January 21, 2021

Ms. Shannon Ames, Executive Director
Low Impact Hydropower Institute
329 Massachusetts Avenue, Suite 2
Lexington, MA 02420

TROUT UNLIMITED
Sebago Chapter

Transmitted via e-mail to comments@lowimpacthydro.org

Subject: **Bonny Eagle Comments**

Dear Ms. Ames:

On behalf of its over 600 members in southwestern Maine, Sebago Chapter of Trout Unlimited ("Sebago TU") submits these comments on the Brookfield White Pine Hydro (Brookfield) revised application for Low Impact Hydro Institute (LIHI) certification dated January 8, 2021. It has been nearly twenty-three years since Federal Energy Regulatory Commission (FERC) relicensed the project and we assert that for that reason increased scrutiny should be applied to this application.

We believe that this project, because of both its impoundment and the cumulative effects of it and that of the other six other mainstem dams on the Saco River operated by Brookfield, is causing continuing adverse ecological impact to the watershed. This has been evidenced by reports filed by Brookfield that document the failure to achieve the watershed's fisheries restoration goals. We have attached the two reports that illustrate this directly: 2017 Saco River Diadromous Fish Passage Report[1] that deals with anadromous fish especially shad and 2018 Upstream Eel Passage Monitoring Report[2] that deals specifically with American eels. As if this were not enough, at the same time, the restoration schedule has been moving steadily to the right for the last two decades - most recently by the 2007 Agreement Amendment.[3] The Bonny Eagle Project itself has had upstream fish passage implementation delayed until 2029, the West Buxton Project immediately downstream has seen two delays, the first from 2019 to 2020 - subsequently to 2027.

Despite the unrelenting stocking and fertilized egg planting efforts of the Saco River Salmon Restoration Alliance and Hatchery, Atlantic salmon returns remain disappointing with only three returning fish documented in 2020. We have included the Maine Department of Marine Resources Report[4] for 2020 as Attachment C. Please note the improved returns for the Penobscot, Kennebec and the Narraguagus indicating that at-sea factors should not be blamed for poor returns on the Saco.

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[1] 2017 Saco River Diadromous Fish Passage Report published February 2018 prepared for Brookfield White Pine Hydro LLC
[2] 2018 Upstream Eel Passage Monitoring Hiram Hydroelectric Project FERC No. 2530 Prepared for Brookfield White Pine Hydro Lewiston, Maine dated January 29, 2019.
[3] Brookfield 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) dated May 8, 2019.
[4] Recent Trap Counts for Fish Returns to Maine by River accessed at https://www.maine.gov/dmr/science-research/searun/programs/trapcounts.html on the MDMR website

A number of factors have affected our indigenous fisheries in southwestern Maine since the 1700s. These include dams, pollution from the effluents produced by the mills the dams once supported, and siltation and loss of overhead cover due to agricultural use of shoreland. Maine now has the largest percentage of forested land of any state in the country. Since the late 1970s, the Clean Water Act has prevented our rivers from being used as the open industrial sewers as they had formerly been. Dams without effective fish passage are what remain of these three major factors. Without free-swim access to critical habitat, the life cycles of our indigenous species are compromised and restoration efforts reduced to a travesty.

On page 1 of the application, Brookfield describes the dam as creating a "*riverine impoundment*." This describes a habitat that is neither fully riverine nor a true impoundment with the result that it is not fully suitable for indigenous aquatic species evolved for either habitat. The impoundment decreases dissolved oxygen and increases disease among indigenous species favoring free-flowing waters. Indeed, the resultant habitat is one most beneficial to introduced species such as smallmouth bass at the expense of mature and young of the year (YOY) alosines, American eels, Atlantic salmon, brook trout and white suckers. All of these are co-evolved, indigenous fish historically abundant in the watershed. Similar effects of the six other Brookfield mainstem dams in the watershed exacerbate the effects of the Bonny Eagle impoundment, so the failure to meet the watershed's fish passage goals is not surprising - it is an expectable outcome.

On page 10 of the application, Brookfield states: *During normal operations, the project releases flows depending on electrical demand, available storage, and river flow and the bypass reach receives a minimum flow of 25 cfs. During high flow periods, all six generator units may be run 24 hours a day, with flows in excess of 4,500 cfs being passed as spillage over the New River Channel dam into the bypass reach*." Please note that this statement is quite misleading. The number of days that 4,500 cfs goes into the bypass reach are dwarfed by the number of days that the bypass reach receives minimum flows.

Beginning on page 25, Brookfield dutifully documents the information required to meet LIHI certification criteria for Ecological Flow Regimes, Water Quality, Upstream Fish Passage, Downstream Fish Passage, Watershed and Shoreline Protection, Threatened and Endangered Species Protection, Cultural and Historic Resources Protection, and Recreational Resources. Please note that the supporting study data provided is over 20 years old. Data that old is suspect - the studies should be repeated, their data refreshed. The courts decided in American Rivers v. FERC[5] that dealt with the relicensing of FERC projects in Alabama, five years was a reasonable shelf life for study data.

Accordingly, **Sebago TU requests that LIHI certification be held in abeyance for the Bonny Eagle Project until the applicant demonstrates that watershed fisheries restoration goals are being met**. The net ecological effect of LIHI certification for the Bonny Eagle Project at this time is zero; the effect of the certification for Brookfield will be the preferential sale of its electricity in states where there are statutory goals for use of renewable energy and LIHI certification is accepted as proof of that. The costs of preparation of Brookfield's application will ultimately be passed on to its ratepayers.

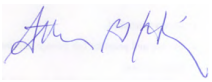
When confronted with the inadequacy of fish passage that Brookfield has provided on its lower four dams on the Kennebec River, the response of Brookfield's spokesperson was: "*These and other dams in Maine have been there for decades and centuries and we are going to use science and engineering to*

[5] American Rivers and Alabama Rivers Alliance v. FERC and United States Secretary of the Interior, No. 16-1195 (D.C. Cir. 2018)

make sure there are solutions for everyone and everything, for people and for fish."[6] On both the Saco and the Kennebec, this remains to be seen. Should LIHI determine that the applicant has met its criteria and certifies the project, it would serve to underline just how misrepresentative those criteria are and how misleading that your organization can be in its use of the term "*low impact.*" Truly, LIHI would be paraphrasing the old hospital one liner: 'The operation was a success but the patient died.'

Sebago TU appreciates the opportunity to comment on this application.

Respectfully,



Stephen G. Heinz
Sebago TU FERC Coordinator

Reply to: heinz@maine.rr.com

Attachments:
A - 2017 Saco River Diadromous Fish Passage Report (without data tables)
B - 2018 Upstream Eel Passage Monitoring Report (entire report - 12 pages)
C - Recent Trap Counts for Fish Returns to Maine by River (table with legend - single page)

[6] Portland Press Herald article of January 3, 2020 "4 dams, the future of Kennebec fish runs and salmon's survival at stake in federal licensing battle" accessed at https://www.pressherald.com/2021/01/03/4-dams-the-future-of-kennebec-fish-runs-and-salmons-survival-at-stake-in-federal-licensing-battle/

Attachment A

Brookfield

Brookfield Renewable
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Lewiston, ME 04240

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Fax 207.755.5655
www.brookfieldrenewable.com

March 26, 2018

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

Subject: **2017 Saco River Diadromous Fish Passage Report for the Cataract Project (FERC No. 2528), Skelton Project (FERC No. 2527), Bar Mills Project (FERC No. 2194), West Buxton Project (FERC No. 2531), and Bonny Eagle Project (FERC No. 2529)**

Dear Secretary Bose:

Brookfield White Pine Hydro LLC (BWPH), licensee for the Cataract Project (FERC No. 2528), Skelton Project (FERC No. 2527), Bar Mills Project (FERC No. 2194), West Buxton Project (FERC No. 2531), and the Bonny Eagle Project (FERC No. 2529) herein files with the Commission the 2017 Saco River Diadromous Fish Passage Report as required by the West Buxton Project license, Article 401, pursuant to fishway prescriptions 4.D.

Please contact Matt Leblanc by e-mail (matthew.leblanc@brookfieldrenewable.com) or by phone (207) 252-4870 if you have any questions or comments.

Sincerely,

Matt LeBlanc for

Kelly Maloney
Manager, Compliance - Northeast

Attachment

Cc: S. Michaud, M. Swett, A. Zarrella, N. Stevens, J. Seyfried, M. LeBlanc, K. Murphy, K. Bernier, BWPH

K. Howatt, MDEP
J. Pellerin, J. Perry; MDIFW
G. Wippelhauser; MDMR
S. McDermott, W. McDavitt; NMFS
A. Bentivoglio, S. Shepard; USFWS

BWPH File: 2528/01, 2527/01, 2194/01, 2531/01, 2529/01

2017
Saco River Diadromous Fish Passage Report

A Report on the Operation of
Brookfield White Pine Hydro LLC Fish Passage Facilities at the
Cataract East and West Channel Projects (FERC No. 2528)
Springs and Bradbury Projects (FERC No. 2528)
Skelton Fish Project (FERC No. 2527)
Bar Mills Project (FERC No. 2194)
West Buxton Project (FERC N0. 2531)
Bonny Eagle Project (FERC No. 2529)

Februay 2018

Prepared by
Brookfield White Pine Hydro LLC

Table of Contents

Cataract Executive Summary

In 2017, the Cataract fishways (East Channel fishlift and West Channel Denil) were operated by personnel from Brookfield White Pine Hydro LLC (BWPH).These fishways were built to pass target diadromous fish species (Atlantic salmon, American shad, river herring, and American eel) as part of resource agency plans to restore these species to the Saco River. 2017 marked the twenty-third full year of operation of the Cataract fishways.

In 2017, the East Channel fishway successfully passed 34,435 river herring, 3,390 American shad, 4 Atlantic salmon and 2,030 juvenile American eels; and the West Channel fishway successfully passed 6,162 river herring, 252 American shad, and 5 Atlantic salmon. In addition to the 34,435 river herring successfully passed through the East Channel fish lift, BWPH biologists trucked an additional 4,357 above the Bar Mills, West Buxton, and Bonny Eagle projects in 2017 to meet upriver stocking goals.

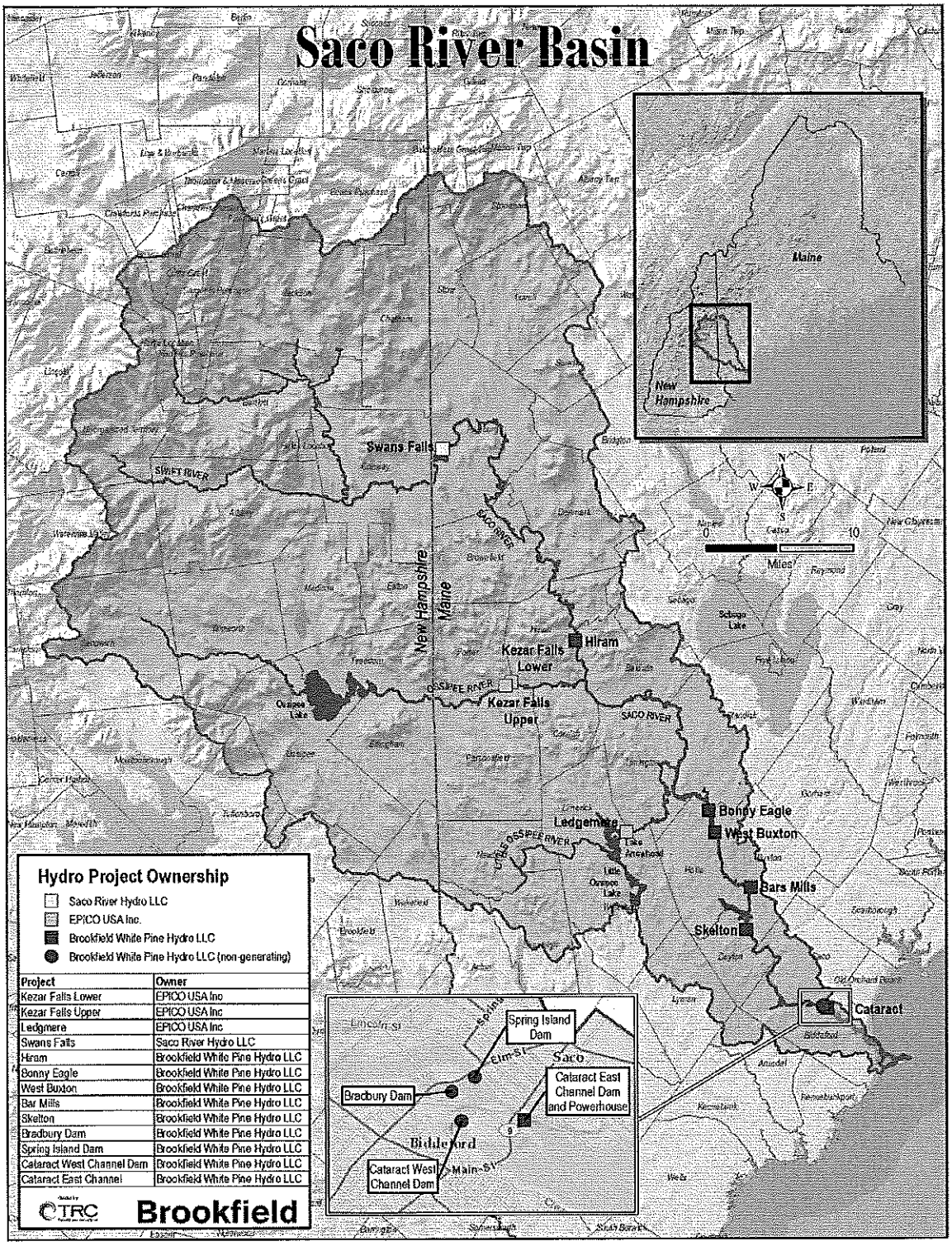
Currently, remnant populations of American shad and river herring appear to be large enough to serve as the necessary brood stock for Saco River restoration purposes without resorting to out-of-basin transfers of adults to the Saco River. The Saco River has the largest documented American shad run in the state of Maine and had been an important source of brood stock for shad restoration on the Kennebec River from 1999 through 2001. At this time, the small run of Atlantic salmon returning to the Saco River consists mainly of hatchery origin strays from other rivers and possibly small numbers of wild fish. In the future, increased Saco River Salmon Club (SRSC) fry releases, stocking of parr and smolts by the USFWS, and natural spawning should increase the local component of the Saco River run.

1.0 Introduction

The Cataract Project is located on the Saco River in the cities of Biddeford and Saco and in the towns of Dayton and Buxton in the State of Maine. The project is licensed by the Federal Energy Regulatory Commission (FERC No. 2528) and is owned by Brookfield White Pine Hydro LLC (BWPH). The project includes the Cataract (East Channel) Dam and East Channel

fishlift and an integral intake powerhouse containing a single turbine generator on the northeastern side of Factory Island in the City of Saco; and the West Channel dam and Denil fishway in the cities of Saco and Biddeford (see Figure 1). The impoundment formed by these dams extends upriver in the cities of Biddeford and Saco about 0.3 mile to another set of dams at Spring Island (see Figure 1), referred to as Bradbury and Spring Island dams. The fish locks at these two dams were first operational in June 1997. The impoundment formed by these dams extends upriver approximately 9.3 miles through the cities of Biddeford and Saco and the towns of Dayton and Buxton to BWPH's Skelton Project. A 90-foot high fish lift was constructed at the Skelton Project and first became operational in the fall of 2001.

In 2017, the Cataract fishways were operated by personnel from BWPH hydro operations division. This marked the twenty-third full year of operation of these fishways which were built to pass target diadromous fish species (Atlantic salmon, American shad, river herring, and American eel) as part of resource agency plans to restore these species to the Saco River. Although fishway construction was completed in the spring of 1993, the fishways were not completely operational until June 2, 1993 (East Channel) and June 25, 1993 (West Channel). Subsequently, 1993 did not constitute a full year of operation.



Project	Owner
Kezar Falls Lower	EPICO USA Inc
Kezar Falls Upper	EPICO USA Inc
Ledgmere	EPICO USA Inc
Swans Falls	Saco River Hydro LLC
Hiram	Brookfield White Pine Hydro LLC
Bonny Eagle	Brookfield White Pine Hydro LLC
West Buxton	Brookfield White Pine Hydro LLC
Bar Mills	Brookfield White Pine Hydro LLC
Skelton	Brookfield White Pine Hydro LLC
Bradbury Dam	Brookfield White Pine Hydro LLC
Spring Island Dam	Brookfield White Pine Hydro LLC
Cataract West Channel Dam	Brookfield White Pine Hydro LLC
Cataract East Channel	Brookfield White Pine Hydro LLC

Figure 1. Map of the Saco River basin and locations of Brookfield hydro facilities.

1.1 Operation of the Cataract East Channel Fishway

The fishways at the Cataract Project are designed to operate up to river flows of 11,000 cubic feet per second (cfs). The fishway at the East Channel dam consists of a lower entrance flume and crowding area, a 45-foot high fishlift or elevator, and an upper exit flume leading into the impoundment. Upper flume water flow is approximately 40 cfs with a velocity of 1 foot per second (fps). Total attraction water flow is approximately 80 cfs with an entrance velocity averaging 5 fps. In an effort to enhance fish passage in 1995, the East Channel fishlift attraction water system was reprogrammed to shut off water flow to the lower flume downstream attraction water diffuser and increase water flow to the upper diffuser. This change increased velocity in the lower flume and eliminated the upwelling flow from the lower diffuser. The modification proved successful in 1995, and has been continued since. (See 1995 Cataract Fishway study report Section 4.4 for more detailed information on water flow modification and fish passage observations made at the East Channel fishlift.)

A counting window and sorting, trapping, and trucking facilities are located near the exit of the upper flume. Fish can be released to swim into the Cataract impoundment or can be transported to upstream locations (i.e. Springs and Bradbury impoundment for shad) (see Figure 2). Fish transport takes place in one of two stocking trucks assigned to the fishway. The trucks are equipped with 990 gallon circular fiberglass insulated tanks with aeration systems utilizing bottled oxygen and water pumps that circulate water in the tanks.

In 2017, the East Channel fishway was opened on May 1 and remained in operation (other than limited down time for general repairs and maintenance) until October 30 when it was closed for the season.

Downstream passage is provided by a sluice at the East Channel forebay area located between the spill gate and the unit intakes, and by a sluice located in the West Channel next to the West Channel fishway exit. Also, two hinged flashboards at the East Channel have been

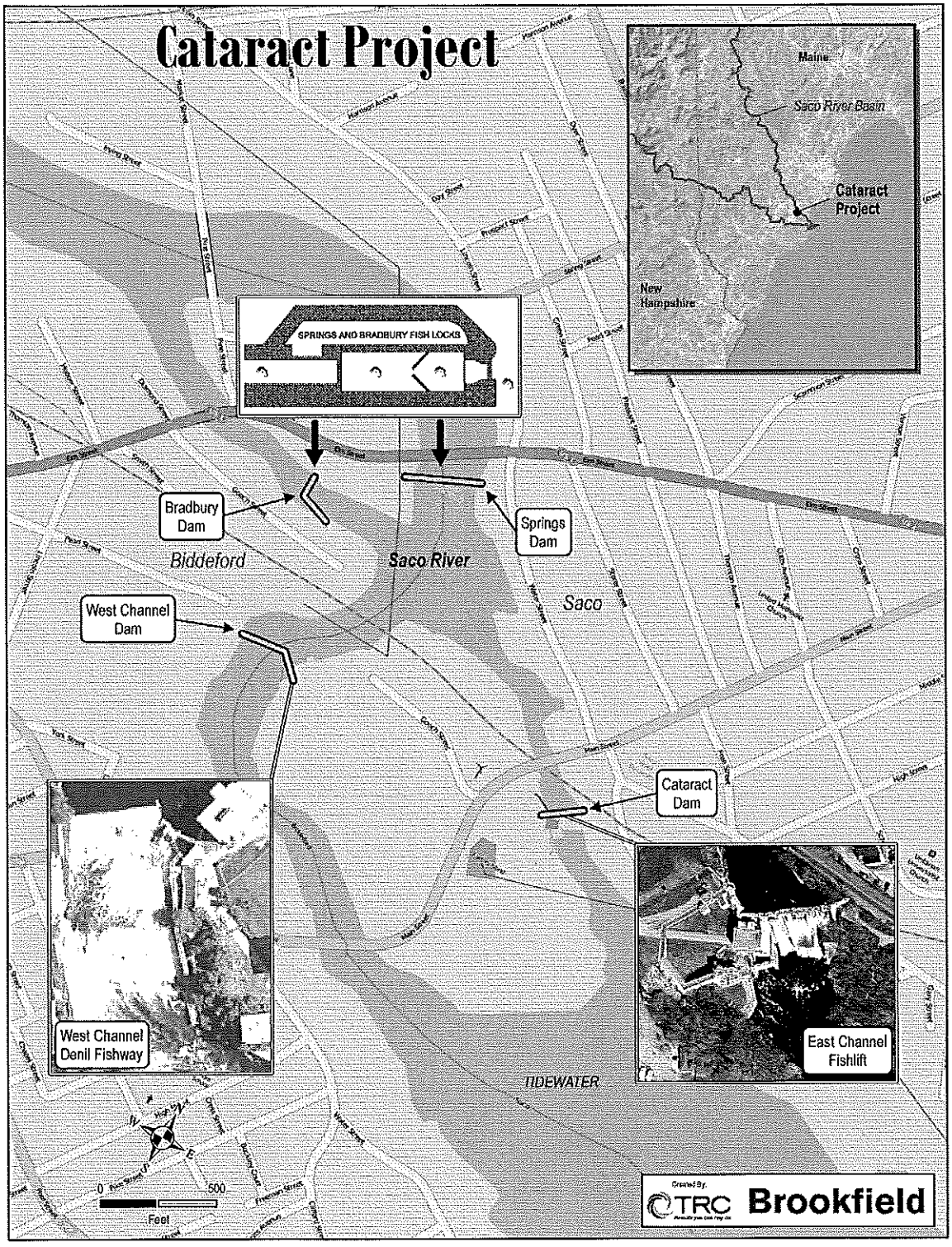


Figure 2. Map of the Cataract Project.

used to facilitate downstream passage at the Cataract facility since 1997. The Cataract headpond is observed for downstream migrants daily starting mid-June and continuing throughout October. The boards are dropped when adequate numbers of fish appear in the headpond area and fishway personnel are stationed to observe downstream passage. "Adequate numbers" are typically signified by a sudden appearance of more than 25 post-spawned shad. BWPH biologists surveying the area have observed that shad will typically migrate in schools; therefore, a sudden appearance of post-spawned shad will trigger a controlled spill. Results of these observations indicate that downstream passage is accomplished by this technique and will be continued in the future.

1.2 Operation of the Cataract West Channel Fishway

The 550-foot-long Denil fishway at the West Channel is 4 feet wide with a 1-foot vertical by 8-foot horizontal slope. The minimum depth of water in the fishway is 2.5 feet with a minimum flow of 12 cfs. The maximum attraction water flow is 33 cfs with an entrance velocity of 2 to 6 fps. A counting window and associated trapping structures are located near the exit of the fishway and target species can swim freely into the Cataract impoundment. A floating trash boom was installed in front of the West Channel exit to help keep floating debris from entering the fishway.

In 2017, the West Channel fishway was opened on May 1 and remained in operation (other than limited down time for general repairs and maintenance) until October 30, 2017 when it was closed for the season.

A 200 foot long rubber dam was installed at the West Channel spillway during the summer of 2006. This rubber dam helps to more easily and safely control river flows during high water events and allows a quicker and safer recovery of headpond levels after such events. There are, however, two sections of flashboards of approximately 35 feet each (one section on each side of the spillgate) that remain on the West Channel spillway.

The West Channel flashboards were lost on June 14, 2014 and not replaced until September 6, 2017.

The following biological data have been compiled to provide a summary of fishway monitoring information collected at the Cataract fishways in 2017. East Channel water temperature and Saco River flow data for 2017 are provided in Attachment 1. Saco River flow data was monitored at the Skelton Project and provided by BWPH's river control center.

2.0 River Herring, American Shad, and Atlantic Salmon Information

During 2017, fishway operations concentrated on passing and/or transporting diadromous fish species (Atlantic salmon, American shad, river herring and American eel) targeted for restoration on the Saco River.

2.1 River Herring - East Channel

In 2017, a total of 34,435 river herring successfully ascended the East Channel fishlift. The first river herring were lifted on May 16th (Table 1) when river water temperature was 12 °C. and the last river herring was lifted on July 6th when river water temperature was 21.5 °C. The river herring run encompassed a 67-day period. The peak of the run occurred between May 18th and May 29th when 32,881 fish passed, representing 95% of the river herring passing the East Channel. The river herring daily lift schedule was adjusted manually by fishway personnel depending on the number of fish observed and the time of the run. In May and June, approximately 182 lifts and 243 lifts respectively, (Attachment 1) were made to capture river herring.

2.1.1 River Herring Trap and Transport Operations

A total of 34,435 river herring were allowed free passage into the Cataract impoundment as part of the evaluation studies for the Skelton fishway. In addition,4,357 river herring were trucked from East Channel to above the Bar Mills, West Buxton, and Bonny Eagle

Projects to achieve upriver stocking goals.

2.1.2 River Herring Biological and Fishway Mortality Data

The majority of river herring mortalities (~550) were a result of a single event when the number of fish in the hopper was underestimated resulting in more biomass (fish) in the truck transport tank than what could be supported by the life support system (supplemental oxygen and circulation pumps). Subsequently, additional training was provided for estimating the number of fish in each lift, and no additional issues occurred.

2.2 American Shad - East Channel

In 2017, a total of 3,390 American shad successfully ascended the East Channel fishlift. The first shad was lifted on May 20th (see Table 2) when river water temperature was 15.5 °C, and the last shad was lifted on July 22nd when river water temperature was 24°C. The shad run encompassed a 69-day period with the peak occurring between June 13th and June 29th when 2,804 fish (83% of the run) passed upstream.

The daily lift schedule was adjusted by fishway personnel depending on the number of fish observed and the time of the run. In May, June, and July, approximately 182, 243, and 106 lifts respectively (Attachment 1), were made to capture shad.

An underwater camera connected to a television monitor and VCR was first used in 1995 to gather information on fish behavior within the lower flume of the East Channel fishlift. The camera documented that shad exhibit a fallback behavior in and around the East Channel lower flume V-gate crowder. On occasion, shad would swim upstream through the V-gate crowder into the hopper area, then within minutes (and sometimes seconds) swim back downstream through the V-gates and out of the lower flume into the tailrace. Also, on many occasions, shad were reluctant to pass through the V-gate crowder in the fishing position. (See 1995 Cataract fishway study report Sections 3 and 4 for detailed information on camera study and results).

Since 1996, the underwater video camera, combined with keeping the V-gate crowder wide open, was a very important technique that increased East Channel fishway efficiency. Fishway personnel observed that by keeping the V-gate crowder open, shad moved readily into the trapping area. Utilizing the underwater camera, fishway personnel could observe shad as they passed through the wide open V-gate crowder, then close the crowder and trap before the shad had a chance to fall back. This technique will continue in 2018.

2.2.1 American Shad Trap and Transport Operations

The majority of the American shad captured at the East Channel fishlift were transported to the Diamond Riverside Boat Ramp stocking location (approximately half mile upstream of the fishway), while the remaining shad were allowed to freely swim through the fishway into the Cataract impoundment. This year the transport operations began on June 7 and ended on July 19 with 3,163 shad successfully transported upstream. A total of 38 transport trips were made and no transport mortalities were observed. Both trucks operated without any mechanical problems. A total of 227 American shad were allowed to swim freely through the fishway; typically passing in conjunction with large numbers of river herring. The trucking trip from the fishway to the Diamond Riverside Boat Ramp takes about 15 minutes and a round trip takes about 1 hour.

2.2.2 American Shad Biological and Fishway Mortality Data

In addition to the 3,390 American shad successfully passing through the Cataract East Channel fishway, a total of 72 shad mortalities were noted. This represents a total fishway mortality of 2.1% which falls within the range of annual shad mortality since the fishway went into operation in 1995 (1.2 – 4.8%). The majority of the mortalities drifted downstream and were discovered at the end of the upper flume area on the water diffusion screen. Many of these fish can only be sampled when the upper flume is drained. As a result, many of these fish are in various stages of decomposition and biological data collection is difficult. Scale samples were collected from a majority of the fish, and will be archived for future aging if requested.

2.3 Atlantic Salmon - East Channel

In 2017, four Atlantic salmon (Table 3) ascended the East Channel fishlift on June 13 (19.5°C), June 17 (20.5°C), June 19 (21.5°C), and July 19 (23.0°C).

The daily lifting schedule was adjusted by fishway personnel depending on the number of fish observed and the time of the run. In May, June, July, August, September, and October, approximately 182, 243, 106, 49, 57, and 49 lifts (Attachment 1) were made, respectively. An underwater camera connected to a television monitor and VCR was first used in 1995 to gather information on fish behavior within the fishway. The camera documented that Atlantic salmon exhibit a strong fallback behavior in and around the East Channel lower flume V-gate crowder. Salmon regularly would swim upstream through the V-gate crowder into the hopper area, then within minutes (and sometimes seconds) swim back downstream through the V-gates and out of the lower flume into the tailrace. (See 1995 Cataract fishways efficiency report for detailed information on camera study and results).

The underwater camera allows fishway personnel to observe salmon as they pass through the V-gate crowder, and then close the gate and trap the salmon before they can fall back. During the months of August and September, when the salmon returns across the State of Maine are low, the lower trap area is monitored using a video recorder and the previous days footage is reviewed daily by fish passage staff. If a salmon is observed to have entered the lower trap area, then fishway personnel stationed at the TV monitor to wait for and capture the fish. This process almost always resulted in a salmon capture within a 24-hour period. This technique has resulted in the majority of salmon captures at the East Channel since 1995.

In 2017, camera operations started as soon as the fishway opened, and continued from May through October. Using the underwater camera greatly increases the efficiency of East Channel fishway and will be continued in 2018.

2.3.1 Atlantic Salmon Trap and Transport Operations

No Atlantic salmon were transported from the Cataract East Channel fishway in 2017.

2.3.2 Atlantic Salmon Biological Data

Of the four Atlantic salmon passing the East Channel fishlift in 2017, one was identified as a multi-sea winter fish, while the other three were all one-sea winter fish (grilse).

2.4 River Herring - West Channel

In 2017, a total of 6,162 river herring successfully ascended the West Channel Denil fishway. The first river herring passed the viewing window on May 18th (Table 4) when river water temperature was 13.0°C and the last river herring passed the viewing window on June 24th when river water temperature was 22.5°C. No river herring mortalities were noted.

2.5 American Shad - West Channel

In 2017, a total of 252 American shad successfully ascended the West Channel Denil Fishway. The first shad passed the viewing window on May 19th (Table 5) when river water temperature was 14°C and the last shad passed the viewing window on July 27th when river water temperature was 23.0°C.

2.6 Atlantic Salmon - West Channel

In 2017, the five Atlantic salmon (Table 6) ascended the West Channel Denil on May 28 (14.5°C), June 4 (16.0°C), June 5 (15.5°C), June 11 (17.0°C), and October 10 (19.0°C).

2.6.1 Atlantic Salmon Biological Data

Of the five Atlantic salmon passing the West Channel fishlift in 2017, three were identified as a multi-sea winter fish, while the other two were both grilse.

2.7 American Eel

The East Channel eel passage is a permanently hinged ramped structure that has the ability to operate during all tidal cycles and river flows. The upstream eel passage for East Channel was operational on from June 1st to September 18th and passed a total of 2,030 eels in 2017. (See Table 9 for Cataract East Channel Eel Inventory).

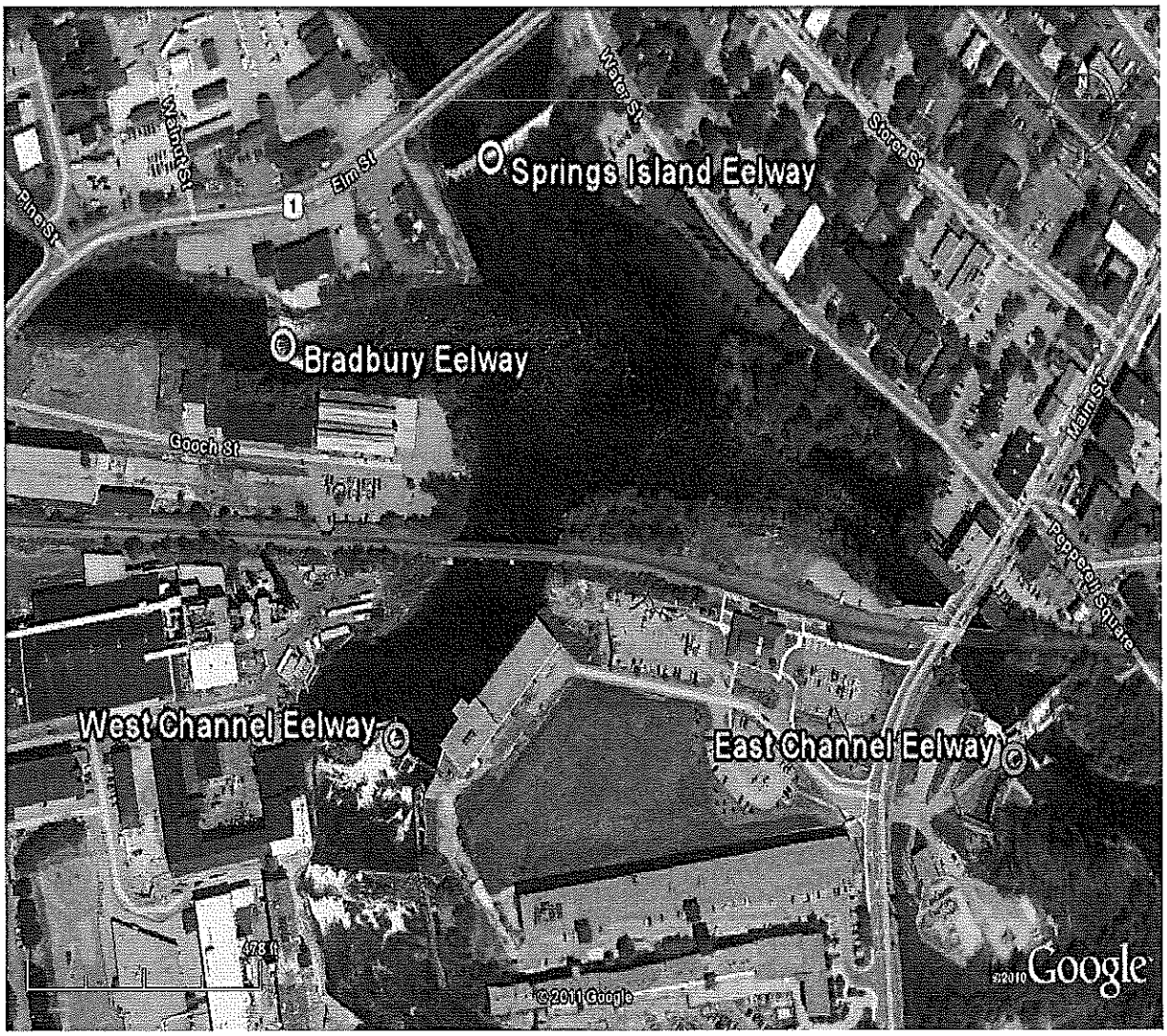
The upstream eel passage at West Channel is seasonally installed below a small section of flashboards located between the old upstream fishway and the rubber dam. The West Channel flashboards were lost on June 14, 2014 and not replaced again during the 2017 season, thus the West Channel eel passage was not installed in 2017.

2.7.1 Downstream American Eel

Downstream passage for adult American eels consists of nightly shutdowns of the Cataract unit starting September 1st and continuing for eight weeks for eight hours per night. River flows are passed through open gates or downed hinge boards during this time.

2.8 Downstream Fish Passage - East and West Channel

Downstream passage is provided by a sluice at the East Channel forebay area located between the spillgate and the unit intakes, and by a sluice in the West Channel next to the West Channel fishway exit. Both the East Channel and West Channel downstream bypasses pass approximately 52 cfs apiece at full pond. The East Channel downstream bypass and the West Channel downstream bypass were opened on March 30st, and remained open, other than limited



downtime for general cleaning, repair and maintenance throughout 2017. In general, headpond/bypass observations are conducted at the Cataract Project at a minimum first thing every morning previous to the first upstream lift of the day, as well as in conjunction with other studies that may be occurring throughout the year. In addition to the downstream sluice, since 1997 two hinged flashboards at the East Channel are lowered to facilitate downstream passage at the Cataract facility since 1997. The boards are dropped when adequate numbers of fish appear in the headpond area and fishway personnel are stationed to observe downstream passage.

2.8.1 Post-spawned River Herring

No post-spawned river herring were observed in the Cataract impoundment in 2017.

2.8.2 Post-spawned American Shad

As agreed upon during agency consultation in January 1996, controlled spills were attempted in addition to the present downstream passage sluices.
Since 1997, observations of control spills have documented that effective passage for shad can be accomplished if the taintor gate is closed, spills are conducted on sunny days, and when adequate numbers of fish are present. "Adequate numbers" are typically signified by a sudden appearance of a school of more than 25 or 30 post-spawned shad observed in the headpond at once.

The controlled spill consists of 2 hinged flashboards being dropped for a combined flow of 400 cfs for a period of time ranging from 2 to 4 hours. The time period is dependent upon river conditions and visual observations of shad numbers and behavior. Fishway personnel are positioned directly above the downed boards, which provide a clear view of the fish and an accurate count of passage numbers.

In 2017, small numbers of shad (5 to 10 fish at a time) were observed periodically in the East Channel headpond area and no controlled spills were conducted . The West channel flashboards were lost on June 14, 2014 The thirty five foot section of missing flashboards

allowed free passage to all out migrating fish throughout the entire year. It is expected that the majority of post-spawned shad utilized the lost flashboard area as a route of downstream passage in 2017. BWHP plans to continue to use this method to pass river herring and shad downstream in 2018.

2.8.3 Juvenile Clupeids

During late-July and mid-October fishway personnel observed small numbers of juvenile clupeids in the East Channel upper flume and in the East Channel headpond area. Ten juveniles were sampled from the East Channel upper hopper area on July 30 and ranged from 46 to 56 mm total length.

3.0 Non-Target Fish Species

3.1 East Channel Fishway

Thirteen (13) non-target species totaling 759 fish ascended the East Channel fishway in 2017 (see Table 7). Striped bass (602 fish) (the vast majority were returned to the tailrace) was the most numerous of these species. Five gizzard shad were caught in 2017 and immediately culled on site. One lamprey was captured attached to an American shad and returned to the tailrace. Innumerable striped bass were captured in the fishlift hopper, but were not lifted to the upper flume area. On these occasions, fishway personnel would lower the hopper back into the lower flume and allow the striped bass to swim back into the tailrace. These striped bass ranged from 10 to 26 inches in length with the majority averaging 10-15 inches long. The eels ranged from 6 to 20 inches long and were observed feeding on the occasional dead herring that fall underneath the elevator into the hopper pit.

3.2 West Channel Fishway

Seven non-target species totaling 73 fish utilized the West Channel Denil fishway in 2017 (see Table 7). These included; striped bass (30 fish), smallmouth bass (20 fish), white wucker (9

fish), brown trout, (8 fish), largemouth bass (3 fish), and brook trout (2 fish). One gizzard shad was passed at the West Channel denil only to be captured and culled at the Skelton fishway a few days later. No carp or sea lampreys were caught in 2017.

4.0 Atlantic Salmon Redd Survey

Atlantic salmon spawning surveys (redd counts) were conducted once per week by boat or by foot in the Skelton tailrace area in conjunction with monitoring for adult eel mortalities during the months of September, October, and November. No salmon redds were observed in 2017.

5.0 2018 Cataract East and West Channel Fishway Operation Plans

The East and West Channel fishways will be operated in 2018 with the benefit of experience and insight gained since 1993. General operational plans are summarized below.

5.1 Upstream Passage

Identify and enumerate all fish species utilizing the East and West Channel fishways. Striped bass will be returned to the estuary unless safe passage of Atlantic salmon, American shad or river herring is potentially compromised. In the event passage is compromised; limited numbers of striped bass will be allowed access to the East Channel headpond. Allow all other species (i.e., trout, black bass, etc.) to pass into the Cataract impoundment at both the East and West Channel fishways.

Utilize the underwater camera to guide operation of the East Channel fishway V-gate crowder to enhance shad, river herring, and Atlantic salmon capture efficiency. Allow all river herring to swim freely into the Cataract impoundment for the evaluation of the Skelton fishway. Transport all American shad captured at East Channel above the Springs and Bradbury dams. Collect biological information (i.e. sex, fork length, and scale sample) from river herring and shad mortalities .

Allow all Atlantic salmon from the East and West Channel fishways to swim freely into the Cataract impoundment. Any salmon captured upstream at the Skelton fishlift will be trucked to the Ossipee River. Biological information (i.e., sex, fork length, and marks observed only) will be collected from Atlantic salmon utilizing the East and West Channel fishways.

5.2 Downstream Passage

Continue to operate the downstream passage sluices as well as lower two flashboards on the East Channel to pass out migrating American shad and river herring. Also, continue to obtain and document information on emigration routes, timing, and numbers of adult and juvenile shad and river herring exiting the Cataract impoundment.

Spring Island and Bradbury Executive Summary

In 2017, the Springs and Bradbury fish locks were operated by personnel from Brookfield White Pine Hydro, LLC (BWPH).These fish locks were built to pass anadromous fish species (Atlantic salmon, American shad, and river herring) as part of resource agency plans to restore these species to the Saco River. 2017 marked the twentieth year of operation for the Springs and Bradbury fish locks.

Despite numerous studies conducted to improve American shad passage through the fish locks since 1997, (see 1997-2002 Springs and Bradbury Fish lock reports) shad passage numbers remain low. BWPH in consultation with the resource agencies, has explored many strategies to improve shad passage at Springs and Bradbury Dams, including; a fallback study, radio-telemetry study, structural modifications, flow modifications, added lighting, underwater camera work, and years of visual observations. Poor shad passage may be related to mechanical or flow issues associated with the fish locks, but there are also questions about the behavior of a schooling fish species and lack of imprinting to upstream habitats which also may affect upstream passage motivation.

In 2003, BWPH proposed and received permission from the resource agencies to truck American shad captured at the East Channel fishway around the Springs and Bradbury Dams as an interim passage measure until American shad numbers increase in the Saco River.

In 2014, in an attempt to increase American shad passage at the Springs and Bradbury dams, a total of 60 adult American Shad were collected out of the East Channel fish lift at the Cataract Project on three dates (June 16, 19, and 23), gastrically radio-tagged. and immediately released into the East Channel via the flume. Releases coincided with operational modifications made by Brookfield to adjust the differential between the Spring Island and Bradbury headpond and tailrace elevations to achieve an approximate velocity of 8.0 ft/s through gates at Spring Island and Bradbury dams. Movements of radio-tagged shad were monitored via a series of six stationary telemetry receivers (located downstream of the East and West Channel dams, upstream and downstream of Spring Island dam, and upstream and downstream of Bradbury dam. Results of this study may be found in BWPH's *Assessment of Upstream Passage of Adult American Shad at the Spring Island and Bradbury Fish Locks, Cataract Project, Saco River, Maine* (December 2014).

During 2017, BWPH successfully trucked 3,163 American shad around the Springs and Bradbury dams. In addition, 479 American shad were passed volitionally into the East and West Channel headponds during times when large numbers of river herring were being passed.

In 2017, 40,597river herring were allowed free passage through the Cataract fishways and were monitored upstream the Springs and Bradbury fish locks as well as at the Skelton fishway. A total of 5,121 river herring were captured at the Skelton fishway in 2017.

Nine Atlantic salmon were passed through the East and West Channel fishways in 2017. One Atlantic salmon was captured at the Skelton fishway.

6.0 Introduction

The Cataract Project (FERC No. 2528) is located on the Saco River in the cities of Biddeford and Saco and in the towns of Dayton and Buxton in the State of Maine. The project is licensed by the Federal Energy Regulatory Commission (FERC) and is owned by Brookfield White Pine Hydro, LLC. The project includes the Cataract (East Channel) dam, East Channel fishlift, and an integral intake powerhouse containing a single turbine generator on the northeastern side of Factory Island in the City of Saco; and the West Channel dam and associated Denil fishway in the cities of Saco and Biddeford. The impoundment formed by these dams extends upriver in the cities of Biddeford and Saco about 0.3 miles to another set of dams at Spring Island (see Figure 1) referred to as Bradbury and Spring Island dams. These dams are also part of the Cataract Project, and fish locks at these two sites were first operational in June 1997. The impoundment formed by these dams extends upriver about 9.3 miles through the cities of Biddeford and Saco and the towns of Dayton and Buxton to BWPH's Skelton Station.

6.1 Operation of the Springs and Bradbury Fish Locks

The fish locks at Springs and Bradbury dams are designed to operate at river flows up to 11,000 cubic feet per second (cfs) and consist of a 5.0 foot wide by 28.0 foot long lock chamber and a 5.0 foot wide by 11.0 foot long exit way (Figure 3). The lock fluctuates water elevation allowing salmon, shad, and river herring to ascend the 5.0-ft elevation difference at the dams (see Figure 3).

The locks have a minimum water depth of 5.0 ft and operate with a flow of approximately 80 cfs. Fishway entrance velocities are 4 to 6 feet per second (fps). The 80 cfs attraction water attracts the fish through the downstream lock gate. The fish then swim through the crowder and remain in the lock chamber. During the cycling process, the downstream gate closes and the surface water elevation in the lock chamber rises from 44.0 to 49.2 ft. The upstream gate then opens and the crowder slowly moves toward the upstream gate and guides the fish into

the upstream reservoir.

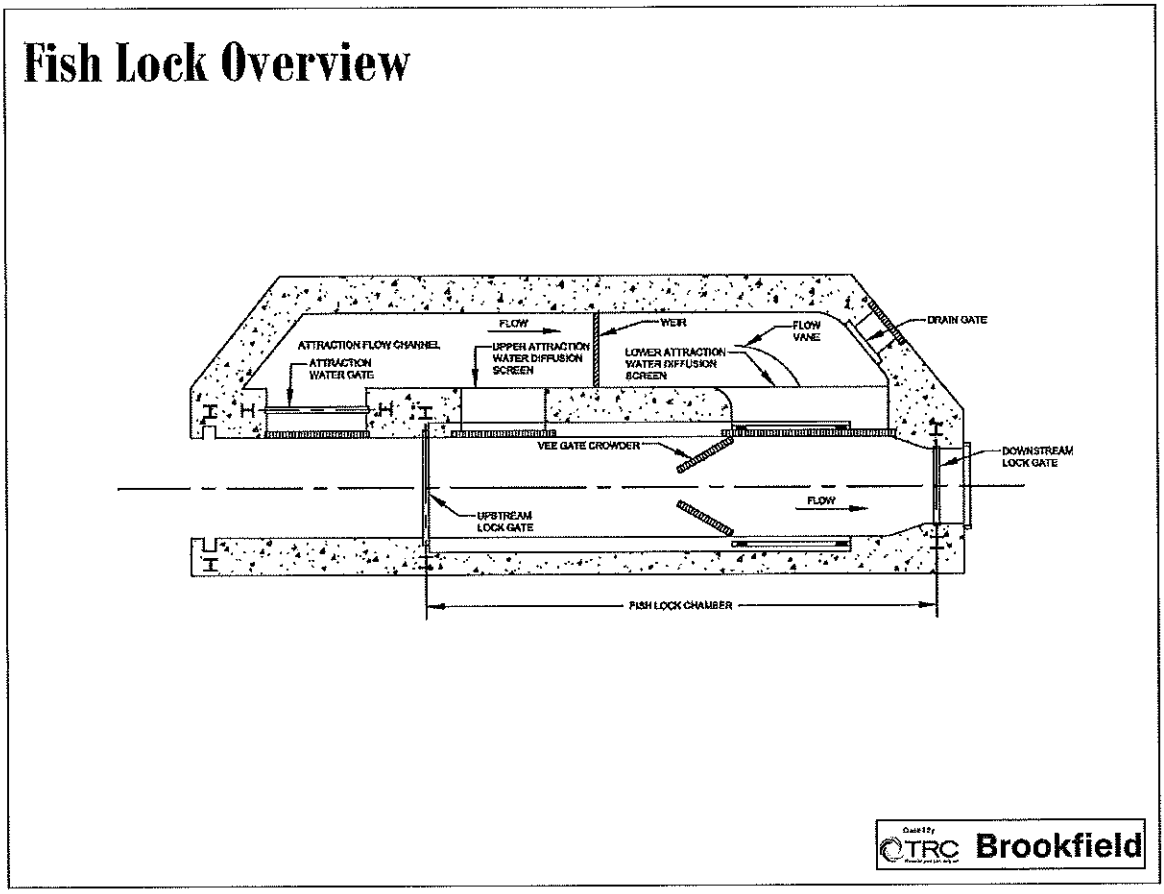


Figure 3. Generic drawing of a fish lock system, similar to what is installed at Springs and Bradbury dams.

The upstream gate then closes and the crowder moves back to its original position (referred to as the fishing position). The discharge gate then opens, returning the surface water elevation in the lock chamber to 44.0 ft. and the downstream gate opens to complete the process.

The hydraulic capacity of the Bradbury gate is approximately 2,060 cfs. River flows up to 2,060 cfs are normally passed through the Bradbury gate because the flows from this gate are directly in line with the Cataract East Channel powerhouse intake structure. This operation produces a more efficient flow pattern than flows out of the Spring Island gates which are directed towards

the West Channel. River flows in excess of 2,060 cfs are passed via gates at the Spring Island gatehouse.

In 2017, the Springs dam fish lock was opened on May 11, 2017 and ran with limited downtime for routine maintenance until October 30st 2017 when it was closed for the season. Although many fishway cycles were completed previous to May 11, the hourly automatic cycling of both Springs and Bradbury fishways coincided with the first herring passed at the Cataract East and West Channel fishway.

Fishlock cycle time was adjusted daily and ranged from every one hour to every eight hours. Since underwater video cameras were not utilized during the 2017 season at the Springs and Bradbury fish locks, cycling continued throughout the night. This allowed continual passage during the early morning and late evening hours throughout the season. Any alarms or shutdown of operations are automatically sent in to the river control center where fishway operations personnel were immediately notified. In the past, it appeared that when river herring were in the area, a one half hour to one hour cycle time captured the most fish.

River water temperature data (see Attachment 1) is monitored at the exit of the Skelton fishway via subsurface probes. River flow data (see Attachment 1) is collected at the Saco River Control Center and is documented as a daily mean river flow as passed through the Skelton Station.

6.2 Springs Dam Fish Lock - River Herring, American Shad, and Atlantic Salmon Information

6.2.1 River Herring

Previous studies have demonstrated that river herring successfully use the Springs Dam fish lock, therefore river herring were not counted passing through the fish lock in 2017.

6.2.2 American Shad

Despite numerous studies conducted to improve American shad passage through the fish locks since 1997, shad passage numbers remain low. Therefore, in consultation with the resource agencies trucks American shad captured at the East Channel fishway around the Springs and Bradbury Dams. During 2017, BWPH successfully trucked 3,163 American shad around the Springs and Bradbury dams (Please refer to Appendix A for a Summary of American Shad Passage Studies Previously Conducted at Springs and Bradbury Dams).

6.2.3 Atlantic Salmon

In 2017, a total of 9 Atlantic salmon passed through the Cataract East and West Channel fishways, one of which passed the Skelton fishway. Atlantic salmon were not counted passing through the Springs fish lock in 2017, but have readily passed through the fish locks or through the open taintor gates in the past.

6.2.4 American Eel

An upstream eel passage was designed, constructed, and installed at the Springs Island Dam in 2010. This new upstream eel passage is a permanently hinged structure that has the ability to raise and lower during high river flows. The Spring Island eel passage entrance is below the flashboards, therefore, the flashboards must be in place for installation and proper operation. The Spring Island flashboards were lost in June, 2014 and have not been replaced. Therefore, the Spring Island eel passage was not operational during the 2017 season.

6.3 Bradbury Dam Fish Lock - River Herring, American Shad, and Atlantic Salmon Information

6.3.1 River Herring

Previous studies have demonstrated that river herring successfully use the Bradbury Dam fish lock, therefore river herring were not counted passing through the fish lock in 2017.

6.3.2 American Shad

Despite numerous studies conducted to improve American shad passage through the fish locks since 1997, shad passage numbers remain low. Therefore, in consultation with the resource agencies trucks American shad captured at the East Channel fishway around the Springs and Bradbury Dams. During 2017, BWPH successfully trucked 3,163 American shad around the Springs and Bradbury dams (Please refer to Appendix A for a Summary of American Shad Passage Studies Previously Conducted at Springs and Bradbury Dams).

6.3.3 Atlantic Salmon

In 2017, a total of 9 Atlantic salmon passed through the Cataract East and West Channel fishways, one of which passed the Skelton fishway. Atlantic salmon were not counted passing through the Springs fish lock in 2017, but have readily passed through the fish locks or through the open taintor gates in the past.

6.3.4 American Eel

An upstream eel passage was designed, constructed, and installed at the Bradbury dam in 2010. This new upstream eel passage is a permanently hinged structure that has the ability to raise and lower during high river flows. The Bradbury eel passage entrance is below the flashboards, therefore, the flashboards must be in place for installation and proper operation.

The Bradbury flashboards were lost in June, 2014 and have not been replaced, therefore, the Bradbury eel passage was not operational during the 2017 season.

7.0 2018 Fishway Operations

The Springs and Bradbury fish locks will be operated in 2018 with the benefit of experience and insight gained in 1997-2017. General operational plans are summarized below.

1.) In the interim, due to less than desired shad passage effectiveness, truck all American shad captured at the East Channel fishway around the Springs and Bradbury Dams. Allow free passage of all American shad through the West Channel fishway.

2.) Pass all river herring and Atlantic salmon through the East and West Channel fishways, allow free passage through the locks and monitor passage at the Skelton fishway.

3.) Use the deep gate adjacent to the Springs Dam fish lock entrance to provide a continuous attraction flow throughout the fish migration period.

Skelton Project Executive Summary

The Skelton fishlift is the newest of the five fishways on the Saco River owned and operated by Brookfield White Pine Hydro LLC. The two head-of-tide fishways at the East and West Channels of the Cataract Project were first operational in 1993, while the Springs and Bradbury fishways became operational in 1997.

This fishway was built to pass anadromous fish species (Atlantic salmon, American shad, and river herring) as part of resource agency plans to restore these species to the Saco River. 2017 marked the sixteenth full year of operation of the Skelton fishlift. Due to logistical difficulties arising from precise rock blasting activities adjacent to the power house, severe winter weather conditions, and delays in the arrival of fishway electrical and mechanical components the new Skelton fishway was not operational until the fall of 2001. Therefore, 2001 did not constitute a full season of operation.

During the 2003 season, lifting ceased at the Skelton fishway during the summer months due to the Maine Department of Marine Resources (MDMR) safe handling temperature protocol for adult Atlantic salmon. This precluded most American shad from utilizing the Skelton fishway in 2003. During the 2004 and 2005 seasons, a camera was placed above the Skelton elevator enabling full visibility of the contents of the hopper shortly after initial lifting. This allowed fishway operators to observe for salmon or shad within the elevator and lower captured Atlantic salmon back into the tailrace (when river water temperature exceeds 22°C) while continuing to capture American shad.

In 2017, the Skelton fishlift was operated by personnel from BWPH operations division. It was opened on May 3rd and remained in operation, other than limited downtime for routine maintenance, until October 30th when the fishway was closed for the season. A total of 5,121 river herring, 221 American shad, and 1 Atlantic salmon successfully passed upstream.

The Skelton fishway will be operated in 2018 with the benefit of experience and insight gained during the 2001 through 2017 operating seasons. Estimates of passage effectiveness will be made

by enumerating American shad, river herring, and Atlantic salmon passing at the Cataract fishways, then comparing these passage numbers with the number of these fish captured at the Skelton fish lift. Behavioral issues such as lack of imprinting to upriver locations (especially for American shad) and spawning below the project (all three target species) will need to be taken into account when determining effectiveness. The underwater cameras will be utilized with the intention of observing Atlantic salmon, American shad, and river herring behavior in and around the fishway in an attempt to assist in capture efficiency.

8.0 Introduction

The Skelton Project (FERC No. 2527) is located on the Saco River in York County, Maine, approximately 11.1 miles upstream of the City of Saco. The Project is located in the towns of Buxton, Dayton, and Hollis, Maine. The Project is one of seven hydroelectric projects located on the mainstem of the Saco River.

The Skelton Project consists of a 1,695-foot long earth and concrete dam, a powerhouse that is integral to the dam, and an impoundment. The tailrace is excavated in the original riverbed and there is no river bypass section. The nameplate generator capacity of the Project is 21.6 megawatts (MW). The arrangement of the Project facilities is shown on Figure 4. Each of the eight spill gates maintains the capacity to pass 8,000 cubic feet per second (cfs).

The powerhouse contains two vertical-shaft Kaplan turbine-generator units. The Kaplan turbine units have a hydraulic capacity of 3,800 cfs. The generators are equally sized and have a combined nameplate rating of 16.8 MW. The gross head available to the site is approximately 76.5 feet.

The Skelton impoundment at the normal full pond elevation of 127.5' is approximately 488 surface acres. It extends upstream approximately 2.8 miles and is 0.2 miles wide at the broadest

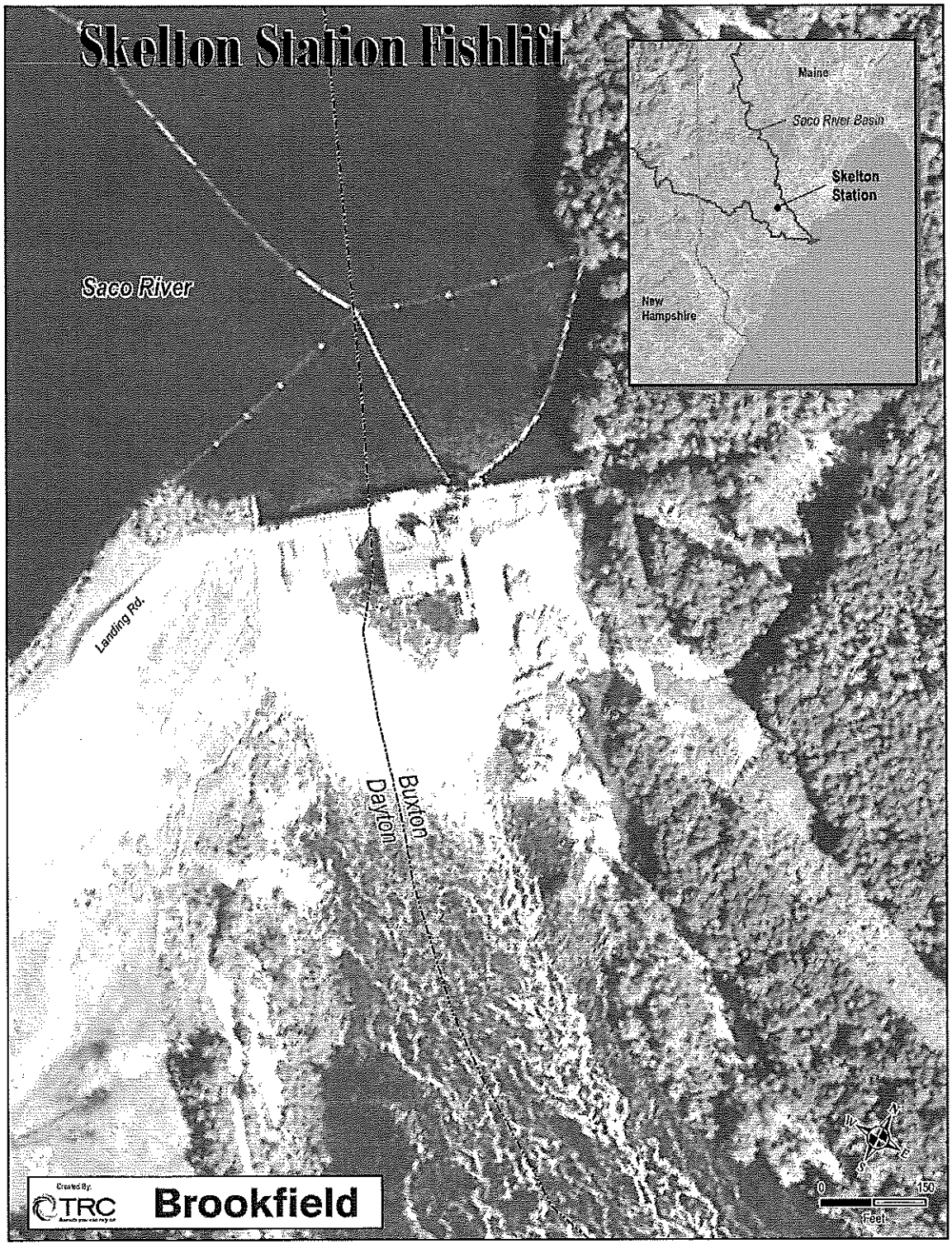


Figure 4. An aerial view of the Skelton Dam on the Saco River, Maine.

point. The impoundment includes 2.1 miles of Cook's Brook at its confluence with the Saco River.

The Skelton fishlift is the newest of the five fishways on the Saco River. The two head-of-tide fishways at the East and West Channels of the Cataract Project were first operational in 1993, while the Springs and Bradbury fish locks became operational in 1997.

Due to a number of major unanticipated setbacks during the construction process (i.e. logistical difficulties arising from precise rock blasting activities adjacent to the power house, severe winter weather conditions and delays in the arrival of fishway electrical and mechanical components) the fishway was not operational until the fall of 2001. Therefore, 2002 marked the first full operational season for the Skelton fishway.

In 2017, the Skelton fishway was operated by personnel from Brookfield White Pine Hydro, LLC (BWPH) operations division. 2017 marks the sixteenth full year of operation of the Skelton fishway. This fishway was built to pass anadromous fish species (Atlantic Salmon, American shad, and river herring) as part of resource agency plans to restore these species to the Saco River. Information learned during the 2001 through 2017 operating seasons will be used to effectively operate the fishway in 2018.

8.1 Operation of the Skelton Fishway

The Skelton fishway was opened on May 3rd and ran continuously other than limited downtime for routine maintenance until October 30th when the fishway was closed for the season

MDMR does not allow handling of Atlantic salmon when river temperature exceeds 22°C. Starting in 2005, a camera mounted above the Skelton elevator hopper has been utilized to monitor each lift for the presence of salmon and shad in the initial stage of each lift (before the hopper is lifted all the way to the top).

This allows fishway operators to observe for the presence of salmon within the elevator and lower captured Atlantic salmon back into the tailrace (when river water temperature exceeded 22°C) while continuing to capture American shad throughout the season.

The fishway at the Skelton Project is designed to operate up to river flows of 11,000 cfs. The fishway consists of a lower entrance flume and crowding area, a 90-foot high fishlift or elevator, an upper exit flume leading to the impoundment, and a trap and truck station located at the top of the lift. (see Figure 4) Depending upon species and numbers collected in any particular lift, the elevator may be directed to the upper flume area or may bypass the flume and continue on to discharge into the trap and truck tank. All fish discharged into the dump-tank must be manually netted into the holding tank, or placed into a discharge pipe releasing them into the Skelton impoundment.

The lower flume is approximately 55 feet long and maintains a velocity of between 1 and 1.7 fps, while the entrance velocity averages 3 to 6 fps. Total attraction water flow ranges from approximately 50 to 120 cfs depending on elevation of the tailrace. A problem identified during the start-up and shake-down period prevented desired flows from being met in 2001. When total attraction water flow would approach 60 cfs, a major vibration would occur in the attraction water piping. During the winter of 2001-2002, the previous licensee made the following modifications in an attempt to alleviate the vibration problem: 1. Move the pipe expansion joints from the valve side of the reducer to the pipe side of the reducer; 2. Install new valves and orifice plates lower in the three attraction water down pipes leading to the lower flume; 3. Remove the three manual valves; and 4. Provide additional supports to the 36" piping. These modifications were successful, and greatly reducing the vibration in the piping while still allowing desired flows in 2002. Approximately 50 cfs provided a five fps entrance velocity when Skelton station was passing a minimum flow of 400 cfs while 90 to 110 cfs was required to attain a five fps entrance velocity while both units were operating at 100%.

A counting window is located in the upper flume. Fish that are discharged into the upper flume via the elevator can be counted, and species can be determined before being allowed to

pass into the Skelton impoundment. The elevator can also discharge fish into a 5,000-gallon circular tank located above the upper flume. At this location, fish may be sorted and either placed into another holding tank to await trucking, or may be released directly into a bypass tube that discharges into the headpond.

Four cameras were utilized to monitor fish movement in and around the fishway in 2017. Three cameras were placed on the floor of the lower flume looking towards the surface directly downstream of the V-gate crowder. This location is used to detect fish entering or leaving the trap area. The fourth camera was placed above the fishway elevator attached to a safety railing. As eluded to previously, this camera provides a view of elevator contents shortly after initial lift cycle and allows for operation of the Skelton fish lift even when river temperature exceeds 22°C.

From June 24th to August 27th the Saco River temperature exceeded MDMR safe handling levels for Atlantic salmon. On August 28, 2017 river water temperatures again dropped below MDMR safe handling levels allowing salmon capture to continue. A summary of river temperature and river flow is provided in Attachment 1.

During the busiest of the fish migration period, fishway personnel were stationed at the Skelton fishway control room every day for between eight and twelve hours, seven days per week. The underwater video camera monitors were observed for fish activity and lifts were conducted as needed. If fish were not observed, a lift would be conducted "blindly" every one to two hours. During the remainder of the year, two to five lifts were conducted each day and fish activity in the lower flume was recorded while personnel were not present. Recordings were reviewed for fish activity within 24 hours. If salmon were observed on the recording, or lifted blindly, more intensive trapping operations resumed.

8.2 River Herring, American Shad, and Atlantic Salmon Information

8.2.1 River Herring

In 2017, 40,597 river herring were passed at the Cataract fishways. These fish were all allowed free passage through the Cataract East and West channel fishways, and the Springs and Bradbury fish locks. A total of 5,121 river herring were captured at the Skelton fishway. It is expected that the remainder of the river herring that were not lifted at the Skelton fishway commenced to spawn below the project.

The river herring daily lift schedule was adjusted by fishway personnel depending on the number of fish observed and the time of the run. This schedule maximized fish passage while minimizing labor requirements and wear and tear on fishlift components.

8.2.2 American Shad

During the 2017 season, 3,163 American shad were trucked above the Springs and Bradbury Dams to the Diamond Riverside boat launch release site (approximately half mile upriver from Cataract). 221 shad were lifted at Skelton fishway in 2017. It is assumed that many of the American shad that were not lifted at the Skelton fishway commenced to spawn below the project, as post-spawned American shad and juvenile American shad have historically been observed at the downstream Cataract Project. Also, the 9.3 miles between the Skelton Project and the Cataract Project provides adequate spawning habitat for approximately 25,000 adult American shad.

In 2018, Brookfield proposes to continue to truck all American shad around the Springs and Bradbury Dams. All American shad captured at the Skelton fishway will be released into the Skelton impoundment.

8.2.3 Atlantic Salmon

Nine Atlantic salmon were passed at the Cataract East and West Channel fishways in 2017. One of those fish was captured at the Skelton fishway in 2017.

BWPH biologists followed the Atlantic Salmon Trap Operating and Fish Handling Protocols provided by the MDMR in 2002 (See Attachment 2). Atlantic salmon monitoring at the Skelton fishway typically began at 08:00 and it was continually monitored for fish activity until between 16:00 and 19:00 depending on fish activity. Typically if there was an Atlantic salmon observed on the underwater cameras, biologists would quickly capture the fish. Between two and ten lifts would be made during the day regardless of fish activity. If a Salmon was captured during the morning hours, and temperatures and weather were conducive to holding fish, the salmon would be held in the 1,000 gallon holding tank. The tank was continually supplied with fresh water until another salmon was captured or until it was obvious that another salmon would not be immediately captured. Salmon were not held during warm weather days and were not held for more than four hours. After the salmon were transferred into the tank truck, the truck immediately left for the forty minute drive to the Ossipee River. In 2017, water temperatures exceeded 22°C on June 24, 2017 and stayed above 22°C until August 28, 2017.

During observations from 2001-2017, Atlantic salmon did not appear to have any problems finding the fishway entrance during generation flows. It also appears that salmon readily enter the trap area. In 2002, biologists experimented with passing minimum flows through different gates in an attempt to attract fish closer to the fishway entrance when the station is not generating. On October 9, 2002, minimum flow was passed through gate #5 instead of the normal gate #2. Gate #2 is an automatic gate, which can be run remotely by the River Control Center thus ensuring minimum flows during headpond level changes and during periods of inflow equal to outflow. Gate #5 is closest to the fishway on the East side of the river by passing minimum flow next to the fishway, BWPH biologists hoped to attract more salmon into the fishway during periods of no generation. Flows passing through gate #5 crashed over the ledges and dumped into the tailrace just below the fishway entrance thus tearing off the wooden end to the downstream passage sluice. The gate remained open for approximately five hours and no salmon were observed either on the cameras or in the tailrace area.

8.2.3.1 Atlantic Salmon Spawning Survey (Redd Survey)

Atlantic salmon spawning surveys (redd counts) were conducted once per week by boat or by foot in the Skelton tailrace area in conjunction with monitoring for adult eel mortalities during the months of September, October, and November. No salmon redds were observed in 2017.

8.3 Downstream Fish Passage

The downstream passage at the Skelton fishway was opened March 30th and remained open throughout the rest of 2017. Downstream passage observations were conducted most mornings at the Skelton Project bypass area between May 3rd and June 30th previous to the first upstream passage lift of the day. Between July 1st and October 30th, downstream passage observations were conducted most mornings and late afternoon/evening.

In addition to the standard downstream fish passage, the Skelton fishway also contains a downstream migrant pipe. The migrant pipe passes approximately 8 cfs over an overflow gate at the lower end of the upper flume of the upstream fishway (15 to 35 cfs). This gate and pipe allows safe downstream passage to any migrating fish drawn into the upper flume by the flows needed for the upstream fish passage.

8.3.1 Post Spawned River Herring

No post spawned river herring were observed utilizing the Skelton bypass in 2017.

8.3.2 Post Spawned American Shad

No post spawned American shad observed utilizing the Skelton Project in 2017.

8.3.3 Post Spawned Atlantic Salmon

No post-spawned Atlantic salmon were observed above the Skelton project in 2017.

8.3.4 Juvenile Clupeids

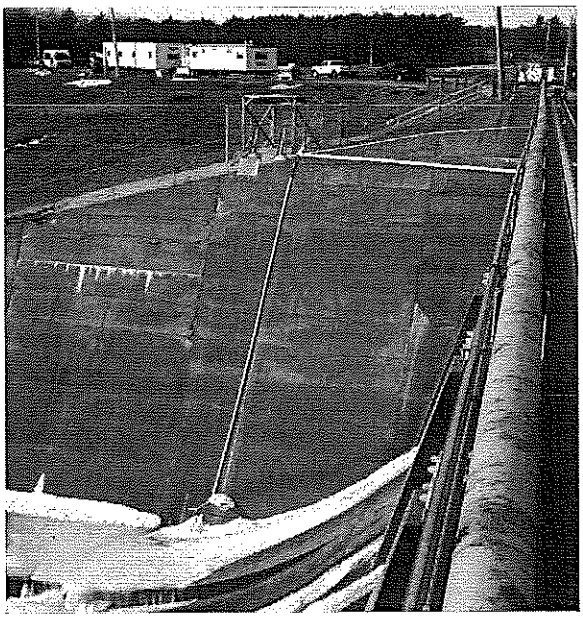
Juvenile clupeid observations were conducted most mornings and afternoons in the Skelton headpond, downstream bypass, and downstream migrant pipe area from July 1st hrough October 30th. During July and August, small schools of juveniles were occasionally seen out in the Skelton headpond but not utilizing the downstream bypass. No juveniles were observed utilizing the downstream passage or downstream migrant pipe outside of this time.

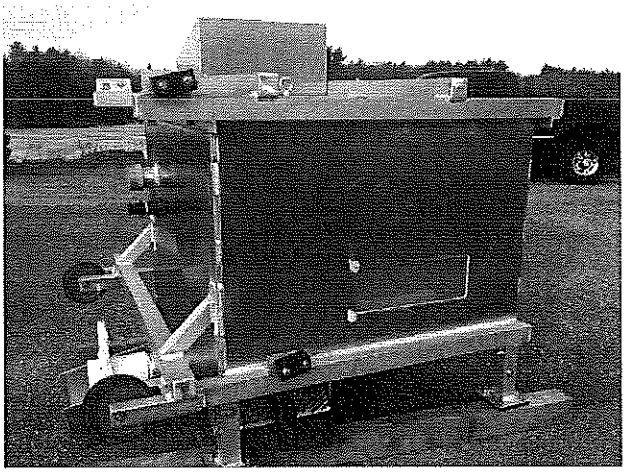
8.3.5 American Eel

Thirteen (13) weekly surveys were conducted for adult American eels mortalities in below the Skelton Project in 2017 between September 1st and November 30th (see Table 14). The surveys consisted of slowly scanning the shoreline and shallow areas of the Skelton tailrace area from a boat or by walking the shoreline with polarized glasses looking for eels. Between September 1st and October 24th , Saco river flows were so low that observations could only by foot survey along the shore. Heavy rains during late October quickly brought river levels high, along with turbidity, and although boat observations were attempted, visibility was very low. No dead eels were observed below the Skelton Project in 2017.

8.3.6 Upstream American Eel

2017 marked the fourth year of operation for the new Skelton eel lift. The lift was first operational on June 1st and ran continuously until September 18th when it was shut down for the season. The Skelton eel lift successfully passed 6,965 eels in 2017 (see Table 10).





8.4 Non-Target Fish Species

Seventeen (17) non-target species totaling 628 fish ascended the Skelton fishway in 2017 (Table 8). Sunfish (152 fish), were the most numerous of these non-target species, followed by smallmouth bass (147), and American eel (137). One gizzard shad was immediately culled while all three striped bass were returned to the tailrace.

Multiple other non-target fish were captured in the Skelton fishway hopper but were lowered back to the tailrace before dumping once it was determined that there were no target species captured. At the request of Maine Department of Inland Fisheries and Wildlife (MDIFW) the majority of the brook trout and brown trout captured at the Skelton fishway were released back into the Skelton tailrace area. All remaining non-target species were allowed free passage into the Skelton impoundment.

8.5 2018 Fishway Operations

The Skelton fishway will be operated in 2018 with the benefit of experience and insight gained during the 2001 through 2017 operating seasons.

All fish utilizing the fish lift will be identified and counted. Estimates of passage effectiveness will be made by enumerating American shad, river herring, and Atlantic salmon passing at the Cataract fishway, then comparing with the number of these fish captured at the Skelton fish lift. Behavioral issues such as lack of imprinting to upriver locations (especially for American shad) and spawning below the project (all three target species) will need to be taken into account when determining effectiveness.

The underwater cameras will be utilized with the intention of observing Atlantic salmon, American shad, and river herring behavior in and around the fishway in an attempt to assist in capture efficiency.

All American shad and river herring will be allowed free passage into the Skelton headpond. All Atlantic salmon will be trucked to the Ossipee River until river temperature reaches 22°C. Trucking salmon will be resumed when river temperature falls below 22°C.

Cameras will continue to be utilized in identifying and capturing American shad river temperature exceeds MDMR's safe handling temperature of 22°C (i.e. shad will be lifted, salmon will be returned to tailrace).

A flow of at least 25 cfs will be maintained through the 24" pipe to retain a 1 fps upper flume velocity for both upstream and downstream migrants.

9.0 Bar Mills

The Bar Mills downstream bypass was opened on March 30th (flow of 120 cfs) and remained in operation until December 31, 2017. Approximately 1,727 (7 fish per surface acre) adult river herring were transported from the Cataract East Channel fish lift and stocked above the Bar Mills Project in 2017. Juvenile clupeid observations were conducted twice per week in the evening between August 15th and October 15th (see Table 12). Small to moderate numbers of juvenile clupeids (schools of 20 to 200) were observed during late August and early September. All juveniles were observed dimpling in the headpond. No fish were observed near or using the

downstream bypass or in front of the units. BWPH will continue to stock river herring above the Bar Mills Project in 2018 and monitor out-migrating juvenile clupeid routes of passage in 2018.

The Bar Mills upstream eel passage was installed and operational on June 1st and remained in operation until September 18th. Only 2 eels were captured in 2017. The Bar Mills spillway is 264 feet long topped with heavily leaking hinged boards. It is expected that juvenile American eels pass across the entire length of the spillway through the leakage between hinged boards.

10.0 West Buxton

The West Buxton downstream bypass was opened on March 30th (flow of 200 cfs) and remained in operation until December 31st. Approximately 1,003 adult river herring (8 fish per surface acre) were transported from the Cataract East Channel fish lift and stocked above the West Buxton Project in 2017. Juvenile clupeid observations were conducted twice per week in the evening between August 15th and October 15th (see Table 12). Small to moderate numbers of juvenile clupeids (schools of 20 to 200) were observed during late August and early September. All juveniles were observed dimpling in the headpond. No fish were observed near or using the downstream bypass or in front of the units. BWPH will continue to stock river herring above the West Buxton Project in 2018 and monitor out-migrating juvenile clupeid routes of passage in 2018.

The West Buxton upstream eel passage was operational on June 1st and remained in operation until September 18th. 2,425 American eels passed upstream at the West Buxton eel passage and ranged in size from 80 mm to 600 mm (Table 11).

11.0 Bonny Eagle

The Bonny Eagle downstream bypass was opened on March 30th (flow of 200 cfs) and remained in operation until December 31st. Approximately 1,627 adult river herring (7 fish per acre) were transported from the Cataract East Channel fish lift and stocked above the Bonny Eagle Project in 2017. Juvenile clupeid observations were conducted twice per week in the evening between

August 15 and October 15 (see Table 13). Small to moderate numbers of juvenile clupeids (schools of 20 to 200) were observed during late August and early September. All juveniles were observed dimpling in the headpond. No fish were observed near or using the downstream bypass or in front of the units. BWPH will continue to stock river herring above the West Buxton Project in 2018 and monitor out-migrating juvenile clupeid routes of passage in 2018.

The Bonny Eagle upstream juvenile American eel passage was installed in fall of 2017 and will be operational on June 1, 2018.

Appendix A

Summary of American Shad Passage Studies Conducted Previously at Springs and Bradbury Dams

A shad fallback study was conducted at the Cataract East and West Channel fishways in 1999 to identify if fallback contributed to the low fish lock passage rates observed in 1998. This study consisted of tagging 247 American shad and releasing them into the Cataract headpond to observe whether the fish were falling back into the tailrace and being captured in the fishway for a second time. None of the 247 tagged American shad were recaptured at the Cataract East or West Channel fishways.

During the 2000 season, 10 American shad were radio tagged, released at the Cataract fishlift, and tracked manually for two weeks in June. In short, the ten shad swam a circuit that ran from the East Channel forebay up past Jubilee Park and to the Spring Island fishway. Although nine of the ten-tagged fish made appearances at the Spring Island fish lock, and two at the Bradbury fish lock, radio telemetry data indicated that shad spent most of their time between the East Channel forebay and the upper end of Jubilee Park. It did not appear that shad were "holding up" in any particular location for long periods of time. All Spring Island gates were closed during the tracking period and no fish passed through the open Bradbury gate.

During the 2001 season, BWPH experimented with a variety of measures to enhance fish passage including adjusting the flow through the deep gate at the Spring Island dam which is adjacent to the Spring Island Lock, installation of lights just inside the fish lock entrances, and the use of additional cameras for monitoring passage.

Deep gate flow adjustments were made in 2001 in an attempt to help attract fish to the fish lock by providing more flow, as well as to try to hold shad in the vicinity of the fish lock during fish lock operations by providing a constant flow in that area. Numerous settings of the deep gate adjacent to Spring Island Lock were attempted and the results. indicated that

the deep gate setting effected fish passage at the Spring Island lock. A deep gate setting of 0.25 ft. appeared to work the best (with all other gates closed). When the deep gate was opened at 1 ft or more shad did not readily enter the fish lock entrance. At the lower settings (1 to 3 ft) a back eddy was created which tended to lead fish away from the fish lock. At higher deep gate settings (> 3 ft), attraction flow from the fish lock entrance was masked by flows from the deep gate.

Mercury vapor lights were installed in 2001 in an attempt to eliminate shadows at the fish lock entrances. A 500-Watt mercury vapor lamp was installed inside the fishway entrance but behind the crowder of each fish lock during the season. Results of the study were inconclusive; however BWPH will continues using the lights to enhance fish lock passage effectiveness.

In an attempt to gather additional information about shad activity in and around the fish locks, additional cameras were added in 2001. . The cameras were installed in an attempt to establish whether shad were entering and leaving the fish lock entrance, or not entering the fish lock at all. The tailrace camera observed many shad. Approximately half of those observed in the tailrace were observed at the entrance camera, and very few actually swam up to the crowder. Most shad were seen in small schools of 2 to 8 fish and would enter and quickly exit the fish lock entrance. Camera observations indicated that American shad do not appear to be having any difficulties finding the fish lock entrance; but hesitatant to actually enter the fish lock, or approach the fish crowder. This hesitation that occurs just inside the fishway entrance may be attributable to the crowder doors, or possibly disorienting flows encountered in the fish lock flume.

In 2014, in an attempt to increase American shad passage at the Springs and Bradbury dams, a total of 60 adult American Shad were collected out of the East Channel fish lift at the Cataract Project on three dates (June 16, 19, and 23), gastrically radio-tagged, and immediately released into the East Channel via the flume. Releases coincided with operational modifications made by Brookfield to adjust the differential between the Spring Island and Bradbury headpond and tailrace elevations to achieve an approximate velocity of

8.0 ft/s through gates at Spring Island and Bradbury dams. Movements of radio-tagged shad were monitored via a series of six stationary telemetry receivers (located downstream of the East and West Channel dams, upstream and downstream of Spring Island dam, and upstream and downstream of Bradbury dam. Results of this study may be found in BWPH's *Assessment of Upstream Passage of Adult American Shad at the Spring Island and Bradbury Fish Locks, Cataract Project, Saco River, Maine* (December 2014).

Attachment B

2018 UPSTREAM EEL PASSAGE MONITORING

HIRAM HYDROELECTRIC PROJECT

FERC NO. 2530

Prepared for:

Brookfield White Pine Hydro
Lewiston, Maine

Prepared by:

Kleinschmidt

Pittsfield, Maine
www.KleinschmidtGroup.com

January 29, 2019

2018 Upstream Eel Passage Monitoring

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September 2018

2018 UPSTREAM EEL PASSAGE MONITORING
HIRAM HYDROELECTRIC PROJECT

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APPENDICES

1.0 INTRODUCTION

Brookfield White Pine Hydro, LLC (White Pine Hydro) is the licensee for the Hiram Hydroelectric Project (Hiram Project) (FERC No. 2530), located on the Saco River in York and Cumberland counties in southern Maine (Figure 1). The Hiram Project is approximately 46 river miles upstream from the confluence of the Saco River and the Atlantic Ocean (Figure 1).

In 2007, the licensee entered into the Saco River Fisheries Assessment Agreement (Agreement) with state and federal agencies, and several non-governmental organizations (FPL Energy 2007). The Agreement sets forth a comprehensive plan to provide fish passage at dams on the main stem of the Saco River, including constructing one upstream American eel passage system at the Hiram Project by June 1, 2020. As noted in the 2007 Agreement, the schedule for the development and implementation of eel passage measures may be delayed following consultation and agreement with the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and Maine Department of Marine Resources (MDMR) that American 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.

In accordance with the Agreement, White Pine Hydro monitored juvenile eel movements at the Hiram Project in 2018 to determine whether they congregate or attempt to ascend the Hiram dam or other project structures. White Pine Hydro submitted a draft study plan to the USFWS, MDMR, NMFS, Maine Department of Environmental Protection, and Maine Department of Inland Fisheries and Wildlife on February 12, 2018; comments were received from USFWS that were incorporated into a final study plan.

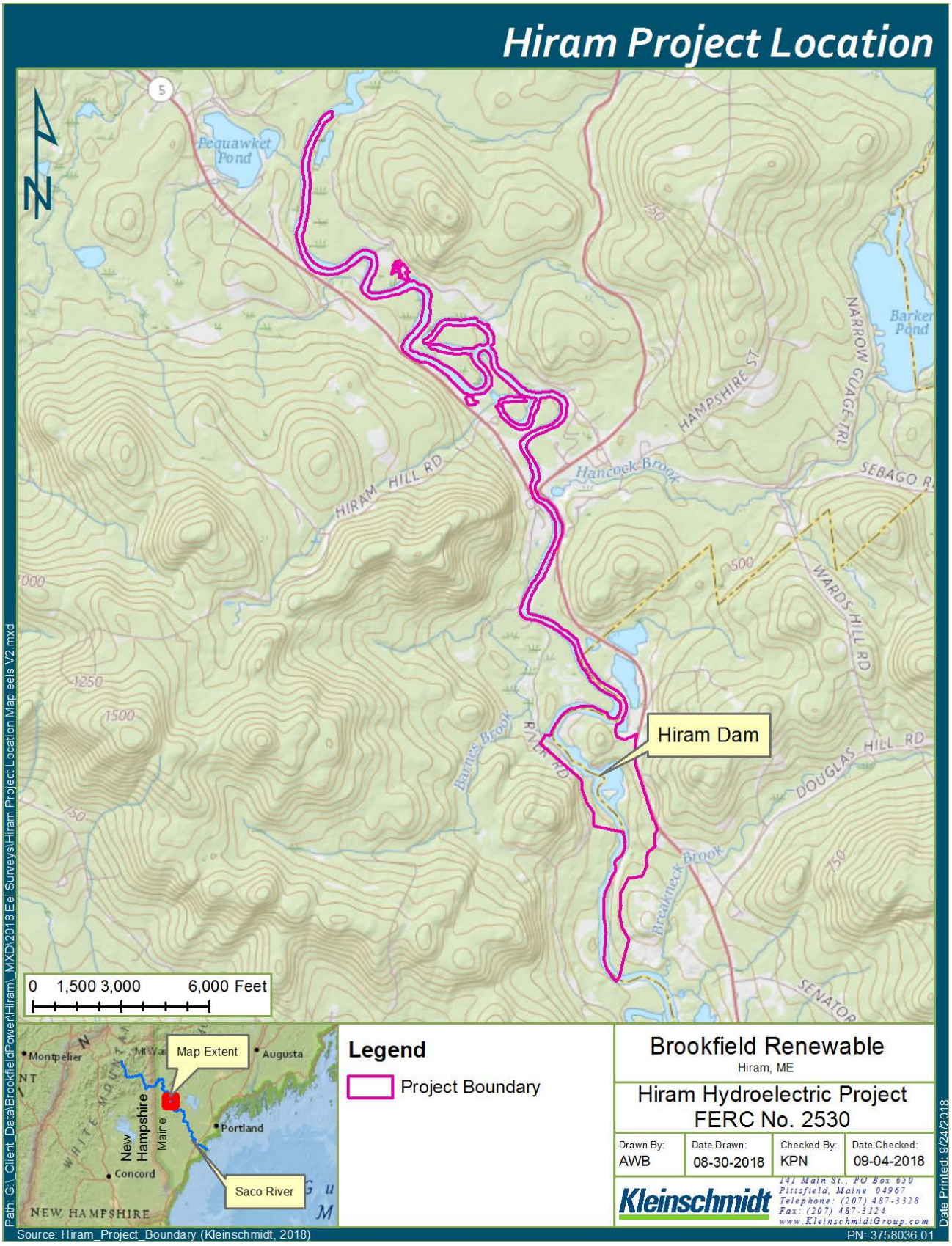

FIGURE 1 HIRAM PROJECT LOCATION MAP

2.0 METHODS

In accordance with the study plan, biologists conducted 15 nighttime surveys at the Hiram Project during the 2018 upstream eel migration season (i.e., June through August) from safely accessible locations along project structures. The survey focused on spill and debris gates, discharge areas below the gates, the spillway, and the tailrace (Figure 2). Surveys were conducted twice a week from June 5 to June 28, 2018 and once a week from July 5 to August 16, 2018. The monitoring schedule was developed to target the beginning, peak, and end of the migration period. Surveyors used binoculars and spotlights to observe eels during non-spill conditions from the top of the dam and the tailrace. During each survey, biologists noted the location of juvenile eels, the approximate number of eels at each location, the approximate size classes of eels at each location, and weather conditions. Each survey lasted approximately 1 hour and took place after sunset between 20:40 and 00:05. White Pine Hydro ended the monitoring after the August 16, 2018 survey because no eels were observed in the first 2.5 weeks of August 2018.

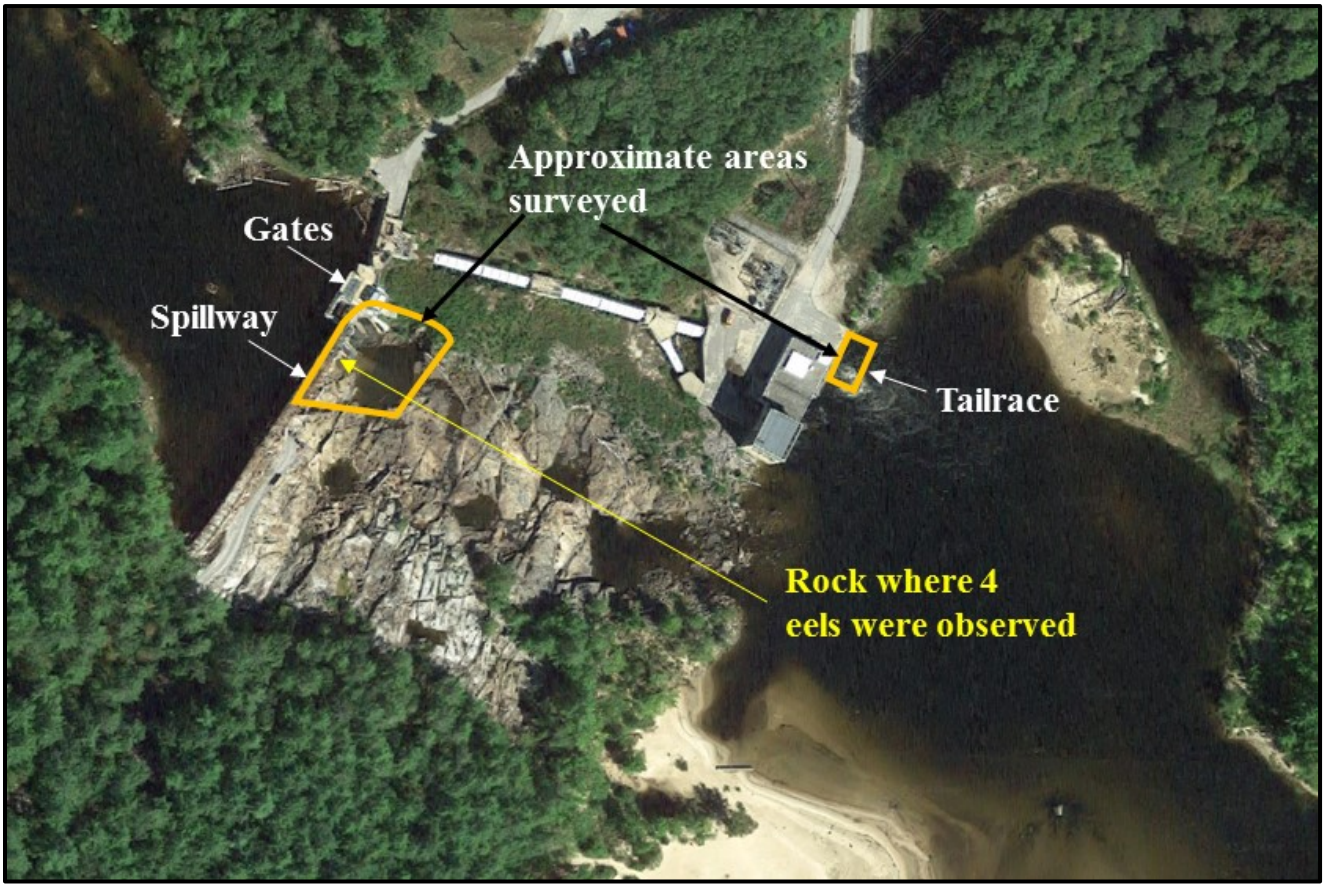

FIGURE 2 SURVEY AREAS FOR 2018 JUVENILE EEL MONITORING AT THE HIRAM PROJECT

3.0 RESULTS

Five eels were observed throughout the monitoring period. Four eels were observed on bedrock to the right of the spill gates (Figure 2, Photo 1) and one eel was seen on the concrete downstream of a debris gate (Photo 2). The number of eels observed during each survey ranged from 0 to 2; eels were observed on June 7 (1), July 5 (2), July 12 (1), and July 24, 2018 (1) (Table 1). The lengths of eels ranged from approximately 3 to 5 inches (75 to 125 mm). No eels were observed at the tailrace. One or both units were operating during each survey. There was no spill during the monitoring except during the August 1, 2018 survey (Table 1); however, there was leakage through the debris gates during every survey.

PHOTO 1 **LOCATION OF JUVENILE AMERICAN EELS ON BEDROCK ADJACENT TO THE SPILL GATES AT THE HIRAM PROJECT DURING THE 2018 NIGHTTIME SURVEYS**

PHOTO 2 **LOCATION OF A JUVENILE AMERICAN EEL DOWNSTREAM OF A DEBRIS GATE AT THE HIRAM PROJECT DURING THE 2018 NIGHTTIME SURVEYS**

TABLE 1 SUMMARY OF THE 2018 NIGHTTIME JUVENILE EEL SURVEY RESULTS AT THE HIRAM PROJECT

2018 Date	Start Time	End Time	# Eels Observed	Description/Location	Length (inches and mm)	Spillway Flow (cfs)	Temperature (°F), Weather	24-hr Precipitation (inches)[1]	Percent Full Moon[2]
6/5	23:00	23:50	0	N/A		0.0	Approximately 50°, cloudy, lightly raining	0.14	67
6/7	22:45	23:45	1	Bedrock at base of dam	3-5" (75-125 mm)	0.0	55°, clear	0.00	48
6/12	21:00	22:10	0	N/A		0.0	75°, clear to partly cloudy	0.00	5
6/14	23:00	23:55	0	N/A		0.0	55°, light rain	0.14	1
6/19	21:00	22:00	0	N/A		0.0	52°, clear	0.02	34
6/21	23:30	0:05	0	N/A		0.0	54°, clear	0.00	56
6/26	23:00	23:45	0	N/A		0.0	57°, clear	0.00	96
6/28	23:25	0:00	0	N/A		0.0	70°, 1 hour after big rain storms, warm and muggy	0.64	99
7/5	20:55	21:55	2	Bedrock at base of dam	3-5" (75-125 mm)	0.0	Warm, clear, humid	0.00	63
7/12	20:55	21:50	1	Bedrock at base of dam	3-5" (75-125 mm)	0.0	Approximately 70°, partly cloudy	0.00	0
7/19	22:55	23:45	0	N/A		0.0	60°, clear	0.00	50
7/24	21:00	21:55	1	Concrete spillway	3-5" (75-125 mm)	0.0	71°, clear	0.03	87
8/1	22:45	23:15	0	N/A		315.8	70°, no rain (had been raining earlier in the evening)	0.38	80
8/9	20:40	21:15	0	N/A		0.0	74°, clear	0.54	5
8/16	22:20	23:00	0	N/A		0.0	63°, clear to partly cloudy	0.01	33
TOTAL			**5**	-	-	-	-	-	-

[1] Weather Underground (2018)
[2] The Old Farmer's Almanac (2018)

4.0 SUMMARY

The 2018 monitoring confirmed that there were very few juvenile American eels at the Hiram Project. The number of juvenile eels observed at the Hiram Project was low compared to observations reported from other dams on the Saco River in recent years using the same survey methods. For example, 59 eels were observed at the Bonny Eagle Hydroelectric Project in 2016 (Kleinschmidt 2016), and 1,020 were observed at the West Buxton Hydroelectric Project in 2015 (Kleinschmidt 2015). Pursuant to the Agreement, White Pine Hydro plans to consult with the resource agencies regarding the study results and whether there is currently a need for installation of an eelway at the Hiram Project.

5.0 REFERENCES

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ATTACHMENT C

Recent Trap Counts for Fish Returns to Maine by River

River	Trap Location	Am.Shad	At.Salmon (MSW)	At.Salmon (grilse)	River Herring	Striped Bass	Sea Lamprey	Trap Opened	Trap Closed	Updated
Androscoggin	Brunswick	23	5	0	67	1	41	June 1	November 6	November 16, 2020
Aroostook	Tinker Dam	NC	3	0	NC	NC	NC	July 2		October 30, 2020
Kennebec	Benton Falls	9	0	0	2847095	0	6	May 1	October 31	October 21, 2020
Kennebec	Lockwood Dam	180	47	4	143269	347	46	May 1	October 31	November 16, 2020
Narraguagus	Cherryfield	780	93	13	NC	0	0	April 29		October 15, 2020
Penobscot	Milford fish lift	11276	1576		1952537	325	5565	April 22	November 16	November 16, 2020
Penobscot	Orono	2	26	0	121787	0	1028	April 22	November 16	November 16, 2020
Penobscot	Weldon Dam	NC	NC	NC	NC	NC	NC	April 30	November 16	November 16, 2020
Saco	Cataract (East + West Channels)	5368	2	1	34404	264	0	May 1		August 30, 2020
Saco	Skelton	48	2	0	34249	48	0			August 30, 2020
St. Croix	Milltown Dam	3	0	0	611907	0	0	April 15		July 30, 2020
Union	Ellsworth	0	3	0	526907	0	0	May 1	November 1	November 16, 2020

Atlantic salmon MSW = multi sea winter (≥ 63 cm fork length); grilse = one sea winter (< 63 cm fork length)
River herring counts = combined count of alewife and blueback herring