MDMR, is pending before FERC.

Downstream Eel Passage

Downstream eel passage measures, consisting of night-time shut-downs in September and October have been implemented at the Cataract Project to date in compliance with the 2007 SRFAA and Ordering Paragraph C. Downstream eel passage at other facilities is to be installed beginning in 2024 pursuant to existing license requirements and the 2007 SRFAA.

Upstream Fish Passage

Upstream fish passage facilities exist at the Cataract and Skelton Projects, and pre-date the 2007 SRFAA.

The 2008 Project License and 2007 SRFAA require upstream fish passage to be operational at the Bar Mills Project by May 1, 2016. On November 1, 2017, BWPH filed an extension of time request to May 1, 2020 to install and commence operation of an upstream anadromous fish passage facility at the Bar Mills Project. Previous extensions of time (to May 1, 2018 and May 1, 2019) had been previously granted to avoid interference with a Maine Department of Transportation (MDOT) bridge replacement project that was occurring within the project boundary. In the 2017 request, BWPH clarified that discussions with the USFWS, NMFS, and MDMR had centered around alternative fish passage measures on the Saco River that may be more beneficial than a new fish passage facility at the Bar Mills Project. FERC approved the extension of time on January 18, 2018.

On July 24, 2017, BWPH filed an extension of time request to May 1, 2020 to construct and commence operation of an upstream anadromous fish passage facility at the West Buxton Project, in compliance with Ordering paragraph (C) of the Commission’s July 18, 2007 Order and the 2007 SRFAA. BWPH requested an extension to install and commence operation of an upstream anadromous fish passage facility at the Project as a result of project relicensing, low and inconsistent river herring returns, and limited shad habitat above the Project. The extension of time was granted on October 4, 2017. As discussed above, a new license was issued for the Project on February 15, 2018 which reiterated the operational date of May 1, 2020 for upstream fish passage facilities at the Project[1].

[1] As a result of renegotiations of the 2007 SRFAA, which were expected to result in a delay of implementation of fish passage at the West Buxton Project, an extension of time to file final design plans by one year (to January 31, 2020) was requested by BWPH to allow sufficient time to file the resulting Amendment, contained herein. The extension is currently pending before FERC.

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The Licensee and the Parties conduct annual and ad hoc meetings, scheduled as necessary or as part of the fishway design process, to discuss the progress, research, and advancement to the Saco River fisheries resources in accordance with the 2007 SRFAA. As a result, it has become clear that an amendment to certain areas of the original 2007 SRFAA are needed to accommodate the latest information and advancements gained as a result of the implementation of the provisions of the 2007 SRFAA undertaken to date.

Section 5 Revisions to be Incorporated as License Conditions

The 2019 Amendment (attached) includes the following applicable revisions to Section 5.3.b.1 of the 2007 SRFAA. In accordance with the 2019 Amendment, Section 5.3.b.1 is deleted in its entirety and replaced with the following:

“b. Permanent Upstream Passage Facilities

1. Licensee will provide a single permanent upstream anadromous fish passage facility at each of the Projects, or an alternative method agreed upon and approved by the Parties, at its cost and according to the following schedule:

Bar Mills	May 1, 2015
West Buxton	May 1, 2027
Bonny Eagle	May 1, 2029
Hiram	May 1, 2032

a. Licensee and the other Parties agree to meet annually to discuss Licensee’s upstream fish passage efforts until passage is operational. Licensee will, by no later than May 1, 2021, commit to the final Bar Mills fish passage plan by issuing a written letter stating its plan to all of the Parties. Such letter shall be concurrently filed with FERC on the Bar Mills docket.

If the Resource Agencies determine that Licensee’s upstream fish passage intentions include a timely commitment to a fish passage design that will be more effective than that contemplated in the SRFAA, but will be completed after the May 1, 2025 deadline for Bar Mills, the Resource Agencies may agree, after consultation with the other signatories, to delay Licensee’s upstream fish passage requirements at Bar Mills, West Buxton, Bonny Eagle and Hiram on a yearly basis. Licensee agrees that any changes to the fish passage timelines set forth in this Section 5.3.b.1 shall require an adjustment to the financial amounts committed to in Section 4 of this Agreement.

b. West Buxton Project is to be completed within two (2) years of the approved completion date for Bar Mills, including any extensions to that date that the Resource Agencies have granted under the terms of Section 5.3.b.1.

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c. Bonny Eagle Project is to be completed within four (4) years of the approved completion date for Bar Mills, including any extensions to that date that the Resource Agencies have granted under the terms of Section 5.3.b.1.

d. Hiram Project is to be completed within seven (7) years of the approved completion date for Bar Mills, including any extensions to that date that the Resource Agencies have granted under the terms of Section 5.3.b.1."

In addition, BWPH will commit to making improvements, as determined in consultation with the agencies, to the upstream and downstream fish passage facilities at the Cataract and Skelton Projects. BWPH will file as built drawings showing any modifications to existing facilities, once completed, and will coordinate construction of such modifications, as necessary, with the FERC New York Regional Office.

The above provisions have been carefully considered and balanced during the 2019 Amendment discussions in consideration of the management priorities of the agencies, the effect of each measure on the overall restoration of migratory species to the Saco River watershed, and their effect upon the developmental resources of the Projects. The Parties to the 2007 SRFAA and the 2019 Amendment agree that the proposed measures are both in the public interest and beneficial to the fishery resources of the watershed and will fulfill fisheries assessment and passage requirements.

BWPH requests that FERC not contravene the provisions of Section 5 therein and issue one or more FERC Orders that integrate the terms and provisions of Section 5 of the 2019 Amendment into the license conditions for the applicable Projects. If, in making its decisions, the Commission determines that any of the provisions contained in Section 5 are not within its jurisdiction to enforce, the Parties request that the Commission expressly and clearly notify the Parties of this in its order(s). BWPH is seeking subsequent modifications to its Section 401 water quality certifications for the Projects and any necessary modifications to its Section 18 fish passage prescriptions concurrently with this request.

Should you have any questions regarding this filing, please contact Matt LeBlanc at matthew.leblanc@brookfieldrenewable.com or by phone at 207-252-4870.

Thank you,

Kelly Maloney

Kelly Maloney
Manager, Compliance - Northeast

Attachments: 2019 Amendment No. 2 to Saco River Fisheries Assessment Agreement

Cc: S. Michaud, N. Stevens, F. Dunlap, J. Seyfried, M. LeBlanc, J. Rancourt; BWPH

SACO RIVER
FISHERIES ASSESSMENT AGREEMENT AMENDMENT No. 2

Brookfield White Pine Hydro LLC (f/k/a FPL Energy Maine Hydro LLC)
Cataract Project (No. 2528)
Skelton Project (No. 2527)
Bar Mills Project (No. 2194)
West Buxton Project (No. 2531)
Bonny Eagle Project (No. 2529)
Hiram Project (No. 2530)

FEBRUARY 2019

AMENDMENT NO.2 TO SACO RIVER FISHERIES ASSESSMENT AGREEMENT

This Amendment No. 2 to Saco River Fisheries Assessment Agreement (the "**Amendment**") is entered into as of February 14, 2019.

Reference is made to that certain Saco River Fisheries Assessment Agreement (SRFAA), dated as of February 2007, among FPL Energy Maine Hydro LLC ("**FPL Energy**"), U.S. Fish and Wildlife Service, National Marine Fisheries Service, Maine Atlantic Salmon Commission, Maine Department of Inland Fisheries and Wildlife (MDIFW), Maine Department of Marine Resources (MDMR), Saco River Salmon Club, Atlantic Salmon Federation, Maine Council of the Atlantic Salmon Federation (MC-ASF), Saco River Hydro, LLC and New Hampshire Fish and Game Department (collectively, the "**Original Signatories**"), as amended by that certain Amendment No. 1 to Saco River Fisheries Assessment Agreement, dated as of May 2009, among FPL Energy and the Original Signatories (as amended, supplemented or otherwise modified from time to time, the "**SRFAA**"). Unless otherwise defined herein, capitalized terms defined in the SRFAA and used herein shall have the meanings given to them in the SRFAA.

WHEREAS, Brookfield White Pine Hydro LLC (as successor in interest to FPL Energy) ("**Brookfield**" or "**Licensee**"), the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Maine Department of Inland Fisheries and Wildlife, Maine Department of Marine Resources, (as successors in interest to the Original Signatories) (the "**Resource Agencies**"), Saco Salmon Restoration Alliance, Atlantic Salmon Federation, and the Maine Council of the Atlantic Salmon Federation have agreed to further amend the SRFAA as provided herein.

NOW THEREFORE, in consideration of the mutual agreements set forth herein, and for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereto agree as follows:

1. Amendments to SRFAA.

(a) Section 2.19 of the SFRAA is hereby deleted in its entirety and replaced with the following:

"2.19 Adjustment of Financial Amounts

Except where otherwise specified herein, all financial amounts committed to in Section 4 of this Agreement are in 2018 dollars and shall be adjusted every three (3) years, beginning in 2020, according to the Gross Domestic Product: Implicit Price Deflator as published by the U.S. Department of Commerce."

(b) Section 4.1 of the SRFAA is hereby deleted in its entirety and replaced with the following:

"4.1 Funds to Support Inland Fisheries Habitat Restoration, Stream Connectivity and Management

Licensee agrees to support various fisheries management projects which may include but are not limited to: enhancing and restoring inland fisheries habitat and habitat connectivity; assessing inland fisheries populations; and/or the implementation of inland fisheries management activities within the Saco River Basin. Licensee agrees to fund such activities up to an aggregate of $10,000 per year for eleven years (2019-2029), for a total of $110,000.

The MDIFW shall, with input and consideration from MDMR, develop inland fisheries management activities funded under this section. For any activities located partially or wholly within Licensee's FERC Project boundaries, MDIFW and Licensee shall, with input and consideration from MDMR, develop management activities funded under this section. Such agreement shall not be unreasonably withheld. Unless MDIFW and Licensee agree to a planned alternative schedule of activities and funding, Licensee will fund activities by $10,000 per year for eleven years beginning in 2019, with an ability to accrue funding in escrow to cover larger planned projects. In no case shall Licensee be required to exceed the total funding required under this section."

(c) Section 4.2 of the SRFAA is hereby deleted in its entirety and replaced with the following:

"4.2 Funds to Support Saco Salmon Restoration Alliance

Licensee agrees to pay a one-time grant of $36,000 for upgrades to the hatchery of the Saco Salmon Restoration Alliance ("SSRA"). Such funds will be expended by the SSRA for continued rearing and stocking of Atlantic salmon as part of the overall restoration goals for the Saco River Watershed."

(d) Section 4.4 of the SRFAA is hereby deleted in its entirety and replaced with the following:

"4.4 Funds to Support Public Education

Licensee agrees to provide total funding of $10,000 to the MC-ASF for the Fish Friends program expansion exclusive to schools within the Saco River Watershed. Funding will be used expressly to provide necessary aquarium equipment and aquarium maintenance equipment for the addition of ten schools, or to replace faulty equipment at participating schools currently obtaining eggs from the SSRA hatchery. The intent of the education program will be to promote thIne cooperative fisheries management and fisheries restoration efforts on the Saco River. The Parties agree that the funding will be provided in $2,000 installments so that equipment purchases can be made by October of each year, beginning in 2018. Exceptions to the above schedule to delay a single year's funding by up to one year or to combine it with the funds for the following year may be requested by consensus of the Parties, which request will not be unreasonably denied by Licensee. However, in no case shall such request require the total funding by Licensee under this section to be increased beyond $10,000. MC-ASF will manage this fund as an account at an accredited financial institution. If this account bears interest, that interest shall be part of the fund and treated no differently than funds deposited by Licensee. SSRA agrees to provide MC-ASF with one (1) itemized invoice annually for equipment purchases. The Parties agree that account debits will not be unreasonably denied or withheld. SSRA will be asked to provide an annual report to both Licensee and MC-ASF for all eligible purchases until such time that the funds are fully expended. MC-ASF agrees to provide SSRA and Licensee with annual, year-end statements from the accredited financial institution. The Parties agree that residual funds will remain in the aforementioned account until such time as they are fully expended for the purposes stated above.

Notwithstanding the above, Licensee will not be required to expend funds under this section beyond the year 2024. The Parties agree that the expansion of the Fish Friends program will be a cooperative joint effort by the MC-ASF, SSRA and Licensee."

(e) Section 5.3.b.1 of the SFRAA is hereby deleted in its entirety and replaced with the following:

"b. Permanent Upstream Passage Facilities

1. Licensee will provide a single permanent upstream anadromous fish passage facility at each of the Projects, or an alternative method agreed upon and approved by the Parties, at its cost and according to the following schedule:

PROJECT	OPERATIONAL DATE
Bar Mills	May 1, 2025
West Buxton	May 1, 2027
Bonny Eagle	May 1, 2029
Hiram	May 1, 2032[1]

a. Licensee and the other Parties agree to meet annually to discuss Licensee's upstream fish passage efforts and design at the Bar Mills Project until passage is operational. Licensee will, by no later than May 1, 2021, commit to the final Bar Mills fish passage plan by issuing a written letter stating its plan to all of the Parties. Such letter shall be concurrently filed with FERC on the Bar Mills docket.

If the Resource Agencies determine that Licensee's upstream fish passage intentions include a timely commitment to a fish passage design that will be more effective than that contemplated in the SRFAA, but will be completed after the May 1, 2025 deadline for Bar Mills, the Resource Agencies may agree, after consultation with the other signatories, to delay Licensee's upstream fish passage requirements at Bar Mills, West Buxton, Bonny Eagle and Hiram on a yearly basis. Licensee agrees that any changes to the fish passage timelines set forth in this Section 5.3.b.1 shall require an adjustment to the financial amounts committed to in Section 4 of this Agreement.

b. West Buxton Project is to be completed within two (2) years of the approved completion date for Bar Mills, including any extensions to that date that the Resource Agencies have granted under the terms of Section 5.3.b.1.

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1 Provided that the Resource Agencies determine that such facility is necessary based upon the status of salmon restoration at that time.

c. Bonny Eagle Project is to be completed within four (4) years of the approved completion date for Bar Mills, including any extensions to that date that the Resource Agencies have granted under the terms of Section 5.3.b.1.

d. Hiram Project is to be completed within seven (7) years of the approved completion date for Bar Mills, including any extensions to that date that the Resource Agencies have granted under the terms of Section 5.3.b.1."

2. Acknowledgements. Brookfield and the Resource Agencies hereby acknowledge and agree:

(a) Construction and Improvements at Cataract East and West and Skelton described in paragraph (b) below, and the Springs Island nature-like fishway ("NLF"), shall be completed no later than May 1, 2020. Licensee will conduct no less than two (2) years of upstream and downstream fish passage studies for adult and juvenile alewife and American shad (the "Study") beginning in the Spring of 2021 or the Spring following the completion of the NLF. Additional years may be needed depending on environmental conditions and Study results, but the Study period will not extend beyond a total of three (3) years for each applicable facility unless agreed upon by Licensee and the other Resource Agencies. The purpose of the Study is to assess the passage improvements made at Cataract East and West, the new NLF at Springs Island and Skelton. The Study will use standard telemetry techniques to determine near-field and far-field attraction, passage efficiencies, and downstream mortality. The design of the Study will be reviewed and approved by the Resource Agencies before filing with FERC. Annual Study results will be reviewed and used to inform subsequent studies. Upstream and downstream passage issues that may be identified based on Study results and specifically noted by the Resource Agencies will be addressed through minor structural, mechanical, operational or procedural adjustments by Licensee.

(b) Licensee will implement the USFWS/NMFS Engineering Recommendations for Saco River Projects ("Improvements"), identified within the USFWS memorandum dated July 26, 2017 ("Memo") and attached hereto as Attachment D, to resolve the issues related to fish passage at Cataract East and West and Skelton ("Issues") identified therein. These Improvements are intended to be structural in nature, however, it is recognized that alternative solutions may be adopted to address the Issues, provided that: (1) the Resource Agencies agree that such solutions are more effective than the Improvements; (2) such solutions are consistent with the 2017 FWS Fish Passage Engineering Design Criteria, or are otherwise approved by the Resource Agencies; and (3) such solutions are within a similar scope and cost to the Improvements. Construction will be completed no later than May 1, 2020 (the "Construction Completion Date") except that, if there is a deviation from the Design Schedule (as defined below) resulting from the actions of any signatory to this Agreement that is not the Licensee, the Construction Completion Date shall be extended by a period equal to the Design Schedule delay. Prior to implementing the Improvements, Licensee will undergo a complete design review process (30, 60, 90% designs) according to a design schedule ("Design Schedule") to be established by the Resource Agencies in consultation with Licensee. The Resource Agencies must approve such designs before construction is commenced. The Resource Agencies will review the existing O&M plans, including the Cataract East and West stranding protocol, and will provide feedback to Licensee to ensure they are sufficient to avoid stranding-associated mortality of fish species.

(c) The completion date for the Springs Island NLF remains May 1, 2020.

(d) Section 4.3 of the SRFAA remains in effect and shall continue up to and through the Bonny Eagle Project completion date (2029) as described in Section 5.3.b.1 of the SRFAA (as amended herein).

3. Effectiveness of Amendment. This Amendment shall become effective upon execution by all of the Parties in accordance with Section 2.8 of the SRFAA (the "**Amendment Effective Date**"). Licensee shall also file with the FERC those modifications set forth in this Amendment that pertain to Section 5 of the SRFAA.

4. Reference to and Effect on the SRFAA. On or after the Amendment Effective Date, each reference to the SRFAA shall be deemed to refer to the SRFAA as amended hereby.

5. Continuing Effectiveness of SRFAA. As amended hereby, all terms of the SRFAA shall be and remain in full force and effect and shall constitute the legal, valid, binding and enforceable obligations of each of the parties thereto.

6. Effect of Amendment. The execution, delivery and effectiveness of this Amendment shall not, except as expressly provided herein, operate as a waiver of any right, power or remedy of a party to the SRFAA, nor constitute a waiver of any provision of the SRFAA.

7. Amendments and Waivers. No amendment, modification, termination, or waiver of any provision of this Amendment will be effective except in compliance with Section 2.8 of the SRFAA.

8. Severability. Whenever possible, each provision of this Amendment will be interpreted in such manner as to be effective and valid under applicable law. In the event any provision of this Amendment is or is held to be invalid, illegal, or unenforceable under applicable law, such provision will be ineffective only to the extent of such invalidity, illegality, or unenforceability, without invalidating the remainder of such provision or the remaining provisions of this Amendment.

9. Successors and Assigns. This Amendment shall be binding upon and inure to the benefit of the parties hereto and their respective successors and assigns.

10. Governing Law. This Amendment shall be construed and governed in accordance with the Federal Power Act and Federal Law, for those portions of the Amendment within the jurisdiction of FERC. The remainder shall be construed and governed by the laws of the State of Maine, without regard to Maine's conflict of law principles.

11. Counterparts. This Amendment may be executed in any number of counterparts and by different parties hereto in separate counterparts, each of which, when so executed and delivered, will be deemed an original and all of which shall together constitute one and the same instrument. This Amendment may be executed and delivered by facsimile or e-mailed PDF transmission of a manually signed counterparty.

[Signature Page Follows]

IN WITNESS WHEREOF, the parties hereto have caused this Amendment to be executed as of the date first above written by their respective duly authorized officers.

BROOKFIELD WHITE PINE HYDRO LLC

By: ______________________________
Name: Walter Di Cesare
Title: Vice President & Secretary

By: ______________________________
Name: Thomas Uncher
Title: Vice President

U.S. FISH AND WILDLIFE SERVICE

By: ______________________________
Name:
Title:

NATIONAL MARINE FISHERIES SERVICE

By: ______________________________
Name:
Title:

MAINE COUNCIL OF THE ATLANTIC SALMON FEDERATION

By: ______________________________
Name:
Title:

MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE

By: ______________________________
Name:
Title:

MAINE DEPARTMENT OF MARINE RESOURCES

By: ______________________________
Name:
Title:

SACO SALMON RESTORATION ALLIANCE

By: ______________________________
Name:
Title:

ATLANTIC SALMON FEDERATION

By: ______________________________
Name:
Title:

IN WITNESS WHEREOF, the parties hereto have caused this Amendment to be executed as of the date first above written by their respective duly authorized officers.

BROOKFIELD WHITE PINE HYDRO LLC

By: ______________________________
Name:
Title:

By: ______________________________
Name:
Title:

U.S. FISH AND WILDLIFE SERVICE

By: ______________________________
Name: Anna Harris
Title: Maine Ecological Services Project Leader

NATIONAL MARINE FISHERIES SERVICE

By: ______________________________
Name:
Title:

MAINE COUNCIL OF THE ATLANTIC SALMON FEDERATION

By: ______________________________
Name:
Title:

MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE

By: ______________________________
Name:
Title:

MAINE DEPARTMENT OF MARINE RESOURCES

By: ______________________________
Name:
Title:

SACO SALMON RESTORATION ALLIANCE

By: ______________________________
Name:
Title:

ATLANTIC SALMON FEDERATION

By: ______________________________
Name:
Title:

IN WITNESS WHEREOF, the parties hereto have caused this Amendment to be executed as of the date first above written by their respective duly authorized officers.

BROOKFIELD WHITE PINE HYDRO LLC

By: ______________________
Name:
Title:

By: ______________________
Name:
Title:

U.S. FISH AND WILDLIFE SERVICE

By: ______________________
Name:
Title:

NATIONAL MARINE FISHERIES SERVICE

By: ______________________
Name:
Title:

MAINE COUNCIL OF THE ATLANTIC SALMON FEDERATION

By: ______________________
Name: GERARD ZEGERS
Title: President, Maine Council

MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE

By: ______________________
Name:
Title:

MAINE DEPARTMENT OF MARINE RESOURCES

By: ______________________
Name:
Title:

SACO SALMON RESTORATION ALLIANCE

By: ______________________
Name:
Title:

ATLANTIC SALMON FEDERATION

By: ______________________
Name: JOHN BURROWS
Title: Director, N.E. Programs

IN WITNESS WHEREOF, the parties hereto have caused this Amendment to be executed as of the date first above written by their respective duly authorized officers.

BROOKFIELD WHITE PINE HYDRO LLC

By: ______________________
Name:
Title:

By: ______________________
Name:
Title:

U.S. FISH AND WILDLIFE SERVICE

By: ______________________
Name:
Title:

NATIONAL MARINE FISHERIES SERVICE

By: ______________________
Name:
Title:

MAINE COUNCIL OF THE ATLANTIC SALMON FEDERATION

By: ______________________
Name:
Title:

MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE

By: ______________________
Name:
Title:

MAINE DEPARTMENT OF MARINE RESOURCES

By: ______________________
Name:
Title: Commissioner

SACO SALMON RESTORATION ALLIANCE

By: ______________________
Name:
Title:

ATLANTIC SALMON FEDERATION

By: ______________________
Name:
Title:

IN WITNESS WHEREOF, the parties hereto have caused this Amendment to be executed as of the date first above written by their respective duly authorized officers.

BROOKFIELD WHITE PINE HYDRO LLC

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Name:
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By: ______________________________
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Title:

U.S. FISH AND WILDLIFE SERVICE

By: ______________________________
Name:
Title:

NATIONAL MARINE FISHERIES SERVICE

By: Michael R P
Name: Michael Pentony
Title: Regional Administrator

MAINE COUNCIL OF THE ATLANTIC SALMON FEDERATION

By: ______________________________
Name:
Title:

MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE

By: ______________________________
Name:
Title:

MAINE DEPARTMENT OF MARINE RESOURCES

By: ______________________________
Name:
Title:

SACO SALMON RESTORATION ALLIANCE

By: ______________________________
Name:
Title:

ATLANTIC SALMON FEDERATION

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BROOKFIELD WHITE PINE HYDRO LLC

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Name:
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U.S. FISH AND WILDLIFE SERVICE

By: ______________________________
Name:
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NATIONAL MARINE FISHERIES SERVICE

By: ______________________________
Name:
Title:

MAINE COUNCIL OF THE ATLANTIC SALMON FEDERATION

By: ______________________________
Name:
Title:

MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE

By: James M Connolly
Name: James M Connolly
Title: Director Bureau Resource Management

MAINE DEPARTMENT OF MARINE RESOURCES

By: ______________________________
Name:
Title:

SACO SALMON RESTORATION ALLIANCE

By: ______________________________
Name:
Title:

ATLANTIC SALMON FEDERATION

By: ______________________________
Name:
Title:

JMC

IN WITNESS WHEREOF, the parties hereto have caused this Amendment to be executed as of the date first above written by their respective duly authorized officers.

BROOKFIELD WHITE PINE HYDRO LLC

By: ______________________
Name:
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By: ______________________
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U.S. FISH AND WILDLIFE SERVICE

By: ______________________
Name:
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NATIONAL MARINE FISHERIES SERVICE

By: ______________________
Name:
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MAINE COUNCIL OF THE ATLANTIC SALMON FEDERATION

By: ______________________
Name:
Title:

MAINE DEPARTMENT OF INLAND FISHERIES AND WILDLIFE

By: ______________________
Name:
Title:

MAINE DEPARTMENT OF MARINE RESOURCES

By: ______________________
Name:
Title:

SACO SALMON RESTORATION ALLIANCE

By: John Blunt
Name:
Title: President 2/6/2019

ATLANTIC SALMON FEDERATION

By: ______________________
Name:
Title:

Document Content(s)

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Exhibit D

PAUL R. LEPAGE
GOVERNOR

PAUL MERCER
COMMISSIONER

March 28, 2018

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

Subject: FERC 2530 – Hiram Hydroelectric Project
Pre-Application Document Comments

Dear Ms. Bose:

The Maine Department of Environmental Protection (MEDEP or Department) received and reviewed a Notice of Intent to File License Application, Filing of Pre-Application Document (PAD), Commencement of Pre-Filing Process, and Scoping: Request for Comments on the PAD and Scoping Document, and Identification of Issues and Associated Study Requests, dated January 29, 2018. MEDEP staff attended a scoping meeting and site visit on March 1, 2018 and reviewed appropriate project documents to prepare the following comments and recommendations.

The proposed relicensing is subject to Water Quality Certification provisions of Section 401 of the Federal Water Pollution Control Act (a.k.a. Clean Water Act). By Executive Order of the governor of the State of Maine, the Maine Department of Environmental Protection is the State certifying agency for projects located wholly or in part in organized towns and cities, and as such, has jurisdiction over the Hiram Hydroelectric Project.

The existing Hiram Hydroelectric Project consists of a 448-foot-long dam, an intake that is integral to the dam, a powerhouse, and appurtenant features. The dam consists of a concrete spillway, divided into two section, four sluiceways with gates, and old intake structure, a concrete abutment, a new intake structure, and a concrete bulkhead. There is an inflatable rubber dam on the crest of each spillway section. The entire dam is founded on bedrock. The powerhouse contains two turbine/generator units, with 2.4 MW (Unit 1) and 8.1 MW (Unit 2) capacity, respectively. The turbine pits contain a Kaplan runner (Unit1) and a Francis runner (Unit 2). The Hiram Project impoundment extends 7.5 miles upstream and is 255 acres at full pond elevation of 349. No fish passage exists at the facility.

Recreation facilities associated with the Project include a canoe portage trail with a landing and parking area, a fisherman’s trail with parking, and a scenic overlook.

Brookfield White Pine Hydro LLC (BWPH) anticipates construction of site specific fish passage facilities by May 1, 2025, as necessary based upon the status of salmon restoration efforts, and of upstream eel passage measures and downstream eel passage measures at the Project by 2020 and 2032, respectively. BWPH proposes no change in project operation, and no new development is proposed.

Comments on PAD

The Department appreciates the effort that BWPH and their consultants have made to prepare a Pre-Application Document. The PAD provides an understanding of the Project, the surrounding resources, and proposed dam operation. The PAD highlights the issues related to dam operations and relicensing that should be investigated to ensure that operations do not have a negative impact on the resources of the Saco River.

1. The Department understands that in order to obtain a federal license or permit, the applicant is required to obtain water quality certification form states where a discharge occurs. Sufficient high quality data is necessary for the Department to assess whether the presence an operation of the Hiram Hydroelectric Project impacts water quality, and whether water quality standards, including designated uses, narrative criteria and numeric criteria are met in the Saco River, including in impoundments created by the Hiram Hydroelectric Dam. Water quality studies to collect such data are necessary to provide such data as needed by the agencies. To ensure that studies are conducted in a manner that collects high quality data, a number of water quality studies are required.

2. Section 6.2.2.2, Tailwater Temperature and Dissolved Oxygen Study – The location of the datasonde is proposed to be determined by single measurements of temperature and dissolved oxygen at the first, second and third quarter points of a transect across the river. The proposal states, "If no significant (<0.4 mg/L) difference in concentrations among the quarter points, the datasonde will be placed at the location shown to be representative of the main flow. Otherwise, the datasonde(s) will be installed at the location of the lowest concentration and the location of the main flow below the dam." Department staff recommends that the difference between quarter point measurements be +/- 0.2 mg/L, rather than 0.4 mg/L, and that the datasonde be placed in the location of the lowest concentration (which may not be the location of the main flow below the dam) if the difference in concentrations is > +/-0.2 mg/L.

3. Section 6.2.2.2, Tailwater Habitat Study – Attainment of the designated use 'habitat for fish and other aquatic life' should be demonstrated in the river below the project dam, as proposed. Additionally, the bypass reach should be sufficiently wetted to provide habitat for resident fish. The cross-section flow study proposed for the tailwater section of the Saco River should be extended to evaluate flows through the bypass reach, in order for the resource agencies to evaluate a minimum bypass flow.

Water Quality Classifications and Standards

Water Quality Standards and the water quality classifications of all surface water of the State have been established by Maine Legislature (Title 38 M.R.S. §§ 464-467). The following classification applies to the water affected by the Hiram Hydroelectric Project:

The Saco River, from its confluence with the impoundment of the Hiram Dam to a point located 1,000 feet below the Hiram Dam – Class A

Class A waters must be of such quality that they are suitable for the designated use of drinking water after disinfection; fishing; agriculture; recreation in and on the water; industrial process and cooling water supply; hydroelectric power generation; navigation; and as habitat for fish and other aquatic life. The habitat must be characterized as natural.

The dissolved oxygen content of Class A waters shall be not less than 7 parts per million or 75% of saturation, whoever is higher. The aquatic life and bacteria content of Class A waters shall be as naturally occurs.

Generally, direct discharges to Class A waters licensed after January 1986 are permitted only if the discharged effluent will be equal to or better than the existing water quality of the receiving waters.

Antidegradation

The State's antidegradation policy provides that water quality certification may be approved only if the applicable standards of the affected water body are met and existing in-stream uses and the level of water quality necessary to protect those existing uses are maintained and protected. The policy also provides that, where the actual quality of any classified water exceeds the minimum standards of the next highest classification, that higher water quality classification shall be maintained and protected.

Water Quality Certification Data Requirements

To certify that the hydropower project does not cause or contribute to non-attainment of Maine's water quality standards, under section 401 of the Federal Water Pollution Control Act, the applicant must demonstrate that designated uses, numeric criteria and narrative criteria are met in the Project impoundments and downstream of the project tailrace. The applicant proposes a number of water quality studies and other resource studies for the relicensing of the Hiram Hydroelectric Project. Water quality studies of the impoundment and tailrace are necessary to evaluate the impact of proposed project operations on the Saco River and to determine if continued operations under a new project license can be expected to meet Maine's water quality standards. Such assessment is provided by issuance of a water quality certification, pursuant to authority delegated by the United State Environmental Protection Agency to the State where a discharge occurs; in this case the discharge is the water affected by the operation of a hydropower facility and the discharge over the spillway occurs in the State of Maine. It has been the Department's practice to determine the metrics, methods, timing, and duration of water quality monitoring necessary to ensure that the water quality studies meet data quality objectives for certification. Therefore, the Department requests that the applicant conduct water quality studies that include the following parameters and adhere to the Department's established sampling protocols in support of water quality certification.

Impoundment Trophic State Study - The applicant has proposed to conduct an Impoundment Trophic State Study to demonstrate that the impoundment exhibits a steady or improving trophic state, and that Maine's water quality standards are met; therefore, the Department is requesting that the Impoundment Trophic State Study be conducted in accordance with established sampling protocols, including sample collection and analysis parameters, as provided under "Lakes, Ponds, and Impoundments" in the DEP Sampling Protocol for Hydropower Studies – December 2017, which is attached to this comment letter.

Impoundment Aquatic Habitat Study – The purpose of this study is to determine the effect of impoundment drawdowns on the impoundment's littoral zone and the ability of the impoundment to support fish and other aquatic life. The Hiram Project is operated with pond drawdown limited to two feet from November 16 through September 30, and to one foot from October 1 through November 15. A two-foot drawdown from full pond (either with the rubber dam inflated or from the top of the spillway when the rubber dam is deflated) can be more than seven feet between the full pond elevation with the rubber dam inflated and the allowed two foot drawdown from the spillway sill. BWPH has proposed to conduct an impoundment habitat study to demonstrate that impoundment drawdowns do not cause or contribute to non-attainment of habitat criteria; therefore, the study must be conducted in accordance with established sampling protocols provided under "Lakes, Ponds, and Impoundments, Habitat Study" in the DEP Sampling Protocol for Hydropower Studies – December 2017.

Temperature and Dissolved Oxygen Study – The applicant will need to conduct a temperature and dissolved oxygen study in the impoundment and in the tailwater of the Hiram Hydroelectric Project to demonstrate compliance with Maine water quality standards. Data must be collected in the Saco River below the Hiram Project I accordance with the Department's "Temperature and Dissolved Oxygen Study" protocol under "Rivers and Streams" in the DEP Sampling Protocol for Hydropower Studies – December 2017, and at the deepest location within the impoundment in accordance with the Department's protocol for Lakes, Ponds, and Impoundment Trophic State Study, which is attached to this comment letter. As noted in the protocol, the applicant will need to consult with the Department to verify representative sampling locations as the study plans are developed.

Benthic Macroinvertebrate (BMI) Monitoring – Assessment of the macroinvertebrate community is critical to determine whether current in-stream flow releases affect attainment of classification criteria for habitat and aquatic life in the Saco River below the Project. A BMI study is proposed by the applicant, to determine the current structure of the community and to evaluate any impacts caused by project operations. To ensure data meets water quality certification compliance objectives, the study plan must be developed in accordance with the Department's Methods for Biological Sampling and Analysis of Maine's Rivers and Streams, which is attached to this comment letter. Similar to the Temperature and Dissolved Oxygen Study, the applicant will need to consult with the Department to verify representative sampling location as the study plan is developed.

Aquatic Habitat Cross-Section Flow Study – This study evaluates whether current in-stream flow releases are affecting attainment of habitat standards for fish and other aquatic life in the Saco River below the Project dam and in the bypass reach. It is the Department's position that there must be both sufficient quality and quantity of habitat for aquatic organisms to meet aquatic life and habitat standards. The Hiram is currently operated with pond drawdown limited to two feet from November 16 through September 30, and to one foot from October 1 through November 15, with a minimum flow of 300 cfs or inflow, whichever is less, below the project; under current operating conditions no water is required to be allocated to the bypass reach. The applicant is proposing to conduct an aquatic habitat study in the tailwater section below the Project dam, at transects across three representative locations. The Department is requesting that the Aquatic Habitat Cross-Section Flow Study be conducted both in the bypass reach and in the location downstream of the dam, in accordance with established protocols for Habitat and Aquatic Life Studies provided under "Rivers and Streams" in the DEP Sampling Protocol for Hydropower Studies – December 2017, which is attached to this comment letter.

Mercury Study – This study assesses the impact of the impoundment drawdown on the bioavailability of mercury. Mercury contamination in Maine lakes is well documented. The largest source of mercury appears to be atmospheric deposition from out of state sources, however study suggests that there may be a correlation between lake drawdowns and the bioavailability of mercury in the form of methyl mercury. Normal operations at the Hiram facility do not require significant drawdowns, therefore no Mercury Study is necessary.

Thank you for the opportunity to comment on the Pre-Application Document for the Hiram Hydroelectric Project. If you have any questions, please contact me by phone at 207-446-2642 or by email at Kathy.Howatt@maine.gov.

Sincerely,

Kathy Howatt

Kathy Davis Howatt
Hydropower Coordinator
Bureau of Land Resources

Encl: DEP Sampling Protocol for Hydropower Studies (December 2017)
DEP Methods for Biological Sampling and Analysis of Maine's Rivers and Streams

LAKES, PONDS, AND IMPOUNDMENTS

Trophic State Study

Sampling personnel must be certified annually for this sampling protocol by DEP's Division of Environmental Assessment Lakes Section.

Each basin shall be sampled at the deepest location twice each month for at least five consecutive months during one open water season as follows.

Parameter	Sampling method	Detection limits
Secchi disk transparency	water scope	0.1 meter
Temperature	profile*	0.1 C
Dissolved oxygen	profile*	0.1 mg/l
Total phosphorus	epilimnetic core	0.001 mg/L
Chlorophyll a	epilimnetic core	0.001 mg/L (trichromatic)
Color	epilimnetic core	1.0 SPU
pH	epilimnetic core	0.1 SU
Total alkalinity	epilimnetic core	1.0 mg/l

*Profiles shall consist of temperature and dissolved oxygen measurements taken every meter up to 15 meters, every other meter to 25 meters, then every 5 meters thereafter.

In addition, during late summer (mid to late August depending on latitude and weather conditions), water samples shall be collected and analyzed from up to three depths in the water column for the parameters below except Chlorophyll *a*. If the waterbody is thermally stratified ($\Delta T \geq 1°C/m$ at any depth below the top 3 m depth), samples will be collected from an epilimnetic core, at the top of the hypolimnion, and at one meter above the sediment. If the waterbody is not thermally stratified, only one sample is needed, that being from an integrated core from the surface to two times the Secchi disk depth or within 1 m of the bottom whichever is less.

Parameter	Detection limit
Total phosphorus	0.001 mg/l
Nitrate	0.01 mg/l
Chlorophyll a (uncorrected)	0.001 mg/l (trichromatic determination)
Color	1.0 SPU
DOC	0.25 mg/l
pH	0.1 SU
Total alkalinity	1.0 mg/l
Total iron `	0.005 mg/l
Total dissolved aluminum	0.010 mg/l
Total calcium	1.0 mg/l
Total magnesium	0.1 mg/l
Total sodium	0.05 mg/l
Total potassium	0.05 mg/l
Total silica	0.05 mg/l
Specific conductance	1 ms/cm
Chloride	1.0 mg/l
Sulfate	0.5 mg/l

Additional sampling may be required due to the hydraulic or physical characteristics of a given waterbody or to the presence of significant water quality problems.

Habitat Study

For lakes, ponds, and riverine impoundments, determination of attainment of the designated use 'habitat for fish and other aquatic life' will be determined as follows. Using a depth of twice the mean summer Secchi disk transparency, determined from the Trophic State Study or historic DEP data, as the bottom of the littoral zone, the volume and surface area dewatered by the drawdown will be calculated to determine if at least 75% of the littoral zone remains watered at all times. Alternatively, studies of fish and other aquatic life communities, including freshwater mussels, may be conducted to demonstrate that the project maintains 'structure and function of the resident biological community' despite a drawdown that results in less than 75% of the littoral zone remaining watered at all times.

Fishing (Mercury Contamination) Study

To ensure that the project does not contribute to the Statewide Fish Consumption Advisory due to mercury, projects with excessive drawdowns (generally >10 feet) may be required to analyze sport fish from the project waterbody and one or more reference waters for mercury. Contact DEP for specific requirements for each project.

RIVERS AND STREAMS

Temperature and Dissolved Oxygen Study

Applicability

This rivers and streams sampling protocol shall apply to tailwater areas that are not impoundments where existing data are insufficient to determine existing and future water quality.

Sampling Stations

Sampling shall occur in the tailwater downstream from the turbine/gate outlet or dam at a location representative of downstream flow as agreed by DEP on a case by case basis. Initially, measurements of temperature and dissolved oxygen should be made along a transect across the stream at the first, second and third quarter points across the width. If there is no violation of dissolved oxygen criteria and no significant (<0.4 mg/l) difference in concentrations among the quarter points, subsequent measurements may be made at the location shown to be representative of the main flow. Otherwise, measurements should be made at the location of the lowest concentration and the location of the main flow. Sampling should also occur in any bypassed segment of the river created by the project. Additional sampling stations may be required in the upstream or downstream areas where significant point or nonpoint sources exist or where slow moving or deep water occurs. The number and spacing of any additional stations will be determined by DEP on a case-by-case basis.

Parameters

Temperature and dissolved oxygen shall be sampled at mid-depth in rivers less than 2 m deep or in a profile of 1 meter increments of depth in rivers greater than 2 m deep. In rivers where it is already known that attainment of required statutory dissolved oxygen criteria is questionable, sampling for additional parameters (e.g. BOD, nitrogen, phosphorus) may be necessary.

Frequency and Timing

Sampling should be conducted during the summer low flow high temperature period, with the ideal conditions being the 7Q10 flow (the 7 day average low flow with a 10 year recurrence interval) combined with daily average water temperatures exceeding 24 ^{o}C. Measurements of temperature and dissolved oxygen shall be made every hour with a datasonde in remote unattended mode continuously during July and August, unless high flows well above seasonal median flows occur.

Alternatively, with concurrence by DEP, sampling could be undertaken one day per week for a minimum of ten weeks throughout the summer low flow, high temperature period. Each discrete grab sampling event for temperature and dissolved oxygen would consist of a minimum of two daily runs, the first of which should occur before 7 AM and the second of which should occur after 2 PM. Sampling results will not be considered complete unless a minimum of 5 sampling days meets the following conditions: The product of the water temperature (^{o}C) and the flow duration (the percentage of the time a given flow is statistically exceeded) at the time of sampling exceeds 1500. For cycling hydropower projects, in addition to twice daily monitoring, continuous monitoring may be required at some locations for a duration equivalent to the period of one cycle of the storage and the release of flow.

For either method, a summer in which low flows and high temperatures are not experienced may result in additional sampling requirements for the next summer. Low flow conditions may occur naturally, as an unregulated river or may be artificially induced, as in the case of upstream flow regulation or flows downstream from a cycling or peaking power project or in the case of a bypassed segment which receives flow only by spillage, leakage or specific releases.

Available Data

The use of data already available is encouraged provided that adequate QA/QC procedures have been followed. Old data may not be acceptable for considerations of meeting minimum sampling requirements, but could still provide useful information. Acceptance/rejection of data will be determined on a case by case basis, but generally data more than 10 years old may be rejected.

Habitat and Aquatic Life Studies

For rivers and streams, determination of attainment of the designated use ‘habitat for fish and other aquatic life’ will be determined as follows. A Cross-Section Flow Study is required that measures width and depth at various flows to determine the flow at which at least 75% of the bank full cross-sectional area of the river or stream is continuously watered. At least three cross-sections representative of the river or stream must be measured. Alternately, a combination of ambient measurements in one cross-section, flow data from existing flow gages, and/or modelling may be approved by DEP.

In addition, to determine if the project ‘attains the aquatic life criteria, i.e. ‘maintains the structure and function of the resident biological community’, biological monitoring of the benthic macroinvertebrate community must be conducted following DEP’s standard protocol in Methods for Biological Sampling and Analysis of Maine’s Rivers and Streams, DEP LW0387-B2002.
A copy can be found at www.maine.gov/dep/water/monitoring/biomonitoring/material.html

Methods for Biological Sampling and Analysis of Maine's Rivers and Streams

Susan P. Davies
Leonidas Tsomides

DEP LW0387-C2014
Revised April, 2014

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION

METHODS

FOR

BIOLOGICAL SAMPLING AND ANALYSIS OF

MAINE'S RIVERS AND STREAMS

Susan P. Davies

Leonidas Tsomides

Maine Department of Environmental Protection
Bureau of Land and Water Quality
Division of Environmental Assessment
Augusta, Maine 04333
January, 1987

Revised April, 2014

Printed under Account #: 010 06A 1327 102

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Photo Credit: *Paragnetina immarginata* by Eric D. Fleek, North Carolina Division of Water Quality

CONTENTS

APPENDICES

FOREWORD

This manual describes the field, laboratory and data preparation methods required by the Maine Department of Environmental Protection to collect and analyze benthic macroinvertebrate samples for the River and Stream Biological Monitoring Program. The biological classification of Maine's inland waters was authorized by the Maine State Legislature with the passage of Public Law 1985 Chapter 698 - The Classification System for Maine Waters. This law states that it is the State's objective "to restore and maintain the chemical, physical and biological integrity" of its waters, and establishes a water quality classification system to enable the State to manage its waters so as to protect their quality. The classification system further establishes minimum standards for each class, which are based on designated uses, and related characteristics of those uses, for each class of water.

Each water quality class contains standards that, among other things, describe the minimum condition of the aquatic life necessary to attain that class. The Maine Department of Environmental Protection (the Department) has developed numeric criteria in support of the narrative aquatic life standards in the Water Quality Classification Law. The Department has collected a large, standardized database consisting of benthic macroinvertebrate samples from above and below all significant licensed discharges in the State, from areas impacted by non-point sources, as well as from relatively unperturbed areas. These sampling locations were chosen to represent the range of water quality conditions in the State. This information has been used to develop numeric criteria which are specific to the natural biotic community potential of the State of Maine (see Davies et al., 1995 and 1999 for a description of the development and application of numeric criteria) and is established in DEP regulation Chapter 579 : Classification Attainment Evaluation Using Biological Criteria for Rivers and Streams.

Standardization of data collection and analytical methods is fundamental to the consistent, unbiased and scientifically sound evaluation of aquatic life impacts. This manual sets forth the standardized practices and procedures used by the Department to acquire or accept benthic macroinvertebrate data for use in regulation, assessment or program development.

Biological Monitoring Unit
Division of Environmental Assessment
Bureau of Land and Water Quality
Maine Department of Environmental Protection
Augusta, Maine 04333
207-287-3901

I GENERAL METHODS FOR RIVER AND STREAM AQUATIC LIFE CLASSIFICATION ATTAINMENT EVALUATION

Each water quality class is defined by standards that describe the minimum condition of the aquatic community necessary to attain that class. The benthic macroinvertebrate community is used as an indicator community of the general state of the aquatic life in flowing waters for the purpose of assessment of classification attainment. Standardized sampling techniques and sample analysis are required for assessment of biological attainment of stream water quality classification. This manual presents the standard practices and procedures that have been adopted by the Department to acquire benthic macroinvertebrate data for purposes of aquatic life classification attainment evaluation.

Purpose:

To determine the water quality class attained by a particular river or stream reach in terms of the aquatic life standards set forth in 38 MRSA Sec. 465 (The Classification System for Maine Waters).

Requirements:

All samples of aquatic life that are collected for purposes of classification attainment evaluation, whether collected by the Department or by any party required to make collections by the Department, must be collected, processed and identified in conformance with the standardized methods outlined in this manual. Selection of appropriate sampling sites and micro-habitat to sample, as well as procedures for quantitative analysis of the sample must conform to methods set forth in this manual. Data submitted by any party required to make collections by the Department must be accompanied by a Quality Assurance Plan, approved by the Commissioner.

1. <u>Qualifications of Sampling Personnel</u>

Biological sampling must be performed by a professional aquatic biologist or by qualified personnel under the supervision of a professional aquatic biologist. The professional aquatic biologist must have, as a minimum, a Bachelor of Science degree in biological sciences with aquatic entomology, invertebrate zoology, fisheries or closely related specialization, and greater than 6 months experience working with macroinvertebrate sampling methods and taxonomy. (See also Qualifications of Laboratory Personnel, Sec. II-1.)

2. <u>Apparatus, Equipment, Supplies, Instruments</u>

(1) Sampling devices

a) Rock-filled wire basket introduced substrate

Use: flowing wadeable, eroded, mineral-based bottom rivers and streams.

Description: cylindrical plastic coated or chrome wire, baskets with at least 1.5 cm spaces between wires, a hinged opening, and secure closure (Klemm, D.J. et al, 1990).

Substrate material: clean, washed, bank-run cobble, graded to uniform diameter range of 3.8 to 7.6 cm (1.5 to 3 inches) in size (#2 roofing stone).

Baskets must be filled to 7.25 +/- 0.5 kg (16 lbs +/-1 lb) of substrate material.

b) Rock-filled mesh bag introduced substrate

Use: small flowing streams, too shallow for rock baskets to be fully submerged.

Description: mesh bags of sufficient size to hold 7.25 +/- 0.5 kg of cobble substrate as described above, with at least 2.54 cm aperture mesh, and secure closures.

c) Closing introduced substrate cone

Use: deep, non-wadeable rivers having sufficient flow to have an eroded, mineral based bottom.

Description: cone shaped wire, or plastic coated wire basket filled with substrate material and closed by means of an inverted, weighted funnel (Courtemanch, 1984).

Substrate material: (see above Rock-filled wire basket substrate material).

(2) Sieves, sieve buckets, nets

Samples are concentrated on sieves having a mesh size between 500 - 600 microns (USA Standard Testing Sieve ASTM-E-11 Specification size No. 30 or No. 35).

(3) Optical equipment

a) Binocular microscope: Magnification range from 10x or less to 30x or greater.

b) Compound microscope: Magnification range from 10x to at least 400x; 100x with oil immersion lens is advisable.

3. Sampling Season, Sampler Exposure Period, Placement and Retrieval

(1) Sampling season

The standard sampling season upon which all macroinvertebrate classification criteria are based is the late summer, low flow period (July 1 to September 30). All baseline data for the biological classification program has been collected during this time period. This period often presents conditions of maximal stress to the biological community due to decreased dilution of pollutional material and increased stream water temperatures. Furthermore, because the composition of the benthic macroinvertebrate community changes with season, due to natural life history features, this period defines a standardized seasonal community.

As noted, the Department's linear discriminant models define biological classification criteria derived from a macroinvertebrate community defined by the specific sampling methods and index season under which they were collected. Samples collected at other times of year may yield valuable water quality related information, however classification attainment may not be assigned solely on the basis of results of the linear discriminant models for these non-standard samples.

(2) Exposure period

Standard methods require that substrate samplers be exposed in the water body for a period of 28 days +/- four days within the above-specified sampling season. However, extended exposure periods may be necessary to allow for adequate colonization in the case of assessments of low velocity or impounded habitats. If such conditions exist a 56 days +/- four days exposure period may be used.

(3) Sampler placement

Rock Baskets/Bags

The actual sampler location should be approached so as to avoid any disturbance in, or upstream of, the sampled site. Position baskets in locations of similar habitat characteristics. Orient baskets with the long axis parallel to stream flow. Provide for relocation of baskets by flagging trees in the vicinity and/or by drawing a diagram with appropriate landmarks indicated.

Cones

Cone samplers should be marked with individual marker buoys (milk jugs or other suitable float) leaving about 5 extra feet of line to allow for water level changes and to provide for easy retrieval. They should be placed on the substrate with a minimum of disturbance, in an apex-up position, and located in the approximate middle fifty percent of the channel. (Note however, care should be taken not to create an obstruction to boat traffic.) In areas subject to vandalism, or in rivers having extensive macrophyte beds, it may be necessary to attach the sampler lines to a common anchor and thence to one unobtrusive surface float. Retrieval funnels will not properly close when lines are fouled with drifting macrophytes.

(4) Sampler retrieval

Rock Baskets/ Bags

Baskets are approached from downstream. Excessive accumulations of macrophytes, algae or debris clinging to the outside of the basket should be carefully removed, taking care to avoid jarring the basket itself. An aquatic net or drift net (mesh size 500 - 600 microns) is positioned against the substrate immediately downstream of the basket which is then quickly lifted into the net. The contents of the basket and all net washings are emptied into a sieve bucket (500 - 600 microns); the basket wires are carefully cleaned first, then rocks are hand washed and inspected and returned to the basket. All sieve bucket contents are placed in sample jars. A small amount of stream water and 95% ethyl alcohol is added to yield an approximately 70% solution of alcohol. Especially dense samples should be re-preserved in the laboratory, with fresh 70% ethyl alcohol. Rock baskets should be thoroughly cleaned and allowed to desiccate prior to re-use.

Cones

Cone samplers should be retrieved with the boat anchored directly upstream of the samplers. Once the float is retrieved and removed, the line should be held as vertically as possible while the weighted funnel is released down the line to enclose the cone. Cone and funnel should be retrieved quickly and smoothly from the bottom, and released directly into a sieve bucket or tub. Field processing should then proceed as described above for rock baskets.

4. <u>Site Selection Criteria</u>

Classification criteria apply to a strictly defined sample of the benthic macroinvertebrate community. Habitat type from which the community is obtained is a significant determinant of the make-up of the target community. Benthic macroinvertebrate communities of flowing streams and rivers having a hard, eroded substrate comprise the majority of samples in the baseline data set. This habitat is characteristic of the majority of the river and stream waters of the State. Exceptions to these conditions may require special consideration and the exercise of professional judgment. (Note: See Section III-2. (3) "Classification attainment evaluation of waters subjected to flow regulation" page 13, for procedures relating to the assessment of regulated flow sites.) While it is useful to obtain both an upstream and downstream sample to evaluate the effect of a pollution source, classification attainment evaluation does not require data from a matched reference site in order to arrive at a determination of aquatic life class. Analytical methods for classification attainment evaluation are described in Section III.

(1) Site attributes

a) The area selected should be generally representative of the habitat of the stream reach as a whole;
b) Where there is alternating riffle/pool habitat, the riffle/run is the habitat of choice;
c) A location should be selected where there is a high degree of certainty that the rock basket samples will remain fully submerged even if the water level drops significantly.

(2) Precautions

a) Avoid atypical influences such as bridges, entering culverts, channelized areas such as road crossings, culverts, or obstructions to flow;
b) Avoid bank effects: samplers should be located in the middle 50% of the bank to bank width, or in an area with a flow regime typical of the overall character of the stream segment;
c) Avoid slackwater areas and eddies immediately upstream or downstream of large rocks or debris.

(3) Matching reference and effluent impacted sites

If possible both stream reaches should be viewed prior to selection of sampling sites. Efforts should be made to sample habitats which are comparable in the following characteristics:

a) Water velocity;
b) Substrate composition (i.e., size ranges and proportions of particles making up the substrate);
c) Canopy coverage;
d) Depth;
e) Other upstream influences except the pollution source in question (for example, use caution when one site is just below a lake outfall and the other is not).

(4) Factors to be considered in site selection below point sources

The area of initial dilution of an effluent should be determined by visual observation of the plume pattern; by observations of biotic effects attributable to the plume, if evident (periphyton growth, die-off patterns); and by transects of specific conductance measurements from the outfall, in a downstream direction. The site selected should be in an area where reasonable opportunity for mixing of the effluent has occurred. If a mixing zone has been defined in a license, sampling should occur immediately downstream of it. In cases where the effluent plume channels down one bank for great distances (>1 km), or where localized effluent impact is expected to be severe for a distance beyond the zone of initial dilution, it is advisable to have a sampling site upstream of the source, one or more in the plume, and at least two farther downstream. One downstream site should be located at the point of presumed bank to bank mixing and subsequent sites should be located to assess the extent of impact downstream.

5. <u>Sample Size</u>

The biological community is evaluated on the basis of benthic macroinvertebrates obtained from at least three samplers which yield an average of at least 50 organisms per sampler. Matched upstream and downstream sites must be sampled using identical methods and level of effort, preferably by the same personnel.

Subsampling may be performed on samples if the mean number of organisms in a sampler exceeds 500 and subsampling will yield at least 100 organisms per rock/cone sampler. All samplers in a site should be treated consistently. Subsampling methods are described in Section II-5. Note: Subsampling will reduce sample richness by an indeterminate amount. This may affect the outcome of linear discriminant analysis. See Section III-2. (2).

6. Physical Habitat Evaluation

A field data sheet (Appendix A) is to be completed at the time of sampler placement. This form records site specific information concerning natural variables that may affect community structure. Items addressed include exact site location (latitude and longitude, narrative description of the mapped location and/or a topographic map with site indicated); substrate composition; canopy coverage; land use and terrain characteristics; water velocity, temperature, dates of exposure and investigator name. The form is to be completed by observation as well as instrument measurement of water velocity, specific conductance, dissolved oxygen, global positioning device, temperature, etc.

II LABORATORY METHODS

1. Qualifications of Laboratory Personnel

Sample processing and taxonomy in the laboratory must be performed or supervised by a professional freshwater macroinvertebrate taxonomist who is certified by the Society of Freshwater Science in the identification of eastern US taxa. Certification must include Genus level categories, such as Ephemeroptera, Plecoptera and Trichoptera (EPT), General Arthropods and Chironomidae taxa. Taxonomic data will not be accepted without verification that the supervising laboratory taxonomist has been certified in relevant categories.

2. Sample Preservation, Sorting

All sample material collected in the field, as described in Section I, is preserved in 70% ethyl alcohol. Samples are stored in airtight containers until sorted. Sorting of macroinvertebrates from detritus and debris should follow methods described in Appendix B. One out of every ten samples is evaluated by a biologist for sorting completeness.

After sorting, recommended storage for macroinvertebrates is in 70% ethyl alcohol with 5% glycerin, in vials sealed with tightly fitting rubber stoppers.

3. Sample Labeling

All samples are labeled in the field immediately upon collection. The label must include the following information:

Date of sample retrieval
Waterbody
Town or target discharge
Whether above or below the discharge (if applicable)
Replicate number

4. Sample Log Book

In the laboratory, the samples from each sampled site are to be assigned a sample log number, written on all items generated by the sample (e.g., sample vials, slides, records, count sheets, etc.). Log numbers are sequentially recorded in a master log book. The log book shall also contain site identification, date of placement and retrieval, investigator name, sampler type and any comments regarding sampler retrieval or data quality.

5. Subsampling

(1) Methods

If it is determined that a sample should be subsampled (see criteria in Section I-5 Sample Size) methods of Wrona et al, (1982) are followed. These are summarized below:

a) Fit a plastic or glass Imhoff-type settling cone with an aquarium air stone sealed in the bottom and connected to a compressed air supply.

b) Place the sorted macroinvertebrate sample in the cone and fill the apparatus with water to a total volume of one liter.

c) Agitate gently for 2 to 5 minutes with the air stone.

d) Remove 25% of the sample in 5 aliquots with a wide-mouth 50 ml dipper and combine into one sample vial. The dipper should be submerged and withdrawn over a five second interval.

e) Ascertain whether or not the required 100 organisms have been obtained in the subsample.

f) Indicate clearly on the sample label and on the data sheet the fraction of the sample that the subsample represents.

(2) Precautions

a) Especially large or dense organisms such as crayfish, molluscs or caddisflies with stone cases, which do not suspend randomly in the sample, should not be included in the subsample. They should be counted separately.

b) When removing aliquots, the subsampler should be careful to avoid biased capture of organisms in the cone. Avoid watching the cone as the dipper is withdrawn.

This method has been tested by the Department and has been found to randomly distribute the sample. The five separate counts conform to a Poisson series and thus can be combined into one sample (Elliott, 1979).

(3) Chironomidae subsampling

A subsampling plan for Chironomidae shall be approved by the Department. A Department recommended subsampling plan follows the following criteria:

a) For samples having less than 100 midges, all midges will be identified to genus/species level.

b) For samples having 100 to 199 midges, a subsample of one half (0.5) will be removed by randomly selecting the specimens to be identified and identified to genus/species level. Remaining unsampled midges will be examined for unusual or rare specimens, which will be removed and identified to genus/species level separate from the subsample of the sample.

c) For samples having 200 to 499 midges, a subsample of one quarter (0.25) will be removed by randomly selecting the specimens to be identified and identified to genus/species level. Remaining unsampled midges will be examined for unusual or rare specimens, which will be removed and identified to genus/species level separate from the subsample of the sample.

d) For samples having 500 or more midges, midges will be grouped by genus for those for which it is possible to confidently identify them to genus level without mounting. For remaining midges not grouped by genus, a subsample of 100 specimens will be randomly selected and identified to genus/species level. Remaining unsampled midges will be examined for unusual or rare specimens, which will be removed and identified to genus/species level separate from the subsample of the sample.

e) Reporting of the subsample of the sample will be as follows. Numbers reported on the Excel spreadsheet will be converted to reflect the sample total. Any round-off errors between the subsample total and the sample total will be equalized by adding or deducting the difference from the most numerous taxon. If unusual or rare specimens are removed from the sample following the subsample removal, the conversion of the subsample total to a "partial" sample total will be based on the sample total minus the number of unusual or rare specimens. Following this procedure, the number of unusual or rare specimens will be added to the "partial" sample total to bring it back to the sample total.

6. Sample Taxonomy

All taxonomic data submitted to the Department must be accompanied by the name(s) of the individual(s) actually performing the identifications. A list of taxonomic references used, and a reference collection of organisms must also be submitted (see below).

(1) Taxonomic resolution

Macroinvertebrate organisms are identified to genus in all cases where possible. If generic keys are not available or taxonomic expertise is lacking for a taxon it should be identified to the lowest level possible. Identification of organisms to species is highly recommended whenever possible. Although quantitative analysis of benthic macroinvertebrate samples by the Department is based on counts adjusted to the generic level of resolution, species designations are recorded in the Department database and can contribute to the final stage of data analysis, Professional Judgment Evaluation of the model outcome. This is especially important for Class Insecta. Taxonomists submitting data for use by the Department must use current taxonomic references.

(2) Identification of Chironomidae

Specimens of chironomid midges are identified from slide mounts of the cleared head capsule and body parts. Euparol or Berlese mounting medium is recommended for preparation of slides. CMCP-9 is recommended for the preparation of permanent slide mounts of reference material, for voucher specimens or for permanent collections. These slides should be prepared under a fume hood. Instructions for preparation and slide mounting may be found in Wiederholm, (1983). In samples in which a given taxon is represented by a large number of individuals, the identification to genus may be made from slide mounts of a sufficient proportion of the individuals to give a high degree of certainty that they are all the same (10-50% depending on the distinctiveness of the taxon visible under binocular microscope). A subsampling plan for Chironomidae is described in Section II-5. Each permanent slide mount is to be fully labeled or coded in a manner which positively associates the slide with the sample from which it originated.

(3) Quality control

All organisms and records from any sampling event intended to serve regulatory purposes must be preserved for a period of at least ten years. In the course of identifying taxa collected as part of the Department's biological monitoring program, or in other collection activities, a special reference collection of separate taxa is established. This collection allows subsequent identifications of the same taxon to be confirmed and thus serves to standardize taxonomy for the program.

Each contracted taxonomist, working for the Department or working for anyone submitting data to the Department, will be required to submit a reference collection of taxa identified, as well as a list of the taxonomic references used in the identifications. Organism identifications will be checked against the Department's collection by a Department taxonomist.

III ANALYTICAL METHODS

In general, it is the responsibility of the Department, or its agents, to conduct sampling for the purpose of making decisions on the attainment of water quality classification. Under certain conditions, sampling may be required of applicants for waste discharge licenses, or applicants requiring Section 401 Water Quality Certification. Sampling may be performed by corporations, businesses, organizations or individuals who can demonstrate their qualifications and ability to carry out the Department's sampling and analytical protocol, described in this manual. Such monitoring will be conducted according to a quality assurance plan provided to the Department and approved by the Commissioner.

Classification attainment evaluation is established in DEP regulation Chapter 579: Classification Attainment Evaluation Using Biological Criteria for Rivers and Streams. Davies et al, 1995 details the conceptual and technical basis for the State’s application of linear discriminant analysis to assess attainment of aquatic life standards. A synopsis of Chapter 579 follows in this section.

1. <u>Minimum Provisions</u>

Properly collected and analyzed samples that fail to achieve the following criteria are unsuitable for further analysis through the numeric criteria statistical models:

- Total Mean Abundance must be at least <u>*50*</u> individuals (average per basket/bag/cone);

- Generic Richness for three replicate basket/bag/cone samplers must be at least <u>*15*</u>.

Samples not attaining these criteria shall be evaluated by Professional Judgment. A determination will be made whether the affected community requires re-sampling or whether the community demonstrates non-attainment of minimum provisions of the aquatic life standards.

2. <u>Aquatic Life Statistical Decision Models</u>

The four statistical decision models consist of linear discriminant functions developed to use quantitative ecological attributes of the macroinvertebrate community (Appendix C-1) to determine the strength of the association of a test community to any of the water quality classes (Appendix D). The coefficients or weights are calculated using a linear optimization algorithm to minimize the distance, in multivariate space, between sites within a class, and to maximize the distance between sites between classes.

(1) Linear discriminant models

The discriminant function has the form:

$$Z = C + W_1X_1 + W_2X_2 + \ldots W_nX_n$$

Where: Z = discriminant score
C = constant
W_i = the coefficients or weights
X_i = the predictor variable values

Association values are computed, using variable values from a test sample, for each classification using one four-way model and three two-way models. The four-way model uses nine variables pertinent to the evaluation of all classes and provides four initial probabilities that a given site attains one of three classes (A, B, or C), or is in non-attainment (NA) of the minimum criteria for any class. These probabilities have a possible range from 0.0 to 1.0, and are used, after transformation, as variables in each of the three subsequent final decision models. The final decision models (the three, two-way models) are designed to distinguish between a given class and any higher classes as one group and any lower classes as the other group (i.e., Classes A+B+C vs. NA; Classes A+B vs. Class C+NA; Class A vs. Classes B+C+NA). The equations for the final decision models use the predictor variables relevant to the class being tested (Appendix E). The process of determining attainment class using association values is outlined in Appendix F.

(2) Application of professional judgment

Where there is documented evidence of conditions which could result in uncharacteristic findings, allowances may be made to account for those situations by adjusting the classification attainment decision through use of professional judgment as provided in DEP regulation Chapter 579: Classification Attainment Evaluation Using Biological Criteria for Rivers and Streams. The Department may make adjustments to the classification attainment decision based on analytical, biological, and habitat information or may require that additional monitoring of affected waters be conducted prior to issuing a classification attainment decision.

Professional Judgment may be utilized when conditions are found that are atypical to the derivation of the linear discriminant model. Factors that may allow adjustments to the model outcome include but are not limited to:

a) Habitat factors
- Lake outlets
- Impounded waters
- Substrate characteristics
- Tidal waters

b) Sampling factors
- Disturbed samples
- Unusual taxa assemblages
- Human error in sampling

c) Analytical factors
- Subsample vs. whole sample analysis
- Human error in processing

(3) Classification attainment evaluation of waters subjected to flow regulation

The Maine State Legislature, in 38 MRSA Article 4-A Sec. 464 (9)-(10), *The Water Classification Program*, acknowledges that changes to aquatic life and habitat occur as the result of the impoundment of riverine waters and has modified the standards of waters so affected. The habitat and aquatic life criteria of riverine impounded waters of Class A, Class B or Class C are deemed to be met if the impoundment attains the standards of Class C (e.g., maintenance of structure and function of the resident biological community). Impoundments managed as Great Ponds must also attain Class C aquatic life standards. If the actual water quality attains any more stringent characteristic or criterion than the Class C standards dictate, then the waterbody must be managed so as to protect those higher characteristics. Class C standards also apply to the *downstream* waters below certain specified riverine impoundments on the Kennebec River and the Saco River (Wyman Dam, Moosehead East Outlet Dam, West Buxton Dam and Skelton Dam) that are classified as A or B. All other waters subjected to flow regulation are managed according to standards of the water quality classification assigned by the Legislature.

(4) Adjustments of a decision

It is the responsibility of the Department to decide if adjustments of a decision should occur. The following adjustments may be made to correct for these conditions:

a) Resample
The Department may require that additional monitoring of the test community be done before a determination of class attainment can be made, based on documented evidence of specific sampling factors that may have influenced the results.

b) Raise the finding
   i. The Department may raise the classification attainment outcome predicted by the model from non-attainment of any class to indeterminate or to attainment of Class C, based on documented evidence of specific conditions, as defined above.

   ii. The Department may raise the classification attainment outcome predicted by the model from attainment in one class to attainment in the next higher class, based on documented evidence of specific conditions, as defined above.

c) Lower the finding
The Department may decide to lower the classification attainment finding, on the basis of documented, substantive evidence that the narrative aquatic life criteria for the assigned class are not met.

d) Determination of non-attainment: minimum provisions not met
Samples having any of the ecological attributes not attaining the minimum provisions, and where there is no evidence of conditions which could result in uncharacteristic findings, as defined above, must be determined to be in non-attainment of the minimum provisions of the aquatic life criteria for any class.

e) Determination of attainment: minimum provisions not met
Where there is evidence of factors that could result in minimum provisions not being met, professional judgment may be used to make a professional finding of attainment of the aquatic life criteria for any class. Such decisions will be provisional until appropriate resampling is carried out.

(5) Sampling procedures do not conform

For classification attainment evaluation of test communities that do not conform to criteria provided in Section I General Methods, or Section III-1, Minimum Provisions, of this manual, and are therefore not suitable to be run through the linear discriminant models, the Department may make an assessment of classification attainment or aquatic life impact in accordance with the following procedures:

a) Approved assessment plan
A quantitative sampling and data analysis plan must be developed in accordance with methods established in the scientific literature on water pollution biology, and shall be approved by the department.

b) Determination of sampling methods
Sampling methods are determined on a site-specific basis, based on habitat conditions of the sampling site, and the season sampled:

i. Soft-bottomed substrates shall, whenever ecologically appropriate and practical, be sampled by core or dredge of known dimension or volume.

ii. The preferred method for sampling hard-bottomed substrates shall be the rock basket/cone/bag as described in Section I-2.

iii. Other methods may be used where ecologically appropriate and practical.

c) Classification attainment decisions
   Classification attainment decisions may be based on a determination of the degree to which the sampled site conforms to the narrative aquatic life classification criteria provided in 38 MRSA Section 465 and found in Appendix D. The decision is based on established principles of water pollution biology and must be fully documented.

d) Site-specific impact decisions
   Site-specific impact decisions may rely on established methods of analysis of comparative data between a test community and an approved reference community.

e) Determination of detrimental impact
   A determination of detrimental impact to aquatic life of a test community without an approved reference community may be made if it can be documented, based on established methods of the interpretation of macroinvertebrate data, and based on established principles of water pollution biology, that the community fails to demonstrate the ecological attributes of its designated class as defined by the narrative aquatic life standards in the water quality classification law.

Appendix A

Maine DEP Biological Monitoring Unit
Stream Macroinvertebrate Field Data Sheet

Log Number ______________________
Station Number____________________
Waterbody_________________________
River Basin________________________
Municipality_______________________
Stream Order_______________________

Directions__________________________
____
____
Lat-Long Coordinates (WGS84, meters)
Latitude___________________________
Longitude__________________________

Type of Sample_____________________
Date Deployed______________________
Number Deployed____________________
Date Retrieved_____________________
Number Retrieved___________________
Agency/Collector(s)_________________

1. <u>Land Use</u> (500 m radius upstream)		**2. <u>Terrain</u>** (500 m radius upstream)	**3. <u>Canopy Cover</u>** (upstream view)
☐ Urban	☐ Upland conifer	☐ Flat	☐ Dense (75-100% shaded)
☐ Cultivated	☐ Swamp hardwood	☐ Rolling	☐ Partly open (25-75% shaded)
☐ Pasture	☐ Swamp conifer	☐ Hilly	☐ Open (0-25% shaded)
☐ Upland hardwood	☐ Marsh	☐ Mountains	(% daily direct sun) _______________

4. <u>Physical Characteristics of Bottom</u> (estimate % of each component over 12 m stretch of site; total = 100%)

[ ] Bedrock	[ ] Rubble (3" – 10")	[ ] Sand (<1/8")	
[ ] Boulders (<10")	[ ] Gravel (1/8" – 3")	[ ] Silt-clay-muck	[ ] Detritus

5. <u>Habitat Characteristics</u> (immediate area)

Time ___________AM PM	Time ___________AM PM
Width (m) ______________	Width (m) ______________
Depth (cm) _____________	Depth (cm) _____________
Flow (cm/s) ____________	Flow (cm/s) ____________
Diss. O_2 (ppm)__________	Diss. O_2 (ppm)__________
Temp (°C) ______________	Temp (°C) ______________
pH ____________________	pH ____________________
SPC (µS/cm) ___________	SPC (µS/cm) ___________
TDS (ppm) _____________	TDS (ppm) _____________

Temperature Probe # ______________________

☐ deployed ☐ retrieved

6. <u>Observations</u> (describe)
Fish_____________________________________
Algae____________________________________
Macrophytes______________________________
Habitat quality____________________________
Dams/impoundments_______________________
Discharges_______________________________
Nonpoint stressors ________________________

7. <u>Water Samples</u>
☐ Standard
☐ Metals
☐ Pesticides

Lab Number

8. <u>Photographs</u>

9. <u>Landmarks of Sampler Placement</u> (illustrate or describe landmarks to be used for relocation)

Appendix B

Instructions for Macroinvertebrate Sorters

1. Pick the sample **in small portions** (1-2 TBS of material) at a time.

2. Pick all organisms you can see. If in doubt it's usually best to include it.

3. Some types of samples can be easily floated by adding a saturated solution of Epsom salt or sugar to the water. Maintain the saturated solution for the lab by adding enough salt or sugar to water to maintain a thick layer of crystals on the bottom of the storage jar. Use the supernatant solution for picking. Large numbers of organisms can be removed with a sieve spoon from the water surface. After the floaters have been removed, proceed to pick the rest of the sample as usual. A significant portion of the sample will not float and must be picked out with forceps.

4. The sample can be considered done when a careful 45 second search, after swirling the sample, yields no further organisms.

5. The samples are picked in water but should not remain unpreserved for more than 8 hours. Be certain that the final sample vial is preserved with 70% alcohol and 5% glycerin solution when done.

6. Return the detrital material to the original sample jar and preserve with 70% alcohol.

7. Write on the sample jar label "Picked X1 (your initials)".

8. Include in the vial of organisms a slip of index card label in hard pencil (No. 2) including **all information appearing on the original jar label**:

   Log Number — River
   Date - month/day/year — Location (Town or industry name)
   whether above or below
   Basket or Cone number
   Vial number if more than 1 vial is needed per basket

   ex. Log 621 Sandy R. 9/5/97
   Below Farmington (disturbed)
   Basket 2 vial #1 of 2

9. Complete all samples from one log number before beginning a new log number.

10. Keep a record of samples picked including log number

    Basket number — Time spent per basket
    Your name — Date

Appendix C-1

Methods for the Calculation of Indices and Measures of Community Structure Used in the Linear Discriminant Models

Variable
Number

1 **Total Mean Abundance**

Count all individuals in all replicate samples from one site and divide by the number of replicates to yield mean number of individuals per sample.

2 **Generic Richness**

Count the number of different genera found in all replicates from one site.

Counting rules for Generic Richness:

a) All population counts at the species level will be aggregated to the generic level.

b) A family level identification which includes no more than one taxon identified to the generic level is counted as a separate taxon in generic richness counts.

c) A family level identification with more than one taxon identified to generic level is not counted towards generic richness. Counts are to be divided proportionately among the genera that are present.

d) Higher level taxonomic identifications (Phylum, Class, Order) are not counted toward generic richness unless they are the only representative.

e) Pupae are ignored in all calculations.

3 **Plecoptera Mean Abundance**

Count all individuals from the order Plecoptera in all replicate samplers from one site and divide by the number of replicates to yield mean number of Plecopteran individuals per sampler.

4 **Ephemeroptera Mean Abundance**

Count all individuals from the order Ephemeroptera in all replicate samplers from one site and divide by the number of replicates to yield mean number of Ephemeropteran individuals per sampler.

5 **Shannon-Wiener Generic Diversity (Shannon and Weaver, 1963)**

After adjusting all counts to genus following counting rules in Variable 2:

$$\bar{d} = \frac{c}{N}\left(N \log_{10} N - \sum n_i \log_{10} n_i\right)$$

where: $\bar{d}$ = Shannon-Wiener Diversity
c = 3.321928 (converts base 10 log to base 2)
N = Total abundance of individuals
n_i = Total abundance of individuals in the i^{th} taxon

6 **Hilsenhoff Biotic Index (Hilsenhoff, 1987)**

$$HBI = \sum \frac{n_i a_i}{N}$$

where: HBI = Hilsenhoff Biotic Index
n_i = number of individuals in the i^{th} taxon
a_i = tolerance value assigned to that taxon
N = total number of individuals in sample with tolerance values.

7 **Relative Chironomidae Abundance**

Calculate the mean number of individuals of the family Chironomidae, following counting rules in Variable 4, and divide by total mean abundance (Variable 1).

8 **Relative Diptera Richness**

Count the number of different genera from the Order Diptera, following counting rules in Variable 2, and divide by generic richness (Variable 2).

9 ***Hydropsyche* Mean Abundance**

Count all individuals from the genus *Hydropsyche* in all replicate samplers from one site, and divide by the number of replicates to yield mean number of *Hydropsyche* individuals per sampler.

10 **Probability (A + B + C) from First Stage Model**

Sum of probabilities for Classes A, B, and C from First Stage Model.

11 ***Cheumatopsyche* Mean Abundance**

Count all individuals from the genus *Cheumatopsyche* in all replicate samplers from one site and divide by the number of replicates to yield mean number of *Cheumatopsyche* individuals per sampler.

12 **EPT - Diptera Richness Ratio**

EPT Generic Richness (Variable 19) divided by the number of genera from the order Diptera, following counting rules in Variable 2. If the number of genera of Diptera in the sample is 0, a value of 1 is assigned to the denominator.

13 **Relative Oligochaeta Abundance**

Calculate the mean number of individuals from the Order Oligochaeta, following counting rules in Variable 4, and divide by total mean abundance (Variable 1).

14 **Probability (A + B) from First Stage Model**

Sum of probabilities for Classes A and B from First Stage Model.

15 **Perlidae Mean Abundance (Family Functional Group)**

Count all individuals from the family Perlidae (Appendix C-3) in all replicate samplers from one site and divide by the number of replicates to yield mean number of Perlidae per sampler.

16 **Tanypodinae Mean Abundance (Family Functional Group)**

Count all individuals from the subfamily Tanypodinae (Appendix C-3) in all replicate samplers from one site and divide by the number of replicates to yield mean number of Tanypodinae per sampler.

17 **Chironomini Mean Abundance (Family Functional Group)**

Count all individuals from the tribe Chironomini (Appendix C-3) in all replicate samplers from one site and divide by the number of replicates to yield mean number of Chironomini per sampler.

18 **Relative Ephemeroptera Abundance**

Variable 4 divided by Variable 1.

19 **EPT Generic Richness**

Count the number of different genera from the Order Ephemeroptera (E), Plecoptera (P), and Trichoptera (T) in all replicate samplers, according to counting rules in Variable 2, generic richness.

20 **Variable Reserved**

21 **Sum of Mean Abundances of**: ***Dicrotendipes, Micropsectra, Parachironomus*** **and** ***Helobdella***

Sum the abundance of the 4 genera and divide by the number of replicates (as performed in Variable 4).

22 **Probability of Class A from First Stage Model**

Probability of Class A from First Stage Model.

23 **Relative Plecoptera Richness**

Count number of genera of Order Plecoptera, following counting rules in Variable 2, and divide by generic richness (Variable 2).

24 **Variable Reserved**

25 **Sum of Mean Abundances of** ***Cheumatopsyche, Cricotopus, Tanytarsus*** **and** ***Ablabesmyia***

Sum the number of individuals in each genus in all replicate samplers and divide by the number of replicates (as performed in Variable 4).

26 **Sum of Mean Abundances of** ***Acroneuria*** **and** ***Stenonema***

Sum the number of individuals in each genus in all replicate samplers and divide by the number of replicates (as performed in Variable 4).

27 **Variable Reserved**

28 **Ratio of EP Generic Richness**

Count the number of different genera from the order Ephemeroptera (E), and Plecoptera (P) in all replicate samplers, following counting rules in Variable 2, and divide by 14 (maximum expected for Class A).

29 **Variable Reserved**

30 **Ratio of Class A Indicator Taxa**

Count the number of Class A indicator taxa as listed in Appendix C-2 that are present in the community and divide by 7 (total possible number).

Appendix C-2

Indicator Taxa: Class A

Brachycentrus (Trichoptera: Brachycentridae)
Serratella (Ephemeroptera: Ephemerellidae)
Leucrocuta (Ephemeroptera: Heptageniidae)
Glossosoma (Trichoptera: Glossosomatidae)
Paragnetina (Plecoptera: Perlidae)
Eurylophella (Ephemeroptera: Ephemerellidae)
Psilotreta (Trichoptera: Odontoceridae)

<u>Appendix C-3</u>

Family Functional Groups

PLECOPTERA

<u>Perlidae</u>
Acroneuria
Attaneuria
Beloneuria
Eccoptura
Perlesta
Perlinella
Neoperla
Paragnetina
Agnetina

CHIRONOMIDAE

<u>Tanypodinae</u>
Ablabesmyia
Clinotanypus
Coelotanypus
Conchapelopia
Djalmabatista
Guttipelopia
Hudsonimyia
Labrundinia
Larsia
Meropelopia
Natarsia
Nilotanypus
Paramerina
Pentaneura
Procladius
Psectrotanypus
Rheopelopia
Tanypus
Telopelopia
Thienemannimyia
Trissopelopia
Zavrelimyia

Appendix C-3

Family Functional Group
(continued)

Chironomini
Pseudochironomus
Axarus
Chironomus
Cladopelma
Cryptochironomus
Cryptotendipes
Demicryptochironomus
Dicrotendipes
Einfeldia
Endochironomus
Glyptotendipes
Goeldichironomus
Harnischia
Kiefferulus
Lauterborniella
Microchironomus
Microtendipes
Nilothauma
Pagastiella
Parachironomus
Paracladopelma
Paralauterborniella
Paratendipes
Phaenopsectra
Polypedilum
Robackia
Stelechomyia
Stenochironomus
Stictochironomus
Tribelos
Xenochironomus

Appendix D

MRSA 38, 4-A Sec 464-465

Aquatic Life Standards for the State of Maine

Classification	Biological Standards
AA	No direct discharge of pollutants; aquatic life shall be as naturally occurs.
A	Natural habitat for aquatic life; aquatic life shall be as naturally occurs.
B	Unimpaired habitat for aquatic life; discharges shall not cause adverse impact to aquatic life in that the receiving waters shall be of sufficient quality to support all aquatic species indigenous to the receiving water without detrimental changes in the resident biological community.
C	Habitat for aquatic life; discharges may cause some changes to aquatic life, provided that the receiving waters shall be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.

Appendix E

Process of Calculating Model Variables and Association Values Using Linear Discriminant Models

Computer calculates model variables (*Var1 – Var30*) using taxa counts from a sample event using procedures described in Appendix C-1.

↓

FIRST STAGE LINEAR DISCRIMINANT MODEL (LDM)
(4-way model: A vs. B vs. C vs. NA)

1. Model calculates Discriminant Score[1] using *Var1 – Var9*.
2. Model uses Discriminant Score to calculate Association Values[1].

Example Results:

probability Class AA/A (*pA1*)	=	0.27
probability Class B (*pB1*)	=	0.70
probability Class C (*pC1*)	=	0.03
probability Non-Attainment (*pNA1*)	=	0.00

↓

SECOND STAGE LDM
(2-way model: C or better vs. NA)

1. Model calculates Discriminant Score[1] using *Var10 (pA1+pB1+pC1)* and *Var11 – Var13*.
2. Model uses Discriminant Score to calculate Association Values[1].

Example Results:
probability C or better (*pABC*) = 1.00
probability NA (*pNA*) = 0.00

SECOND STAGE LDM
(2-way model: B or better vs. C, NA)

1. Model calculates Discriminant Score[1] using *Var14 (pA1+pB1)* and *Var15 – Var21*.
2. Model uses Discriminant Score to calculate Association Values[1].

Example Results:
probability B or better (*pAB*) = 1.00
probability C or NA (*pCNA*) = 0.00

SECOND STAGE LDM
(2-way model: A vs. B, C, or NA)

1. Model calculates Discriminant Score[1] using *Var22 (pA1)* and *Var23 – Var30.*
2. Model uses Discriminant Score to calculate Association Values[1].

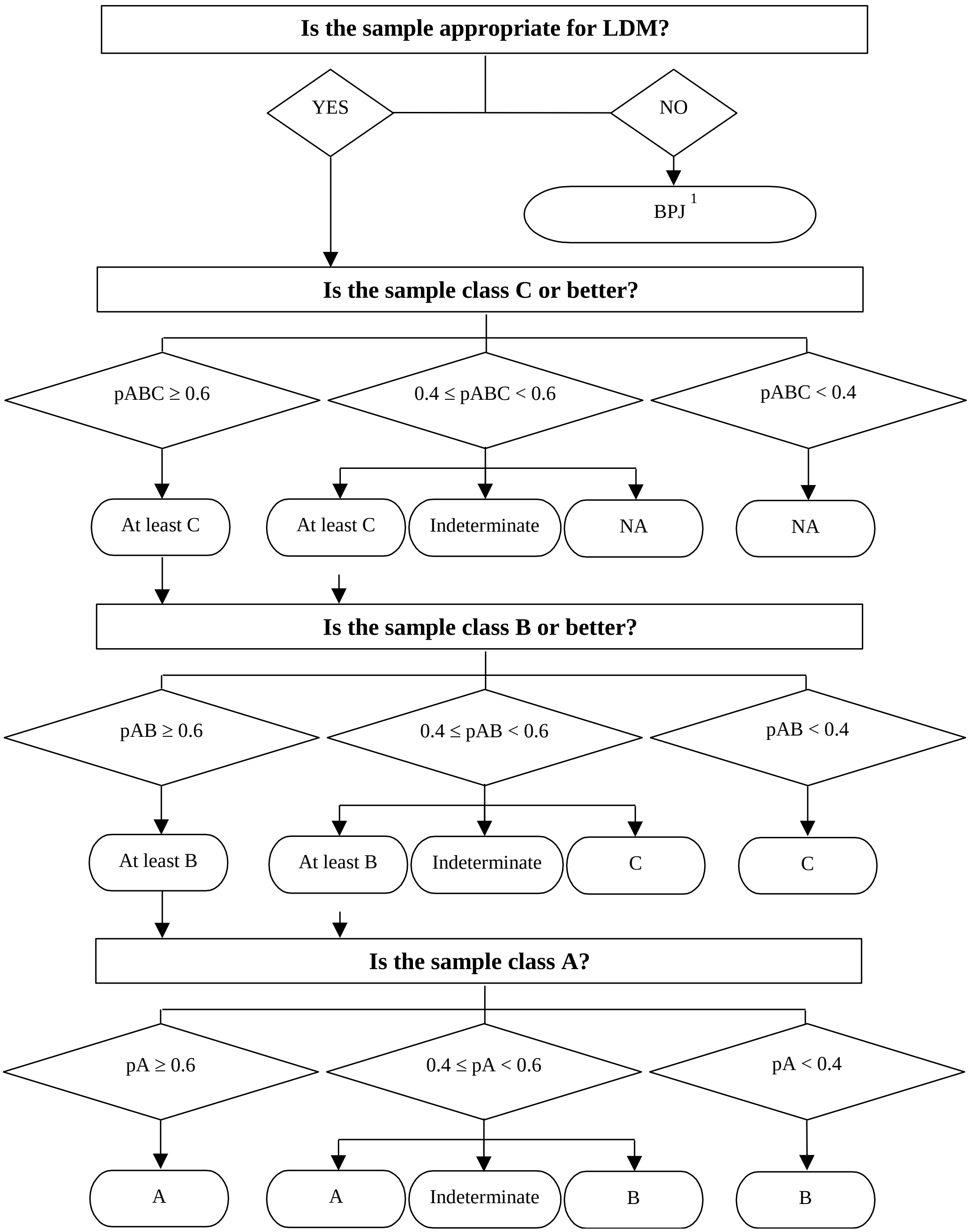
Example Results:
probability AA/A (*pA*) = 0.07
probability B, C, or NA (*pBCNA*) = 0.93

[1] Discriminant Score and Association Values are defined in Section III-2.(1).

Chart by Thomas J. Danielson

Appendix F

Process for Determining Attainment Class Using Association Values



[1] Best Professional Judgment (BPJ) is defined in Section III-2. (2), (4), and (5)

Chart by Thomas J. Danielson

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Maine DEP Biological Monitoring Unit
Stream Macroinvertebrate Field Data Sheet

Location: ______________________________

____

Potential Stressor: ______________________

____

Log Number ________________________
Station Number______________________
Waterbody___________________________
River Basin__________________________
Town_______________________________
Stream Order_________________________

Directions____________________________
____
____
Lat-Long Coordinates (WGS84, meters)
Latitude______________________________
Longitude____________________________

Type of Sampler_______________________
Date Deployed_________________________
Number Deployed_______________________
Date Retrieved_________________________
Number Retrieved_______________________
Agency/Collector(s) Put-In:
Take-Out:

1. Land Use (surrounding watershed)
☐ Urban ☐ Upland conifer
☐ Cultivated ☐ Swamp hardwood
☐ Pasture ☐ Swamp conifer
☐ Upland hardwood ☐ Marsh

2. Terrain (surrounding watershed)
☐ Flat
☐ Rolling
☐ Hilly
☐ Mountains

3. Canopy Cover (surrounding view)
☐ Dense (75-100% shaded)
☐ Partly open (25-75% shaded)
☐ Open (0-25% shaded)
(% daily direct sun) _______________

4. Physical Characteristics of Bottom (estimate % of each component over 12 m stretch of site; total = 100%)
[ ] Bedrock [ ] Cobble (2.5" – 10") [ ] Sand (<1/8") [ ] Clay
[ ] Boulders (>10") [ ] Gravel (1/8" – 2.5") [ ] Silt [ ] Muck [ ] Detritus

5. Habitat Characteristics (immediate area)

Flag location where measured

Time ___________ AM PM	Time ___________ AM PM
Wetted Width (m)_______	Wetted Width (m) _______
Bank Full Width (m) _____	Bank Full Width (m) _____
Depth (cm) ___________	Depth (cm) ___________
Velocity (cm/s) _________	Velocity (cm/s) _________
Diss. O_2 ___ (ppm) ___ (%)	Diss. O_2 ___ (ppm) ___ (%)
Temp (°C) ____________	Temp (°C) ____________
SPC (µS/cm) ___________	SPC (µS/cm) ___________
pH ___________________	pH ___________________
DO Meter #_______ Cal? Y / N	DO Meter #_______ Cal? Y / N
SPC Meter # ______ Cal? Y / N	SPC Meter # ______ Cal? Y / N

Temperature Probe # _________________
☐ deployed ☐ retrieved

6. Observations (describe, note date)

7. Water Samples
☐ Standard
☐ Other
Lab Number:

8. Photograph #
Put-In
Up
Down
Take-Out
Up
Down

9. Landmarks of Sampler Placement (illustrate or describe landmarks to be used for relocation)

Options for Potential Stressor:

Agricultural Runoff
Altered Habitat
Altered Hydrology
BOD (Low DO)
Bog Headwaters
Chlorine
Gravel Pit
Impounded
Inorganic Solids
Lake Outlet
Logging
Low Gradient
Low pH
Metals
NPS Pollution
Nutrients
Organic Solids
Pesticides
Regulated Flows
Sedimentation
Superfund Site
Thermal
Tidal/Estuary
Toxic Organics
Urban Runoff

Options for 6. Observations:

Fish
Algae
Macrophytes
Habitat quality
Dams/impoundments
Discharges
Nonpoint stressors

Options for Location:

Above Road Crossing
Below Road Crossing
Above Town
Below Town
Above Fish Hatchery
Below Fish Hatchery
Above POTW
Below POTW
Above Landfill
Below Landfill
Below Airport
Below In-Place Contamination
Above In-Place Contamination
Above Point Source
Below Point Source
Above Urban NPS
Below Urban NPS
Above Agriculture NPS
Below Agriculture NPS
Above Forestry NPS
Below Forestry NPS
Above Dam
Below Dam
Impoundment
Lake Outlet
Main Stem (only for larger systems)
Above Confluence
Below Confluence
Below Falls
Pristine Landscape
Designated Ecoreserve
Minimally Disturbed

Exhibit E

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
July 18, 2018

OFFICE OF ENERGY PROJECTS

Project No. 2530-054 – Maine
Hiram Hydroelectric Project
Brookfield White Pine Hydro LLC

Frank Dunlap, Licensing Specialist
Brookfield Renewable
Brookfield White Pine Hydro LLC
150 Main Street
Lewiston, ME 04240

Reference: Staff Comments on the Proposed Study Plan for the Hiram Hydroelectric Project

Dear Mr. Dunlap:

We have reviewed Brookfield White Pine Hydro LLC's (White Pine Hydro) proposed study plan (PSP) for the Hiram Hydroelectric Project (Hiram Project) filed on May 14, 2018, and attended the study plan meeting in Augusta, Maine on June 13, 2018. Pursuant to 18 C.F.R. § 5.12 of the Commission's regulations, we provide our comments in the enclosed schedule A.

White Pine Hydro proposes to begin implementing the field work for studies proposed in the PSP starting in the summer of 2018 to take advantage of the 2018 study season. You anticipate completing many of the year 1 studies in 2018, and request that the Process Plan and Schedule be adjusted such that the Initial Study Report (ISR) would be filed by February 11, 2019, and the Updated Study Report (USR) would be filed by February 11, 2020. This schedule modification was discussed at the June 13, 2018, PSP meeting, and there were no objections. Adjusting the schedule, as you propose, would allow you to complete the studies and develop a licensing proposal prior to the Preliminary Licensing Proposal deadline. For the above reasons, I am approving the requested schedule adjustment. The ISR is due by February 11, 2019, and the USR is due by February 11, 2020.

We appreciate the opportunity to comment on your proposed study plan for the Hiram Project. If you have any questions, please contact Allan Creamer at (202) 502-8365, or at allan.creamer@ferc.gov.

Sincerely,

Stephen Bowler

Stephen Bowler, Chief
South Branch
Division of Hydropower Licensing

Enclosures: Schedule A

SCHEDULE A
COMMENTS ON THE PROPOSED STUDY PLAN

Tailwater Aquatic Habitat Study

1. In section 7.1.5.4 of the Proposed Study Plan (PSP),[1] White Pine Hydro proposes to conduct a transect-based habitat study, in combination with HEC-RAS[2] modeling, to determine whether Hiram Project operation meets the Maine Department of Environmental Protection's (Maine DEP) guideline of maintaining 75 percent of bank full cross-sectional area.[3] Maine DEP recommended this study be extended to include the bypassed reach (*i.e.*, Great Falls/Hiram Falls). In Scoping Document 2 (SD2), issued on May 11, 2018, we indicated that the effects of continued project operation on fish and aquatic habitat in the bypassed reach would be part of our environmental review. As discussed at the June 13, 2018, PSP meeting, we clarified that our focus will be on maintaining dissolved oxygen and water temperature in the bypassed reach's two pools,[4] and what, if any, flow releases are necessary to ensure water quality is sufficient to maintain aquatic life in the pools.

Brook Trout Movement Study

2. The issue of brook trout movement, and the need for a telemetry study to document such movement, was discussed at length during the June 13, 2018, PSP meeting. As

---

[1] Reference to the Proposed Study Plan throughout this Schedule A is to White Pine Hydro's Proposed Study Plan filed on May 14, 2018.

[2] U.S. Army Corps of Engineers' Hydrologic Engineering Center's River Analysis System (HEC-RAS).

[3] The proposed methods include: (a) establishing transects in the Saco River within the first 0.45 mile downstream from Hiram Dam; (b) performing river bed and bank profile surveys at the transects up to the bank full elevation; (c) measuring river width and water depth across each transect at about 20 stations at a low flow release from the dam (*e.g.*, 300 cubic feet per second, or less) to characterize the stream bed cross-sectional profile and water surface elevation; (d) gauging river flow to determine the amount of water released from the dam during the study; (e) estimating bank full conditions, based on physical stream bank characteristics; and (f) using a HEC-RAS model to determine at which flow 75 percent of the bank full cross-sectional area of the river is continuously watered.

[4] We visited the project on June 12, 2018, and observed that the bypassed reach is composed entirely of ledge/bedrock, with only two pools providing aquatic habitat.

part of the discussion we identified a possible alternative to a brook trout telemetry study that could be much less expensive, but potentially could answer the question of whether the native brook trout that inhabit the tributaries, use habitat in the Saco River, or otherwise move through the project area. The study described is a fish assemblage study that would be conducted seasonally (*i.e.*, multiple times a year, based on known brook trout behavior). In addition, temperature loggers could be employed at strategic locations (*e.g.*, tributary mouths) as part of the study to document seasonal changes in water temperature that might act as barriers to brook trout movement in the Saco River. If designed correctly, the fish assemblage study could help address the issue of brook trout presence and movement in the Saco River, as well as serve to update 12-year-old fish data for the project area,[5] including the river's IBI score(s) in the project area.

Wildlife and Botanical Resources/T&E Species Surveys

3. As described in sections 7.2.7 and 7.3.7 of the PSP, the wildlife and botanical resource report(s) will: (a) summarize the wildlife and botanical species, including rare, threatened, and endangered (RTE) species, and habitats encountered within the impoundment and downstream reach of the project; and (b) include general habitat mapping and descriptions. To support our analysis of wildlife and botanical resources, the survey report(s) should include an assessment of project-related effects on wildlife and botanical resources, including RTE species. The assessment should look at effects on these resources within the project boundary, including at existing formal and informal project facilities (*e.g.,* the existing sand bar), as well as areas under consideration for potential development as part of the licensing proposal.[6] In addition, the report(s) should describe proposed tree-removal[7] activities, and include a completed Northern Long-Eared Bat 4(d) Rule Streamlined Consultation Form, which is available on the U.S. Fish and Wildlife Service's (FWS) website at https://www.fws.gov/midwest/endangered/mammals/nleb/s7.html.

[5] In August 2006, the Midwest Biodiversity Institute completed fish surveys in the Saco River near the Hiram Project, as part of an Index of Biotic Integrity (IBI) model for large Maine rivers. *See* White Pine Hydro's Preliminary Application Document at 5-28.

[6] *See* Commission staff's March 29, 2018, Comments at 7-8.

[7] FWS defines tree removal as cutting down, harvesting, destroying, trimming, or manipulating in any other way the trees, saplings, snags, or any other form of woody vegetation likely to be used by northern long-eared bats.

4. Section 7.2.1 of the PSP states that the wildlife survey is designed to provide information on: (a) existing, representative wildlife (*bird and mammal*)[8] habitats in riparian, wetland, and upland areas along the project impoundment and downstream reach; (b) the presence of wildlife species at the project; and (c) the presence of RTE species or associated habitats. It appears that the proposed survey would focus exclusively on bird and mammal representative habitats. However, the Preliminary Application Document (PAD) identifies many herptiles that may be found in the project vicinity, as well (*see* Tables 5.3.6-1, 5.4.2-1, and 5.7.1-1). We recommend that the wildlife resource survey include birds, mammals, and herptile species.

5. In sections 7.2.5 and 7.3.5 of the PSP, White Pine Hydro proposes to collect data in the field using global positioning system (GPS) units[9] to facilitate mapping observed resources. To facilitate our analysis of potential project effects on wildlife and botanical resources, including RTE species, we recommend that the habitat and occurrence maps, as well as the Geographic Information System (GIS) source data be filed with the study report(s). The GIS data should be filed in a georeferenced electronic file format (such as ArcView shape files, or a similar GIS format).

Recreation Facilities Inventory

6. In section 6.3 of the PSP, White Pine Hydro discusses the potential for project boundary modifications at the Hiram Project. The potential for such changes was also discussed at the June 13, 2018, PSP meeting. As described, White Pine Hydro plans to review all land and waters within the existing project boundary to determine whether they serve a project purpose. Please include in the study report an assessment of how any proposed changes in the project boundary may affect access to, and use of, existing recreation features within the project boundary.

7. In section 7.4 of the PSP, White Pine Hydro proposes to conduct a recreation facilities inventory at the Hiram Project. The goals and objectives of the inventory are to identify and assess existing recreational facilities within the project boundary, which provide access to the project impoundment and waters downstream from Hiram Dam, along with their locations, amenities, general conditions, and ownership.

---

[8] Emphasis added.

[9] GPS units are navigation devices that receive information from satellites and then calculate the device's geographical position.

On June 12, 2018, we visited the project area to see recreation sites and amenities not observed during the March 1, 2018, Environmental Site Review.[10] During our June 12 visit, we noted that the sand bar, while described as ephemeral (or temporary) in the PAD, is extensive and appears to be a permanent feature of the area that is used regularly. We witnessed multiple groups of people recreating on the sand bar. We also observed multiple campfire rings and numerous trash items spread out among the various areas of the sand bar. Given our observations, assessing the potential for providing trash receptacles and a portable toilet in the study report would be helpful. Possible locations for the facilities could be near the Fisherman's Trail parking area and along the shoreline, where the trail opens onto the sand bar.

In addition, we observed trees close to the informal campfire rings that appear to have severely damaged bark. The proposed site inventory form for the recreation facilities inventory (Figure 7.4-2 in the PSP) includes a section to document site aesthetics and evidence of use of each site with an option to document vegetation removal. To facilitate our review of recreation on project resources, we suggest that the form be modified to document both vegetation removal and any damages to trees and other vegetation that could be related to recreation uses.

8. The 2015 Form 80 in Appendix C of the PSP states that there are 2 miles of trails in the project area. The 2009 Form 80 states that there are 1.5 miles of trails in the project area. Though included on the Form 80s, trails of this length were not described in the PAD. Please include these trails among the existing recreation sites at the project to be described and mapped as part of the Revised Study Plan.

Cultural Resources Surveys

9. On June 11, 2018, the Maine Historic Preservation Commission (SHPO) filed its comments on White Pine Hydro's proposed study plan for archaeological and architectural resources. The SHPO indicated that it concurred with the scope of the proposed archaeological and architectural studies, but stated that consultation regarding the Area of Potential Effects (APE) has not been initiated. The SHPO requests that White Pine Hydro identify the proposed boundaries for the APE. As discussed at the June 13, 2018, PSP meeting, White Pine Hydro will need to consult with the Maine SHPO to define the APE prior to conducting any cultural resources studies.

---

[10] The sites visited primarily included the canoe take-out and portage trail, as well as the Fisherman's Access Trail, parking area, and the large sand bar located on the western side of the Saco River downstream from Hiram Dam.

Exhibit F

From: Howatt, Kathy
To: Jesse Wechsler; Dunlap,Frank (Frank.Dunlap@brookfieldrenewable.com)
Subject: Hiram Falls Aquatic Habitat Study Plan
Date: Thursday, May 23, 2019 3:25:08 PM

Frank and Jesse,

Department staff have reviewed the proposed study plan for the bypassed reach (Hiram Falls) and have the following comments;

1. The plan calls for collection of dissolved oxygen/temperature data to be collected hourly for eight weeks beginning in late June or early July. Department sampling protocol for hydropower studies requires ten weeks of DO/temperature sampling, however in this case we believe that the proposed eight week sampling will be sufficient.
2. The plan indicates that information about aquatic biota observed in the pools will be collected, although no formal benthic macroinvertebrate (BMI) study is proposed. The Department understands that a quantitative assessment (BMI study) has been completed below the project, and so agrees that a qualitative evaluation of organisms present in this reach of the river would be adequate and would provide useful information about the habitat found in the pools of the Hiram Falls reach. Observers should lift rocks (if any are present in the pools) to ascertain the presence of aquatic organisms not immediately visible.

Thanks for the opportunity to review and provide comment on the Hiram Falls Aquatic Habitat Study Plan.

Kathy Davis Howatt
Hydropower Coordinator, Bureau of Land Resources
Maine Department of Environmental Protection
Phone: 207-446-2642
www.maine.gov/dep

Exhibit G

FINAL ENVIRONMENTAL ASSESSMENT FOR HYDROPOWER LICENSE

Hiram Hydroelectric Project, P-2530-057

Maine

Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
888 First Street, NE
Washington, D.C. 20426

April 2022

TABLE OF CONTENTS

LIST OF FIGURES

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ACRONYMS AND ABBREVIATIONS

APE	area of potential effect
Assessment	Recreation Facilities Inventory and Condition Assessment
°C	degrees Celsius
CEQ	Council on Environmental Quality
certification	water quality certification
CFR	Code of Federal Regulations
cfs	cubic feet per second
Commerce	U.S. Department of Commerce
Commission	Federal Energy Regulatory Commission
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DO	dissolved oxygen
EA	environmental assessment
EFH	Essential Fish Habitat
EIA	U.S. Energy Information Administration
EPRI	Electric Power Research Institute
ESA	Endangered Species Act
°F	degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FWS	U.S. Fish and Wildlife Service
GMCME	Gulf of Maine Council on the Marine Environment
GOM DPS	Gulf of Maine Distinct Population Segment
HPMP	Historic Properties Management Plan
Interior	U.S. Department of the Interior
IPaC	Information for Planning and Consultation
kV	kilovolt
kW	kilowatt
LIDaR	Laser Imaging, Detection, and Ranging
Maine DEP	Maine Department of Environmental Protection
Maine DIFW	Maine Department of Inland Fisheries and Wildlife
Maine DMR	Maine Department of Marine Resources
Maine DOT	Maine Department of Transportation
mg/L	milligrams per liter
MW	megawatt
MWh	megawatt-hour
National Register	National Register of Historic Places
NEPA	National Environmental Policy Act
NGVD 29	National Geodetic Vertical Datum of 1929
NHPA	National Historic Preservation Act
NLEB	northern long-eared bat
NMFS	National Marine Fisheries Service
NPCC-New England	Northeast Power Coordinating Council's New England region
O&M	operation and maintenance

PA	Programmatic Agreement
REA	Ready for Environmental Analysis
Recreation Plan	Recreation Facilities Management Plan
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SD	Scoping Document
Sebago TU	Sebago Chapter of Trout Unlimited
SHPO	State Historic Preservation Officer
SPDES	State Pollution Discharge Elimination System
sq ft	square feet
U.S.C.	United States Code
USGS	U.S. Geological Survey

FINAL ENVIRONMENTAL ASSESSMENT
Federal Energy Regulatory Commission
Office of Energy Projects
Division of Hydropower Licensing
Washington, DC

Hiram Hydroelectric Project No. 2530-057
Maine

1.0 INTRODUCTION

1.1 APPLICATION

On November 20, 2020, Brookfield White Pine Hydro LLC (White Pine Hydro) filed an application with the Federal Energy Regulatory Commission (Commission) for a new license to continue to operate and maintain the Hiram Hydroelectric Project No. 2530 (Hiram Project or project).[1] The 11.633-megawatt (MW) project is located on the Saco River near the towns of Hiram, Baldwin, Denmark, and Brownfield in Oxford and Cumberland Counties, Maine (figure 1). The project does not occupy federal land.

1.2 PURPOSE OF ACTION AND NEED FOR POWER

1.2.1 Purpose of Action

The purpose of the Hiram Project is to provide a source of hydroelectric power. Therefore, under the provisions of the Federal Power Act (FPA), the Commission must decide whether to issue a new license to White Pine Hydro for the project and what conditions should be placed on any license issued. In deciding whether to issue a license

[1] The Commission issued Central Maine Power Company (Central Maine) an original license for the Hiram Project on November 19, 1970. *Central Maine Power Company*, 44 F.P.C. 1451 (1970). On December 22, 1982, the Commission issued Central Maine a new 40-year license with an effective date of December 1, 1982, and an expiration date of November 30, 2022. *Central Maine Power Company*, 21 FERC ¶ 62,483 (1982). On December 28, 1998, the Commission approved transfer of the license for the project from Central Maine to FPL Energy Maine Hydro, LLC (FPL Energy). *See Central Maine Power Company, Union Water Power Company, and FPL Energy Maine Hydro LLC*, 85 FERC ¶ 62,208 (1998). The license was amended on July 29, 2013, to reflect a name change from FPL Energy to Brookfield White Pine Hydro LLC. *See FPL Energy Maine Hydro LLC and Brookfield White Pine LLC*, 144 FERC ¶ 62,075 (2013).

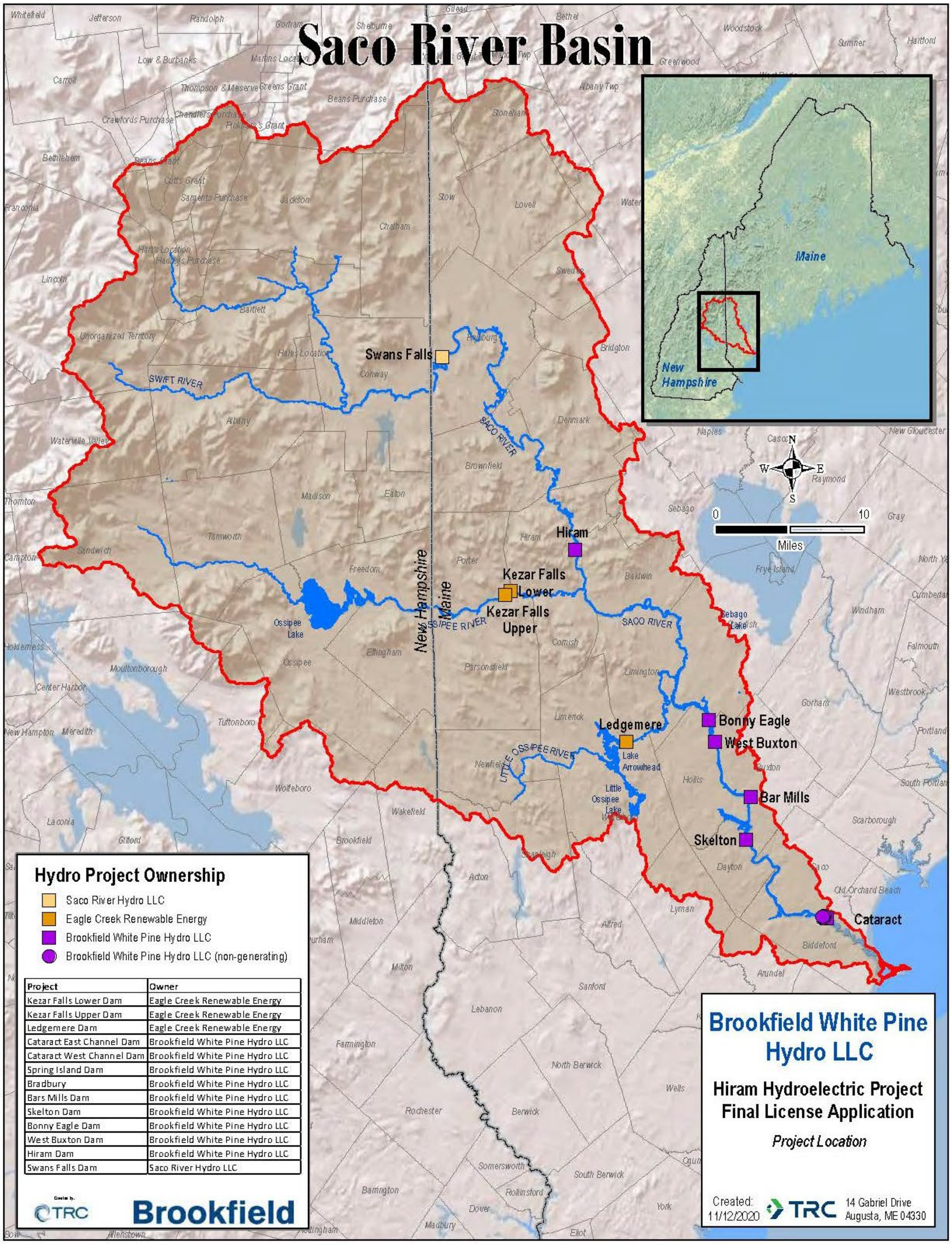

Figure 1. Location of Hiram and other licensed or exempted hydroelectric projects on the Saco River Basin (Source: Application, as modified by staff).

for a hydroelectric project, the Commission must determine that the project would be best adapted to a comprehensive plan for improving or developing a waterway.

In addition to the power and developmental purposes for which licenses are issued (such as flood control, irrigation, or water supply), the Commission must give equal consideration to the purposes of: (1) energy conservation; (2) the protection of, mitigation of damage to, and enhancement of fish and wildlife resources; (3) the protection of recreational opportunities; and (4) the preservation of other aspects of environmental quality.

Issuing a new license for the Hiram Project would allow White Pine Hydro to continue to generate electricity at the project for the term of the new license, making electric power from a renewable resource.

This environmental assessment (EA) has been prepared in compliance with the National Environmental Policy Act of 1969 (NEPA)[2] to assess the environmental and economic effects associated with operation of the project, and alternatives to the proposed project. It includes recommendations to the Commission on whether to issue a new license, and if so, recommends terms and conditions to become part of any issued license.

In this EA, we assess the environmental and economic effects of continuing to operate the project: (1) as proposed by White Pine Hydro, (2) as proposed by White Pine Hydro with staff-recommended measures (staff alternative), and (3) with staff-recommended measures as modified by the U.S. Department of the Interior's (Interior) mandatory conditions (staff alternative with mandatory conditions). We also consider the effects of the no-action alternative. The primary issues associated with relicensing the project are upstream and downstream passage for Atlantic salmon and American eel and recreation.

1.2.2 Need for Power

The project would continue to provide hydroelectric generation to meet part of the region's power requirements, resource diversity, and capacity needs. The project has a generating capacity of 11.633 MW and generates approximately 49,287 megawatt-hours (MWh) per year.

The U.S. Energy Information Administration (EIA) provides estimates of electrical supply and demand nationally and regionally for a 10-year period in its Annual Energy Outlook Report. The Hiram Project is located within the Northeast Power Coordinating Council's New England region (NPCC-New England), which is one of six regional reliability councils. According to EIA's 2021 Energy Outlook Report, electric demand in the NPCC-New England

[2] On July 16, 2020, the Council on Environmental Quality (CEQ) issued a final rule, *Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act* (Final Rule, 85 Fed. Reg. 43304), which was effective as of September 14, 2020. Commission staff prepared this EA in accordance with CEQ's new regulations.

region is projected to increase by about 21 percent over the 10-year period from 2020 to 2030 (EIA, 2021).

If it is relicensed, power from the Hiram Project would continue to help meet the need for power in the NPCC-New England region. The project would continue to provide low-cost power that displaces generation from non-renewable sources. Displacing the operation of non-renewable facilities may avoid some power plant emissions, thus creating an environmental benefit.

1.3 STATUTORY AND REGULATORY REQUIREMENTS

Any new license for the project would be subject to numerous requirements under the FPA and other applicable statutes. The major regulatory and statutory requirements are described in Appendix A.

1.4 PUBLIC REVIEW AND COMMENT

The Commission's regulations (18 C.F.R. §§ 5.1-5.16) require applicants to consult with appropriate resource agencies, tribes, and other entities before filing an application for a license. This consultation is the first step in complying with the Fish and Wildlife Coordination Act, Endangered Species Act (ESA), National Historic Preservation Act (NHPA), and other federal statutes. Pre-filing consultation must be completed and documented according to the Commission's regulations.

1.4.1 Scoping

Before preparing this EA, staff conducted scoping for the project to determine what issues and alternatives should be addressed. Scoping Document 1 (SD1) was distributed on January 29, 2018. Two scoping meetings were held to obtain comments on the project: one on February 28, 2018, in West Baldwin, Maine; and one on March 1, 2018, in Lewiston, Maine. A court reporter recorded all comments and statements made at the scoping meetings, and a transcript is part of the Commission's public record for the project. In addition to the comments provided at the scoping meetings, the following entities provided written comments:

Commenting Entity	Date
U.S. Fish and Wildlife Service (FWS)	March 23, 2018
Maine Department of Inland Fisheries & Wildlife (Maine DIFW)	March 28, 2018
Maine Department of Environmental Protection (Maine DEP)	March 28, 2018
National Marine Fisheries Service (NMFS)	March 28, 2018
Trout Unlimited, Sebago Chapter (Sebago TU)	March 30, 2018

A revised scoping document (SD2) addressing these comments was issued on May 11, 2018.

1.4.2 Interventions

On January 11, 2021, the Commission issued a notice accepting the application and stating that the application was ready for environmental analysis. This notice set March 12, 2021, as the deadline for filing motions to intervene and protests. Sebago TU filed a timely motion to intervene on March 1, 2021. Interior,[3] and Maine DIFW filed timely notices of intervention on March 11 and 12, 2021, respectively, and on March 18, 2021, NMFS filed a late notice of intervention, which was granted.

1.4.3 Comments on the Application

The January 11, 2021 notice also requested comments, recommendations, terms and conditions, and prescriptions. The following entities and individuals filed comments and recommendations: Interior (March 11, 2021); NMFS (March 11, 2021); Maine DIFW (March 12, 2021); Sebago TU (March 1 and April 23, 2021); Saco Sea Restoration Alliance (March 11, 2021); John Moore (February 25, 2021); Alexander M. Green (February 25, 2021); Henry Harding (February 25, 2021); Heather Thompson (February 26, 2021); Thomas C. Klak (March 1, 2021); Patricia A. Barber (March 1, 2021); Michael Herman (March 2, 2021); and Tucker Pierce (March 2, 2021).

Brookfield filed reply comments on April 19, 2021.

1.4.4 Comments on the Draft Environmental Assessment

Commission staff issued the draft EA for the Hiram Project on September 13, 2021. Comments on the draft EA were due by October 22, 2021. Sebago TU filed comments on the draft EA on October 22, 2021.

Appendix B summarizes the comments that were filed, includes responses to those comments, and indicates where modifications were made to the EA.

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO ACTION ALTERNATIVE

Under the no-action alternative, the project would continue to operate under the terms and conditions of the current license, and no new environmental protection, mitigation, or enhancement measures would be implemented. We use this alternative to establish baseline environmental conditions for comparison with other alternatives and to judge the benefit and costs of any measures that might be required under a new license.

2.1.1 Existing Project Facilities

The project facilities are shown in figure 2. Hiram Dam is a 448-foot-long concrete gravity dam that consists of a 258-foot-long concrete spillway section; a 64-foot-long gated

[3] Interior filed a notice of intervention on behalf of its component bureau, the FWS.

section; an 88-foot-long, 40-foot-high feet high, reinforced concrete intake integral with the dam; a concrete abutment; and a concrete bulkhead. The concrete spillway is divided into two sections topped with inflatable bladders. The section closest to the western shore is approximately 143 feet in length, while the other is approximately 105 feet in length. The maximum crest elevation of the spillways is 349.25 feet[4] when the rubber bladder atop the dam is inflated and a maximum elevation of 343.62 feet when the rubber bladder is deflated. The gated section consists of a deep sluice with a 10-foot-wide by 8.5-foot-high lift gate, a former log sluice with a 10-foot-wide by 7.5-foot-high Tainter gate (log sluice), a trash sluice with a 6.75-foot-wide by 5.2-foot-high lift gate, and a 22-foot-wide by 11-foot-high Tainter gate. The four sluiceways are separated by a 4-foot-, a 4.5-foot-, and a 3-foot-wide pier.

The project's reservoir is 254 acres at full pool and extends about 7.5 miles upstream of the dam. The reservoir volume is 572 acre-feet at full pool and has an average depth of 9 feet.

The intake contains two openings, each 15 feet wide by 24 feet high protected by trash racks. The trash racks are constructed of 3/4-inch bar steel at 4 inches on center, resulting in a clear spacing of 3.25 inches. Water is conveyed from the intake through a 320-foot-long, 15.5-foot-diameter penstock that bifurcates to a 10-foot-diameter, 170-foot-long penstock leading to a 3.008-MW turbine-generator 1 (Unit 1) and a 15.5-foot-diameter, 80-foot-long penstock leading to a 8.625-MW turbine-generator 2 (Unit 2). The generating units are housed in a 133.42-foot-long by 50-foot-wide reinforced concrete powerhouse located at the eastern end of the dam and at the foot of "Hiram Falls." Water is discharged into the Saco River at the bottom of "Hiram Falls," which is a naturally occurring 55-foot-high, 500-foot-long cascade comprised of a series of ledge drops and pools that make up the bypassed reach. Project power is transmitted from the project substation to a non-project switching station 50 feet north of the powerhouse. The project substation includes two step-up transformers, two banks of circuit breakers, and associated switching equipment. The project also includes a gravel access road from the Pequawket Trail (Maine Routes 5/113) that splits, with a branch going to powerhouse and the other branch going to the dam and intake structure. A gate across the access road at Pequawket Trail prevents drivers from accessing the project, but a pedestrian pass-through allows the public to access the project lands and the Nature Study Area recreation site behind the gate. The Hiram Project has four project recreational facilities: a Canoe Portage, a Downstream Access Trail and Sandbar Area, an Overlook, and a Nature Study Area.

[4] All elevations are National Geodetic Vertical Datum of 1929 (NGVD 29).

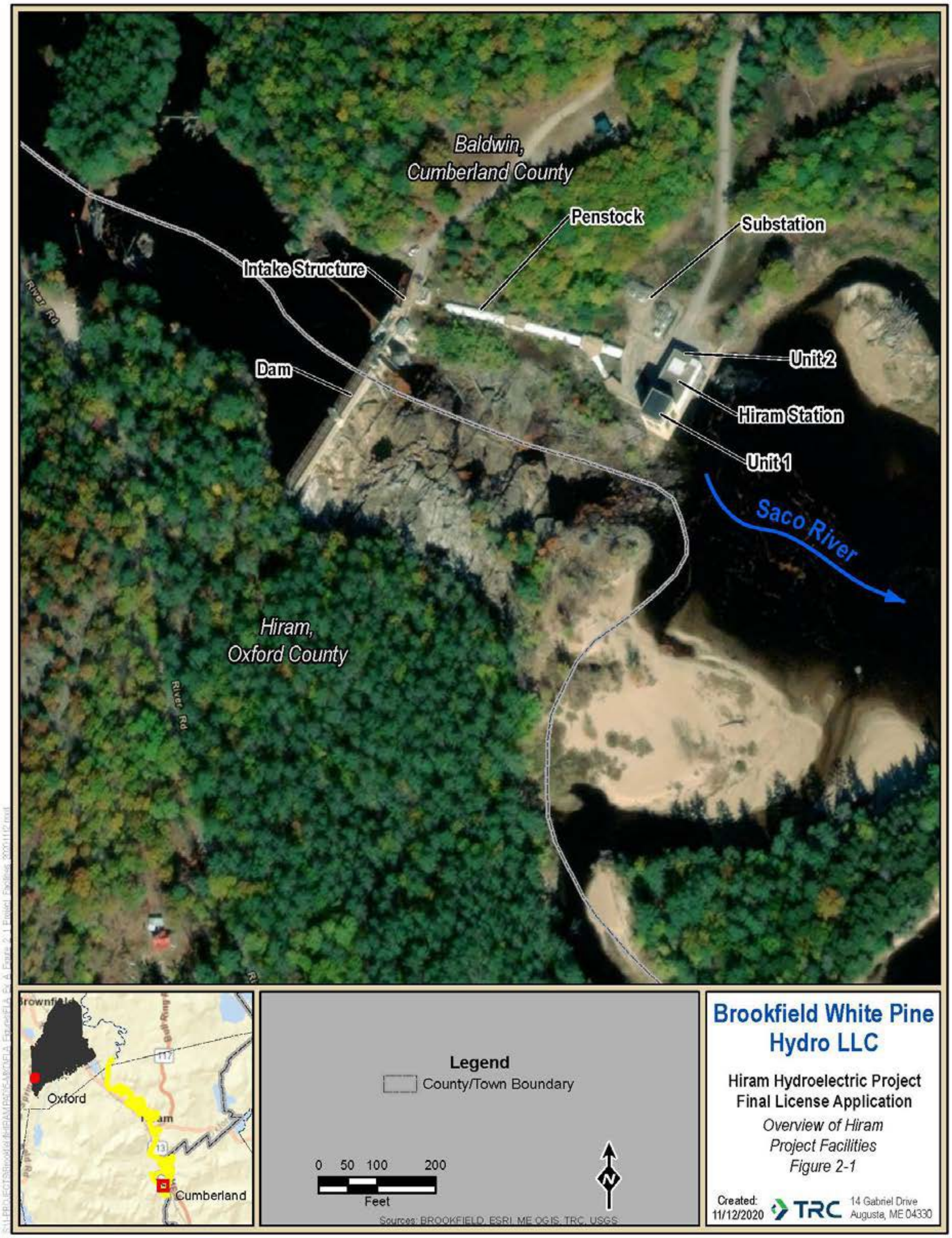

Figure 2. Hiram Hydroelectric Project facilities (Source: Application).

2.1.2 Current Project Boundary

The project boundary currently encompasses 1,757.6 acres and extends about 7.5 miles upstream of the dam and about 1.5 miles downstream of the dam. The project boundary generally follows the impoundment at its normal full pond elevation of 349.0 feet, and encloses the dam, powerhouse, and the project recreation facilities. However, the existing project boundary includes two parcels of land above the 349.0-foot contour that White Pine Hydro proposes to remove from the project boundary, as discussed in section 2.2.1.

2.1.3 Project Safety

The Hiram Project has been operating since 1982 under the current license. During this time, Commission staff has conducted operational inspections focusing on the continued safety of the structures, identification of unauthorized modifications, efficiency and safety of operations, compliance with the terms of the licenses, and proper maintenance.

As part of the licensing process, Commission staff will evaluate the continued adequacy of the project's facilities under a new license. Special articles will be included in any license issued, as appropriate. Commission staff will continue to inspect the project during the term of any new license to ensure continued adherence to Commission-approved plans and specifications, special license articles relating to construction (if any), operation and maintenance, and accepted engineering practices and procedures.

2.1.4 Current Project Operation

White Pine Hydro operates the project in a run-of-river mode, where outflows approximate inflows and impoundment water levels are maintained within one to two feet of the full pool elevation of 349 feet. From November 16 through September 30, White Pine Hydro maintains the impoundment within 2 feet of the full pool elevation of 349 feet (or the crest elevation of 343.25 feet if the bladders are deflated) during normal operation. From October 1 through November 15, White Pine operates the project to maintain the impoundment within one foot of the full pool level or the crest elevation if the bladders are deflated. To ensure that flows downstream of the powerhouse are not diminished at any time while the project impoundment surface elevation fluctuates up to 2 feet below normal full pool from November 16 through September 30, White Pine Hydro releases a minimum flow of 300 cubic feet per second (cfs), or inflow, whichever is less, from the project powerhouse, or in the event the project powerhouse is inoperable, from the dam.[5] The automated log sluice gate is designed to automatically open to pass the minimum flow when the station trips off-line. Operated in this manner, the project has no appreciable storage or flood control capacity.

When flows exceed the maximum combined hydraulic capacity of the two project turbines, 2,310 cfs, White Pine opens the log sluice Tainter gate because this gate is automated

[5] The reservoir fluctuation limits and minimum flows were agreed to as part of the 1997 Saco Instream Flow Agreement and incorporated into the license in 1998. *See* Order Amending License, 88 FERC ¶ 62,033 (1999).

and controlled remotely. The remaining gates and the rubber dams are operated locally, although the rubber dam automatically deflates with a certain amount of overtopping. Once the capacity of the log sluice gate has been exceeded, the large Tainter gate, trash sluice gate, and deep sluice gate are used in that order to pass flows. Once flows exceed the capacity of the four gates (approximately 4,681 cfs), White Pine Hydro deflates the two sections of rubber dam.

2.2 APPLICANT'S PROPOSAL

2.2.1 Proposed Project Boundary Modifications

White Pine Hydro proposes to remove from the project boundary 151.5 acres of land and 25 acres of water located in two parcels, one upstream and one downstream from the dam (see figures 3, 4, and 5 in Appendix C). The upstream parcel consists of a 32-acre tract (Parcel A) located on the west side of the impoundment above the full pool elevation 349.0 feet. White Pine Hydro proposes to remove Parcel A because it is above the zone of influence of project operation and thus not needed for project purposes. The downstream parcel consists of a 144.5-acre tract (Parcel B) composed of 119.5 acres of land and 25 acres of the Saco River. Parcel B contains the Overlook and the Saco River beginning about 1,000 feet downstream of the dam to the current project boundary.

2.2.2 Proposed Operation and Environmental Measures

White Pine Hydro proposes to:

- Continue to operate the project in a run-of-river mode where outflow approximates inflow by maintaining impoundment levels: (1) within two feet of normal full pond elevation of 349 feet or from the spillway crest when the rubber dams are down from November 16 through September 30; and (2) within one foot of full pool elevation of 349 feet or from the spillway crest when the rubber dams are down from October 1 through November 15.

- Continue to provide a 300-cfs minimum flow or inflow if less from the project powerhouse, or in the event the project powerhouse is inoperable, from the dam from November 16 through September 30.

- Implement the Project Operations Monitoring Plan filed with the license application to monitor compliance with the project's operation requirements.

- Develop and implement a dissolved oxygen (DO) monitoring plan to monitor DO in the Hiram Falls bypassed reach and the project tailwater.

- Continue to implement the following provisions of the Fisheries Agreement applicable to the Hiram Project as required by the existing license:[6]

    - Construct and begin operation of a permanent upstream Atlantic salmon passage facility by May 1, 2032, contingent on an unspecified returning number of Atlantic salmon and following consultation with, and agreement by, FWS, NMFS, and Maine Department of Marine Resources (Maine DMR)
    - Construct and begin operation of a downstream passage facility for Atlantic salmon by the earlier of (1) April 15 following two years after White Pine Hydro receives written notification of the commencement of annual stocking of juvenile Atlantic salmon above Hiram Dam, or (2) the operation of permanent upstream fish passage facilities for Atlantic salmon at the project.
    - Construct and begin operation of a permanent upstream American eel passage facility by June 1, 2025, if sufficient numbers of eels are present to require an eelway or to determine the location of an upstream eelway.
    - Install and operate a permanent downstream American eel passage facility or implement operational measures that achieve a 90-percent passage efficiency at the project by September 1, 2032.
    - Beginning the 10th year after installation of an upstream eelway, and until permanent downstream facilities or measures for American eel are constructed at the project, continue to monitor for eel mortality downstream from Hiram Dam weekly from September 15 through November 15, and, if more than 50 eel mortalities per night occurs at the project and persists, implement interim measures including (a) opening an existing sluice or gate at the project to provide an unimpeded passage route, or (b) reducing nighttime generation to reduce the approach velocity to the turbine intake.
    - Develop a fishway operation and maintenance plan.
    - Operate each upstream and downstream fish passage facility for a one-season "shakedown" period to ensure that it is generally operating as designed and to make minor adjustments to the facilities and operation.
    - Develop a fishway effectiveness monitoring plan to evaluate the effectiveness of all newly constructed or significantly modified permanent upstream and downstream fish passage facilities or measures for Atlantic salmon and eels, implement the monitoring studies at the start of the first migratory season following the facility "shakedown" period, and continue monitoring for up to 3 years for each species.

[6] The Fisheries Agreement collectively refers to the Saco River Fisheries Assessment Agreement, a comprehensive 1994 agreement, revised in 2007 ("2007 Fisheries Agreement") and amended in 2009 and 2019 that covers the Cataract, Skelton, Bar Mills, West Buxton, Hiram, and Bonny Eagle Projects.

    - If the facilities or measures are not effectively passing the target species, conduct reasonable, cost-effective adjustments to the facilities or measures to improve fish passage effectiveness.
    - Obtain FWS and/or NMFS approval of the final design of any permanent upstream or downstream fish passage facility prior to construction.
- Conduct tree removal between October 16 and April 19 to avoid impacts to northern long-eared bats (NLEB), but if tree removal is required between April 20 and October 15 (e.g., emergency conditions), then consult with FWS prior to conducting the tree removal.

- Implement the Recreation Facilities Management Plan (Recreation Plan) filed with the license application, which includes the following provisions:

    - Maintain the Canoe Portage, Downstream Access Trail and Sandbar Area, and Nature Study Area.
    - Improve the Downstream Access Trail and Sandbar Area by adding signage describing hours of operation and security measures, three picnic tables, a seasonal portable restroom, seasonal trash service, and a security gate.
    - Remove the informational kiosk, picnic area, and parking inside the gate at the Nature Study Area recreation site.
    - Remove the Overlook from the project boundary and as a project recreation facility.
    - Monitor recreation use at the project every 10 years.
- Attempt to acquire rights to the private boat launch located on the impoundment to ensure permanent public access. If securing rights voluntarily to the existing boat launch is not possible, conduct a feasibility study to identify an alternate launch location, and design and construct a new launch at the alternate location.

- Implement the Historic Properties Management Plan (HPMP) filed with the Commission on August 23, 2021 to protect cultural resources.

2.3 STAFF ALTERNATIVE

Under the Staff Alternative, the project would include all of White Pine Hydro's proposed measures as described above in section 2.2, except for the proposal to develop and implement a plan to monitor DO in the project's tailwater and Hiram Falls bypass reach, implementing interim downstream eel passage monitoring and protection measures, developing and implementing a fishway effectiveness monitoring plan, achieving a 90-percent downstream passage efficiency for American eel, and some of its proposed modifications to the recreation plan.

The Staff Alternative includes the following modifications and additional staff-recommended measures, including some additional conditions from Interior's section 18 fishway prescription and Maine DEP's water quality certification:

- Revise the proposed Project Operations Monitoring Plan to include: procedures for maintaining and calibrating the monitoring equipment, procedures for refilling the impoundment and maintaining flows downstream of the project following maintenance or emergency drawdown of the impoundment, and revised reporting requirements for deviations from the operating requirements of the license.

- Once the upstream and downstream passage facilities are installed, operate them according to the following schedule:[7]

Species	**Upstream Migration Period**	**Downstream Migration Period**
Atlantic salmon	May 1 – October 31	April 1 – June 30 (smolts and kelts) October 15 – December 31 (kelts)
American eel	June 1 – September 15	September 15 – November 15 (night)

- Revise the proposed Recreation Plan to include the following measures:

    - Instead of removing the information kiosk and picnic tables from the Nature Study Area, (a) design and install signage at the entrance to the project access road directing users to the Nature Study Area and include a map of the trail and its length, and the hours of operation of the recreation area; (b) repair or replace the plant identification signs along the trail; and (c) repair or replace as appropriate, the roofs to the two picnic shelters and the two picnic tables under the shelters and remove the two picnic tables that are in disrepair.
    - Instead of installing signage at the parking area of the Downstream Access Trail and Sandbar Area, place signage identifying the site so that it is visible from River Road.
    - Include a description of the methodology to be used to monitor recreation use, how the monitoring results and any proposed changes to the project recreation facilities would be distributed to the agencies, and an implementation

[7] The Fisheries Agreement did not specify the operating period for fish passage facilities. The operating period is defined in Interior's section 18 fishway prescription.

schedule for conducting monitoring and filing the results with the Commission for approval.

    - Include a maintenance schedule, including trash and litter removal for all recreation areas and from behind the powerhouse following high flow events.
    - Install a security camera on the powerhouse capable of monitoring the Downstream Access Trail and Sandbar Area for unauthorized camping and a procedure for reporting misuse to appropriate authorities.
    - Paint the project penstock a color that blends better with the surrounding landscape within 3 years of license issuance.

- File a plan and schedule for providing a public boat launch on the project impoundment, using either the existing launch or by constructing a new facility. The plan should include a conceptual drawing and maps, and identify the location of the site, parking, signage, operation and maintenance schedule, and any proposed improvements (e.g., ramp improvements, trash receptacles, or restrooms).

2.4 STAFF ALTERNATIVE WITH MANDATORY CONDITIONS

We recognize that the Commission is required to include all section 18 fishway prescriptions and water quality certification conditions in any license issued for the project. Therefore, the Staff Alternative with Mandatory Conditions includes all the measures in the staff alternative, the section 18 fishway prescriptions provided by Interior (Appendix D), and the water quality certification conditions provided by Maine DEP (Appendix E). Thus, this alternative would include developing and implementing a plan to monitor DO in the project's tailwater and Hiram Falls bypass reach, implementing interim downstream eel passage monitoring and protection measures, developing and implementing a fishway effectiveness monitoring plan, and achieving a 90-percent downstream passage efficiency for American eel that were excluded from the Staff Alternative. It would also include Interior's prescription to design the upstream and downstream passage facilities or measures in a manner that is consistent with FWS's Design Criteria Manual.

In addition to the specific fish passage measures listed above, Interior and NMFS have reserved their authority to prescribe fishways at the project under section 18 of the FPA during the term of any new license.

2.5 ALTERNATIVE CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Certain alternatives to White Pine Hydro's proposal were considered but eliminated from further analysis because they are not reasonable in this case. These alternatives are presented in Appendix F.

3.0 ENVIRONMENTAL ANALYSIS

This section includes a general description of the project vicinity, and our analysis of the proposed action and other recommended environmental measures. Sections are organized by resource area (aquatic, recreation, *etc.*). Historic and current conditions are described under each resource area. The existing conditions are the baseline against which the environmental effects of the proposed action and alternatives are compared, including an assessment of the effects of proposed protection, mitigation, and enhancement measures, and any cumulative effects of the proposed action and alternatives. Staff conclusions and recommended measures are discussed in section 5.1, *Comprehensive Development and Recommended Alternative*.[8]

3.1 GENERAL DESCRIPTION OF THE RIVER BASIN

The Hiram Project is located at river mile 46 on the Saco River in Oxford and Cumberland Counties, Maine. The Saco River originates near Crawford Notch in the White Mountains of New Hampshire and flows approximately 44 miles southeast before crossing the Maine-New Hampshire border near Fryeburg, Maine. The Saco River then flows approximately 90 miles to the Gulf of Maine and the Atlantic Ocean. There are three primary headwater tributaries that drain into the Saco River: the Swift River in Conway, New Hampshire; the Ossipee River in Cornish, Maine; and the Little Ossipee River in East Limington, Maine. Both the Ossipee River and the Little Ossipee River enter the mainstem Saco River below the project. The Saco River Basin has a total drainage area of 1,700 square miles. The drainage area at the Hiram Project is approximately 830 square miles.

The topography of the Saco River Basin varies from high mountainous areas with rugged terrain in New Hampshire leading into the foothills and flat wooded plains of southern Maine. Approximately 85 percent of the Saco River Basin is forested, and 10 percent is under agricultural use. Major land use activities include forest products (e.g., pulp and lumber operations) and agricultural activities such as small dairy and poultry operations. Lands within the project boundary are largely forested, except for project facilities near the dam. Most of the land abutting the project boundary is privately owned. There are no federal lands within or adjacent to the project boundary.

The climate is continental, characterized by frequent changes in weather with relatively cool summers and long, cold winters. Annual rainfall averages about 40-50 inches, with an addition 90.85 inches of snowfall. The average annual temperature is about 45 degrees Fahrenheit (°F) and average monthly temperatures vary from 60-70°F in July to 10-20°F in January and February.

There are seven existing FERC licensed or exempted hydroelectric generating projects located on the mainstem of the Saco River (table 1). The Hiram Project is located between the Swans Falls and the Bonny Eagle Projects (figure 1).

[8] Unless otherwise indicated, our information is taken from the application for license filed by White Pine Hydro on November 20, 2020; additional information filed on June 15, 2021 and July 14, 2021; and White Pine Hydro’s reply comments filed on April 19, 2021.

Table 1. Hydroelectric generating projects on the Saco River (Source: Application).

Dam / Project Name	FERC Project Number	River Mile	FERC Project Type	Capacity (MW)
Swans Falls	11365	85	Exemption	0.82
Hiram	2530	46	License	11.633
Bonny Eagle	2529	26	License	7.2
West Buxton	2531	24	License	7.8
Bar Mills	2194	20	License	4
Skelton	2527	17	License	21.6
Cataract	2528	5	License	6.65

3.2 PROPOSED ACTION AND ACTION ALTERNATIVES

In this section, we discuss the project-specific effects of the project alternatives on environmental resources. For each resource, we first describe the affected environment, which is the existing condition and baseline against which we measure project effects. We then discuss and analyze the environmental effects of the project alternatives. [9]

Only the resources that would be affected are addressed in this EA. We have determined that aquatic resources, terrestrial resources, threatened and endangered species, recreation, land use and aesthetic resources, and cultural resources would be affected by the proposed action and alternatives. We have not identified any substantive issues related to geology and soils or socioeconomics associated with the proposed action; therefore, these resources are not addressed in the EA. We also consider the effects of the project on environmental justice communities. We present our recommendations in section 5.1, *Comprehensive Development and Recommended Alternative*.

3.2.1 Aquatic Resources

3.2.1.1 Affected Environment

Water Quantity and Use

[9] Per CEQ's final rule (July 15, 2020), Commission staff considered and evaluated effects that are reasonably foreseeable and have a reasonably close causal relationship (proximate cause) to the proposed action.

From 1990 through 2019, the average annual flow at the Hiram Project was about 1,931 cfs (table 2 in Appendix C).[10] Monthly average flows typically reach their highest values in April and the lowest in August and September. The minimum and maximum average daily flows during the period evaluated were 162 cfs (September 13, 2002) and 17,552 cfs (June 18, 1998), respectively. Maximum hydraulic capacity of the project (2,310 cfs) is exceeded about 30 percent of the time.

The Saco River at the Hiram Project is used for recreation and hydroelectric generation. The river is also used for water supply in the towns of Saco and Biddeford, downstream of the project.

Municipal or industrial discharges to surface or ground waters of Maine are regulated through State Pollution Discharge Elimination System (SPDES) permits from the Maine DEP. White Pine Hydro is permitted by Maine DEP to discharge up to 203,000 gallons per day of non-contact cooling water from two outfalls into project waters. Additionally, there are five additional outfalls into the Saco River permitted by the Maine DEP that do not discharge into project waters.

Water Quality

The Saco River from the upper limit of the Hiram impoundment to 1,000 feet below the Hiram Dam is classified as a Class A waterbody. The Saco River from 1,000 feet downstream of the dam to the confluence with the Little Ossipee River is a Class AA waterbody. Maine DEP defines the best usage of Class A waters as a sources of water supply for agriculture, fishing, drinking water after disinfection, recreation, industrial process and cooling water supply, hydroelectric power generation, navigation, and as habitat for fish and other aquatic life. In addition, for Class A waters, the habitat must be classified as natural, and "the aquatic life and bacteria content of Class A waters shall be as naturally occurs."[11] Relevant state water quality standards for Class A waters are as follows: (1) dissolved oxygen (DO) shall be greater than 7 milligrams per liter (mg/L) or 75-percent saturation; (2) pH values shall be between 6.0 and 8.5; and (3) Secchi disk depth shall be greater than or equal to 2.0 meters.

White Pine Hydro conducted water quality studies in the impoundment and tailwater in 2018 and in the bypassed reach (Hiram Falls reach) in 2019.

White Pine Hydro collected water quality samples from the impoundment twice per month from June through October 2018 from a location about 1,600 feet upstream of the dam with a depth of 24 feet. Sample parameters included Secchi disk transparency (a measure of

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[10] White Pine Hydro calculated annual average flow using data collected at USGS gage no. 01066000, located downstream on the Saco River in Cornish, Maine, and prorated the flow by a factor of 0.6526 to compensate for the difference in the drainage area between the Hiram Dam (830 square miles) and the USGS gage (1,293 square miles).

[11] The term "as naturally occurs" is defined to mean "conditions with essentially the same physical, chemical and biological characteristics as found in situations with similar habitats free of measurable effects of human activity."

water clarity) and water temperature, DO, and pH measurements collected at one-meter intervals. Secchi disk transparency ranged from 11.5 to 20.3 feet. Water temperature throughout the water column ranged from 6.6 degrees Celsius (ºC) (43.9 degrees Fahrenheit [ºF]) on October 25 to 26.8ºC (80.2ºF) on August 9. The DO concentration throughout the water column ranged from 7.0 mg/L on August 9 to 11.5 mg/L on October 25 and the DO percent saturation ranged from 86.5 percent on August 9 to 96.7 percent on September 13. The pH ranged from 6.3 to 6.7 with an average of 6.5. All values were within the range recommended for Class A waters. The results indicate that the impoundment did not thermally stratify and that waters were generally well mixed.

White Pine Hydro monitored water quality in the tailwater using a data sonde to measure hourly water temperature and DO from July 12 to September 13, 2018. The sampling site was located about 975 feet downstream of the project's powerhouse. During the monitoring period, water temperature in the tailwater ranged from 18.2ºC (64.8ºF) on September 13 to 27.2ºC (81.0ºF) on August 10. DO concentration ranged from 6.4 mg/L on September 2 to 9.5 mg/L on September 11 and DO saturation ranged from 74.7 percent on September 2 to 103.5 percent on July 26 and September 11. The DO concentration was above the Maine state standard (7.0 mg/L) for 97.8 percent of the monitoring period and the DO percent saturation met or exceeded the Maine state standard for Class A waters (75 percent) throughout the entire monitoring period, except for a single hourly measurement that was 74.7 percent on September 2.

To assess DO and water temperature conditions in the 500-foot-long Hiram Falls Reach during warmwater, low river flow and non-spill conditions, White Pine Hydro installed a data sonde in two large pools (Pool 1 and Pool 3) that collected hourly water temperature and DO levels from July 3 to September 12, 2019. In Pool 1, water temperature ranged from 17.0ºC (62.6ºF) to 27.4ºC (81.3ºF), the DO concentration ranged from 5.9 mg/L to 9.5 mg/L, and the DO percent saturation ranged from 71.1 percent to 112.1 percent. In Pool 3, water temperature ranged from 16.4ºC (61.5ºF) to 30.1ºC (86.2ºF), the DO concentration ranged from 6.8 mg/L to 10.0 mg/L, and the DO percent saturation ranged from 83.4 percent to 114.5 percent. The DO concentration was at or above Maine's standard of 7.0 mg/L in 99.7 percent of the hourly measurements and most measurements in both pools (73.8 percent) were between 8.0 and 8.99 mg/L. Ten of the 3,285 total hourly measurements (0.3 percent) were below 7.0 mg/L and the lower DO concentrations were infrequent, intermittent, and of very short duration (lasting no longer than 2 hours, sequentially). Only two of the 3,285 measurements were below 75-percent saturation during the monitoring period.

Aquatic Habitat

There are four primary aquatic habitats at the Hiram Project: (1) the impoundment; (2) a set of cascading falls (Hiram Falls) between the dam and powerhouse; (3) a tailwater pool immediately downstream of Hiram Falls and the powerhouse; and, (4) a long, deep, sandy run interspersed by a few small riffles downstream of the tailwater pool.

The Hiram impoundment is narrow, sinuous, and relatively shallow, extending approximately 7.5 river miles upstream from the dam. The average width of the impoundment is 200 feet and the average water depth is about 9 feet, with a maximum depth of 31.2 feet. The impoundment shoreline is steep in many areas, particularly in the upper half of the impoundment. The dominant substrate is sand, and several sand bars occur throughout the impoundment. Woody debris, undercut banks, and overhanging vegetation are prevalent throughout the impoundment. Bands of submerged and emergent aquatic plant beds on both shorelines provide rearing habitat for juvenile fishes and other aquatic organisms.

Aquatic habitat in the Hiram Falls reach consists of high-gradient bedrock ledge with four deep pools (maximum water depth in the pools ranged from 4.0 to 15.8 feet) that are connected by shallower cascades of flowing water during low-flow, non-spill conditions. Pool habitat makes up about 50 percent of the reach and cascades account for the remaining 50 percent. Water leaking from the gates at the dam or spilling over the dam maintains a surface flow connectivity between all four pools during the low-flow, non-spill summer period. The pools are 42 to 113 feet long and 25 to 71 feet wide. There is a 25.5-foot-wide by 30.4-foot-long pool near the top of the reach that becomes isolated during low-flow conditions because it is outside of the main channel bed. Three cascades separating the pools range in length from 15 and 150 feet. The dominant substrate in the reach is bedrock ledge with some large boulder, small boulder, and cobble material present.

To characterize the tailwater habitat, White Pine Hydro conducted a transect-based study of the 0.5-mile-long reach of the Saco River downstream of the Hiram Dam during low river flows. Aquatic habitat in the study reach is composed of deep, wide pools and deep, slow runs, with a few small, transitional, deep riffles where the bed elevation drops slightly. The channel is incised, with steep banks consisting of sand and other fine sediments, undercut banks, canopy cover, and some woody debris along both banks. The average water depth across the transects ranged from 3.3 to 4.1 feet, with a maximum depth of 5.6 feet.

Fish Community

Resident Fish

In May and October 2019, White Pine Hydro conducted electrofishing and gill net surveys to characterize the occurrence, distribution, and relative abundance of fish species within the Hiram impoundment and the Hiram tailwater. A total of 257 fish representing 16 species were collected in the project area. The fish assemblage consists mostly of yellow perch (28.8 percent) and white sucker (21.4 percent), followed by fallfish (17.1 percent), common shiner (15.2 percent), and smallmouth bass (5.4 percent). Other fish species collected in lower abundance included chain pickerel, largemouth bass, redbreast sunfish, black crappie, American eel, brown trout, bluegill, brook trout, brown bullhead, golden shiner, and pumpkinseed.

Maine DIFW maintains a brook trout and brown trout population in the Saco River near the Hiram Project via stocking. From 2015 to 2019, Maine DIFW stocked a total of 2,150 brook trout and 1,500 brown trout in the Saco River near the town of Hiram and a total of 1,500 brown trout near the town of Baldwin. Wild brook trout also inhabit tributary streams in the Saco River Basin and may use the Hiram impoundment at certain times of the year.

Diadromous Fish

Diadromous fishes that have historically inhabited the Saco River watershed include Atlantic salmon, American shad, alewife, blueback herring, and American eel. Currently, runs of diadromous fish in the Saco River are small, and represent remnant populations of the historic runs of these species. American eel and Atlantic salmon are currently the only diadromous fishes that occur in the vicinity of the project; however, future improvements to fish passage facilities and trap and transport operation downstream of Hiram could increase American shad, blueback herring, and alewife access to the upstream reaches of the Saco River, including the Hiram tailwater (Interior, 2021).

Atlantic salmon

Although Atlantic salmon in several Maine watersheds are listed as endangered under the ESA as part of the Gulf of Maine Distinct Population Segment (GOM DPS), the Saco River is not considered part of the GOM DPS, and Atlantic salmon in the Saco River are not protected under the ESA. Currently, Atlantic salmon may occur in the vicinity of the Hiram Project because adults captured at Cataract Project fish lift (first dam on the Saco River at river mile 5) and the Skelton Project fish lift (second dam on the Saco River at river mile 17) are transported by Maine DMR to suitable spawning habitat in the Ossipee River, which joins the mainstem Saco River approximately 3 river miles downstream of the Hiram Project. From 2016 to 2020, the number of salmon passing the Cataract Project (East Channel fish lift and West Channel fish ladder combined) ranged from 1 to 9 individuals per year and the number of salmon passing the Skelton Project fish lift (29 miles downstream from the Hiram Project) ranged from 0 to 4 individuals per year. The existing run of Atlantic salmon returning to the Saco River consists mainly of hatchery strays from other rivers and possibly a small number of wild fish. Estimates of suitable habitat for Atlantic salmon in the Saco River Basin indicate that about 1,162 habitat units with an estimated production potential of 1,843 Atlantic salmon smolts occur in the reach between Hiram and Swans Falls Dam (FERC, 1996).

Since the 1980's, the Saco River Salmon Club and Saco Salmon Restoration Alliance, in cooperation with Maine DMR and FWS, have periodically stocked Atlantic salmon fry into the Saco River watershed. FWS has also periodically stocked hatchery salmon smolts into the Saco River. Most stocking has occurred in the Maine portion of the Saco River upstream of the Bonny Eagle Project, which is about 23 river miles downstream of the Hiram Project. Because salmon stocking and transport operations have targeted the lower Saco River and Ossipee River, Atlantic salmon do not occur upstream of the Hiram Project.

American eel

The American eel, a catadromous[12] species, occurs upstream and downstream of the Hiram Project. American eels spawn in the ocean, specifically in the Sargasso Sea, but spend the majority of their lives in freshwater or estuarine habitats. In New England, juvenile American eels migrate upstream in rivers from March through October (Richkus and Whalen, 1999), and

[12] The term "catadromous" is used to describe a life history strategy where fish reproduce and spend early life stages in saltwater, move into freshwater to rear as sub-adults, then move back into saltwater to spawn as adults.

adult eels migrate downstream from mid-August to December (Haro *et al*., 2003; GMCME, 2007). The Saco River Basin serves as rearing habitat for eels that eventually migrate downstream to return to the ocean as adults and spawn. There is currently no upstream eelway at the Hiram Project; however, upstream eelways are operated at five Saco River dams downstream of the Hiram Project (table 3 in Appendix C). From 2018 to 2020, the number of eels collected at the Bonny Eagle Project (the next dam downstream of the Hiram Project) ranged from 598 to 784. In 2018, a juvenile eel survey to assess the need and location for an eelway only observed 5 eels attempting to pass Hiram Dam.

<u>Fish Passage Agreement</u>

Fish restoration efforts in the Saco River Basin have been a collaborative effort among state and federal fishery agencies, local and national fish and fishing interests, and dam owners. Restoration efforts have focused on optimizing available habitat and using fish passage facilities and stocking to get fish to the most viable spawning and juvenile rearing habitat available. In 1994, Central Maine (the licensee at that time for six of the Saco River hydropower projects, including Hiram) entered into an agreement to settle issues related to anadromous fish passage on the mainstem Saco River (Central Maine, 1994). The 1994 agreement established: (1) dates or timeframes for developing upstream anadromous fish passage facilities for the Cataract and Skelton Projects; (2) a schedule to construct downstream passage at each of its six projects on the Saco River; and (3) a process for assessing the need, design, and schedule for providing upstream passage facilities at its Bar Mills, West Buxton, Bonny Eagle, and Hiram Projects.

In 2007, FPL Energy (the new licensee of the six Saco River projects, including Hiram), along with the parties to the 1994 agreement, entered into the 2007 Fisheries Agreement, which established: (1) a revised schedule for future upstream anadromous fish passage measures at Bar Mills, West Buxton, Bonny Eagle, and Hiram Projects; (2) requirements for installation of upstream and downstream American eel passage measures at each of the six licensee-owned projects; and (3) the studies related to migratory fish passage, including studies of fish migration and passage effectiveness. In July 2007, the Commission included the measures of the 2007 Fisheries Agreement in each of the projects' respective licenses.

The 2007 Fisheries Agreement was amended in 2009 and again in 2019. The 2009 amendment, approved by the Commission on August 18, 2009, required detailed studies of downstream passage of Atlantic salmon kelts at the Cataract, Skelton, Bar Mills, West Buxton, and Bonny Eagle Projects. The 2009 amendment did not involve the Hiram Project. The 2019 amendment modified the current licensee's (White Pine Hydro) financial commitments and funding of various fishery management projects within the Saco River Basin, and further revised the schedules for providing permanent upstream anadromous fish passage at the Bar Mills, West Buxton, Bonny Eagle, and Hiram Projects.

The Fisheries Agreement (collectively referring to the 1994 Agreement, the 2007 Agreement, and the 2009 and 2019 amendments) specifies the following upstream and downstream fish passage requirements for the Hiram Project:

- **Upstream passage for American eel** – Installation of an upstream eel passage system was to be installed in 2020. However, because of the low number of returning eels observed during a 2018 monitoring study (a total of 5 juvenile eels were observed), White Pine Hydro requested, and the Commission approved an extension of time to install the eelway on May 13, 2019. Installation of the eelway is now required by June 1, 2025 under the current license.

- **Upstream passage for Atlantic salmon** – Upstream passage for Atlantic salmon is to be installed by 2032, based on the status of Atlantic salmon restoration at that time.

- **Downstream passage for American eel** – Downstream passage for silver American eels is to be provided by September 1, 2032. Interim downstream passage measures are required to be installed if more than 50 eels per night are observed killed from passing through the project turbines. Any observed mortality needs to be confirmed by Maine DMR or White Pine Hydro to trigger the interim measures. To date, there has been no significant mortality observed that would require the implementation of interim downstream eel passage measures.

- **Downstream fish passage measures for Atlantic salmon** – Permanent downstream passage at the Hiram Project is to be operational 2 years after White Pine Hydro receives written notification of the commencement of scheduled annual stocking of juvenile Atlantic salmon in the Saco River watershed above Hiram Dam, or once the operation of permanent upstream fish passage facilities for Atlantic salmon commences at the Hiram Project.

3.2.1.2 Environmental Effects

Project Operation and Impoundment Levels

Flow fluctuations from the operation of hydroelectric projects may dewater shoreline habitat in project impoundments and downstream riverine habitat. Water level fluctuations during fish spawning periods are of particular concern because such fluctuations may alter habitat suitability (e.g., depth and water temperature), or result in exposure and mortality of fish eggs and larvae if spawning has already occurred.

White Pine Hydro proposes, Interior recommends, and Maine DEP water quality certification conditions 1A and 2A require that White Pine Hydro continue to operate the project consistent with the 1997 Saco River Instream Flow Agreement, which requires White Pine Hydro to operate the project in a run-of-river mode where outflow approximates inflow by maintaining impoundment levels: (1) within two feet of normal full pond elevation of 349 feet or from the spillway crest when the rubber dams are down from November 16 through September 30; and (2) within one foot of full pool elevation of 349 feet or from the spillway crest when the rubber dams are down from October 1 through November 15. It also requires White Pine Hydro to provide a 300-cfs minimum flow or inflow if less from the project powerhouse, or in the event the project powerhouse is inoperable, from the dam from November 16 through September 30.

Staff Analysis

White Pine Hydro operates the Hiram Project in a run of river mode and typically limits impoundment fluctuations to within 1 foot on a daily basis even though its license permits it to fluctuate the impoundment up to 2 feet between November 16 and September 30. White Pine Hydro states that it uses that 2-foot fluctuation to allow for adjustments between inflow and minimum flow requirements, to conduct maintenance, or in response to operating emergencies. Since the bladder dam was installed in 2013, White Pine Hydro reports that impoundment drawdowns of 2 feet have occurred only on two occasions that lasted between 3 and 6 days. To ensure that flows downstream of the powerhouse are not diminished at any time while the project impoundment surface elevation fluctuates up to two feet between November 16 and September 30, White Pine Hydro releases a minimum flow of 300 cfs, or inflow, whichever is less, from the project powerhouse, or in the event the project powerhouse is inoperable, from the dam.

Continuing to operate the project in a run-of-river mode as described above would result in little fluctuation in downstream river flows and would maintain any spawning and migration habitat for Atlantic salmon downstream of Hiram Dam. White Pine Hydro's 2018 assessment of aquatic habitat in the tailwater showed that 89.8 percent of the channel remains wetted at a minimum flow of 300 cfs and maintains sufficient deep run and pool habitat (up to about 5 feet deep) to provide an adequate zone of passage for all resident and diadromous fish species across most of the channel. Continuing to maintain relatively stable reservoir levels and providing a minimum flow of 300 cfs, or inflow, whichever is less, below the project powerhouse, or from the dam when the powerhouse is inoperable, would maintain existing aquatic habitat and reduce the chances of fish stranding.

Impoundment Drawdowns and Refill Procedures

Periodically, the project impoundment may need to be drawn down for maintenance or for emergencies. Water levels in the impoundment would be reduced, with potential negative effects on aquatic biota. The refill of the impoundment following a drawdown could also disrupt flows downstream from the project and affect water quality and aquatic habitat.

In its Project Operation Monitoring Plan, White Pine Hydro proposes to consult with Maine DEP, Maine DIFW, Maine DMR, FWS, and NMFS regarding temporary variances in minimum flow and impoundment level limits prior to any planned maintenance drawdowns. In the event emergency maintenance or repairs are required, White Pine Hydro would immediately notify the agencies and take all reasonable steps necessary to maintain downstream river flows and minimize impoundment drawdowns.

Interior recommends that White Pine Hydro develop a refill procedure that ensures flows below the project are maintained during the refilling of the impoundment. Interior also recommends that any modifications to the refill procedure be approved by FWS, NMFS, Maine DEP, Maine DIFW, and Maine DMR.

Staff Analysis

Refilling the impoundment as soon as possible after maintenance activities are complete or following an emergency would minimize the effects of dewatering on littoral and riverine habitats. There is no evidence that past operation, including maintenance drawdowns and refilling the impoundment, has affected water quality or the existing fishery and other aquatic organisms. Although White Pine Hydro's proposed Project Operation Monitoring Plan states that it would maintain downstream river flows and minimize impoundment drawdowns, it does not specifically explain its procedures for maintaining flows downstream of the project during refilling of the impoundment after a maintenance or emergency drawdown. Developing such procedures would ensure that aquatic habitat conditions downstream are maintained during refilling.

Project Operation Monitoring

To document compliance with project operation, White Pine Hydro proposes to implement the Project Operations Monitoring Plan filed with the license application.[13] The plan includes provisions for: (1) maintaining minimum flows and impoundment levels, (2) high water operations, (3) low water operations, (4) maintenance operations, (5) turbine-generator unit shutdowns, (6) impoundment drawdowns, (7) unscheduled operations, (8) operation monitoring, (9) reporting, and (10) agency consultation.

Maine DEP certification conditions 1C and 2C require White Pine Hydro to file a final operation monitoring plan within six months of license issuance to monitor compliance with the impoundment level limits and flows required by conditions 1A and 2A, respectively.

Staff Analysis

Although compliance measures do not directly affect environmental resources, they assist the Commission in determining whether a licensee is complying with the environmental requirements of a license. Therefore, operational compliance monitoring and reporting are typical requirements in Commission-issued licenses. The operation protocols included in the Project Operations Monitoring Plan would formalize the project's operating requirements and the methods for monitoring and reporting compliance with those requirements under various conditions. However, as written, the plan does not currently describe the mechanisms and structures to be used to monitor compliance with impoundment elevation limits, run-of-river operation, and minimum flows (i.e., type and exact locations of all flow and impoundment elevation monitoring equipment and gages), nor does it include procedures for maintaining and calibrating such monitoring equipment. Additionally, the plan does not include provisions for reporting deviations from all project operating requirements. Revising White Pine Hydro's proposed plan to include these additional provisions would ensure that operation monitoring and reporting procedures are adequate to facilitate the Commission's administration of the license.

[13] *See* Final License Application, Appendix E-4.

Dissolved Oxygen Monitoring

Waters discharged from the project generally meet state water quality standards; however, DO levels occasionally drop below state standards during the warmer summer months. White Pine Hydro proposes to develop and implement a DO Monitoring Plan, in consultation with Maine DEP, to monitor DO in the tailwater and the Hiram Falls bypassed reach for a single summer season within 2 years of license issuance.

Maine DEP's certification condition 4A requires White Pine Hydro to file a final dissolved oxygen and temperature monitoring plan within six months of license issuance. The plan must include a provision for monitoring DO concentrations in Hiram Falls and the project's tailrace for a single season within two years of license issuance. The certification does not define which season must be monitored; we assume the period of interest is the summer when DO levels are likely to be the lowest and temperatures the warmest.

Staff Analysis

As described in section 3.3.1.1, White Pine Hydro collected 1,505 hourly measurements of DO in the project's tailwater, of which 97.8 percent of the measurements were above the State of Maine's Class A water quality standard of 7 mg/L. The DO measurements below the standard ranged from 6.4 to 6.9 mg/L and typically occurred at night, late in the day, or in the morning. Further, except for one hourly measurement (74.7-percent saturation), the DO percent saturation was above the 75 percent water quality standard during all times when the DO measurement was less than 7 mg/L. In the Hiram Falls reach, of the 3,285 hourly DO measurements collected in 2019, only 10 measurements (0.3 percent) were below 7 mg/L (with minimum DO measurements ranging from 5.9 mg/L in Pool 1 to 6.8 mg/L in Pool 2). Further, White Pine Hydro reported that the occurrences of low DO concentrations were infrequent, intermittent, and lasted no longer than 2 hours. There is no evidence indicating these incidences of low DO are adversely affecting aquatic habitat in the tailwater or the Hiram Falls bypassed reach.

Conducting another season of DO monitoring in the tailwater and Hiram bypassed reach would add to the data set evaluating the project's effects on DO levels. However, the existing data, which were collected when DO levels are likely to be the lowest, show that project operations are not adversely affecting DO levels. Further, no changes in project operations are specified by the proposed action or action alternatives that would affect DO levels in the tailwater. Therefore, there is no evidence supporting the need to conduct an additional season of DO level monitoring.

Upstream Atlantic Salmon Passage

Currently, there are no upstream passage facilities for Atlantic salmon at the Hiram Project.

Consistent with the Fisheries Agreement, White Pine Hydro proposes, and Interior's fishway prescription and Maine DEP's water quality certification condition 3A requires, installing a single permanent upstream Atlantic salmon passage facility at the Hiram Project and that the facility be operational by May 1, 2032. Interior's fishway prescription also stipulates that, consistent with the Fisheries Agreement, the schedule for developing and installing upstream Atlantic salmon passage may be delayed contingent upon the returning numbers of salmon and following consultation with, and agreement by, FWS, NMFS, and Maine DMR.

Staff Analysis

While Atlantic salmon do occur in the Saco River, the numbers of returning salmon are low. Currently, adults that migrate into the lower Saco River are either passed volitionally through the Denil fishway at the West Channel Dam of the Cataract Project or trapped at either the East Channel Dam of the Cataract Project's fish lift or the Skelton Project's fish lift and transported by truck to spawning habitat on the Ossipee River, a tributary that flows into the Saco River downstream of the Hiram Project. From 2016 to 2020, the annual average number of Atlantic salmon counted passing the Cataract Project's fish lift and fish ladder combined was about 4 per year, whereas at the Skelton Project's fish ladder the annual average for the same period was about 2 per year. Salmon returning to the Saco River are typically of hatchery origin and/or strays from other river systems.

The Fisheries Agreement does not specify the number of salmon that must be present to trigger installation of fish passage at the Hiram Project. Rather, it provides a mechanism to collaboratively evaluate whether there are enough returning Atlantic salmon to warrant installing a permanent fishway at the Hiram Project. If enough return by 2032 and the installation of an Atlantic salmon fishway is deemed necessary and installed at the Hiram Project, it would provide access to an additional 1,162 habitat units with an estimated production potential of 1,843 Atlantic salmon smolts in the reach between Hiram and Swans Falls Dam (FERC, 1996).

Downstream Atlantic Salmon Passage

Consistent with the Fisheries Agreement, White Pine Hydro proposes, and Interior's fishway prescription and Maine DEP's water quality certification condition 3A requires, installation and operation of permanent downstream passage for Atlantic salmon at the Hiram Project by the earlier of (1) April 15 following 2 years after White Pine Hydro receives written notification of the commencement of annual stocking of juvenile Atlantic salmon in the Saco River watershed above the Hiram Dam pursuant to a written agency-approved Atlantic salmon stocking program, developed by FWS, NMFS, Maine DMR, or New Hampshire Fish and Game Department, or (2) the operation of a permanent upstream fish passage facility for Atlantic salmon at the Hiram Project.

Staff Analysis

Currently no anadromous Atlantic salmon exist upstream of the Hiram Project and there are no downstream fish passage facilities for Atlantic salmon. As noted above, the number of returning Atlantic salmon are not sufficient to warrant installing a permanent fishway at the Hiram Project and there is no information in the record to suggest that the resource agencies are prepared or planning to begin stocking Atlantic salmon above the Hiram Project. Consequently, there is no current need to install downstream passage at the project.

If the numbers of returning salmon increase sufficiently to warrant passage or if the agencies change their management objectives and begin stocking salmon above the Hiram Project, downstream passage improvements would allow salmon smolts to successfully pass the project. There is little information available to evaluate passage alternatives because the numbers of returning salmon have not warranted such studies.

Brook Trout and White Sucker Passage

Sebago TU recommends that White Pine Hydro be required to install and operate upstream and downstream fish passage facilities for salmonids, including brook trout, by 2032 without contingencies. Sebago TU also recommends that the upstream fish passage facility be designed to pass white suckers.

Maine DEP certification condition 3B requires White Pine Hydro to, upon commencement of fish passage planning for migratory fish, consult with Maine DIFW to include, as needed, studies, measures, and facilities to provide access to project waters upstream and downstream of the Hiram dam for native trout species.

Staff Analysis

In Maine, about 70 percent of streams support predominately brook trout fisheries, and stocked and wild brook trout occur in the Saco River Basin upstream and downstream of the Hiram Project. Maine DIFW (2021) reports that wild brook trout occur in tributaries just upstream (Shepards River and Tenmile River) and downstream (Breakneck Brook and Pease Brook) of the project. Brook trout surveys in Shepards River from 1999 to 2004, and in 2010 indicated the presence of a well-established brook trout population and a high-quality fishery (Sebago TU, 2018). Although some stream-dwelling adult brook trout exhibit seasonal movements that can extend throughout and between drainages, it is thought that these movement patterns are determined at the individual level and are not necessarily characteristic of the entire stream population (Cross, 2013). Further, these movement patterns may be influenced by habitat quality, food availability, and competition (Cross, 2013). Thus, although some individuals within a brook trout population exhibit seasonal movement from tributary streams to mainstem rivers or lakes, recruitment of stream-dwelling populations of brook trout does not necessarily depend on the ability of trout to migrate upstream and downstream of a blockage, such as Hiram Dam. Regardless, the presence of self-sustaining wild brook trout in tributary streams both upstream and downstream of the Hiram Project suggests that, despite the lack of fish passage, recruitment still occurs, and there is no evidence that brook trout require fish passage at Hiram Dam to complete their life cycle.

Similarly, there is no evidence that fishways at dams are needed for catostomids (*e.g.*, white suckers) to complete their life cycle and maintain sustainable populations. Unlike diadromous species such as Atlantic salmon, white sucker and other catostomids can successfully complete their life cycle in freshwater as long as appropriate habitat is present.

Although individual white sucker in some populations will migrate many kilometers to spawning habitat (Cooke, 2005; Doherty *et al*., 2010), migration does not always occur (Bunt *et al*., 1999). In fact, white sucker can maintain sustainable populations in very small (*e.g*., 147 feet long), isolated, and fragmented segments of streams when suitable substrate, water temperature, and flow exist (McManamay *et al.*, 2012). Thus, catostomids are capable of successfully maintaining populations in fragmented habitats, such as riverine habitat between dams.

During the 2019 fish assemblage study in the Hiram impoundment and tailwater, white sucker was the second most abundant fish species collected and accounted for 21.4 percent of the total catch. In addition, in 2006 electrofishing surveys conducted at locations about 1.4 and 2.7 river miles upstream and 0.3 and 5.7 river miles downstream of Hiram Dam demonstrated that white sucker was the third most abundant species collected upstream of the dam and the fourth most abundant species collected downstream of the dam. Thus, white sucker are clearly able to maintain robust populations in the Saco River near the Hiram Project, and there is no evidence that white sucker require fish passage at Hiram Dam to complete their life cycle, or sustain healthy populations.

Upstream Passage for American Eel

There are no existing upstream eelways for juvenile American eels at the Hiram Project.

Consistent with the Fisheries Agreement, White Pine Hydro proposes, and Interior's fishway prescription and Maine DEP's water quality certification condition 3A requires, installing a permanent upstream eelway at the Hiram Project that is to be operational by June 1, 2025, unless it is determined that an insufficient number of eels are present to require an eelway or to determine the location for installing an eelway at the dam.

Staff Analysis

Despite the project dam's potential to impede upstream migration, eels have been documented in the Saco River upstream of the project, suggesting that some upstream movement of eels occurs under existing conditions. However, there is no estimate of the annual number of eels that successfully pass upstream.

During White Pine Hydro's 2018 eel passage study, five juvenile eels were documented near the project's spill gates and downstream of the debris gate. Because there is no upstream eelway at the project, eels must climb over or around the dam to access upstream habitat in the Saco River. While climbing over or around dams is a well-documented behavior for juvenile eels (GMCME, 2007), the climbing ability of eels declines as they grow longer than 4 inches (Legault, 1988). Based on the results from the 2018 eel passage study, all of the eels observed downstream of the project dam were between 3 and 5 inches long, suggesting that any existing route over or around the dam may not be effective for all juvenile eels that reach the project. Regardless, based on the results of the 2018 eel passage survey, the overall number of eels attempting to pass Hiram Dam is relatively low compared to those collected at existing eelways on the Saco River downstream of the project (table 3 in Appendix C). For example, in 2018, 3,690 eels were passed at the West Buxton Project and 634 eels were passed at the Bonny Eagle

Project. Therefore, when the eel abundance below the dam increases, installing and operating an upstream eel passage at the project would improve passage conditions for all sizes of juvenile eels and improve access to habitat upstream of the project.

Downstream American Eel Passage

There are no existing downstream fish passage facilities for adult eels at the Hiram Project.

Consistent with the Fisheries Agreement, White Pine Hydro proposes, and Interior's fishway prescription and Maine DEP's water quality certification condition 3A requires, installing a permanent downstream passage facility or implementing downstream passage measures for American eel at the project by September 1, 2032 that achieves a 90-percent passage efficiency,[14] unless it is determined that insufficient numbers of eels are present to require an eelway. Also consistent with the Fisheries Agreement, starting the 10th year after an upstream eelway is installed at Hiram and until permanent downstream eel measures are implemented, White Pine Hydro would monitor weekly for eel mortality from September 15 through November 15. If more than 50 adult eels are found dead below the project, White Pine Hydro would implement interim measures to minimize losses such as controlled spillage from a gate, reduced nighttime generation, or other cost-effective measures depending on the severity and duration of the eel mortalities.

Interior's fishway prescription requires the interim measures stipulated by the Fisheries Agreement; however, Interior notes that because the upstream eelway is not required to be installed until 2025 and permanent downstream eel passage until 2032, conducting interim monitoring for eel mortality beginning the 10th year after an upstream eelway is installed at Hiram no longer fits the fishway installation timelines. Thus, Interior's prescription requires instead that interim downstream eel passage measures be implemented as needed.

Sebago TU recommends that White Pine Hydro provide downstream eel passage by 2032 without the contingencies. Sebago TU also recommends that White Pine Hydro cease generation during nighttime hours until downstream eel passage is installed and upgrade the existing trashracks with 0.75-inch mesh screens to prevent the entrainment and potential injury or mortality to adult eels from turbine passage.

Staff Analysis

In New England, adult eel out-migration typically occurs from mid-August to December (Haro *et al.*, 2003; GMCME, 2007). Adult eels often move downstream in pulses, with large numbers of eels moving during short periods, followed by longer periods with relatively little movement (EPRI, 2001). Peak movements often occur at night during periods of increasing river flow (Richkus and Whalen, 1999). Other environmental cues, such as local rain events and

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[14] FWS (2019) defines passage efficiency as "a measure of the proportion of fish entering the fishway that also successfully pass through the fishway."

moon phase, may also encourage downstream movement of out-migrating eels (EPRI, 2001; Haro *et al*., 2003).

Under existing conditions, downstream passage for adult eels is over the spillway when the dam spills; through the deep sluice, trash sluice, or Tainter gates when those structures are being used; or through the turbines during generation. Because the turbines have a hydraulic capacity of 2,310 cfs and White Pine Hydro generally passes all river flow through the turbines when possible, turbine passage is the most likely downstream passage route.

To become entrained, eels would have to pass through the existing trash rack. Based on the estimated body width of adult American eel in proportion to the typical range of body lengths (13 to 40 inches), the existing trashrack with 3.25-inch clear bar spacing would not prevent adult American eels from passing downstream through the powerhouse. Estimates of survival for adult eels passing through turbines are highly variable and can be influenced by eel size (Richkus and Dixon, 2003) and turbine design (EPRI, 2001). The Hiram Project generates power using two Francis turbines. In studies of eels passing through Francis turbines, mortality rates have ranged from 2 to 41 percent. Eyler *et al.* (2016) found immediate mortality rates for American eels passing through each of four hydroelectric projects operating Francis turbines on the Shenandoah River ranged from 16 to 41 percent. Whereas, Heisey *et al.* (2017) reported the 48-hour survival for American eels passing through five Francis turbine units at four different hydroelectric projects on the Connecticut River ranged from 90 to 98 percent. Although there are no project-specific estimates of turbine-related eel mortality at the Hiram Project, White Pine Hydro has voluntarily monitored the project tailwaters for adult eel mortalities. Since 2008, White Pine Hydro reports that there has been no significant mortality observed. This information suggests either that (a) the number of adult eels out-migrating past Hiram is low, and/or (b) turbine passage survival is high.

There are several measures that could be implemented to improve downstream eel passage survival if significant eel mortality is observed or once permanent upstream eelways are installed in 2025. These measures include night-time turbine shutdowns, installing intake screens with appropriate spacing to prevent entrainment and impingement, increasing spillage over the dam, or installing an eel-specific bypass facility (Haro *et al*., 2016). However, based on the low number of juvenile eels observed attempting to ascend the dam and the low mortality of adult eels observed downstream of the dam, downstream passage of eels is not needed at this time and would provide little benefit to the eel population in the Saco River at this time.

Regarding installing downstream eel passage facilities or measures for American eel that achieve 90-percent passage efficiency, neither White Pine Hydro nor Interior provide any project-specific evidence to support the need for this specific passage efficiency or what needs to be installed to achieve this efficiency; therefore there is no evidence to support a finding that this standard would enhance the eel population relative to existing conditions or to support the need for this standard at this time.

As noted by Interior, the proposed timing to begin monitoring for eel mortality (i.e., in the 10th year following installation of upstream passage) as stipulated in the Fisheries Agreement, no longer makes sense. If enough eels return to cause the upstream eelway to be installed in 2025 as proposed and downstream passage is installed in 2032, there would not be enough time to trigger the proposed monitoring and interim measures before downstream passage measures are installed, making the need for mortality monitoring and interim measures implausible. Further, in Maine, the majority of American eel (about 95 percent of the females and 70 percent of the males) become mature at 12 years of age and out-migrate to spawn (Oliveira and McCleave, 2000). Because there would only be seven years between the installation of an upstream eelway (2025) and downstream passage (2032) for eels to mature and migrate back downstream at Hiram, there likely would not be enough eels migrating downstream to warrant earlier monitoring and to trigger interim measures. If significant eel mortality is ultimately observed and reported before installation of an upstream eelway, interim protection measures could be considered and implemented in accordance with Interior's section 18 prescription.

Fishway Design

Consistent with the Fisheries Agreement, White Pine Hydro proposes, and Interior's fishway prescription and Maine DEP's water quality certification condition 3A requires, that the plans and designs for each permanent fish passage facility be reviewed with the resource agencies. Interior's fishway prescription also requires that White Pine Hydro provide design-level plans for review and comment prior to submitting the plans to the Commission for approval. Further, Interior's fishway prescription requires that the fishway designs be consistent with the 2019 Fish Passage Engineering Design Criteria Manual (FWS, 2019) or the most up-to-date version.

Staff Analysis

The installation of fishways, such as the proposed eelway and upstream Atlantic salmon fishway, along with downstream fish passage facilities or measures, would require careful design consideration to ensure the fishways can pass fish effectively. The proposed fish passage facilities would be new structures at the project that would require considerations such as proper placement along the dam and necessary attraction flows to provide adequate passage for the target species. White Pine Hydro's proposal to consult with the resource agencies on the design of new fishways, and Interior's fishway prescription that includes general provisions for the design of fishways, would help guide the design process and ensure fishways are constructed to operate effectively.

Fishway Operation and Maintenance Plan

To effectively pass fish, fishways need to be properly operated and maintained. Consistent with the Fisheries Agreement, White Pine Hydro proposes, and Interior's fishway prescription and Maine DEP's water quality certification condition 3A requires, development of a fishway operation and maintenance plan. The plan, to be developed in consultation with FWS, NMFS, Maine DMR, and the Maine Atlantic Salmon Commission,[15] is to include general

[15] In 2009, funding for the Maine Atlantic Salmon Commission was eliminated and the agency was officially abolished in 2010.

schedules for routine maintenance, procedures for routine operation, procedures for monitoring and reporting on the operation of each fish passage facility or measure, procedures for annual start-up and shut-down, and procedures for emergencies and outages significantly affecting fishway operations.

Staff Analysis

Fishways require routine maintenance to ensure they operate effectively. An operation and maintenance plan would set forth those procedures operators would follow to ensure that routine cleaning and maintenance, including debris removal, are timely performed and that the fishways are operated during the appropriate times of the day and year, and with an appropriate attraction and conveyance flows. Including monitoring and reporting requirements in the plan would facilitate Commission administration of the license and agency review of any problems encountered during the operation that might require modifications to the operating protocols to better achieve their intended objectives.

Fishway Shakedown Period

Consistent with the Fisheries Agreement, White Pine Hydro proposes, and Interior's fishway prescription and Maine DEP's water quality certification condition 3A requires, the operation of each new fish passage facility for a one-season "shakedown" period to ensure it is generally operating as designed and to make minor adjustments to facilities and operation.

Staff Analysis

Operating the new facilities for a one-season "shakedown" period would allow White Pine Hydro to evaluate the fishways and make adjustments to any facilities that are not operating properly. This would ensure that new fishways are operating as designed during the term of any new license.

Fishway Operating Schedules

Once installed, Interior's fishway prescription requires White Pine Hydro to operate the upstream eelway from June 1 to September 15, and any downstream eel passage facilities or measures at night from September 15 to November 15. For Atlantic salmon, Interior requires the upstream fishway to be operated from May 1 to October 31 for adults and the downstream passage facilities from April 1 to June 30 for smolts and kelts and from October 15 to December 31 for kelts.

White Pine Hydro did not propose an operating schedule for any of the upstream and downstream fish passage measures.

Staff Analysis

In New England, downstream migration of adult American eels to spawning grounds typically occurs from September through November (Winn *et al.*, 1975). In addition, peak movements of eels occur at night (Richkus and Whalen, 1999). On the Saco River, upstream migrating juvenile eels have been collected at the Cataract Project's East Channel Dam eelway from June through September.

Regarding Atlantic salmon, most adults enter Maine rivers during the spring and early summer (May-July), but upstream migrations can occur from April to early November (Baum, 1997). Counts of adult Atlantic salmon at the Cataract Project's fish lift from 1993 to 2020, indicate upstream movements in the Saco River generally occur from mid-May to mid-October. Atlantic salmon kelts in Maine typically move downstream in the fall (October or November) or the following spring (April through June) (USASAC, 2007). Naturally reared smolts in Maine typically migrate down rivers during May to begin their ocean migration (USASAC, 2004), although the peak of movement shifts from year to year in response to environmental conditions (Bakshtansky *et al.*, 1976; Jonsson and Ruud-Hansen, 1985).

Based on this seasonal migration information, if fishways are installed and operated for Atlantic salmon and American eel, the fishway operating schedule required by Interior's fishway prescription, represents an operational window that would afford both adult and juvenile Atlantic salmon and American eel an opportunity to migrate to upstream and downstream habitats.

Fish Passage Effectiveness Studies

Consistent with the Fisheries Agreement, White Pine Hydro proposes, and Interior's fishway prescription and Maine DEP's water quality certification condition 3A requires White Pine Hydro, to develop a fishway effectiveness monitoring plan in consultation with FWS, NMFS, and Maine DMR. The plan is to include conducting up to 3 years of effectiveness studies for newly constructed or significantly modified upstream and downstream Atlantic salmon and American eel passage measures. Additionally, White Pine Hydro proposes, and Interior's fishway prescription and Maine DEP's water quality certification condition 3A requires White Pine Hydro, to implement reasonable, cost-effective adjustments[16] to the facilities or measures to improve fish passage effectiveness if the facilities or measures as initially implemented are not effectively passing the target species.

Staff Analysis

Fish passage effectiveness studies would help ensure that any passage measures meet defined passage goals. Passage effectiveness studies typically evaluate factors such as attraction flows, attraction efficiency, passage efficiency, passage delay, and survival rates. If collected, this type of information could assist White Pine Hydro in modifying the design or operation of

[16] The Fisheries Agreement defines "reasonable, cost-effective, adjustments" as "such adjustments to the facilities or measures, as initially implemented, to improve the fish passage effectiveness towards desired levels, but in no event shall the aggregate cost of such adjustments exceed 5% of the initial capital cost of that fish passage facility or measure, or of the significant modification of an existing fish passage facility, as applicable. The "initial capital cost" will include capital costs expended on the fish passage facility or measure up to the date of certification."

any fish passage measures implemented at the project, potentially improving upstream or downstream fish passage effectiveness.

However, except for a 90-percent passage efficiency required for downstream eel passage measures, neither Interior's fishway prescription requires nor White Pine Hydro proposes any specific performance standards or methodologies to test the effectiveness of other passage measures. Instead, Interior's fishway prescription requires and White Pine Hydro proposes to develop fishway effectiveness study plans post-licensing, in consultation with resource agencies. Without a specific performance standard to analyze, there is no information to determine whether the performance standards are reasonable or would effectively evaluate passage conditions for Atlantic salmon and American eels.

Similarly, until the fishways are constructed and operating, passage standards are established and tested, and any necessary improvements identified to meet the established standards, we have no basis to evaluate whether improvements (such as structural or operational changes) would be appropriate and would benefit Atlantic salmon and eels, or to require White Pine Hydro to make yet to be defined improvements to achieve the standards. If specific structural and/or operational modifications are identified as necessary at a future date, implementation could occur, but would require Commission approval.

Essential Fish Habitat

Essential fish habitat (EFH) refers to those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity and covers a species' full life cycle. EFH for Atlantic salmon has been defined as "all waters currently or historically accessible to Atlantic salmon within the streams, rivers, lakes, ponds, wetlands, and other water bodies of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut." The project area constitutes EFH for Atlantic salmon because it is located in Maine and on the Saco River, which contains habitat currently accessible to Atlantic salmon up to Hiram Dam. Although the project dam currently blocks upstream fish passage, the Saco River upstream of the dam also constitutes EFH for Atlantic salmon because it was historically accessible to this species.

Staff Analysis

As discussed in section 3.2.1.2, *Aquatic Resources, Environmental Effects*, continuing to operate the project as it has historically operated would continue to prevent stranding of Atlantic salmon as they migrate upstream or downstream, and prevent dewatering of any spawning habitat that might be present downstream of the project. Further, the proposed Project Operations Monitoring Plan with staff's recommended additional reporting procedures would ensure that White Pine Hydro consistently maintains the impoundment elevation and downstream flows at levels that protect Atlantic salmon EFH.

Further, if sufficient numbers of Atlantic salmon return to warrant installing upstream and downstream fish passage facilities for Atlantic salmon, such passage improvements would also improve salmon EFH by increasing connectivity between the ocean and freshwater habitats important for salmon recovery, increasing the number of returning adult salmon through higher in-river survival, and improving migration habitat for Atlantic salmon migrating through the project area. Overall, these measures would enhance Atlantic salmon EFH over the term of any license issued.

3.2.2 Terrestrial Resources

3.2.2.1 Affected Environment

Habitat at the project is predominantly northern hardwood forest, consisting of a mixture of deciduous and coniferous trees, such as sugar maple, paper birch, yellow birch, American beech, eastern hemlock, and red oak. Silver maple also occurs in the overstory on low riverbanks along the reservoir.

Wetlands within the project boundary include forested wetlands (11.5 acres), scrub-shrub wetlands (19.8 acres), emergent wetlands (18.5 acres), and unconsolidated bottom wetlands (1.4 acres). Several backwater areas and old river oxbows connected to the impoundment support wetlands in the middle reach of the reservoir. Most of these areas consist of water greater than 3 feet in depth, but some shallower areas contain emergent vegetation including bulrush species, pickerelweed, arrowhead, water starwort, broadleaf cattail, northern blue flag, and various sedge species.

Areas along the middle impoundment also support forested wetlands, generally in medium to large tracts in backwaters, along large river meanders, and in the lower reaches of some tributary streams. These areas are often inundated during the spring by high water. These forested wetlands are characteristic of the silver maple floodplain forest community, with dominant overstory species including red maple, silver maple, American elm, and green ash. Emergent and unconsolidated-bottom wetland types dominate the lower impoundment, and wetlands in the tailwater area include emergent and scrub-shrub types.

White Pine Hydro identified three invasive plant species within the project boundary: Japanese knotweed, bush honeysuckle, and black locust.

Wildlife

Upland, riparian, and wetland habitats in the vicinity of the Hiram Project support a variety of wildlife species, including resident and migratory birds, herptiles, and small and large mammals. White Pine Hydro's surveys of the project identified songbirds; upland game birds including ruffed grouse and wild turkey; raptors including bald eagle, osprey, and red-tailed hawk; species associated with riparian and wetland areas including belted kingfisher and great blue heron; and waterfowl including mallard, black duck, and common merganser. Herptiles observed at the project include bullfrog, American toad, grey tree frog, pickerel frog, wood frog, painted turtle, and garter snake. Mammals common to the area include eastern chipmunk, red and grey squirrels, striped skunk, woodchuck, Virginia opossum, red fox, raccoon, porcupine, coyote, and white-tailed deer.

3.2.2.2 Environmental Effects

Wetland and Riparian Habitat

Flow fluctuations during operation of hydropower projects can affect wetland and riparian habitat at the edge of reservoirs and downstream reaches by exposing them to periodic water level changes, decreasing the area of such habitat and its wildlife value.

White Pine Hydro proposes to continue to operate the project in a run-of-river mode, limiting reservoir fluctuations within 2 feet or less from full pond elevation of 349 feet during normal operation from November 16 through September 30 and within 1 foot from October 1 through November 15. No comments on project effects on wetland and riparian habitat were filed in response to the REA notice.

Staff Analysis

Continuing to operate the project as it has historically would maintain relatively stable reservoir levels and minimize effects on wetland and riparian habitat along the reservoir and the Saco River downstream of the project. White Pine Hydro has no plans to clear or modify any project lands. Because there are no changes in project operation or maintenance practices, no changes in the forest or wetland communities or the wildlife that they support would result from continued project operation

3.2.3 Threatened and Endangered Species

3.2.3.1 Affected Environment

The FWS Information for Planning and Consultation (IPaC) database indicates that the threatened small whorled pogonia (*Isotria medeoloides*) and northern long-eared bat (*Myotis septentrionalis*), and candidate monarch butterfly (*Danaus plexippus*) have the potential to occur within the project boundary.[17] There are no proposed or designated critical habitats in the project area.

Small Whorled Pogonia

The small whorled pogonia is a member of the orchid family. It flowers in May or June. Although widely distributed, the small whorled pogonia is rare. It is found in 18 eastern states (including Maine) and Ontario, Canada. Populations are typically small with fewer than 20 plants. It grows in older hardwood stands of beech, birch, maple, oak, and hickory that have an open understory, and sometimes in stands of softwoods such as hemlock. It prefers acidic soils with a thick layer of dead leaves, often on slopes near small streams. Although the hardwood forests found in the project boundary, include habitats that could support the pogonia, none were

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[17] *See* Interior's official lists of threatened and endangered species, accessed by staff using the IPaC database (https://ipac.ecosphere.fws.gov) on March 3, 2022, and placed into the records for Docket No. P-2530-057 on the same day.

found during White Pine Hydro's surveys of project lands. Because pogonia are not known to occur at the project and because no changes in project land use or operations are being proposed that could affect habitat supporting the pogonia, we conclude that the project would not affect this species and do not discuss it further.

Northern Long-eared Bat (NLEB)

Traditional ranges for the NLEB include most of the central and eastern U.S., as well as the southern and central provinces of Canada, coinciding with the greatest abundance of forested areas. The NLEB, whose habitat includes large tracts of mature, upland forests, typically feeds on moths, flies, and other insects. These bats are flexible in selecting roost sites, choosing roost trees that provide cavities and crevices, and trees with a diameter of 3 inches or greater at breast height.[18] Human-made structures, such as buildings, barns, bridges, and bat houses can be considered potential summer habitat. However, trees found in highly developed urban areas (*e.g.,* street trees, downtown areas) are unlikely to be suitable NLEB habitat (FWS, 2014). NLEB are generally active from April through October (FWS, 2015; FWS, 2016b), and hibernate over the winter season. Winter hibernation typically occurs in caves and areas around them and can be used for fall-swarming[19] and spring-staging.[20]

The project is located within the white-nose syndrome buffer zone for this species.[21] In its letter filed June 24, 2021, FWS indicates that no known NLEB hibernacula sites occur within 0.25 mile of the project, and no known maternity roost trees occur within 150 feet of the project. Further, no critical habitat has been designated for NLEB. Although there is no documentation of NLEB use of habitat at or near the project, upland forests within the project boundary may provide suitable habitat for NLEB summer roosting and foraging activities.

Monarch Butterfly

The Hiram Project is within the range of the eastern migratory population of the monarch butterfly. The license application provides no information about butterfly occurrences at the

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[18] Diameter at breast height refers to the tree diameter as measured about 4 to 4.5 feet above the ground.

[19] Fall-swarming fills the time between summer and winter hibernation. The purpose of swarming behavior may include: introduction of juveniles to potential hibernacula; copulation; and gathering at stop-over sites on migratory pathways between summer and winter regions.

[20] Spring-staging is the time period between winter hibernation and migration to summer habitat. During this time, bats begin to gradually emerge from hibernation and exit the hibernacula to feed, but re-enter the same or alternative hibernacula to resume daily bouts of torpor (*i.e.*, a state of mental or physical inactivity).

[21] The white-nose syndrome buffer zone encompasses counties within 150 miles of a U.S. county or Canadian district in which white-nose syndrome or the fungus that causes white-nose syndrome is known to have infected bat hibernacula.

project, but monarch butterflies may use project lands for summer breeding. Summer habitat requirements include the existence of milkweed plants for egg laying and larval feeding, and a variety of flowering plants for adult nectar feeding.

3.2.3.2 Environmental Effects

The following discussion addresses environmental effects on threatened, endangered, and candidate species that would result from relicensing the Hiram Project with all staff-recommended environmental measures and modifications to White Pine Hydro's proposal, as outlined in section 2.3 of this EA.

Northern Long-eared Bat

Interior states that while White Pine Hydro may not plan activities that include land disturbance or clearing/trimming of vegetation, it is conceivable that within the term of a new license, White Pine Hydro might need to cut trees at the project. Interior states that in the absence of protocol-level surveys indicating that NLEB is not present in the project area, it would assume the species may be present and could be adversely affected by tree cutting. Therefore, Interior recommends White Pine Hydro implement a tree removal protocol that prohibits tree removal between April 20 and October 15, or if 10 or fewer trees are to be removed, undertaking bat exit surveys immediately before tree cutting and remove trees only if bats are not observed exiting them. Interior states that the time-of-year restriction would not apply under public safety or other emergencies, and in those instances, White Pine Hydro should notify FWS within two business days of the unplanned safety/emergency action and provide details of the action and response.

In its reply comments, White Pine Hydro states that any tree removal would occur outside the April 20 to October 15 period, and if tree removal during that period is necessary for safety or security, it would consult with FWS before tree removal.

Staff Analysis

The NLEB was listed as a federally threatened species on May 4, 2015. In January 2016, the FWS finalized the ESA section 4(d) rule for this species, which focuses on preventing effects on bats in hibernacula associated with the spread of white-nose syndrome and effects of tree removal on roosting bats or maternity colonies (FWS, 2016a). As part of the 4(d) rule, take incidental to certain activities conducted in accordance with the following habitat conservation measures, as applicable, would not be prohibited: (1) occurs more than 0.25 mile from a known, occupied hibernacula; (2) avoids cutting or destroying known, occupied maternity roost trees during the pup season (June 1 – July 31); and (3) avoids cutting or destroying any tree within a 150-foot radius of a known, occupied maternity tree during the pup season.

White Pine Hydro does not anticipate any maintenance activities at the Hiram Project during the term of a new license that would require tree removal that would affect NLEB maternity roost habitat. Nonetheless, implementing its proposed restrictions of not removing any trees between April 20 and October 15, except for emergencies, would protect any NLEB that may be roosting in the project area. Therefore, we conclude that relicensing the Hiram Project may affect the NLEB, but any incidental take that may result is not prohibited by the final 4(d) rule.

Monarch Butterfly

Based on annual censuses, the eastern North American population has been generally declining over the last 26 years (FWS, 2020). FWS identifies the causes for this decline as loss and degradation of habitat (from conversion of grasslands to agriculture, widespread use of herbicides, logging/thinning at overwintering sites in Mexico, urban development, and drought), continued exposure to insecticides, and effects of climate change (FWS, 2020).

Staff Analysis

White Pine Hydro proposes no changes in project operation or facilities. Therefore, no loss or degradation of existing summer habitat is expected, and continued operation of the project would not affect the monarch butterfly.

3.2.4 Recreation

3.2.4.1 Affected Environment

Local and Regional Recreation Opportunities and Land Use

The Hiram Project is located on the Saco River in Oxford and Cumberland Counties, Maine in the towns of Hiram and Baldwin. The Saco River upstream and downstream of the project offers opportunities for camping, hiking, biking, picnicking, canoeing, and kayaking. Some of the additional recreation opportunities in the project vicinity include Sebago Lake State Park, Douglas Mountain Nature Preserve, Brownfield Bog Wildlife Management Area, and the Town of Hiram's Mount Cutler Park. The upper reach of the Saco River, where the project is located, is known for its relatively easy paddling, scenic nature, and sandy, beach-like shorelines, which all contribute to the popularity of day and overnight paddle trips.

Project Recreation Facilities and Use

Recreation within the project boundary typically includes boating (non-motorized and motorized), fishing, and enjoying time on the sandy beach below the project. The project has four recreation facilities: the Canoe Portage, the Downstream Access Trail[22] and Sandbar Area, the Overlook, and the Nature Study Area (figure 6 in Appendix C). The Canoe Portage consists of a take-out on the west bank of the impoundment, an approximately 1,130-foot-long portage trail, and a put-in on the Saco River about 700 feet below the dam. The take-out also has a parking area for six vehicles adjacent to River Road. The portage trail parallels a chain-link fence installed to prevent unauthorized access to the dam for public safety and project security reasons.

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[22] The Downstream Access Trail is also referred to as the Fisherman's Trail or Woods Trail.

The Downstream Access Trail and Sandbar Area is also located on the west bank of the river. Facilities associated with this area include a parking area that is accessible by a short driveway of approximately 60 feet immediately off River Road with space for eight vehicles, a 560-foot-long trail that connects to the canoe portage trail and ending at the large, naturally formed sandbar about 700 feet downstream of the dam. A swing arm gate across the trail prevents vehicle access down the access trail. There are no signs identifying the parking area off River Road. Although the site is managed for day-use only, there are three user-created camping areas along the shoreline of the river south of the dam. Trash and damaged trees have been observed near the camping areas, and the sandbar area shows evidence of unauthorized fires, vegetation damage, and litter. White Pine Hydro recently installed a swing arm gate at the entrance to the parking area off River Road to help control unauthorized camping.

The Overlook is a pull-off along the Pequawket Trail (Maine Routes 5/113) on the east side of the river that afforded picnicking and views of the project and falls at one time. The site no longer provides picnicking or, because of a dense mixture of pine and hardwood trees, a view of the project or falls, but it includes a parking area for approximately six vehicles. The Overlook is currently managed by the Maine Department of Transportation (Maine DOT) as an emergency highway pull-off.

The Nature Study Area site is located on the east side of the impoundment, in a wooded area northeast of the powerhouse. The site has historically been known as the Hiram Station Nature Study Area. The site provides approximately 4,520 feet of informal walking trails with some signs identifying vegetation, such as ferns and mosses. The site also includes four picnic tables, a trash can, and two shelters over two of the picnic tables. Access to the Nature Study Area is provided by walking through a gate installed across the project access road from the Pequawket Trail and walking about 750 feet down the project access road to the Nature Study Area. Parking for about 4 cars is available at the entrance to the project access road. The gate controlling vehicle access to the powerhouse was installed in the early 2000's for site security reasons. The gate cut off parking for about 10 vehicles that used to be provided at the Nature Study Area. A second gate and chain-link fence prevents visitors from continuing down the project access road to the powerhouse and dam. Signs stating, "Danger/no trespassing and no canoe portage available" are posted at the entrance to the second gate.

In addition to the project recreation facilities, there is also a non-project informal boat launch located on the impoundment approximately 3 miles upstream of the Hiram Dam. Although partially within the project boundary, the site is privately owned, but the landowner allows public access to the impoundment. The one-lane gravel boat launch is accessed from a 525-foot-long, one-lane unpaved driveway off Main Street/State Route 117, which is across non-project lands. A mowed grass area next to the launch is used for parking and can accommodate approximately 15 vehicles with trailers.

The most recent project recreational use data was collected in 2014.[23] White Pine Hydro reports that the project received an annual total of approximately 4,000 recreation days with a peak weekend average of 10 recreation days.[24] Estimates of relative use are provided in table 4 in Appendix C.

Recreation Studies

White Pine Hydro conducted a Recreation Facilities Inventory and Condition Assessment (Assessment) in August 2018. The objectives of the study were to (1) identify and assess existing public recreation sites, facilities, locations, amenities, general conditions, and ownership; (2) document vegetation removal and damage that could be related to recreation use at the sandbar access area, (3) examine a potential location for a hard-surface impoundment boat ramp and parking area; and (4) assess how any proposed changes to the project boundary would affect recreation access and use at the project.

The assessment concluded that the Canoe Portage is in good condition and functioning as intended. The Overlook is in reasonable condition, but not functioning completely as intended because vegetation growth has obscured the view of the project and large potholes exist at the exit and entrance to the Overlook. The Downstream Access Trail and Sandbar Area were in good condition and functioning as intended; however, trash and damage to trees were found among the three user-created campsites, including downed trees.

The Nature Study Area amenities (informational kiosk, picnic area, nature study signage, and parking for approximately 10 cars inside the gate) are in poor condition due to a reduction in maintenance after the vehicle gate was installed. However, the site remains available to informal, walk-in access by recreation users.

The assessment also evaluated the existing non-project boat launch located about 3 miles upstream from the Hiram Dam. The evaluation found that the riverbank and impoundment conditions at this site are suitable for boat launching. In the Initial Study Report filed February 11, 2019, White Pine Hydro stated that it is not aware of any other sites within the project boundary that would be suitable for a boat launch.

3.2.4.2 Environmental Effects

Recreation Facilities Management

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[23] The most recent FERC Form 80 (Licensed Hydropower Development Recreation Report) was filed on April 1, 2015 for the Hiram Project.

[24] A recreation day is defined as each visit by a person to a development for recreational purposes during any portion of a 24-hour period.

White Pine Hydro filed a Recreation Facilities Management Plan (Recreation Plan) for the project with its license application.[25] The plan describes how White Pine Hydro would maintain and monitor the project recreation sites over the term of a new license, including mowing, vegetation management, and checking to be sure that signs are in place and unobstructed.

Maine DEP water quality certification conditions 5A and 5B require that White Pine Hydro continue to provide access to the project waters upstream and downstream of Hiram Dam for recreation and navigation to the extent possible. The water quality certification conditions also require White Pine Hydro to submit a final Recreational Facilities Management Plan to Maine DEP that provides for the maintenance and management of project recreational sites.

As part of its Recreation Plan, White Pine Hydro also proposes to modify the project recreation facilities as described below.

Downstream Access Trail and Sandbar Area Enhancements

To improve recreation opportunities at the project, White Pine Hydro proposes to install signage, a portable toilet and a trash receptacle. White Pine Hydro would service the portable toilet and the trash receptacle from July through August. A concrete slab would be poured to support the portable toilet and the maintenance road to the river would be upgraded to be accessible to a pump truck. White Pine Hydro also proposes to increase site security to prevent unauthorized overnight camping. To increase site security, White Pine Hydro installed a swing gate at the parking area entrance off River Road, which would be locked at night. White Pine Hydro proposes to install signage at the parking area explaining the hours the site is open for use (dawn until dusk), use restrictions (*e.g.*, no camping, fires, etc.), and directing visitors to contact the Sheriff's Department if their vehicle is locked behind the gate.

Several members of the public filed comments about the lack of policing and maintenance of the Downstream Access Trail and Sandbar Area and the need for better bathroom facilities and more parking. For example, Patricia Barber observed that "some users leave mounds of trash and rotted food, dig out shallow toilet areas in the sand, and camp out overnight and party against permission." Sebago TU states that the proposed signage would have little effect "if it is not backed up by enforcement to address the illegal camping, vandalism, and resource depredation documented in the area." Sebago TU recommends compensating a police agency to enforce published standards of conduct and have the agency conduct regular security patrols during summer months. Sebago TU also recommends that White Pine Hydro provide a schedule or more details as to how White Pine Hydro would conduct maintenance activities such as trash collection and maintenance of the portable toilet and trail.

Sebago TU also recommends that a recreation study be conducted at the Downstream Access Trail and Sandbar Area "to evaluate appropriate uses." In the absence of such a study, Sebago TU recommends that White Pine Hydro provide parking for 18 vehicles, widen the road leading to the parking area to improve traffic flow, and better identify the parking area. In

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[25] See Final License Application, Appendix E-3.

support, Sebago TU cites an August 13, 2020 Town of Hiram Municipal Officer Meeting where complaints about parking issues from a property owner on River Road caused the town to post no parking signs along River Road. Sebago TU suggests that the "the old parking area that Brookfield fenced off along with the area traditionally used to view the falls could accommodate about a dozen cars" (see figure 7 in Appendix C). White Pine Hydro did not respond to these comments.

Staff Analysis

The Downstream Access Trail and Sandbar Area is the most heavily used of all the project recreation facilities (table 4 in Appendix C). Installing and servicing a portable toilet and trash can from July through August would improve visitor experiences to the area when swimming and other water-based recreation activities are likely to be in the greatest demand. It would also help control trash and human waste which would improve the site environmental conditions. However, as Sebago TU points out, the Recreation Plan does not explain how frequently White Pine Hydro would service the toilet or remove trash or conduct any other maintenance to ensure that the recreation area continues to provide suitable recreation. Periodically removing trash and litter from all the recreation sites would improve the enjoyment and use of project recreation areas.

There is clear evidence of abuse of the site prohibitions against camping and campfires, with associated adverse effects on vegetation and area resources. However, controlling camping and prohibiting fires is difficult given the project's remote location and operation. No one is suggesting that better camping sites should be provided to meet this demand. Rather, the comments suggest that better control is required to prevent the nuisances created by those violating the area restrictions.

White Pine Hydro's proposed signage and closing the access gate at night should alert visitors to the site rules and deter overnight use. Installing a security camera on the powerhouse that can monitor the Downstream Access Trail and Sandbar Area, along with an appropriate procedure for reporting misuse to authorities, would further deter camping and enforce site restrictions. Greater policing and enforcement of site access rules would also help deter camping and vandalism (*e.g.*, painting graffiti on the dam face).

Regarding the need for additional parking, White Pine Hydro's site assessment found parking at the Downstream Access Trail and Sandbar Area to be adequate. On the weekday afternoon that the assessment was conducted, five of the eight available parking spaces at the Downstream Access Area were occupied and none of the spaces at the Canoe Portage parking area were occupied. While increasing parking might reduce the number of times parking capacity might be exceeded, particularly during peak use periods, there is little information to suggest parking is not adequate at this time. White Pine Hydro's periodic evaluation of recreation needs should consider parking needs. This information would help determine if needs are changing and more parking is warranted.

Existing signage for the parking area does not advertise the recreation site. Installing signage at the project entrance such that it is visible from River Road would make finding the site easier. While widening the road could improve egress from the parking area, there is nothing in the record to suggest that this is a documented problem.

Nature Study Area

White Pine Hydro states that after several years of limited use and periodic reports of misuse of the Nature Study Area, it stopped maintaining the Nature Study Area. Because of the recreation site's low use and unspecified continued concerns about vandalism and periodic reports of misuse of the area, White Pine Hydro proposes to remove the existing Nature Study Area informational kiosk, picnic area, and parking area inside the gate. White Pine Hydro would continue to maintain the parking area outside the access road gate and the Nature Study Area. The Nature Study Area would remain available for informal, walk-in day-use.

Sebago TU acknowledges that the Nature Study Area receives little use, but that use could be increased if White Pine Hydro conducted outreach to local schools and other organizations. Heather Thompson recommends cleaning up the Nature Study Area recreation site and monitoring for vandalism. White Pine Hydro did not respond to these comments.

Staff Analysis

The existing information kiosk states that the Nature Study Area provides access for hunting,[26] fishing, and nature study. The use of the area for these purposes is low; in 2015 the Nature Study Area was used at 25 percent of capacity (table 4 in Appendix C). Information provided by White Pine Hydro suggests that recreation use began to drop after installing the gate across the project access road in the early 2000s to improve site security and reduce vandalism.[27] Users still have access to the Nature Study Area and its amenities by walking through a pedestrian pass-through in the gate across the project access road and walking about 750 feet up the project access road. Another gate just past the Nature Study Area trailhead and old parking area provides additional security against unauthorized access to the powerhouse and dam.

Consistent with the lack of site maintenance, site visits by staff found that some of the picnic tables and shelters at the Nature Study Area have fallen into disrepair, garbage receptacles needed emptying, and some of the signs identifying plants along the trail had fallen. No signs identifying the availability of the recreation area are visible to the public until you pass through the access gate.

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[26] The signage states, "Field trips are not scheduled during the hunting season."

[27] See May 15, 2001 letter to FPL Energy (the Hiram licensee at the time) discussing vandalism and directing FPL Energy to file as-built drawings of the project recreation facilities. On July 31, 2001, FPL Energy filed revised Exhibit E drawings showing the two gates on the access road leading to the Nature Study Area, powerhouse, and dam. *See Order Approving As-Built Exhibits*, 98 FERC ⁋ 62,027 (2002).

While use is low, the Nature Study Area is still used by the public. Replacing or repairing the two picnic tables under the picnic shelter, re-roofing the picnic shelters, removing the two picnic tables that are in poor condition, adding signage describing the Nature Trail and its length and hours of operation, and improving site maintenance would improve the experience of those using the site and may encourage more use. While conducting additional outreach might increase its use as suggested by Ms. Thompson, installing a sign identifying the project recreation area at the project access road entrance off the Pequawket Trail should alert the public to the availability of the site and its amenities, which may prompt greater use. Section 8.2(a) of the Commission's regulations require signs posting recreation use information at all points of public access, which because of the gate across the project access road, would be at the project entrance off Pequawket Trail. However, parking, which is limited to about 5 cars, may become a problem if use increases. White Pine Hydro's periodic evaluation of recreation needs through monitoring efforts would provide more information to determine if needs are changing and if more parking is warranted.

As noted above, if vandalism and reports of misuse continue or increase because of the recreational improvements, White Pine Hydro could implement additional security measures such as installing a security camera that can be monitored remotely. If there is an issue the police can be summoned, and the video can be used as evidence. Hopefully this would further deter any misuse of the property. The second access gate should continue to deter access to the powerhouse and dam if kept locked.

Overlook

White Pine Hydro proposes to remove the Overlook as a project recreation site because it no longer provides views of the project, nor does the site provide access to project lands and waters. Maine DOT would continue to maintain the site as a roadside emergency pull-out.

Sebago TU states that removing the Overlook from the project would remove a significant recreational asset because currently there is no good vantage point from which to view the falls. Heather Thompson recommends cleaning up the Overlook recreation site. White Pine Hydro did not respond to these comments.

Staff Analysis

The Overlook is located adjacent to the Pequawket Trail. Views from this site include a dense forest of hardwood and evergreen trees and a railroad track. Because of the maturity and density of the forest, the site no longer provides a view of the Hiram Falls. There are no picnic tables or amenities to encourage picnicking and use of the site is low (table 4 in Appendix C). Therefore, the Overlook does not provide any project-related recreational benefit. Approximately 1.5 - 2 acres of forest likely would need to be cleared to provide a view of Hiram Falls from the Overlook. Cleaning up the site and adding picnic tables to improve its use for such purposes would have limited benefits. Removing parcel B, which includes the Overlook and adjacent project lands downstream of the dam, would eliminate some access to project lands and water downstream of the dam; however, there is no information to suggest that these lands are being used to access the river or for any project recreation purpose.

Canoe Portage

White Pine Hydro proposed to continue to maintain the existing Canoe Portage and associated parking area in its current state.

Sebago TU states that the existing portage is inadequate and provides poor footing that could lead to user injury. Sebago TU recommends replacing the existing Canoe Portage with the Old Portage Trail (see figure 7 in Appendix C), which it describes as "an existing but neglected facility leading to an Old Put In on the west side of the river." Sebago TU states that the current put-in is not located at the water's edge, but at the sandbar, which is an inconvenience to users. Further, Sebago TU recommends connecting the project recreation areas to the Mt. Cutler Trails so that project recreational activities are "better integrated with other area attractions." White Pine Hydro did not respond to Sebago TU's recommendation.

Staff Analysis

White Pine Hydro's site assessment found the existing portage in good condition and functioning as intended. Site visits by staff found the portage well-marked, wide, and in good condition. Further, the portage and associated parking at the take-out are not heavily used (5 percent of capacity in 2014, table 4 in Appendix C).

The aerial photograph submitted by Sebago TU shows the location of their recommended trail and put-in relative to the existing portage trail and put-in. The existing portage trail parallels a chain-link fence installed to prevent unauthorized access to the dam for public safety and project security reasons for about 650 feet before descending about 85 feet to a point adjacent to the sand bar. Under high flows, the put-in would be at the water's edge. During low flows, boaters would need to carry their boats about 345 feet across the sand bar. Sebago TU's preferred put-in location would require extending the existing portage trail about 875 feet to a point further downstream that remains watered year-round. Traversing the sand bar to access the river is not a difficult carry. Further, there is no information in the record on the condition of this "old trail," and what might be required to make it useable. Given the low use and adequacy of the existing portage trail in meeting portage requirements, any benefit from extending the portage to Sebago TU's recommended put-in would be minor.

Sebago TU provides no information to supplement its recommendation for connecting the project recreation facilities to the Mt. Cutler Trails via a new trail. Information available online shows that the Mt. Cutler properties are owned by the Town of Hiram and have approximately 5 miles of hiking trails for the public to enjoy; the Mt. Cutler Trails are approximately 3 miles northwest of the Hiram Dam. The Mt. Cutler Trails have two trailheads accessible to the public; one is located off Hiram Hill Road and the other is located off Mountain View Avenue. The trails and parking areas are all located west of the Saco River and do not intersect the project reservoir or impoundment and do not include any project lands. Connecting Mt. Cutler trails to the project recreation area would involve almost 3 miles of trail building. No information showing a public interest in this recommended trail connection has been found in any recreation management plans or reports, including the Town of Hiram's Annual Report

(Town of Hiram, 2020), which included a detailed report on the Mt. Cutler recreation area. The Annual Report discussed volunteer efforts for the Mt. Cutler Trails and how use at the trail system has increased in 2020, most likely due to the Covid-19 pandemic. The Annual Report also mentioned other popular trails located near Hiram village that are maintained by the Francis Small Heritage Trust. Despite the increased use in 2020, the Annual Report did not mention any need for more hiking opportunities.

Boat Launch

Access to the impoundment for both motorized and non-motorized boats is currently provided by a private, non-project boat launch located approximately 3 miles upstream of the Hiram Dam. The one-lane gravel boat launch is accessed from a 525-foot-long, one-lane unpaved driveway across non-project lands.

In the license application, White Pine Hydro states that although the existing boat launch is privately owned, it has long been and currently remains available for public use; therefore, there is no need for the development of a new impoundment boat launch.

In response to the Commission's ready for environmental analysis notice, Maine DIFW states that the private, informal site is not well known or advertised, and there is no guarantee that it will remain available to the public for the duration of the new license. Therefore, Maine DIFW recommends that White Pine Hydro secure a permanent boat launch site at the Hiram impoundment with adequate parking capacity for trailered/non-trailered rigs, as well as appropriate signage to inform the public of the site. Sebago TU also recommends providing an impoundment boat launch.

In its reply comments, White Pine Hydro proposes to work with Maine DIFW to acquire the land rights needed to make the boat launch and parking area a permanent project recreation site. If those efforts are unsuccessful, White Pine Hydro would work with Maine DIFW to further investigate alternative Hiram impoundment boat launch location sites.

Maine DEP's certification condition 5A requires White Pine Hydro to secure permanent rights to access, operate and maintain the informal impoundment boat launch or develop and include in the final Recreational Facilities Management Plan a plan and schedule for constructing a new boat launch providing access to the impoundment, developed in consultation with Maine DIFW. The certification condition also requires that the Recreational Facilities Management Plan include a provision for installing signage and directions for the public to locate and use the impoundment access site.

Staff Analysis

There are no other trailer boat launches upstream of the existing non-project boat launch on the Saco River, and the closest hand boat launch is located about 14 miles upstream. The project impoundment offers good boating and angling opportunities, and the existing boat launch is being used to access those opportunities. While there is no information on the existing level of use at the launch, there is nothing in the record to suggest that the current demand is being exceeded. However, because the launch is located on private land and access provided through the good will of the landowner, boating access could cease if the landowner chooses to deny access. Providing a permanent boat launch with capacity for 15 cars and trailers would ensure that the public continues to have suitable access to project waters and its resources. Including signage identifying the launch would alert the public to its location and availability and would be consistent with section 8.2 of the Commission's regulations for providing signage at public access points.

Although White Pine Hydro proposes to work with Maine DIFW to acquire the rights to the existing site or find another suitable site if those efforts fail, it does not provide a schedule for doing so or explain what criteria it would use to select the alternative site. Boating access to the project impoundment could be met with the existing facility or a new facility. Therefore, a plan needs to be developed to better explain how White Pine Hydro would provide the boat launch. If the existing facility is to be used, White Pine Hydro should document that it has secured the rights from a willing seller to operate and maintain the facility in perpetuity. If it is not possible to secure the rights from a willing seller, there are likely other sites available where White Pine Hydro already has sufficient rights to develop the launch, such as the portage take-out or in the Nature Study Area. If a new facility is proposed, the plan should include a schedule for constructing the facility within 3 years of license issuance and provide sufficient parking for vehicles and trailers. To fully evaluate White Pine Hydro's proposal the Commission would need a plan that contains a conceptual drawing and map and identifies the location of the site, parking, signage, operation and maintenance schedules, and any proposed improvements (*e.g.*, ramp improvements, trash receptacles or restrooms). This information is needed to facilitate Commission administration of the license and ensure timely construction of a facility to meet project recreation needs.

Recreation Use Monitoring

As part of its Recreation Plan, White Pine Hydro proposes to monitor recreation use at the project to evaluate the need for additional access and improvements every 10 years during the license term, using possible methodologies such as trail cameras, spot counts, drone/aerial counts, or other readily available and cost-effective technology. White Pine Hydro proposes to file a revised Recreation Plan every 10 years that would include the results of the recreation use monitoring, any proposed changes to recreation facilities based on the monitoring results, an implementation schedule, and documentation of agency consultation on the proposals. No comments on the proposal to monitor recreation use and periodically revise the Recreation Plan were filed.

Staff Analysis

Unless there is an expectation of increasing demand, which is not the case here, monitoring of site recreation facilities at 10-year intervals is typically sufficient to evaluate changing recreation demands and needs.

White Pine Hydro indicates several options are possible for monitoring recreation but does not commit to a specific methodology or include a schedule for completing monitoring or sharing the results and any proposed changes to the plan with agencies before filing the updated plan for Commission approval. Revising the Recreation Plan to include this information would ensure that the monitoring data clearly describe recreation use and that any proposed measures would consider agency expertise.

Whitewater Boating

The Saco River in the project area does not support whitewater kayaking under existing conditions, and White Pine Hydro does not propose releasing flows from the project for whitewater opportunities. Sebago TU recommends that White Pine Hydro provide four whitewater releases during the late spring and early summer. White Pine Hydro did not reply to this recommendation.

Staff Analysis

As stated in the June 10, 2019 Study Plan Determination, there is no information to suggest that there is an unmet demand for whitewater boating in the region or the project area that could be met at the project. Based on maximum inflows from June through August (table 2 in Appendix C) and the project's maximum hydraulic capacity (2,310 cfs), flows in the bypassed reach can sometimes be as high as 15,242 cfs in June and 3,837 cfs in August, but are often much less (leakage estimated at 2 cfs). While there is no information in the record to determine what flows might be suitable for whitewater kayaking, there is also no information to suggest that boaters have tried or are interested in accessing these flows when they are available. While providing whitewater releases from the dam could create a whitewater opportunity, the steep and rugged falls would likely only be runnable by expert boaters and only provide a short run of about 500 feet. Further, finding a suitable and safe put-in would be difficult given the rugged falls and being located immediately below the project spillway. Other Maine rivers within a 3-hour drive of the project, such as the Kennebec or the Dead Rivers, provide more extensive runs for a wide variety of skill levels.

3.2.5 Land Use and Aesthetic Resources

3.2.5.1 Affected Environment

Land use surrounding the project is primarily undeveloped forested areas, interspersed with residential areas and agricultural land. The land within the project boundary is primarily undeveloped with a few small open fields along parts of the western and eastern shorelines. A non-project electric transmission corridor is located within the project boundary.

Based on the maximum daily inflows to the project, river flows that exceed the maximum hydraulic capacity of the project (2,310 cfs) and result in spill over Hiram Falls can occur during any month of the year. However, based on median daily inflows, spill over Hiram Falls typically only occur in April and May with spill flows ranging from 391 to 1,687 cfs. However, because most daily inflows rarely exceed the project's maximum hydraulic capacity, project flow diversions typically result in leakage flows of 2 cfs over Hiram Falls. This is particularly true during the months of June through October when visitors that may want to view the falls are most likely to be present. A chain-link fence topped with barbed-wire extends from just upstream of the dam on the western shore and parallels the portage trail to about 50 feet below the project dam, which prevents public access to the top of the falls and the dam to view the falls.

As noted earlier, although camping and fires are prohibited, there is evidence of these uses in the Downstream Access and Sandbar Area. There are other signs of vandalism including painting of graffiti on the dam face and concrete block below the dam and broken windows in the powerhouse. There is also a large quantity of wood and debris deposited behind the powerhouse immediately upstream and to the right of the powerhouse. The debris consists primarily of weathered branches and tree trunks and some garbage. The debris is deposited during regular high flows (such as spring melt or fall rain events) because the water will eddy in that area, slow down, and drop river debris. White Pine Hydro estimates that it was last cleared approximately 15 to 20 years ago, partially due to the regular re-occurrence of the debris and the difficulty in removing the debris.

3.2.5.2 Environmental Effects

Site Aesthetic Improvements

Sebago TU, Patricia Barber, and Mike Herman state that in their opinion the project infrastructure is not aesthetically pleasing, and a major clean-up of the site is needed. Sebago TU recommends removing the chain-link fence from the west bank, stating without elaboration that it is a safety issue, and removing the fence would allow recreationists to view the Hiram Falls. Sebago TU also recommends painting or burying the above-ground penstock, repairing broken powerhouse windows, updating the powerhouse exterior, and conducting periodic litter removal and clean-up of debris from behind the powerhouse.

Staff Analysis

The project resembles most small hydroelectric projects constructed in the early 20th century. Views of the powerhouse, dam and penstock are limited to those recreating on the sandbar and in the river below the dam. As discussed in section 3.2.6, *Cultural Resources*, the dam, powerhouse, substation, and other related structures are eligible for listing on the National Register of Historic Places (National Register). Consequently, any modifications to "update the powerhouse exterior" as recommended by Sebago TU would adversely affect the integrity for which the site was found eligible. Further, any aesthetic benefits would be minor because of the viewing distance from the sandbar. Repairing the broken windows would improve the appearance of the powerhouse. Vandalism has been a reoccurring problem and routine project maintenance is likely to require frequent replacement of the windows, which is a normal part of a licensee's operation and maintenance of the project.

The 320-foot-long, 15.5-foot diameter penstock is painted white and is weathered, but in good condition. Painting the penstock a more natural color would reduce its contrast with the landscape and therefore blend in better with the natural surroundings, making the penstock, and the overall project, more aesthetically pleasing. Burying the penstock would eliminate it from view from those recreating on the sandbar; however, there would be a significantly high cost and effort associated with burying the penstock and there is nothing in the record to suggest that it would be feasible to bury the penstock. Because the penstock follows the face of Hiram Falls, it reasonable to assume that burying the penstock would require tunnelling or blasting and redesigning the flow line. Also, burying the penstock would adversely affect the integrity of the project that makes the site eligible for listing on the National Register.

Removing the unsightly debris pile as recommended by Patricia Barber and Mike Herman would be difficult because of the large size of some of the debris and difficulty of access to the area by heavy equipment needed to move the debris. The recreating public cannot view the debris from the sandbar area. It is only visible by climbing the falls near the powerhouse and below the spillway, which presents a significant public safety hazard from any sudden releases of water from the spillway. Therefore, climbing on the rocks below the spillway should continue to be discouraged by White Pine Hydro. Thus, removing the woody debris would result in limited aesthetic benefit. However, periodically picking up the small amount of litter that is also dropped during high flows would be relatively easy, would improve environmental site conditions, and prevent the refuse from being carried downstream later. Litter removal should be carried out all project recreation sites on a regular basis.

A temporary access road was built for installing the rubber dam and the public started using the road, even though it was never intended for public access. The chain link fence on the west bank was installed between 2016 and 2018 as an added safety measure to prevent unauthorized access to project facilities through the temporary access road.[28] Although the fence is not aesthetically pleasing, the fence is needed to deter the public from accessing and walking on the rubber dam (several incidents have been reported to the Commission's New York Regional Office). Walking on the rubber dam presents a serious public safety hazard. Therefore, we do not recommend removing the fence as proposed by Sebago TU.

Aesthetic Flow

Sebago TU recommends that the 300-cfs minimum flow be released over the dam to provide a more natural flow over Hiram Falls. Further, Sebago TU recommends that if higher minimum flows are required to maintain adequate wetted width below the powerhouse, then aesthetic flows over the dam should be increased accordingly. Heather Thompson recommends a return of flow to the natural falls over the spillway to improve aquatic habitat and aesthetics.

Staff Analysis

Providing flows over the dam and the falls could improve the aesthetic appearance of the falls if they could be seen by the public. There are no areas from the west bank for the public to safely view the falls because of the fencing required to prevent unauthorized access to the dam as noted above. High spring flows and the rugged terrain make establishing a site to view the falls below the fencing likely impracticable. Views from the sandbar are poor and we are not aware of any trails or access from the east bank of the river to view the falls. As noted above, the Overlook does not provide a view of the falls due to the dense mixture of hardwood and

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[28] *See* Public Safety Plan for the Hiram Project filed August 22, 2018.

coniferous trees. Therefore, any benefits from providing any spill flows over the dam to improve aesthetics would be minimal.

Sebago TU recommends that the required minimum flow be provided over the falls instead of through the powerhouse. The project is currently required to release a minimum flow of 300 cfs below the powerhouse from November 16 to September 30. Based on median flows (table 2 in Appendix C) and the project's maximum hydraulic capacity of 2,310 cfs, a flow of 300 cfs over the falls typically occurs only in April and May, when median monthly flows are 3,997 and 2,701cfs, respectively. The remainder of the year, flow is limited primarily to leakage (2 cfs). Therefore, releasing 300 cfs over the falls during this period, as recommended by Sebago TU, would require White Pine Hydro to curtail or cease generation for about 8.5 months of the year.

When inflow is not sufficient to generate and provide the 300-cfs minimum flow below the powerhouse, White Pine Hydro opens the log sluice Tainter gate because it is automated and easy to control the required release. Because of the large expanse of the bladders and because the bladder only operates in a fully inflated or deflated condition, White Pine Hydro would not be able to easily adjust operation to provide a 300-cfs flow across the entire spillway. Therefore, if White Pine Hydro were required to provide the 300-cfs minimum flow into the Hiram Falls bypassed reach instead of the project tailrace, it would likely continue to release the 300-cfs through the log sluice Tainter gate, which would only wet the eastern portion of the falls. Further, releasing a minimum spill flow of 300 cfs during the late fall and winter months would provide minimal aesthetic benefits because the number of winter visitors is likely to be few.

Project Boundary Modifications

White Pine Hydro proposes to remove from the project boundary two parcels of land. Parcel A is a 32-acre tract located on a tributary on the west side of the reservoir. It consists of a mixture of palustrine scrub-shrub and emergent wetlands, with some palustrine forest, open water, and northern hardwood forest. White Pine Hydro argues that the land serves no project purpose and is above the influence of project operation; therefore, the land does not need to be included in the project boundary (figure 5 in Appendix C).

Parcel B is a 144.5-acre track that extends from the Pequawket Trail to the western shore of the Saco River and from about 1,000 feet downstream of the dam to the end of the current project boundary, about 1.5 miles. The parcel consists of 115 acres of northern hardwood forest and 25 acres of the Saco River. It also contains the Overlook recreation site. White Pine Hydro proposes to remove the portion of the free-flowing river starting at a point more than 1,000 feet downstream of the dam to align the project boundary with the point at which the water quality classification of the river changes from A to AA. White Pine Hydro proposes to remove the lands on the east side of the river because they are not needed for project purposes. White Pine Hydro states that it would retain all project lands on the west side of the river and downstream of the dam to provide access to the Downstream Access and Sandbar and canoe put-in recreation sites, including the current tailwater access and sand bar area.

Sebago TU recommends that lands inside the current project boundary be retained. Sebago TU states that the proposed project boundary change would not be in accordance with the Commission's policy that excluding lands from a project boundary is predicated upon a showing that such lands are not needed for project purposes and asserts that removing the land associated with Parcel B would affect recreation use of the Downstream Access Area. In addition, Sebago TU questions whether the change in water quality classification from Class A to Class AA is a valid benchmark for the downstream extent of the project boundary. Sebago TU also disagrees with the proposal to remove the 32-acre upstream area, arguing that the area's wetlands store floodwaters and reduce peak discharge below the dam, benefiting public safety.

In its reply comments, White Pine Hydro acknowledges that the wetlands within Parcel A may provide important ecological functions such as retention and attenuation of runoff, but the tract is above the normal pond elevation at the 349.0-foot contour and thus is unaffected by project operation.

Staff Analysis

Commission regulations at 18 C.F.R. 4.51(h) require that the project boundary enclose only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of environmental resources. Because the land in Parcel A is above the normal full pond level of 349 feet and no changes in project operation are being considered that would influence lands above this contour, the land is not needed for project operation and there is no reason to believe that the wetlands that are established in the parcel would be altered or threatened by removing the land from the project boundary. The parcel does not serve any project recreation need. We are not aware of any development threats if the lands were to be removed from the project boundary.

Regarding Parcel B, contrary to White Pine Hydro's reasoning, the Commission does not define the project boundary based on the extent of a project's effect on resources. Project effects can often extend beyond the project boundary. Therefore, a change in water quality classifications has no bearing on whether the land and water should be included in the project boundary. As noted above, only those lands that serve a project purpose should be included in the project boundary.

The land and water associated with Parcel B do not provide for project recreation. We are not aware of any potential development threats that would result if they were removed from the project boundary. Contrary to Sebago TU's assertion, sufficient lands are being retained to operate and maintain the Canoe Portage, Downstream Access Trail and Sandbar Area, and Nature Study Area. Removing Parcel B would remove the Overlook from the project boundary; however, this would not have a significant effect on project recreation because the site is rarely used and no longer provides a view of the Hiram Falls due to the dense forest of hardwoods and evergreens. Thus, the site no longer serves a project purpose.

3.2.6 Cultural Resources

3.2.6.1 Affected Environment

Section 106 of the NHPA requires that the Commission evaluate the potential effects on properties listed or eligible for listing in the National Register. Such properties listed or eligible for listing in the National Register are called historic properties. In this document, we also use the term "cultural resources" for properties that have not been evaluated for eligibility for listing in the National Register. Cultural resources represent things, structures, places, or archaeological sites that can be either prehistoric or historic in origin. In most cases, cultural resources less than 50 years old are not considered historic. Section 106 also requires that the Commission seek concurrence with the state historic preservation office (SHPO) on any finding of effects on historic properties and allow the Advisory Council on Historic Preservation an opportunity to comment on any finding of effects on historic properties. If Native American (i.e., aboriginal) properties have been identified, section 106 requires that the Commission consult with interested Indian tribes that might attach religious or cultural significance to such properties.

Area of Potential Effects (APE)

Pursuant to section 106, the Commission must consider whether any historic property could be affected by the issuance of a proposed license within a project's area of potential effect (APE). The APE is determined in consultation with the SHPO and is defined as the geographic area or areas within which an undertaking may directly or indirectly cause alternation in the character or use of historic properties, if any such properties exist. The APE consists of all areas within the project boundary, as well as areas outside of the project boundary that could be directly affected. In this case, the APE consists of all areas within the project boundary or within 50 feet of the normal full pool (349 feet), whichever is greater. The Maine SHPO concurred with the APE on July 26, 2018.[29]

Cultural and Historical Background[30]

Aboriginal Settlement

The archaeological record of Maine dates to more than 10,000 years ago and is divided into three major periods known as the Paleoindian, the Archaic, and the Ceramic cultural periods. The Paleoindian period dates from 11,500 to 9,500 years ago. The Paleoindian people were highly mobile hunter-gatherers relying mainly on caribou for subsistence and camping in short-term habitations typically removed from present day water bodies (Spiess, Wilson, and Bradley, 1998).

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[29] *See* July 26, 2018 letter from Kirk F. Mohney, Maine State Historic Preservation Officer, Maine Historic Preservation Commission, to Wendy Bley, TRC, filed with the Commission on September 11, 2018 as part of the Revised Study Plan.

[30] The cultural and historical background is taken and generalized from the draft HPMP filed on November 20, 2020 and the PAD filed on November 30, 2017.

The Archaic Period (9,500 to 3,000 years ago) represents the longest cultural period in the region. Although early and middle Archaic people probably continued a nomadic hunter gatherer lifestyle, their subsistence and settlement patterns were located along present-day water bodies and the occupants relied on aquatic species as a food source.

The close of the late Archaic period is characterized by the Susquehanna Tradition (Bourque, 1995; Sanger, 1979), which was widespread in Maine and New England. The people of the Susquehanna Tradition appear to have been focused more on a terrestrial, rather than a maritime, economy.

During the Ceramic Period (3,000 to 450 years ago), pottery was first manufactured and used. Cultures in Maine during the Ceramic period continued to rely primarily on hunting and gathering. Ceramics persisted until European contact when clay pots were replaced by iron and copper kettles that were traded for beaver pelts and other furs. Ceramic period sites are abundant in Maine, both on the coast and in the interior. Interior sites are common along waterways, ponds, and lakes.

Euro-American Settlement and Occupation

The first settlers of Hiram arrived in 1774 and surveyed the lots that served as a foundation of the town. The town of Hiram was incorporated in 1814. A significant early settler was General Peleg Wadsworth, a native of Duxbury, Maine and a Revolutionary War veteran. In appreciation of his military service, Wadsworth was awarded 7,800 acres of land between the Ossipee River and the Saco River in 1790 where he built a large house for his family which also served as space for town meetings, indoor military drills, and other public functions. Hiram continued to grow in the 19th Century as it annexed land from surrounding towns. Forest products and agriculture were significant drivers in Hiram's early economy and development. The town's location at Hiram Falls encouraged the development of water-powered mills. Pine lumber from the surrounding forest was transported down the Saco River to the town's many sawmills, the earliest of which was built by John Ayer in 1785 (Mitchell, 1907). By 1886, the town had five saw and planing mills, two grist mills, and a carding mill. In 1874, Isaac Emery and Ephraim Sanders built a large sawmill at Hiram Falls but it burned in 1880 and its remnants were subsequently swept away in an 1896 flood (Mitchell, 1907). Additional mills were constructed to process local agricultural products such as wool, corn, and wheat and the area's abundant apple orchards supplied local cider mills (Mitchell, 1907). Dairy farming became a major industry in the late 19th and early 20th Centuries with the establishment of the Hiram Creamery Association and a local creamery in the early 1900s. The Hiram Hydroelectric Project was constructed in 1917 by the Cumberland County Power & Light Company and was the first hydropower project in the area. The project supplied electricity to residential and industrial customers in Cumberland and Oxford Counties.

Archaeological and Historic Investigations

White Pine Hydro conducted Pre-Contact Archaeological surveys, Historic Archaeological Resources surveys, and a Historic Architectural Resources survey within the project APE. A description of each survey and its findings are discussed below.

Pre-Contact Archaeological Survey

White Pine Hydro conducted a Pre-Contact period Phase IA[31] archaeological investigation in 2017 (Will, 2018) that identified 24 sensitive areas that needed a Phase 1B[32] investigation to determine if they held any archaeological resources. Landowner permission was not granted to survey 11 of these 24 sites. As part of the Phase 1B survey (Moore, Will, and Mack, 2020), White Pine Hydro conducted a pedestrian walkover of the accessible 13 sensitive sites and eliminated three from further testing because they did not meet the criteria for conditions for field testing. Subsurface testing was conducted at the remaining 10 sites which included a total of 182 shovel test pits (50 square centimeters each) and 16 test units (one square meter each). Testing did not identify any Precontact period archaeological resources within the project APE.

At the request of the Maine SHPO, White Pine Hydro conducted an observation survey from a canoe survey (Moore *et al*., 2020) of these remaining 11 sites. The observer was looking for eroding exposures of buried soil layers and/or signature of possible precontact period sites (fire-cracked rock, artifacts, etc.) The canoe survey was completed on September 16 and 17, 2020. Of the 11 sites, only one (Test Area 24 located below the dam in the southern most portion of the project) could not be accessed during the canoe survey due to low water levels. No evidence of precontact period sites were observed in the fluctuation zone or the faces of eroding banks along the shoreline; however, active riverbank erosion was observed along archaeologically sensitive landforms in seven of the areas, which White Pine Hydro recommended for further survey once landowner permission is obtained to access these sites. By letter filed on June 15, 2021, the Maine SHPO concurred with the findings of the report.

Post-Contact Archaeological Resources Survey

White Pine Hydro conducted a Phase 1A/1B post-contact period archaeological resources survey during September and October 2019 (Dinsmore, 2020). The post-contact period Phase 1A assessment identified one archaeological site – the late 19th Century Emery Mill Complex located on the west side of the Saco River in Hiram and close to Hiram Falls. The survey found evidence of seven of the 19 buildings associated with the Emery Mill Complex depicted on an 1880 Oxford County map.

White Pine Hydro conducted a Phase 1B survey at the seven Emery Mill site locations. Excavations resulted in the identification of five post-contact sites within the Hiram Project boundary that included the probable Saw Mill Landing Site, three Cooper Shop sites (Cooper Shop Sites #1-3), and the Boarding House Site. All five sites tested positive for post-contact materials. The Cooper Shop sites are considered historically significant because they portray the

[31] A Phase 1A survey generally consists of historical research and field inspection to determine the presence or absence of archaeological resources.

[32] A Phase 1B survey is a reconnaissance survey designed to identify all archaeological resources within an area of potential effect.

manufacturing aspect of the shook[33] trade and all appear to be mostly undisturbed. Because these sites are far removed from project effects, White Pine Hydro did not recommend any further survey of these sites now but proposed to conduct a Phase II[34] survey post-licensing if future project-related activities are identified that could impact these sites. The Boarding House is also considered significant from an archaeological standpoint and appears to be undisturbed since a fire razed the structure sometime between 1880 and 1890. White Pine Hydro did not recommend further testing because the site is located high above the Saco River and unaffected by project operation; however, White Pine Hydro proposed to conduct Phase II surveys post-licensing if future project-related activities could disturb this site. The identity of the Saw Mill Landing Site is not entirely clear but is tentatively identified as the Saw Mill/Landing Site to the Emery Mill Complex. The site consists of a series of logs that contain large iron bolts and spikes, remnant iron cables, and associated hardware. However, it was not clear whether these remains are elements of the Emery Saw Mill or a landing site where lumber was towed by steamboat for processing at the mill. Three shovel test pits were excavated at this location and all tested positive for post-contact material that dates from the late 19th century to early 20th century. Based on the findings in these test pits, White Pine Hydro postulates that it is possible that this site post-dates the 1874 to 1896 timeframe for the operation of the saw mill; however, an 1880 Oxford County map, examined as part of the study, shows this site as the location of the saw mill. The Phase 1B study found that fluctuating river levels due to natural flood events could adversely affect this site.

Because the identity of the Emery Saw Mill/Landing Site is not conclusive, White Pine Hydro found this site as potentially eligible for listing on the National Register. By letter filed on May 19, 2020, the Maine SHPO concurred with the applicant's findings and recommendations and did not recommend a Phase II survey of the Emery Saw Mill/Landing Site to confirm eligibility because it is currently not being impacted by the project. However, the Maine SHPO did recommend that a Phase II survey be conducted post-licensing if future project-related activities could affect the Emery Saw Mill/Landing Site.[35]

Historic Architectural Resources

In 2018, White Pine Hydro conducted a historic architectural survey of the Hiram Project features. White Pine Hydro initially found the project features to be ineligible for listing on the

[33] A shook is a small slice of pine wood used in making boxes for the transport of fruit and vegetables.

[34] A Phase II survey is an intensive survey targeting cultural areas found in the Phase IB survey for further study and evaluation for eligibility on the National Register.

[35] *See* February 26, 2020, letter from J. N. Leith Smith, Maine Historic Preservation Commission to Frank H. Dunlap, Brookfield White Pine Hydro, LLC, filed with the Commission on May 19, 2020.

National Register. The Maine SHPO disagreed with the findings.[36] The Maine SHPO concluded that despite the 1980s modifications and the addition of the bladder dam, "the dam, powerhouse, substation, other related structures and that portion of the impoundment that visually and physically convey the existence of the impounded waterway…retains sufficient integrity of location, setting, material, feeling and association, as well as some elements of design and workmanship" to be eligible for listing on the National Register. The Maine SHPO concluded that the Hiram Project is eligible under Criterion A due to its association with the Cumberland County Power and Light Company, which had significant association with broad patterns of local history, and under Criterion C as a part of a dis-contiguous historic district that includes the West Buxton and Bonny Eagle Hydroelectric Project facilities that are both eligible for listing on the National Register. White Pine Hydro concurred with the Maine SHPO's finding that project features are eligible under Criteria A and C in its letter filed on June 15, 2021.

White Pine Hydro also surveyed an abandoned railroad bridge that spans the Saco River north of the project that was built in 1942 on the Mountain Division Rail Line. The evaluation concluded that the bridge is a good example of a Pratt-type, steel through-truss from the mid-20th century and recommended it be found eligible for listing on the National Register under Criterion C in the area of Engineering. Its period of significance is 1942, the year it was built. The bridge is not part of the Hiram Project and White Pine Hydro finds that continued project operations would not affect the bridge. By letter dated May 27, 2019,[37] the Maine SHPO concurred with White Pine Hydro's findings in relation to the Mountain Division Rail Line Bridge but stated that its period of significance is not limited to 1942 but encompasses the time period from 1869 to 1969.

3.2.6.2 Environmental Effects

To protect cultural resources during the term of the license, White Pine Hydro proposes to implement a HPMP filed on August 23, 2021. The HPMP includes the following: (1) provisions to periodically try to obtain permission from adjoining landowners to conduct Class IB surveys on the eight culturally-sensitive sites that could not be accessed (sites 3, 15, 18, 19, 21, 22, 23, and 24) during pre-filing studies; (2) protocols for handling of previously undiscovered cultural resources; (3) protocols for protecting cultural resources from future project-related activities or modifications; (4) provisions to train project personnel in cultural

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[36] *See* May 27, 2019, letter from Kirk F. Mohney, State Historic Preservation Officer, Maine Historic Preservation Commission to David L. Price, TRC, filed with the Commission on June 15, 2021.

[37] *See* May 27, 2019, letter from Kirk F. Mohney, State Historic Preservation Officer, Maine Historic Preservation Commission to David L. Price, TRC, filed with the Commission on June 15, 2021.

resource management; (5) consultation protocols; and (6) a schedule to report annually on activities conducted under the HPMP. The Maine SHPO concurred with the HPMP.[38]

The future construction of upstream and downstream passage facilities for eel and Atlantic salmon, per the 2007 Fisheries Agreement, could involve some modification of the Hiram Dam that could adversely affect the properties that make the dam eligible for listing on the National Register. White Pine Hydro proposes to manage historic properties within the APE, including National Register-eligible properties through its HPMP, but does not specifically address the possible effects of constructing fish or eel passage facilities on the historic properties of the dam.

Staff Analysis

The Hiram Project facilities are eligible for listing on the National Register under Criteria A and C for the reasons stated by the Maine SHPO. Because White Pine Hydro does not propose any immediate new construction or changes to project operation, continued project operation is not likely to adversely affect the historic character of the project facilities, although it is important that periodic maintenance over any new license term is carried out carefully to avoid any adverse effects on these historic facilities. However, future construction of upstream and downstream Atlantic salmon and eel passage facilities has the potential to adversely affect the historic properties of the dam because construction of either a ladder or a fish lift could require significant construction and may require some modification of the dam. The degree of adverse effect would depend on the final design of the fishway, which would occur after license issuance. Evaluating such effects upon completion of a conceptual design of the fish passage facilities and revising the HPMP to address any adverse effects would ensure that any impacts to the historic properties of Hiram Dam are minimized or adequately mitigated.

The culturally sensitive sites within the APE that could not be accessed by White Pine Hydro during pre-filing studies could be affected by maintenance activities (such as reservoir drawdowns) over any new license term and could hold important information for the archaeological record. Attempting to periodically obtain landowner permission to conduct Phase IB surveys, as provided for in the HPMP could make it possible for White Pine Hydro to survey all or some of these sites to determine whether National Register-eligible resources are present that require protection.

With the execution of a Programmatic Agreement to implement the HPMP, any potential project-related adverse effects to historic properties would be adequately addressed over the term of a new license.

3.2.7 Environmental Justice

3.2.7.1 Affected Environment

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[38] *See* August 10, 2021 letter from Kirk F. Mohney, State Historic Preservation Officer, Maine Historic Preservation Commission, to Angela Whelpley, TRC, filed with the Commission on August 10, 2021.

In conducting NEPA reviews of proposed hydropower projects, the Commission follows the instruction of Executive Order 12898, which directs federal agencies to identify and address "disproportionately high and adverse human health or environmental effects" of their actions on minority and low-income populations (i.e., environmental justice communities).[39] Executive Order 14008 also directs agencies to develop "programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts."[40] Environmental justice is "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (EPA, 2021a).

Consistent with CEQ and EPA guidance, Commission staff considers: (1) whether environmental justice communities (e.g., minority or low-income populations)[41] exist in the project area; (2) whether impacts on environmental justice communities are disproportionately high and adverse; and, if so, (3) what mitigation measures might be needed (CEQ, 1997; EPA, 2016). Following the recommendations set forth in *Promising Practices*, the Commission uses the fifty-percent and the meaningfully greater analysis methods to identify minority populations (EPA, 2016 at 21-25). Using this methodology, minority populations have been defined as block groups within the area of study where: (1) the aggregate minority population of the block group in the affected area exceeds 50 percent; or (2) the aggregate minority population in the block group affected is 10 percent higher than the aggregate minority population percentage in the county.[42]

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[39] Exec. Order No. 12,898, 59 Fed. Reg. 7629 (Feb. 16, 1994). While the Commission is not one of the specified agencies in Executive Order 12898, the Commission nonetheless addresses environmental justice in its analysis, in accordance with our governing regulations and guidance, and statutory duty to evaluate all factors bearing on the public interest.

[40] Exec. Order No. 14,008, 86 Fed. Reg. 7619 (Feb. 1, 2021). The term "environmental justice community" includes disadvantaged communities that have been historically marginalized and overburdened by pollution. *Id.* § 219, 86 Fed. Reg. 7619, 7629. The term also includes, but may not be limited to, minority populations, low-income populations, or indigenous peoples (EPA, 2021b).

[41] *See generally* Exec. Order No. 12,898, 59 Fed. Reg. 7629 (Feb. 16, 1994). Minority populations are those groups that include: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic (CEQ, 1997 at 25).

[42] Here, Commission staff selected "county" as the comparable reference community to ensure that affected environmental justice communities are properly identified. A reference community may vary according to the characteristics of the particular project and the surrounding communities.

CEQ's *Environmental Justice Guidance* also directs low-income populations to be identified based on the annual statistical poverty thresholds from the U.S. Census Bureau (Census; CEQ, 1997). Using *Promising Practices'* low-income threshold criteria method, low-income populations are identified as block groups where the percent of low-income population in the identified block group is equal to or greater than that of the county (EPA, 2016).

To identity potential environmental justice communities for the analysis presented here, Commission staff used 2019 U.S. Census American Community Survey data for the race, ethnicity, and poverty data at the block group level (Census, 2020). For this project, staff chose a 1-mile radius around the project boundary as the area of study. The 1-mile radius includes all census block groups that border the Hiram Project for two counties where the project is located - Cumberland and Oxford Counties. Staff found that a 1-mile radius is the appropriate unit of geographic analysis given the limited scope of the project proposal and concentration of project-related effects on the segment of the Saco River between the dam and the project's reservoir.

Within the study area, staff identified one census block group in which the population qualifies as an environmental justice community with a minority population meaningfully greater than the minority populations within their surrounding counties (*see* figure 8 and table 5, Appendix C. The identified block group is Census Tract 9669, Block Group 1 in Oxford County.[43]

No block groups meet the threshold for environmental justice communities on the basis of low-income status.[44]

3.2.7.2 Environmental Effects

As described in section 2.2.2, *Proposed Operation and Environmental Measures*, White Pine Hydro proposes to continue operating the project in a run-of-river mode where outflow approximates inflow by maintaining stable impoundment levels. As discussed in section 3.2.4, *Recreation Resources*, White Pine Hydro proposes to improve the project's Downstream Access Trail and Sandbar Area by adding three picnic tables, signage, a seasonal portable restroom and trash service, and a security gate. White Pine Hydro also proposes to attempt to acquire land rights to the existing private boat launch on the impoundment to ensure continued public access to the project impoundment, and if that is not possible, White Pine Hydro proposes to design and

[43] Oxford County has a total aggregate minority population of 4.7 percent (*see* table 5 in Appendix C). To qualify as an environmental justice community under the "meaningfully greater" criteria, the minority population percentage in the affected area must be 10 percent greater than the minority population percentage calculated for the county (*i.e.*, 4.7 x 1.1 = 5.17 percent or greater). Census Tract 9669, Block Group 1 has a 7.8 percent total minority population, which is greater than the 5.17 percent threshold (table 5 in Appendix C). Thus, it qualifies as an environmental justice community.

[44] Data from the 2019 U.S. Census American Community Survey File # B01017 and File # B03002, the most recently available data, were used as the source for race, ethnicity, and poverty data at the census block group level (U.S. Census Bureau, 2020).

construct a new launch at an alternative location. The existing private boat launch is located within the environmental justice community.

No entity provided comments or recommendations regarding the effects of the project on environmental justice communities in response to the Commission's notice that the application was ready for environmental analysis.

Staff Analysis

Continuing to operate in a run-of-river mode with minimal impoundment fluctuations would protect aquatic and riparian habitat and would have no effect on water supply or other aquatic resources. Construction activities associated with modifying White Pine Hydro's recreation facilities at the Downstream Access Trail and Sandbar Area would be of short duration and scope and these activities are unlikely to create substantial noise or excessive construction traffic within the identified environmental justice community, given that the Downstream Access Trail and Sandbar Area is located downstream and outside of the identified community. Although recreation use on the Saco River could increase with the proposed public access improvements at the Downstream Access Trail and Sandbar Area, the site is remote and unlikely to experience such large increases in usage that would adversely affect the identified community, such as long-term and sustained increases in traffic or impacts to recreational fishing opportunities via overfishing. Continuing to maintain the existing boat launch is not expected to result in an increase in traffic or use that could adversely affect the identified environmental justice community. Rather, it would ensure the continued availability of the ramp to the community. If a new ramp is required to be constructed to ensure public access, the effects on the environment would depend on the site chosen but would be localized and short-term. The ramp's construction would be unlikely to create substantial noise or excessive construction traffic. Therefore, we conclude that relicensing the Hiram Project would not result in a disproportionately high and adverse impact on the environmental justice community present within the project area.

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the project's use of the Saco River for hydropower generation to see what effect various proposed or recommended environmental measures would have on the cost to operate and maintain the project and on the project's power generation. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp.*,[45] the Commission compares the current cost to produce project power to an estimate of the cost to provide the same amount of energy and capacity[46] for the region using the

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[45] *See Mead Corp.*, 72 FERC ¶ 61,027 (July 13, 1995). In most cases, electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.

[46] We use the term "capacity benefit" to describe the benefit a project receives for providing capacity to the grid, which may be in the form of a dependable capacity credit or credit for monthly capacity provided.

most likely alternative source of power (cost of alternative power). In keeping with the policy described in *Mead Corp.*, our economic analysis is based on current electric power cost conditions and does not anticipate or estimate changes in fuel costs that could occur during a project's license term.

For each of the licensing alternatives, our analysis includes an estimate of: (1) the annualized cost of providing the individual measures considered in the EA; (2) the cost of the most likely alternative source of project power; (3) the total annual project cost (i.e., for construction, operation, maintenance, and environmental measures); and (4) the difference between the cost of the current alternative source of project power and the total annual project cost. If the difference between the cost to produce an equivalent amount of power from an alternative source and the total annual project cost is positive, the project produces power at a cost less than the cost of producing power from the most likely least-cost source of alternative power. If the difference between the alternative source of power's annual cost and the total annual project cost is negative, the project costs more to produce power than the cost to produce an equivalent amount of power from the most likely least-cost source of alternative power. This estimate helps support an informed decision concerning what is in the public interest with respect to a proposed license. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

4.1 POWER AND DEVELOPMENTAL BENEFITS OF THE PROJECT

Table 6 of Appendix C summarizes the assumptions and economic information used in the analysis. Most of this information is provided by White Pine Hydro in its license application. Some is developed by Commission staff. The values provided by White Pine Hydro are typically reasonable for the purposes of our analysis. If they are not, it is noted below. Cost items common to all alternatives include taxes and insurance, estimated capital investment required to develop the project or major modifications for relicensing, licensing costs, normal operation and maintenance (O&M) cost, and Commission fees. All costs are adjusted to current year dollars.

4.2 COMPARISON OF ALTERNATIVES

Table 7 of Appendix C summarizes the installed capacity, annual generation, capacity benefit, alternative source of power's cost, estimated total project cost, and difference between the alternative source of power's cost and total project cost for each of the alternatives considered in this EA: no-action, White Pine Hydro's proposal, the staff alternative, and staff alternative with mandatory conditions.

4.2.1 No-Action Alternative

Under the No-Action alternative, the project has an installed capacity of 11.633 MW, a capacity benefit of 8.90 MW, and an average annual generation of 49,287 MWh. The alternative source of power's current cost to produce the same amount of energy and provide the same capacity benefit is $4,561,434. The total annual project cost is $1,596,050. Subtracting the total annual project cost from the alternative source of power's current cost, the project's cost to produce power and capacity is $2,965,384 less than that of the alternative source of power's cost.

4.2.2 White Pine Hydro's Proposal

Under White Pine Hydro's proposal, the project would have a total installed capacity of 11.633 MW, a capacity benefit of 8.90 MW, and an average annual generation of 49,287 MWh. The alternative source of power's current cost to produce the same amount of energy and provide the same capacity benefit would be $4,561,434. The total annual project cost would be $2,209,257. Subtracting the total annual project cost from the alternative source of power's current cost, the project's cost to produce power and capacity would be $2,352,177 less than that of the alternative source of power's cost.

4.2.3 Staff Alternative

Under the staff-recommended alternative, the project would have a total installed capacity of 11.633 MW, a capacity benefit of 8.90 MW, and an average annual generation of 49,287 MWh. The alternative source of power's current cost to produce the same amount of energy and provide the same capacity benefit would be $4561,434. The total annual project cost would be $2,171,388. Subtracting the total annual project cost from the alternative source of power's current cost, the project's cost to produce power and capacity would be $2,390,046 less than that of the alternative source of power's cost. The total cost of the staff alternative is less than White Pine Hydro's proposal and the staff alternative with mandatory conditions because staff's alternative does not include monitoring DO in the project's tailwater and Hiram Falls bypass reach for a single season and 3 years of passage studies to evaluate effectiveness of all newly constructed or significantly modified permanent upstream and downstream fish passage facilities or measures for Atlantic salmon and American eel.

4.2.4 Staff Alternative with Mandatory Conditions

Under the staff-recommended alternative with mandatory conditions, the project would have a total installed capacity of 11.633 MW and a capacity benefit of 8.90 MW. In addition, the project would produce 49,287 MWh of electricity annually. The alternative source of power's current cost to produce the same amount of energy and provide the same capacity benefit would be $4,561,434. The total annual project cost would be $2,208,424. Subtracting the total annual project cost from the alternative source of power's current cost, the project's cost to produce power and capacity would be $2,353,010 less than that of the alternative source of power's cost.

4.3 COST OF ENVIRONMENTAL MEASURES

Table 8 in Appendix C presents the cost of each of the environmental enhancement measures considered in our analysis for the Hiram Project. All costs are in 2021 dollars. We convert all costs to equal annual (levelized) values over a 30-year period of analysis to give a uniform basis for comparing the benefits of a measure to its cost.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. This section contains the basis for, and a summary of, our recommendations for relicensing the project. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review of agency and public comments filed on the project and our review of the environmental and economic effects of the project alternatives, we selected the staff alternative as the preferred alternative for the Hiram Project. We recommend this alternative because: (1) issuing a new license would allow White Pine Hydro to continue operating the project as a beneficial and dependable source of electrical energy; (2) the 11.633 MW of electric capacity of the Hiram Project comes from renewable resources that do not contribute to atmospheric pollution; (3) the public benefits of the staff alternative would exceed those of the no-action alternative; and (4) the recommended measures would protect and enhance fisheries, recreation, and cultural resources at the project.

In the following sections, we make recommendations as to which environmental measures proposed by White Pine Hydro or recommended or prescribed by agencies and others should be included in any license issued for the project. We also recommend additional environmental measures to be included in any license issued for the project. Staff's recommended draft license conditions are provided in Appendix G, which consider the mandatory conditions of the water quality certification and section 18 fishway conditions.

5.1.1 Measures Proposed by White Pine Hydro

Based on our environmental analysis of White Pine Hydro's proposal in section 3.0, *Environmental Analysis,* and the costs presented in section 4.0, *Developmental Analysis,* we conclude that the following environmental measures proposed by White Pine Hydro would protect or enhance environmental resources and would be worth their cost. Therefore, we recommend including these measures in any license issued for the project.

- Continue to operate the project in a run-of-river mode where outflow approximates inflow by maintaining impoundment levels: (1) within two feet of normal full pond elevation of 349 feet or from the spillway crest when the rubber dams are down from November 16 through September 30; and (2) within one foot of full pool elevation of 349 feet or from the spillway crest when the rubber dams are down from October 1 through November 15.

- Continue to provide a 300-cfs minimum flow or inflow if less from the project powerhouse, or in the event the project powerhouse is inoperable, from the dam from November 16 through September 30.

- Continue to implement the provisions of the Fisheries Agreement applicable to the Hiram Project as required by the existing license:

    - Construct and begin operation of a single permanent upstream Atlantic salmon passage facility by May 1, 2032, contingent upon the sufficient returning numbers of Atlantic salmon and following consultation with, and agreement by, FWS, NMFS, and Maine DMR.
    - Construct and begin operation of a downstream passage facility for Atlantic salmon by the earlier of (1) April 15 following two years after White Pine Hydro receives written notification of the commencement of annual stocking of juvenile Atlantic salmon above Hiram Dam, or
(2) the operation of permanent upstream fish passage facilities for Atlantic salmon at the project.
    - Construct and begin operation of a permanent upstream American eel passage facility by June 1, 2025, if sufficient numbers of eels are present to require an eelway or to determine the location of an upstream eelway.
    - Install and operate a permanent downstream American eel passage facility or implement operational measures at the project by September 1, 2032.
    - Develop a fishway operation and maintenance plan.
    - Operate each upstream and downstream fish passage facility for a one-season "shakedown" period to ensure that it is generally operating as designed and to make minor adjustments to the facilities and operation.
    - Obtain FWS and/or NMFS approval of the final design of any permanent upstream or downstream fish passage facility prior to construction.

- Conduct any tree removal between October 16 and April 19 to avoid impacts to NLEB, but if tree removal is required between April 20 and October 15 (*e.g.*, emergency conditions), then consult with FWS prior to conducting the tree removal.

- Implement the following provision defined in the proposed Recreation Plan filed with the license application:

    - Maintain the Canoe Portage, Downstream Access Trail and Sandbar Area, and Nature Study Area.
    - Improve the Downstream Access Trail and Sandbar Area by adding signage describing hours of operation and security measures, three picnic tables, a seasonal portable restroom, seasonal trash service, and a security gate.
    - Remove the Overlook from the project boundary and as a project recreation facility.

- Implement the HPMP filed with the Commission on August 23, 2021 to protect cultural resources.

5.1.2 Additional Measures Recommended by Staff

In addition to White Pine Hydro's proposed measures noted above, we recommend including the following additions or modifications to the proposed measures:

- Revise the proposed Project Operations Monitoring Plan to include: (1) procedures for maintaining and calibrating all monitoring equipment; (2) procedures for refilling the impoundment and maintaining flows downstream of the project following maintenance or emergency drawdown of the impoundment; and (3) revised reporting requirements for deviations from the operating requirements of the license.

- Once the upstream and downstream passage facilities are installed, operate them according to the following schedule:[47]

Species	Upstream Migration Period	Downstream Migration Period
Atlantic salmon	May 1 – October 31	April 1 – June 30 (smolts and kelts) October 15 – December 31 (kelts)
American eel	June 1 – September 15	September 15 – November 15 (night)

- Revise the Recreation Plan to include the following measures:

    - Instead of removing the information kiosk and picnic tables from the Nature Study Area, (a) design and install signage at the entrance to the project access road directing users to the Nature Study Area and include a map of the trail and its length, and the hours of operation of the recreation area; (b) repair or replace the plant identification signs along the trail; and (c) repair or replace as appropriate, the roofs to the two picnic shelters and the two picnic tables under the shelters and remove the two picnic tables that are in disrepair.
    - Instead of installing signage at the parking area of the Downstream Access Trail and Sandbar Area, place signage identifying the site so that it is visible from River Road.
    - Include a description of the methodology that would be used to monitor recreation use, how the monitoring results and any proposed changes to the project recreation facilities would be distributed to the agencies, and an implementation

[47] Neither the Fisheries Agreement nor White Pine Hydro identify the operating period for fish passage facilities. This operating period is defined in Interior's section 18 fishway prescription.

schedule for conducting monitoring and filing the results with the Commission for approval.

  - Include a maintenance schedule, including trash and litter removal for all recreation areas and from behind the powerhouse following high flow events.
  - Install a security camera on the powerhouse capable of monitoring the Downstream Access Trail and Sandbar Area for unauthorized camping and a procedure for reporting misuse to appropriate authorities.
  - Paint the project penstock a color that blends better with the surrounding landscape within 3 years of license issuance.

- File a plan and schedule for providing a public boat launch on the project impoundment, using either the existing launch or by constructing a new facility. The plan should include a conceptual drawing and maps, and identify the location of the site, parking, signage, operation and maintenance schedule, and any proposed improvements (e.g., ramp improvements, trash receptacles, or restrooms).

In Appendix H, we discuss the reasons for recommending the additions or modifications to White Pine Hydro's proposal.

5.2 UNAVOIDABLE ADVERSE IMPACTS

Continued operation of the project would result in some unavoidable entrainment injury or mortality to resident fish as well as diadromous fish species migrating downstream, even after downstream passage measures are implemented. Project operations would continue to result in minor reservoir fluctuations (within one to two feet of full pool) and occasional, temporary dewatering of the reservoir littoral zone during maintenance drawdowns. Including procedures for refilling the impoundment and maintaining flows below the dam following a maintenance or emergency drawdown of the reservoir in the Operations Compliance Monitoring Plan would help minimize those effects.

5.3 FISH AND WILDLIFE AGENCY RECOMMENDATIONS

Under the provisions of section 10(j) of the FPA, each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project.

Section 10(j) of the FPA states that whenever the Commission finds that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency must attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of the agency.

In response to our January 11, 2021, ready for environmental analysis notice accepting the relicense application and soliciting motions to intervene, protests, comments, recommendations, preliminary terms and conditions, and preliminary fishway prescriptions, Interior filed five section 10(j) recommendations on March 11, 2021. Table 9 in Appendix C lists the recommendations filed pursuant to section 10(j), and indicates whether the recommendations are included under the staff alternative, as well as the basis for our preliminary determinations concerning measures that we consider inconsistent with section 10(j). Environmental recommendations that we consider outside the scope of section 10(j) have been considered under section 10(a) of the FPA and are addressed in the specific resource sections of this document.

5.4 CONSISTENCY WITH COMPREHENSIVE PLANS

Section 10(a)(2)(A) of the FPA, 16 U.S.C., § 803(a)(2)(A), requires the Commission to consider the extent to which a project is consistent with federal or state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the projects. Appendix I lists the comprehensive plans that are applicable to the Hiram Project. No inconsistencies were found.

6.0 FINDING OF NO SIGNIFICANT IMPACT

If the Hiram Project is issued a new license as proposed with the additional staff-recommended measures, the project would continue to operate while providing enhancements to fish and aquatic resources, and protection of recreation, cultural, and historic resources in the project area.

Based on our independent analysis, we find that the issuance of a new license for the Hiram Project, with additional staff-recommended environmental measures, would not constitute a major federal action significantly affecting the quality of the human environment.

7.0 LITERATURE CITED

The literature cited in this EA is presented in Appendix J.

8.0 LIST OF PREPARERS

The list of preparers of this EA is presented in Appendix K.

APPENDIX A

STATUTORY AND REGULATORY REQUIREMENTS

Federal Power Act

Section 18 Fishway Prescriptions

Section 18 of the FPA, 16 U.S.C. § 811, states that the Commission is to require construction, operation, and maintenance by a licensee of such fishways as may be prescribed by the Secretaries of the U.S. Department of Commerce (Commerce) or the U.S. Department of the Interior (Interior). On March 11, 2021, Interior timely filed preliminary fishway prescriptions for the project. On March 11, 2021, Interior and NMFS requested that the Commission include a reservation of authority to prescribe fishways under section 18 in any license issued for the project. Interior's prescriptions are included in Appendix D and summarized in section 2.4, *Modifications to Applicants' Proposals – Mandatory Conditions*.

Section 10(j) Recommendations

Under section 10(j) of the FPA, 16 U.S.C. § 803(j)(1), each hydroelectric license issued by the Commission must include conditions based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, or enhancement of fish and wildlife resources affected by the project. The Commission is required to include these conditions in any new or subsequent license unless it determines that they are inconsistent with the purposes and requirements of the FPA or other applicable law. Before rejecting or modifying an agency recommendation, the Commission is required to attempt to resolve any such inconsistency with the agency, giving due weight to the recommendations, expertise, and statutory responsibilities of such agency.

Interior timely filed recommendations under section 10(j) on March 11, 2021. These recommendations are summarized in table 8. In section 5.3, *Fish and Wildlife Agency Recommendations*, we discuss how we address the agencies' recommendations and comply with section 10(j).

Clean Water Act

Under section 401(a)(1) of the Clean Water Act (CWA), 33 U.S.C. § 1341(a)(1), a license applicant must obtain either a water quality certification (certification) from the appropriate state pollution control agency verifying that any discharge from the project would comply with applicable provisions of the CWA, or a waiver of such certification. A waiver occurs if the state agency does not act on a request for certification within a reasonable period of time, not to exceed one year after receipt of such request.

On March 12, 2021, White Pine Hydro applied to the Maine Department of Environmental Protection (Maine DEP) for water quality certification (certification) for the project, which Maine DEP received on the same day. Maine DEP issued the certification on March 4, 2022. The conditions of the certification are described under section 2.4, *Staff*

Alternative with Mandatory Conditions. The certification is included in Appendix E for informational purposes.

Endangered Species Act

Section 7 of the Endangered Species Act (ESA), 16 U.S.C. § 1536, requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of the critical habitat of such species. On June 24, 2021, we accessed the U.S. Fish and Wildlife Service's (FWS) Information for Planning and Consultation (IPaC) database to determine whether any federally listed species could occur in vicinity of either project. According to the IPaC database, the federally threatened northern long-eared bat (NLEB) and small whorled pogonia and the candidate monarch butterfly may occur in the vicinity of the project.[48] No critical habitat has been designated for either species.

Our analysis of the impacts of the project on the NLEB and small whorled pogonia is presented in section 3.3.3, *Threatened and Endangered Species, Environmental Effects*, and our recommendations are included in section 5.1, *Comprehensive Development and Recommended Alternative*. Maintenance activities at the Hiram Project during the term of a new license would require periodic tree trimming and removal; however, tree removal would not affect NLEB habitat because tree removal would not be conducted between April 20 and October 15 unless it was an emergency. We conclude that relicensing the Hiram Project may affect the NLEB, but any incidental take that may result from maintenance activities is not prohibited by the final 4(d) rule of the ESA.[49]

White Pine Hydro's surveys did not identify any small whorled pogonia within the project boundary. We conclude that relicensing the project would have no effect on this species.

Monarch butterfly may use project lands for summer breeding. Because White Pine Hydro proposes no changes to project operation or facilities, there would be no effect on summer breeding habitat and the project would not affect this species.

Magnuson-Stevens Fishery Conservation and Management Act

Section 305 of the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. § 1855(b)(2), requires federal agencies to consult with NMFS on all actions that may adversely affect Essential Fish Habitat (EFH). EFH for Atlantic salmon has been defined as, "all waters currently or historically accessible to Atlantic salmon within the streams, rivers, lakes,

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[48] *See* Interior's official list of threatened and endangered species, accessed by staff using the IPaC database (https://ipac.ecosphere.fws.gov) on March 3, 2022, and placed into the records for Docket No. P-2530-057 on the same day.

[49] 81 Fed. Reg. 1900-22 (Jan. 14, 2016).

ponds, wetlands, and other water bodies of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut," which includes the project area.

The project area includes EFH for Atlantic salmon because it is in Maine and on the Saco River, which contains habitat currently accessible to Atlantic salmon up to the project's dam. Although the project's dam currently blocks upstream fish passage, the Saco River upstream of the dam also includes EFH for Atlantic salmon because it was historically accessible to this species. Our analysis of project effects on Atlantic salmon EFH is presented in section 3.2.1. We conclude that relicensing the project under the staff alternative with mandatory conditions would have minor adverse effects on EFH, but the habitat and passage improvements included in this alternative (e.g., fish passage facilities) would provide a net benefit to EFH. Therefore, over the long term, aquatic habitat and EFH would be enhanced over existing conditions. On September 24, 2021, we provided NMFS with our EFH assessment and requested that NMFS provide any EFH recommendations. NMFS has not yet acted on the request.

Coastal Zone Management Act

Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), 16 U.S.C. § 1456(c)(3)(A), the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA Program, or the agency's concurrence is conclusively presumed by its failure to act within 180 days of its receipt of the applicant's certification.

White Pine Hydro filed on July 14, 2021, an email dated the same day from Maine Department of Marine Resources stating that the project is not located in Maine's designated coastal zone and CZMA consistency review is not required.

National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA), 54 U.S.C. § 306108, requires that every federal agency "take into account" how each of its undertakings could affect historic properties. Historic properties are districts, sites, buildings, structures, traditional cultural properties, and objects significant in American history, architecture, engineering, and culture that are eligible for inclusion in the National Register of Historic Places (National Register).

In response to White Pine Hydro's September 21, 2015, request, Commission staff designated White Pine Hydro as its non-federal representative for the purposes of conducting section 106 consultation under the NHPA on January 21, 2016. Pursuant to section 106, and as the Commission's designated non-federal representative, White Pine Hydro initiated consultation with the Maine Historic Preservation Officer (Maine SHPO) to identify historic properties, determine National Register eligibility, and assess potential adverse effects on historic properties within the project's area of potential effects. The results of White Pine Hydro's cultural resources investigations indicate that continued operation and maintenance of the project would have no effect on six sites that are potentially eligible for listing on the National Register. White Pine Hydro's investigations also identified eight culturally sensitive areas located around the impoundment, but the sites could not be surveyed because permission could not be obtained from landowners to access these areas.

White Pine Hydro proposes to implement a Historic Properties Management Plan (HPMP) that includes a schedule to periodically request landowner permission over any new license term to survey the remaining eight archaeologically sensitive areas it could not access during the pre-licensing process.

The Maine SHPO concurs with White Pine Hydro's findings of no effect for the potentially eligible sites, provided White Pine Hydro conducts Phase II surveys post-licensing to confirm the sites' eligibility.[50] The Maine SHPO also recommends that White Pine Hydro complete a post-licensing Phase IB survey of the eight culturally sensitive areas once it obtains landowner permission and that this be done yearly.[51] The Maine SHPO, however, did not concur with White Pine Hydro's findings of its Historic Architecture Survey that the project facilities are not eligible for listing on the National Register, and recommended that White Pine Hydro revise its draft HPMP to include the project as an eligible facility and measures to protect its integrity. White Pine Hydro filed a revised HPMP that incorporates all the Maine SHPO's recommendations. The Maine SHPO concurred with the revised HPMP in its letter filed on August 10, 2021.

Our analysis in section 3.2.5 of this EA concurs with White Pine Hydro's findings of no effect on the six potentially eligible sites and its recommendations to conduct further surveys of the eight archaeologically sensitive areas as part of the HPMP. We also concur with the Maine SHPO's finding that the project facilities are eligible for listing on the National Register. As discussed in section 3.2.5 of this EA, we find that implementing White Pine Hydro's HPMP would protect cultural resources, including the integrity of the project facilities, by directing the long-term management of historic properties and archaeological sites within the APE and including measures to avoid, minimize, or mitigate adverse effects on historic properties throughout the term of a new license.

To meet the requirements of section 106, Commission staff intends to execute a Programmatic Agreement with the Maine SHPO for the protection of historic properties from the effects of operating the Hiram Project. The terms of the Programmatic Agreement would require White Pine Hydro to address and treat all historic properties identified within the project's APE by implementing the HPMP.

Executive Orders 12898 and 14008

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[50] *See* February 21, 2020 letter from J. N. Leith Smith, Maine Historic Preservation Commission, to Frank H. Dunlap, Brookfield White Pine Hydro, LLC, filed with the Commission on February 25, 2021.

[51] *See* March 2, 2020, letter from Arthur Spiess, Senior Archaeologist, Maine Historic Preservation Commission, to Frank Dunlap, Licensing Specialist, Brookfield White Pine Hydro, LLC, filed with the Commission on February 25, 2021.

In conducting NEPA reviews of proposed hydropower projects, the Commission follows the instruction of Executive Order 12898, which directs federal agencies to identify and address "disproportionately high and adverse human health or environmental effects" of their actions on minority and low-income populations (i.e., environmental justice communities).[52] Executive Order 14008 also directs agencies to develop "programs, policies, and activities to address the disproportionately high and adverse human health, environmental, climate-related and other cumulative impacts on disadvantaged communities, as well as the accompanying economic challenges of such impacts."[53] Environmental justice is "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (EPA, 2021a).

Staff identified one environmental justice community within a 1-mile radius of the project boundary and considered how the community may be affected by noise, visual, and traffic impacts from the modification and installation of new recreation facilities, concentration of recreational activity, and the effect of project operation and recreation on subsistence fishing. Our analysis of the project's impacts on these communities are presented in section 3.2.7, *Environmental Justice*. We conclude that relicensing the project, as proposed with staff's recommended measures or as would be required under the staff alternative with mandatory conditions, would not result in disproportionately high and adverse impacts on the identified environmental justice population.

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[52] Exec. Order No. 12,898, 59 Fed. Reg. 7629 (Feb. 16, 1994). While the Commission is not one of the specified agencies in Executive Order 12898, the Commission nonetheless addresses environmental justice in its analysis, in accordance with our governing regulations and guidance, and statutory duty to evaluate all factors bearing on the public interest.

[53] Exec. Order No. 14,008, 86 Fed. Reg. 7619 (Feb. 1, 2021). The term "environmental justice community" includes disadvantaged communities that have been historically marginalized and overburdened by pollution. *Id.* § 219, 86 Fed. Reg. 7619, 7629. The term also includes, but may not be limited to, minority populations, low-income populations, or indigenous peoples (EPA, 2021b).

APPENDIX B

STAFF RESPONSE TO COMMENTS ON DRAFT ENVIRONMENTAL ASSESSMENT

Commission staff issued its draft environmental assessment (draft EA) for the relicensing of the Hiram Hydroelectric Project (Hiram Project) on September 22, 2021. Staff requested comments on the draft EA to be filed by October 22, 2021. The Sebago Chapter of Trout Unlimited (Sebago TU) filed comments on October 22, 2021.

Below, we summarize the comments received on the draft EA that pertain to our analysis; respond to those comments; and indicate, where appropriate, how we modified the EA. The comments are grouped by topic for convenience. We do not summarize and respond to comments that request legal determinations, only express opinions (e.g., either for or against the proposed project or the staff alternative), or simply reiterate a stakeholder's position or recommendation.

General

Comment: Sebago TU states that, under the precedent set by *American Rivers III*,[54] the draft EA may not limit its analysis to impacts of its action on the current situation but must take into account the cumulative impacts of the dam, and even other dams, on the river system over time. To meet this standard, Sebago TU states that the draft EA must use the original (pre-dam) conditions as the baseline against which to compare the impacts of the proposed license action. Using these conditions as baseline, Sebago TU states that the Commission must not issue a license or relicense the project unless it first determines that the proposed action "*will be best adapted to use for a comprehensive plan for improving or developin*g" the waterway, giving equal weight to the impacts on fish and wildlife, recreation and the environment when compared with the pre-dam, and cumulative impacts conditions.

Response: Contrary to Sebago TU's assertion, the Commission's long-standing policy, which has been upheld in the courts, is to use the environment as it exists at the time of relicensing as the environmental baseline, not pre-project conditions.[55]

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[54] *American Rivers v. FERC*, 187 F.3d 1007, amended and rehearing denied, 201 F.3d 1186 (9th Cir., 1999).

[55] *See, e.g.*, *Conservation Law Foundation, et al. v. FERC*, 216 F.3d 41 (D.C. Cir. 2000)(treating existing conditions at the dam as the baseline "no action" option did not violate the Commission's duty of protecting, mitigating damage to, and enhancing fish and wildlife). Also, in accordance with the new CEQ regulations (*see* n.2 *supra*), which eliminated the term "cumulative impacts," we considered "the changes to the human environment from the proposed action or alternatives that are reasonably foreseeable and have a reasonably close causal relationship to the proposed action or alternatives, including those effects that occur at the same time and place as the proposed action or alternatives and may include effects that are later in

Comment: Sebago TU states that the Federal Power Act (FPA) standard in Sections 4(e) and 10(a)(1) requires the Commission to give equal consideration to the power development and to the purposes of the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Sebago TU states that the draft EA recommends a small number of very minor remediations to balance out, on behalf of the environment and the public, the equal value in annual hydropower generation dollars to the license applicant. For example, Sebago TU suggests that although the draft EA considered the cost of construction and operation of proposed environmental measures such as an upstream fishway and minimum flows over the dam, it did not evaluate the environmental or recreational value of these measures. Thus, Sebago TU states that the draft EA failed to equally balance the project's environmental and recreational purposes and instead bases its recommendations solely on the economics of power generation, without adequate environmental study data. Sebago TU requests the draft EA be revised to comply with the clear and explicit requirements of the FPA.

Response: Sebago TU's comments suggest that section 4(e) requires that the National Environmental Policy Act (NEPA) analysis must assign a dollar value to the benefits of proposed measures to appropriately balance the development and non-development values. Nothing in the FPA requires the Commission to place a dollar value on nonpower benefits. Nor does the fact that the Commission assigns dollar figures to the licensee's economic costs require that the Commission do the same for nonpower benefits: "Equal consideration is not the same as equal treatment."[56]   Where the dollar cost of enhancement measures, such as diminished power production, can be reasonably ascertained, we did so in section 4 and in table 9 (Appendix C). However, for non-power resources such as aquatic habitat, fish and wildlife, recreation, and cultural and aesthetic values, to name just a few, the public interest cannot be evaluated adequately only by dollars and cents. In section 5.1, *Comprehensive Development and Recommended Alternative* of the EA, we explain the basis for our recommendations, giving equal consideration to development and non-developmental values.

Aquatic Resources

Comment: Sebago TU states that dewatering the Hiram Falls significantly impairs water quality and is highly detrimental to aquatic species and plant life. Sebago TU contends that the draft EA did not include an analysis, including a cumulative analysis, of the water quality impairments and impacts resulting from dewatering a significant river reach downstream for extended periods during the year.

Response: As discussed in section 3.2.1, *Aquatic Resources*, White Pine Hydro measured temperature and dissolved oxygen (DO) from July through September in the Hiram Falls

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time or farther removed in distance from the proposed action or alternatives." *See* 40 C.F.R. § 1508.1(g) (2021).

[56] *Conservation Law Foundation, et al. v. FERC*, 216 F.3d 41 (D.C. Cir., 2000), citing *California v. FERC*, 966 F.2d 1541, 1550 (9th Cir. 1992).

bypassed reach pools during warmwater, low flow, and non-spill conditions and found temperatures ranged from 61.5ºF to 86.2ºF and DO concentrations at or above Maine's standard of 7.0 mg/L in 99.7 percent of the hourly measurements. In the project's tailwater, downstream of the bypassed reach, White Pine Hydro collected 1,505 hourly measurements of DO in the project's tailwater, of which 97.8 percent of the measurements were above the State of Maine's Class A water quality standard. Although a few cases of low DO occurred, these cases were infrequent, intermittent, and lasted no longer than 2 hours. Further the project is operated in a run-of-river mode which prevents dewatering of the river below the project. Therefore, there is no evidence that the project is adversely affecting water quality.

Comment: Sebago TU states that the draft EA seems to claim, without citing any supporting data or reason, that the current population of wild brook trout in the tributaries surrounding the project is sufficient simply by virtue of it's being self-sustaining and suggests that any effort to improve its numbers and diversity by requiring a fishway is outweighed by the cost. Sebago TU also suggests that no effort was made to quantify the effects of the project on brook trout and the draft EA greatly understates and simplifies the need for brook trout mobility to ensure healthy and diverse populations.

Response: In the draft EA, we acknowledge that brook trout occur in the project area and that some fish within resident trout populations, can and do make annual movements for various purposes such as dispersal and spawning. However, our analysis indicates that there is no evidence of significant adverse effects on the brook trout population as a whole due to the lack of passage conditions at Hiram Dam. Therefore, there would be only minor benefits to the trout population from installing a fish ladder, and we continue to find that this benefit does not outweigh the cost of installing a fish ladder specifically for resident fish populations.

Comment: Sebago TU states that because there is no data to assess mortality of American eel during downstream passage through the project, no informed conclusions can be drawn as part of the draft EA analysis to justify that eel passage measures are not warranted at this time.

Response: Sebago TU's comments seem to suggest that precise study data on eel mortality rates is needed to inform conclusions about the need for downstream eel passage measures. To the contrary, sufficient information exists, as summarized in section 3.2.1.2, *Environmental Effects*, that shows any eels moving downstream of the project would likely pass through the project turbines, the existing trash rack bar spacing would not prevent entrainment of adult American eels, and most flow passes through the turbines except during periods of spill. Based on a review of the literature, staff estimated that eel passage through the project's Francis turbines could result in mortality rates from 2 to 41 percent. However, based on the low number of juvenile eels observed attempting to pass upstream of the dam along with the lack of substantial eel mortality reported downstream of the project, we found that either there are a low number of adult eels out-migrating past the dam or turbine passage survival is high. In either case, we are recommending that once a sufficient number of eels are present at the project, White Pine Hydro should install and operate a permanent downstream American eel passage facility or implement operational measures that would limit turbine passage of eel at the project. In the interim, White Pine Hydro would monitor weekly for eel mortality from September 15 through

November 15, and implement interim measures to minimize losses if more than 50 adult eel are found dead below the project. Therefore, we continue to find that the benefits of installing downstream passage facilities for American eel at this time do not justify the cost.

Comment: Sebago TU states that its request for studies to determine whether fishways are needed to protect white suckers and brook trout was rejected by White Pine Hydro and that its concern about these native species has not been addressed, despite staff's conclusion that there is no evidence that fishways are needed.

Response: As discussed in section 3.2.1.2 *Environmental Effects*, fish assemblage studies conducted in 2006 and 2019 in the Saco River near the Hiram Project found white sucker to be in relatively high abundance both upstream and downstream of the dam. Therefore, our analysis found that white sucker are able to maintain populations in the Saco River near the Hiram Project, and there was no evidence that white sucker require fish passage at Hiram Dam to complete their life cycle.

In regard to brook trout, although White Pine Hydro did not conduct a study of brook trout using the methods recommended by Sebago TU, White Pine Hydro did tailor a portion of its fish assemblage study to determine whether brook trout use waters in the mainstem of the Saco River, including the project area. Our analysis addressed the need for fishways for brook trout and found that the presence of self-sustaining wild brook trout in tributary streams both upstream and downstream of the Hiram Project suggests that, despite the lack of fish passage, successful reproduction and rearing in areas upstream and downstream of the dam still occurs, and there is no evidence that brook trout require fish passage at Hiram Dam to complete their life cycle.

For these reasons, we continue to find that the benefits of installing upstream fish passage facilities for white sucker and brook trout do not justify the cost.

Comment: Sebago TU states that the draft EA notes the prescriptive authority retained by the Department of the Interior to require fishways at the project but did not include any reference to the State of Maine's fishway prescription authority under its Clean Water Act Water Quality Certification program.

Response: Any license for the project would be subject to the requirements of the FPA and other applicable statues including the Clean Water Act (CWA). Under section 401(a)(1) of the CWA,[57] White Pine Hydro must obtain certification from Maine DEP. On March 12, 2021, White Pine Hydro applied to Maine DEP for water quality certification for the project. Maine DEP issued a water quality certification for the project on March 4, 2022 which included conditions requiring fishways, which are addressed in this Final EA.

Project Boundary Modifications

[57] 33 U.S.C. § 1341(a)(1).

Comment: Sebago TU states that White Pine Hydro's proposal to remove project lands from the project boundary is problematic because the areas proposed for removal serve a project purpose and would be excluded from full consideration in Commission actions in the future. Sebago TU states that although it has demonstrated that these lands are needed for flood control and recreation, White Pine Hydro did not provide any rationale for removing the lands except to state that they are not needed for project purposes. Further, Sebago TU states, "the DEA does not present any information to refute these contentions, only that they are not used for recreational purposes." Sebago TU requests that the FEA include justification for removing or retaining the project lands.

Response: As discussed in section 5.1.2, *Additional Measures Recommended by Staff*, Commission regulations at 18 C.F.R. 4.51(h) require that the project boundary enclose only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of environmental resources. As explained in the analysis, because the project has no appreciable storage or flood control capacity, and no changes in project operation are being considered, the lands are not needed for flood control or other operational purposes. Likewise, the wetlands that are established in Parcel A that is to be removed from the project boundary are located above the normal full pond level, thus continued operation in a run-of-river mode with stable reservoir levels would not affect these wetlands. The land and water associated with Parcel B do not provide for project recreation. Sufficient lands are being retained to operate and maintain the Canoe Portage, Downstream Access Trail and Sandbar Area, and Nature Study Area. As explained in the EA, removing Parcel B would remove the Overlook from the project boundary; however, this would not have a significant effect on project recreation because the site is rarely used and does not provide a view of the Hiram Falls due to the dense forest of hardwoods and evergreens. Approximately 1.5 - 2 acres of forest likely would need to be cleared to provide a view of Hiram Falls from the Overlook and no one has suggested that the forest be cleared to provide such views. Therefore, we continue to find that the land and waters proposed to be removed from the project boundary (Parcels A and B) do not serve any project purpose and can be removed.

Recreation Resources

Comment: Sebago TU reiterates its prior comments stating that parking has been reduced by the applicant over the years and again stresses the importance of a comprehensive recreation study to gather data to make an informed decision about parking at the west bank.

Response: As explained in the EA, sufficient information exists to characterize parking at the project site and to conclude that the site is meeting existing needs. As discussed in section 5.1.2, *Additional Measures Recommended by Staff*, we recommend that White Pine Hydro monitor and evaluate recreation needs at the project and that White Pine Hydro's evaluation should also consider parking needs. This should be adequate to determine if needs are changing and if more parking is warranted in the future.

Comment: Sebago TU states, "when fencing was installed on the east shore for powerhouse security, parking close to the fisherman's trail was discontinued. It was not replaced. The DEA makes no mention of this."

Response: The EA does not describe a historical "fisherman's trail" on the east shore because there is no information in the record regarding such a trail or the need to replace such a trail. Sebago TU's comments on the EA is the first mention of such a trail. Nevertheless, in the EA, we assessed the recreation use of the project's existing recreation facilities and found that with staff's recommended improvements, the existing recreation facilities would continue to meet the project's recreation needs for the immediate future.

Comment: Sebago TU states that parking inside the gate at the Nature Study Area was eliminated and that the draft EA does not propose to replace the parking spaces.

Response: Current use of the Nature Study Area is relatively low and parking outside the project entrance gate on Pequawket Trail is adequately serving needs at the facility; therefore, we do not recommend adding parking spaces inside the gate as recommended by Sebago TU. We do recommend other improvements at the Nature Study Area, which are described in section 3.2.4.2 of the EA. If use increases at the Nature Study Area, more parking may be warranted. We recommend that White Pine Hydro's periodic evaluation of recreation needs consider whether more parking is warranted.

Comment: Sebago TU states that a "simple inspection [of the Old Portage Trail] would reveal that all that is needed [to use the trail] is normal trail maintenance." Therefore, Sebago TU again recommends replacing the existing Canoe Portage with the Old Portage Trail (see figure 8 in Appendix C).

Response: Our description of the existing portage trail conditions in the draft EA considers staff's observations during site visits and the recreation site inventory, both of which indicate that the current portage is sufficiently maintained, well-marked, wide, in good condition, and functioning as intended. Therefore, we continue to find that the current trail is sufficient to meet recreation needs.

Aesthetic Resources

Comment: Sebago TU suggests that the recreational features included as staff recommendations do not deal with the historically scenic value of Hiram Falls. Sebago TU states that the approximately 500 feet of fencing that was installed by Brookfield to restrict access to the dam is not needed and a much smaller fence built closer to the dam would serve the same purpose for public safety. Sebago TU states that the dam is still accessible by walking around the existing fence and therefore a smaller span of fence would allow for the traditional area on the west bank to be used again by residents to view the falls. Sebago TU states that members of the public are angry with the closure of the west bank and have resorted to vandalism, which involves walking around the existing fence.

Response: As explained in the EA, the chain link fence on the west bank was installed as a safety measure to prevent unauthorized access to project facilities. While the fence may not be entirely effective at eliminating the access and vandalism, reducing the size of the fencing would make the fencing even less secure and effective at preventing unauthorized access and increasing public safety. Therefore, we do not recommend modifying the 500-feet of fencing as recommended by Sebago TU.

Comment: Sebago TU states that painting the penstock accomplishes nothing unless it is accompanied by an area from which to view the falls, and without this view, invites more vandalism and graffiti.

Response: Painting the penstock a more natural color would reduce its contrast to the landscape and help make the project more aesthetically pleasing to those recreating on the sandbar and in the river below the dam. Therefore, we have no reason to modify our recommendation that White Pine Hydro paint the penstock a color that blends better with the surrounding landscape

APPENDIX C

FIGURES AND TABLES

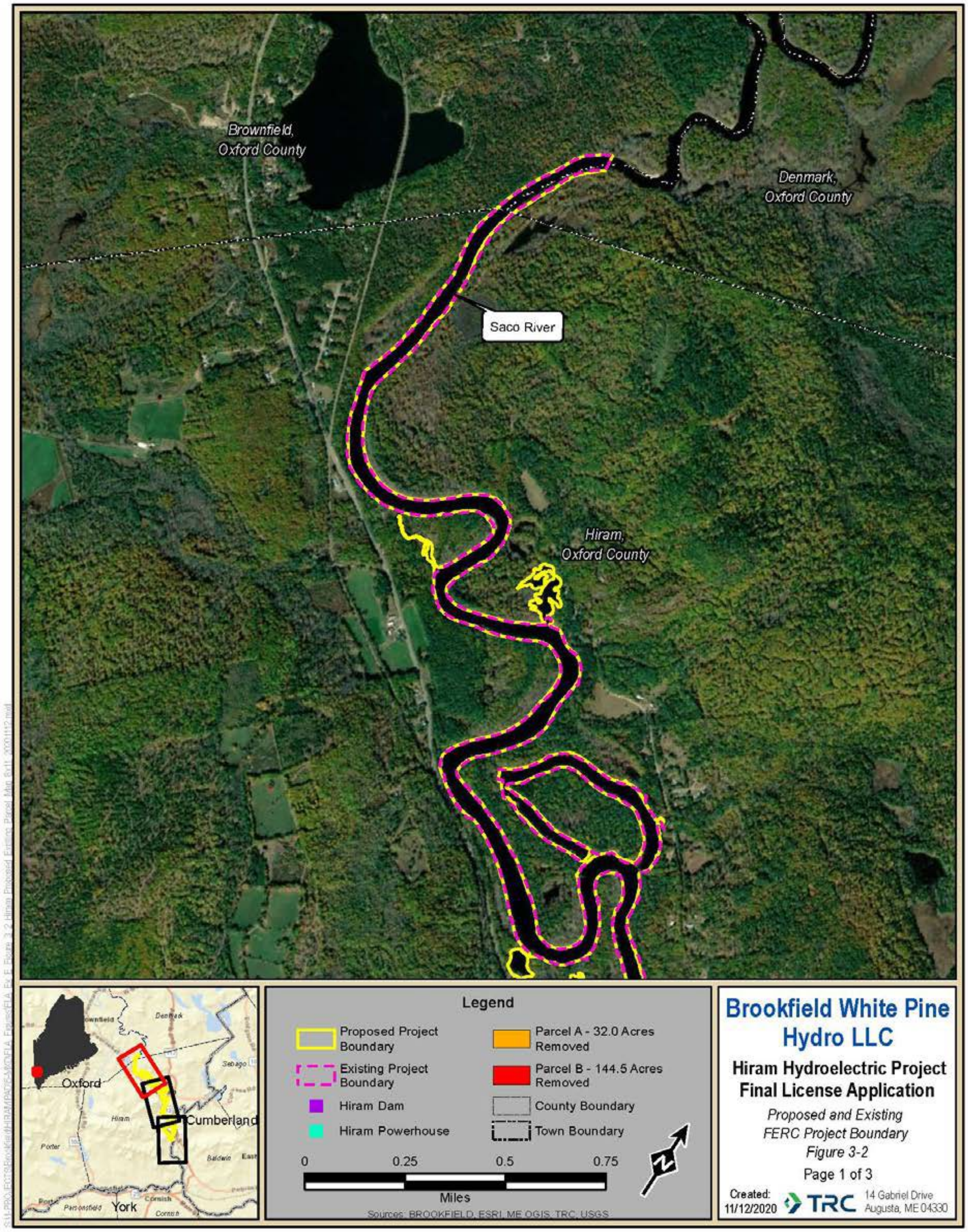

Figure 3. Existing and Proposed Project Boundary in Upper Reach of Hiram Project (Source: Application).

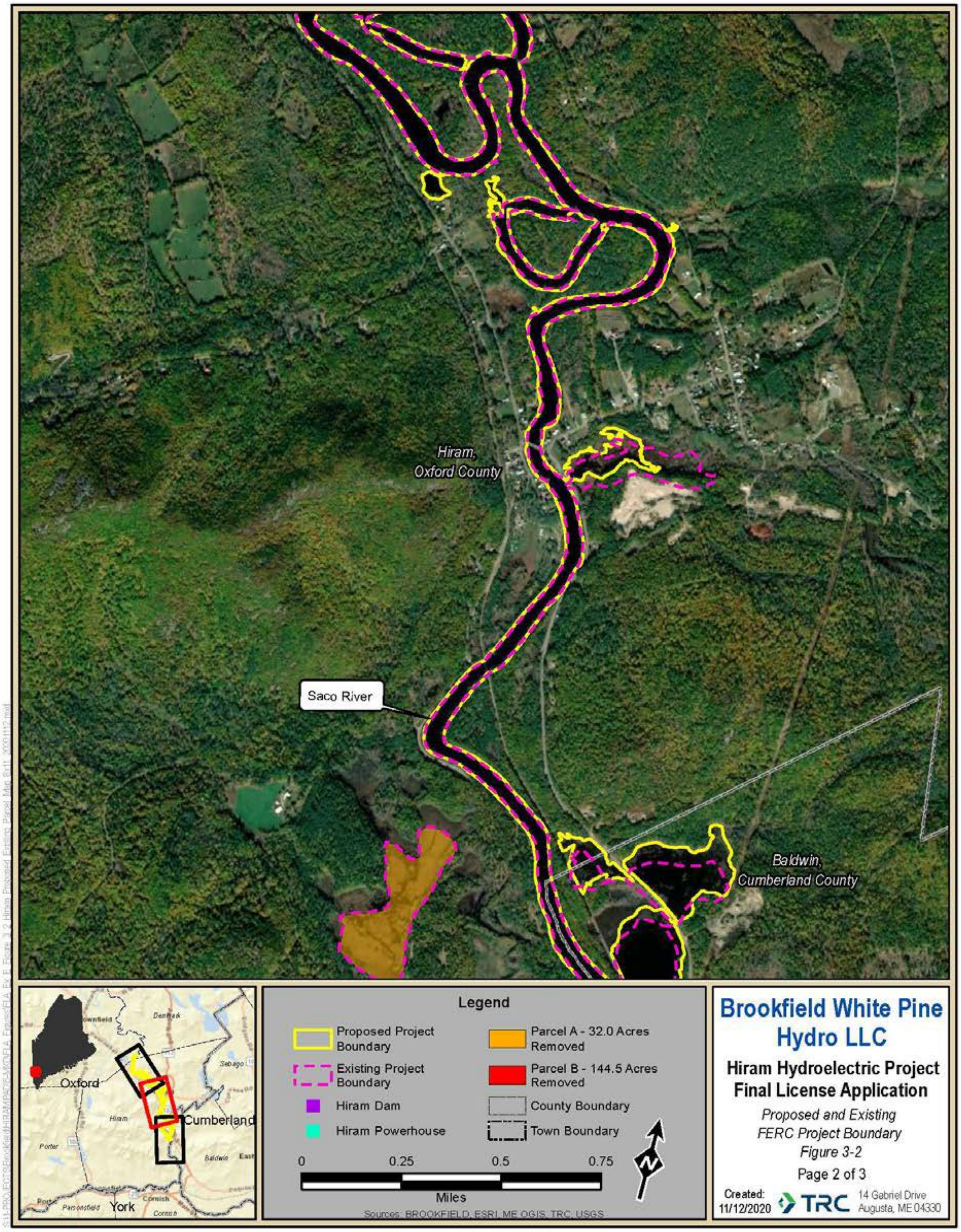

Figure *4*. Existing and Proposed Project Boundary for the Middle Reach of the Hiram Project (Source: Application).

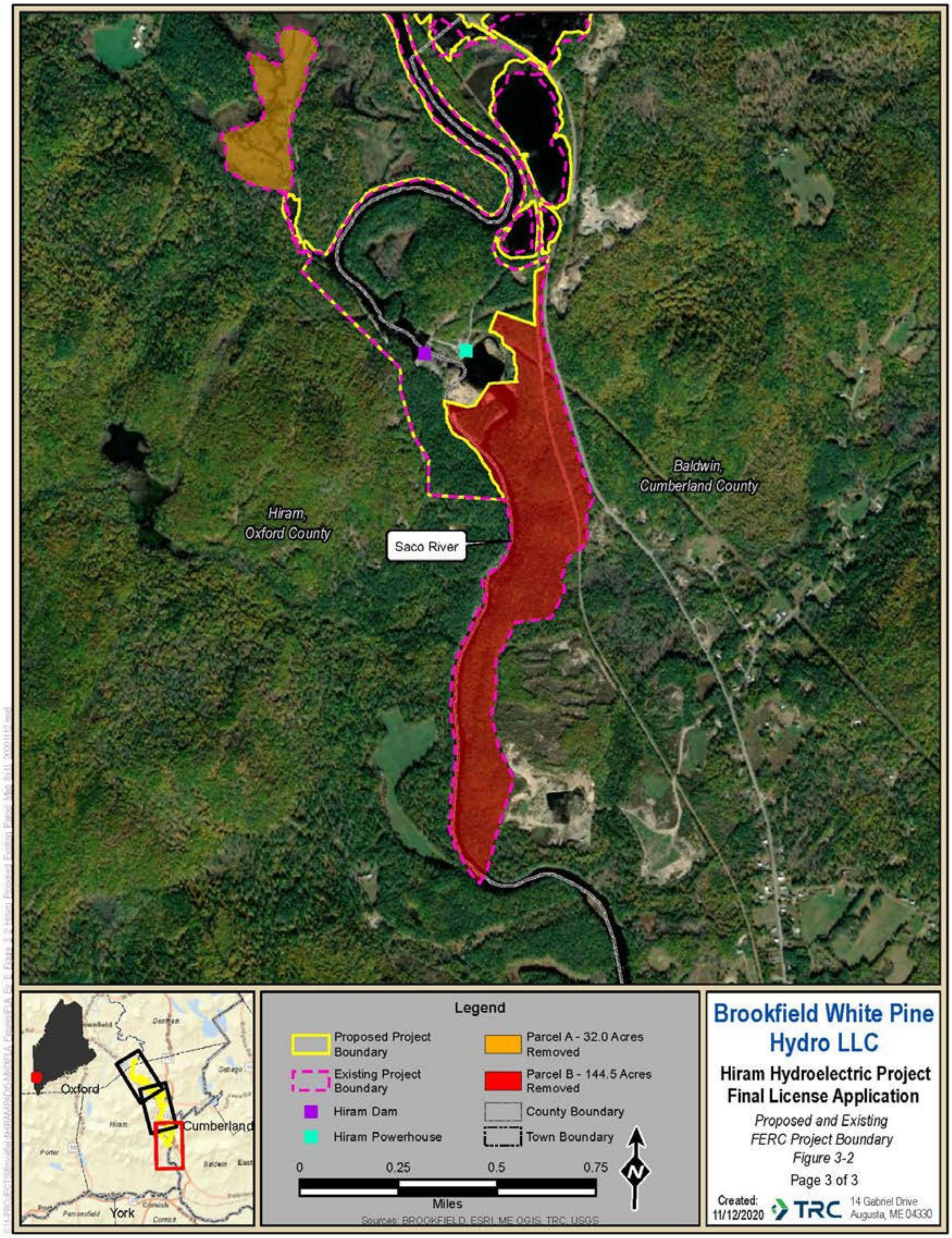

Figure 5. Existing and Proposed Boundary for the Lower Reach of the Hiram Project (Source: Application).

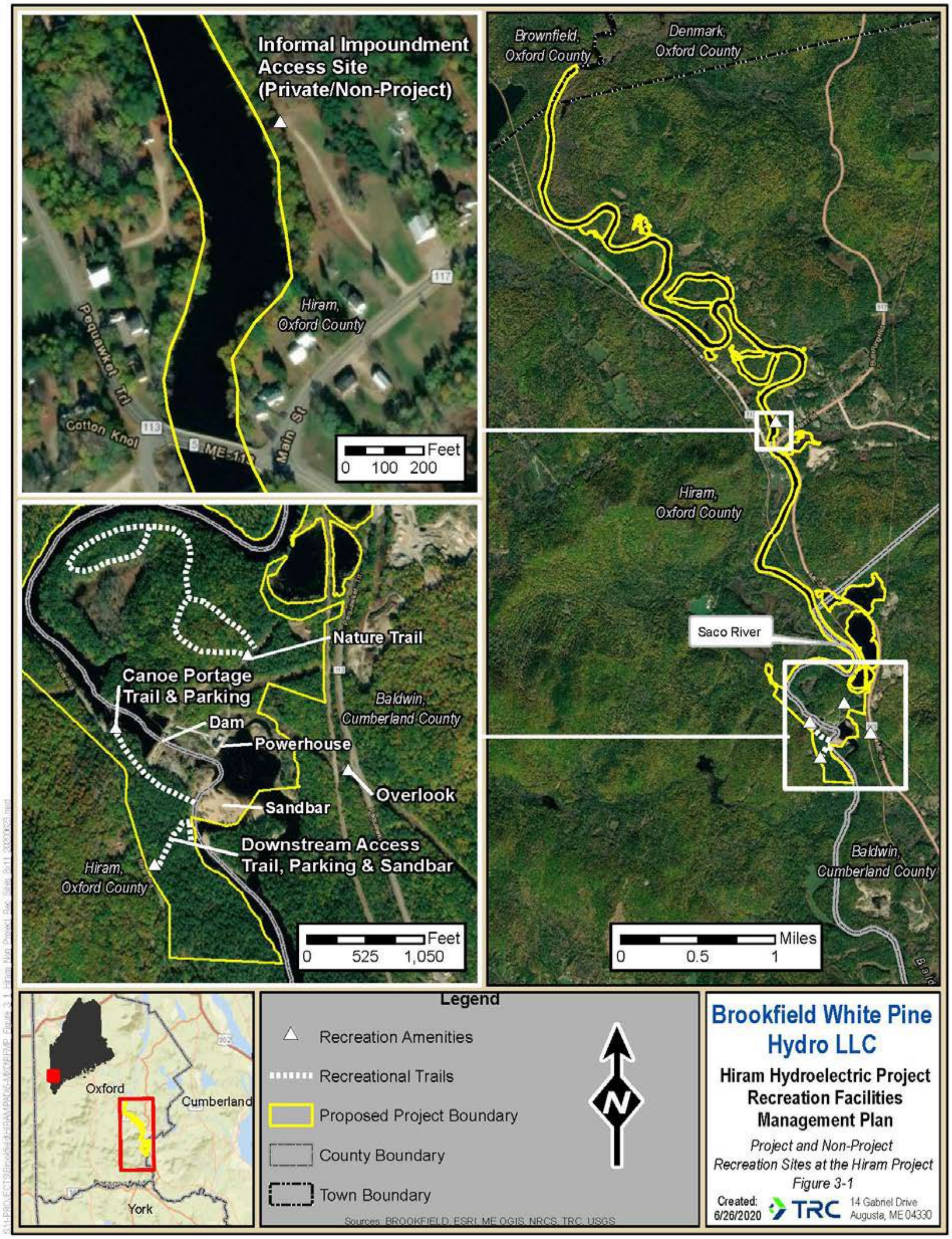

Figure 6. Existing Recreation Facilities Overlaid with the Proposed Project Boundary at the Hiram Project *(Source: Application).*

Figure 7. Trails and Parking Areas at the Hiram Project (Source: Sebago TU Motion to Intervene filed March 1, 2021).

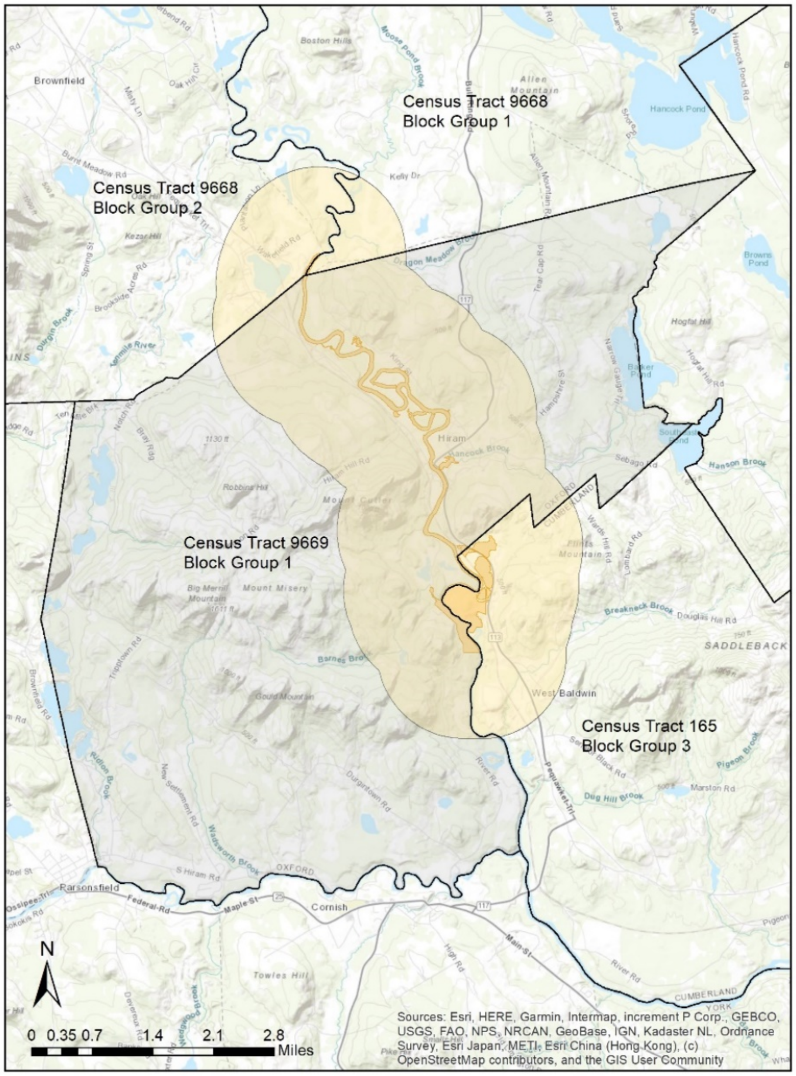

Figure 8. Block Groups and Environmental Justice Community within 1-mile of the project boundary (source: staff).

Table 2. Minimum, maximum, average, and median daily inflow for the project based on prorated gage data for the period 1990-2019 (Source: Application).

Month	Minimum (cfs)	Maximum (cfs)	Average (cfs)	Median (cfs)
January	385	7,308	1,693	1,442
February	473	6,218	1,322	1,083
March	522	9,853	2,136	1,860
April	744	13,311	4,665	3,997
May	724	11,223	3,034	2,701
June	350	17,552	1,727	1,312
July	241	6,264	1,121	744
August	189	6,147	894	579
September	162	6,395	754	526
October	164	9,331	1,462	923
November	325	9,461	2,156	1,847
December	488	8,874	2,207	1,876
Annual	162	17,552	1,931	1,390

Table 3. Number of American eel collected at upstream eelways on the mainstem Saco River (Source: White Pine Hydro, 2017, 2018, 2019, 2020, 2021).

Year	Cataract[a]	Skelton	Bar Mills[b]	West Buxton	Bonny Eagle	Hiram
2016	536	2,829	20	1,908	NA	NA
2017	2,030	6,965	2	2,425	NA	NA
2018	1,956	2,015	10	3,690	634	NA
2019	6,574	8,013	0	823	784	NA
2020	1,520	8,805	ND	3,307	598	NA

[a]Although the Cataract Project operates eelways on the East and West Channel Dams, only the eelway on the East Channel Dam was operated during this period.
[b]Because of flashboard leakage along the entire spillway, it is expected that juvenile eels are passing upstream of the Bar Mills Dam without using the eelway.

ND = No data, the Bar Mills Project was not operational in 2020.

NA = Not applicable, no upstream eelways installed at project.

Table 4. Recreation use per recreation facility location (Source: White Pine Hydro, 2015).

Project Recreation Facility	Capacity Utilization
Portage	5%
Nature Study Area	25%
Overlook	25%
Downstream Access Trail and Sandbar Area	40%

Table 5. Minority and low-income populations within one mile of the project boundary. (Source: U.S. Census Bureau, 2020, as modified by staff).

Race and Ethnicity											**Low Income**
Geographic Area	Total Population	White (%)	African American/ Black (%)	American Indian/ Alaska Native (%)	Asian (%)	Native HI & Other Pacific Islander (%)	Some Other Race (%)	Two or More Races (%)	Hispanic Origin (any race) (%)	Total Minority Population (%)	Households in Poverty (%)
Maine	n = 1,335,492	93.2% n = 1,244,531	1.3% n = 17,368	0.6% n = 8, 017	1.1% n = 14,946	0.03% n = 353	0.09% n = 1,192	2% n = 26,985	1.7% n = 22,100	6.8% n = 90, 961	12.2%
Cumberland County	n = 292,307	90.3% n= 263,921	2.9% n= 8,571	0.1% n= 375	2.1% n= 6,269	0.01% n=31	0.1% n= 435	2.3% n= 6,644	2.1% n= 6,061	9.7% n = 28,386	9.8%
Census Tract 165, Block Group 3	n = 1,506	99.4% n = 1,497	0.3% n = 4	0% n = 0	0% n = 0	0% n = 0	0% n = 0	0% n = 0	0.3% n = 5	0.6% n = 9	9.3%
Oxford County	n = 57,550	95.3% n = 54,829	0.4% n= 206	0.3% n= 171	0.4% n= 210	0.01% n= 7	0.01 n= 4	2.3% n= 1,110	1.4% n= 793	4.7% n = 2,721	13.5%
Census Tract 9668, Block Group 1	n = 1,282	98.7% n = 1,265	0% n = 0	0% n = 0	0.5% n = 7	0.5% n = 7	0% n = 0	0.2% n = 3	0% n = 0	1.3% n = 17	9.2%

Census Tract 9668, Block Group 2	n = 1,401	99.9% n= 1,399	0% n = 0	0% n = 0	0.1% n = 2	0% n = 0	0% n = 0	0% n = 0	0% n = 0	0.1% n = 2	11.4%
Census Tract 9669, Block Group 1	n = 1,747	92.2% n = 1,610	0% n = 0	2.3% n = 45	0% n = 0	0% n = 0	0% n = 0	4% n = 70	1.3% n = 22	**7.8% n = 137**	12.2%

Note: Gray shading indicates an environmental justice community.

Table 6. Parameters for economic analysis of project (Source: White Pine Hydro and staff) (All costs are escalated from 2019 and 2020 to 2022)

Parameter	Value
Installed Capacity	11.633 MW
Average annual generation (under no action alternative)	49,287 MWh
Period of analysis	30 years
Federal income tax rate	33%
Property Tax	$355,105
Insurance rate	Included in the O&M cost
Interest rate	5.5 %
Application cost	$769,450
Operation and maintenance [a]	$1,047,290/yr
Estimated Commission fees [b]	$30,000/yr
Cost of Alternative Power (2020) [c, d]	
1) Energy cost (2021)	$63.27/MWh
2) Dependable Capacity Cost (2021)	$162.14/kW-yr

[a] The annual O&M cost includes local property and real estate taxes, but excludes income taxes and cost of financing.

[b] The Commission collects an annual administration charge for all licensed projects that is based on the authorized installed capacity of the project and amount of federal land occupied by the project.

[c] The alternative source of power cost is based on the current cost of providing the same amount of generation and capacity from a natural gas-fired combined cycle plant, as reported by the U.S. Energy Information Administration (EIA), Annual Energy Outlook 2021, for the Division 1, New England Region. The total cost of alternative power, reported in table 7, is a combination of the cost of energy and capacity benefit.

[d] White Pine Hydro provided no estimate of the value of power.

Table 7 Summary of the annual cost of alternative power and annual power cost for four alternatives for the Hiram Project (Source: staff).

	No Action	**White Pine Hydro's Proposal**	**Staff Alternative**	**Staff Alternative with Mandatory Conditions**
Installed capacity	11.633 MW	11.633 MW	11.633 MW	11.633 MW
Annual generation	49,287 MWh	49,287 MWh	49,287 MWh	49,287 MWh
Capacity benefit [a]	8.90 MW	8.90 MW	8.90 MW	8.90 MW
Current alternative source of power cost [b]	$4,561,434	$4,561,434	$4,561,434	$4,561,434
Total annual project cost (2021) [c]	$1,596,050	$2,209,257	$2,171,388	$2,208,424
Difference between the alternative source of power cost and total annual project cost [d]	$2,965,384	$2,352,177	$2,390,046	$2,353,010

[a] Staff estimated the capacity benefit based on the ratio of the mean annual flow available for generation for each of 12 months, and the hydraulic capacity of the project. This ratio is multiplied by the authorized installed capacity to determine the capacity benefit.

[b] The value of power for the Hiram Project is based on the alternative source of power cost in the New England Region, as identified in table 6 in Appendix C above.

[c] Project costs include the cost of environmental measures listed in table 8 in Appendix C, and the costs identified in table 6 in Appendix C. All project costs were adjusted to 2021 dollars.

[d] A number in parentheses denotes that the difference between the alternative source of power cost and total project cost is negative, thus the project's cost to produce power is greater than the alternative source of power cost.

Table 8. Costa of environmental measures considered in assessing the environmental effects of operating the Hiram Project (Source: White Pine Hydro and staff). (All costs are escalated from 2020 to 2022)

Enhancement/Mitigation Measures	Entity	Capital cost ($2022)	Annual Cost[b] ($2022)	Levelized Annual Cost[c] ($2022)
Project Operation				
1. Continue to operate the project in a run-of-river mode where outflow approximates inflow by maintaining impoundment levels: (1) within 2 feet of normal full pond elevation of 349 feet or from the spillway crest when the rubber dams are down from November 16 through September 30; and (2) within one foot of full pool elevation of 349 feet or from the spillway crest when the rubber dams are down from October 1 through November 15. Continue to provide a 300-cfs minimum flow or inflow if less from the project powerhouse, or in the event the project powerhouse is inoperable, from the dam from November 16 through September 30. .	White Pine Hydro, Interior, Maine DEP, staff	$0[d]	$0[d]	$0[d]
2a. Operation Monitoring Plan.	White Pine Hydro, Maine DEP	$0 [d]	$5,000 [d]	$5,000 [d]

Enhancement/Mitigation Measures	Entity	Capital cost ($2022)	Annual Cost[b] ($2022)	Levelized Annual Cost[c] ($2022)
2b. Revise the Project Operations Monitoring Plan to include procedures for maintaining and calibrating all monitoring equipment, procedures for refilling the impoundment and maintaining flows downstream of the project following maintenance or emergency drawdown, and revised reporting requirements for deviations from the operating requirements of the license	Staff, Interior	$2,000[d]	$5,000 [d]	$5,138 [d]
Aquatic Resources				
3. Prepare a DO Monitoring Plan and conduct an additional season of post-license DO and temperature monitoring in the Hiram Falls reach and the tailwater area.	White Pine Hydro, Maine DEP	$5,000 [d]	$0 [d]	$344
4. Construct and operate upstream and downstream fish passage facilities for Atlantic salmon passage in accordance with the Fisheries Agreement.	White Pine Hydro, Interior, Maine DEP, staff	$6,500,000 [f]	$40,000 [f]	$487,235

Enhancement/Mitigation Measures	Entity	Capital cost ($2022)	Annual Cost[b] ($2022)	Levelized Annual Cost[c] ($2022)
5. Upon commencement of fish passage planning, consult with Maine DIFW to include, as needed, studies, measures and facilities to provide access to waters upstream and downstream of the Hiram dam for native trout species.	Maine DEP	Unknown – lacks specificity to determine a cost	Unknown – lacks specificity to determine a cost	Unknown – lacks specificity to determine a cost
6. Construct and operate upstream and downstream fish passage facilities for salmonids, including brook trout, by 2032.	Sebago TU	$6,500,000[d]	$40,000 [d]	$487,235
7. Design the upstream anadromous fish passage facility to pass white sucker.	Sebago TU	Unknown – lacks specificity to determine a cost	Unknown – lacks specificity to determine a cost	Unknown – lacks specificity to determine a cost
8. Conduct up to 3 years of passage studies to evaluate effectiveness of all newly constructed or significantly modified permanent upstream and downstream fish passage facilities or measures for Atlantic salmon.	White Pine Hydro, Interior, Maine DEP	$381,590 [e]	$0 [e]	$26,255

Enhancement/Mitigation Measures	Entity	Capital cost ($2022)	Annual Cost[b] ($2022)	Levelized Annual Cost[c] ($2022)
9. Continue to monitor for American eel mortality downstream from Hiram Dam from September 15 through November 15	White Pine Hydro, Interior,	$0 [f]	$0[f]	$0
10. Construct and operate upstream and downstream passage facilities for American eel in accordance with the Fisheries Agreement.	White Pine Hydro, Interior, Maine DEP, staff	$300,000 [e]	$30,000 [e]	$50,641
11. Achieve a 90-percent passage efficiency for American eel at downstream passage facilities or measures.	White Pine Hydro, Interior, Maine DEP	Unknown – lacks specificity to determine a cost	Unknown – lacks specificity to determine a cost	Unknown – lacks specificity to determine a cost

Enhancement/Mitigation Measures	Entity	Capital cost ($2022)	Annual Cost[b] ($2022)	Levelized Annual Cost[c] ($2022)
12. Until downstream passage facilities are installed for American eel, cease generation from September 1 through October 31 during nighttime hours.	Sebago TU	$0 [g]	$88,208[g]	$45,747
13. Upgrade the existing trashracks to include 0.75-inch mesh screens	Sebago TU	$500,000[d]	$15,000[d]	$49,402
14. Conduct up to 3 years of passage studies to evaluate effectiveness of all newly constructed or significantly modified permanent upstream and downstream fish passage facilities or measures for American eel	White Pine Hydro, Interior, Maine DEP	$120,000 [e]	$0 [e]	$8,256
15. Conduct reasonable, cost-effective adjustments to the facilities or measures in an effort to improve fish passage effectiveness in accordance with the Fisheries Agreement.	White Pine Hydro, Interior, Maine DEP	Unknown – lacks specificity to determine a cost	Unknown – lacks specificity to determine a cost	Unknown – lacks specificity to determine a cost

Enhancement/Mitigation Measures	Entity	Capital cost ($2022)	Annual Cost[b] ($2022)	Levelized Annual Cost[c] ($2022)
16. Operate each fish passage facility for a one-season "shakedown" period and make minor adjustments to facilities and operations in accordance with the Fisheries Agreement.	White Pine Hydro, Interior, Maine DEP, staff	$0[h]	$0[h]	$0
17. Once installed, operate the upstream eelway from June 1 to September 15, and the downstream eel passage facilities or measures at night from September 15 to November 15. For Atlantic salmon operate the upstream fishway from May 1 to October 31 and the downstream passage facilities from April 1 to June 30 (smolts and kelts) and from October 15 to December 31 (kelts).	Interior, staff	$0[h]	$0[h]	$0
18. Develop fish passage operation and maintenance plan in accordance with the Fisheries Agreement	Interior, White Pine Hydro, Maine DEP, staff	$5,000[d]	$3,000[d]	$3,344
19. Design fish passage facilities to be consistent with the FWS' Fish Passage Engineering Design Criteria Manual.	Interior	Unknown	Unknown	Unknown

Enhancement/Mitigation Measures	Entity	Capital cost ($2022)	Annual Cost[b] ($2022)	Levelized Annual Cost[c] ($2022)
Threatened and Endangered Species				
20. Avoid tree removal from April 20 through October 15 to protect NLEB.	Interior, Staff	$0	$0	$0
Recreation				
21. Implement the Recreation Facilities Management Plan (Recreation Plan) including the following:				
21a. Maintain and monitor the Canoe Portage recreation site.	White Pine Hydro, Staff, Maine DEP	$0	$1,090	$1,090
21b. Maintain and monitor the Downstream Access Trail and Sandbar Area recreation site. Install additional signage, 3 picnic tables, a portable restroom (seasonal), and conduct seasonal trash service. Install an overnight security gate.	White Pine Hydro, Staff, Maine DEP	$81,770	$16,350	$21,975

Enhancement/Mitigation Measures	Entity	Capital cost ($2022)	Annual Cost[b] ($2022)	Levelized Annual Cost[c] ($2022)
21c. Maintain and monitor the Nature Study Area recreation site with the current outside the gate parking area and public walk-in access; remove the informational kiosk, picnic area, and parking adjacent to the study area.	White Pine Hydro, Maine DEP	$0	$2,180	$2,180
21d. Discontinue the Overlook as a project recreation site.	White Pine Hydro, Staff	$0	$0	$0
21e. Evaluate recreation needs and revise the Recreation Plan as needed every 10 years.	White Pine Hydro	$0	$5,450	$5,450
22. Revise and implement the Recreation Plan as proposed above in items 20a, b, d, and e with the following modifications:	Staff	$3,000[i]	$0	$206
22a. Replace or repair the two picnic tables and their shelters at the Nature Study Area and remove the picnic tables in disrepair; repair or replace plant identification signs along trail as needed; and install a new sign at the entrance to the access road that directs users to the recreation site that includes a map of the Nature Trail, its length, and hours of operation.	Staff	$6,600[d]	$0[j]	$454

Enhancement/Mitigation Measures	Entity	Capital cost ($2022)	Annual Cost[b] ($2022)	Levelized Annual Cost[c] ($2022)
22b. Include a schedule for periodic litter removal from all project recreation areas and from behind the powerhouse.	Staff, Sebago TU, and members of the public	$500[k]	$0	$34
22c. Install a security camera on the powerhouse to monitor for inappropriate use of the Downstream Access Trail and Sandbar Area.	Staff	$5,000[d]	$0	$344
23. Provide a boat launch on the impoundment by either securing the necessary property rights for the existing site or at an alternative site within 3 years of license issuance.	White Pine Hydro, Maine DIFW, Staff, Sebago TU, Maine DEP	$5,000[l]	$0	$344
24. Remove the fencing from the west bank.	Sebago TU, Patricia Barber	$4,000[d]	$0	$275
25a. Improve aesthetics by painting the penstock.	Sebago TU, Staff	$50,000[d]	$0	$3,440
25b. Dispose of the debris pile behind the powerhouse.	Sebago TU	Unknown – insufficient information to determine cost[m]	Unknown – insufficient information to determine cost	Unknown – insufficient information to determine cost
25c. Periodically repair powerhouse windows.	Sebago TU	$0[n]	$0	$0

Enhancement/Mitigation Measures	Entity	Capital cost ($2022)	Annual Cost[b] ($2022)	Levelized Annual Cost[c] ($2022)
25d. Update the powerhouse exterior.	Sebago TU	Unknown – lacks specificity to determine cost[o]	Unknown – lacks specificity to determine cost	Unknown – lacks specificity to determine cost
25e. Bury the penstock.	Sebago TU	Unknown – insufficient information to determine cost [p]	Unknown – insufficient information to determine cost	Unknown – insufficient information to determine cost
26. Restore the Old Portage Trail route.	Sebago TU	Unknown – insufficient information to determine cost [q]	Unknown – insufficient information to determine cost	Unknown – insufficient information to determine cost
27. Connect the project recreation area to the Mt. Cutler Trails.	Sebago TU	Unknown – lacks specificity to determine cost[r]	Unknown – lacks specificity to determine cost	Unknown – lacks specificity to determine cost
28. Install two picnic tables and perform site clean-up, such as trash removal, at the Overlook.	Heather Thompson	$2,200[d]	$0	$151
29. Compensate police agency to enforce published standards of conduct and conduct regular security patrols during summer months.	Sebago TU	Unknown	Unknown	Unknown
30. Provide four whitewater releases during late spring and early summer.	Sebago TU	Unknown – lacks specificity to determine cost[q]	Unknown – lacks specificity to determine cost	Unknown – lacks specificity to determine cost

Enhancement/Mitigation Measures	Entity	Capital cost ($2022)	Annual Cost[b] ($2022)	Levelized Annual Cost[c] ($2022)
31. Release the 300-cfs minimum flow as aesthetic spillage flow over the dam.	Sebago TU	$0	$543,884	$543,884[s]
Cultural Resources				
32. Implement an HPMP.	White Pine Hydro, Maine SHPO, staff	$0	$1,090	$1,090

[a] Costs were provided by White Pine Hydro in the license application or subsequent additional information request responses unless otherwise noted.

[b] Annual costs typically include project O&M costs and any other costs that occur on a yearly basis.

[c] All capital and annual costs are converted to equal annual costs over a 30-year period to give a uniform basis for comparing all costs.

[d] Cost estimated by staff.

[e] Costs provided by White Pine Hydro.

[f] Cost estimated by staff. Assumes eel monitoring in the tailrace would occur until downstream eel passage facilities or measures are implemented in 2032.

[g] This amount is an estimate of the cost that would result from nighttime shutdown for downstream eel passage from September through October for an interim period of 10 years (opportunity cost). The measure would reduce generation by 1,777 MWh. Using an energy cost of $49.64/MWh from table 6 as a proxy for the value of foregone generation, 1,777 MWh of foregone generation would be valued at $45,747/year.

[h] Cost estimated by staff. Assumes cost of the "shakedown" period and the schedule for fishway operation would be included in routine O&M, and thus this cost would be negligible.

[i] Cost estimated by staff. The cost is for the administrative effort to revise and refile the Recreation Plan within 6 months of license issuance. Additional costs for implementing the plan are considered separately.

[j] Cost estimated by staff. Assumes there would be no additional cost to conduct routine maintenance activities.

[k] Cost estimated by staff. Estimated cost is for developing a plan and maintenance schedule for trash and litter removal at all recreation areas and from behind the powerhouse following high flow events. It does not include a cost for implementation of the plan.

[l] Cost estimated by staff. Estimated cost is for developing a plan and schedule to construct a boat launch on the project impoundment if securing rights for public access to the existing, private launch is not possible. It does not include a cost for securing the rights to the existing launch site or construction of the alternative launch as that would depend on the site-specific details.

[m] Because of the unknown information related to the difficulty of clearing up the debris pile, staff cannot estimate a cost.

[n] Part of routine O&M costs for White Pine Hydro.

[o] Because of the lack of detail as to how the powerhouse should be "updated," staff cannot estimate a cost.

[p] Because of the lack of information, staff cannot estimate a cost. Nonetheless, the penstock follows the face of the falls; therefore, it is reasonable to assume that it would require more than trenching and burying but would require tunneling or blasting and redesigning the flowline to bury the penstock.

[q] Staff could not estimate a cost because of the lack of information on the condition of the "Old Portage Trail" and what it would take to make this trail usable. Regardless of the cost, the existing put-in is adequate so there is no reason to expend any funds to restore the trail.

[r] Staff could not estimate a cost because of the lack of information (*i.e.*, amount of flow, duration of flow).

[s] This amount is an estimate of the cost that would result from a 300-cfs minimum flow being released over the dam as aesthetic spillage for approximately 8.5 months of the year. The measure would reduce generation by 10,956 MWh. Using an energy cost of $49.64/MWh from table 6 as a proxy for the value of foregone generation, 10,956 MWh of foregone generation would be valued at $543,884/year.

Table 9. Analysis of fish and wildlife agency recommendations for the Hiram Project (Source: staff).

Recommendation	Agency	Within scope of section 10(j)?	Levelized Annual Cost	Recommend Adopting? And Basis for Preliminary Determination of Inconsistency
Continue to operate the project in a run-of-river mode where outflow approximates inflow by maintaining impoundment levels: (1) within two feet of normal full pond elevation of 349 feet or from the spillway crest when the rubber dams are down from November 16 through September 30; and (2) within one foot of full pool elevation of 349 feet or from the spillway crest when the rubber dams are down from October 1 through November 15. Continue to provide a 300-cfs minimum flow or inflow if less from the project powerhouse, or in the event the project powerhouse is inoperable, from the dam from November 16 through September 30.	Interior	Yes	$0	Yes

Recommendation	Agency	Within scope of section 10(j)?	Levelized Annual Cost	Recommend Adopting? And Basis for Preliminary Determination of Inconsistency
Develop a procedure for refilling the impoundment following maintenance-related or emergency drawdowns	Interior	Yes	$137	Yes
Maintain digital records of generation, inflows, outflows, and impoundment levels at the project and make available for agency review within 72 hours of request.	Interior	Yes, in regard to recording flow data to document compliance with measures to protect fish; no to providing the flow data because that is not a specific measure to protect fish and wildlife	$0	Yes
Avoid tree removal during the April 20 through October 15 period.	Interior	Yes	$0	Yes

Recommendation	Agency	Within scope of section 10(j)?	Levelized Annual Cost	Recommend Adopting? And Basis for Preliminary Determination of Inconsistency
Reinitiate ESA section 7 consultation with FWS or NMFS, as appropriate, on any new activities over the license term that may affect listed species.	Interior	No	$0	No. Consultation is not a fish and wildlife measure. Standard license article 15 is sufficient to allow the Commission to reopen the license on its on motion or at the recommendation of fish and wildlife agencies to address any future effects on fish and wildlife resources.

APPENDIX D

U.S. DEPARTMENT OF THE INTERIOR'S SECTION 18 PRELIMINARY FISHWAY PRESCRIPTIONS

10 PRELIMINARY PRESCRIPTION FOR FISHWAYS

Pursuant to Section 18 of the FPA, as amended, the Secretary of the Interior, as delegated to the Service, hereby exercises his authority to prescribe the construction, operation and maintenance of such fishways as deemed necessary, subject to the procedural provisions contained above.

The Department's Preliminary Prescription for Fishways is based on agreed upon fish passage provisions in the Passage Agreement and the Fisheries Agreement (and amendments). Fishways shall be constructed, operated, and maintained to provide safe, timely, and effective passage for American eel and Atlantic salmon at the Licensee's expense.

10.1 UPSTREAM AND DOWNSTREAM PASSAGE

The Licensee shall construct, operate, maintain, monitor, and periodically test the effectiveness of fishways for American eel and Atlantic salmon (collectively, the "target species") as described below. The fishways will be designed, constructed, maintained, and operated (which includes project operations) to safely, timely, and effectively pass the target species upstream and downstream of the Project. Provisions of this fishway prescription are consistent with the Passage Agreement, the Instream Flow Agreement, and the Fisheries Agreement, and their amendments, and are outlined in the paragraphs that follow.

10.2 DESIGN POPULATIONS

The American eel is a panmictic species; therefore, there are no subpopulations. All individuals are genetically, behaviorally, and physically representative of the entire worldwide population and offspring spawned in the Sargasso Sea have the same random chance of ending up in any watershed between Florida and Maine. Based on 2019 study results, 6,574 American eels were recorded passing upstream of the first project on the Saco River (Cataract FERC No. 2528), 8,013 eels passed the second dam (Skelton, FERC No. 2527), 823 eels passed the fourth dam (West Buxton, FERC No. 2531), and 784 eels passed the fifth dam (Bonny Eagle, FERC No. 2529). A conventional eel ramp (or equivalent) should provide sufficient passage for American eels at the Hiram Project.

In 2019, a single Atlantic salmon was recorded passing upstream at Cataract with four fish captured at the Skelton fishway. In the Fisheries Agreement, Section 5.3(b)(2), the Applicant agreed that the design goal for upstream Atlantic salmon passage was to be "as effective as a single standard-Denil type fishway." A standard 4-foot-wide Denil fish ladder is estimated to have an annual biological capacity of 12,000 Atlantic salmon (USFWS 2019). Given these capacities, a single 4-foot Denil ladder (or equivalent), installed at a slope of 1:8

(vertical:horizontal) or milder, should be sufficient to pass the design population of Atlantic salmon.

10.3 FISH PASSAGE OPERATING PERIODS

Once installed, Licensee shall maintain and operate permanent fishways during the upstream and downstream migration periods for Atlantic salmon and American eel (Table 1). The specified migration dates are consistent with those for the most recently licensed project downstream of Hiram, West Buxton (FERC No. 2531). Any of the operating schedules during these migration periods may be modified during the term of the license based on migration data, new information, and in consultation with the Service, NMFS, Maine Department of Marine Resources (MDMR), and the Licensee.

Table 1. Summary of migration periods for which fish passage will be provided.

Species	Upstream Migration Period	Downstream Migration Period
Atlantic salmon	May 1 – October 31	April 1 – June 30 (smolts and kelts) October 15 – December 31 (kelts)
American eel	June 1 – September 15	September 15 – November 15 (night)

10.4 FISHWAY OPERATION AND MAINTENANCE PLAN

Section 5.1(d) of the Fisheries Agreement states:

"Licensee will, in consultation with the USFWS, NMFS, MDMR and MASC, draft and maintain a standard set of written Fishway Operating Procedures for each of its Projects on the Saco River.[10] These Fishway Operating Procedures will include general schedules for routine maintenance, procedures for routine operation, procedures for monitoring and reporting on the operation of each fish passage facility or measure, procedures for annual start-up and shut-down, and procedures for emergencies and Project outages significantly affecting fishway operations. Copies of these Fishway Operating Procedures, and any revisions made during the term of this Agreement, will be sent to the USFWS, NMFS, MDMR and MASC."

Section 3.2 of the Fisheries Agreement states:

"[The] Licensee and USFWS, NMFS, MDMR, MASC and MDIFW agree that there will be a meeting in March annually to review fish passage operational data from the previous year, draft an annual report, and develop an operational plan for the upcoming year. The fish passage operational data should include the number of fish passed daily (by species), the number and timing of lifts made each ay, daily water and air temperature data, and other related fishway operational information."

10.5 INSPECTION

The Licensee shall, upon prior written notice by the Service and NMFS, provide authorized personnel of the Service, NMFS, and other agency-designated representatives, reasonable access to the project site and pertinent project records for the purpose of inspecting the fishways.

10.6 SCHEDULING

Timely construction, operation, maintenance, and measures for upstream and downstream fish passage, including studies and evaluations, are necessary to ensure their effectiveness and to achieve restoration goals. Therefore, the Licensee shall notify, and obtain approval from, the Service for any extension to comply with conditions agreed upon in the Saco River Fish Passage Agreement, Saco River Fisheries Assessment Agreement (and amendments), and the Instream Flow Agreement for Hydroelectric Projects on the Saco River as well as the prescribed conditions contained in this fishway prescription.

10.6.1 IMPLEMENTATION

Licensee shall submit an fishway conceptual design drawing to the agencies in accordance with Section 7 of the Passage Agreement.

Section 7 of the Passage Agreement states:

“A final design of any permanent upstream or downstream fish passage facility must be approved in writing by an authorized official of the Department of the Interior (U.S. Fish and Wildlife Service) and/or the Department of Commerce (National Marine Fisheries Service) pursuant to Section 18 of the Federal Power Act, as amended, before the dam owner is obligated to construct that facility at its project site.”

Section 5.3(b)(2) of the Fisheries Agreement states:

“[The] Licensee will, 18 months prior to the planned construction of each upstream passage facility, submit conceptual designs of the upstream passage facility, submit conceptual designs for approval by the USFWS, NMFS, MASC, and MDMR, and will subsequently file functional design drawings with the Commission for approval.”

Licensee shall provide 30%, 60%, and 90% design level plans for review and comment leading to final approval prior to filing with FERC for final approval. Designs shall be consistent with the 2019 Fish Passage Engineering Design Criteria Manual (USFWS 2019, entire) or the most up to date version.

10.7 FISH PASSAGE EFFECTIVENESS MEASURES

Effectiveness testing of both upstream and downstream American eel and Atlantic salmon passage is critical to evaluating passage success, diagnosing problems, and determining when fish passage modifications are needed and what modifications are most likely to be effective over the term of the license.

10.7.1 FISHWAY EFFECTIVENESS MONITORING PLAN

Consistent with Section 10.4 and the Fisheries Agreement, the Licensee will develop written Fishway Operating Procedures which, in accordance with Section 5.1(d) of the Fisheries Agreement, shall "include general schedules for routine maintenance, procedures for routine operation, procedures for monitoring and reporting on the operation of each fish passage facility or measure, procedures for annual start-up and shut-down, and procedures for emergencies and Project outages significantly affecting fishway operations." As such, the Licensee shall develop a Fishway Effectiveness Monitoring Plan (FEMP) in consultation with the Service, NMFS, and MDMR. The FEMP will contain plans for ensuring the effectiveness of the upstream salmon, upstream eel, downstream salmon, and downstream eel passage measures required pursuant to Sections 10.8 through 10.11. The FEMP shall be submitted to FERC for approval 6 months prior to the implementation dates for installing fishways specified in Sections 10.8–10.11.

After the Licensee submits draft passage effectiveness study plans and consults with the Service, NMFS, and MDMR, the Service, NMFS, and MDMR will provide written comments. Studies will be initiated during the passage season following the facility shakedown period and carried out for up to three years for each species. The shakedown period is defined in Section 5.1(b) in the Fisheries Agreement as, "Once each new fish passage facility is constructed under this Agreement, Licensee will operate each fish passage facility for a one-season "shakedown" period to ensure that it is generally operating as designed and to make minor adjustments to the facilities and operation."

The Licensee shall conduct effectiveness studies for all newly constructed or significantly modified permanent upstream and downstream fish passage facilities or measures consistent with provisions of the Fisheries Agreement.

Section 5.4(g) of the Fisheries Agreement states:

"All studies contemplated herein will be developed in consultation with NMFS, USFWS, MASC, MDIFW, or MDMR as applicable. Results will be submitted to FERC by Licensee after study completion; NMFS, USFWS, MASC, MDIFW, or MDMR as applicable will be asked for comment on the results, which comments will be submitted to FERC with the study results."

As detailed in Section 5.1 (c) of the Fisheries Agreement,

"[The] Licensee agrees to conduct effectiveness studies following the shakedown period of all newly constructed or significantly modified permanent upstream and downstream fish passage facilities or measures required under this Agreement. In the event that the facilities or measures as initially implemented are not effectively passing the target species, Licensee agrees to make, in consultation with USFWS, NMFS, MDMR and MASC, reasonable, cost-effective, adjustments to the facilities or measures in an effort to improve fish passage effectiveness. "Reasonable, cost-effective, adjustments" shall mean such adjustments to the facilities or measures, as initially implemented, to improve the fish passage effectiveness towards desired levels, but in no event shall the aggregate cost of such adjustments exceed 5% of the initial capital cost of that fish passage facility or measure, or of the significant modification of an existing fish passage facility, as applicable. The "initial capital cost" will include capital costs expended on the fish passage facility or measure up to the date of certification."

10.8 UPSTREAM AMERICAN EEL PASSAGE

The Licensee shall construct a permanent upstream American eel passage facility at the Hiram Project in accordance with the terms of Section 5.2(a) of the Fisheries Agreement. The Fisheries Agreement specified an upstream eel passage operational date of June 1, 2020, but the licensee was granted an extension of time to June 1, 2025 to install and operate upstream American eel passage facilities at the Hiram Project.[58]

The Fisheries Agreement Section 5.2(a)(3) states:

"If it is the consensus of the Service, NMFS, and MDMR that insufficient numbers of eels are present to require a fishway or to determine the location of an upstream fishway, those agencies may elect to delay the requirement to install passage

10.9 UPSTREAM ATLANTIC SALMON PASSAGE

In accordance with the Fisheries Agreement, the Licensee shall provide a single permanent upstream anadromous fish passage facility at the Hiram Project to be operational by May 1, 2032. The permanent upstream fishway at Hiram should be designed to be as effective as a single standard-Denil type fishway as described in Section 10.2, or another equally effective technological alternative proposed by the Licensee and approved by the Service, and be designed to be operational for flows between 5% and 95% exceedance during the upstream passage season. The schedule for the development and installation of upstream Atlantic salmon passage may be delayed contingent upon the returning numbers of the target species and following consultation with and agreement by the Service, NMFS, and MDMR as appropriate. The Fisheries Agreement Amendment No. 2 provides guidance on the provision of permanent upstream passage in the event downstream projects are delayed via consultation with the Service, NMFS, MDIFW, and MDMR.

10.10 DOWNSTREAM AMERICAN EEL PASSAGE

10.10.1 Interim Downstream American Eel Passage

The Fisheries Agreement Section 5.2(b)(3) specifies conditions during which interim downstream eel passage shall be implemented.

[58] 167 FERC ¶ 62,103 Order Granting Extension of Time, Issued May 13, 2019

"If, in the interim period prior to implementing permanent downstream eel passage measures at the various projects, downstream eel passage measures are needed under certain circumstances at a specific Project to reduce significant adult eel mortality from downstream turbine passage, Licensee agrees to undertake the following measures during the passage season for that year, 1) open an existing fish sluice or other gate at the Project to provide an unimpeded passage route, and 2) reduce generation if necessary to reduce the calculated hydraulic approach velocity to the turbine intake(s), thereby reducing the potential for impingement or entrainment of eels."

The Licensee shall monitor for eel mortality below the dam weekly from September 15 through November 15 as described in Section 5.2(b)(3) of the Fisheries Agreement below:

"The implementation of these measures will be initiated as described below by the confirmed observation of more than 50 adult eel mortalities per night at a given Project ("trigger number").

Subject to any license conditions, these measures will be implemented as follows:

A. Licensee will routinely monitor the tailrace of one project from September 15 through November 15 annually for adult eel mortalities. The Skelton Project will initially serve as the indicator site for the Projects; routine monitoring will be instituted at Bar Mills and each subsequent upstream Project the 10th year after upstream eel passage has been installed at the subject Project.

B. Routine monitoring will occur once per week at the applicable Project. The monitoring will consist of visual observations of the tailrace area conducted from the shore or from watercraft.

C. Licensee will report any observed eel mortalities greater than the trigger number to the MDMR within 24 hours of the observation, or, if on a weekend, by the next business day. Licensee will clear dead eels from the tailrace when practical and safe to do so.

D. If observed mortalities during the routine monitoring are greater than the trigger number, then the monitoring frequency at the affected Project tailrace will be increased to once per weekday and once per weekday monitoring will be initiated at the next upstream Project.

E. Subsequently, if additional observed eel mortalities at the Project:

i. are less than the trigger number for 5 days, then routine weekly monitoring may resume.

ii. continue to be greater than the trigger number, Licensee will implement controlled spillage at the subject Project by the 3rd night following the observation of the trigger number. Controlled spillage will consist of opening a gate to pass approximately 4% of actual turbine flow for up to eight hours per night (a lesser quantity or duration of spillage may be allowed based upon studies or a demonstration of effectiveness). The controlled spillage and weekday monitoring for the Project will continue for 5 nights.

F. If additional observed eel mortalities during the above 5-night spillage period:

i. are less than the trigger number, then normal operation and weekly monitoring may be resumed on the 6th day.

ii. continue to be greater than the trigger number, Licensee will continue the controlled spillage and will, by the 3rd night following the observation of the trigger number, implement reduced nighttime generation at the affected Project such that the calculated hydraulic approach velocity to the turbine intake(s) is approximately 2 feet per second (fps) or less during the controlled spillage hours. The controlled spillage, reduced generation and once per weekday monitoring for the Project will continue for 5 nights.

G. Subsequently, if daily monitoring continues to show eel mortalities greater than the trigger number at a Project, Licensee, USFWS, NMFS or MDMR may initiate discussions to define further cost effective interim measures for reducing adult eel mortality at that Project. These measures may include additional spillage or generation reductions. If the USFWS, NMFS or MDMR and Licensee cannot agree upon the implementation of additional interim measures, then they will follow the dispute resolution process of Section 2.9 of this Agreement.

H. In no case shall interim downstream passage measures be required at a particular Project for more than eight hours per night for more than two weeks per season.

I. The need for interim downstream monitoring and passage measures will cease at a given Project once permanent downstream eel passage is implemented at that Project.

J. The MDMR, USFWS, NMFS and Licensee may, by consensus, agree to modify the above interim protocol or measures."

The Fisheries Agreement Section 5.2(b)(3)(A) states:

"The Skelton Project will initially serve as the indicator site for the Projects; routine monitoring will be instituted at Bar Mills and each subsequent upstream Project the 10th year after upstream eel passage has been installed at the subject Project".

Since the Fisheries Agreement, the timelines for eel passage have changed through downstream passage implementation delays and time extensions specific to the Hiram Project. Consequently, upstream eel passage is required by 2025,[59] whereas permanent downstream passage is required in 2032. Consequently, interim monitoring as defined in the Fisheries Agreement no longer fits the previously established timelines.

Therefore, downstream passage for American eel shall be installed by 2032, with interim downstream eel passage measures at the Project if needed to reduce significant adult eel mortality from downstream turbine passage.

[59] Accession No. 20190513-3040

10.10.2 Permanent Downstream American Eel Passage

The licensee shall provide engineering and/or operational plans for permanent downstream eel passage measures to the MDMR, the Service, and NMFS for consultation by February 28, 2032. The Licensee shall install a permanent downstream eel passage facility or implement operational measures that achieve a 90% passage efficiency at this Project to mitigate project related impacts on migrating adult eels by September 1, 2032. The efficiency goal of 90% may be revised following consultation with and consensus by and between the Licensee and the Service, NMFS, and MDMR.

The Fisheries Agreement Section 5.2(a)(3) states:

“If it is the consensus of USFWS, NMFS, and MDMR that insufficient numbers of eels are present to require a fishway or to determine the location of an upstream eel fishway, those agencies may elect to delay the requirement to install passage facilities until adequate numbers of eels are present or a fishway location can be determined."

10.11 DOWNSTREAM ATLANTIC SALMON PASSAGE

The Passage Agreement establishes a schedule for the provision of downstream fish passage facilities for the six Licensee-owned mainstream Saco River hydroelectric projects, including Hiram.

The Fisheries Agreement Section 5.3(a)(2) states that Atlantic salmon is the only anadromous species that needs downstream passage at the Hiram Project, whereas the Fisheries Agreement Section 5.3(a)(1) specifies that the “Licensee shall not be required to institute any additional downstream fish passage measures at the Hiram Project until permanent downstream fish passage measures are operational at Hiram pursuant to this section”.

Section 5.3(a)(2) of the Fisheries Agreement indicates that permanent downstream passage shall be operational by the earlier of (1) April 15 following two years after the Licensee receives written notification of the commencement of annual stocking of juvenile Atlantic salmon in the Saco River watershed above the Hiram dam pursuant to a written agency-approved Atlantic salmon stocking program, developed by the Service, NMFS, MDMR or New Hampshire Fish and Game Department, which establishes a stocking program to develop a permanent run of Atlantic salmon above Hiram, or (2) the operation of permanent upstream fish passage facilities for Atlantic salmon at the Hiram Project.

APPENDIX E

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION SECTION 401 WATER QUALITY CERTIFICATION (issued March 4, 2022)

DECISION AND ORDER

THEREFORE, the Department APPROVES the water quality certification of BROOKFIELD WHITE PINE HYDRO, LLC and CERTIFIES pursuant to Section 401 (a) of the Clean Water Act that there is a reasonable assurance that the continued operation of the HIRAM HYDROELECTRIC PROJECT, as described above will not violate applicable Class A water quality requirements, SUBJECT TO THE FOLLOWING CONDITIONS:

1) WATER LEVELS

A. Except as temporarily modified by 1) approved maintenance activities, 2) extreme hydrologic conditions,[60] 3) emergency electrical system conditions,[61] or 4) agreement between the Applicant, the Department, and appropriate state and/or federal agencies, daily Project impoundment water levels shall be maintained in accordance with the provisions of the Instream Flow Agreement for Hydroelectric Projects on the Saco River. Current provisions of the Agreement require the impoundment water level remain within 2 feet of the normal full pond elevation of 349.0 feet between November 16 and September 30 and within 1 foot of full pond from October 1 through November 16.

B. The Applicant shall, in consultation with the signatories to the Instream Flow Agreement, review, reconsider, and renegotiate, if such consultation determines necessary, the terms of the Agreement upon its expiration in 2038, coincident with expiration of BWPH's Skelton and Bonny Eagle Project licenses, or subsequent annual licenses, if applicable.

C. The Applicant shall, within six months of issuance of a New License for the Project by FERC or upon such schedule as established by FERC, submit a Final Operations

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[60] For the purpose of the certification and Order, extreme hydrologic conditions mean the occurrence of events beyond the Licensee's control such as, but not limited to, abnormal precipitation, extreme runoff, flood conditions, ice conditions, drought, or other hydrologic conditions such that operational restrictions and requirements contained herein are impossible to achieve or are inconsistent with the safe operation of the Project.

[61] For the purpose of this certification and Order, emergency electrical system conditions mean operating emergencies beyond the Licensee's control which require changes in flow regimes to eliminate such emergencies which may in some circumstances include, but are not limited to, equipment failure or other temporary abnormal operating conditions, generating unit operations or third-party mandated interruptions under power supply emergencies, ad orders from local, state, or federal law enforcement or public safety authorities.

Monitoring Plan to the Department for providing and monitoring Project impoundment water levels required by Part A of this condition.

D. These conditions regarding water levels are necessary to ensure that the discharge from the Project will comply with water quality requirements, including those found at 38 M.R.S. § 465(2)(A) and as discussed above at section 4(A) and (C). The water levels of the impoundment, which are determined by the discharge, affect, among other things, the water quality requirements of the designated uses of fishing; recreation in and on the water; navigation; and habitat for fish and other aquatic life.

2) MINIMUM FLOWS

A. The Applicant shall provide flow releases from the Hiram Hydroelectric Project in accordance with the provisions of the Instream Flow Agreement for Hydroelectric Projects on the Saco River. Except as temporarily modified by 1) approved maintenance activities, 2) extreme hydrological conditions (see footnote 30), 3) emergency electrical system conditions (see footnote 31), or 4) agreement between the Applicant, the Department and appropriate state and/or federal agencies, an instantaneous minimum flow equal to 300 cfs or inflow, whichever is less, shall be released from the Project dam from November 16 to September 30, annually. From October 1 through November 15 annually, or for such alternate six week period as may be mutually agreed to by the Applicant and state and federal fisheries resource agencies, outflow from the Project shall be approximately equal to inflow under run-of-river operation, while allowing for up to one foot drawdown of the impoundment. All required flows shall be the sum of generating flows from the powerhouse and sluice gate/Taintor gate/leakage/spillage flows from the dam.

B. The Applicant shall, in consultation with the signatories to the Instream Flow Agreement for Hydroelectric Projects on the Saco River, review, reconsider, and renegotiate the terms of the Agreement upon its expiration in 2038, coincident with expiration of BWPH's Skelton and Bonny Eagle Project licenses, or subsequent annual licenses, if applicable.

C. The Applicant shall, within six months of issuance of a New License for the Project by FERC or upon such schedule as established by FERC, submit a Final Operations Monitoring Plan to the Department for providing and monitoring Project minimum flows required by Part A of this condition.

D. These conditions regarding minimum flows are necessary to ensure that the discharge from the Project will comply with water quality requirements, including 38 M.R.S. § 465(2)(A) as discussed above at section 4(A) and (C). The flow of the discharge from the Project affects, among other things, whether the receiving waters are of sufficient quality to support the designated uses of fishing; recreation in and on the water; navigation; and habitat for fish and other aquatic life.

3) UPSTREAM and DOWNSTREAM FISH PASSAGE

A. The Applicant shall continue to implement the applicable provisions of the 2007 Saco River Fisheries Assessment Agreement, including all amendments as approved by FERC, at the Hiram Project to provide upstream and downstream fish passage facilities and measures for migratory fish species.

B. Upon commencement of fish passage planning, the Applicant shall consult with DIFW to include, as needed, studies, measures and facilities to provide access to Project waters upstream and downstream of the Hiram dam for native trout species.

C. These conditions regarding fish passage measures are necessary to ensure that the discharge from the Project will comply with water quality requirements, including 38 M.R.S. § 465(2)(A) as discussed above at sections 4(A) and (C). The nature of the Project's discharge affects, among other things, whether the receiving waters are of sufficient quality to support the designated uses of fishing and habitat for fish and other aquatic life, including use of all Project waters.

4) DISSOLVED OXYGEN

A. The Applicant shall, within six months of issuance of a New License for the Project by FERC or upon such schedule as established by FERC, and in consultation with the Department, submit a Final Dissolved Oxygen and Temperature Monitoring Plan for Department review and approval that provides for monitoring DO concentrations in Hiram Falls and in the Project tailrace for a single season within two years of final issuance of a New License by FERC.

B. This condition is necessary to reaffirm that the discharge from the Project will comply with water quality requirements, including 38 M.R.S. § 465(2)(B) as discussed above at sections 4(B). The nature of the Project's discharge affects, among other things, whether the receiving waters are of sufficient quality to support the growth of salmonid fish and support the designated uses of fishing and habitat for fish and other aquatic life.

5) RECREATIONAL ACCESS AND USE

A. The Applicant shall continue to provide formal and informal access to the Project waters upstream and downstream of the Project dam for the purpose of recreation in and on the water, for fishing, and for navigation to the extent possible, for the term of a New License. The Applicant shall submit a final Recreational Facilities Management Plan to the Department that provides for the maintenance and management of Project Recreational sites. Further, the Applicant shall secure permanent rights to access, operate and maintain the existing informal impoundment boat launch or shall develop and include in its final Recreational Facilities Management Plan a plan and schedule for constructing a new boat launch providing access to the impoundment, developed in consultation with DIFW. The Recreational Facilities Management Plan shall provide for installation of sufficient signage and directions for the public to locate and use the impoundment access site.

B. This condition is necessary to ensure that the discharge from the Project will comply with water quality requirements, including 38 M.R.S. § 465(2)(A), as discussed above at section 4(A) and (C). Because the discharge affects, among other things, the water level of the impoundment and the flow downstream of the dam, it necessarily affects the water quality requirements of the designated uses of fishing, recreation in and on the water, and navigation, among others.

6) WATER QUALITY

Upon any future determination by the Department that operation of the Hiram Project, as approved by the certification and as conditioned by FERC for the Project, may be causing or contributing to a decline in water quality or non-attainment of water quality standards, the Department reserves the right to, in its discretion and upon notice to the Applicant and opportunity for hearing in accordance with its regulations, reopen this certification to consider requiring modifications to the certification or additional conditions as may be deemed necessary by the Department to ensure that the Project does not cause or contribute to any decline in water quality or non-attainment of water quality standards

7) STANDARD CONDITIONS

The Applicant shall comply with all Standard Conditions attached to the certification, with such compliance to be determined by the Department.

8) LIMITS OF APPROVAL

This approval is limited to and includes the proposals and plans contained in the application and supporting documents submitted and affirmed to the Department by the Applicant. Any variations from the plans and proposals contained in said documents are subject to the review and approval of the Department prior to implementation.

9) COMPLIANCE WITH ALL APPLICABLE LAWS

The Applicant shall secure and appropriately comply with all applicable federal, state, and local licenses, permits, authorizations, conditions, agreements, and Orders required for the operation of the Project, in accordance with the terms and conditions of the certification, as determined by the Department.

10) EFFECTIVE DATE

This water quality certification shall be effective concurrent with the effective date of the New License issued by FERC for the Project.

11) SEVERABILITY

In the event any provision, or part thereof, of this certification is declared to be unlawful by a reviewing court, the remainder of the certification shall remain I n full force and effect, and shall be construed and enforced in all respects as if such unlawful provision, or part thereof, had been omitted, unless otherwise ordered by the court.

STANDARD CONDITIONS

1. Noncompliance. Should the project be found, at any time, not to be in compliance with any of the conditions of this approval, or should the permittee construct or operate this project in any way other than specified in the application or supporting documents, as modified by the conditions of this approval, then the terms of this approval shall be considered to have been violated.

2. Inspection and Compliance. Authorized representatives of the Commissioner or the Attorney General shall be granted access to the premises of the permittee at any reasonable time for the purpose of inspecting the operation of the project and assuring compliance with the conditions of this approval.

3. Assignment of Transfer of Approval. This approval shall expire upon the assignment or transfer of the property covered by this approval unless written consent to transfer this approval is obtained from the Commissioner. To obtain approval of transfer, the permittee shall notify the Commissioner 30 days prior to assignment or transfer of property which is subject to this approval. Pending Commissioner determination on the application for a transfer or assignment of ownership of this approval, the person(s) to whom such property is assigned or transferred shall abide by all of the terms and conditions of this approval. To obtain the or Commissioner's approval of transfer, the proposed assignee or transferee must demonstrate the financial capacity and technical ability to (1) comply with all terms and conditions of this approval and (2) satisfy all other applicable statutory criteria.

   A "transfer" is defined as the sale or lease of property which is the subject of this approval or the sale of 50 percent or more of the stock of or interest in a corporation or a change in a general partner of a partnership which owns the property subject to this approval.

APPENDIX F

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Issuing a Non-power License

A non-power license is a temporary license that the Commission would terminate when it determines that another governmental agency will assume regulatory authority and supervision over the lands and facilities covered by the non-power license. At this time, no agency has suggested a willingness or ability to take over the project. No party has sought a non-power license, and we have no basis for concluding that the Hiram Project should no longer be used to produce power.

Federal Government Takeover

Federal takeover and operation of the Hiram Project would require congressional approval. While that fact alone would not preclude further consideration of this alternative, there is currently no evidence to indicate that federal takeover should be recommended to Congress. No party has suggested that federal takeover would be appropriate, and no federal agency has expressed interest in operating the project.

Project Retirement

Project retirement could be accomplished with or without dam removal.[62] Either alternative would involve denial of the relicense application and surrender or termination of the existing license with appropriate conditions.

Decommissioning Without Dam Removal

Project retirement without dam removal would involve retaining the dam and disabling or removing equipment used to generate power. Certain project works could remain in place and could be used for historic or other purposes. This approach would require the State of Maine to assume regulatory control and supervision of the remaining facilities. However, no participant has advocated this alternative, nor do we have any basis for recommending it.

Decommissioning with Dam Removal

[62] In the event that the Commission denies relicensing a project or a licensee decides to surrender an existing project, the Commission must approve a surrender "upon such conditions with respect to the disposition of such works as may be determined by the Commission." 18 C.F.R. § 6.2. This can include simply shutting down the power operations, removing all or parts of the project (including the dam), or restoring the site to its pre-project condition.

The Hiram Project is a source of clean, renewable energy. With decommissioning, this source of power would be lost and replacement power would need to be found. In addition, there would be significant costs associated with decommissioning the project and removing any project facilities, including Hiram Dam and the powerhouse.

As the Commission has previously held, decommissioning is not a reasonable alternative to relicensing a project in most cases, when appropriate protection, mitigation, and enhancement measures are available. While dam removal would result in better upstream and downstream passage for Atlantic salmon and American eel compared to relicensing the project, the upstream and downstream fish passage measures included in the staff alternative with mandatory conditions would nevertheless enhance fish passage over existing conditions.

Because, as discussed in this EA, protection, mitigation, and enhancement measures can be fashioned to support the recovery of diadromous fish in the basin and still provide for the generation of power, decommissioning is not a reasonable alternative to relicensing.

APPENDIX G

DRAFT LICENSE CONDITIONS RECOMMENDED BY STAFF

On March 10, 2021, the U.S. Department of the Interior (Interior) filed preliminary section 18 prescriptions (Appendix D in this EA). On March 4, 2022, Maine Department of Environmental Protection (Maine DEP) issued the water quality certification for the project (Appendix E in this EA). Unless modified by Interior, these conditions would be included in any license issued for the project. The following draft license articles are based on the inclusion of their mandatory conditions.

ADDITIONAL LICENSE ARTICLES RECOMMENDED BY COMMISSION STAFF

In addition to the mandatory section 18 prescriptions submitted by Interior and the water quality certification conditions issued by Maine DEP, we recommend including the following license articles in any license issued for the project.

Draft Article 001. *Commission Notification and Filing of Amendments*

(a) Requirement to Notify Commission of Modifications of Planned and Unplanned Deviation from License Requirements, and Fulfilling License Requirements.

Interior's prescription 10.3 and 10.10.1 in Appendix D would allow the licensee to implement interim downstream American eel passage measures and modify the timing of fishway operations under certain conditions. The Commission must be notified as soon as possible in writing, but no later than 10 days after each such modification. Any modification(s) in the seasonal timing of fishway operation must be based on consultation with the National Marine Fisheries Service, U.S. Fish and Wildlife Service, and Maine Department of Marine Resources. The Commission reserves the right to further modify the timing of fishway operations for any reason, including to address any project or public safety concerns.

(b) Requirement to File Amendment Applications.

Certain conditions of U.S. Department of Interior's (Interior) section 18 prescriptions and Maine Department of Environmental Protection's (Maine DEP) water quality certification conditions contemplate long-term changes to project operations or facilities (e.g., Interior's prescription 10.6, 10.7.1, 10.8, 10.9, 10.10.2, and 10.11 and Maine DEP's conditions 1B, 2B, 3A, and 3B). These changes may not be implemented without prior Commission authorization granted after the filing of an application to amend the license. In any amendment request, the licensee must identify related project requirements and request corresponding amendments or extensions of time as needed to maintain consistency among requirements.

Draft Article 002. *Project Operation and Impoundment Levels*. While operating in accordance with Maine Department of Environmental Protection's (Maine DEP) water quality certification (Appendix E), the licensee must not use the 1- to 2-foot reservoir fluctuation limits specified by Maine DEP's certification condition 1 for peaking generation.

Further, the run-of-river, minimum flow, and impoundment level requirements of Maine DEP water quality certification conditions 1 and 2 may be temporarily modified as follows:

Reporting of Planned Deviations

Run-of-river operation, impoundment level, and minimum flow requirements may be temporarily modified for short periods, of up to 3 weeks, after mutual agreement among the licensee and the Maine Department of Environmental Protection, U.S. Fish and Wildlife Service, National Marine Fisheries Service, Maine Department of Inland Fisheries and Wildlife, and Maine Department of Marine Resources (collectively, agencies). After concurrence from the agencies, the licensee must file a report with the Secretary of the Commission as soon as possible, but no later than 14 days after the onset of the planned deviation. Each report must include: (1) the reasons for the deviation and how project operations were modified, (2) the duration and magnitude of the deviation, (3) any observed or reported environmental effects and how potential effects were evaluated, and (4) documentation of consultation with the agencies. For planned deviations exceeding 3 weeks, the licensee must file an application for a temporary amendment of the operational requirements and receive Commission approval prior to implementation.

Reporting of Unplanned Deviations

Run-of-river operation, impoundment level, and minimum flow requirements may be temporarily modified if required by operating emergencies beyond the control of the licensee (*i.e.*, unplanned deviations). For any unplanned deviation from run-of-river operation, minimum flow, or impoundment level requirements that lasts longer than 3 hours or results in visible environmental effects such as a fish kill, the licensee must notify the agencies within 24 hours, and the Commission within 14 days, and file a report as soon as possible, but no later than 30 days after each such incident. The report must include: (1) the cause of the deviation, (2) the duration and magnitude of the deviation, (3) any pertinent operational and/or monitoring data, (4) a timeline of the incident and the licensee's response, (5) any comments or correspondence received from the agencies, or confirmation that no comments were received from the agencies, (6) documentation of any observed or reported environmental effects and how potential effects were evaluated, and (7) a description of measures implemented to prevent similar deviations in the future.

For unplanned deviations from run-of-river operation, minimum flow, or impoundment level requirements lasting 3 hours or less that do not result in visible environmental effects, the licensee must file an annual report, by March 1, describing each incident that occurred during the prior January 1 through December 31 time period. The report must include for each 3 hours or less deviation: (1) the cause of the deviation, (2) the duration and magnitude of the deviation, (3) any pertinent operational and/or monitoring data, (4) a timeline of the incident and the licensee's response to each deviation, (5) any comments or correspondence received from the agencies, or confirmation that no comments were received from the agencies, and (6) a description of measures implemented to prevent similar deviations in the future.

Draft Article 003. *Operation Compliance Monitoring Plan*. Within six months of license issuance, the licensee must file with the Commission for approval, the final Operation Compliance Monitoring Plan required by Maine Department of Environmental Protection's (Maine DEP) water quality certification conditions 1 and 2 (Appendix E). The plan must include the provisions included in the draft Project Operations Monitoring Plan in Appendix E-4 of the license application, filed on November 20, 2020, with the following modifications:

(1) update the plan to include the project operation requirements included in Draft Article 002 (*Project Operation*);

(2) a detailed description of how the licensee will monitor compliance with the operational requirements of Draft Article 002 (*Project Operation*), including descriptions of the mechanisms and instrumentation or gages used (i.e., type and exact locations of all flow and impoundment elevation monitoring equipment), and procedures for maintaining and calibrating all compliance monitoring equipment;

(3) a detailed description of the impoundment refill procedures that will be implemented to ensure that flows downstream of the project are maintained after drawdown of the impoundment for maintenance activities or emergencies; and

(4) remove section 5.0 "Reporting."

The licensee must prepare the plan after consultation with the Maine DEP, U.S. Fish and Wildlife Service, National Marine Fisheries Service, Maine Department of Inland Fisheries and Wildlife, and Maine Department of Marine Resources (collectively, agencies). The licensee must include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee must allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons, based on project specific information.

The Commission reserves the right to require changes to the plan. The licensee must not begin implementing the plan until the Commission notifies the licensee that the plan is approved. Upon Commission approval the licensee must implement the plan, including any changes required by the Commission.

Draft Article 004. *Reservation of Authority to Prescribe Fishways*. Authority is reserved to the Commission to require the licensee to construct, operate, and maintain fishways as may be prescribed by the Secretaries of the Interior and Commerce pursuant to section 18 of the Federal Power Act.

Draft Article 005. *Time of Year Restrictions on Tree Removal*. The licensee must limit tree removal within the project boundary to October 16 to April 19 for the protection of northern long-eared bat. In the event of public safety or other emergencies that require tree removal during this period, the licensee may remove trees but must notify the U.S. Fish and Wildlife Service within two business days of the unplanned safety/emergency action and provide details of the action and licensee's response.

Draft Article 006. *Final Recreation Facilities Management Plan.* Within six months of license issuance, the licensee must file with the Commission for approval, the final Recreation Facilities Management Plan required by the Maine Department of Environmental Protection's (Maine DEP) water quality certification condition 5 (Appendix E). The plan must include the provisions included in the draft Recreation Facilities Management Plan in Appendix E-3 of the license application, filed on November 20, 2020, with the following modifications:

(1) Remove the provision to eliminate the information kiosk and picnic area from the Nature Study Area.

(2) Include a plan and schedule for completing the following improvements to the Nature Study Area: (1) installing a sign at the entrance to the project access road that directs users to the Nature Study Area, and includes a weather-proof trail map with trail mileage, site use restrictions, and hours of operation; (2) replacing or repairing the two picnic tables and shelters as needed and removing any other picnic tables in disrepair; (3) replacing or repairing the education signs along the trail; and (4) a maintenance schedule, including trash and litter removal.

(3) Include a description of the methodology that would be used to monitor recreation use every 10 years, how the monitoring results and any proposed changes to the project recreation facilities would be distributed to the agencies, and an implementation schedule for conducting monitoring and filing the results with the Commission for approval.

(4) Include a maintenance schedule, including trash and litter removal for all recreation areas and from behind the powerhouse following high flow events.

(5) Install a security camera on the powerhouse that is capable of monitoring the Downstream Access Trail and Sandbar Area for unauthorized camping and a procedure for reporting misuse to appropriate authorities.

(6) Remove the provision to install signage at the parking area for the Downstream Access Trail and Sandbar Area and instead install signage for the Downstream Access Trail and Sandbar Area immediately off River Road following Section 8.2(a) of the Commission's regulations.

(7) Paint the project penstock a color that blends better with the surrounding landscape within three years of license issuance.

The licensee must prepare the plan after consultation with the Maine Department of Inland Fisheries and Wildlife, Maine Bureau of Parks and Lands, and Maine DEP. The licensee must include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee must allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons, based on project specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Draft Article 007. *Impoundment Boat Launch.* Within six months of license issuance, the licensee must file with the Commission for approval, a plan and schedule for providing a public boat launch on the project impoundment required by the Maine Department of Environmental Protection's (Maine DEP) water quality certification condition 5 (Appendix E). This requirement can be met with an existing facility or by constructing a new facility. The plan must include a conceptual drawing and map, and identify the location of the site, parking, signage, operation and maintenance schedules, and any proposed improvements (*e.g.*, ramp improvements, trash receptacles, or restrooms).

If an existing facility is proposed for this purpose, the plan must document that the licensee has secured the rights from a willing seller to operate and maintain the facility in perpetuity. If a new facility is proposed, the plan must include a schedule for constructing the facility within 3 years of license issuance and provide sufficient parking for vehicles and trailers.

The licensee must prepare the plan after consultation with the Maine Department of Inland Fisheries and Wildlife, Maine Bureau of Parks and Lands, and Maine DEP. The licensee must include with the plan documentation of consultation, copies of comments and recommendations on the completed plan after it has been prepared and provided to the agencies, and specific descriptions of how the agencies' comments are accommodated by the plan. The licensee must allow a minimum of 30 days for the agencies to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing must include the licensee's reasons, based on project specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan must not begin until the licensee is notified by the Commission that the plan is approved. Upon Commission approval, the licensee must implement the plan, including any changes required by the Commission.

Draft Article 008. *Programmatic Agreement and Historic Properties Management Plan.* The licensee must implement the "Programmatic Agreement Between the Federal Energy Regulatory Commission and the Maine State Historic Preservation Officer for Managing Historic Properties that May be Affected by Issuance of a License to Brookfield White Pine Hydro for the Continued Operation of the Hiram Hydroelectric Project in Oxford and Cumberland Counties, Maine (FERC No. 2530-057)," executed on [date], and including but not limited to the approved Historic Properties Management Plan (HPMP) for the project. In the event that the Programmatic Agreement is terminated, the licensee must continue to implement the provisions of its approved HPMP.

The Commission reserves the authority to require changes to the HPMP at any time during the term of the license.

Draft Article 009. *Use and Occupancy*. (a) In accordance with the provisions of this article, the licensee must have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee must also have continuing responsibility to supervise and control the use and occupancies for which it grants permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for, any interests that it has conveyed, under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant of a conveyance made under the authority of this article is violated, the licensee must take any lawful action necessary to correct the violation. For a permitted use or occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The type of use and occupancy of project lands and waters for which the licensee may grant permission without prior Commission approval are: (1) landscape plantings; (2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 water craft at a time and where said facility is intended to serve single-family type dwellings; (3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline; and (4) food plots and other wildlife enhancement. To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee must require multiple use and occupancy of facilities for access to project lands or waters. The licensee must also ensure, to the satisfaction of the Commission's authorized representative, that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the licensee must: (1) inspect the site of the proposed construction, (2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site, and (3) determine that the proposed construction is needed and would not change the basic contour of the impoundment shoreline. To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and to require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or rights-of-way across, or leases of project lands for: (1) replacement, expansion, realignment, or maintenance of bridges or roads where all necessary state and federal approvals have been obtained; (2) storm drains and water mains; (3) sewers that do not discharge into project waters; (4) minor access roads; (5) telephone, gas, and electric utility distribution lines; (6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary; (7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69-kV or less); and (8) water intake or pumping facilities that do not extract more than one million gallons per day from a project impoundment. No later than January 31 of each year, the licensee must file with the Commission a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed. No report filing is required if no conveyances were made under paragraph (c) during the previous calendar year.

(d) The licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for: (1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained; (2) sewer or effluent lines that discharge into project waters, for which all necessary federal and state water quality certification or permits have been obtained; (3) other pipelines that cross project lands or waters but do not discharge into project waters; (4) non-project overhead electric transmission lines that require erection of support structures within the project boundary, for which all necessary federal and state approvals have been obtained; (5) private or public marinas that can accommodate no more than 10 water craft at a time and are located at least one-half mile (measured over project waters) from any other private or public marina; (6) recreational development consistent with an approved report on recreational resources of an Exhibit E; and (7) other uses, if: (i) the amount of land conveyed for a particular use is five acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from project waters at normal surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year. At least 60 days before conveying any interest in project lands under this paragraph (d), the licensee must file a letter with the Commission, stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked Exhibit G map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any federal or state approvals required for the proposed use. Unless the Commission's authorized representative, within 45 days from the filing date, requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) Before conveying the interest, the licensee must consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the State Historic Preservation Officer.

(2) Before conveying the interest, the licensee must determine that the proposed use of the lands to be conveyed is not inconsistent with any approved report on recreational resources

of an Exhibit E; or, if the project does not have an approved report on recreational resources, that the lands to be conveyed do not have recreational value.

(3) The instrument of conveyance must include the following covenants running with the land: (i) the use of the lands conveyed must not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; (ii) the grantee must take all reasonable precautions to ensure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner that will protect the scenic, recreational, and environmental values of the project; and (iii) the grantee must not unduly restrict public access to project lands or waters.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised Exhibit G drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project must be consolidated for consideration when revised Exhibit G drawings would be filed for approval for other purposes.

(g) The authority granted to the licensee under this article must not apply to any part of the public lands and reservations of the United States included within the project boundary.

APPENDIX H

COMPREHENSIVE DEVELOPMENT

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to the power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. Below discusses the basis for our recommendations and modifications to the applicant's proposal.

Operation Compliance Monitoring

White Pine's proposed Project Operations Monitoring Plan generally describes the project and protocols for: (1) maintaining run-of-river operation and impoundment levels, (2) high water operations, (3) low water operations, (4) maintenance operations, (5) turbine shutdowns, (6) impoundment drawdowns, (7) unscheduled operations, (8) operation monitoring, (9) reporting, and (10) agency consultation. However, the proposed plan does not include a detailed description of the mechanisms and structures to be used (*i.e.*, type and exact locations of all flow and impoundment elevation monitoring equipment and gages), and procedures for maintaining and calibrating monitoring equipment. The proposed plan also does not include procedures for refilling the impoundment and maintaining flows below the dam following maintenance or emergency drawdown. Lastly, the plan's provisions for reporting deviations are insufficient for the Commission to determine compliance with the operational requirements of the license. Therefore, to ensure compliance with the operational requirements of the license and facilitate the Commission's administration of the license, we recommend that the proposed Project Operations Monitoring Plan be revised to include these modifications. We estimate the levelized cost to revise and implement the plan, as discussed above, would be $5,138.

Schedule for Operating Upstream and Downstream Fish Passage

White Pine Hydro does not provide a schedule for operating its proposed upstream and downstream fish passage facilities or measures for Atlantic salmon and American eel, once they are installed. Interior's preliminary fishway prescription requires White Pine Hydro to operate the upstream eelway from June 1 to September 15, and any downstream eel passage facilities or measures at night from September 15 to November 15. For Atlantic salmon, Interior requires the upstream fishway to be operated from May 1 to October 31 and the downstream passage facilities from April 1 to June 30 for smolts and kelts and from October 15 to December 31 for kelts. As discussed in section 3.3.1.2, available information on upstream and downstream migration periods for Atlantic salmon and American eel in Maine, as well as data on upstream fish passage at the Cataract Project's fish lift indicate both species are known to migrate during the fishway operating period required by Interior. Operating any future upstream and downstream passage improvements in accordance with Interior's prescribed schedule would protect salmon and eels from project-related passage delay as well as injury and mortality. We estimate that the levelized annual cost of the fishway operating schedules would be included in routine O&M, and thus the cost would be negligible. Therefore, the benefits of the measure outweigh the cost.

Recreation Plan Modifications

White Pine Hydro's proposed Recreation Facilities Management Plan (Recreation Plan) includes provisions to continue to maintain and operate the Nature Study Area, Canoe Portage, and the Downstream Access Trail and Sandbar Area and to monitor recreation at the project every 10 years and revise the Recreation Plan if needed. White Pine Hydro would enhance recreation at the Downstream Access Trail and Sandbar Area by adding signage that describes hours of operation and security measures, three picnic tables, a seasonal portable restroom, seasonal trash service, and a security gate that is locked each night. However, White Pine Hydro proposes to remove the information kiosk, picnic tables and parking area from the Nature Study Area.

Sebago TU and several members of the public do not believe White Pine Hydro's measures are enough to meet the current project recreation needs and recommend additional measures at these recreation sites. We discuss each site and our recommendations below.

Nature Study Area

The Nature Study Area consists of a large tract of land on the east side of the reservoir off the access road leading to the powerhouse and dam. Amenities include a 4,520-foot-long trail with education signs identifying common and scientific names of selected forest plants, four picnic tables of which two are under shelters, and parking for about 10 vehicles. In the early 2000's, White Pine Hydro installed a security gate across the project access road that moved the parking for this recreation site outside the gate along Pequawket Trail. However, walk-in access to the nature trail is still available. A second security gate, just beyond the picnic area and former parking area, prevents the public from accessing the powerhouse and dam and signage on the second gate warns of no trespassing and to keep out.

White Pine Hydro states that after several years of limited use and periodic reports of misuse of the Nature Study Area, it stopped maintaining the Nature Study Area. Because of continued concerns about vandalism and periodic reports of misuse of the area, White Pine Hydro proposes to discontinue the picnic area, kiosk and inside the gate parking area as formal amenities provided at this recreation site. White Pine Hydro would continue to provide day-use access to the area and parking outside the project access road gate for about 4 vehicles. Sebago TU and members of the public acknowledge the area's low use but argue that poor maintenance and lack of knowledge of the site is contributing to the low use; therefore, White Pine Hydro should continue to maintain the amenities at the site and better promote the site.

Observations by staff during site visits found the picnic tables and shelters have not been maintained, some of the educational signs along the trail have fallen from their supports and need maintenance, and more frequent garbage and litter removal is needed. There is no signage documenting the availability of the recreation site outside of the security gate.

Although use of the site is low (at 25 percent of capacity in 2015), limited parking, poor maintenance and lack of knowledge of the site could be contributing to its low use. Replacing or repairing the two picnic tables and their shelters, removing the two picnic tables in disrepair, replacing the plant signs along the trail, and adding a sign at the entrance to the project access road that identifies the recreation site, provides a map of the trail and its length, and the hours of operation would better alert the public to the availability of the recreation site and improve their enjoyment of the site, which could increase its use. Staff estimates that implementing these measures would have an annualized cost of $454 and that the recreational benefits are worth the cost.

Documented evidence of recurring problems of vandalism and misuse of the area is limited. If reports of vandalism and misuse continue, White Pine Hydro could install a security camera that could be monitored remotely. If there is an issue the video coverage could be used as evidence in prosecuting those responsible. This could further deter any misuse of the property. The second access gate would continue to deter access to the powerhouse and dam if kept locked.

Overlook

The Overlook consists of a pull-off from the Pequawket Trail. White Pine Hydro proposes to remove the Overlook as a project recreation site because it no longer provides views of the project because of the density and maturity of intervening hardwood and evergreen forest. Maine DOT would continue to maintain the site as a roadside emergency pull-out.

Sebago TU states that removing the Overlook from the project would remove a significant recreational asset because currently there is no good vantage point from which to view the falls. Heather Thompson recommends cleaning up the Overlook recreation site.

The site receives little use. Views from this site include a dense forest and a railroad track. Because of the maturity and density of the forest, the site no longer provides a view of the Hiram Falls, and there are no picnic tables or amenities to encourage picnicking. Approximately 1.5 - 2 acres of forest likely would need to be cleared to provide a view of Hiram Falls from the Overlook and no entity has suggested that the forest be cleared to create a view of the falls. The public can still view Hiram Falls through the fencing along the Canoe Portage. For these reasons, the site no longer serves a project purpose, and the Overlook should no longer be a licensed project recreation site. It thus follows that cleaning up the site and adding picnic tables to improve its use for such purposes would have no nexus to the project if the Overlook is no longer a project recreation site.

Canoe Portage

The Canoe Portage consists of a take-out on the west bank of the impoundment, an approximately 1,130-foot-long portage trail, and a put-in on the Saco River about 700 feet below the dam. The take-out also has a parking area for six vehicles adjacent to River Road. The portage trail parallels a chain-link fence installed to prevent unauthorized access to the dam for public safety and project security reasons for about 650 feet before descending about 85 feet to a point adjacent to the sand bar. Under high flows, the put-in would be at the water's edge. During low flows, boaters would need to carry their boats about 345 feet across the sand bar. White Pine Hydro proposes to continue to maintain the existing Canoe Portage and associated parking area in its current state.

Sebago TU states that the existing portage is inadequate and provides poor footing, and that the current put-in is not located at the water's edge, but at the sandbar, which is an inconvenience to users. Sebago TU recommends replacing the existing Canoe Portage with the Old Portage Trail.

Observations by staff during site visits and the recreation site inventory indicate that the current portage is well-marked, wide, in good condition and functioning as intended. Although the put-in is located at the sandbar rather than the river, it is not a difficult carry across the sandbar. Sebago TU's preferred put-in location would require extending the existing portage trail about 875 feet to a point further downstream. A cost cannot be estimated for extending the existing portage trail because there is no information on the condition of the "Old Portage Trail" and what would be required to make this trail useable. Regardless, given the low use of the portage and adequacy of the existing portage trail in meeting portage requirements, we have no basis for recommending extending the existing portage trail downstream to Sebago TU's recommended put-in.

Downstream Access Trail and Sandbar Area

The Downstream Access Trail and Sandbar Area is located on the west bank of the river and consists of a parking area that is accessible by a short driveway of approximately 60 feet immediately off River Road with space for eight vehicles, a 560-foot-long trail that connects to the canoe portage trail, and a large, naturally formed sandbar about 700 feet downstream of the dam. A swing arm gate across the trail prevents vehicle access down the access trail. Although the site is managed for day-use only, there are three user-created camping areas along the shoreline of the river south of the dam. Trash and damaged trees have been observed near the camping areas, and the sandbar area shows evidence of unauthorized fires, vegetation damage, and litter. White Pine Hydro recently installed a swing arm gate at the entrance to the parking area off River Road to help control unauthorized camping.

White Pine Hydro proposes to install signage, a portable toilet and a trash receptacle; and pour a concrete slab to support the toilet and upgrade the maintenance road so it could service the toilet and trash receptacle in July and August. The security gate at the entrance to River Road would be locked at night. The new signage would be installed in the parking area and would explain the hours the site is open for use (dawn until dusk), use restrictions (*e.g.*, no camping, fires, etc.), and directing visitors to contact the Sheriff's Department if their vehicle is locked behind the gate.

Sebago TU and several members of the public are concerned that White Pine Hydro's efforts would not effectively control the illegal camping, vandalism, and resource depredation documented in the area. Sebago TU recommends compensating a police agency to enforce published standards of conduct and have the agency conduct regular security patrols during summer months. Sebago TU also recommends that White Pine Hydro provide a schedule or more details as to how White Pine Hydro would conduct maintenance activities such as trash collection and maintenance of the portable toilet and trail.

In addition, Sebago TU recommends that a study be conducted at the Downstream Access and Sandbar Area to evaluate recreation needs and potential recreation improvements. In the absence of such a study, Sebago TU recommends that White Pine Hydro provide parking for 18 vehicles, widen the road leading to the parking area to improve traffic flow, and better identify the parking area.

The Downstream Access Trail and Sandbar Area is the most heavily used of the project recreation facilities. Installing and servicing a portable toilet and trash receptacle in July and August would improve the visitor experience. It would also help control trash and human waste which would improve environmental conditions at this location. However, as Sebago TU points out, the Recreation Plan does not explain how frequently White Pine Hydro would service the toilet or remove trash or conduct any other maintenance. Periodically removing trash and litter from all the recreation sites and from behind the powerhouse where high flows periodically deposit litter would improve the enjoyment and use of project recreation areas. Including a schedule for litter removal in the Recreation Plan would help ensure that the area is properly maintained and continues to provide recreation opportunities and would have a nominal cost.

Section 8.2(a) of the Commission's regulations a requires sign posting recreation use information at all points of public access. Currently there is no sign advertising the availability of the parking and recreation area visible from River Road. White Pine Hydro's proposed signage would be installed in the parking area, which is not visible from River Road. Installing the sign such that it is visible from River Road would benefit visitors by providing clear identification of the facility location.

Controlling camping and prohibiting fires is difficult given the project's remote location and operation. White Pine Hydro's proposed signage and closing the access gate at night should alert visitors to the site rules and help deter overnight use; however, it may not be sufficient to stop camping. Installing a security camera on the powerhouse that can monitor the Downstream Access Trail and Sandbar Area, along with an appropriate procedure for reporting misuse to authorities, would further deter camping and enforce site restrictions. Installing a security camera would have an estimated annualized cost of $344. We find the benefits of deterring unauthorized camping and other site restrictions to be worth the cost.

Regarding the need for additional parking and widening the access road, White Pine Hydro's site assessment found parking at the Downstream Access Trail and Sandbar Area to be adequate. On the weekday afternoon that the assessment was conducted, five of the eight available parking spaces at the Downstream Access Area were occupied and none of the spaces at the Canoe Portage parking area were occupied. While increasing parking might reduce the number of times parking capacity might be exceeded, particularly during peak use periods, there is little information to suggest parking is not adequate at this time. White Pine Hydro's periodic evaluation of recreation needs should consider parking needs. This information would help determine if needs are changing and more parking is warranted.

While widening the road could improve egress from the parking area, there is nothing in the record to suggest that this is a documented problem. White Pine Hydro's proposed signage should be adequate to alert the public to the site's parking availability and use restrictions as recommended by Sebago TU.

Boat Launch

Access to the impoundment for both motorized and non-motorized boats is currently provided by a private, non-project boat launch located approximately 3 miles upstream of the Hiram Dam. The one-lane gravel boat launch is accessed from a 525-foot-long, one-lane unpaved driveway off Main Street/State Route 117, across non-project lands and has parking capacity for 15 cars and trailers. In the license application, White Pine Hydro states that although the current boat launch is privately owned, it has been and currently remains available for public use; therefore, there is no need for the development of a new impoundment boat launch.

In response to the Commission's ready for environmental analysis notice, Maine DIFW states that the private, informal site is not well known or advertised, and there is no guarantee that it will remain available to the public for the duration of the new license. Therefore, Maine DIFW recommends that White Pine Hydro secure a permanent boat launch site at the Hiram impoundment with adequate parking capacity for trailered/non-trailered rigs, as well as appropriate signage to inform the public of the site. Sebago TU also recommends providing an impoundment boat launch. In its reply comments, White Pine Hydro proposes to work with Maine DIFW to acquire the land rights needed to make the boat launch and parking area a permanent project recreation site. If those efforts are unsuccessful, White Pine Hydro would work with Maine DIFW to further investigate alternative Hiram impoundment boat launch location sites.

There are no other trailer boat launches upstream of the non-project boat launch on the Saco River, and the closest hand-carry boat launch is located about 14 miles upstream. The project impoundment offers good boating and angling opportunities. Because the existing launch is located on private land and access provided through the good will of the landowner, boating access could cease if the landowner chooses to deny access. Providing a permanent project boat launch with adequate parking for cars and trailers would ensure that the public continues to have access to project waters and its resources. Including signage identifying the launch would alert the public to its location and availability.

We recommend that White Pine Hydro file a plan and schedule for providing a public boat launch on the project impoundment, using either the existing launch or by constructing a new facility. If an existing facility is proposed, White Pine Hydro should document that it has secured the rights from a willing seller to operate and maintain the facility in perpetuity. If a new facility is proposed, the plan must include a schedule for constructing the facility within 3 years of license issuance and provide sufficient parking for vehicles and trailers. The plan should include a conceptual drawing and map, and identify the location of the site, parking, signage, O&M schedules, and any proposed improvements (*e.g.*, ramp improvements, trash receptacles or restrooms). Developing a plan and schedule to ensure timely construction of a boat launch facility to meet project recreation needs would have an annual levelized cost of $344. The recreation benefits provided by a permanent launch justify the cost.

Recreation Monitoring

White Pine Hydro proposes, as part of its Recreation Plan, to evaluate recreation needs every 10 years and file an updated Recreation Plan with the Commission after each evaluation. The updated Recreation Plan would include the monitoring results and any proposed modifications to the plan to meet recreational demand. White Pine Hydro indicates several options are possible for monitoring recreation but does not commit to a specific methodology or include a schedule for completing monitoring or sharing the results and any proposed changes to the plan with agencies before filing the updated plan for Commission approval. Revising the Recreation Plan to include this information would ensure that the monitoring data clearly describe recreation use and that any proposed measures would take into account agency expertise. The cost to revise the plan to include this information would be negligible and would help ensure that recreation needs are met over the license term.

Aesthetics

Sebago TU and members of the public recommend painting or burying the above-ground penstock, repairing broken powerhouse windows, "updating the powerhouse exterior," and conducting periodic litter removal and clean-up of natural debris from behind the powerhouse to improve the aesthetic appearance of the project. The debris behind the powerhouse consist primarily of weathered branches and tree trunks and some litter naturally deposited during regular high flows.

As explained in section 3.2.5.2, the project resembles most small hydroelectric projects constructed in the early 20th century. Views of the powerhouse, dam, and penstock are limited to those recreating on the sandbar and in the river below the dam. While it is not entirely clear what it is meant by "updating the powerhouse exterior," any such modifications to the dam, powerhouse, substation, and other related structures would adversely affect the integrity for which the site was found eligible for listing on the National Register. Further, any aesthetic benefits would be minor because of the limited views from the sandbar. Repairing broken windows would improve the appearance of the powerhouse but should be done regularly as part of normal project maintenance.

The penstock is currently painted white and is weathered but is in good condition. Burying the penstock would eliminate it from view from those recreating on the sandbar. However, there is nothing in the record to suggest that it would be feasible to bury the penstock and more information is needed to determine how much it would cost to bury the penstock (*e.g.*, geotechnical studies). Because the penstock follows the face of Hiram Falls, it reasonable to assume that burying the penstock would require tunnelling or blasting and redesigning of the flowline. Burying the penstock would adversely affect the integrity of the project that makes the site eligible for listing on the National Register. Therefore, we do not recommend burying the penstock. Painting the penstock a more natural color would reduce its contrast with the landscape and help make the project more aesthetically pleasing. Painting the penstock would have an estimated annualized cost of $3,440. We find the aesthetic benefits are worth the cost. Therefore, we recommend White Pine Hydro paint the penstock a natural color within 3 years of license issuance.

Removing the unsightly woody debris pile as recommended by Patricia Barber and Mike Herman would be difficult because of the large size of some of the debris and difficulty in accessing the area by heavy equipment needed to move the debris. We could not estimate a cost for removing the debris because of lack of information as to how White Pine Hydro might accomplish this effort. Nonetheless, removing the debris would result in limited aesthetic benefits because the debris is only visible to those climbing on the rocks below the spillway and near the powerhouse, which is unsafe and should continue to be discouraged by White Pine Hydro. Because of the limited benefit, we do not recommend a license requirement to remove the debris pile. However, periodically picking up the litter that is also dropped during high flows would be relatively easy, would improve site environmental conditions, and prevent the refuse from being carried downstream later. As noted above, litter removal should be carried out at all project recreation sites, including the area behind the powerhouse, on a regular basis. Therefore, we recommend including a schedule for removing litter in the revised recreation management plan.

Project Boundary Modifications

White Pine Hydro proposes to modify the project boundary to remove 32 acres of lands upstream of the dam (Parcel A) and 119.5 acres of land and 25 acres of water downstream from the dam (Parcel B) because these areas are not affected by project operation and are not needed for project purposes. Parcel A includes lands located above elevation 349 feet and is not affected by project operation. White Pine Hydro states that Parcel B includes lands that are not needed for project purposes and waters of the Saco River that are downstream of the project's influence, as shown by the change in water quality designation.

Sebago TU opposes removing the lands because Parcel A serves the project purpose of flood control and removing Parcel B would affect recreation use of the Downstream Access Area.

Commission regulations at 18 C.F.R. 4.51(h) require that the project boundary enclose only those lands necessary for operation and maintenance of the project and for other project purposes, such as recreation, shoreline control, or protection of environmental resources. Because the land in Parcel A is above the normal full pond level of 349 feet and no changes in project operation are being considered that would influence lands above this contour, there is no reason to believe that the wetlands that have established in the parcel would be altered or threatened by removing the land from the project boundary. The parcel does not serve any project recreation need. We are not aware of any development threats if the lands were to be removed from the project boundary. Therefore, we recommend authorizing the removal of the lands in Parcel A from the project boundary.

Regarding Parcel B, contrary to White Pine Hydro's reasoning, a change in water quality classifications has no bearing on whether the land and water should be included in the project boundary. Nonetheless, the land and water associated with Parcel B does not provide for project recreation or other purposes. Sufficient land would be retained in the project boundary to operate and maintain the Canoe Portage, Downstream Access Trail and Sandbar Area, and Nature Study Area. Removing Parcel B would remove the Overlook from the project boundary; however, as noted above this would not have a significant effect on project recreation because the site is rarely used and no longer provides a view of the Hiram Falls due to the dense forest of hardwoods and evergreens. We are not aware of any potential development threats that would result if they were removed from the project boundary. Therefore, we recommend authorizing the removal of Parcel B from the project boundary.

5.1.3 Measures Not Recommended

Some of the measures proposed by White Pine Hydro, or recommended or prescribed by Interior, Sebago TU, and individuals would not contribute to the best comprehensive use of Saco River water resources, do not exhibit sufficient nexus to the project environmental effects, or would not result in benefits to non-power resources that would be worth their cost or generation losses. The following discussion includes the basis for staff's conclusion not to recommend such measures.

Dissolved Oxygen Monitoring

White Pine Hydro proposes to develop and implement a DO Monitoring Plan to monitor DO in the tailwater area and the Hiram Falls reach for a single summer season within 2 years of license issuance. Maine DEP water quality certification condition 4A requires White Pine Hydro to develop the DO monitoring plan within six months of license issuance and to implement the plan within 2 years of license issuance. As described in section 3.2.1, DO levels at the Hiram Project generally conform to state standards. In relatively few cases and for short durations, DO can fall slightly below 7.0 mg/L or 75-percent saturation in the tailwater and Hiram Falls reach during summer months. However, there is no indication that these few cases of low DO affected the biological community in the project's tailwater or Hiram Falls reach. Although monitoring DO in the project's tailwater and Hiram Falls reach would provide an additional season of data on water quality in project waters, the existing water quality monitoring data set appears to be robust and adequately represents conditions when DO and temperatures would be most likely to exceed state standards and adversely affect aquatic resources. Thus, there would be little benefit to collecting additional water quality monitoring data. Therefore, we have no basis for recommending the development and implementation of a DO monitoring plan and conclude the benefits of the plan would not be worth the levelized annual cost of $344. Nonetheless, this condition would be required in any license that would be issued because it is mandatory.

Downstream Passage Efficiency for American Eel

Consistent with the Fisheries Agreement, White Pine Hydro proposes, and Interior's fishway prescription and Maine DEP's water quality certification condition 3A require, without elaboration, that any downstream passage facilities or passage measures for American eel achieve a 90-percent passage efficiency.

There is no existing site-specific information on the downstream survival rate of American eel through the project, but our analysis shows that some adult American eels could be entrained into the generating units and injured or killed during turbine passage. Our analysis in section 3.2.1.2 indicates the turbine mortality through Francis turbines can range from 2 to 41 percent and that there are several protective measures that could be implemented at hydroelectric projects that may reduce eel passage mortality. However, neither White Pine Hydro nor Interior specify the measures that would be implemented at the Hiram Project. Further, based on the low number of juvenile eels attempting to pass the Hiram Dam, as well as the unknown proportion of adults that migrate downstream through the project, there is no evidence to indicate any additional benefit to the American eel population under a 90-percent passage efficiency compared to survival under existing conditions. Because there is no evidence demonstrating that American eel population benefits would accrue from this measure, we have no basis for recommending the 90-percent downstream passage efficiency for American eel. Nonetheless, this condition would be required in any license that would be issued because it is mandatory.

Upstream and Downstream Fish Passage for Resident Fish Species

Sebago TU recommends that White Pine Hydro install and operate upstream and downstream fish passage facilities for salmonids, including brook trout, by 2032, regardless of the number of returning Atlantic salmon. Sebago TU also recommends the design of the upstream fish passage for Atlantic salmon accommodate the passage of white sucker. Our analysis in section 3.2.1.2 indicates that there is no evidence that fishways are needed for white sucker or wild brook trout to complete their life cycles and maintain sustainable populations because fish surveys indicate that populations of these species are self-sustaining above and below the project. For these reasons, we conclude that the limited passage benefits specific to white sucker and brook trout do not justify the $487,235 levelized annual cost of upstream and downstream fishways specifically designed for these species at the project, and we do not recommend these measures.

Maine DEP’s certification condition 3B requires White Pine Hydro to consult with Maine DIFW, upon the planning of fishways for migratory fish, to include, as needed, studies, measures, and facilities to provide native trout species access to waters upstream and downstream of the Hiram dam. Although Maine DEP does not describe what specific additional studies, measures, or facilities would be required to pass native trout at the project, we expect such measures could include operational modifications, structural enhancements, or additional fishways. However, without specific information to determine the costs for any future potential studies and modifications to project operations or the project’s fishways as well as our finding that that there is limited passage benefits specific to native trout at the project, we do not recommend this measure. Nonetheless, this condition would be required in any license that would be issued because it is mandatory.

Interim Downstream Eel Passage Measures

Sebago TU recommends that, until permanent downstream passage for eels is installed at the project, White Pine Hydro cease project generation at night from September through October and upgrade the existing trashrack to 0.75-inch mesh screens to prevent adult eel entrainment. White Pine Hydro proposes to implement interim monitoring for eel mortality in the 10th year after the upstream eelway is installed, and if necessary, implement interim downstream eel measures until permanent downstream eel passage or measures is installed at the project. Interior's fishway prescription also includes the same interim downstream eel measures as proposed by White Pine Hydro but indicates that such measures would not be feasible since the proposed time between installing permanent upstream and downstream eel passage is less than 10 years. Thus, Interior's fishway prescription, without elaboration, also requires White Pine Hydro to implement interim downstream passage measures as needed.

As previously discussed, the number of juvenile eels observed attempting to pass Hiram Dam in 2018 was low and, to date, White Pine Hydro's tailwater mortality observations have indicated no significant eel kills at the project. Likewise, Sebago TU's own observations of eel mortality for the period of September 12, 2019 to October 23, 2019, reported only a single dead eel in the tailwater.

Because of the low number of eels observed at the Hiram Dam and low mortality rates, there would be a very limited population benefit to eels by requiring White Pine Hydro stop generating at night during the September to October migration season and to install 0.75-inch screening. We estimate that shutting down generator units during the September and October migration season would result in reduced generation and an associated annual levelized opportunity cost of $45,747, and the annual levelized cost of installing and operating 0.75-inch screens would be an additional $49,402. We conclude the benefits do not outweigh the costs at this time.

Further, we do not recommend that White Pine Hydro conduct interim downstream eel monitoring or measures in the 10th year following installation of the upstream eelway and until downstream eel passage is installed. The timeline proposed by White Pine Hydro and required by Interior and Maine DEP for installing upstream and downstream eel passage in 2025 and 2032, respectively, make any interim monitoring or measures the 10th year after installing the upstream eelway implausible. Thus, based on the current schedule for eel passage installation at the project there would be no fishery-related benefit to requiring interim downstream eel passage measures. Nonetheless, this condition would be required in any license that would be issued because it is a mandatory condition.

Fishway Design Criteria

Because upstream and downstream passage measures for Atlantic salmon and American eel are deferred until there are sufficient numbers of returning salmon and eel to warrant their installation, White Pine Hydro does not include fishway design specifications in its proposal. Interior's preliminary fishway prescription requires White Pine Hydro to design the upstream and downstream passage facilities or measures in a manner that is consistent with FWS's Design Criteria Manual (FWS, 2019). FWS's design criteria manual was developed by FWS's Fish Passage Engineering Team to establish, among other things, general guidance on baseline design criteria, operation, and maintenance of fishways throughout the northeastern U.S. However, FWS acknowledges in the manual that the criteria are not universally applicable and any fishway design should consider site specific information and conditions. Thus, while the design criteria are likely to be a good starting point for designing future fish passage measures, requiring White

Pine Hydro to design the future fishways to explicitly meet these criteria may not improve upstream and downstream passage at the Hiram Project. Only once site-specific conditions are evaluated and potential designs proposed, can the Commission fully evaluate whether the fishways should meet a specified design criterion. Nonetheless, this condition would be required in any license that would be issued because it is a mandatory condition.

Fish Passage Effectiveness Studies

Interior's fishway prescription and Maine DEP's water quality certification condition 3A requires White Pine Hydro to monitor all newly constructed or significantly modified upstream and downstream fish passage facilities or measures for Atlantic salmon and American eel, to ensure the facilities or measures are effectively passing the target species. Further, White Pine Hydro proposes, and Interior's fishway prescription and Maine DEP's water quality certification condition 3A require, White Pine Hydro to implement reasonable, cost-effective adjustments to the facilities or measures to improve fish passage effectiveness in the event that the facilities or measures as initially implemented are not effectively passing the target species.

The monitoring would begin during the passage season following the facility "shakedown" period and be carried out for up to 3 years for each species. As noted above, Interior specifies that proposed permanent downstream eel passage facility or operational measures must achieve a 90-percent passage efficiency, but it does not specify a performance standard for the Atlantic salmon fishways or upstream eel passage measures. The prescription stipulates that White Pine Hydro develop study plans for monitoring the effectiveness of upstream and downstream fishways or measures for Atlantic salmon and American eel in consultation with FWS, NMFS, and Maine DMR and file study reports with the Commission and resource agencies for review and consultation.

Effectiveness testing can be used to ensure that fish passage facilities are operating as expected. However, without specific performance standards and management goals, we cannot evaluate whether the effectiveness studies are necessary and would achieve the designed benefits. Likewise, the extent and cost of the adjustments to the fishways that could be necessary to improve fish passage effectiveness, as well as the benefits of these adjustments, are unknown and cannot be determined until the fish passage facilities are constructed and operating. Further, depending on the proposed measures, there could be dam safety considerations. Thus, any adjustments to the fish passage facilities to achieve effective passage would likely require a license amendment and prior Commission approval before implementing the measures. Nonetheless, these conditions would be required in any license that would be issued because they are mandatory conditions.

Removal of Fencing on West Bank

Sebago TU and individuals recommend removal of a chain-link fence from the west bank in the vicinity of the dam to allow visitors to view the Hiram Falls. The fence was installed between 2016 and 2018 to prevent unauthorized access to project facilities after a temporary access road was built to install the rubber dams and the public started using the road, even though it was never intended for public access. There have been several incidents reported to the Commission's New York Regional Office that the public accessed and walked on the rubber dams. Although removing the chain-link fence would allow visitors to view the falls and would have a relatively low annual levelized cost of $275, we do not recommend its removal because walking on the rubber dam presents a serious public safety hazard.

Whitewater Boating

Sebago TU recommends that whitewater flow releases be provided over Hiram Dam four times a year during the late spring and early summer to support potential boating opportunities down Hiram Falls which is bypassed by the project. However, Sebago TU did not specify a flow to be provided, and no other recommendations for whitewater flow releases were received. White Pine Hydro argues that the Hiram Falls cascade is not suitable or safe for whitewater boating. There is no information in the record to suggest that boaters have tried or are interested in accessing flows down the Hiram Falls. While providing whitewater releases from the dam could create a whitewater opportunity, the steepness and bedrock formations of the falls would likely require a high level of expertise to run the short reach of about 500 feet. Further, finding a suitable and safe put-in would be difficult given the rugged falls and being located immediately below the project spillway. Other Maine rivers within a 3-hour drive of the project, such as the Kennebec or the Dead Rivers, provide extensive runs for a wide variety of skill levels. Therefore, given the availability of other nearby resources and the short length of the bypassed reach, we do not recommend that White Pine Hydro be required to provide whitewater boating flows.

300-cfs Aesthetic Spill Flow

As discussed in section 3.2.5.1, maximum daily inflows to the project that exceed the maximum hydraulic capacity of the project (2,310 cfs) could result in spill over Hiram Falls during any month of the year. However, based on median daily inflows to the project, spill over Hiram Falls typically only occurs in April and May with spill flows ranging from 391 to 1,687 cfs. In other months where daily inflows rarely exceed the project's maximum hydraulic capacity, project flow diversions typically result in leakage flows of 2 cfs over Hiram Falls.

Sebago TU recommends that the 300-cfs minimum flow being released through the powerhouse be released over the dam to provide a more natural flow over Hiram Falls. Further, Sebago TU states that if higher minimum flows are required to maintain adequate wetted width below the powerhouse, then aesthetic flows over the dam should be increased accordingly.

The project is currently required to release a minimum flow of 300 cfs below the powerhouse from November 16 to September 30. To provide a flow of 300 cfs over the dam during the same period would require White Pine Hydro to curtail or reduce generation for about 8.5 months of the year and to release the flows through the log sluice Tainter gate because this gate is automated and able to control the desired release. Releases through the Tainter gate would only wet the eastern portion of the falls, which would provide minimal aesthetic improvements. Further, releasing a minimum spill flow of 300 cfs during the late fall and winter months would provide minimal aesthetic benefits because the number of winter visitors is likely to be few at that time. In addition, there would be minimal benefit for an aesthetic spillage flow at Hiram Dam because there are few areas for the public to safely view the falls. In Appendix C, we estimate that the loss in generation would be 10,956 MWh/year with an opportunity cost of $543,884/year. The minor aesthetic benefit of releasing the minimum flow over the dam instead of through the powerhouse does not justify the costs in lost generation. Therefore, we do not recommend this measure.

APPENDIX I

LIST OF COMPREHENSIVE PLANS

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APPENDIX J

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APPENDIX K

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