UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930

August 3, 2022

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

RE: Preliminary Prescription for Fishways; Barkers Mill Hydroelectric Project (FERC No. 2808-020) Under Exercise of Reserved Federal Power Act Section 18 Authority

Dear Secretary Bose:

On April 29, 2022, Troutman Pepper, on behalf of its client, Kruger Energy Incorporated (KEI) Maine Power Management (III), LLC, filed a License Amendment Application to Adopt Settlement Agreement for the Barkers Mill Hydroelectric Project (settlement agreement) (FERC No. 2808) (Accession # 20220429-5405).

By this correspondence, NOAA's National Marine Fisheries Service (NMFS) is invoking the reserved authority of the Secretary of Commerce under Section 18 of the Federal Power Act (FPA)[1] during the term of the license for the Barkers Mill Hydroelectric Project (Lower Barker/Project). Included herewith is NMFS' Preliminary Prescription for Fishways (Preliminary Prescription), which we will develop further and modify in accordance with its regulations at 50 C.F.R. part 221. We also formally request that the Federal Energy Regulatory Commission (Commission or FERC) open a proceeding to amend the license as required by the NMFS prescription.

We have made the following filings as part of the previous license process for this Project:

1. Motion to Intervene on July 31, 2017 (Accession # 20170731-5253);
2. Preliminary Fishway Prescription (and administrative record) on December 21, 2017 (Accession # 20171221-5191); and
3. Modified Fishway Prescription on November 2, 2018 (Accession # 20181102-5076).

After new proceedings are opened by FERC and all parties have been identified, NMFS will serve copies of the Preliminary Prescription on any additional license party. *See* 50 C.F.R. § 221.20(b).

[1] 16 U.S.C. § 811.

Overview and Background

The Barkers Mill Hydroelectric Project (Lower Barker/Project) is located near the City of Auburn in Androscoggin County in southwestern Maine. The Project is on the Little Androscoggin River approximately 2,000 feet upstream of the river's confluence with the Androscoggin River. Project works include a concrete dam with spillway, non-overflow stop log and gate sections; a power canal, intake and gatehouse; an underground concrete penstock; and appurtenant facilities. The Project boundary generally includes the impoundment, dam, buried penstock, and the powerhouse. The Lower Barker Project operates as a run-of-river facility with a continuous minimum flow of 20 cfs conveyed to the approximately 2,800-foot-long bypass reach. Inflows less than 170 cfs (minimum hydraulic capacity plus bypass minimum flows) and greater than 520 cfs (maximum hydraulic capacity plus bypass minimum flows) discharge over the spillway. The Project has a total rated capacity of 1.5 MW, but generates 1.2 MW due to limitations with the installed generator.

FERC issued the project's original license order on February 23, 1979 (Accession # 19790223-4000). Under that license, KEI (Maine) releases a minimum flow of 20 cfs to the bypassed reach. From June 1 through November 15, KEI (Maine) releases the minimum flow through the stop log section of the dam, which provides a potential egress route for emigrating diadromous species other than turbine passage and spill. There are no entrainment prevention measures at the Lower Barker Project. During the remainder of the year, KEI (Maine) releases the minimum flow from one of the fixed deep gates in the dam or over the spillway. The minimum flow was determined in consultation with agencies during the initial licensing and was intended "to enhance fishery resources" (FERC 1979).

Article 11 of the initial license (FERC 1979), states:

> *The Licensee shall, for the conservation and development of fish and wildlife resources, construct, maintain, and operate, or arrange for the construction, maintenance, and operation of such reasonable facilities, and comply with such reasonable modifications of the project structures and operation, as may be ordered by the Commission upon its own motion or upon the recommendation of the Secretary of the Interior or the fish and wildlife agency or agencies of any State in which the project or a part thereof is located, after notice and opportunity for hearing.*

Currently, there are no upstream fishways for diadromous species at the Lower Barker Project. Diadromous species have had volitional access to the Lower Barker Project since 1988 when the Worumbo Hydroelectric Project (FERC No. 3428) fishway became operational (MDMR and MDIFW 2017). On November 2, 2018, we reserved authority to prescribe fishways for the Project in our modified fishway prescription when we stated:

> … we hereby reserve authority under Section 18 of the FPA to prescribe such additional or modified fishways at those locations and at such times as we may subsequently determine are necessary to provide for effective upstream and downstream passage of anadromous fish through the Project facilities. This

> reservation of authority includes, without limitation, our authority to amend this fishway prescription upon approval by us of such plans, designs, and completion schedules pertaining to fishway construction, operation, maintenance, and monitoring as may be submitted by the Licensee in accordance with the terms of the license articles containing such fishway prescriptions. We propose to reserve authority by requesting that the Commission include the following condition in any license it may issue for the Project: *Pursuant to Section 18 of the Federal Power Act, the licensee shall build the fishways described in the National Marine Fisheries Service' Prescription for Fishways at the Lower Barker Hydroelectric Project (FERC No.2808). The Secretary of Commerce reserves his authority to prescribe additional or amended fishways as he may decide are required in the future* (Accession # 20181102-5076).

On April 15, 2020, FERC issued its Order Issuing Subsequent License (Accession 20200415-3017). The Commission issued this license for a term of 40 years. This reservation of authority was referenced and incorporated into the Commission's license order when it wrote "by letters filed November 2, 2018 … Commerce … requested that the Commission reserve authority to prescribe fishways. Consistent with Commission policy, Article 407 of the license reserves the Commission's authority to require fishways that may be prescribed by … Commerce for the Barker's Mill Project." FERC explicitly states its own authority to reopen the license for fishway purposes in Article 407 *Reservation of Authority to Prescribe Fishway* whereby "authority is reserved to the Commission to require the licensee to construct, operate, and maintain, or to provide for the construction, operation, and maintenance of such fishways as may be prescribed by the Secretary of Interior and the Secretary of Commerce pursuant to section 18 of the Federal Power Act."

Comprehensive Settlement Agreement

Since 2017, NMFS has been in settlement discussions with KEI, the U.S. Fish and Wildlife Service (FWS), and State of Maine Departments of Marine Resources (Maine DMR) and Inland Fisheries and Wildlife (IF&W) (collectively, "the agencies") to address fish passage interests on the Little Androscoggin River. These discussions stalled briefly, after NMFS and FWS filed with FERC Section 18 fish passage prescriptions under the Federal Power Act (FPA), but resumed when KEI filed a Petition for Review of those prescriptions in the U.S. Court of Appeals for the District of Columbia Circuit (Circuit Case). While the impetus for revisiting settlement discussions was the Circuit Case, the agencies and KEI decided to pursue a more comprehensive settlement that included terms for future fish passage at two other projects (Upper Barker and Marcal) owned and operated by KEI on the same river system. In March 2022, the parties signed a relicensing settlement agreement for the Barker Mill Project (FERC NO. 2808), Upper Barker Project (FERC NO. 3562), and Marcal Project (FERC NO. 11482).

The settlement agreement solidifies a basin-wide approach to addressing the need for fish passage improvements in the Little Androscoggin River. This balanced approach will result in a clear schedule for restoration of diadromous fish in the watershed, which will enable federal and state partners to plan additional restoration actions accordingly. The negotiation efforts that contributed to this global settlement agreement have been an investment in securing efficient use of agency resources during the upcoming FERC relicensing processes for the two upstream projects. Key components of the settlement agreement include specific dates for operation of upstream and downstream fish passage facilities, support for Low Impact Hydropower Institute certification, and the Maine DMR Androscoggin River Basin Stewardship Fund, as well as seasonal operational windows for diadromous fish passage facilities, and passage performance standards and monitoring. The settlement agreement also addresses compliance with NMFS 2019 Biological Opinion for the Lower Barker project.

<u>Endangered Species Act (ESA), Section 7 Consultation</u>

NMFS completed an ESA consultation on the effects of the continued operation of the Lower Barker Project, inclusive of fishway modifications required by NMFS and FWS through FPA section 18 fishway prescriptions, on ESA-listed Atlantic salmon during relicensing. In the August 2019 Biological Opinion, we concluded that continued operation of the Project consistent with the proposed license was not likely to adversely affect critical habitat designated for the Gulf of Maine distinct population segment (DPS) of Atlantic salmon and was likely to adversely affect, but not likely to jeopardize, the continued existence of the Gulf of Maine DPS of Atlantic salmon. The Biological Opinion issued to FERC provided an Incidental Take Statement for Atlantic salmon, including reasonable and prudent measures and terms and conditions that FERC incorporated into the license. These terms and conditions focused on monitoring the effects of project operations on migrating Atlantic salmon.

As described in the settlement agreement, NMFS has determined that the Proposed License Measures described in the settlement agreement for Lower Barker do not change any analysis, finding, or conclusion reached by NMFS in the 2019 Biological Opinion completed for the Lower Barker relicensing. Additionally, KEI's planned implementation of the Proposed License Measures, as described in the settlement agreement, for Lower Barker, together with other applicable terms of the Amended Lower Barker Subsequent License, is consistent with all reasonable and prudent measures, terms and conditions, and conservation recommendations included in the 2019 Lower Barker Biological Opinion. Finally, the sorting facility described in section 1.3.7.1 of the settlement agreement will help satisfy the reasonable and prudent measure and implementing terms and conditions included in the 2019 Biological Opinion's Incidental Take Statement, related to the initiation of monitoring passage of Atlantic salmon at the project.

<u>Actions Requested</u>

Where NMFS has reserved its Section 18 authority in a hydropower license, and subsequently exercises that reservation of authority during the license term, FERC is "require[ed] to reopen the license" and begin proceedings regarding amendment of the license in accordance with the prescription. *Trafalgar Power, Inc*., 150 FERC ¶ 61,100, 61,684 (2015); *see also Bangor Hydro-Electric Company v. FERC*, 78 F.3d 659, 663 (D.C. Cir. 1996); *American Rivers v. FERC*, 201 F.3d 1186, 1210 (9th Cir. 1999) ("[T]he Commission may not modify, reject, or reclassify any prescriptions submitted by the Secretaries under color of section 18 … at the administrative stages, 'it is not the Commission's role to judge the validity of [the Secretary's] position-substantially or procedurally.'") (Quoting *Bangor Hydro–Electric*, 78 F.3d at 663).

As we are hereby invoking our reserved Section 18 authority, we request that the Commission open a proceeding to amend the license conditions as appropriate in accordance with the NMFS prescription, after providing the Licensee and other interested members of the public with an opportunity for hearing. Pursuant to the NMFS's regulations, the hearing and alternatives processes under 50 C.F.R. Part 221 will be available in these proceedings. 50 C.F.R. § 221.1(c). A request for a hearing on disputed issues of material fact, or an alternative prescription, must be filed within 60 days of the date of this filing. 50 C.F.R. § 221.1(d)(2); 221.21(a)(2)(ii). The NMFS's regulations also state that an intervention in any such hearing must be filed 20 days thereafter. 50 C.F.R. § 221.22(a)(ii).

Please note that we are not requesting the Commission to alter or reconsider any license terms other than those necessary to implement its fishway prescription. However, NMFS recognizes that the Commission may need to consider other aspects of the license in order to conduct a National Environmental Policy Act analysis, as well as to comply with its statutory public interest determinations to ensure that the Project continues to be best adapted to a comprehensive plan for developing the Little Androscoggin River for beneficial public uses. *See* 16 U.S.C. § 803.

The United States Department of Commerce through the National Oceanic and Atmospheric Administration, NMFS, hereby submits our Preliminary Prescription for Fishways pursuant to Section 18 of the Federal Power Act for the Barker's Mill Project (No. 2808) (Attachment A). Section 8.3 of this fishway prescription contains text that is consistent with the terms of the settlement agreement. We are also including Attachments B and C that were part of the modified prescription we filed in November 2018 (Accession # 20181102-5076).

We appreciate the opportunity to coordinate with the Commission in the development of appropriate fish passage and protection measures at the Project. Please contact Christopher Boelke (Christopher.boelke@noaa.gov or 978-281-9131) if you have any questions or if you require any additional information.

Sincerely,

Michael Pentony
Regional Administrator

cc: Service List

Attachment A: United States Department of Commerce's Preliminary Prescription for Fishways for the KEI Maine, LLC Lower Barker Hydroelectric Project (P-2808)
Attachment B: Draft Little Androscoggin Upstream Fish Passage Design Populations
Attachment C: Documentation of River Herring (Alewife) in the Lower Barker Project (P-2808) Area.

ATTACHMENT A

UNITED STATES DEPARTMENT OF COMMERCE'S PRELIMINARY PRESCRIPTION FOR FISHWAYS FOR THE KEI (MAINE) III, LLC BARKER'S MILL HYDROELECTRIC PROJECT (P-2808) UNDER EXERCISE OF RESERVED FEDERAL POWER ACT SECTION 18 AUTHORITY

BEFORE THE

UNITED STATES OF AMERICA

FEDERAL ENERGY REGULATORY COMMISSION

KEI (Maine) Power	)	**Barker's Mill Hydroelectric Project**
Management (III), LLC, Applicant	)	**Little Androscoggin River**
	)	**Androscoggin County**
	)	**Auburn, Maine**
	)	**FERC No. 2808-020**

UNITED STATES DEPARTMENT OF COMMERCE'S

PRELIMINARY PRESCRIPTION FOR FISHWAYS

PURSUANT TO SECTION 18 OF THE FEDERAL POWER ACT UNDER EXERCISE OF RESERVED

FEDERAL POWER ACT SECTION 18 AUTHORITY

Approved this Third day of August 2022, by

Michael Pentony, Regional Administrator
Greater Atlantic Regional Fisheries Office
United States Department of Commerce
National Marine Fisheries Service
55 Great Republic Drive
Gloucester, MA 01930

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1.0 INTRODUCTION

The U.S. Department of Commerce through the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) hereby submits our *Preliminary Prescription for Fishways for the Barker's Mill Hydroelectric Project (P- 2808)*, and is invoking the reserved authority of the Secretary of Commerce under Section 18 of the Federal Power Act (FPA)[2] during the term of the license for the Barkers Mill Hydroelectric Project (Lower Barker/Project).

Comments, terms and conditions included here are supported by Congressional mandates and our agency mission for protecting and conserving these and all target diadromous fish species and their associated habitat. An index to our Administrative Record will be provided to FERC…..ADMINISTRATIVE PROCESS, HEARING RIGHTS AND SUBMISSION OF ALTERNATIVES

This preliminary prescription was prepared, and will be processed, in accordance with our regulations at 50 CFR 221 et seq. These regulations provide that any party to a license proceeding before the Commission in which the Department of Commerce exercises mandatory authority has both the right to a trial-type hearing on issues of material fact and the opportunity to propose alternatives to the terms contained in the preliminary prescription.

Any party to the proceeding may challenge the facts upon which our Section 18 prescription is based by requesting a trial-type hearing within 30 days (50 CFR 221.4). The challenge is limited solely to the facts; the party may not use this process to contest the weight accorded to the facts or the opinions drawn from these facts by the agency. Agency expertise in forming its opinions and conclusions is entitled to deference under the law and the Commission lacks the authority to modify the Secretary of Commerce's prescription. The prescription, however, including the opinions and conclusions upon which it is based, may be challenged in the Court of Appeals after the Commission issues its license.

Although a party may not use the trial type hearing process to challenge the agency's prescriptive opinions and conclusions – in other words, the Licensee cannot challenge the deliberative choices made by the agency in the preliminary prescriptive process – a party may

[2] 16 U.S.C. § 811.

submit alternative prescriptions according to agency regulations at 50 CFR 221.70 et seq. Requests for a trial-type hearing or alternatives to the terms contained in this preliminary prescription must be submitted within 30 days of this filing to the following address: Chief, Habitat Protection Division, NMFS Office of Habitat Conservation, 1315 East-West Highway, F/HC2, Silver Spring, MD 20910.

Modified prescriptions, conditions, and other recommendations are due within 60 days of the close of the Commission's National Environmental Policy Act (NEPA) comment period or in accordance with a schedule otherwise established by the parties to the licensing. We will file our analysis of any alternative prescriptions with the Commission at that time.

If the Commission considers a Section 10(j) recommendation inconsistent with the purposes of relicensing, the Commission shall attempt to resolve the inconsistency, giving due weight to the recommendations, expertise and statutory responsibilities of the agency (10 USC 803(j)). If after such an attempt, the Commission does not adopt in whole or in part a recommendation, the Commission must detail in writing how the recommendation is inconsistent with the purposes of the licensing and how the condition ultimately selected by the Commission protects, mitigates damages to, and enhances fish and wildlife (including related spawning grounds and habitat). In such circumstances, we request the Commission set forth such details in its NEPA document.

We will consider any comments on the preliminary prescription filed by any member of the public, state or federal agency, the Licensee, or other entity or person. Comments must be filed within 30 days of the filing of this preliminary prescription to the following address: Regional Administrator, NMFS Greater Atlantic Regional Fisheries Office, 55 Great Republic Drive, Gloucester, MA 01930.

2.0 NMFS STATUTORY AUTHORITY

We have statutory authority for protecting and managing a variety of living marine resources that may be affected by the proposed relicensing, including, alewife, blueback herring, American shad, Atlantic salmon, sea lamprey and American eel in accordance with the following statutes:

2.1. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT (AS AMENDED) (16 USC §§1801, *ET SEQ*.).

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act set forth a number of mandates for NMFS, regional fishery management councils, and other federal agencies to identify and protect important marine and anadromous fish habitats. Fishery management councils, with assistance from us, are required to designate EFH for all federally-managed species. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." Federal action agencies that fund, permit, or carry out activities that may adversely affect EFH are required to consult with us regarding the potential effects of their actions on EFH, and to respond in writing to our recommendations. In addition, we may comment on any state agency activities that would affect EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH.

2.2. ENDANGERED SPECIES ACT OF 1973 (AS AMENDED) (16 USC §§1531, *ET SEQ*.).

Section 7(a)(1) of the ESA requires federal agencies to use their authorities to further the conservation of listed species. ESA section 7(a)(2) states that each federal agency shall, in consultation with the Secretary of Commerce or Interior, as appropriate, insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. Any discretionary federal action that may affect a listed species or its critical habitat must undergo ESA section 7 consultation. Issuance of a hydroelectric project license by the Commission is an action that requires ESA section 7 consultation.

2.3. ATLANTIC COASTAL FISHERIES COOPERATIVE MANAGEMENT ACT (AS AMENDED) (16 USC §§5101, *ET SEQ*.).

The purpose of the Atlantic Coastal Fisheries Cooperative Management Act is to provide for more effective conservation of coastal fish species that are distributed across the jurisdictional boundaries of the Atlantic states and the federal government. These coastal fish species, including blueback herring and alewife (collectively, “river herring”), American shad, and American eel, are managed by various boards of the Atlantic States Marine Fisheries Commission (ASMFC). The ASMFC creates fishery management plans and recommends management action to the states and NMFS.

2.4. Fish and Wildlife Coordination Act (as amended) (16 USC 661, *et seq.*).

The Fish and Wildlife Coordination Act provides that wildlife conservation shall receive equal consideration and be coordinated with other features of water resource development programs. A federal action agency, such as FERC, must consult with us and consider the conservation of wildlife resources by preventing loss and damage to such resources. In addition, action agencies must consider providing for the development and improvement of wildlife resources in connection with such water-resource development. We may provide recommendations to the federal action agency; the action agency is required to give these recommendations full consideration.

2.5. National Environmental Policy Act (as amended) (42 USC §§4321, *et seq.*).

NEPA and its implementing regulations require federal action agencies to analyze the direct and indirect environmental effects and cumulative impacts of project alternatives and connected actions. NEPA requires the federal action agency to conduct a comparative evaluation of the environmental benefits, costs, and risks of the proposed action, and alternatives to the proposed action.

2.6. Federal Power Act (as amended) (16 USC §§791a, et seq.)

2.6.1. Section 10(a) Consistency with Comprehensive Plans

Under Section 10(a), the Commission must consider a project’s consistency with federal and state comprehensive plans for improving, developing, or conserving a waterway. Comprehensive plans include management and restoration of fish and habitat resources. The Commission must ensure that hydropower projects are consistent with a comprehensive plan for improving or developing a waterway and for other beneficial public use. Under Section 10(a)(1), a project in a river basin must serve the public interest, not just power generation. Section 10(a) requires the Commission to solicit recommendations from resource agencies and Indian tribes (if affected by the project) on how to make a project more consistent with federal or state comprehensive plans. The Commission will give consideration to a plan which a federal or state agency has adopted under its own authority, if the plan: (1) is a comprehensive study of one or more of the beneficial uses of the river; (2) specifies the standards, data, and methodology used; and, (3) is filed with the Commission's Secretary before Section 10(a) conditions are established for a given project.

2.6.2. Section 10(j) Recommendations for Fish, Wildlife and Habitat

Under section 10(j), licenses for hydroelectric projects must include conditions to protect, mitigate damages to, and enhance fish and wildlife resources, including related spawning grounds and habitat. Recommendations received from federal and state fish and wildlife agencies form the basis of these conditions. The Commission is required to include such recommendations in the license unless it finds that they are inconsistent with Part I of the Federal Power Act (FPA) or other applicable law, and that alternative conditions adequately address fish and wildlife issues. Before rejecting an agency recommendation, the Commission must attempt to resolve the inconsistency, giving due weight to the agency's recommendations, expertise, and statutory authority. If the Commission does not adopt a section 10(j) recommendation, in whole or in part, it must publish findings that adoption of the recommendation is inconsistent with the purposes and requirements of Part 1 of the FPA or other applicable provisions of law, and that conditions selected by the Commission adequately and equitably protect, mitigate damages to, and enhance fish and wildlife and their habitats.

2.6.3. Section 18 Prescriptions for Fishways

Section 18 grants to the Department of Commerce and the Department of the Interior unilateral authority to prescribe fishways. Section 18 states that the Commission must require construction, maintenance, and operation by a Licensee, at the Licensee's own expense, of such fishways, as may be prescribed by the Secretary of Commerce or the Secretary of the Interior. Within the Department of Commerce, the authority to prescribe fishways is delegated to the NMFS Regional Administrator.

3.0 GOALS AND OBJECTIVES

3.1. NOAA STRATEGIC PLANS

We are responsible for the stewardship of the nation's living marine resources and their habitats. The NOAA Strategic Plan 2022-2026, NOAA Fisheries Strategic Plan 2019-2022 and the New England/Mid-Atlantic Geographic Strategic Plans 2020-2023(NMFS 2019, 2020b, NOAA 2022), each of these include long-term goals for resilient coastal ecosystems and conserving habitat for protected resources. Our agency goals strive for aquatic habitats and the species that inhabit them to be sustainable in the face of future challenges. Working toward the long-term sustainability of all species will help ensure commercial, recreational and cultural access for present and future generations; non-consumptive uses of living marine resources continue to support vibrant coastal communities and economies; and sustaining species of cultural and economic value. Objectives include recovered and healthy marine and coastal species; healthy habitats that sustain resilient and thriving marine resources and communities; improved understanding of ecosystems to inform resource management decisions; and sustainable fisheries and safe seafood for healthy populations and vibrant communities.

Anadromous fish species, including American shad, alewife and blueback herring, were historically important prey items for commercially important groundfish species (e.g., Atlantic cod, haddock) in the Gulf of Maine (Ames 2004). The loss of prey may have hastened the decline of nearshore groundfish stocks (Ames 2004). Large-scale restoration efforts in the Penobscot River system, and elsewhere, have enhanced the abundance of anadromous fish species, and may aid in the restoration of cod and other groundfish species.

Throughout the NOAA organization, a key strategic objective is to stabilize the most critically endangered species and improve populations of those species nearing recovery. Preventing the extinction of Atlantic salmon is a national priority under the Species in the Spotlight program. The Species in the Spotlight effort is a component of the strategic plan focusing attention on the eight most critically endangered species in the country under our jurisdiction. Together with the U.S. Fish and Wildlife Service (USFWS), we (collectively, "the Services") are charged with conserving and recovering species listed as threatened or endangered under the ESA. Recovery is the process of restoring listed species and the ecosystems upon which they depend to the point they no longer require the protections of the ESA.

Goals and objectives specific to the Little Androscoggin River as stated below are based on our statutory authority and derived from our overarching long-term agency goals and objectives.

3.2. NMFS Objectives for the Little Androscoggin River

Our principal objective for the Little Androscoggin River is to provide access to historical spawning, rearing, and migration habitats necessary for anadromous species to complete their life cycles and to make accessible those seasonal habitats necessary to contribute to the enhancement of the stocks (NMFS 2020a). Modifications to Lower Barker Project facilities and project operations to ensure the safe, timely, and effective passage of migrating adults and juveniles past the Project, including passage necessary for dispersal and seasonal movement, will facilitate this principal objective.

Concurrent with issuance of a subsequent license for the Lower Barker Project on April 15, 2020, we completed the *Androscoggin River Watershed Comprehensive Plan for Diadromous Fishes* (*Androscoggin CP*). The *Androscoggin CP* was published in our regional policy series and filed with the Commission as a comprehensive plan (Accession # 20200414-5171). The Androscoggin CP outlines a framework that balances our agency mission, restoration of diadromous fishes, the interests of diverse stakeholders, and the need for sustainable energy production. The Androscoggin CP builds off existing management actions in the Recovery Plan for the Gulf of Maine Distinct Population Segment of Atlantic Salmon (*Salmo salar*) and the State of Maine's Draft Androscoggin Fisheries Management Plan to provide synergistic restoration benefits. The geographic scope of the Androscoggin CP is the Androscoggin River watershed with a restoration focus downstream from Lewiston Falls, the Little Androscoggin River, the Sabattus River, and the Little River. These areas represent a practical portion of the historical diadromous fish habitat on which we intend to focus our efforts. The vision for the Androscoggin CP is to support development of terms and conditions in the hydropower licensing process, foster coordination among agencies and stakeholders, and support a collaborative restoration approach.

3.3. Atlantic States Marine Fisheries Commission

The ASMFC acts to coordinate the conservation and management of 25 nearshore fish species. Commissioners, representatives of the state's marine fisheries management agency, legislators and appointed stakeholder representatives for each state constitute the ASMFC. The commissioners deliberate policy regarding interstate fisheries management, fisheries science, habitat conservation, and law enforcement. In furtherance of their mission, the states work closely with their federal partners, including us. Through this forum, the states collaborate to ensure the sound management and conservation of shared coastal resources and the associated fishing and non-fishing public benefits. We are an active partner of the ASMFC. Agency representatives participate on several ASMFC committees and Boards, including the Sturgeon Technical Committee and Management Board, Shad and River Herring Technical Committee and Management Board, Fish Passage Working Group, Assessment Science Committee, and Habitat Committee.

Management authority for American shad, blueback herring, alewife, and American eel lies with the coastal states and the Services, and is coordinated through the ASMFC. The ASMFC developed Interstate Fishery Management Plans (FMP) for these fish under the authority of the Atlantic Coastal Fisheries Cooperative Management Act. There is also an FMP for Atlantic sturgeon; however, the species has since been listed under the ESA which supersedes that FMP. Each FMP recognizes the depletion of stocks from overfishing, habitat loss (including the presence of dams), inconsistent management actions, and lack of data.

The goals and objectives of the following ASMFC fishery management plans are consistent with our agency's objectives for restoring runs of American shad, blueback herring, American eel, and alewives to historical habitat within the Little Androscoggin River watershed. Implementing fish passage protection measures at the Lower Barker Project is a critical step toward achieving our restoration goals.

Goals and objectives of the shad and river herring Fishery Management Plan include (ASMFC 1985):

1. Promote, in a coast-wide manner, the protection and enhancement of shad and river herring stocks on the Atlantic seaboard.

2. Regulate exploitation to achieve fishing mortality rates sufficiently low to ensure sustainability of the stocks.
3. Improve habitat accessibility and quality, including addressing fish passage needs at dams and other obstructions, improving water quality, addressing river flow allocations to support habitat needs, and preventing mortality at water withdrawal facilities.
4. Initiate stocking programs in historical alosine[3] habitat that do not presently support natural spawning migrations, expand existing stock restoration programs, and initiate new programs to enhance depressed stocks.

Goals and objectives of the American Eel Fishery Management Plan include (ASMFC 2000):

1. Protect and enhance the abundance of American eel in inland and territorial waters of the Atlantic states.
2. Contribute to the viability of American eel spawning populations.
3. Improve knowledge of American eel habitat use at all life stages through mandatory reporting of harvest and effort by commercial fishers and dealers, and enhanced recreational fisheries monitoring. Increase understanding of factors affecting eel population dynamics and life history through increased research and monitoring.
4. Protect and enhance American eel abundance in all watersheds where eel now occur.
5. Where practical, restore American eel to those waters where they had historical abundance but may now be absent by providing access to inland waters for glass eel, elvers, and yellow eel and adequate escapement to the ocean for pre-spawning adult eel.
6. Investigate the abundance level of eel at the various life stages, necessary to provide adequate forage for natural predators and support ecosystem health and food chain structure.

3.4. State of Maine

The State of Maine's Department of Marine Resources (MDMR), Division of Sea-Run Fisheries and Habitat mission is to "protect, conserve, restore, manage and enhance diadromous fish populations and their habitat in all waters of the State; to secure a sustainable recreational fishery for diadromous species; and to conduct and coordinate projects involving research, planning, management, restoration or propagation of diadromous fishes." MDMR has identified the

[3] Alosine refer to fish from the Genus *Alosa*, such as American shad, alewife and blueback herring.

following sea-run fish species of most management concern: alewife, American eel, American shad, Atlantic salmon, Atlantic sturgeon, blueback herring, rainbow smelt, sea lamprey, sea-run brook trout, shortnose sturgeon, and striped bass. Several of these sea-run fish use the habitat within the Lower Barker Project area, including alewife, blueback herring, Atlantic salmon and American eel.

Maine's fishery management in the Little Androscoggin River is guided by the *Draft Fishery Management Plan for the Lower Androscoggin, Little Androscoggin River, and Sabattus River (MDMR and MDIFW 2017)*. The goal of that plan is to protect, conserve, and enhance the fishery resources of the Androscoggin River for their intrinsic, ecological, economic, recreational, scientific, and educational value. The diadromous species managed in the Androscoggin River by MDMR are river herring, American shad, Atlantic salmon, American eel, shortnose sturgeon, Atlantic sturgeon, striped bass, rainbow smelt, and sea lamprey. Specifically, MDMR manages the Little Androscoggin River for river herring, American shad, Atlantic salmon, American eel, striped bass, and sea lamprey. MDMR stocks alewives in Lower Range Pond, Marshall Pond, and Taylor Pond upstream of the Lower Barker Project to restore a run to the drainage. The stocking program, sourced at the Brunswick fishway trap, maintains a population of adults river herring imprinted to the Little Androscoggin River in advance of successful restoration efforts. Similar river herring stocking efforts have proven successful in other river systems such as the Kennebec, Penobscot and Union Rivers. The state's annual production goal for the Little Androscoggin River is 1,728,895 returning alewife, 327,188 blueback herring, 37,694 American shad, and an escapement of 368 Atlantic salmon. Details describing the methods for estimating production potential are included in the *Draft Fisheries Management Plan for the Mousam River Drainage* (MDMR and MDIFW 2016). Our staff completed a draft assessment of production potential (Attachment B). That assessment did not include production potential of Whitney, Hogan and Tripp Ponds. Our assessment is consistent with the production potential calculated by MDMR in their draft fisheries management plan.

The draft management plan does not provide production goals for American eel and sea lamprey.

3.5. Species Specific Goals and Objectives

The following discussion outlines our goals and objectives for anadromous species restoration in the Little Androscoggin River.

3.5.1. ALEWIFE AND BLUEBACK HERRING

Alewife and blueback herring (collectively, "river herring") are iteroparous, anadromous species occurring in waters of the eastern United States. Our management goal is to maximize production of river herring in the Little Androscoggin River by providing access to historical spawning and rearing habitat in the watershed through safe, timely and effective passage at barriers. We anticipate the Little Androscoggin River will produce approximately 1.7 million adult river herring per year once historical spawning habitat is accessible (MDMR and MDIFW 2017). The state of Maine's three-phased approach for implementing restoration efforts is a reasonable approach to attaining our goal (MDMR and MDIFW 2017).

3.5.2. AMERICAN SHAD

American shad are an iteroparous, anadromous species occurring in waters of the eastern United States. Our management goal is to maximize production of American shad in the Little Androscoggin River by providing access to spawning and rearing habitat in the watershed. We anticipate the Little Androscoggin River will produce over 38,000 returning American shad per year once spawning habitat is accessible (MDMR and MDIFW 2017).

3.5.3. ATLANTIC SALMON

Atlantic salmon are an anadromous species occurring in waters of the northeast United States. Our management objective for this re-licensing is to minimize impacts of continued operation of the Lower Barker Project to Gulf of Maine DPS of Atlantic salmon and associated habitat. Further, our goal is to enhance the recovery potential of the Gulf of Maine DPS of Atlantic salmon by seeking improvements to the project that would allow for increased abundance and genetic diversity of Atlantic salmon (NMFS and USFWS 2016). Restoring endangered Atlantic salmon to the point where it is a secure, self-sustaining member of its ecosystem is a primary goal of our endangered species program (NMFS and USFWS 2016).

3.5.4. AMERICAN EEL

American eel is a semelparous, catadromous species occurring in waters of the eastern United States. American eel are native to the coastal rivers of Maine, including the Androscoggin and Little Androscoggin. The historical abundance and distribution of American eel in the Little

Androscoggin River is unknown. Therefore, our management goals and objectives for this species in the Little Androscoggin River focuses on improving access to historical nursery habitat for juveniles and providing safe, timely, and effective adult eel emigration at barriers.

3.5.5. Sea Lamprey

Sea lamprey are a semelparous, anadromous species occurring in waters of the eastern United States. Sea lamprey are native to coastal rivers of Maine, including the Androscoggin and Little Androscoggin. The historical abundance and distribution of sea lamprey in the Little Androscoggin River is unknown. Therefore, our management goals and objectives for sea lamprey in the Little Androscoggin River focuses on improving access to historical spawning and nursery habitat throughout the drainage by providing safe, timely and effective passage at barriers.

3.6. Riparian and Aquatic Habitat

Agency objectives for protecting riparian and aquatic habitats include avoiding, minimizing and mitigating the direct, indirect, and cumulative effects of the Lower Barker Project on riparian and aquatic habitats and habitat functions. This includes providing instream flows necessary to protect native diadromous species and their habitat in the project area below the dam to:

- optimize suitable habitat for spawning, rearing, and incubation;
- restore channel-forming processes and riparian ecological function; and,
- facilitate the efficient migration of spawning adults, safe and timely emigration of juveniles, and movement of juveniles between feeding and sheltering areas.

4.0 CONSIDERATION OF CLIMATE CHANGE

Under the Biden Administration, multiple Executive Orders have been issued to encourage Federal agencies to further consider climate change in their decision-making processes. These include E.O. 13990, Executive Order on Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis[4]; E.O. 14008 Executive Order on Tackling the

[4] https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-protecting-public-health-and-environment-and-restoring-science-to-tackle-climate-crisis/

Climate Crisis at Home and Abroad[5], and; E.O. 14072 Strengthening the Nation's Forests, Communities, and Local Economies[6].

On January 4, 2016, we issued revised guidance for the treatment of climate change in NMFS Endangered Species Act decisions (NMFS 2016). The guidance provides seven policy considerations pertaining to: (1) future climate conditions and uncertainty; (2) projecting climate change effects on the future status of species; (3) evaluating the adequacy of existing regulatory mechanisms to reduce greenhouse gas emissions; (4) making critical habitat designations in a changing climate; (5) future benefits; (6) responsiveness and effectiveness of management actions in a changing climate; and (7) incorporating climate change in project designs. On August 1, 2016, the Council on Environmental Quality issued guidance to assist federal agencies in their consideration of the effects of climate change when evaluating proposed federal actions (CEQ 2016). Measures within this prescription are intended to mitigate the potential impacts of climate change for critically endangered Atlantic salmon and the full suite of anadromous fish by ensuring safe access to climate resilient habitat upstream of the project.

4.1. Potential Effects of Climate Change in the Project Area

The global mean temperature has risen 0.85°C from 1880 to 2012; the linear trend over the last 50 years is nearly twice that for the last 100 years (IPCC 2007, 2014). Precipitation has increased nationally by 5 centimeters (cm), associated with an increased frequency of heavy downpours (Melillo et al. 2014). Observed changes in marine systems thought to be associated with global climate change; these changes include ocean acidification, decreased productivity, altered food web dynamics, shifting species distributions, among others (Hoegh-Guldberg and Bruno 2010).

The Intergovernmental Panel on Climate Change models predict that Maine’s annual temperature will increase another 1.7–2.8 C by 2050 (Fernandez et al. 2015). The Intergovernmental Panel on Climate Change models predict that precipitation will continue to increase across the Northeast by 5–10 percent by 2050, although the distribution of this increase is likely to vary across the climate zones (Fernandez et al. 2015); model predictions show greater

[5] https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/
[6] https://www.federalregister.gov/documents/2022/04/27/2022-09138/strengthening-the-nations-forests-communities-and-local-economies

increases in precipitation within interior Maine. Total accumulated snow is predicted to decline in Maine especially along the coast where total winter snow loss could exceed 40 percent relative to recent climate (Fernandez et al. 2015). Since 2004, the rate of increase in sea surface temperature in the Gulf of Maine has accelerated to 0.23 °C per year; a rate faster than 99 percent of the world's oceans (Fernandez et al. 2015).

Information on how climate change will impact the Lower Barker Project area is extremely limited. As there is significant uncertainty in the rate and timing of change as well as the effect of any changes experienced in the project area due to climate change, it is difficult to predict the impact of these changes on any particular species. In the project area, it is possible that changing seasonal temperature regimes could result in changes to the timing of seasonal migrations for all anadromous fish in the Androscoggin River watershed. Presumably, if water temperatures warm earlier in the spring and water temperature is a primary spawning cue, spawning migrations and spawning events could occur earlier in the year. However, because migration is not triggered solely by water temperature, but also by river flow (which is affected by climate change), it is not possible to predict how any change in water temperature or river flow alone will affect the seasonal movements of migrating fish through the action area.

Ensuring access to a diversity of suitable habitat, including climate resilient habitats, is essential. A diversity of suitable habitat will likely provide the most suitable habitats capable of supporting spawning and rearing given forecasted climate predictions. Safe, timely and effective passage at the Lower Barker, and ultimately passage at each barrier to migration, will support our restoration goals by promoting access to a greater expanse and diversity of spawning, rearing and nursery habitat.

4.2. Climate Change Effects to Habitat for Anadromous Species

Alterations in stream temperatures, volume, velocity, and other abiotic characteristics affected by climate change and the presence of dams can influence larval and juvenile fish development, as well as the ecology and biota of the river (Hare et al. 2016, Spence et al. 1996). The slowing of free-flowing water by dams can exacerbate the effects of climate change by altering streamflow temperature via increased water residence times (e.g., reduced flow velocity) and decreased daily temperature fluctuations (Bergkamp et al. 2000, Spence et al. 1996). The distribution, abundance and composition of many benthic invertebrate and fish communities are determined by water velocity. Fluctuating water levels may delay migration, impact spawning conditions, and reduce or expose spawning and rearing habitat (Beiningen 1976). Lower water levels may also concentrate fish and increase predation and competition among species (Spence et al. 1996). Any forage species that are temperature dependent may also shift in distribution as water temperatures warm.

Since fish maintain a body temperature almost identical to their surroundings, thermal changes of a few degrees Celsius can critically affect biological functions in salmonids (NMFS and USFWS 2005). While some fish populations may benefit from an increase in river temperature for greater growth opportunity, there is an optimal temperature range and a limit for growth after which salmonids will stop feeding due to thermal stress (NMFS and USFWS 2005). Thermally stressed fish may also become more susceptible to mortality from disease (Clews et al. 2010).

Atlantic salmon are among the two most vulnerable species to climate change in the Northeast U.S. Continental Shelf, with bay scallop being the other species (Hare et al. 2016). This is due to factors including habitat specialization, dependence on both freshwater and marine resources, sensitivity to water temperatures, and complex spawning cycles (Hare et al. 2016). American shad, blueback herring and alewife were identified in the same report as highly vulnerable to the anticipated effects of climate change.

Atlantic salmon are cold-water fish and have a thermal tolerance zone where activity and growth is optimal (DeCola 1970). Temperature can be a stimulant for salmon migration, spawning, and feeding (Elson 1969). Temperature can also significantly influence egg incubation success or failure, food requirements and digestive rates, growth and development rates, vulnerability to disease and predation, and may be responsible for direct mortality (Garside 1973, Peterson et al. 1977, Spence et al. 1996, Whalen et al. 1999). When temperatures exceeded 23° C, adult Atlantic salmon can cease upstream movements, seeking refuge in cooler water (Baum 1997). Salmon mortalities have been associated with daily average temperatures of 26 to 27° C (Baum 1997). Thus, increasing sea and river temperatures could have a significant impact on sea-run fish abundance, reproduction, and distribution in the Androscoggin River watershed.

Atlantic salmon may be especially vulnerable to the effects of climate change in New England, since the areas surrounding many river catchments where salmon are found are heavily populated and have already been affected by a range of stresses associated with agriculture, industrialization, and urbanization (Elliott et al. 1998). Climate effects related to temperature regimes and flow conditions determine juvenile salmon growth and habitat (Friedland 1998). One study conducted in the Connecticut and Penobscot Rivers, where temperatures and average discharge rates have been increasing over the last 25 years, found that dates of first capture and median capture dates for Atlantic salmon have shifted earlier by about 0.5 days per year (Juanes et al. 2004). These consistent shifts correlate with long-term changes in temperature and flow (Juanes et al. 2004). Temperature increases are also expected to reduce the abundance of salmon returning to home waters, particularly near the southern edge of the geographic range (Beaugrand and Reid 2003).

5.0 CONSIDERATION OF DAM REMOVAL

Throughout this document, and in ample filings contained in the licensing administrative record, we describe our thorough consideration of the factors related to the Project's effects on fisheries, need for fish passage as well as the balance of social benefits verses public trust resource impacts. Within this relicensing process, we consider decommissioning and subsequent removal as a potentially reasonable alternative that the Commission must analyze. The dam removal has well defined benefits for fish passage, water quality and habitat restoration. Without man-made barriers to impede essential fish movements, all fish may move freely and naturally, according to their life history adaptations for fulfilling their biological requirements.

The Little Androscoggin River watershed once produced large runs of diadromous fish, including Atlantic salmon, blueback herring, American shad, alewife, and American eel. These runs once contributed to substantial commercial, recreational, and subsistence fisheries (Foster and Atkins 1867, Starbird 1928). Diadromous production within the Little Androscoggin, as well as the larger Androscoggin River watershed, has been in general decline throughout the 20th century (ASMFC 2012b, Shepard 2015). The draft fisheries management plan (MDMR and MDIFW 2017) clearly identifies the lack of passage at dams as a significant detriment to the diadromous fishery. Significant spawning and rearing habitat exists upstream of the Lower Barker Dam, including within the mainstem Little Androscoggin River. Existing dams prevent access to historically productive habitat.

Dam removal would address the following ecosystem functions and values:

Loss of migration, spawning, rearing and nursery habitat – Presence of the dam impedes passage of American eel and fully blocks passage of anadromous species. The dam and current/proposed bypass reach flows limit the ability to access historical habitat and fully realize the potential productivity in the watershed. A dam removal would mitigate cumulative effects (e.g. delay, passage inefficiencies, downstream mortality, and increased predation) of multiple barriers in the watershed whereas fish passage and continued Project operation would still have these negative effects to some degree with a compromised bypass reach flow. Fish passage measures alone do not fully mitigate hydroelectric project effects (FERC 2004). Dam removal would be a key step in the comprehensive planning efforts by us and the state of Maine for restoring diadromous fish.

Ecosystem and societal functions – Diadromous fish support key ecological functions as a mechanism for nutrient transport, prey for commercially and recreationally important fish, and baitfish for the lobster industry. For example, the current price for harvested river herring in the lobster bait industry in Maine is $75 per crate (Nate Gray, personal communication). A crate is roughly equal to 400 river herring. A restored river herring run in the Little Androscoggin River would result in a potential annual harvest worth over $200,000 assuming an escapement of 43%. Dam removal will support restoration of these key species in support of these ecological and social functions and values.

Alteration of natural hydrologic regime – Hydroelectric projects that have bypass reaches can produce negative demographic changes (biomass and community structure) in salmonid species (Ovidio et al. 2008). Low flow conditions cause these negative effects and relate to changes in habitat quantity and quality. In addition, rapid changes in flow (e.g. turbine shutting on/off) can lead to stranding and mortality. The Lower Barker Project bypass reach has the potential to be high quality habitat for diadromous species including the endangered Atlantic salmon. Returning the bypass reach to a natural flow regime by removing the dam will result in the greatest benefit to our trust species.

Habitat loss due to impoundment effects – Dams inundate lotic habitat that alters ecosystem structure and function (Poff et al. 2007). The Lower Barker dam impounds approximately 3,000 feet of lotic habitat that under a natural condition would be high gradient (approximately 1% slope) river that is optimal for salmonids and other diadromous species. Considering the number of impoundments in the Androscoggin River watershed, returning a river reach to high quality habitat would alleviate some of the cumulative effects of multiple dams; thereby rebalancing the public benefits of energy production and fisheries production.

6.0 FACTUAL BACKGROUND

6.1. Project Specifics

The following description is from the Final License Application for the Lower Barker Project (KEI (Maine) 2017) and the existing license (FERC 1979).

6.1.1. Project Description

The Lower Barker Hydroelectric Project (Project) is located near the City of Auburn in Androscoggin County in southwestern Maine. The Project is on the Little Androscoggin River approximately 2,000 feet upstream of the river's confluence with the Androscoggin River. Project works include a concrete dam with spillway, non-overflow stop log and gate sections; a power canal, intake and gatehouse; an underground concrete penstock; and appurtenant facilities. The Project boundary generally includes the impoundment, dam, buried penstock, and the powerhouse. The Lower Barker Project operates as a run-of-river facility with a continuous minimum flow of 20 cfs conveyed to the approximately 2,800 foot-long bypass reach. Inflows less than 170 cfs (minimum hydraulic capacity plus bypass minimum flows) and greater than 520 cfs (maximum hydraulic capacity plus bypass minimum flows) discharge over the spillway. The Project has a total rated capacity of 1.5 MW, but generates 1.2 MW due to limitations with the installed generator.

6.1.2. Project Operations

The Lower Barker Project is a run-of-river hydroelectric operation. A programmable logic controller (PLC) at the powerhouse modifies operation based on headpond elevation as measured by a pressure transducer in the headpond. KEI (Maine) installed a Supervisory Control and Data Acquisition (SCADA) to monitor the headpond levels of the Project and maintain compliance with run-of-river operations. The SCADA also minimizes fluctuations of the reservoir and allows remote Project start-up and shutdown.

6.1.3. Project Fishways

KEI (Maine) releases a minimum flow of 20 cfs to the bypassed reach. From June 1 through November 15, KEI (Maine) releases the minimum flow through the stop log section of the dam, which provides a potential egress route for emigrating diadromous species other than turbine passage and spill. There are no entrainment prevention measures at the Lower Barker Project. During the remainder of the year, KEI (Maine) releases the minimum flow from one of the fixed deep gates in the dam or over the spillway. The minimum flow was determined in consultation with agencies during the initial licensing and was intended "to enhance fishery resources" (FERC 1979).

Article 11 of the initial license (FERC 1979), states:

The Licensee shall, for the conservation and development of fish and wildlife resources, construct, maintain, and operate, or arrange for the construction, maintenance, and operation of such reasonable facilities, and comply with such reasonable modifications of the project structures and operation, as may be ordered by the Commission upon its own motion or upon the recommendation of the Secretary of the Interior or the fish and wildlife agency or agencies of any State in which the project or a part thereof is located, after notice and opportunity for hearing.

There are no upstream fishways for diadromous species at the Lower Barker Project. Diadromous species have had volitional access to the Lower Barker Project since 1988 when the Worumbo Hydroelectric Project (FERC No. 3428) fishway became operational (MDMR and MDIFW 2017).

6.2. Androscoggin Watershed

The Androscoggin River watershed extends from the White Mountains in New Hampshire and Blue Mountains in Maine to the coast of Maine where it joins the Kennebec River to form Merrymeeting Bay. The watershed has a total drainage area of 3,530 square miles. At 164 miles long, the Androscoggin River is the third largest river in Maine. Major tributaries of the Androscoggin River include the Kennebago River, Cupsuptic River, Rapid River, Magalloway River, and the Little Androscoggin River. In 1990's, the Androscoggin River basin contained 45 hydroelectric developments with a generation capacity of 261 MW (FERC 1996a). Many of these projects are still operating today.

The Little Androscoggin River, where the Lower Barker Project is located, is the largest tributary to the Androscoggin River with a watershed area of approximately 350 square miles. The Little Androscoggin River is 52 miles long from its headwaters in Bryant Pond to the confluence with the Androscoggin River. Major lakes and tributaries in the basin are Thompson Lake, Lake Pennesseewassee, Taylor Pond, Andrews Brook, Black Brook, Cushman Stream, Meadow Brook, and Bog Brook. The Little Androscoggin River basin contains six hydroelectric developments with a generation capacity of 4.5 MW (FERC 1996a). In addition to the hydroelectric facilities, there are three mainstem dams owned by public and private entities that affect aquatic connectivity. Non-hydropower dams without federal oversight are numerous. These include dams on the mainstem Little Androscoggin River as well as outlet lakes important to alewife restoration goals throughout the watershed (MDMR and MDIFW 2017). Water quality in the Little Androscoggin River has improved since the mid-twentieth century with environmental samples showing designated use criteria are met for recreational and fisheries resources (MDMR and MDIFW 2017).

6.3. Fish Resources – Historical

Historically, the Androscoggin River had extensive and diverse aquatic habitat accessible for large numbers of diadromous species (Foster and Atkins 1867). One of the earliest river fisheries in New England was located at Pejepscot Falls in 1628 (MDMR 2007). The Androscoggin River has four natural barriers in the watershed that limited diadromy: Lewiston Falls, Rumford Falls, Snow Falls, and Biscoe Falls. None of those natural barriers prevents the migration of American eel which have been caught throughout the watershed (MDMR and MDIFW 2017). Lewiston Falls precluded passage of alosines and sturgeon, but was passable for Atlantic salmon who were then able to ascend to Rumford Falls (Foster and Atkins 1867, Starbird 1928). In the Little Androscoggin River, alosines could swim to Biscoe Falls, and Atlantic salmon and sea lamprey could migrate to Snow Falls (MDMR and MDIFW 2017). A fishery existed for Atlantic salmon in Lewiston as late as 1815, which could leap over the earliest built low head dams. However, a dam built at head-of-tide at Brunswick in 1807 excluded other anadromous species (i.e. alosines and sturgeon) from the non-tidal sections of the Androscoggin River. Continued dam construction and pollution from industry extirpated diadromous fish populations in the Androscoggin River by the early 1930's. In 1983, after improvement of water quality and the construction of a fish ladder at the Brunswick Hydroelectric Project (FERC No. 2284), the MDMR started an anadromous fisheries restoration program in the Androscoggin River which includes their present day stocking efforts. Additional fishway facilities at the Pejepscot Hydroelectric Project (FERC No. 4784) and Worumbo Hydroelectric Project (FERC No. 3428) started operation in 1987 and 1988, respectively.

6.4. Fish Resources - Present Day

The Androscoggin River and the Little Androscoggin River have the potential to support numerous diadromous fish species, including Atlantic salmon, American eel, American shad, sea lamprey, alewife, and blueback herring. Fisheries management for fish passage and sea-run fish restoration in the Androscoggin watershed will be entering its 40th year in 2022. Federal and state management actions in the Little Androscoggin River include stocking of adult alewife into spawning habitat above the Lower Barker Project, stocking of game fish for recreational fishing, and engaging in licensing permitting actions for activities affecting aquatic habitat. Mandates and regulations guide management activities that identify protection and conservation sea-run fish and their habitat as public trust resources.

6.4.1. American Shad

Coast-wide landings of American shad decreased dramatically from the early 1900s, when approximately 50 million pounds were being landed annually, to the 1980s when only 3.8 million pounds were being landed annually (ASMFC 2010). In response to these dramatic declines in commercial landings, the ASMFC completed a Cooperative Interstate Fishery Management Plan for American shad in 1985 recommending management measures that focused on regulating exploitation and promoting stock restoration efforts that would largely be left up to the discretion of individual states that had regulatory authority over the species (ASMFC 2010). In 1994, the plan review team and management board determined that the original FMP was insufficient in protecting and restoring the remaining stocks, leading to the adoption of Amendment 1 to the FMP in 1999 (ASMFC 2010). Amendment 1 established benchmarks that effectively created a ceiling for directed fishing mortality. This action was in effect until the adoption of Amendment 3 in 2010. Amendment 3 incorporates the recommendations of the ASMFC stock assessment (ASMFC 2007) that accounted for combined human-induced instantaneous mortality (including directed fishing, dam-induced, pollution, and bycatch) and natural mortality to establish benchmark values for total instantaneous mortality. Under Amendment 3, states are required to monitor bycatch of American shad in jurisdictional waters and submit sustainable fisheries management plans for any areas that remain open to commercial or recreational fisheries.

From 1985 to 2009, MDMR supplemented the American shad population in the Androscoggin River through a hatchery program using stock from the Merrimack River (Massachusetts and New Hampshire). However, passage of American shad at the Brunswick Project remained anemic; see Table 4-9 of the FLA (KEI (Maine) 2017). In 2015, 53 American shad ascended the fishway at the Brunswick Hydroelectric Project (FERC No. 2284) with 18 of those fish eventually passing the Worumbo Hydroelectric Project (FERC No. 3428). In 2016, 1,123 American shad passed the Brunswick Project fishway, the highest observed annual count since the fishway opened in 1982 (MDMR 2017). During the same year, 45 American shad passed the Worumbo project. No direct observations of American shad are available at the Lower Barker Hydroelectric Project, but fish count data indicate shad are passing lower dams and, therefore, have volitional access to the Little Androscoggin River. Approximately 754 acres of American shad spawning habitat has been identified within the Little Androscoggin River watershed above the Lower Barker Project (MDMR and MDIFW 2017).

6.4.2. Alewife and Blueback Herring

Alewife and blueback herring stocks across their range have declined considerably from their historical abundances (ASMFC 2009, NMFS 2013). Both species serve as important prey for federally managed groundfish stocks. On August 5, 2011, we received a petition from the Natural Resource Defense Council to consider listing alewife and blueback herring as threatened species. On August 12, 2013, we conducted a status review and published a determination that listing alewife and blueback herring under the Endangered Species Act was not necessary for the continued existence of the species at that time. However, we did acknowledge that populations of both species are at historically low abundances and committed to revisiting the status of both species within 3 to 5 years (78 FR 48944, August 12, 2013). In March 2017, a D.C. district court vacated the finding on blueback herring under the ESA; the appropriate remedy has not yet been determined by the court. On August 15, 2017, the Department of Commerce announced its intent to reinitiate the status review of alewife and blueback herring under the ESA (82 FR 38672, August 15, 2017). NOAA Fisheries Service determined that listing the alewife rangewide, or as any of the identified distinct population segments as threatened or endangered was not warranted.[7]

The state of Maine annually stocks adult alewife collected in the trapping facility at the Brunswick Hydroelectric Project (FERC No. 2284) in spawning habitat above the Lower Barker Project including Taylor Pond, Marshall Pond, and Lower Range Pond (MDMR 2017). To date, biological samples collected at the Brunswick fishway indicate passage of blueback herring is severely limited. Therefore, in 2016, the MDMR initiated stocking of blueback herring in the Androscoggin River collected in the trapping facility at the Lockwood Hydroelectric Project (FERC No. 2574). Emigrating post-spawn adults and juvenile river herring attempt to pass the Lower Barker Project to reach marine and estuarine habitat. Passage facilities at downstream dams allows migrating adult alewife and blueback herring access to the Lower Barker Project area. MDMR has observed that these fish are present in the project area[8]. On May 22, 2016, we collected video evidence of river herring present at the base of the Lower Barker dam (personal observations, B. Lake). On June 10, 2014, representatives from the City of Auburn collected video and photographic evidence of river herring presence and project-induced mortality in the bypass reach of the Lower Barker Project (personal observations, Eric Cousens). Images of these observations are in Attachment C. Our staff reviewed the video observations to verify the species observed were river herring. Quantification of the number of river herring arriving at the Lower Barker Project is not available. However, from 2012 through 2016, the Worumbo Hydroelectric Project (FERC No. 3428) passed an average of 38,281 river herring annually from 2012 to 2016 (Table 1). Based on our experience at other rivers with major tributaries in the lower system (e.g., Sebasticook River confluence with the Kennebec River; Mohawk River confluence with the Hudson River), we anticipate a significant proportion of river herring will migrate into the Little Androscoggin River. As such, thousands of river herring presently have the potential to reach the Lower Barker Project area and seek a passage route every year.

[7] Federal Register :: Endangered and Threatened Wildlife and Plants; Endangered Species Act Listing Determination for Alewife and Blueback Herring

[8] MDMR comments of January 23, 2017, on the KEI (Maine) draft license application. (Accession # 20170123-5057).

Approximately 7357 acres of alewife spawning habitat and 754 acres of blueback herring spawning habitat has been identified within the Little Androscoggin River watershed above the Lower Barker Project (MDMR and MDIFW 2017).

Table 1. Anadromous fish counts at the Worumbo Project (P-3428) from 2003 to 2016[9]

Year	River Herring	American Shad	Atlantic Salmon
2003	26,315	0	1
2004	42,725	7	1
2005	2,038	0	0
2006	9,826	0	2
2007	19,078	0	7
2008	46,749	0	2
2009	14,961	0	1
2010	11,952	0	5
2011	136	0	3
2012	58,654	0	1
2013	28,714	0	1
2014	32,030	0	2
2015	59,200	18	0
2016	12,807	45	0

6.4.3. Atlantic Salmon

Atlantic salmon conservation and restoration efforts have been underway for more than 150 years in Maine following stock depletions resulting from non-sustainable commercial fisheries, pollution and habitat loss due to impassable dams. The Craig Brook National Fish Hatchery and later the Green Lake National Fish Hatchery established an artificial propagation and fish culture program in Maine. These programs have allowed Atlantic salmon to survive when many of Maine's rivers were not suitable for salmon survival; they also allowed for maintenance of an economically important recreational fishery through the early 1990s. Today, the hatchery and stocking program are preventing the extinction of the species. Currently there is no allowable

[9] MDMR. 2015. Pejepscot and Worumbo Project Meeting: 2014 Annual Fisheries Report, ibid., MDMR. 2016. Anadromous fish restoration in the Androscoggin River Watershed. 2015 and 2016 Annual Report for the Worumbo Project P-3428, ibid., Miller Hydro Group. 2004. Worumbo Project (FERC No. 3428-ME) annual fish passage status report for 2003, Miller Hydro Group. 2005. Worumbo Project (FERC No. 3428-ME) annual fish passage status report for 2004, Miller Hydro Group. 2006. Worumbo Project (FERC No. 3428-ME) annual fish passage status report for 2005, Miller Hydro Group. 2007. Worumbo Project (FERC No. 3428-ME) annual fish passage status report for 2006, Miller Hydro Group. 2008. Worumbo Project (FERC No. 3428-ME) annual fish passage status report for 2007, Miller Hydro Group. 2009. Worumbo Project (FERC No. 3428-ME) annual fish passage status report for 2008, Miller Hydro Group. 2010. Worumbo Project (FERC No. 3428-ME) annual fish passage status report for 2009, Miller Hydro Group. 2011. Worumbo Project (FERC No. 3428-ME) annual fish passage status report for 2010, Miller Hydro Group. 2012. Worumbo Project (FERC No. 3428-ME) annual fish passage status report for 2011, Miller Hydro Group. 2013. Worumbo Project (FERC No. 3428-ME) annual fish passage status report for 2012, Miller Hydro Group. 2014. Worumbo Project (FERC No. 3428-ME) annual fish passage status report for 2013.

fishery for sea-run Atlantic salmon in U.S. waters. The commercial fishery for Atlantic salmon closed in 1947 and the last recreational fishery for Atlantic salmon closed in 2008.

Atlantic salmon were initially listed as endangered by USFWS and NMFS under the ESA in 2000. This initial federal listing of Atlantic salmon as endangered (65 FR 69459, November 17, 2000) and original recovery plan put emphasis on making major improvements to the conservation hatchery and stocking programs, as well as expanding habitat conservation efforts (NMFS and USFWS 2005). Conservation efforts included reducing the negative effects of aquaculture, protecting accessible freshwater habitats by reducing threats from water and land use practices, and identifying and mitigating the effects associated with poor water quality.

In 2009, the Gulf of Maine Distinct Population Segment (DPS) expanded to include Merrymeeting Bay and the entire Penobscot River watershed (74 FR 29344, June 19, 2009). Designation of critical habitat in the Gulf of Maine DPS of Atlantic salmon occurred at this time (74 FR 29300, June 19, 2009). Conservation actions in response to this new listing and designation of critical habitat built off previous efforts. A new focus, however, was the effects of dams on the continued existence of Atlantic salmon. NMFS, USFWS and hydropower developers in the Gulf of Maine DPS, as well as state resource agencies and tribes, worked together to craft plans to address survival past hydropower projects and implementation of fish passage. Downstream and upstream fish passage improvement projects and fish passage studies are underway at many hydropower projects within the designated critical habitat for Atlantic salmon. The conservation efforts of the past century, largely driven by regulatory measures, have afforded important conservation benefit to the Gulf of Maine DPS and the entire suite of diadromous fish that coexist alongside Atlantic salmon.

The abundance of Atlantic salmon in the Gulf of Maine DPS has been low and either stable or declining over the past several decades. The proportion of fish that are of natural origin is small and displays no sign of growth. The conservation hatchery program has assisted in slowing the decline and helping to stabilize populations at low levels, but has not contributed to an increase in the overall abundance of salmon and has not been able to halt the decline of the naturally reared component of the Gulf of Maine DPS. The Gulf of Maine DPS remains critically endangered.

The Lower Barker Project is within the Gulf of Maine DPS for Atlantic salmon, however, it is not within designated critical habitat. There are 9,426 habitat units within the entire Little Androscoggin HUC 10 above Lower Barker Project (Wright et al. 2008). In addition, there is suitable spawning and nursery habitat for Atlantic salmon immediately below the Lower Barker Dam and adult salmon have been in the Project area[10]. During 2011, MDMR conducted a tagging study of 20 adult Atlantic salmon collected at the Brunswick Hydroelectric Project (FERC No. 2284). Detections of two of the tagged salmon were above the Worumbo Hydroelectric Project (FERC No. 3428). One male Atlantic salmon was regularly in the bypass reach of the Lower Barker during the spawning season from October 14th to December 12th suggesting that he spawned with an untagged female within the influence of the Lower Barker Project (MDMR 2012).

6.4.4. AMERICAN EEL

The fishery for American eel in Maine waters has occurred since the earliest colonial settlements. The onset of the elver[11] fishery is relatively recent, as market demand has increased dramatically. American eels are a highly valued food item in many Asian markets. Subsequently, elver harvesters sell to distributors who ship to areas within Asia where they are cultured and reared to adult size for the food fish market[12]. Due to recent intense market demand, elvers have now become the most valuable marine resource in Maine in terms of price per pound. Fishing for elvers occurs in the spring with a dip or fyke net. A license is required for elver fishing, and license issuance is heavily regulated (MDMR Regulations Chapter 32).

American eel populations in U.S. waters are at or near historically low levels due to overfishing, habitat loss, food web alterations, predation, turbine mortality, climate change factors, pollution and disease (ASMFC 2012a). In 2015, the USFWS completed a Status Review of American eel (80 FR 60834, October 8, 2015). Based on the Status Review, USFWS concluded that, although populations are at low levels, the species did not warrant listing as threatened or endangered under the ESA.

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[10] MDMR comments of January 23, 2017, on the KEI (Maine) draft license application. (Accession #20170123-5057).

[11] Elvers are a juvenile stage in the life cycle of American eel.

[12] http://www.maine.gov/dmr/science-research/species/eel-elver/factsheet.html

Juvenile American eel of various sizes (75 – 600 mm) were observed in the Lower Barker Project area (KEI (Maine) 2017). At the Worumbo Hydroelectric Project (FERC No. 3428) in 2015, 404 juvenile American eels passed upstream of the dam through the dedicated eel fishway. Based on the limited nighttime survey conducted by the Licensee (KEI (Maine) 2017), more than 10% of those counted at Worumbo (n=44) were observed at the base of Lower Barker dam. This indicates that the Little Androscoggin River provides habitat features suitable to attract American eel.

6.5. Species Life History Summary

6.5.1. American Shad

American shad are an iteroparous, anadromous fish that utilize freshwater rivers and streams for spawning and juvenile rearing. Their range extends along the East Coast from the Bay of Fundy, Canada to Florida (ASMFC 2010). They exhibit strong homing to their natal river and are capable of migrating long distances (e.g. 204 miles in the Connecticut River) up unimpeded rivers and streams (CRASC 1992, 2017, MDMR and MDIFW 2008, SRAFRC 2010). These strong homing tendencies lead to the development of discrete spawning stocks (Hasselman et al. 2013). Maturation of American shad in New England waters occurs between 3 to 5 years for males, and 4 to 6 years for females (Collette and Klien-MacPhee 2002). Adult shad begin to congregate along the coast and in estuaries when temperatures range from 3 to 15^{o} C. They engage in spawning when temperatures range between 8 and 26^{o} C; American shad require well oxygenated water of 5 milligrams per liter or more for successful spawning, egg and larval development (Stier and Crance 1985). Their preferred spawning habitats are broad shallow water areas of rivers and streams over a clean sand and gravel substrate (Stier and Crance 1985). Spawning has been documented in a wide range of water velocities ranging from 0.09 to 1.32 meters per second (Stier and Crance 1985). Shad usually spawn at night or during overcast days. Most shad in the northern part of the species range are capable of spawning more than once and may live up to 10 years (MDMR 2014). Juvenile shad spend the summer in their natal riverine habitat and migrate to the estuary in the fall before entering the ocean (Weiss-Glanz et al. 1986). Suitable habitat for American shad spawning and juvenile development is present above the Lower Barker and Upper Barker Projects (MDMR and MDIFW 2017).

6.5.2. BLUEBACK HERRING

Blueback herring in the Gulf of Maine typically begin their upstream spawning migration in mid-May (Saunders et al. 2006) depending on when water temperatures exceed 14° C (Loesch and Lund 1977). Adult blueback herring are fairly strong swimmers, with abilities comparable to alewives adjusted for body size (Castro-Santos 2005). Generally, blueback herring do not leap or jump over obstacles. Blueback herring use streaming flow to pass impediments and may avoid plunging and turbulent flows. Blueback herring spawning migrations typically peak in mid-June, 3 to 4 weeks after the peak of the alewife spawning runs (Mullen et al. 1986). Unlike alewives, blueback herring spawn and rear in lotic (flowing) habitats. Post-spawn adults migrate rapidly downstream after spawning usually leaving the spawning area within five days (Loesch and Lund 1977). Juvenile blueback herring migrate to the ocean from August through November in the Gulf of Maine (Saunders et al. 2006). Juvenile emigration exhibits the same schooling and environmental cues as alewives (Mullen et al. 1986). Suitable habitat for blueback herring spawning and juvenile development is present above the Lower Barker and Upper Barker Projects (MDMR and MDIFW 2017).

6.5.3. ALEWIFE

Alewives in the Gulf of Maine typically begin their upstream spawning migration in early May (Saunders et al. 2006) depending on when water temperatures exceed 10.5 °C . Alewives can migrate in vast numbers displaying schooling behavior that may overwhelm upstream fishways. Alewives exhibit a preferred diel migratory behavior based on light and temperature (Mullen et al. 1986). In general, alewives migrate upstream during the day within a preferred temperature range (i.e. early year spawners will peak during the warmest time of the day and late year spawners will peak during the coolest time of the day). In Maine, the preferred temperature range is approximately 12 to 16 ° C (Kircheis et al. 2004). Adult alewives are moderately strong swimmers, but rarely leap out of the water column to pass obstacles. Unlike salmonids, alewives prefer streaming flow; plunging flow and turbulence may disorient them. Alewives are able to spawn in a variety of lentic (standing water) habitats, but typically spawn in ponds and lakes connected to the Gulf of Maine (Mullen et al. 1986). Adult alewives emigrate shortly after spawning. Juvenile alewives live in freshwater for one to several months, emigrating from freshwater during August to as late as November (Saunders et al. 2006). Juvenile emigration is strongly correlated with precipitation events that result in transient decreases in water temperature and increases in stream flow (Gahagan et al. 2010). Juvenile emigration occurs in waves as large schools of fish, typically reaching estuarine habitats in a matter of days (Mullen et al. 1986). Suitable lake habitat for alewife spawning and juvenile development is present above the Lower Barker and Upper Barker Projects (MDMR and MDIFW 2017).

6.5.4. ATLANTIC SALMON

Adult Atlantic salmon return to Maine from the ocean with the objective of migrating to their natal stream and spawning. Adults ascend natal rivers beginning in the spring. These upstream migrating fish will continue their ascent into the fall with the peak influx of adults occurring in June. Although spawning does not occur until late fall, the majority of Atlantic salmon in Maine enter freshwater between April and mid-July (Baum 1997, Collette and Klien-MacPhee 2002). Salmon that return in early spring spend nearly five months in the river before spawning; often seeking cool water refugia (e.g., deep pools, springs, and mouths of smaller tributaries) during the summer months.

In the fall, the female Atlantic salmon selects a site for spawning. Spawning sites are positioned within flowing water allowing for percolation of water through the gravel where up-welling of groundwater occur (Danie et al. 1984). These sites typically occur at the head of a riffle (Beland et al. 1982), the tail of a pool, or on the upstream edge of a gravel bar where water depth is decreasing, water velocity is increasing (McLaughlin and Knight 1987, White 1942), and where a hydraulic head of water allows for permeation of water through the redd.

The embryos develop in the redd for a period of 175 to 195 days (Danie et al. 1984). After eggs hatch in late March or April, the newly hatched salmon are referred to as larval fry, alevin or sac fry. Alevins remain in the redd for approximately six weeks after hatching and are nourished by their yolk sac (Danie et al. 1984). Alevins emerge from the gravel and begin active feeding in mid-May. At this stage, they are termed fry. When fry reach approximately 4 cm in length, the young salmon are termed parr (Danie et al. 1984). Parr growth is a function of water temperature (Elliott 1991, Elliott and Elliott 2010), parr density (Randall 1982), photoperiod (Lundqvist 1980), interaction with other fish, birds and mammals (Bjornn and Reiser 1991), and food supply (Swansburg et al. 2002). Parr movement may be quite limited in the winter (Cunjak 1988, Heggenes 1990); however, movement in the winter does occur and is often necessary as ice formation reduces total habitat availability (Hiscock et al. 2002, Whalen et al. 1999).

In Maine, the vast majority of wild/naturally reared parr remain in freshwater for two years (90 percent or more) with the balance remaining for either one or three years (Schaffer and Elson 1975, USASAC 2005). Parr must reach a critical size of 10 cm total length at the end of the previous growing season to smoltify (Hoar 1988). Smolt transition into seawater is usually gradual as they pass through a zone of mixing from freshwater to the marine environment that occurs most frequently in the estuary. Smolts undergo smoltification while they are still in the river; therefore, they are pre-adapted to make a direct entry into seawater with minimal acclimation (McCormick et al. 1998). This is necessary under some circumstances where a short transition zone exists between the coastal river or stream and the marine environment. Naturally reared smolts in Maine range in size from 13 to 17 cm and most smolts enter the sea during May to begin their ocean migration (USASAC 2016). Suitable habitat for Atlantic salmon is present below and above the Lower Barker and Upper Barker Projects (MDMR and MDIFW 2017, Wright et al. 2008).

6.5.5. American Eel

American eel spawn and die in the Sargasso Sea. Their larva, called leptocephali, drift on ocean currents (i.e. no homing behavior) until transforming into glass eels as they approach the continental shelf. As glass eels migrate towards estuaries, they gain pigment and size becoming elvers that then enter freshwater habitats. Elvers commonly inhabits streams, rivers, lakes and ponds, tidal marshes and estuaries typically seeking muddy substrates and quiescent waters. They may settle in moving water habitats. Elvers can occupy nearly any habitat type, including burrows, tubes, woody debris, the submerged or inundated man-made structures, and other shelter substrates (Facey and Van Den Avyle 1987). Their ability to traverse wetted surfaces for long distances provides opportunity to occupy habitat that would otherwise be inaccessible (Collette and Klien-MacPhee 2002, Shepard 2015). Adult American eel (called yellow eels) inhabit benthic areas of streams, rivers, lakes and ponds, tidal marshes and estuaries for 10 to 25 years before transforming into silver eels that migrate back to the Sargasso Sea (Collette and Klien-MacPhee 2002). Silver eel emigration is typically triggered by large precipitation/flow events occurring mostly at night (Haro 2003). American eels are anguilliform swimmers with poor swimming ability for their body size (Solomon and Beach 2004). Suitable habitat for American eel juvenile development and maturation is present above the Lower Barker and Upper Barker Projects (MDMR and MDIFW 2017).

6.5.6. Sea Lamprey

Sea lamprey spawn in riffle sections of rivers with sandy and cobble substrate (Kelly and King 2001, Kircheis 2004). Sea lamprey construct spawning nests of gravel and small rocks in riffles by carrying stones with their mouths and creating a silt free nest with their bodies that may be as much as 25 cm deep and up to a meter long (Kircheis 2004, Scott and Scott 1988). In constructing their nests, lamprey carry stones from other locations and deposit them centrally in a loose pile within riffle habitat and further utilize body scouring to clean silt off stones already at the site (Kircheis 2004). The lamprey's silt-cleaning activities during nest construction engineer the substrate and may improve the "quality" of the surrounding environment with respect to potential diversity and abundance of macroinvertebrates (Hogg et al. 2014, Kircheis 2004).

Sea lampreys played a role in nutrient and sediment cycling (Hogg et al. 2014, Nislow and Kynard 2009, Saunders et al. 2006). Their semelparous history results in the deposition of marine-origin nutrients deposition within rivers (Nislow and Kynard 2009, Saunders et al. 2006). Nutrients associated with decomposing lamprey would likely have enhanced the primary production capability and be transferred throughout the trophic structure of the ecosystem including macroinvertebrate production.

6.6. Project Impacts

6.6.1. Fish Passage

Dams and hydropower generation facilities on a river adversely affect the behavior, life cycle and survival of diadromous fish. Historical runs of migratory fish across the northeastern United States were largely eliminated by dams, pollution, and over-fishing (ASMFC 2007, Haro et al. 2000). In dammed systems, diadromous species must negotiate fishways or manually transported above barriers during upstream migrations to access suitable spawning and rearing habitat to complete their life cycle. Under certain site-specific conditions, migrating juvenile eel have the ability to scale the wetted surface of a dam structure, including near vertical faces, to find upstream habitat (Shepard 2015). However, dedicated eel fishways can significantly improve passage success by decreasing energetic demands, delay, and predation (Solomon and Beach 2004). The energetics required to pass many fishways may have a greater impact on females than males, potentially skewing the spawning sex ratio and reducing overall productivity (Libby 1981). Delays caused by fishways can limit spawning success and the number of repeat spawning adults (Castro-Santos and Letcher 2010). The Lower Barker Project does not provide upstream fish passage for any diadromous species preventing the fisheries management goal potential in upstream habitat of the Little Androscoggin River of 1,728,895 alewives, 37,694 American shad, 327,188 blueback herring, 398 Atlantic salmon, and an undetermined amount of sea lamprey (MDMR and MDIFW 2017). In addition, the lack of a dedicated eel fishway limits the ability of American eel to pass upstream of the project.

Post-spawn and juvenile anadromous fish and adult American eels migrating downstream must locate and use bypass facilities, gates, spillways or turbines to pass a hydroelectric project. Depending on site-specific conditions, downstream passage via these potential routes of egress can result in injury, delay, or mortality (Miracle et al. 2009, Pracheil et al. 2016, Stich et al. 2015). In addition, emigrants may experience impingement on hydraulic structures (e.g. trash racks) causing injury, delay, or mortality (Schilt 2007). The Lower Barker Project does not provide downstream passage using the best available technology. The power canal does not have entrainment prevention to eliminate turbine mortality and injury. The spillway discharges onto ledge near both abutments potentially leading to injury and mortality (Miracle et al. 2009). Finally, the existing dedicated downstream bypass system does not meet standard criteria for acceleration of flow (Enders et al. 2009), discharge, and safe egress requirements (USFWS 2017).

6.6.2. Riverine Processes

Riverine systems are dynamic. Physical and chemical attributes vary in space and time primarily as a result of the distribution of surface runoff from a watershed (Poff et al. 2010). The variability in flow and other environmental factors is required to sustain freshwater ecosystems (Poff et al. 1997). As such, flow regime is a primary determinant of the structure and function of aquatic ecosystems (Poff et al. 2010). Diadromous fish have evolved to take advantage of this variation and interconnection of diverse habitat (Fay et al. 2006, Pess et al. 2014).

Dams interrupt nearly every ecological process in a river by altering the flow of water, sediment, nutrients, energy, and biota (Ligon et al. 1995). In the case of the Penobscot River, the Commission acknowledged that the presence of dams throughout the basin has altered the timing and magnitude of water flow (FERC 1996b). The impoundment created by a dam reduces flow velocities and supports native and introduced fish species suitable for lentic habitat, including predatory fishes. These conditions increase the potential for predation of emigrating diadromous fishes (Blackwell and Juanes 1998, Marschall et al. 2011). Restoring the habitat-forming processes that native diadromous fish communities require offers the best opportunity for restoring the production capacity of these habitats. Dam removal promotes re-establishing many of the ecological processes in rivers (Magilligan et al. 2016).

The Lower Barker Project has a limited effect on riverine processes upstream of the dam because of the proximity of the Upper Barker Project (FERC No. P-3562) and run-of-river operations. However, the project facilities and operation significantly affect the bypass reach extending from the dam to the powerhouse. Current (FERC 1979) and proposed (KEI (Maine) 2017) minimum bypass flow results in a significant loss of habitat quantity and quality for diadromous species (Accession No. 20170320-5096). Current and proposed minimum bypass flows also result in a limited zone-of-passage for migrating fish to migrate through the bypass reach. On June 10, 2014, a representative from the City of Auburn obtained photographic and video evidence of river herring stranding and struggling in the bypass reach with some mortality due to low flows (personal observation, Eric Cousens; Attachment C). We evaluated potential zone-of-passage issues with the proposed minimum flows based on Licensee data (KEI (Maine) 2017) and modified hydrologic simulations of the Federal Emergency Management Agency one-dimensional hydraulic model of the bypass reach. Both the measured Licensee data and the model results show that the river in sections of the bypass reach has less than 1 foot of depth that inhibits or prevents upstream or downstream passage of diadromous species at the current and proposed minimum bypass flows.

7.0 MANDATORY CONDITIONS AND RECOMMENDATIONS

7.1. Section 10(a) Consistency with Comprehensive Plans

Section 10(a)(1) of the FPA requires the project adopted by the Commission to be, in its judgment, the "best adapted to a comprehensive plan for "... beneficial public uses, including ...purposes referred to in section 4(e) ..." 16 USC §803(a)(1). This includes consideration of adequate protection, mitigation and enhancement of fish and wildlife, including related spawning grounds and habitat 16 USC §803(a). Section 10(a)(2) requires that, in making this determination, the Commission consider the recommendations of federal agencies exercising jurisdiction over resources of the state in which the project is located (16 USC §803(a)(2)). Our interest at the Lower Barker Project is safe, timely and effective fish passage for the benefit of diadromous fish species, as well as habitat considerations for migration, spawning and rearing which is consistent with the restoration goals for the diadromous fishery that we state in our Androscoggin River Watershed Comprehensive Plan for Diadromous Fishes (NMFS 2020a).

In fulfilling the balancing provisions of section 10(a) of the FPA, FERC guidance states that it must consider the economics of hydropower projects in terms of a project's current operating costs as compared to likely alternative power. 72 FERC ¶ 61,027 (1995). The project's power benefits are to be evaluated as previously licensed, and under the new license with the mitigation and enhancement measures set forth in the recommendations, prescriptions and conditions under FPA sections 10(j) and section 18.

We have no section 10(a) recommendations at this time.

7.2. Section 10(j) Protection, Mitigation and Enhancement of Fish and Wildlife

The following Section 10(j) recommendations are for the protection, mitigation of damages to, and enhancement of fish and wildlife resources at the Lower Barker Project. These recommendations are consistent with state and federal management goals and objectives for restoring, protecting, and enhancing fish and wildlife resources in the Androscoggin River watershed, and are based on our assessment of project related impacts on those resources. Evidentiary support for these recommendations is contained in the Commission's administrative record and cited herein. Recommendations submitted by us pursuant to Section 10(j) of the FPA must be accepted by the Commission, as conditions to any license(s) issued, unless, after giving due weight to our subject matter expertise, the Commission finds, based on substantial evidence in the record, that the recommendations are inconsistent with the FPA.

1. Maintain a continuous minimum bypass reach flow of 175 cfs or inflow;
2. Operate the facilities at the project in a run-of-river mode in which outflow from the Project impoundment, including spillage, leakage, lockage, fish passage, etc. is equal to the inflow to the impoundment to the extent possible. The Project should minimize fluctuations of the reservoir, within one foot of the top of the flashboards on a regular basis, or within one foot of the permanent crest when replacing flashboards.

Rationale

Our recommended minimum bypass reach flow of 175 cfs provides maximum habitat benefit for target species (Figure 1; Table 2). Specifically, this flow value provides depth and far field attraction flow to support a zone of passage for upstream fishway function. Details of our analysis of minimum flows were provided in a filing on March 20, 2017 (Accession No. 20170320-5096). The existing and proposed operational conditions at the Lower Barker Hydroelectric Project directly affect four of the six hydrologic attributes: duration, seasonality, rate of change, and frequency. The extent these changes in hydrologic attributes effect our managed species is yet to be determined because of the inherent complexity in ecological responses and the lack of site specific study. However, based on the information provided in the License application and our own analysis, we can conclude that a bypass flows less than 175 cfs reduces habitat quantity for all the managed species and life stages. This will effect biotic composition, trophic structure, and carrying capacity. We note that the physical habitat simulation model used in the study may systematically overestimate productive capacity compared to process-based models (Armstrong and Nislow 2012, Hayes et al. 2016, Rosenfeld et al. 2016, Rosenfeld and Ptolemy 2012).

When the Lower Barker Hydroelectric Facility is not operating, the bypass reach, the mainstem Little Androscoggin River, consists of high quality habitat suitable for spawning, rearing and growth stages of our managed species as measured by benthic macroinvertebrates. We note that the four hydrologic attributes altered by hydroelectric project operations have been shown to affect benthic macroinvertebrate ecology (Dewson et al. 2007, Walters and Post 2011).

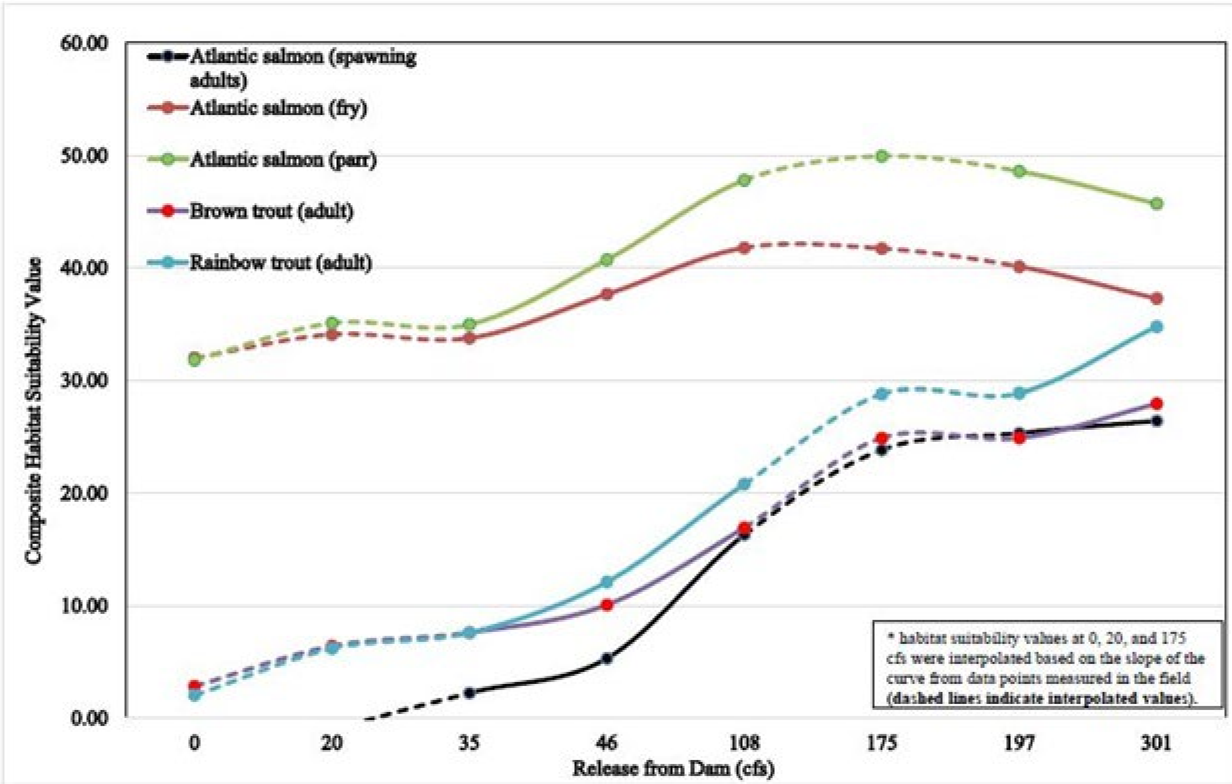

Figure 1. Habitat suitability curves for target species at the Lower Barker Project. Taken from the final study report within KEI (Maine)'s Final License Application (KEI (Maine) 2017), Figure 12, Habitat suitability curves for Atlantic salmon, brown trout, and rainbow trout, Lower Barker Project, Little Androscoggin River.

Table 2. Percent of Maximum Habitat Suitability in the Lower Barker Bypass Reach under seven flow conditions (Note – the 20 cfs data are extrapolated and the 175 cfs data are interpolated values). Taken from the final study report within KEI (Maine)'s Final License Application (KEI (Maine) 2017).

Species/Life Stage	20 cfs	35 cfs	46 cfs	108 cfs	175 cfs	197 cfs	301 cfs
Atlantic salmon (adults)	0%	8%	20%	62%	90%	96%	100%
Atlantic salmon (fry)	82%	81%	90%	100%	100%	96%	89%
Atlantic salmon (parr)	70%	70%	82%	96%	100%	97%	92%
Brown trout (adult)	24%	29%	40%	73%	89%	89%	100%
Rainbow trout (adult)	18%	22%	35%	66%	83%	83%	100%

7.3. Section 18 Modified Prescription for Fishways

We hereby submit the following modified prescription for fishways pursuant to Section 18 of the FPA, 16 USC §811. Section 18 of the FPA states in relevant part that, "the Commission must require the construction, maintenance, and operation by a Licensee of...such fishways as may be prescribed by the Secretary of Commerce or the Secretary of the Interior." Congress provided guidance on the term "fishway" in 1992 when it stated as follows:

"The items which may constitute a 'fishway' under Section 18 for the safe and timely upstream and downstream passage of fish must be limited to physical structures, facilities, or devices necessary to maintain all life stages of such fish, and Project operations and measures related to such structures, facilities, or devices which are necessary to ensure the effectiveness of such structures, facilities, or devices for such fish." Pub.L. 102-486, Title XVII, § 1701(b), Oct. 24, 1992.

We base the following mandatory fishway prescription on the best biological and engineering information available at this time, as described in the explanatory statements that accompany each prescription. We developed this prescription over a period of several years by our biological and engineering staff, in close consultation with the Licensee, the USFWS and other entities that participated in this relicensing proceeding.

We support each prescription measure by substantial evidence contained in the record of pre-filing consultation, and subsequent updates, compiled and submitted in accordance with the Commission's procedural regulations. The explanatory statements included with each prescription summarizes the supporting information and analysis upon supplying the basis for the prescription. We include an index to the administrative record for this filing herein, and reserve the right to file updated and supplemental supporting information as needed.

7.3.1. Upstream Fish Passage – Anadromous Species

The Licensee shall construct, operate and maintain upstream fish passage facilities that pass anadromous fish species in a safe, timely and effective manner consistent with the performance standards described in Section 6.1.6. Based on the best scientific information available at this time, one of the following types of fishways could satisfy the standard of safe, timely and effective: a fish lift, vertical slot fishway, or an ice harbor fishway. We have confidence based on experience that each of these designs will function for the full suite of anadromous species. The size of the fishway shall accommodate the anticipated production potential of the Little Androscoggin River: 1.7 million river herring, 37,000 American shad, approximately 370 Atlantic salmon, and other resident or target species. The design elements (e.g. slope, pool/slot size, attraction water) of the fishway shall ensure successful passage of river herring, American shad, Atlantic salmon, and sea lamprey. The fishway shall operate for the full range of design flows based on the migratory season for each species in accordance with provisions of Section 6.1.5.

Except as provided in section 6.3 of the Settlement Agreement, the fishway shall be constructed and operational by May 1, 2031. Design review will proceed guided by the provisions in Section 6.1.7.

The Licensee shall keep the fishways in proper order and shall keep fishway areas clear of trash, logs, and material that would hinder passage. Anticipated maintenance shall be performed in sufficient time before a migratory period such that fishways can be tested and inspected and will properly operate prior to the migratory periods. In addition, the fishway shall include a viewing area[13], fish sorting facility, or other infrastructure that allows for the observation of passing of fish, to ensure that the fish counting facility measure of the Biological Opinion is satisfied.

Rationale

Restoration of anadromous fish is a long-standing resource goal for the Little Androscoggin River watershed. The original order issuing a license for the Lower Barker Project contemplated fishways in 1979[14]. The requirement for dedicated fish passage facilities issued during this licensing proceeding, as well as the Upper Barker's Mill (FERC No. P-3562) relicensing which started in 2018, is necessary to support our broader restoration goal for the watershed. Upstream fish passage at Lower Barker, and eventually Upper Barker's Mill, will open approximately 3.7 miles of mainstem migratory, spawning and rearing habitat for diadromous fish. Fish passage at Lower Lower Barker, along with relicensing of other hydroelectric facilities on the river and the state of Maine's fishery management plan for the Little Androscoggin River (MDMR and

[13] Consisting of a window installed in the exit flume wall of the fish passage facility and a view dock platform.
[14] Maine Hydroelectric Development Corporation, Project No 2808, Order Issuing License (Minor), February 23, 1979. (Accession # 19790223-4000)

MDIFW 2017), will stimulate increased fish passage at dams along the mainstem and tributaries. The timing of passage implementation, by May 1, 2031, reflects the timing of other watershed-based improvements provided by the Settlement Agreement, including improvements at the Upper Barker Project (and other FERC relicensing proceedings on the mainstem Androscoggin River downstream of Lower Lower Barker).

As the first fishway on the Little Androscoggin River, the viewing area, sorting facility, or other facility that allows for the observation of passing of fish would allow for the monitoring of the success of restoration in the watershed.

We further support this position on the factual background herein and the following facts:

1. Anadromous fish historical habitat has been identified in many reaches of the Little Androscoggin River watershed (MDMR and MDIFW 2017).
2. Alewife, blueback herring, American shad, sea lamprey, and Atlantic salmon have access to the Little Androscoggin River. Alewife and blueback herring[15] and Atlantic salmon[16] have been within the project bypass reach.
3. The state of Maine has stocked alewife in lake habitat above the Barker Mill Project since the early 1980's (KEI (Maine) 2017), resulting in juveniles imprinted to spawning habitat within the Little Androscoggin River (Mullen et al. 1986).
4. Dams such as the Lower Barker dam are an impediment to upstream migration of anadromous fish (74 FR 29300, June 19, 2009; 74 FR 29344, June 19, 2009; 78 FR 48944, August 12, 2013)
5. Properly designed and located fishways, with suitable near-field and far-field attraction are capable of passing Atlantic salmon, sea lamprey, American shad, and river herring upstream of dams (Bunt et al. 2012, Larinier 2002a, b, Larinier and Marmulla 2004, NMFS 2012, USFWS 2017, 2019)

7.3.2. Upstream Fish Passage – Catadromous Species

[15] MDMR comments of January 23, 2017, on the KEI (Maine) draft license application (Accession # 20170123-5057); observations of NOAA staff (B. Lake, May 22, 2016); observations of Eric Cousens, City of Auburn (June 10, 2014).
[16] KEI (Maine) Power Management (III), LLC. 2017. Final License Application, Barkers Mill Hydroelectric Project (FERC No. 2808) (Accession # 20170130-5361)

The Licensee shall construct, operate and maintain an upstream passage facility for American eel that provides safe, timely and effective upstream passage consistent with the performance standards described in Section 6.1.6. This facility shall provide passage from the downstream side of the dam to the Lower Barker impoundment. This facility shall be operational by June 1, 2024. The Licensee shall keep the upstream eel passage facility in proper order and clear of trash, logs, and material that would hinder flow and passage. Anticipated maintenance shall be performed in sufficient time before a migratory season such that fishways can be tested and inspected and will operate effectively prior to migration. Design review of the new fishway shall follow the process outlined in Section 6.1.7. Fishway Design Review.

Rationale

Dedicated upstream eel passage is necessary to provide migration to rearing habitat upstream of the Project throughout the migratory season. We base this position on the factual background herein and the following:

1. Upstream migrating juvenile eel were observed at the Lower Barker Project (KEI (Maine) 2017).
2. Dams similar to the Lower Barker Project inhibit the passage of American eel juveniles, including elver and yellow eel (Shepard 2015).
3. Upstream migrating juvenile eels can be effectively passed at hydroelectric projects (Solomon and Beach 2004).
4. The proposed upstream fishway design can function to support passage and prevent injury and mortality of adult eel (Solomon and Beach 2004).

7.3.3. Downstream Fish Passage

The Licensee shall construct, operate and maintain downstream fish passage facilities for diadromous species that provide safe, timely and effective downstream passage consistent with the performance standards described in Section 7.3.6. The downstream passage facility shall be operational by June 1, 2024. The downstream passage facility shall prevent entrainment into the penstock without causing injury or mortality due to impingement and provide a safe route of passage to the bypass reach. The downstream fish passage facility shall consist of:

1. entrainment prevention using a minimum of ¾-inch spaced bar racks (or equivalent);

2. impingement prevention by minimizing approach velocity and maximizing sweeping velocity components near the bar racks;
3. sufficient flow to attract emigrating fish to the bypass entrance;
4. gradually accelerating flow near the bypass entrance;
5. safe hydraulic conditions through the bypass; and
6. safe discharge conditions at the bypass outfall.

These design parameters are consistent with criteria used nationally (NMFS 2011, USFWS 2017). Downstream passage facilities shall be operational by June 1, 2024. The Licensee shall keep the downstream passage facilities in proper order and clear of trash, logs, and material that would hinder flow and passage. Anticipated maintenance shall be performed in sufficient time before a migratory period such that fishways can be tested and inspected and will operate effectively prior to the migratory periods.

KEI (Maine) proposes to make improvements to the existing downstream fishway to prevent turbine entrainment in their final license application. On June 5, 2017, we provided potential downstream passage measures to the Licensee, but no specifics were included in the final license application or subsequently agreed to in writing or on the record. Design review of any new downstream fish passage facility shall follow the process outlined in Section 8.3.7. Fishway Design Review such that modifications can be implemented and operational by June 1, 2024.

Rationale

Dedicated fish passage facilities are necessary to protect diadromous species emigrating past the Project. We base this position on the factual background herein and the following:

1. Approximately 6,100 alewife are presently stocked upstream of the Lower Barker Project (KEI (Maine) 2017, MDMR and MDIFW 2017).

2. Downstream migrating adult and juvenile alosines are exposed to project related impacts (Franke et al. 1997).

3. Adult American eel are present upstream of the Lower Barker Project (KEI (Maine) 2017) [17].

[17] Lakes of Maine provides species distribution maps. Website accessed May 26, 2022. http://www.lakesofmaine.org/lake-maps.html

4. Downstream migrating adults and juvenile diadromous fish through hydropower projects such as Lower Barker can be effectively protected from project operations that result in injury and mortality (NMFS 2011, 2012, USFWS 2017). 74 FR 29344, June 19, 2009, 78 FR 48944, August 12, 2013.

7.3.4. Zone of Passage

The Licensee shall provide a flow in the bypass reach sufficient for safe, timely, and effective passage to the dam during the upstream anadromous fish passage season (See Section 8.3.5.). The zone of passage refers to the contiguous area of sufficient lateral, longitudinal, and vertical extent in which adequate hydraulic and environmental conditions are maintained to provide a route of passage through a stream reach influenced by a dam (USFWS 2017). We propose a flow of 175 cfs will be adequate based on the best available information. The 175 cfs seasonal release, from May 1 through November 10, will commence once permanent upstream anadromous fish passage is installed at the Lower Barker Dam. The current and proposed minimum bypass flow have depths less than 1 foot in sections of the bypass reach that may limit or preclude upstream passage of the full suite of targeted diadromous species to be passed by the Project.

Rationale

Unless the Licensee is willing to build two upstream fishways, one at the powerhouse and another at the dam, adequate flow is necessary in the bypass reach to attract fish upstream from the powerhouse discharge and deep enough to provide a zone-of-passage to the upstream fishway entrance at the dam. We base this position on the factual background herein and the following:

1. Observations on June 10, 2014 show that alewife have difficulty migrating through the bypass reach during low flow conditions (Attachment C, personal observation, Eric Cousens, June 10, 2014).
2. Migrating diadromous fish require a zone-of-passage with suitable depth to swim upstream. Typically, this is 2 to 3 times the body depth of the target species (Turek et al. 2016, USFWS 2017).
3. Migrating fish are subject to predation in low flow conditions (Attachment C).

7.3.5. Seasonal Migration Windows

Based on state-wide and Androscoggin River watershed specific data, approved fish passage protective measures, including the zone of passage, shall be operational during the migration windows for each life stage of Atlantic salmon (adults, kelts and smolts), and adults and juveniles of American shad, blueback herring, American eel, and alewife (Table 3). These dates may change based on new information and agency consultation.

Table 3. Summary of migration periods for which fish passage is required. The migration period for Atlantic salmon is depended on presence and may be refined in consultation with the resource agencies.

Species	Upstream Migration Period	Downstream Migration Period
Atlantic salmon	May 1–November 10	April 1 – June 15 (smolts and kelts) October 15 – December 31 (kelts)
American shad	May 15–July 31	July 15 – November 30 (juveniles) June 1 – July 31 (adults)
Alewife and Blueback herring	May 1–July 1	July 15 – November 30 (juveniles) June 1 – July 31 (adults)
American eel	June 1–September 15	August 15 – November 15 (adults; night)

Rationale

1. Adult alosine in Maine rivers commonly migrate upstream between May and June, and as late as August and emigrate soon after spawning from June to early August (ASMFC 2009, Loesch 1987).
2. Juvenile alosine in Maine rivers typically emigrate in September and October but may emigrate as early as August and as late as December (Loesch 1987, Mullen et al. 1986, Weiss-Glanz et al. 1986).
3. Juvenile American eel in Maine rivers start immigration in early June and continue as late as September 15th in Maine (Shepard 2015).
4. Adult Atlantic salmon typically pass in April (Baum 1997). Trap operations at the former Veazie Dam typically captured adult salmon from May to November (Dubé et al. 2011, Dubé et al. 2012).
5. Following spawning in the fall, Atlantic salmon kelts in Maine rivers typically return to the sea immediately, or over-winter in freshwater habitat and migrate in the spring, typically April or May (Baum 1997).

6. Based on NMFS Penobscot River smolt trapping studies in 2000 - 2005, smolts migrate in Maine rivers between late April and early June with a peak in early May (Fay et al. 2006).

7.3.6. Passage Performance Standards and Monitoring

Fishways need to be tested to ensure they are constructed, operating and functioning as intended, and whether improvements are needed to ensure safe, timely and effective passage is provided. Therefore, the Licensee shall conduct the following monitoring studies:

1. Alosine – A minimum of two years of quantitative monitoring for the new upstream and downstream measures. Monitoring shall begin after a one-year operational shakedown period for each fishway facility with another year of monitoring during the Project license in consultation with resource agencies.
2. Atlantic salmon – Upstream and downstream monitoring of all life stages is contingent on agency consultation and presence of testable individuals.
3. The Licensee shall develop study design plans in consultation with state and federal resource agencies. The resource agencies shall approve the study design prior to the Licensee filing with the Commission for final approval.
4. All monitoring will adhere to scientifically accepted practices.
5. The Licensee shall prepare reports of the monitoring studies to the resource agencies for a minimum 30-day review and consultation prior to submittal to the Commission for final approval.
6. The Licensee shall include resource agencies' comments in the monitoring study reports submitted to the Commission for final review.
7. The Licensee shall prepare annual fish passage reports that consist of data from the fish passage season including passage counts for each species, daily river flow conditions, fishway operational settings, and Project operations.
8. The Licensee shall allow resource agencies access to the fishway for inspection throughout the length of the license provided reasonable notice.

If the facility does not meet performance standards for safe, timely and effective passage, then studies will continue biennially until achievement of performance standards. We will develop performance standards in consultation with other resource agencies and the Licensee during the development of monitoring plans. Based on previous work (Stich et al. 2018), we anticipate downstream performance standards of approximately 95% survival past the project for all life stages. Upstream passage efficiency will likely include a passage rate greater than 80% within a defined period of time, typically 24 – 48 hrs. If the facility does meet performance standards, a second year of monitoring will occur during the license timeframe through consultation with the resource agencies. If the fishway facility does not meet performance standards, additional improvements to the fishways will be required in consultation with resource agencies.

The same monitoring process will occur for any new upstream or downstream fish passage measure implemented at the Project through our reservation of Section 18 authority.

7.3.7. FISHWAY DESIGN REVIEW

The Licensee shall submit design plans to NMFS for review and approval during the conceptual, 30, 60 and 90 percent design stages. The Licensee shall incorporate into their schedule a minimum of 30 days of review time by resource agencies for each stage.

The Licensee shall adhere to the following design milestone schedule for upstream American eel passage facilities and downstream diadromous passage facilities:

1. Conceptual design within 24 months before the commencement of construction
2. 30% design within 20 months before the commencement of construction
3. 60% design and a basis of design report (if requested) within 16 months before the commencement of construction, and
4. 90% design within 12 months before the commencement of construction.

The Licensee shall adhere to the following design milestone schedule for upstream anadromous passage facilities:

1. Conceptual design by January 2029,
2. 30% design by April 2029,
3. 60% design by August 2029 and
4. 90% design by March 2030.

The Licensee may deviate from the design milestone schedule based on design complexity, or as provided in section 6.3 of the Settlement Agreement; however changes to this schedule requires approval by the resource agencies before filing extension of time requests with the Commission. The Licensee shall allow reasonable time to construct the fishway such that it is operational as prescribed. Following resource agency approval, the Licensee shall submit final design plans to the Commission for final approval prior to the commencement of fishway construction activities. Once the fishway is constructed, final as-built drawings that accurately reflect the project as constructed shall be filed with the resource agencies.

7.3.8. Reservation of Authority

This prescription for fishways was developed in response to the Settlement Agreement and accompanying License Amendment Application, the proposals developed through the relicensing proceeding, our current policies and mandates, and our understanding of current environmental conditions at the Project. It is anticipated that future modifications to this prescription for fishways may be needed to adapt to changed circumstances or new information during the term of the license. Accordingly, pursuant to Section 18 of the Federal Power Act, as amended, the Secretary of the Department of Commerce, acting through the National Marine Fisheries Service (NMFS), hereby reserves the authority to prescribe the construction, operation, and maintenance of such fishways as deemed necessary, including measures to determine, ensure, or improve the effectiveness of such fishways. NMFS requests that FERC also include in the license an appropriate reopener clause acknowledging FERC's authority to reopen the license upon a request by NMFS to exercise this reservation pursuant to Section 18 of the Federal Power Act.

8.0 ADMINISTRATIVE RECORD

Evidence to support our prescription for fishways is contained in the Administrative Record before the Commission. Citations to the extant record are provided below.

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10.0 BRUNSWICK FISWAY REPORTS

Evaluation of fish passage at mainstem Androscoggin River hydroelectric projects has a long history. MDMR has conducted monitoring of fish passage and management activities for more than 30 years. While not cited directly in this document, the data generated and conclusions developed therein were considered in our decision process. Below is a list of the prominent studies, reports and additional literature considered. The fish passage studies are generally available on the FERC e-library. Those less accessible are provided within our administrative record.

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11.0 RESOURCE MANAGEMENT PLANS

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12.0 FEDERAL REGISTER NOTICES

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ATTACHMENT B

DRAFT LITTLE ANDROSCOGGIN UPSTREAM FISH PASSAGE DESIGN POPULATIONS

Little Androscoggin Upstream Fish Passage Design Populations
Submitted to Kruger Energy Incorporated on December 13, 2016
By Bill McDavitt and Bjorn Lake, Ph.D., P.E., National Marine Fisheries Service

Abbreviations
National Oceanographic and Atmospheric Administration (NOAA)
Maine Department of Marine Resources (MDMR)
United State Geological Survey (USGS)
Kruger Energy Incorporated (KEI)
Lower Barker (LB)
Upper Barker (UB)
Hackett Mills (HM)
Mechanic Falls (MF)

Introduction
Lower Barker is currently the first mainstem dam on the Little Androscoggin River located just upstream from the confluence with the Androscoggin River in Auburn, Maine. In 2019, KEI will be required to construct an upstream fishway as a condition of their new license. Upper Barker (license expiration in 2023), Hackett Mills (license expiration in 2024), and Mechanic Falls (license expiration in 2037) constitute the remaining active federally licensed projects on the Little Androscoggin River required to provide upstream fish passage upon licensure (Note - MF already has an upstream fish passage condition in the current license). Order of magnitude estimates are needed for diadromous fish populations including adult shad, alewife, blueback herring and Atlantic salmon in order to appropriately size the upstream passage facilities.

Methods
Population estimates are completed by conducting habitat surveys and desktop exercises. To date, no documented field habitat surveys have been completed in the Little Androscoggin River. Therefore, this desktop exercise was completed to provide order of magnitude estimates of design populations to appropriately size the proposed upstream fishways at the hydroelectric projects on the Little Androscoggin River. For lotic spawning species, river miles of habitat were estimated by quantifying the length of river upstream of each barrier using Google Earth software. Habitat area was then calculated by multiplying the reach length by 80% of the average bankfull width (Wright et al 2008) estimated by USGS regression equations (Dudley 2004). The bankfull width was also estimated using Google Earth software between each barrier as a check on the habitat width of the river. Additional spawning habitat in tributaries was not analyzed as part of this exercise. For lentic spawning species, surface acres of potential habitat ponds upstream from each barrier were quantified using publically available data from Maine Inland Fisheries and Wildlife. The ponds included in the analysis are Taylor Pond, Worthley Pond, Marshall Pond, Lower Range Pond, and Thompson Lake. Areal production potential for both lotic (MDMR) and lentic species (MDMR and St. Pierre 1979) were based on empirically derived estimates.

Alewives
Total Production: 1,309,890 (235 alewives/acre x 5,574 acres)
Total to be passed at LB: 1,123,067 alewives
Total to be passed at UB: 1,066,914 alewives

Total to be passed at HM: 885,008 alewives
Total to be passed at MF: 813,464 alewives

In the 1980s, the MDMR developed a method of estimating the number of adult alewife that would be produced by a specific amount of habitat. Total production is computed by multiplying the total surface area of known or assumed historical spawning habitat by the number of adults produced per unit of spawning habitat. Unit production for alewife (235 fish/acre) was developed from the commercial harvest in six coastal Maine watersheds for the years 1971-1983, which was assumed to be 100 pounds/surface acre of ponded habitat. This value was slightly less than the average of the lowest yield/acre for all six rivers, and within the range of yields experienced in other watersheds. Assuming a weight of 0.5 pounds per adult, the commercial yield equals 200 adults/surface acre. The commercial harvest was assumed to represent an exploitation rate of 85%, because most alewife runs were harvested six days per week. For example, exploitation rates on the Damariscotta River ranged from 85 to 97% for the years 1979 to 1982. When commercial yield is adjusted for the 15% escapement rate, the total production is 235 adult alewives/acre.

Three scenarios were analyzed to determine the production potential for the Little Androscoggin River based on current legislation and access to the largest spawning habitat area in the watershed, Thompson Lake. We assumed that the legislation barring the stocking of Hogan and Whitney Ponds and subsequently Tripp Pond would remain in place, but the public reluctance of alewives in Thompson Lake would likely be overcome at some point during the license's term through an outreach and education program. We also assumed that Pennesseewassee Lake will not be stocked as there is a natural barrier that precluded historical abundance of alewives in this pond. Finally, we assumed 95% upstream passage efficiency at the Androscoggin River and Little Androscoggin fishways and Littlefield dam is removed (representing 100% passage).

American Shad
Total Production: 23,672 shad (50 shad/acre x 473.4 acres)
Total to be passed at LB: 20,296shad
Total to be passed at UB: 18,877 shad
Total to be passed at HM: 12,992 shad
Total to be passed at MF: 9,787 shad

Unit production for American shad is based on information from the Susquehanna River (St. Pierre 1979), because runs of shad in Maine have not been restored and detailed information on historical abundance is minimal. However, the 50 shad/acre estimate is likely a low estimate based on commercial landings in Maine. A significant fishery for American shad existed in the freshwater tidal section of the Kennebec River and its tributaries after access to inland waters was obstructed by impassable dams at the head-of-tide. From 1896 to 1906 the average annual landings of American shad in the Kennebec River were 802,514 pounds. This represents 200,628 adult shad, assuming an average weight of four pounds per fish. If the exploitation rate ranged from 25 to 50%, then the total run from Merrymeeting Bay to Augusta (including tributaries) may have ranged from 401,257 to 802,512 shad. This represents a 49 to 98 shad/acre production potential.

Blueback Herring

Total Production: 229,145herring (484 herring/acre x 473.4 acres)
Total to be passed at LB: 196,463herring
Total to be passed at UB: 182,732herring
Total to be passed at HM: 125,762herring
Total to be passed at MF: 94,738herring

In the past, MDMR has not had sufficient information about blueback herring runs in Maine to develop an estimate of unit production. However, based on three years of passage data at Benton Falls, production is 237 to 484 per acre for 875,500-1,788,000 fish. We suggest a 484 herring/acre production potential for planning purposes in the Little Androscoggin as blueback herring will likely use smaller tributary habitat to spawn which is not accounted for in the spatial analysis. We assumed 95% upstream passage efficiency at the Androscoggin River and Little Androscoggin River fishways and Littlefield dam is removed (representing 100% passage).

Atlantic Salmon

Atlantic salmon returns to the Androscoggin River have been extremely low over the last few decades. Therefore, we did not estimate production potential as there is no active restoration program in the watershed. However, because we have estimated there are 419.4 acres of Atlantic salmon habitat in the Little Androscoggin (NOAA 2009), fishways must be designed to pass Atlantic salmon even though the migration numbers will likely not effect fishway capacity.

Summary of Estimated Population of Target Species in the Little Androscoggin River

American Shad	23,672 fish
Alewives	1,309,890 fish
Blueback Herring	229,145fish
Atlantic Salmon	TBD

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ATTACHMENT C

DOCUMENTATION OF RIVER HERRING (ALEWIFE) IN THE LOWER BARKER PROJECT (P-2808) AREA

Photo documentation of river herring (alewife) in the Little Androscoggin River. Photos and screen shots from video by Eric Cousens, City of Auburn on June 10, 2014 in the area below the Lower Barker Project (Photos 1-4) and a screen shot from video by Bjorn Lake, National Marine Fisheries (Photo 5). Additional video documentation by Eric Cousens and Bjorn Lake, NMFS Engineer, has been filed under separate cover as part of the administrative record.

Photo 1.

Photo 2

Photos 1 and 2. Upstream migrating river herring schooling below the Lower Barker Project area. Photo 3 is a screen shot from video taken during observations.

Photo 3

Photo 4

Photos 3 and 4. Upstream migrating adult alewife in low flow conditions below the Lower Barker Project. Photo 3 is a screen shot from video taken during observations.

Photo 5

Photo 5. Upstream migrating adult river herring, likely alewife, in immediately below the Lower Barker Project. This image is a screen shot from video taken during observations on May 22, 2016.