

Appendix G

Draft Eel Passage Management Plans

DRAFT American Eel Management Plan for Penobscot Mills Hydroelectric Project

1.0 Introduction

Great Lakes Hydro America, LLC (“GLHA” or “Licensee”) is the Licensee for the Penobscot Mills Hydroelectric Project (Federal Energy Regulatory Commission (“FERC” or “Commission”) No. 2458) (“Penobscot Mills Project” or “Project”). The Project currently operates under a license issued by FERC, which expires on September 30, 2026.

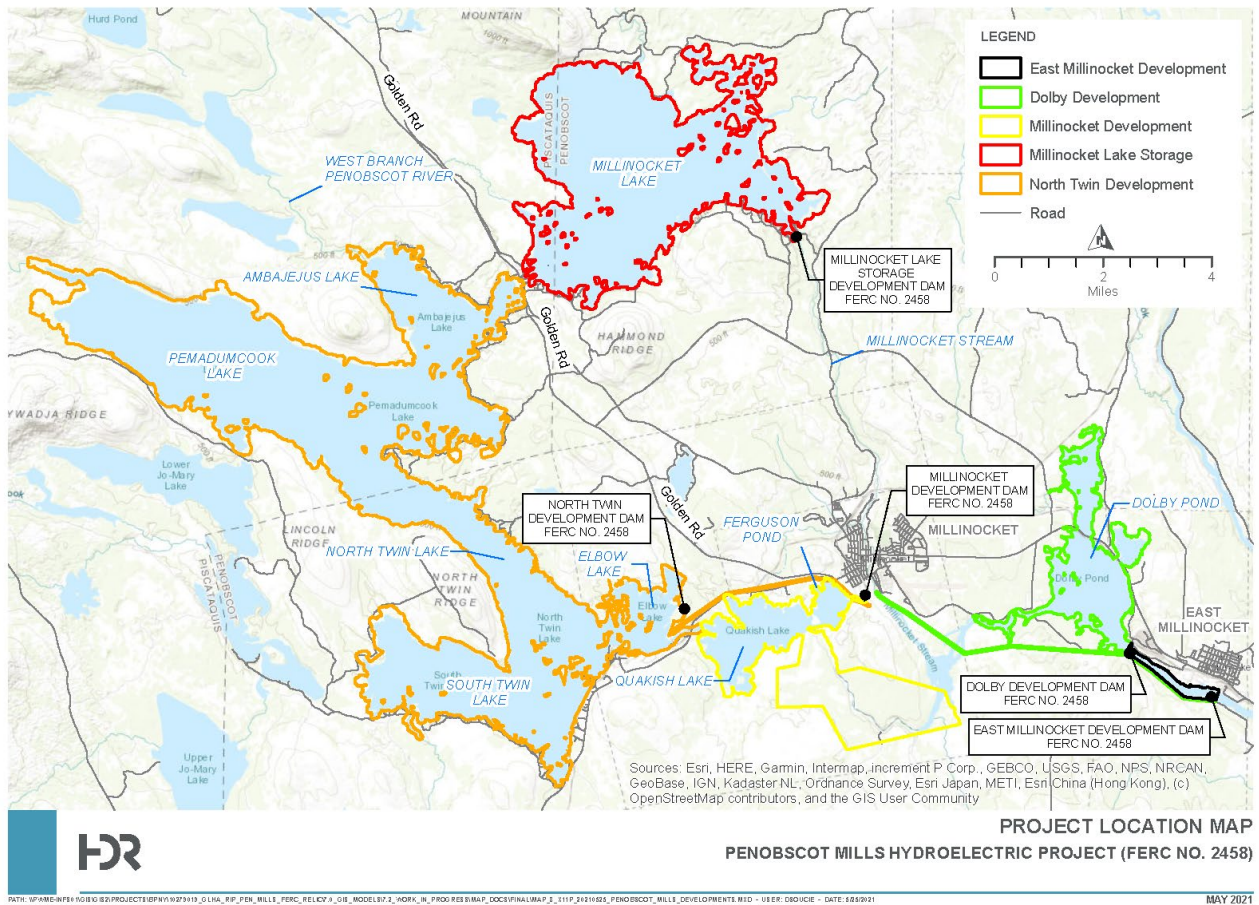
In the Final License Application (FLA) for the Penobscot Mills Project, GLHA proposed certain measures regarding American eel passage to be undertaken during the term of the new license. This draft American Eel Management Plan (Draft Plan) was requested by FERC in an additional information request dated February 28, 2025. In accordance with FERC’s request, GLHA has prepared this Draft Plan incorporating the measures proposed to be undertaken at the Penobscot Mills Project after the new license is issued by FERC.

2.0 Background

The Penobscot Mills Project is located on the West Branch of the Penobscot River (West Branch) and Millinocket Stream in Piscataquis and Penobscot counties, Maine, and includes five developments: Millinocket Lake Storage, North Twin, Millinocket, Dolby, and East Millinocket (Figure 1).

The North Twin impoundment is located at the upstream end of the Project and receives flow from the Ripogenus Project. Releases from the North Twin Development pass through three other developments and associated generation facilities of the Penobscot Mills Project including Millinocket, Dolby, and East Millinocket. The Millinocket Lake Storage Development includes a pumping station located on the opposite end of the lake from the dam. Water from Millinocket Lake is either pumped to the North Twin impoundment or discharged from Millinocket Lake Dam to Millinocket Stream, where it joins the West Branch at Shad Pond (downstream of the Millinocket Development) and then passes through the Dolby and East Millinocket Developments.

Figure 1. Project location map of the Penobscot Mills Hydroelectric Project.



The Medway Project (FERC No. 2666) is located downstream of the Penobscot Mills Project on the West Branch (Figure 2). Just downstream of the Medway Project is the confluence of the West Branch and the East Branch of the Penobscot River to form the mainstem Penobscot River. One water storage dam at the outlet of Grand Lake Matagamon is located on the East Branch of the Penobscot River (Figure 2).

Further downstream on the mainstem Penobscot River (and on the Stillwater Branch of the Penobscot River), there are five hydroelectric projects including the Mattaceunk Project (FERC No. 2520), the West Enfield Project (FERC No. 2600), the Milford Project (FERC No. 2534), the Orono Project (FERC No. 2710), and the Stillwater Project (FERC No. 2712) (Figure 2). Dedicated upstream American eel passage facilities have been newly installed or improved at each of these hydroelectric projects on the mainstem and Stillwater Branch of the Penobscot River in recent years.

Figure 2. Hydroelectric Projects on the West Branch and Mainstem Penobscot River.

On the West Branch, an upstream eel passage facility was installed at the Medway Project in 2004. The existing eel ramp at the Medway Project is located on the dam between an existing downstream passage for adult American eels and the spillway. The Medway eel ramp is operated annually from June 1 to August 15.

Bangor-Pacific Hydo Associates, licensee of the West Enfield Project (FERC No. 2600), operates an upstream eel passage facility at the West Enfield Dam, which is located about 40 river miles (RMs) downstream of the Penobscot Mills Project. Annual upstream eel passage counts have been completed by the licensee of the West Enfield Project since 2008 (Table 1). In 2024, an estimated 40,430 eels were trapped, tallied, and released to the headpond from the West Enfield upstream eel passage. In 2024, most of the eels (95.0%) were observed during the month of June, and 90.4 percent were estimated to be less than 6 inches in length (Table 1). In addition to the dedicated upstream eel passage at the West Enfield Project, juvenile eels are also known to use the vertical slot fishway at the West Enfield Project to migrate upstream, as thousands of juvenile eels were observed on video passing by the fishway's observation window during fishway monitoring studies conducted in 2016 and 2017.

Table 1
Upstream Eel Passage Collections at West Enfield from 2008 to 2024.

Year	Estimated No. of Eels
2008	58
2009	760
2010	2,192
2011	1,637
2012	28
2013	22
2014	64
2015	73
2016	2,548
2017	12,501
2018	88,264
2019	60,528
2020	218,755
2021	53,829
2022	97,352
2023	46,928
2024	40,430

A new upstream eel passage was constructed at the Mattaceunk Project in 2024, and it became operational on June 17, 2024. The passage facility operated intermittently through the first-year shakedown period between June 23 and July 3, 2024. The passage facility was also shut down on July 21 and July 22, 2024, due to water pump issues, but otherwise remained operational through September 10, 2024 (GLHA 2025).

Upstream eel monitoring occurred at the Medway Project between 2004 and 2015, but monitoring was suspended in 2016 due to low returns. Two eels were observed in 2008, 14 eels were observed in 2009, 16 eels were observed in 2015, and 56 eels were observed in 2007; no eels were observed in 2004-2006 or from 2010 to 2014. Pursuant to a FERC order dated June 20, 2016, monitoring of the upstream eel passage ramp at the Medway Project was suspended due to the consistently low numbers of American eels observed. Although monitoring was not conducted after 2016, the Medway Project upstream eel passage facility continues to be operated annually, which provides a dedicated upstream passage route for juvenile American eels to reach the Penobscot Mills Project.

2.1 Upstream Eel Passage Studies

During the FERC relicensing process for the Project, GLHA studied upstream American eel passage at the East Millinocket Development in 2022 using a combination of nighttime surveys and temporary trapping (GLHA 2023). GLHA again studied upstream American eel passage at the Project in 2023 at the Dolby, Millinocket (Stone Dam), North Twin, and Millinocket Lake Storage Developments using a combination of nighttime surveys and electrofishing (GLHA 2024b).

GLHA's American eel studies in 2022 and 2023 documented upstream-migrating juvenile eels distributed throughout the Penobscot Mills Project area. In 2022, biologists observed approximately 700 juvenile eels at the East Millinocket Development (GLHA 2023). In 2023, biologists documented approximately 2,045 juvenile eels at the Dolby Development, most of which were observed ascending a large bedrock outcrop by swimming and climbing in flowing rivulets, as well as climbing and passing over or through the flashboards on the dam crest on river right (GLHA 2024b). Upstream of the Dolby Development, GLHA documented a small number of juvenile eels at Stone Dam of the Millinocket Development and at the North Twin Development, while over 800 juvenile eels were observed at the Millinocket Lake Storage Dam in 2023 (GLHA 2024b).

Based on the 2022 and 2023 American eel study results at the Penobscot Mills Project, it is apparent that juvenile eels are reaching the Penobscot Mills Project and finding upstream passage routes at several of the Penobscot Mills Project dams. The greatest number of eels were observed at Dolby Dam, Millinocket Lake Storage Dam, and East Millinocket Dam, respectively. The

number of eels observed at Stone Dam and North Twin Dam were an order of magnitude lower than at the other Project locations, and all eels at North Twin Dam were seen in the existing fish ladder designed to pass landlocked salmon.

Based on these results and the fact that juvenile eels are reaching the East Millinocket, Dolby, and Millinocket Lake Storage Developments, GLHA proposed in the FLA filed with FERC on September 30, 2024, certain measures to address upstream eel passage at the Project as further described in Section 4 below.

2.2 Downstream Eel Passage Desktop Evaluation

During the FERC relicensing process for the Project, GLHA conducted a desktop downstream American eel passage study. GLHA's desktop evaluation of downstream passage for adult American eels at the Project focused on the four hydroelectric developments: North Twin, Millinocket, Dolby, and East Millinocket. Downstream eel passage success at the four developments over the range of exceedance flow conditions between 10 and 90 percent during the outmigration window (i.e., August through December) ranged from a low of 49.0 percent for large female eels at the Dolby Development, to a high of 68.8 percent for smaller-sized male eels at the North Twin Development (GLHA 2023). Cumulative survival estimates for female eels under a median (50% exceedance condition) flow varied based on the number of developments required for passage during movement through the Project area. This calculated survival rate was as low as 10.1 percent for eels originating in the West Branch downstream of the Ripogenus Project to as high as 62.1 percent for eels originating in the West Branch between Dolby Dam and East Millinocket Dam (GLHA 2023).

Under GLHA's proposed operation of the Penobscot Mills Project, there would be no near-term change to these potential survival rates for downstream-migrating adult silver eels. Although eels have historically reached (and are currently reaching) the Penobscot Mills Project, their numbers are relatively low compared to the eel numbers being observed at the projects downriver. As a result, the number of adult eels currently passing back downstream past the various Penobscot Mills Project dams/powerhouses is also likely low, in comparison. Therefore, it is not clear that the existing Project mortality rates would have a significant effect at the population level. However, given the upstream eel passage improvements recently implemented at the downstream

projects, GLHA anticipates increasing numbers of eels at the Penobscot Mills Project in the coming years.

Because relatively few eels are currently reaching the Penobscot Mills Project impoundments, and because current knowledge of American eel biology suggests that eels residing high in the watershed will spend 20-30 years before out-migrating, GLHA proposed in the FLA to revisit the need for more effective downstream eel passage in 20 years (GLHA 2024a).

3.0 Management Plan Goals and Objectives

This Draft Plan has been developed to effectively implement anticipated FERC license requirements for American eel at the East Millinocket Development, Dolby Development, and at the Millinocket Lake Storage Dam, as proposed by GLHA in the FLA.

The primary goal of the Plan is to enhance passage of American eel upstream and downstream of the Project Developments.

Based on the Licensee's current proposals, the primary objectives of the management plan are as follows:

- Implement upstream passage measures at the East Millinocket and Dolby Developments within 2 years of new license issuance and at the Millinocket Lake Storage Development within 5 years of new license issuance.
- Develop a Fishway Operations and Maintenance Plan for upstream passage within 6 months of upstream passage measure implementation.
- Study upstream American eel passage at the East Millinocket, Dolby, and Millinocket Lake Storage Developments for up to 2 years following upstream American eel passage implementation.

More specific objectives for the Plan will be developed after the issuance of the new license.

4.0 Plan Implementation

4.1 Plan Area

This Plan will be implemented at the East Millinocket, Dolby, and Millinocket Lake Storage developments of the Penobscot Mills Project.

4.2 Upstream Eel Passage Measures

Upstream eel monitoring (nighttime observations and electrofishing) conducted by GLHA in 2022 and 2023 documented upstream-migrating juvenile eels at the East Millinocket, Dolby, and Millinocket Lake Storage developments. Very few eels were observed at either Stone Dam of the Millinocket Development or at the North Twin Development. These results suggest that most eels are currently primarily migrating up Millinocket Stream rather than into the West Branch below Stone Dam, likely due to the higher flows coming from Millinocket Stream (which are typically at least 2,000 cubic feet per second [cfs] based on the flows released from the Millinocket powerhouse).

Given the documented distribution of American eels in 2022 and 2023 in the Penobscot Mills Project area, GLHA is proposing upstream American eel passage measures at the East Millinocket, Dolby, and Millinocket Lake Storage developments.

GLHA proposes to provide interim upstream eel passage (i.e., a ramp, trap, or similar) at the East Millinocket and Dolby developments within 2 years of issuance of a new license. GLHA proposes to install interim upstream eel passage (i.e., a temporary ramp, trap, or similar) at the Millinocket Lake Storage Dam within 5 years of the issuance of a new license. Interim upstream eel passage at these three sites would be installed in locations to be determined in consultation with the U.S. Fish and Wildlife Service (USFWS) and the Maine Department of Marine Resources (MDMR) and based on data from the two years of nighttime observation and electrofishing studies conducted as part of the FERC relicensing of the Project. GLHA proposes to develop a Fishway Operation and Maintenance Plan in consultation with the USFWS and MDMR that will define the operation

and maintenance of fish passage facilities within 6 months of installation of the upstream eel passages.

GLHA also proposes to conduct up to 2 years of upstream eel passage studies following upstream passage facility installation. Such studies would be designed to evaluate the effectiveness of the upstream eel passage facilities. A study plan for the 2-year proposed study will be developed in consultation with the USFWS and MDMR.

4.3 Downstream Eel Passage Measures

Previous literature has documented higher rates of female eels at locations high within watersheds due in part to habitat characteristics, growth rates, and population densities (Shepard 2015). Because the West Branch is located in the upstream portion of the watershed, the majority of eels that migrate to the Penobscot Mills Project are likely females that experience slower growth rates, grow to larger sizes, and mature to older ages than eels residing further downstream in the watershed (Greene et al. 2009). Estimates of American eel age at outmigration has been recorded at 8-43 years in Nova Scotia rivers and from 6-18 years in Maine rivers (Shepard 2015, ASMFC 2012). Average age at maturity for female eels has been documented to be 20 years in the St. Lawrence River (ASMFC 2012). The USFWS has determined that maturation of eels (i.e., silvering that triggers outmigration) occurs between 15 and 30+ years in the upper portions of river watersheds (Eyler 2024).

Given the Project location in the Penobscot River watershed, research has shown that female eels may stay in the watershed for up to 30 years.

In comparison to the downstream projects, the 2022 and 2023 monitoring results demonstrated that relatively few eels are currently ascending the West Branch to the Penobscot Mills Project dams. With the recent upstream eel passage improvements that have been made at the downriver projects (especially with the new Mattaceunk Project eel passage that was constructed and became operational in 2024), upstream eel passage is expected to increase at the Penobscot Mills Project developments in the coming years. Thus, and considering the lengthy time to maturation for these eels, GLHA is proposing to provide downstream passage for adult silver eels at the East Millinocket and Dolby developments within 20 years following new license issuance. Measures for downstream American eel passage may include operational changes (e.g., nighttime shut-

downs), engineered protection measures, fish-friendly turbine runner replacements, or other measures. Downstream eel passage is not proposed for the Millinocket Lake Storage Dam, since eels will continue to have unobstructed passage into Millinocket Stream via the flow releases from the dam.

4.4 Eel Passage Monitoring

Following installation of the interim upstream American eel passages at the East Millinocket, Dolby, and Millinocket Lake Storage developments, GLHA will conduct up to 2 years of upstream eel passage studies at these developments. Specific methods used to study and evaluate the upstream eel passage measures will be developed in consultation with USFWS and MDMR.

5.0 Reporting

Within 3 months of the end of the upstream eel passage season, a summary report of study results following the 2 years of monitoring study will be provided to the USFWS and MDMR for 30-day review, and then subsequently filed with FERC within three months of the close of the comment period.

6.0 Modifications to the Plan

Proposed modifications to this Plan will be submitted to the USFWS and MDMR for a 30-day review and comment prior to submittal to FERC for approval.

7.0 Literature Cited

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