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Connecticut River Conservancy

February 24, 2025

DEP-BWR
Elizabeth Stefanik
Attn: *FirstLight 401WQ*
100 Cambridge Street, Suite 900
Boston, MA 02114
dep.hydro@mass.gov

Re: Comments on Massachusetts Department of Environmental Protection's January 24, 2025 Draft Water Quality Certification with Conditions for FirstLight Hydroelectric Projects, FERC License Nos. 1889 (Turners Falls) and 2485 (Northfield Mountain)

Dear Ms. Stefanik:

The Connecticut River Conservancy ("CRC") thanks you for this opportunity to comment on the Draft Water Quality Certification with Conditions ("Draft WQC") for the FirstLight Hydroelectric Project. However, the Draft WQC does not meet the State Water Quality Standards ("WQS") as we will describe herein. As an environmental organization dedicated to the protection and restoration of the Connecticut River and its tributaries, CRC is deeply concerned about the significant adverse impacts the Turners Falls Dam (FERC No. 1889) ("Turners Falls Dam" or "TFD") and the Northfield Mountain Pumped Storage Project (FERC No. 2485) ("NFM") (collectively, "FirstLight Projects") will have on water quality and aquatic ecosystems. FirstLight's Section 401 Application submitted on April 22, 2024 to the Massachusetts Department of Environmental Protection ("DEP") does not meet the requisite standard for ensuring that the continued presence and operation of the FirstLight Projects will comply with Massachusetts WQS. To compound matters, the Draft WQC that DEP published on January 24, 2025, fails in its duty to require the FirstLight Projects to meet WQS.

Since 1952, CRC has worked to protect and restore the Connecticut River and its tributaries. CRC represents thousands of members across four states, including Massachusetts, and as the only nonprofit organization dedicated to protecting the entire Connecticut River ecosystem, our comments consider not only the localized impacts of the FirstLight Projects, but also the watershed-wide implications of DEP's Draft WQC. To that point, the Vermont and New Hampshire section of the river from above the TFD to the Bellows Falls Dam also is adversely impacted by failure of the Draft WQC to require compliance with WQS.

American Rivers works to protect wild rivers, restore damaged rivers, and conserve clean water for people and nature. Since 1973, American Rivers has protected and restored more than 150,000 miles of rivers through educational and advocacy efforts, on-the-ground projects, and an

annual America's Most Endangered Rivers campaign. Annually American Rivers engages in more than 20 hydropower relicensings across the country. American Rivers has regional programs across the country including the Northeast, and more than 100,000 supporters, members, and volunteers nationwide. American Rivers' staff and volunteers work to enhance river flows and increase river connectivity to benefit biodiversity, protect floodplains and wetlands, and restore rivers providing climate change refugia. Members of American Rivers enjoy and are sustained by the resources of the Connecticut River including for angling, boating, swimming, hiking, and wildlife viewing.

CRC stands with the Franklin Regional Council of Governments ("FRCOG") and the local political delegation of Jo Comerford, Natalie Blais, and Mindy Domb, fully supporting comments submitted by these two groups.

CRC appreciates DEP's decision, at CRC's request, to provide a comment period before the Draft WQC was written, to hold a public information session in-person in the Project area, and to extend the Draft WQC comment period from 21 days to 30 days. CRC looks forward to continuing to work with DEP during the remainder of the 401 process to ensure the protection and restoration of the Connecticut River for the next half century and beyond.

I. Introduction

The Connecticut River flows through the heart of Massachusetts. It is a crucial corridor for migratory and other fish and for their habitat. It has long captured the attention of human inhabitants of the area and remains a site of historic and cultural significance. People have been and are drawn to its waters and particularly to the river's aquatic life: "*The perch, the dace in silvered pride; The princely salmon, sturgeon brave, And lamprey, emblem of the knave.*"[1] Perhaps as a result, it is one of the few resources Massachusetts regulations explicitly lists as a public trust resource.[2] However, by the twentieth century, the river had been pervasively dammed and, as result, water quality throughout the watershed is impaired.[3] The stretch of river in the Project area is no exception. Dewatering and stream flow modification impair these segments.[4] Indeed, the lengthy and largely dewatered so-called Bypassed Reach below TFD is emblematic of the deleterious effect that dams can have on rivers.

Luckily, while it is ailing, the river can still recover. And the Clean Water Act requires that it does.

This FERC relicensing comes at a precarious, but also opportune, moment. Through its water quality certification, Massachusetts has an obligation to ensure that the FirstLight Projects meet state water quality standards. As such, this water quality certification represents an outstanding opportunity to safeguard the health of the river for future generations by addressing lessons learned over the term of the previous license and by incorporating newly discovered information. For instance, relicensing at this time will also allow DEP to fully incorporate the now-known presence of endangered shortnose sturgeon in the Turners Falls Impoundment ("TFI") and to better protect intrepid sturgeon following their ancient migratory impulses up to the base of TFD. Relicensing can also address climate change that is already impacting the Project area, and which will only increase in pace and intensity within the term of the upcoming license.

CRC acknowledges and uplifts that DEP added a number of requirements to the WQC that will help enhance water quality. CRC supports: the required reports on impoundment fluctuations and that this information will be made public (for the first time); The Riparian Management Plan An Invasive Species Management Plan; A Sediment Management Plan for times when they need to dredge the upper reservoir at NFM; the full incorporation of the Recreation Management Plan that was a part of the Recreation Settlement Agreement; and although not complete, the Riverbank Erosion Monitoring, and Riverbank Repair of previously stabilize sites and new sites that develop.

As it considers whether to grant and, if so, how to condition its water quality certification for the Project, DEP should recognize the long-term impact of its decision. Done poorly and without adequate foresight, there is the risk that the river's health will continue to be compromised until

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[1] Josias Lydon Arnold, "Ode to Connecticut River," (1797) available at https://allpoetry.com/Ode-To-Connecticut-River.
[2] 310 CMR § 9.04(1)(b).
[3] *Draft Water Quality Certification with Conditions,* FirstLight Hydroelectric Project (P-1889, P-2485) (Jan. 24, 2025) at 7 (hereinafter "Draft WQC")
[4] Draft WQC at 7.

well into the 21st century. Done well, DEP has a generational opportunity to protect, restore, and enhance the health of the Connecticut River for the next 30 to 50 years, and beyond.

II. Legal Background

Pursuant to Section 401 of the Clean Water Act, 33 U.S.C. § 1341, any applicant for a federal license or permit to conduct an activity which may result in a discharge to navigable water must first obtain certification that the activity complies with applicable state water quality standards. Specifically:

> [A]n applicant for a federal license or permit to conduct any activity which may result in any discharge into the navigable waters [is required] to obtain from the State a certification that any such discharge will comply with the applicable provisions of sections [1311, 1312, 1313, 1316, and 1317 of this title]. Section 401(d) further provides that any certification . . . shall set forth any effluent limitations and other limitations, and monitoring requirements necessary to assure that any applicant . . . will comply with any applicable effluent limitations and other limitations, under section [1311or 1312 of this title] . . . and with any other appropriate requirement of State law set forth in such certification.

PUD No. 1 of Jefferson Cnty v. Wash. Dep't of Ecology, 511 U.S. 700, 707-708 (1994) (internal citations and quotations omitted). In this case, DEP may only issue such certification if it finds that FirstLight has "demonstrated compliance" with applicable WQS. And DEP's certification must set forth any limitations, in the form of conditions, and monitoring requirements necessary to ensure such compliance for the life of the federal license.

Massachusetts state law imposes on DEP "the duty and responsibility" to "*enhance* the quality and value of water resources" of the Commonwealth.[5] As part of this obligation, DEP must "[t]ake all action necessary or appropriate to secure to the commonwealth the benefits of the Federal [Clean Water Act]."[6] The Clean Water Act, in turn, has as its objective "to *restore* and maintain the chemical, physical, and biological integrity of the Nation's waters."[7] Thus, improvements from a severely degraded or highly impaired state, while positive, are not sufficient–-restoration and enhancement are the standards DEP must meet.

Further, the Clean Water Act prioritizes "the protection and propagation of fish, shellfish, and wildlife and provid[ing] for recreation in and on the water" as interim national water quality goals to meet its objective.[8] To meet its obligations under state law and the Clean Water Act, DEP:

> has adopted the Massachusetts Surface Water Quality Standards which designate the most sensitive uses for which the various waters of the Commonwealth shall be enhanced, maintained and protected; which prescribe the minimum water

[5] M.G.L. Ch. 21 § 27 (emphasis added); 314 CMR 4.01(3).
[6] M.G.L. Ch. 21 § 27(3); 314 CMR 4.01(3).
[7] 33 U.S.C. § 1251(a) (emphasis added); 314 CMR 4.01(3).
[8] 33 U.S.C. § 1251(a)(2).

> quality criteria required to sustain the designated uses; and which contain regulations necessary to achieve the designated uses and maintain existing water quality including, where appropriate, the prohibition of discharges.[9]

Specifically with regard to Section 401 certifications for FERC licenses, "*flows* shall be maintained or restored to protect existing and designated uses."[10] "Designated uses" are defined as "[t]hose uses specified in 314 CMR 4.05 and 314 CMR 4.06 for each water Class whether or not they are being attained."[11] The regulations define "existing uses" as "[t]hose designated uses and any other uses *that do not impair the designated uses* that are actually attained in a waterbody on or after November 28, 1975."[12] Thus, if the attainment of an existing use impairs a designated use, then that use does not qualify as an existing use. Accordingly, pursuant to the regulations, if there is a conflict between a designated use and an existing use, attainment of the designated use is prioritized.

Water quality standards also must include a statewide antidegradation policy, which in Massachusetts is set forth in 314 CMR 4.04, and provides that "[i]n all cases existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected."[13]

The FirstLight Projects will directly impact a several mile stretch of the Connecticut River, from the Vernon Dam in Vermont and New Hampshire[14] to well downstream of the Turners Falls Dam in Massachusetts. This stretch of the Connecticut River is comprised of multiple river segments subject to a number of WQS including sensitive designated and existing uses, narrative water quality criteria, numerical water quality criteria, and the state's antidegradation policy.[15] The river segments above and below the Turners Falls Dam are classified as Class B waters.[16] Class B waters "are designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation."[17]

Hydroelectric facilities and the impoundments they create have contributed to impairment of Massachusetts waterways for at least a century.[18] The three river segments spanning the Project area—from the state line to Route 10 (MA34-01); from Route 10 to Turners Falls (MA34-02); and from Turners Falls Dam to Gill/Montague (MA34-03)— are listed as impaired on Massachusetts's 303(d) list meaning that those river segments are not meeting water quality standards. Among other causes of impairment, flow regime modification impairs all three

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[9] 314 CMR 4.01(3).
[10] 314 CMR 4.03(3)(b) (emphasis added).
[11] 314 CMR 4.02.
[12] 314 CMR 4.02 (emphasis added).
[13] 314 CMR 4.04(1).
[14] Due to the water quality impacts upstream of the FirstLight Projects in Vermont and New Hampshire the Clean Water Act's "Neighboring Jurisdictions" regulation is implicated. 33 U.S.C. § 1341(a)(2); 40 C.F.R. § 121, Subpart B.
[15] 314 CMR 4.05(3)(b), 4.05(5); 4.04, 4.06 Table 7.
[16] 314 CMR 4.06, Table 7.
[17] 314 CMR 4.05(3)(b).
[18] Draft WQC at 7.

segments. Additionally, for MA34-03, which is the segment immediately below Turners Falls Dam, dewatering is a cause of impairment. For each of these impairments, impacts from the FirstLight Projects are the source of impairment.[19]

III. DEP's Draft WQC Does Not Comply With Water Quality Standards

DEP did not participate in the FERC settlement negotiations because it claimed it would do its own independent analysis once it received FirstLight's 401 application. However, the Draft WQC does not bear the hallmarks of an independent evaluation; rather, it adopts the proposed settlement almost in its entirety, despite robust comments and evidence provided by a variety of stakeholders, including CRC, river-adjacent municipalities, and private landowners. This lack of independent judgment is particularly manifest in DEP's conclusions regarding flows below TFD from July 1 through November 15. In addition to inadequate flows below TFD, the Draft WQC does not impose sufficient conditions to address water quality impairments related to erosion in the TFI, impacts to endangered shortnose sturgeon, impacts to migratory fish, the reasonably foreseeable impacts of climate change, and financial assurances for decommissioning and removal of the FirstLight Projects at the end of their useful life.

A. The Draft WQC Does Not Meet DEP's Burden to Justify 500 cfs Flows Will Protect, Restore and Enhance Aquatic Life Uses in the One-Mile Stretch of the Connecticut River Below Turners Falls Dam

The flows proposed first in Firstlight's 401 Certification Application and affirmed in DEP's Draft WQC are inadequate to support aquatic life uses ("ALUs") and recreation in the section of the river that is known as the Bypassed Reach, from TFD to Cabot Station. Specifically, in the one-mile section of the Bypassed Reach from TFD to Station One, the low flows notably impact state and federally listed endangered shortnose sturgeon, but also a wide range of invertebrates and other aquatic species, including a fish designated by Massachusetts as a species of special concern. While state endangered and threatened plant species, Tufted Hairgrass *(Deschampsia cespitosa ssp. glauca)* and Tradescant's Aster *(Symphyotrichum tradescantia*), are present along the shoreline below the dam, they only exist there due to the dam's long-term dewatering of that stretch of the river. The incongruity of DEP's reliance on the plants to meet its obligations to ensure "flows shall be maintained or restored to protect existing and designated uses" while ignoring the adverse impact of low flows on aquatic organisms is inescapable. Here, flows are not being "maintained or restored" to protect the plants; they are being kept artificially lower. It cannot be that a discharge can impair the use of a river segment to such a degree that a new species appears there, and that new species becomes a reason to continue the impairment and stall recovery for decades. Simply put, this makes no sense. DEP has a duty under the Clean Water Act and State Water Quality Standards to consider and weigh other ALUs, such as sturgeon, other aquatic life, recreation, and aesthetic values in the process of ensuring that FirstLight is in compliance with the law.

CRC has consistently requested that DEP undertake a more comprehensive analysis of the level of flows necessary to enhance and protect aquatic life uses rather than simply relying on the proposed settlement agreement arising out of the FERC process that is based solely on protecting

[19] Draft WQC at 7.

the plant species. DEP must examine the entire "*community* of aquatic flora and fauna" to determine proper flow levels to be protective of and enhance that community.[20] This is imperative in this case because DEP is using non-aquatic species to set flow levels that impact aquatic life uses. This contradicts the scientific and policy reasons underpinning the regulatory requirement to protect "the most sensitive use" in a particular river segment; the policy being that protecting the most sensitive use will provide the broadest and most robust protections for all other aquatic life in that river segment. Here, by choosing to protect the plants over all other aquatic life species, DEP's decision runs counter to the most sensitive use policy embodied in the Clean Water Act and state water quality standards. Moreover, DEP's conclusion to set flow levels below the dam based on what would be protective of the plant species is based on a faulty scientific premise—that the plants are aquatic—and even if the premise were correct, DEP has not rebutted the substantial record evidence that higher flows would enhance and be more beneficial for the aquatic life community as a whole, even if the plants were to be harmed.

1. DEP Has Not Established the Plants Are Aquatic

CRC has long questioned DEP's and FirstLight's assumption that the plants on which DEP is basing its flow levels are aquatic life.[21] This fundamental premise underlies DEP's assumption that they should be protected as an ALU in the same way as fish or benthic macroinvertebrate species. Given CRC's and other stakeholders' significant and legitimate concerns about this issue, CRC expected DEP would have provide a detailed analysis supporting its position in the Draft WQC. Instead, DEP offered this conclusory statement: "The plant species present below Turners Falls Dam, are unquestionably classified as aquatic/wetland species and included in the definition of Aquatic Life Use."[22]

Usually, definitive statements like that are accompanied by citations to authority. Here, however, there is no footnote and no authority. Who "classified" them? Where are the "classified" as such? The only inference that the public can draw from such conspicuous absence of authority is that DEP has none to support its conclusion. If DEP has authority to support its conclusion on this controversial and critical issue, by not citing it in the Draft WQC, it is depriving the public from making informed comments on the agency's analysis.[23]

DEP also does not explain whether the plants are aquatic or wetland species or both. It makes a difference and DEP's use of "aquatic/wetland" is telling. DEP seems to be trying to hedge its bets, but such ambiguity is not sufficient for a determination that will set flow levels below TFD for the next 30–50 years. The law demands—and the public deserves—to know the scientific foundation on which rests DEP's seemingly arbitrary position.

Not only did DEP fail to cite to authority for its conclusion about the plants, it also failed to grapple with or rebut the contrary scientific evidence CRC provided in prior comments and

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[20] 314 CMR 4.02 (definition of aquatic life) (emphasis added).
[21] *See, e.g.*, CRC's June 13, 2022 Letter to Secretary Card; CRC's June 3, 2024 Comments on FirstLight's WQC Application (hereinafter CRC's June 3, 2024 Comments"), at 12-13.
[22] Draft WQC at 23.
[23] This is also a departure from DEP's practice of citing authority to support its positions, as it does in other sections of the Draft WQC.

letters. Both sensitive plant species are classified as "facultative wetland species," meaning that they usually occur in wetlands, but may occur in non-wetlands. While there is no national system which categorizes aquatic plants, there is a large body of scientific literature which distinguishes aquatic plants from non-aquatic plants. In his classic treatise on aquatic plants, Sculthorpe states that aquatic plants "live and reproduce in partly or wholly submerged state."[24] More recent researchers have defined aquatic plants as "… photosynthetic organisms … that actively grow permanently or periodically submerged below, floating on, or growing up through the water surface,"[25] or plants "whose life cycle takes place completely or periodically in the aquatic environment."[26] Further, the Environmental Protection Agency's ("EPA") definition of aquatic plant does not fit either species: "[p]lants that grow in water either floating on the surface, growing up from the bottom of the body of water or growing under the surface of the water."[27] Likewise, MassWildlife's descriptions of the plants do not identify them as aquatic; the word aqautic does not appear on MassWildlife's summary descriptions of either species.[28] To the extent that DEP is relying on MassWildlife to graft the word "aquatic" onto these two species, MassWildlife does not use that descriptor and DEP has not identified any other source for this characteristic. Finally, a botanical inventory of aquatic plant species was conducted of this stretch of the Connecticut River by Hickler et al. This survey documented all of the "truly aquatic taxa, which rarely stray beyond the permanently flooded reaches of the river."[29] Neither Tradescant's Aster nor Tufted Hairgrass are included in that list. While their presence is well known to local botanists, their omission from Hickler's list is strong evidence that they are not considered aquatic flora.

In order to survive in aquatic environments, there are a wide range of adaptive mechanisms that aquatic plants have evolved, including specialized tissues for internal gas exchange to survive in anoxic environments, reduced or absent cuticles to facilitate gas and nutrient exchange, and adaptive morphology such as highly dissected leaves.[30] Neither Tradescant's Aster nor Tufted Hairgrass are known to survive in truly aquatic environments. A review of the herbarium records of each of these species in Massachusetts fails to find any occurrences documented in aquatic environments. In addition, neither of these species is known to possess any specific adaptive features that indicate they have evolved to survive in an aquatic environment.[31] DEP

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[24] Affidavit of Michael Lew-Smith, ¶ 5 (citing Sculthorpe, C.D. 1967. *The Biology of Aquatic Vascular Plants*. 2nd ed. London: Edward Arnold Publishers Ltd. , attached as Exhibit A (hereinafter "Lew-Smith Affidavit").
[25] Lew-Smith Affidavit, ¶ 5 (citing Chambers, P. A., P. Lacoul, K. J. Murphy, and S. M. Thomaz. 2007. "Global Diversity of Aquatic Macrophytes in Freshwater." *Freshwater Animal Diversity Assessment*, April, 9–26. https://doi.org/10.1007/978-1-4020-8259-7_2).
[26] Lew-Smith Affidavit, ¶ 5 (citing Lesiv, M S, A I Polishchuk, and H L Antonyak. 2020. "AQUATIC MACROPHYTES: ECOLOGICAL FEATURES AND FUNCTIONS." https://doi.org/10.30970/sbi.1402.619).
[27] Aquatic Biodiversity Glossary, U.S. Env't Prot. Agency, Office of Mission Support, (last updated Dec. 8, 2010) available at: https://ofmpub.epa.gov/sor_internet/registry/termreg/searchandretrieve/glossariesandkeywordlists/search.do?details=&glossaryName=Aquatic%20Biodiversity%20Glossary#:~:text=Definition:%20A%20beneficial%20use%20designation,component%20of%20a%20biological%20system.
[28] *See* https://www.mass.gov/doc/tradescants-aster/download; https://www.mass.gov/doc/tradescants-aster/download.
[29] Lew-Smith Affidavit, ¶ 12 (citing Hickler, Matthew G., Robert I. Bertin, Glenn Motzkin, and Karen B. Searcy. 2018. "Notable Aquatic Plants from the Connecticut River in Franklin County, Massachusetts." *Rhodora* 120 (981): 76–86. https://doi.org/10.3119/17-14).
[30] Lew-Smith Affidavit, ¶ 6.
[31] Lew-Smith Affidavit, ¶ 9.

concedes this in the Draft WQC, stating the "vertical lower extent of habitat is limited by persistent inundation,"[32] but as noted above being able to survive persistent inundation is what defines an "aquatic" plant. Accordingly, DEP's continued insistence that the two plant species are "unquestionably" aquatic is not supported by record evidence before DEP and therefore it is arbitrary and capricious to use the plants to set flows to protect and restore "aquatic life uses."

2. DEP Has Not Met Its Burden To Show the Plants are Existing Uses

If the plants are not designated aquatic life uses, they still might be protected as existing uses. DEP's argument for prioritizing the protection of the plants over all other aquatic species hinges in part on its characterization of the plants as an "existing use" under the antidegradation provisions of the state WQS.[33] However, DEP omits a key component of the definition of "existing use" in Massachusetts WQS in the Draft WQC, stating "[e]xisting [u]ses are defined as the designated uses and any other uses actually attained in a water body on or after November 28, 1975."[34] The full text of Massachusetts WQS in fact reads: "[t]hose designated uses and any other uses ***that do not impair the designated uses*** that are actually attained in a waterbody on or after November 28, 1975."[35]

By omitting this key language, DEP obscures the possibility that an existing use that impairs a designated use would not be properly considered an existing use, and therefore the antidegradation policy would not apply. Here, designated ALUs will be impaired if the plants are prioritized when establishing flows below TFD. As asserted previously, lower flows will decrease habitat availability for all other aquatic species in the river, including sturgeon, state fish species of special concern, and macroinvertebrates, impairing these other uses.[36] DEP's reliance on the plants as "existing uses" is misplaced and unsupported.

3. DEP Has Not Analyzed the Possibility of Transplanting the Plants

Transplanting the plants is another option that DEP should have considered and analyzed, but the Draft WQC does not contemplate that option and certainly does not rule it out. The Massachusetts Endangered Species Act ("MESA")[37] itself contemplates the relocation of species where necessary: "The director may permit the taking, possession, purchase, sale, transportation, exportation or shipment of any species appearing on the list of endangered or threatened species or species of special concern developed by the director pursuant to section four for scientific, conservation, management or educational purposes."[38] Transplanting is a tool that should be evaluated to alleviate the conflict between protecting the plants and protecting ALUs. However,

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[32] Draft WQC at 21.
[33] Draft WQC at 23.
[34] Draft WQC at 22.
[35] 314 CMR § 4.02 (emphasis added).
[36] *See* Donald Pugh, Affidavit on Behalf of the Connecticut River Conservancy (hereinafter "Pugh Affidavit"), in Comments of Connecticut River Conservancy in Opposition to certain conditions from the March 31, 2023 Offer of Partial Settlement for the Turners Falls Hydroelectric Project et al. under P-1889 et al., FERC Accession No. 20230525-5090 (filed May 25, 2023), at ¶ 1, 5-7.
[37] M.G.L. Ch. 131A.
[38] M.G.L. Ch. 131A § 3; 321 CMR 10.04(3)(a)-(c).

DEP, despite urging from CRC and other stakeholders, failed to evaluate this option, despite possessing clear statutory authority under MESA to do so.

Transplanting has been used in analogous situations to alleviate similar conflicts in the past. The Tubercled Orchid (*Plantanthera flava*) was transplanted out of portions of the Deerfield River during the Deerfield River, Gardners falls, and Bear Swamp Pumped Storage Project's relicensing in the 1990s.[39] The Deerfield River relicensing was an analogous situation to ours, because the orchid, a threatened species in Vermont, had established itself in areas that had been bypassed and thus de-watered. The solution in the case of the orchid at the Deerfield River Project was to develop a "Tubercled Orchid Mitigation and Monitoring Plan" incorporated as part of the license, which contained provisions for relocating and maintaining populations affected by the increased flows, monitoring relocations, mapping, and follow up to check on the species after the fact.[40] The transplant was so successful that the Vermont Nongame and Natural Heritage Program wrote a letter to Great River Hydro, specifically thanking it for its efforts in protecting the Orchid.[41] This example shows that transplanting endangered plant species in order to accommodate higher flow levels to protect ALUs is a viable option. DEP has an obligation to fully evaluate this possibility and explain its reasoning for rejecting it so the public can provide meaningful input on that decision.

As it stands now, CRC and the public do not know whether DEP considered the option at all, or if it did, why the agency rejected it. Given this option was successfully employed in a previous analogous situation, and was specifically raised in comments by CRC and others, DEP's failure to consider and analyze this possibility is arbitrary and capricious and a failure to explore a feasible option that would protect, restore and enhance a greater extent of the aquatic community.

4. DEP Arbitrarily Ignores Evidence of State Listed Fish Species in the Bypassed Reach

DEP claims in the Draft WQC that "there is no evidence to support a conclusion that habitat for the two rare fish species . . ., the Burbot (*Lota lota*) and the Longnose Sucker (*Catostomus catostomus*) , is an existing use."[42] To support this contention, DEP further states "these species are not currently present, nor would they return to the area if flows were increased."[43] DEP's claims are both legally and factually incorrect. First, CRC provided DEP with a scientific reference of a 12-inch burbot caught in a pool below TFD in 2000. The angler who caught the burbot reported that other burbot specimens had been caught. This establishes the presence of

[39] Susan Taft, *Hydropower Project Summary: Deerfield River, VT and MA*, Hydropower Reform Coalition and River Management Society at 8 (September 1, 2020), available at https://www.river-management.org/assets/Hydro/2020/Deerfield%20River_P-2323_11-16-20.pdf.
[40] Tubercled Orchid Mitigation and Monitoring Plan, Deerfield River Project, FERC No. 2323 (May 1997); Final Environmental Impact Statement, Deerfield River Projects, (August 1996), available at https://lowimpacthydro.org/wp-content/uploads/2021/02/FERC_Final_EIS_1996.pdf.
[41] LIHI Recertification Application, Deerfield Hydroelectric Project, LIHI Certification # 90, at 45 (November 2020), available at https://lowimpacthydro.org/wp-content/uploads/2020/11/PUBLIC-Deerfield-Final-revised-application-signed.pdf.
[42] Draft WQC at 24.
[43] Draft WQC at 24.

burbot in the bypass reach after 1975, which makes it an existing use under the Clean Water Act. DEP's claim that burbot "are not currently present" in that stretch of the Connecticut River is irrelevant to whether burbot is an existing use. And DEP's conclusion that burbot would not "return to the area if flows were increased" is an admission by DEP that burbot were once there (which is consistent with the evidence from Hartel, et al. (2002)), and thus are an existing use, but DEP's conclusion that they would not return with higher flows is not supported by any authority or analysis.

5. DEP's Purported Balancing And Compromise Does Not Protect the Aquatic Community Of The River Below Turners Falls Dam

DEP claims that for flows below TFD, MassWildlife "sought the compromise of 500 cfs" to protect the plant species.[44] DEP apparently accepted this "compromise" because that is the flow level in the Draft WQC. There are at least two problems with this. First, MassWildlife's mission, and in particular the Natural Heritage and Endangered Species Program's ("NHESP") mission, is different from DEP's. NHESP is responsible for protecting the state's wide range of native biological diversity, including species listed as endangered or threatened under MESA. Thus, it is understandable why MassWildlife would seek a compromise to protect the plants. DEP's mission, however, in the context of WQC, is to ensure the FirstLights Projects comply with WQS. That obligation requires DEP to recover and enhance aquatic life uses and to elevate the water quality of this segment of the river to non-impaired status. There is no authority in the Clean Water Act or Massachusetts WQS for balancing recovery of aquatic life uses with protection of non-aquatic species.[45]

Second, MassWildlife's "compromise," as demonstrated in the table below, is weighted far too heavily in favor of the non-aquatic plants. Even accepting DEP's percentages as true–which CRC does not concede–the proposed 500 cfs flows are not fully recovering habitat for a multitude of ALUs, much less enhancing that habitat. The percentage increases in the Weighted Usable Area ("WUA") that DEP touts look more significant than they are because they are percentage increases from a historically dewatered and impaired section of the river. Further, other designated uses such as recreation and aesthetic values remain impaired in order to accommodate the plants.

[44] Draft WQC at 20.

[45] Even FirstLight in its Section 401 Application acknowledged the balancing taking place: "the 500 cfs minimum flow represents an equivalent flow agreed upon by the [U.S. Fish & Wildlife Service], [National Marine Fisheries Service], and [Massachusetts Division of Fisheries & Wildlife] reflecting the balancing of aquatic resources and rare plants." FirstLight 401 Certificate Application, at Att. C-8 (emphasis added).

Non-Aquatic Plants Currently Being Used to Set Flows Below Turners Falls Dam	**Aquatic Life Uses That Would Be Protected, Recovered and Enhanced by Additional Flows Below Turners Falls Dam**
Tufted Hairgrass *(Deschampsia cespitosa ssp. glauca):* state endangered facultative wetland plant **Tradescant's Aster** *(Symphyotrichum tradescantia)*: state threatened facultative wetland plant (also occurs in relatively equal numbers within the impoundment of the Holyoke Dam)	**Migratory fish**: DEP claims "in some areas[46] [proposed] flows will provide" the following: <u>For spawning sea lamprey</u>: an average of 84 percent of maximum WUA, which means additional flows could provide up to **an additional 16% WUA** <u>For spawning shad</u>: 73 percent of maximum WUA, which means additional flows could provide up to **an additional 27% WUA** <u>For juvenile shad</u>: 88 percent of maximum WUA, which means additional flows could provide up to **an additional 12% WUA** <u>For spawning state and federally endangered sturgeon</u>: 96% of maximum WUA, which means additional flows could provide up to **an additional 4% WUA** <u>For state and federally endangered sturgeon fry</u>: 73% of maximum WUA, which means additional flows could provide up to **an additional 27% WUA**
	Resident Riverine Fish: DEP claims the proposed flows provide "from 53 to 81 percent of maximum WUA for resident riverine fish species from summer through early spring," which means additional flows could provide up to **an additional 47 to 19% WUA during that same time period**

[46] DEP does not define what it means by "in some areas" which begs the question of what areas will these percentages apply to and what are the percentages of maximum WUA in "other" areas.

	Burbot: Massachusetts species of special concern that is an existing use in the Bypass Reach
	Macroinvertebrates: Despite having evidence before it related to the beneficial effects of additional flows on macroinvertebrates, DEP provides no analysis in its Draft 401 Certification for this Aquatic Life Use.[47]
	Recreation: Additional flows would recover and enhance boating in the Bypass Reach, which was barely navigable at 545 cfs.[48]
	Aesthetics: Additional flows would recover and enhance the aesthetic value of the Bypass Reach, consistent with the requirement under WQS that Class B waters "have consistently good aesthetic value."[49]

6. DEP To Consider Protection Of Cultural Resources In Choosing Higher Flows

CRC stands in alignment with The Nolumbeka Project and the local Indigenous tribes of the area. Maintaining higher river flows would protect culturally important sites on Rawson Island and Peskeomskut Island by impeding public foot access that may otherwise cause damage to cultural artifacts. CRC stresses the importance of considering Indigenous perspectives in the WQC process, which previously have been overlooked by regulatory agencies and are still largely being dismissed by FirstLight. The higher flows will not only mean that WQS are being met, but also that cultural resources are being protected and respected.

B. DEP Has Not Met Its Burden To Show Shortnose Sturgeon Will Be Adequately Protected

There is perhaps no more sensitive truly aquatic species present in the stretches of the Connecticut River, both above and below Turners Falls Dam, than the shortnose sturgeon. Listed as endangered both under the federal Endangered Species Act and under Massachusetts Endangered Species Act, shortnose sturgeon face a host of adverse impacts from the relicensing of the FirstLight Projects. Shortnose sturgeon are both an existing and designated ALU for the portions of the Connecticut River affected by the Project. Given their endangered status, they are

[47] *See generally* Pugh Affidavit.
[48] CRC's June 3, 2024 Comments, at 15-16.
[49] CRC's June 3, 2024 Comments, at 17-19.

unquestionably the most sensitive ALU. Thus, in order to issue a WQC for the Project, DEP must demonstrate that shortnose sturgeon and its habitat will be "enhanced, maintained and protected" in compliance with WQS.[50] In the 2019 Biological Opinion done for the Holyoke Dam relicensing, the National Marine Fisheries Service ("NMFS") noted that while the Connecticut River shortnose sturgeon population "has remained relatively stable for the past 30 years, it has shown no sign of recovery."[51] Further, NMFS noted "the Connecticut River, although capable of supporting a much larger population of shortnose sturgeon (1000s-10,000), continues to accommodate a very small population for the amount of habitat currently available, as compared to shortnose sturgeon populations in other river systems."[52] At a minimum, "enhancement" of shortnose sturgeon and its habitat must include meaningful progress toward recovery.

DEP has not met its burden to show shortnose sturgeon will be adequately protected or that its habitat will be enhanced or maintained. To the contrary, DEP has failed to meaningfully address new evidence of sturgeon strandings below TFD and of the presence of sturgeon in the TFI. It continues to rely on resource agencies' analyses that did not account for the new evidence and claims that mitigation equipment that has not yet been designed will be protective of shortnose sturgeon.

In a December 5, 2024 letter to DEP ("Sturgeon Letter"), CRC outlined new evidence regarding shortnose sturgeon that had not previously been addressed by the proposed settlement agreement in the FERC proceeding or by FirstLight's related draft Biological Assessment. While DEP acknowledges the new evidence in its Draft WQC, it does not meaningfully consider it or explain why the new evidence does not require a reevaluation of the proposed settlement conditions both below and above Turners Falls Dam.

1. DEP Does Not Adequately Address Recent Sturgeon Strandings And Their Implications For Compliance With Water Quality Standards

In its Draft WQC, DEP briefly references one shortnose sturgeon stranding that occurred in July 2024.[53] There are multiple problems with DEP's characterization. First, DEP only discusses one stranding event when in fact there were two, very close together in time, as CRC informed DEP in its Sturgeon Letter.[54] Second, DEP appears to question whether it was a sturgeon or not, referring to "a recent sighting *of what was believed to be* a shortnose sturgeon stranded in a pool,"[55] even though the fish was rescued and released downstream and confirmed by a United States Geological Survey fisheries biologist to be a shortnose sturgeon.[56] Third, as CRC detailed in its Sturgeon Letter, these strandings were not a first, as the FirstLight spokesperson noted in the press that incidents like these happen "infrequently," indicating FirstLight is aware of

[50] 314 CMR 4.01(3).
[51] NMFS, Endangered Species Act Section 7 Consultation Biological Opinion, Continued operation of the Holyoke Hydroelectric Project (FERC #2004), at 122 (Dec. 4, 2019) (hereinafter "Holyoke BiOp").
[52] Holyoke BiOp at 122–23.
[53] Draft WQC at 34.
[54] CRC December 5, 2024 Letter to MassDEP at 2 (hereinafter "CRC Sturgeon Letter").
[55] Draft WQC at 34 (emphasis added).
[56] Chris Larabee, *Endangered shortnose sturgeon found near Turners Falls dam*, GREENFIELD RECORDER, https://www.recorder.com/Endangered-shortnose-sturgeon-found-near-Turners-Falls-dam-56269496.

previous sturgeon strandings.[57] Indeed, as far back as 1993, when sturgeon were first caught and seen in the pools below the Turners Falls Dam, NMFS has expressed concern about potential strandings and isolation of sturgeon "as a result of changes in flow releases at the dam."[58] It is troubling, given all of this evidence before it, that DEP minimizes the stranding as a "one-off" event.

Finally, DEP engages in a highly convoluted explanation of why the sturgeon were stranded there that does not address the relevant question of how this sensitive designated ALU will be protected and enhanced under the proposed flow conditions. Specifically, DEP acknowledges that it received comments that flows should be increased to address the sturgeon stranding problem below the dam, but apparently concludes this is unnecessary after MassWildlife opined:

> that fish strandings in isolated pools below the dam occur from natural or unnatural high flow events where fish swim upstream and then as flows decrease, whether naturally or unnaturally, they are stranded in isolated pools until the next high flow event[59]

Rather than rebut the idea that increased flows are needed, DEP's description supports the need for increased flows to mitigate sturgeon strandings. While CRC does not know what DEP and MassWildlife are referring to by "natural" flows—none of the flows on this stretch of the river are natural and they are all controlled by FirstLight, so they are unnatural by definition and the direct cause of the strandings—the fact that sturgeon are stranded "until the next high flow event" implies that FirstLight does not control when the next "high flow event" will occur. It also indicates that increased flows would mitigate the strandings, flows which DEP can mandate as part of the WQC. DEP's failure to reach this logical conclusion based on its own characterization is inexplicable.

Noted sturgeon expert, Boyd Kynard concludes that the currently proposed flows below TFD "could result in strandings that can injure or, potentially kill, sturgeon" and sturgeon would be aided by enough water being released to create more escape routes so they are not stranded in isolated pools.[60]

DEP states that NMFS is "reevaluating the proposed fish passage protections required in relicensing" in light of the strandings, but predetermines the outcome of that evaluation stating that it is "highly likely" the proposed measures will be found to be protective of shortnose sturgeon. DEP lists four reasons why this is "likely" to be the case, but none of the four reasons address factors that would improve sturgeons' chances of avoiding or otherwise being able to

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[57] CRC Sturgeon Letter at 2. DEP must inquire with FirstLight regarding evidence of prior sturgeon strandings and outcomes to determine frequency of occurrence.

[58] CRC Sturgeon Letter at 2–3, n.14 (citing Letter from J. Mark Robinson, Director, Division of Project Compliance and Administration, FERC to Nancy Haley, Protected Species Program, NMFS, Sept. 13, 1993, Accession No. 199309230178). This letter is part of a longer exchange between NMFS and FERC regarding potential stranding and harm to shortnose sturgeon. *See* Letter from J. Mark Robinson, Director, Division of Project Compliance and Administration, FERC to Nancy Haley, Protected Species Program, NMFS, Aug. 19, 1993, Accession No. 199308190100.

[59] Draft WQC at 34.

[60] Affidavit of Boyd Kynard, at ¶¶ 4–10, attached as Exhibit B (hereinafter "Kynard Affidavit").

escape strandings on their own.[61] DEP must undertake its own independent evaluation of the evidence before it, and it should be skeptical of information provided by FirstLight on this issue. As a reminder, FirstLight, in its draft BA that concluded with a no jeopardy finding, stated that "no stranding has ever been observed at the Project," which is inconsistent with FirstLight's spokesperson's acknowledgement after the July events that strandings occur "infrequently," and NMFS's previously stated concern about strandings there.

It is also inconsistent with the analogous situation at the Holyoke Dam where strandings were known to occur; for that reason, the Holyoke BiOp is more instructive than speculation about what NMFS will conclude after its reevaluation. In that BiOp, NMFS clearly identified the Holyoke Dam as the cause of the sturgeon strandings and noted that without active efforts to remove dozens of sturgeon stranded in the isolated pools below the dam between 1990 and 2013, "they could have died due to increased temperatures and decreased dissolved oxygen."[62] As it was, many of the rescued sturgeon "possessed heavy abrasions," including "significant hemorrhaging along the ventral scutes and damage to their fins."[63] NMFS further noted that climate change, including increased droughts and associated water withdrawals, can lead to more strandings: "If a river becomes too shallow or flows become intermittent, all shortnose sturgeon life stages, including adults, may become susceptible to strandings."[64]

DEP does not grapple with any of these impacts. Instead, it relies on conclusory statements regarding the minimum flow requirements consistency with the ESA and the Recovery Plan for shortnose sturgeon.[65] But these conclusions are inadequate and unsupported. CRC does not dispute that the proposed minimum flow requirements "are essential to support the survival and recovery of the [shortnose sturgeon] in the Connecticut River,"[66] but this is not the question DEP must answer in order to issue a WQC. The relevant question is whether increased flows, above the proposed minimum flows, such as those proposed by CRC's experts, are also needed to support the survival and recovery of shortnose sturgeon. DEP never answers this question; rather it avoids it by focusing on flows purportedly need to protect non-aquatic plants.

DEP also avoids the question by claiming that the proposed flows are consistent with the requirements of Section 7(a)(1) and 7(a)(2) of the Endangered Species Act ("ESA"), but DEP does not provide any support for this claim.[67] DEP also states that the agreed upon minimum flows are consistent with section 3.1.1 of the Shortnose Sturgeon Recovery Plan, but again fails to provide a citation or any evidence for its claim.[68] Section (7)(a)(1) requires federal agencies to use their authority to further the goals of listed species' conservation. Under Section 7(a)(2) of the ESA, Federal agencies are required to ensure, via consultation with the Services, that any actions authorized, funded, or carried out are not likely to jeopardize species or adversely affect

[61] Draft WQC at 34–35.
[62] Holyoke BiOp at 70.
[63] Holyoke BiOp at 108; *see also* Kynard Affidavit at ¶¶ 9–10.
[64] Holyoke BiOp at 77–78.
[65] Draft WQC at 34.
[66] Draft WQC at 34.
[67] Draft WQC at 34.
[68] Draft WQC at 34. DEP also fails to address whether the shortnose sturgeon Recovery Plan, which is 27 years old and likely based on data far older than that, is the correct measuring stick for recovery of the species today. NMFS, Final Recovery Plan for the Shortnose Sturgeon (Dec. 1998) (hereinafter "SNS Recovery Plan").

critical habitat. Here, consultation under 7(a)(2) of the ESA has not been completed, leaving a significant question as to the extent of relicensing impacts on shortnose sturgeon. Absent a formal finding from NMFS as to whether the project is likely to adversely affect shortnose sturgeon, any statement regarding the sufficiency of the Flows and Fish Passage Settlement Agreement ("FFP") at this point is premature and cannot serve as a justification to grant WQC.

Several serious impacts to shortnose sturgeon remain as areas of concern under the ESA. First, the FFP did not take sturgeon passage into account in its focus on other species, as noted by NMFS in its comments on the FFP.[69] Second, NMFS also noted the impacts below the dam: "Manipulation of flow below the Turners Falls Dam has direct effects on spawning and rearing of shortnose sturgeon, including limiting available habitat, disrupting and displacing spawning adults, and displacing or destroying early life stages."[70] Finally, strandings below the dam constitute "take" under Section 9 of the ESA.[71] These serious impacts to shortnose sturgeon should be considered by DEP at this critical juncture, and DEP cannot use speculation about compliance with the ESA as justification for granting the WQC.

DEP must impose more definitive conditions to protect, restore and enhance shortnose sturgeon and their habitat both above and below TFD, as well as facilitate sturgeon passage. As one specific example, at Holyoke the shortnose sturgeon handling plan included a requirement that facility staff "inspect pools below the dam for stranded sturgeon anytime conditions are such that these isolated pools may occur.[72] Currently, the draft BA for sturgeon at Turners Falls includes a shortnose sturgeon handling plan that only involves sturgeon that make it into the new fishway lift. As the Holyoke BiOp recognized, the facility operater—here, FirstLight—is responsible for dropping flows that cause isolated pools and therefore should be responsible for ensuring no shortnose sturgeon are stranded. The only reason the stranded sturgeons were discovered and rescued in July 2024 was because passers-by happened to see and report them. Given the precedent at Holyoke, DEP does not need to wait for NMFS to finish its ESA consultation to impose such a condition as part of the shortnose sturgeon handling plan for the FirstLight Projects. DEP also could, for instance, include conditions requiring FirstLight to achieve the fish passage outcomes for shortnose sturgeon that are listed on page 35 of the draft WQC. These outcomes include designing passage at TFD specifically for shortnose sturgeon and requiring barrier net design at NFM that is protective for shortnose sturgeon. DEP should not rely on other entities to design or include measures that DEP knows are needed to be protective of shortnose sturgeon; DEP should mandate those designs and measures as conditions of the WQC and ensure they are implemented as timely as possible.

2. DEP Does Not Adequately Address New Environmental DNA Evidence of Shortnose Sturgeon Above Turners Falls Dam

Like with the new stranding evidence, DEP acknowledges but attempts to downplay and does not meaningfully analyze the new environmental DNA ("eDNA") evidence of shortnose sturgeon above TFD, especially as it relates to impacts on sturgeon from the operations of NFM.

[69] NMFS Comments and Preliminary Prescription on FFP at 35.
[70] NMFS Comments and Preliminary Prescription on FFP at 35.
[71] *See* Kynard Affidavit, at ¶ 15.
[72] Holyoke BiOp at 109.

Particularly troubling is DEP's reference to "other eDNA studies upstream of the Turners Falls Dam have not resulted in the detection of any shortnose sturgeon between Turners Falls and Bellows Falls."[73] Although unstated, CRC can only presume DEP is referring to FirstLight's eDNA study, which, as CRC has noted, contained multiple flaws with its methodology since samples were collected at the surface during a rainstorm to try to detect a bottom dwelling fish. DEP's mention of this eDNA sampling event, without also mentioning the criticisms of the methodology, creates a false equivalency for the public between those negative results and CRC's positive eDNA hits.

Importantly, DEP acknowledges that, regardless of how they arrived there, the shortnose sturgeon above Turners Falls Dam are protected by both federal and state endangered species laws, but as pointed out above, NMFS is still evaluating potential impacts. CRC does not dispute that more information and analysis is needed. The Connecticut River Migratory Fish Restoration Cooperative also issued a statement in November 2024 calling for more information to be collected in a timely manner "to determine whether hydropower project operations, or other activities, may affect shortnose sturgeon above [TFD]." But, in order to certify compliance with WQS, DEP must undertake its own analysis of impacts to ensure this sensitive aquatic life use will be protected and enhanced.

DEP speculates that the fish passage conditions currently proposed will be "highly likely" to be protective of shortnose sturgeon, "or will be designed during design phases" to be protective.[74] But it is DEP's duty to ensure, not just hope, that fish passage conditions will protect and restore ALUs. It is unclear from the Draft WQC what designated or existing use in the impoundment DEP is identifying as the most sensitive use, but state and federally endangered sturgeon certainly qualify. Accordingly, it is incumbent upon DEP to include conditions in the WQC that are protective of sturgeon living in the impoundment, including conditions mandating the barrier net at NFM and downstream fish passage installations be designed to provide maximum protections for sturgeon at all life stages.[75] DEP's states that "[i]f correctly designed and operated, the upstream and downstream fish passage systems at TFD could be a substantial gain for the Connecticut River shortnose sturgeon population, opening miles of previously blocked habitat."[76] CRC does not disagree with this premise, but it is DEP's duty to ensure this *is* the outcome instead of musing about what would happen *if* it happens.

C. DEP Must Impose Additional Conditions to Protect Migratory Fish

1. Fish Passage at Turners Falls Dam

DEP contends that American Shad (*Alosa sapidissima)* modeling prioritizes downstream passage before upstream and that concurrent installation is difficult to coordinate due to complexity of dam construction.[77] CRC urges DEP to reconsider simultaneous installation of up- and downstream passage at TFD in light of undue deference to the FFP and new evidence of

[73] Draft WQC at 33–34.
[74] Draft WQC at 34.
[75] *See* Kynard Affidavit at ¶¶ 11–15.
[76] Draft WQC at 35.
[77] Draft WQC at 29–33.

shortnose sturgeon above the TFD. Regardless of whether simultaneous installation occurs, DEP must require fish passage installation on shorter timeframes than currently contemplated.

The Draft WQC acknowledges that simultaneous installation is possible from a "theoretical engineering standpoint" and that "it would be ideal to install both the upstream and downstream passages simultaneously."[78] However, DEP defers to the FFP and characterizes phased installation as a "balance of many interests and tradeoffs" and "a compromise that … federal and state experts deemed worthwhile."[79] Rather than defer to a compromise "deemed worthwhile," DEP has a duty under CWA § 401 and the WQS to independently certify and condition federal licenses in order to protect and enhance water quality.

DEP appears to support its conclusion that simultaneous installation is infeasible based on the complexity of the dam operations and Project. As part of that assessment, DEP discounts CRC's expert testimony from Edwin Zapel's on the grounds that a comparison made between TFD and another dam project is not perfectly analogous. Specifically, DEP claims Mr. Zapel is unaware of project complexities associated with the FirstLight Projects, including environmental permitting, that will require more time than the Diablo Dam project he opines is analogous.[80] But it is clear in Mr. Zapel's affidavit that he has taken the differences between the two projects into account, as he acknowledges "no agency input was required on the Diablo trashrack design" and "agency review and input on the proposed Cabot Station trashrack [is] expected and included."[81] So, contrary to DEP's criticism, Mr. Zapel did take into account FirstLight Projects' complexities and still opined the Cabot Station trashrack could be completed on a faster timeline than DEP has proposed.

Finally, DEP also appears to support its conclusion to not require simultaneous installation based on the status of American Shad: "While it would be ideal to install both the upstream and downstream passages simultaneously, that is not compelled by the status of the American Shad population."[82] The presence of endangered shortnose sturgeon both above and below the dam changes this calculus by vastly increasing the benefit of simultaneous installation. DEP's failure to take endangered sturgeon into account when discussing the benefits of simultaneous installation is a fundamental flaw in the agency's analysis.

2. DEP Should Require Installation of the Barrier Net at the Northfield Mountain Pumped Storage Facility in Three Years

CRC acknowledges that DEP credits Mr. Zapel's expertise and amended the deadline to install a barrier net at the NFM intake by June 1 of Year 5 after the license rather than by Year 7.[83] As a result, DEP imposed Special Conditions Nos. 20–22 that amend Proposed Articles B200–220 regarding timelines for operations, and effectiveness testing.[84]

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[78] Draft WQC at 32.
[79] Draft WQC at 32.
[80] Draft WQC at 32.
[81] Zapel Affidavit at 15.
[82] Draft WQC at 32.
[83] Draft WQC at 35–36, 74.
[84] Draft WQC at 36.

Given that Mr. Zapel's affidavit concluded that the barrier net should be installed within three years, it is unclear why DEP imposed a five-year installation deadline. Moreover, DEP fails to explain why installation within three years is infeasible. In addition to being "persuaded" by Mr. Zapel, DEP bases its determination on three additional factors. First, the barrier net is entirely separate from upstream and downstream passage facilities so there is no need to install the net serially with fish passage.[85] Second, the presence of shortnose sturgeon above the Turners Falls elevates the importance of expeditiously installing a barrier net to protect these endangered fish from entrainment.[86] Third, FirstLight's previously proposed Amended Final License Application stated the net could be operational by Year 5. DEP also points to FirstLight's Gantt chart asserting that from design to installation the barrier net will take five years.[87]

CRC contends that none of these factors can explain why DEP rejected the three-year timeline Mr. Zapel proposed based on his experience with a more complicated scenario.[88] The presence of shortnose sturgeon makes faster installation all the more important.

Finally, CRC notes that while the Special Conditions update the timing for effectiveness testing, there appears to be a typo in Special Condition No. 22.[89] Under the "Effectiveness Testing of Round 1 AMMs – Years 10 and 11," the draft certification states that the Licensee shall "provide the effectiveness study report … by February 1 of Years 15 and 16 for adult American Shad."[90] The Year 15 and 16 timeframe was the originally proposed timing in FirstLight's 401 application and does not reflect the updated timeline in the Draft WQC.[91] The effectiveness testing for juvenile American Shad and adult American Eel correctly lists the deadlines for the first round of effectiveness testing as Years 11 and 12.[92]

D. DEP Has Not Meet Its Burden To Show That Erosion Above Turners Falls Dam Will Move Water Quality From Impaired to Attainment

On September 25, 2024, CRC staff toured the Connecticut River from Turners Falls Dam to just upstream of the MA/NH/VT state line to collect evidence of the current state of erosion on the riverbanks. The attached Exhibit C[93] shows some highlighted photos that indicate extensive erosion along much of the Connecticut River, with frequent notching at the typical level of water fluctuations. The hypothesis that erosion is largely caused by high flow events does not seem logical based on observation of the banks. The full set of photos was submitted with this comment via a Sharepoint Folder from DEP. DEP had originally asked CRC to provide a report on which sites are new sites of erosion since 2014, and which sites are highlighted as priority sites for mitigation. CRC believes that a comprehensive review is needed in order to assess the

[85] Draft WQC at 35.
[86] Draft WQC at 36.
[87] Draft WQC at 35.
[88] Draft WQC at 36.
[89] Draft WQC at 76.
[90] Draft WQC at 76.
[91] *Compare* FirstLight 401 Application at 46–49 *with* Draft WQC at 76.
[92] Draft WQC at 76.
[93] Connecticut River Conservancy Photo Log: The Current State of Erosion as of Sept 25, 2024. Included as Exhibit C.

answers for what DEP is looking for. The comprehensive review of the erosion sites should be looked at as a part of Appendix F: Erosion Mitigation, Stabilization, and Monitoring Plan. CRC shares perspective with Franklin Regional Council of Governments' ("FRCOG") in this regard. CRC is in complete alignment with FRCOG on how DEP needs to take action to improve the state of erosion on the riverbanks. FRCOG's comments are included here as Exhibit E[94]. CRC fully incorporates FRCOG's comment by reference, acknowledging the valuable insights and recommendations provided by the organization's historical tracking of the issue.

Additionally, Exhibit D, the new expert report[95] on erosion impacts in TFI provided by CRC's hired erosion experts at Princeton Hydro further supports the argument that the FirstLight project operations cause severe erosion and must be addressed more strictly by the WQC.

E. DEP Has Not Adequately Taken Into Account Reasonably Foreseeable Impacts of Climate Change

Climate change impacts nearly every aspect of FirstLight's Projects from water quality and temperature to changed flows, shifting energy demands, and infrastructure viability, among other implications. However, the Draft WQC focuses discussion of climate change almost exclusively on implications for timing of seasonal migrations.[96] While agreeing that climate change has implications on fish passage seasonality, CRC notes that climate change also implicates flows, decommissioning funding, water quality, and the length of the license term among other aspects of this WQC. Because DEP discusses only fish passage timing in its "consideration of climate change" section, CRC mainly focuses on fish passage here and will note how and where climate change impacts other aspects of the water quality certification in the appropriate section.

In theory, CRC supports DEP's imposition of Special Condition No. 31, which requires FirstLight to comply with United States Fish and Wildlife Service's ("USFWS") annual schedules for opening and closing fish passage facilities, which DEP says "can account for climate-induced changes in migration timing for affected fish."[97] However, while there is no question USFWS schedules "can" account for climate-induced changes," the relevant question for DEP is will they? Reliance on the current administration's USFWS to account in any way for climate change given its early actions and policies that are antagonistic toward addressing climate change is an unreasonable and pollyannaish position for DEP to take. DEP cannot assume USFWS's schedules will take climate change into account and therefore must have an alternative condition to accomplish this result.

Additionally, CRC supports the imposition of Special Condition No. 26 requiring water quality monitoring to screen for "adverse impact [that] can develop over time, particularly from climate

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[94] FRCOG Comment on Water Quality Certification with Conditions Firstlight Hydroelectric Project FERC License Nos. 1889 (Turners Falls) and 2485 (Northfield Mountain) (Feb. 24, 2025). Included as Exhibit E.
[95] Princeton Hydro, LLC, Comment on Water Quality Certification with Conditions Firstlight Hydroelectric Project FERC License Nos. 1889 (Turners Falls) and 2485 (Northfield Mountain) (Feb. 24, 2025). Included as Exhibit D.
[96] *See* Draft WQC at 45.
[97] Draft WQC at 45, 81.

change."[98] CRC urges DEP to consider the broader implications of climate change on the region and on fish species in the Project area and to incorporate greater climate change mitigation and adaptation into the final WQC.

The bulk of DEP's discussion of climate change comes on page 45 of the Draft WQC and amounts to three scant paragraphs, mostly quoting NMFS's preliminary prescriptions.[99] DEP's consideration of climate change relies heavily NFMS's observation that "fine scale predictions on how climate change will impact [the Project] area are not available" leading to "significant uncertainty in the rate and timing of change" and difficulty in "predict[ing] the impact of these changes on any particular species."[100] While true that NMFS notes the lack of granular modeling in the Project area, NMFS also notes that there is general information available regarding clear models in the Northeastern United States and in the Connecticut River watershed.[101] In other contexts, NFMS has presumed that predictive models developed for nearby areas are a valid basis to project localized impacts.[102]

CRC offers three main comments regarding DEP's conclusions on climate change and timing of fish passage: (1) DEP does not fully address NMFS's preliminary prescription analysis, (2) DEP does not address that the preliminary prescription is designed with American shad and eels in mind, not shortnose sturgeon now known to be present throughout the Project area, and (3) DEP should incorporate climate change analysis from NMFS's Holyoke BiOp into this WQC.

First, DEP does not fully address NMFS's analysis. As a result, DEP does not address more general observations and principles applicable to the Project area. For instance, NFMS highlights that:

> [d]ams can exacerbate the effects of climate change by altering streamflow temperature via increased water residence times and decreased daily temperature fluctuations. When droughts occur, migratory fish experience both temperature and oxygen stress and become crowded with predators into small areas as habitat disappears. *Changes in magnitude and duration of future summer and fall low flows in the Northeast U.S. have been documented and intensified drought conditions are likely.*[103]

Greater density of fishes, reduced flow, reduced volume, and increased temperature can also lead to high fish mortality.[104] As such, despite difficulty in predicting the exact climate change impacts on the Project area and on particular species, NMFS concludes that "ensuring access to a diversity of suitable habitat, including climate resistant habitats, is essential for the continued

[98] Draft WQC at 42, 77–79. CRC endorses the acknowledgment that climate change will exacerbate adverse water quality impacts. However, CRC echoes FRCOG's comments regarding Special Condition No. 26. Namely, it is also unclear to CRC exactly how DEP arrived at these particular monitoring parameters.
[99] FERC Accession No. 20240521-5074
[100] Draft WQC at 45 (quoting NMFS Preliminary Prescription at 13).
[101] Draft WQC at 45 (quoting NMFS' Preliminary Prescription at 13).
[102] *See* Holyoke BiOp at 74.
[103] NMFS Comments and Preliminary Prescription on FFP at 13 (emphasis added) (internal citations omitted)
[104] NMFS Comments and Preliminary Prescription on FFP at 14.

survival and recovery potential of diadromous fish."[105] Flexibility in timing of fish passage is surely part of this goal, but DEP could ensure access to habitat, including increasing flows below the dam.

Second, NFMS's prescription is assessed in order to "provide American shad and American eel safe and timely access to climate resilient habitat upstream of the Project."[106] As such, this prescription, and DEP's reliance on it, is out-of-date as it does not consider the presence of shortnose sturgeon both above and below Turners Falls Dam or the strandings of shortnose sturgeon below the dam due to "natural or *unnatural* high flow events" followed by "naturally or *unnaturally*" decreased flows.[107] This mismatch between assessment and reality is particularly troubling given the need for ensuring access to habitat,[108] alongside likely intensifying droughts, changes in low flow periods and the lack of planned-for up- and downstream passage for shortnose sturgeon at Turners Falls. As discussed previously in this comment, DEP can and should mandate conditions that will ensure the protection and recover of shortnose sturgeon both below and above TFD.

Third, given the geographic proximity and overall similarity, CRC urges DEP to consider conclusions of the Holyoke BiOp. This BiOp provides more detail on the regional and Project area impacts of climate change and on general and Project area-specific likely impacts on shortnose sturgeon. As an initial matter, the Holyoke BiOp confronted similar modeling and data constraints as the current water quality standard certification: "While we can make some predictions on the likely effect of climate change on [shortnose and Atlantic sturgeon], without modeling and additional scientific data these predictions remain speculative."[109] Nonetheless, despite these limitations, the BiOp goes on to more fully consider climate change impacts.

The Holyoke BiOP makes four key observations regarding climate impact on the region generally that relate to the certification at issue here:

1. Change will occur within the term of the proposed FERC license. "Warming is very likely to continue in the U.S. over the next 25 to 50 years, regardless of reduction in GHGs, due to emissions that have already occurred. It is very likely that the magnitude and frequency of ecosystem changes will continue to increase in the next 25 to 50 years, and it is possible that the rate of change will accelerate."[110] Given that change will continue and potentially accelerate over the course of the license (whether a 30-year term as CRC advocates or a 50-year term as FirstLight wants), it is imperative that more robust conditions be imposed now.

2. Excessive water withdrawals and land development have already stressed many rivers and "this stress may be exacerbated by changes in climate" such that "anticipating and planning adaptive strategies may be critical."[111] Crucially,

[105] NMFS Comments and Preliminary Prescription on FFP at 14.
[106] NMFS Comments and Preliminary Prescription on FFP at 13.
[107] Draft WQC at 34 (emphasis added).
[108] NMFS Comments and Preliminary Prescription on FFP at 14.
[109] Holyoke BiOp at 76.
[110] Holyoke BiOp at 71.
[111] Holyoke BiOp at 71.

segments at issue here are listed as impaired by dewatering on Massachusetts's 303(d) list.[112] As such, water quality certification should put greater emphasis on developing critical adaptive strategies given the confluence of stressors on this waterway above and beyond timing of fish passage and barrier net installation.

3. "Because stresses on water quality are associated with many activities, the impacts of the existing stresses are likely to be exacerbated by climate change."[113]

4. Finally, analogous modeling suggests water temperature increases of "somewhere between 3–4 °C by 2100 and a pH drop of 0.3–0.4 units by 2100" based on predictive models for comparable and proximate waters.[114] "While we are not able to find predictive models for the Connecticut River, given the geographic proximity of these waters to the Northeast, we assume that predictions would be similar" and "assuming that these predictions also apply to the Project area (around Holyoke), one could anticipate similar conditions in the Project area over the same time period."[115]

Given the proximity of Holyoke to the Project area in question here, these same analogous data and assumption of applicability should apply. Rather than waiting to see how climate change impacts develop, DEP should proceed assuming the worst-case scenarios accepted in the Holyoke BiOp. Based on these climate observations, NMFS' Holyoke BiOp outlined potential impacts on shortnose sturgeon. Given the now-known presence of sturgeon above and below TFD, these species-specific concerns are especially pertinent to the current Project. While changing migration patterns is among those impacts discussed, it is far from the only impact considered.[116] Generally, the BiOp highlights the degree to which shortnose sturgeon are vulnerable to reduced flow, whether climate or human driven:

> Increased droughts (and water withdrawal for human use) predicted by some models in some areas may cause loss of habitat including loss of access to spawning habitat. If a river becomes too shallow or flows become intermittent, all shortnose sturgeon life stages, including adults, may become susceptible to strandings. Low flow and drought conditions are also expected to cause additional water quality issues.[117]

Given the proximity of shallow and low flow and spawning habitat below the Turners Falls, these concerns are particularly worrisome. Additionally, the BiOp notes that climate change in the region could impact distribution of forage species, which would have an indirect impact on sturgeon.[118] Finally, the BiOp notes that there is limited information on thermal tolerance of

[112] *See* Massachusetts' 303(d) list, MA34-03, 04 at 167-8.
[113] Holyoke BiOp at 71.
[114] Holyoke BiOp at 74.
[115] Holyoke BiOp at 74.
[116] Holyoke BiOp at 74–76.
[117] Holyoke BiOp at 74.
[118] Holyoke BiOp at 75.

shortnose sturgeon meaning that the anticipated 3 to 4 °C increase in water temperature could have significant consequences.[119]

Taken together, there is a much broader array of potential impacts for fish and fish passage beyond the timing of migrations. While recognizing that data and modeling limit the extent to which DEP can anticipate precise climate change impacts, CRC urges DEP to be less conservative in its analysis in order to proactively consider the climate change implications on fish passage, including impacts to shortnose sturgeon that have not been closely analyzed to date.

F. DEP's Canal Drawdown Process To Be Strengthened For Efficacy And Longevity

1. CRC Consultation Should Be Required In The Protection Plan

In special Condition 32. Turners Falls Canal Drawdown Aquatic Organism Protection, DEP requires that the Protection Plan be developed by the Licensee with consultation from USFWS, MassWildlife, and DEP. As the leading organization for river protection in the watershed, CRC's input should also be required in the development of the Plan. For years, CRC has led Canal Drawdown Rescues. CRC and USFWS have partnered on this effort and hold the expertise needed to create a Protection Plan that would be submitted to the Commission.

2. Canal Drawdown Team Should Include CRC And The Team Should Not Be Disbanded

In b) of Special Condition 32., DEP requires the creation of a temporary Canal Drawdown Team composed of USFWS, MassWildlife, and DEP and allows the Team to be disbanded after three years. The Canal Drawdown Team should also include CRC, as CRC has led the process and has developed needed expertise. The Canal Drawdown team should not be temporary, as the Licensee has not shown willingness nor expertise to carry out the Rescue in the canal drawdown process and without help from USFWS and CRC, and therefore would likely not be able to carry out the rescue effectively on their own accord. For the sake of protecting the aquatic organisms that FirstLight has normally let die year after year, it is imperative to have CRC and USFWS be involved in the rescue for the remainder of the license.

3. FirstLight Should Be Required To Participate In and Fund the Canal Drawdown Rescue

The Licensee should be required to provide staff to complete the rescue and also offer financial compensation to the experts from USFWS and CRC for running the Canal Drawdown Rescue.

4. Information Collected From Canal Drawdown Should Be Publicly Shared

CRC recommends that DEP make it mandatory for FirstLight to share the results of the surveys publicly, which will allow the next license to be informed by data collected starting now.

[119] Holyoke BiOp at 75–76.

G. DEP Inexplicably Fails To Address Decommissioning Funding As A Condition Of The WQC

CRC has consistently held the position that DEP, as the state agency responsible for water quality and water quality certification under CWA § 401, has the authority to require financial assurances as a condition of FirstLight's WQC. CRC provided DEP with a Legal Memo on December 23, 2021 and sent a letter to Secretary Card on June 13, 2022 outlining DEP's legal authority to require financial assurances. CRC incorporated these two documents by reference into its June 3, 2024 comment on FirstLight's 401 certification application.

Nonetheless, the DEP's Draft WQC is silent on decommissioning funding. Given DEP has had more than four years to assess CRC's request and comments on decommissioning funding, such silence is unacceptable. Even if DEP does not agree with CRC's reasoning, DEP is under an obligation to consider it as it must consider all reasonably supported comments and explain why it is not requiring financial assurances for when the Project is decommissioned in the future. Once again, CRC sets out the basis for DEP's authority to require decommissioning funding and the public benefit of doing so.

There is ample support in Massachusetts' WQS, 314 CMR 4.00, *et. seq.*, for the goal of restoring rivers to their original conditions, which necessarily includes decommissioning and removing a hydropower facility at the end of its useful life. Given this clear and direct nexus to water quality, a condition in a state's CWA § 401 certification requiring hydropower facilities provide financial assurances sufficient to decommission and remove a non-operating hydropower project falls squarely within the scope of CWA § 401(d).

We set forth the specific Massachusetts WQS supporting such a condition below:

314 CMR 4.01: Massachusetts WQS impose a "duty and responsibility" upon DEP to "protect the public health and enhance the quality and value of the water resources of the Commonwealth" and "direct[] the Department to take all action necessary or appropriate to secure the Commonwealth the benefits of the Clean Water Act."[120] In turn, the Purpose provision of the WQS explicitly incorporates the primary objective of the CWA, which is "the *restoration* and maintenance of the chemical, physical, and biological integrity of the Nation's waters."[121] The plain meaning of "integrity" is the state of being whole and undivided." Dams, whether operational or not, divide rivers and disrupt their chemical (by, for example, altering the pH of the river), physical (by, for example, unnaturally altering flow through a river segment), and biological integrity (by, for example, preventing fish migration). Decommissioning and removal financial assurances directly relate to the "restoration" prong, a value that is emphasized expressly in the state regulations, including those specific to dams as discussed further below. Moreover, the plain meaning of enhance—"to increase or improve in value, quality, desirability, or attractiveness"[122]—is forward-looking in that it reflects a positive change from a current

[120] 314 CMR 4.01(3).
[121] 314 CMR 4.01(3) (emphasis added).
[122] *Enhance*, Merriamwebster.com, https://www.merriam-webster.com/dictionary/enhance#:~:text=1,%2C%20quality%2C%20desirability%2C%20or%20attractiveness (last visited Feb. 23, 2025).

condition to a better future one. Therefore, future planning through decommissioning fits squarely within the forward-looking mandate of "enhance[ing] the quality … of water resources of the Commonwealth."[123] Thus, conditioning this WQC on FirstLight providing adequate financial assurances for decommissioning and removal falls squarely within the very purpose of Massachusetts WQS and the cooperative federalism that the Clean Water Act envisions.

314 CMR 4.03(3): The Hydrologic Conditions provision of Massachusetts' WQS directly addresses state waters containing dams and other hydropower facilities, and sets forth a clear mandate: "When the Department issues a 401 Water Quality Certification of an activity subject to licensing by the Federal Energy Regulatory Commission, flows shall be maintained or *restored* to protect existing and designated uses."[124] This is perhaps the most applicable WQS provision as it deals directly with FERC-licensed dams and CWA § 401 certifications, and specifically contemplates *restoration* of flows, which would occur if a dam or other hydropower facility were decommissioned and removed. Thus, this provision supports requiring financial assurances that would plan for and thereby enable such restoration.

314 CMR 4.03(4): Massachusetts WQS must balance competing public interest goals when it comes to *operating* hydropower facilities. In cases where dams preclude the attainment of a designated use, DEP may remove that use, after a Use Attainability Analysis, so long as "it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use."[125] This provision provides support for requiring financial assurances in two ways. First, it explicitly contemplates restoring a river to "its original [undammed] condition," which is precisely what funding decommissioning and removal would accomplish.[126] Second, it highlights a negative, and perhaps unintended, consequence of *not* requiring financial assurances. Once a dam is no longer operating and therefore no longer making money, it may make it easier for the facility owner/operator to argue that it is not "feasible" to restore the waterbody to its original condition thus paving the way for the removal of whatever use cannot be obtained while the dam exists. In other words, failing to provide financial assurance allows owners / operators to externalize the costs of operation by passing those costs on to future generations. On the other hand, if financial assurances for decommissioning and removal are required as part of the WQC, it negates a non-feasibility argument from the facility owner/operator.

314 CMR 4.05 (Designated Uses): Massachusetts WQS designate the most sensitive uses "for which the various waters of the Commonwealth shall be enhanced, maintained and protected."[127] The stretch of the Connecticut River adjacent to the TFD and the NFM is listed as Class B waters, which are designated "as habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation."[128] It is indisputable that the TFD and NFM have negative impacts—including flow impairment, temperature increases, impingement and entrainment, and habitat

[123] 314 CMR 4.01(3).
[124] 314 CMR 4.03(3)(b) (emphasis added).
[125] 314 CMR 4.03(4)(d).
[126] 314 CMR 4.03(4)(a)(4).
[127] 314 CMR 4.01(3).
[128] 314 CMR 4.05(3)(b).

alteration and erosion, among others—on these designated uses. Once the facilities are no longer operational, their presence in the river will *per se* violate WQS. Further, given that the FERC licenses last for decades, there is tremendous uncertainty regarding what the existing and designated uses of that portion of the Connecticut River will be when the licenses expire. For example, will there be additional species listed as threatened or endangered under the ESA or MESA in that portion of the river that are negatively impacted by the presence of the non-operational hydropower facilities? Indeed, after CRC initially commented on the FirstLight's 401 application, CRC scientists found new eDNA evidence of federal and state-listed endangered shortnose sturgeon above TFD. Requiring financial assurances sufficient to decommission and remove such facilities—especially given the uncertainty of river conditions when the licenses expire—has a direct nexus to and clearly supports DEP's mandatory duty set forth in the WQS to protect and enhance designated uses.

314 CMR 4.05(5): In addition to the specific water quality criteria associated with Class B waters to protect and enhance those designated uses, all surface waters in Massachusetts shall be free from "from alterations that adversely affect the physical or chemical nature of the bottom, interfere with the propagation of fish or shellfish, or adversely affect populations of non-mobile or sessile benthic organisms."[129] Non-operational dams constitute such alterations, and, as such, requiring financial assurances for their decommissioning and removal is supported by this WQS as well.

THE PUBLIC TRUST DOCTRINE SUPPORTS REQUIRING FINANCIAL ASSURANCES FOR DECOMMISSIONING AND REMOVAL COSTS

The public trust doctrine, codified in both the Massachusetts Constitution, as well as the General Laws, provides another basis of support to require financial assurances for decommissioning and removal of hydropower facilities.[130] Using trust-like language, DEP is charged with the "effective planning and management of water use and conservation in the commonwealth" to "ensure an adequate volume and quality of water for all citizens of the commonwealth, both present and future."[131] DEP, through its regulations, defines "trust lands" as "present and former waterways in which the fee simple, any easement, or other proprietary interest is held by the Commonwealth in trust for the benefit of the public."[132] These statutes and regulations are evidence of the Commonwealth of Massachusetts adopting the public trust doctrine into State law, which brings it within the purview of CWA 33 U.S.C. § 1341(d).

The Connecticut River is one of the few geographic areas explicitly listed as "trust lands" in state regulations.[133] Accordingly, Massachusetts can require financial assurances pursuant to its public trust obligations for the Connecticut River, which have been codified in state law. Arguably, *not* requiring such financial assurance would constitute a breach of Massachusetts' duty to protect an identified trust resource. This is especially the case when a hydropower facility

[129] 314 CMR 4.05(5)(b).
[130] *See* Mass. Const. art. XLIX, as amended by art. XCVII; *see also* Mass. Gen. Laws Ann. ch.. 91 § 2 (2016).
[131] Mass. Gen. Laws Ann. ch. 21G, § 3 (2024).
[132] 310 CMR § 9.02.
[133] *See* 310 CMR § 9.04(1)(b).

is no longer operational. At that point, there is no countervailing public benefit—electricity generation—to offset the ongoing impairment of the trust resource.

SOUND PUBLIC POLICY DEMANDS MASSACHUSETTS EXERCISE ITS LEGAL AUTHORITY TO REQUIRE FINANCIAL ASSURANCE

Hydropower facilities, like other large-scale infrastructure, require significant financial expenditures to decommission safely. Indeed, perhaps for that reason, requiring decommissioning funding for large infrastructure projects is not a novel concept. Industrial solar facilities, wind turbines, nuclear power plants, and landfills all pose environmental and public health risks to the communities where they are sited once their useful operational life is over. Accordingly, the facility owners are typically required to provide financial assurance, either at the federal, state or local level—often in the form of a surety bond or proof of a decommissioning fund—in order to build and/or continue operating such facilities. Requirements for such funds are good public policy to prevent host communities and/or taxpayers from bearing the financial burden if the owner/operator does not adequately plan for decommissioning.

Like other large energy and infrastructure projects, hydropower facilities, both large and small, are expensive to decommission. Additionally, such facilities pose similar environmental and public health risks and impacts when they are no longer operating as they did while in operation (e.g., ongoing adverse impacts to habitat, obstruction of fish passage, dangers of breaching and flooding risks). Moreover, hydropower facilities pose their own unique risks, that only accentuate the need for decommissioning funding, including (1) a clear trend — nationally and globally —toward removing old dams and restoring natural river flows; (2) direct impact on a public trust resource; and (3) lengthy federal licenses for dams that can last up to 50 years, meaning some of the dams being relicensed today will be nearly a century old (and some far older since they existed before their original FERC licenses) when their new license expires.

Unwillingness of the lead federal agency involved with dam relicensing to exercise their authority further underscores the importance of Massachusetts doing so. While FERC could condition its licenses with financial assurances for decommissioning and removal,[134] CRC is unaware of FERC ever exercising this authority. Thus, it is incumbent upon Massachusetts to exercise its authority under CWA § 401(d) and WQS to require such assurances. Such a proactive approach to financing dam removal would be consistent with Massachusetts' efforts to remove derelict dams throughout the state.

Financial assurances also would be consistent with the positions of several federal resource agencies. For example, the U.S. Fish and Wildlife Service recently told FERC it supported financial assurances for decommissioning funds, stating:

> The Service also recommends that financial assurances address decommissioning costs, including the removal of project infrastructure and the restoration of habitat when a licensee or exemptee surrenders its license or otherwise voluntarily abandons a project. This would ensure projects that are abandoned do not pose a

[134] *See* 60 Fed. Reg. 339, 340 (Jan. 4, 1995).

> risk to the environment and would reduce the risk that taxpayers and ratepayers would have to pay to remove project infrastructure and restore habitat if a project is abandoned.[135]

The U.S. Fish and Wildlife Service clearly articulates the risk of *not* conditioning CWA § 401 certification on financial assurances for decommissioning and removal: local communities, taxpayers and ratepayers will be stuck with an enormous bill for removing obsolete, un-economical and un-safe dams and restoring river habitat.

Finally, decommissioning funding allows flexibility and prevents hydropower facilities such as TFD and NFM from becoming locked-in. Climate change and shifting energy demands inject significant uncertainty into long-term viability of hydroelectric project that underlines the importance of avoiding long-term lock-in. Absent decommissioning funds, by the time these facilities are un-economical, un-safe, or otherwise obsolete, removing them may be financially un-feasible. In other words, by issuing a WQC without decommissioning financial assurances, DEP makes it more likely that the facility will remain in place after the project no longer produces energy. Requiring financial assurance would allow much greater flexibility to respond to changing energy, climate, environmental, and economic needs in the future. Relatedly, one core benefit of periodic relicensing is to allow responsiveness to changing circumstances; the fact that decommissioning funding has not be commonplace in past hydro licenses is irrelevant to whether decommissioning funding should be adopted going forward.

Accordingly, because it is good public policy as evidenced by the similar requirements imposed on other energy-generating and/or potentially hazardous facilities, because of the unique factors involved with hydropower facilities, and because federal agencies have not exercised their authority to require decommissioning funding, Massachusetts must exercise its authority to require financial assurances for their decommissioning and removal.

H. DEP Should Require More Data Availability And Participation Opportunities For The Public

1. All information the Licensee is required to collect for their records or to send to DEP throughout the remainder of the license term should be accessible to the public. For example, Canal Drawdown Results, Erosion Monitoring results, Water Quality Monitoring, etc.

2. Over the course of the license, there should also be significant opportunity and requirement for public involvement. Citizens who live and recreate in this region should be firsthand involved throughout the course of the entire license, including the process of monitoring erosion. Local groups such as CRC, FRCOG, Town Commissions, and the Nolumbeka Project should all be able to weigh in on the

[135] *See* CRC's June 13, 2022 Letter to Secretary Card, Ex. 4 at 3 (citing U.S. Fish and Wildlife Service Comments on the Federal Energy Regulatory Commission's Notice of Inquiry on Financial Assurance Measures for Hydropower Projects, Docket RM21-9-000, at pdf page 4 (March 26, 2021).

current state of erosion in the impoundment and on how to prevent the erosion from worsening.

Further, CRC stands in agreement with the local delegation of Jo Comerford, Natalie Blais, and Mindy Domb in what they are requesting for more public access to and participation in the new license.

I. DEP Must Consider State Climate Legislation's Impact on Northfield Mountain Pumped Storage Project

An Act promoting a clean energy grid, advancing equity, and protecting ratepayers was signed into law by Governor Healey in November 2024. This legislation defined all storage facilities as clean energy facilities. The law mandates procurements by Massachusetts local electric distribution companies of long-term contracts for 5000 megawatts ("MW") of energy storage in MA by 2030, and states that existing facilities shall be eligible. This means that the large-scale existing storage facility of NFM will be eligible for procurements, and because its facilities are already built, and because other utility-scale storage is still very limited, NFM may well be able to underbid other proposals and secure a large procurement for up to its full capacity of 1167 MW.

If so, FirstLight will reap enormous financial benefit from the procurements. Based on cost estimates of similar storage procurements in New York state, a procurement for almost 1200 MW could be worth almost $480 million over the course of a 15-year contract. Depending on how the procurements are implemented, they could also incentivize NFM to pump and generate at times when it would not be profitable to do so based on the ISO-NE markets alone. This, especially in combination with larger upper-reservoir storage, means more water fluctuations of longer duration and more often. This would result in larger river height fluctuations and all the negative impacts on the river associated with that, such as erosion.

It is necessary for DEP to take this new law into consideration when thinking about granting a new license that will define how NFM can operate for the next 30-50 years.

J. DEP Should Use Its Authority To Require A 30-year License Term

The Federal Power Act allows for federal dam licenses to range between 30- and 50-year terms.[136] FirstLight seeks relicensing for 50 years at which point the facilities involved would be over a century old. Instead, CRC urges Massachusetts to use its authority under § 401 to impose a term of 30 years.

Against the backdrop of climate change, likelihood of increased drought and reduced flows, and shifting energy demands, a lengthy, 50-year term deprives DEP, and Massachusetts citizens more generally, from flexibility in protecting and enhancing state water quality. Climate change, as discussed above, creates considerable uncertainty and will very likely result in temperature

[136] 16 U.S.C. § 808(e) ("any license issued … under this section shall be for a term which the [Commission] determines to be in the public interest but not less than 30 years, nor more than 50 years[.]").

and flow alterations over the course of the next 25 to 50 years.[137] These changes in temperature and flow can impair designated uses of this stretch of the Connecticut River including use as habitat for fish, other aquatic life, and wildlife, primary and secondary contact recreation, and good aesthetic value.[138] Dams only exacerbate these climate-driven concerns.[139] A license that lasts for 50 years would mean that as conditions change, water quality deteriorates, and designated uses are harmed, DEP will be hamstrung and unable to adequately respond. Shortening the term of the license to 30 years complies with the FPA while also allowing DEP to reconsider whether additional conditions are necessary to protect and enhance water quality on a more reasonable timeline.

Additionally, federal, state, and local energy policy is likely to change in that time. As a result, FirstLight's Projects ongoing economic viability is far from certain over the next 50 years. Allowing a longer license increases the risk that the Projects will be obsolete by the licenses' end. This in turn increases the risk that the facilities will remain in place and/or the costs of removal will be borne by the public after FirstLight has wrung all the profit they could from the Projects, especially if DEP does not require decommissioning financial assurances.

Furthermore, it is true that this relicensing process has been going on for 13 years now and is not over. Granting a 50-year license really could mean a 65-year license.

It is shortsighted to permit a license of 50 years when it is clear that conditions on the ground are likely to substantially change within that time frame, and when the law allows a shorter term. Indeed, the very purpose of periodic licensing is to allow agencies to adapt to changing realities, whether climate driven or not. As such, Massachusetts should use its § 401 authority to set the term of FirstLight's license to a 30-year term.

[137] Holyoke BiOp at 71.
[138] *See* 314 CMR §4.06.
[139] NMFS Comments and Preliminary Prescription on FFP at 13.

IV. Conclusion

Under the current conditions, DEP should deny the WQC as the FirstLight Projects do not meet WQS. With the changes included here, DEP could impose additional conditions that balance the needs of FirstLight while still upholding necessary and required environmental protections.

The above comments outline ways in which DEP must improve the WQC in order to meet Massachusetts WQS. CRC urges DEP to closely consider these comments as it makes its final determination, so that the WQC meets applicable standards under federal and state law.

CRC appreciates the opportunity to comment during the WQC process. Please feel free to contact me, Nina Gordon-Kirsch, Massachusetts River Steward and the Connecticut River Conservancy, at ngordonkirsch@ctriver.org, or contact Rebecca Todd, Executive Director of the Connecticut River Conservancy, at rtodd@ctriver.org.

Thank you,

2/24/25

Nina Gordon-Kirsch

Massachusetts River Steward

Connecticut River Conservancy

2/24/25

Rebecca Todd

Executive Director

Connecticut River Conservancy

2/24/25

Andrew Fisk

Northeast Regional Director

American Rivers

Connecticut River Conservancy Comment Exhibit List*

Exhibit A	Affidavit of Michael Lew-Smith (Feb 24, 2025)
Exhibit B	Affidavit of Boyd Kynard (Feb 24, 2025)
Exhibit C	Connecticut River Conservancy Photo Log: The Current State of Erosion as of Sept 25, 2024
Exhibit D	Princeton Hydro, LLC, Comment on Water Quality Certification with Conditions Firstlight Hydroelectric Project FERC License Nos. 1889 (Turners Falls) and 2485 (Northfield Mountain) (Feb. 24, 2025).
Exhibit E	FRCOG Comment on Water Quality Certification with Conditions Firstlight Hydroelectric Project FERC License Nos. 1889 (Turners Falls) and 2485 (Northfield Mountain) (Feb. 24, 2025).

* These exhibits are attached to this comment document for reference. The complete set of photos from Exhibit C was too large to attach in an email and will be submitted to DEP via the Sharepoint folder that Elizabeth Stefanik sent to Nina Gordon-Kirsch on 2/20/25.

EXHIBIT A

AFFADAVIT OF MICHAEL LEW-SMITH
ON BEHALF OF THE CONNECTICUT RIVER CONSERVENANCY

1. My name is Michael Lew-Smith. I am an ecologist and principal botanist for Arrowwood Environmental, an ecological services and consulting firm located at 950 Bert White Road, Huntington, Vermont. I have a Bachelor of Science from the University of Michigan School of Natural Resources and a Master of Science from the University of Minnesota, Department of Plant Biology. I have worked throughout New England on natural resource identification, assessment, and management projects. This work includes considerable experience inventorying aquatic invasive species and rare aquatic plant species. For instance, I have worked closely with lake associations on vegetation management plans and throughout Lake Champlain mapping and controlling aquatic invasive species. I am also currently working on an aquatic natural community classification system.
2. The purpose of my affidavit is to explain the classification of two plants — Tradescant's aster and tufted hairgrass — as wetland plants and to explain the Connecticut River Conservancy's ("CRC") comments regarding those plants.
3. To provide this affidavit testament, I reviewed the Draft Water Quality Certification ("DraftWQS") and am familiar with its contents. I also reviewed scientific literature regarding the classification of these plants. A complete list of this literature is cited at the end of this affidavit.
4. Based upon my review, I conclude that Tradescant's aster and tufted hairgrass could be considered wetland plants, as distinct from aquatic plants.
5. While there is no national system which categorizes aquatic plants, there is a large body of scientific literature which distinguishes aquatic plants from non-aquatic plants. In his classic treatise on aquatic plants, Sculthorpe states that aquatic plants "live and reproduce in partly or wholly submerged state" (Sculthorpe 1967). More recent researchers have defined aquatic plants as "… photosynthetic organisms … that actively grow permanently or periodically submerged below, floating on, or growing up through the water surface." (Chambers et al. 2007) or plants "whose life cycle takes place completely or periodically in the aquatic environment." (Lesiv, Polishchuk, and Antonyak 2020).
6. In order to survive in aquatic environments, there are a wide range of adaptive mechanisms that aquatic plants have evolved, including specialized tissues for internal gas exchange to survive in anoxic environments, reduced or absent cuticles to facilitate gas and nutrient exchange, and adaptive morphology such as highly dissected leaves (Sculthorpe 1967).
7. It is also important to make a distinction between wetland plants and aquatic plants. According to the National Wetlands Inventory ("NWI") classification, both Tradescant's aster and tufted hairgrass are considered facultative wetland plants ("FACW"). FACW plants usually occur in wetlands, but may occur in non-wetlands. Due to the wide ecological amplitude of both of these species, they are also very commonly found in non-wetland habitats.

8. For the purposes of determining how often a species occurs in wetlands, wetlands are defined "as … those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." 33 C.F.R. § 328.3
9. Using the above definitions and NWI classification as a guidance, both Tradescant's aster and tufted hairgrass could be considered wetland plants. However, neither Tradescants' aster nor tufted hairgrass are known to survive in truly aquatic environments. A review of the herbarium records of each of these species in Massachusetts fails to find any occurrences documented in aquatic habitats. In addition, neither of these species is known to possess any specific adaptive features that indicate they have evolved to survive in an aquatic environment.
10. The habitats that the aster and hairgrass occupy in the bypass area have been defined by MassWildlife as "river-scoured bedrock, cobble and gravel shores" and state that the plants are "rooting in very limited soil (i.e. rock crevices/cracks)." The habitat that the plants currently occupy in the bypass area can therefore not be considered an aquatic habitat. While it may experience flooding for brief periods outside of the growing season, environmental conditions during most of the growing season are clearly not aquatic.
11. In their assessment of the available habitat at the site for both the aster and hairgrass, MassWildlife has stated that the "vertical lower extent of habitat is limited by persistent inundation" (Draft WQS, p21). However, as noted above, being able to survive persistent inundation is what defines an "aquatic" plant. While elsewhere MassWildlife has stated that these species are "unquestionably classified as aquatic/wetland species" they are here admitting that neither plant can actually survive in aquatic habitats.
12. Finally, Hickler, *et al.*, conducted a botanical inventory of aquatic plant species of this stretch of the Connecticut River (Hickler et al. 2018). This survey documented all of the "truly aquatic taxa, which rarely stray beyond the permanently flooded reaches of the river." Neither Tradescant's aster nor tufted hairgrass are included in that list. While their presence is well known to local botanists, they were not included in the list because they were not considered aquatic flora.
13. I declare under penalty of perjury that the foregoing is true and correct.

Executed this 24th day of February 2025, in Hardwick, Vermont.

Michael Lew-Smith

Works Cited

Chambers, P. A., P. Lacoul, K. J. Murphy, and S. M. Thomaz. 2007. "Global Diversity of Aquatic Macrophytes in Freshwater." *Freshwater Animal Diversity Assessment*, April, 9–26. https://doi.org/10.1007/978-1-4020-8259-7_2.

Hickler, Matthew G., Robert I. Bertin, Glenn Motzkin, and Karen B. Searcy. 2018. "Notable Aquatic Plants from the Connecticut River in Franklin County, Massachusetts." *Rhodora* 120 (981): 76–86. https://doi.org/10.3119/17-14.

Lesiv, M S, A I Polishchuk, and H L Antonyak. 2020. "Aquatic macrophytes: ecological features and functions." https://doi.org/10.30970/sbi.1402.619.

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MICHAEL LEW-SMITH

PARTNER – ECOLOGIST – BOTANIST

ARROWWOOD ENVIRONMENTAL

Areas of Expertise

- Rare, Threatened and Endangered Plant Inventories
- Aquatic Plant Inventories
- Wetland Delineation
- Natural Community Mapping and Assessment
- Freshwater Mussel Inventories
- Vernal Pool Mapping and Assessment
- Invasive Species Mapping and Management
- Herpetological Studies
- Rare Plant Transplantation and Monitoring

Education & Professional Training

- M.S., University of Minnesota Department of Plant Biology, 1997
- B.S., University of Michigan School of Natural Resources. Natural Resource Management, 1991
- Freshwater Mussel Identification and Ecology, USFWS Training Center, Shepardstown, WV, 2016
- Reptiles and Amphibians of Vermont, Hogback Community College Vt. Family Forests. Bristol VT, 2011
- Boreal Flora, University of Michigan Biological Station, 1995
- Bryophytes, University of Michigan Biological Station, 1995

Mr. Lew-Smith is an ecologist and principal botanist for Arrowwood Environmental. He has worked closely with conservation organizations, agencies, municipalities, companies, and private individuals on natural resource identification, assessment and management. Mr. Lew-Smith conducts botanical inventories, wetland delineations, wildlife habitat assessments, and ecological restorations. He also has considerable experience mapping and assessing natural communities for private organizations and public land managers and is currently working on an aquatic natural community classification system. Mr. Lew-Smith regularly conducts inventories of aquatic invasive species and rare aquatic plants and works closely with lake associations on aquatic vegetation management plans. Mr. Lew-Smith has also worked throughout Lake Champlain mapping and controlling aquatic invasive species. He is one of the founders of the Vermont Vernal Pool Mapping project, which mapped and assessed vernal pools statewide.

Significant Projects & Experience

- Aquatic Species Mapping and Assessment: Map native and non-native aquatic plants in lakes throughout Vermont and develop plans for the management of aquatic nuisance species.
- Freshwater mussel inventories: Conduct inventories for freshwater mussels throughout Vermont.
- Northern Pass: Project Manager and ecologist working for the NH Attorney General's office on providing an independent review of the environmental assessment of the proposed Northern Pass transmission line.
- Wetland Reclassification: Provide technical support and detailed analysis to support Class I reclassification petition for the LaPlatte River Marsh Wetlands.
- Renewable Energy: Project manager and principal ecologist working with project sponsors and engineers of small and large scale solar projects to design layouts that avoid and protect significant natural resources.
- Member of the Floral Advisory Group: Advising the Vermont Endangered Species Committee on matters related to Vermont's Rare, Threatened and Endangered Plants.
- Vernal Pool Mapping: Co-founder of the Vermont Vernal Pool Mapping Project. Developed a vernal pool mapping methodology and a statewide Vernal Pool map and database.

Exhibit B

AFFADAVIT OF BOYD KYNARD
ON BEHALF OF THE CONNECTICUT RIVER CONSERVENANCY

1. My name is Boyd Kynard. I am a migratory fish behaviorist who consults on conservation, research and fish passage for migratory fish. I have dedicated most of my life to studying sturgeon and have published nearly 200 scientific articles on sturgeons and other fishes. In 2012, I published a book on Shortnose sturgeon (*Acipensor brevirostrum*) entitled *Life history and behaviour of Connecticut River shortnose and other sturgeons.* I earned a PhD from the University of Washington, College of Fisheries in 1971. Between 1989 and 2007, I worked for the United States Geological Survey as a research fish biologist. I was a section lead of fish behavior and conducted research on life history of migratory fish and fish passage in the United States, Brazil, China, and Romania. I have also taught courses at the University of Arizona and at the University of Massachusetts–Amherst, including Biology and management of anadromous fish and ecological genetics of fish. In 2008, I formed a private company, BK-Riverfish, LLC, with my son. The business specializes in developing fish ladders for sturgeon and non-salmonid riverine fish. My curriculum vitae is attached as Exhibit 1 to this Affidavit.
2. The purpose of my affidavit is to explain the Connecticut River Conservancy's ("CRC") comments regarding the potential impacts of Massachusetts Department of Environmental Protection's ("MassDEP") draft water quality certification ("401 certification") on Shortnose sturgeon in the project area.
3. To provide this affidavit testimony, I reviewed the draft 401 certification. I am also familiar with the Turners Falls Dam and Turners Falls Impoundment. I have researched Connecticut River Shortnose sturgeon extensively and have published widely on the topic, including my 2012 book, *Life history and behaviour of Connecticut River shortnose sturgeon and other sturgeons*.
4. Based upon my review, I conclude that proposed flows below the dam could result in strandings that can injure or, potentially, kill Shortnose sturgeon. Additionally, fish passage should account for upstream and downstream migration of Shortnose sturgeon, including those Shortnose sturgeon now known to live above the Turners Falls Dam.
5. Along with my co-researchers, I studied Connecticut River Shortnose sturgeon for a 15-year period between 1990 and 2005 to evaluate the effects of Holyoke Dam on migrations and population structure. The results of those studies are published in *Life history and behaviour of Connecticut River shortnose sturgeon and other sturgeons.* My co-researchers and I concluded that the Holyoke Dam impacts Shortnose sturgeon population structure by limiting the number of spawning adults to only a few upstream adults (i.e., those adults living above the Holyoke Dam), decreasing the production of young sturgeons, and reducing abundance by killing downstream migrants. Based on that research and my understanding of the the Turners Falls Dam and the associated power station, Cabot Station, I believe that these same impacts apply to the Turners Falls Dam and, thus, would likewise impede the restoration of the segment of Shortnose sturgeon upstream of Turners Falls Dam.

LOW SUMMERTIME FLOW PUNCTUATED BY PERIODS OF HIGH FLOW COULD CAUSE SHORTNOSE STURGEON TO BE STRANDED BELOW THE TURNERS FALLS DAM; STRANDINGS COULD HARM STURGEON.

6. It is my understanding, based on my review of CRC's comments, that two adult Shortnose sturgeon were stranded below the Turners Falls Dam in separate instances this past summer (summer of 2024).
7. High flows during the summer, when my co-researchers and I have tracked rare adult Shortnose sturgeon in the bypass reach, would attract and facilitate upstream movements of exploring adults.
8. Based on my understanding of Shortnose sturgeon, I would conclude that Shortnose sturgeon venturing upstream to Turners Falls Dam, as the two stranded this summer did, would be helped by more water being released in the July–November timeframe because it would create more escape routes for Shortnose sturgeon to swim back downstream. Adults are in small wintering areas in September – March.
9. Given the rocky nature of the substrate below Turners Falls Dam, there is potential for Shortnose sturgeon stranded in that area to injure themselves scraping against the rocks, especially during periods of lower flow.
10. Based on observations of hundreds of adults contacting rocks during migration at Holyoke, it can be certain that the two rows of ventral scutes of adults stranded in the bypass reach would be similarly damaged by scraping against rocks. Bloody wounds can result from this scraping and can lead to infection and possibility death, though I cannot verify a Shortnose sturgeon mortality from this cause. To protect adult Shortnose sturgeon attracted into the bypass reach during periods of high flows or unnatural spillage through the bascule gate from stranding and injury, flows through the bascule gate should be reduced slowly overnight for a one-night period. This will enable adult Shortnose sturgeon to escape from potential stranding prompted by high flow in the dark when Shortnose sturgeon will most prefer to use shallow water. There must be escape channels to the main channel available to them.

FISH PASSAGE MUST ACCOUNT FOR THE UP- AND DOWNSTREAM MIGRATION OF SHORTNOSE STURGEON AT THE TURNERS FALL DAM

11. Now that there is eDNA evidence of Shortnose sturgeon above Turners Falls Dam, conditions must be put in place to protect Shortnose sturgeon from the operations at Northfield Mountain Pump Station and during downstream passage, including protection at Turners Falls Dam. Telemetry research in the 2012 sturgeon book demonstrates that some adult Shortnose sturgeon will migrate downstream annually and some juveniles will do similarly. These sturgeons would be migrating downstream past Holyoke Dam, but the population segment upstream of Turners Falls Dam will behave similarly and need protection. Shortnose sturgeon migrations are genetically coded and have been going on for millions of years and any examination of Shortnose sturgeon population segments in one river have found they are identical genetically. Therefore, age-0 juveniles upstream of Turners Fall Dam will undertake downstream migrations similar to age-0 juveniles spawned at Rock Dam when those upstream age-0 juveniles reach their migration time. My research also shows that many adults migrated downstream from the Rock Dam after

spawning; thus, the same migration by some adults upstream of Turners Falls Dam should occur. Additionally, although we did not study migrations of older juveniles at Holyoke, we know from telemetry data that older juveniles (age 2-4 years old) also migrate up- and downstream all summer. Thus, juveniles and adult sturgeons are migrating downstream May – August. Our research in the 2012 sturgeon book also shows that adult (and likely juvenile) migrations take months. Mortality of adults at Holyoke Dam was 44.9% or higher. Juvenile mortality is unknown, but would be less.

12. Likewise, the design of the fish lift at Turners Fall Dam must take Shortnose sturgeon passage into account. If the fishway entrance is accessible to adult sturgeons, Shortnose sturgeon may still pass upstream via the new lift. Experience at the Holyoke lift shows that, even when fish lifts are not designed for Shortnose sturgeon, some, but very few, Shortnose sturgeon still pass upstream. Once modifications to the fish lift were made at Holyoke around 2016, the numbers of sturgeons documented in the fish lift increased dramatically; specifically, the National Marine Fisheries Service December 4, 2019 Holyoke Biological Opinion shows the number of sturgeons documented in the fish lift increased from 3.8 sturgeons per year from 1975 to 2015, to 85 per year from 2016-2018. Based on the few adults we tracked in the bypass reach downstream of the Turners Falls Dam, the data predict that few adults will use the lift at Turners Falls at this time. Nonetheless, adult Shortnose sturgeon will use the bypass reach into the summer, so if the fish lift operates into July for passing American shad, the lift might attract non-spawning Shortnose sturgeon in June and July. Presently, 27 years of telemetry have shown that adult Shortnose sturgeon do not swim far up the bypass reach in April or May when spawning occurs because females are at the Rock Dam at this time and males are attracted to the females' pheromones. Spawning typically ends around mid-May. In the future, that could change if there is successful downstream migration from the sturgeon population segment upstream of Turners Falls Dam, because there will be prespawning adults returning to the bypass reach that were imprinted to the spawning site upstream of Turners Falls Dam. It is important that the fish lift at Turners Falls Dam is designed to pass sturgeon.
13. We do not yet understand the biological significance of the small population of Shortnose sturgeon upstream of the Turners Falls Dam. We will never know if this upstream group is a natural upstream segment of the larger downstream population or if it is a group of dislocated individuals that began to spawn together. However, genetically they are the same as the downstream segment. Thus, if lower river adults are passed upstream and juveniles and adults migrating downstream are protected, the two groups / population segments can be joined. Such a joining would not genetically or otherwise disadvantage the lower river population segment, but it should increase the Darwinian fitness of the entire population for long-term survival.
14. Based on my understanding of the Northfield Mountain operations and of Shortnose sturgeon behavior, there may be detrimental impacts on Shortnose sturgeon from Northfield operations. Shortnose sturgeon on downstream migrations remain in the dominant river flow (usually in the channel in natural systems) to protect themselves from stranding and conserve energy. The flow of water into Northfield's intake could attract age 0 and older sturgeons (to adults) migrating downstream because evolution has evolved this behavior in response to survival success. Those sturgeon could die if they remain in the generation water, or are otherwise impinged or entrained due to

Northfield's operations. Additionally, when operations at Northfield result in a reversal of river flow, Shortnose sturgeon in the channel migrating downstream will be impacted. Shortnose sturgeon have no evolutionary history with changes in river flow direction, so downstream migrating Shortnose sturgeon would remain in the dominant flow, whether that flow is natural or unnatural. In this case, the dominant flow (which is upstream when Northfield is releasing water to generate electricity) may direct sturgeons in the opposite direction of their normal migratory route. Removal of small juveniles from their normal migration route could expose them to increased predation and reduced forage plus physical damage if they reach the facility.

15. Take of Shortnose sturgeon, as the term take is defined in the Endangered Species Act, could occur for downstream migrants from impacts from Northfield's water intake structures or the river flow being reversed and, at Turners Falls Dam or at Cabot Station, from impacts from operations and turbines. For upstream migrants, take could occur due to strandings below the dam. While there are no data available, my understanding of Shortnose sturgeon and their behavior, as informed by 27 years of research, and my experience with similar structures and barriers at Holyoke Dam indicate there would likely be takes, particularly of older juveniles and adults at Turners Falls Dam and Cabot Station. Though without data, because the presence of Shortnose sturgeon above Turners Falls Dam has only been recently established, it seems likely that a guidance barrier could be installed at the intake to Northfield that would protect age-0 juveniles, larger juveniles, and adults, but such a net must be designed and installed taking sturgeon behavoir and morphology into account. A barrier to protect downstream migrant sturgeon from entering the Hadley Falls Station at Holyoke Dam can provide guidance on a similar facility at Cabot Station.

OTHER BENEFITS OF RESTORING A DEWATERED SECTION OF THE RIVER

16. Increasing river flow in the bypass reach would restore a major dewatered part of the river with life, providing rearing areas for diverse fish species and invertebrates. In addition to sturgeons, juvenile eels, a major emphasis for restoration, live in the area. Additionally, snorkeling surveys I have conducted revealed many yearling smallmouth bass in the reach. The bypass reach is likely the major spawning reach for adults and rearing there provides most of the smallmouth bass to the river. Providing flow for a normal river width would greatly increase benthic invertebrates and rearing habitat for many fish species.

I declare under penalty of perjury that the foregoing is true and correct. Executed this 23rd day of February, 2025, in Amherst, Massachusetts.

Boyd Kynard

Boyd Kynard

Vitae – November 2025

Boyd E. Kynard

Owner, BK-Riverfish, LLC
Office: 28 Echo Hill Road, Amherst, MA 01002-1633
Fish Behavior-Fish Passage Laboratory @ Renovators Supply, 1 River Road, Erving, MA 01344
&
Adjunct Professor of Fisheries, Environmental Conservation Department, University of Massachusetts, Amherst, MA 01003

Office: 413-253-9421; mobile 413-695-6571; e-mail: drboyd@umass.edu; web site: bk-riverfish.com

Personal Information

Born: January 2, 1939 in Jackson, MS; Married with two children (son 50, daughter 55); *Health*: normal activities in treatment of multiple myeloma; *Hobbies*: reading, travel, gardening.

Military Service

U.S. Marine Corps (Active): 1957-60.
U.S. Navy Active Reserve: 1963-67.

Research and Experience Summary

Boyd Kynard is a fish behaviorist who studies behavior of migratory fish during life history to conserve fish populations and to design up- and downstream fish passage facilities for migrant fish at dams. His expertise is in (1) migratory fish life history behavior (timing and ecology of up- and downstream migrations and evolution of migration styles), (2) R & D on the design of up- and downstream passage for migrant fish at dams in North America, China, and Brazil, 3) designing research facilities and techniques to study migratory fish and fish passage in large rivers and artificial streams, and 4) conservation of migratory fish in large north temperate and neo-tropical rivers with hydroelectric dams. Prior to moving to Massachusetts, he was a tenured Associate Professor of Fisheries at the University of Arizona, Tucson, where he started the undergraduate fisheries major and studied endangered desert fishes in Arizona and Mexico. In Massachusetts, he has 41 years of experience studying the behavior, ecology, and fish passage of Atlantic coast diadromous fishes, with a focus on sturgeons, American shad, and sea lamprey. In the USA, research has involved many species of Atlantic coast fish: American shad, river herring, Atlantic salmon, striped bass, sea lamprey, shortnose and Atlantic sturgeons; and also, sturgeons in the central USA and the Pacific coast: pallid, shovelnose, green and white sturgeons and American paddlefish. He has led or co-led field and laboratory research projects on migrations, habitats, and fish passage for migratory fishes in the United States (Connecticut, Merrimack, Kootenai, and Potomac rivers); Brazil (San Francisco and Grande rivers and the Madeira R., a headwater tributary of the Amazon River); Romania (Danube River); and China (Yangtze River). As a federal employee of the FWS or USGS, he developed four state-of-the-art research programs: (1) field and lab research on migrations and habitats of shortnose and white sturgeons, (2) a lab research program on the ontogenetic behavior, habitat selection, and dispersal of sturgeons from North America, Asia, and Europe, and (3) flume research on

American shad, sturgeons, and riverine fishes to develop up- and downstream passage systems, and (4) evaluation of river regulation on migratory fish life history behavior. After retiring from the US Dept. of Interior (USGS) in 2007, he established a private migratory fish consulting business (BK-Riverfish,llc) and for 10 years has conducted research on fish behavior in the lab, conducted R&D to develop a new type of fish ladder (Patent granted in USA & Canada) for diverse riverine fishes, including sturgeons, and consulted on migratory fish conservation and protection. Details on this work with his son, Brian, is under the heading BK-Riverfish,llc Consulting.

Education

B.S. Biology, Millsaps College, Jackson, MS, 1965.
M.S. Zoology, Mississippi State University, State College, MS, 1967.
Ph.D. Fisheries Biology, College of Fisheries, University of Washington, Seattle, 1972.

Professional Employment

Assistant Marine Biologist, Gulf Coast Research Lab, Ocean Springs, MS, 1965-66.
Research Assistant, Zoology Department, Mississippi State University, State College, MS, 1966-67.
Assistant Curator & Research Assistant, College of Fisheries Museum, University of Washington, Seattle, WN, 1968-72.
Assistant & Associate Professor of Fisheries Science, Department of Watershed Management, University of Arizona, Tucson, AZ, 1972-78.
Research Scientist, U.S. Forest Service, Forest Science Lab, Juneau, AK (participant, Forestry Faculty Program), Summer 1973.
Assistant Unit Leader, Massachusetts Cooperative Fishery Research Unit, Department of Forestry and Wildlife, University of Massachusetts, Amherst, MA, 1978-79 and 1980-89.
Acting Unit Leader, Massachusetts Cooperative Fishery Research Unit, Department of Forestry and Wildlife, University of Massachusetts, Amherst, MA, 1979-80 and 1989.
Fish Research Biologist & Fish Behavior Section Leader, Conte Anadromous Fish Research Center (USFWS and USGS/BRD), Turners Falls, MA, 1989-2007.
Owner, BK-Riverfish, LLC, (a consulting company on migratory fish behavior and fish passage), 28 Echo Hill Rd., Amherst, MA 01002-1633, 2008-present.

Professional Affiliations

American Fisheries Society (Life Member)
Danube River Society (member)
World Sturgeon Conservation Society (member)
North American Soc. For Conservation of Sturgeons & Paddlefish (Life Member)

Professional Service

Desert Fish Council
Lower Sonoran Desert Fish Committee, Chair, 1976-78.
Arizona Chapter American Fisheries Society, Founder and Faculty Sponsor, 1978.
National American Fisheries Society
Monetary Values of Fish Committee, Member, 1978-80.

Career Opportunities Committee, Chair, 1985.
Career Opportunities Committee, Member, 1986.
Best Paper Committee, Member, 1988.

Northeast Division American Fisheries Society

Best Student Presentation Committee, Chair, 1984-91.
Nominations Committee, Member, 1987.
Cooperative extension Education Committee, Member, 1991- 2002.

Southern New England Chapter American Fisheries Society

Vice President, 1980, President, 1981, Membership Committee, 1983.

Nat. Marine Fish. Serv. Shortnose Sturgeon Recovery Team

Member, 1980-1998

North Amer. Chapter, World Sturgeon Cons. Soc.

Executive Board, 2008-2012

North American Society for Conserv of Sturgeons & Paddlefish

Exec. Board 2012-2015

The Nature Conservancy, Massachusetts Chapter

Trustee – 2010-2015

Journal of Fishery Science of China

Member, Editorial Board 2014-present

IUCN- Sturgeon Specialists Group

Member, 1995-present

Awards

Northeast Division American Fisheries Society -- D. W. Webster Award of Merit, 2008.

PhD paper in the journal Behaviour selected for the book Tinbergen's Legacy: 60 years of landmark stickleback papers, 2010.

International Conf. on Engineering and Fish Passage – Life-Time Achievement Award, 2012.

University Experience and Classes Taught

University of Arizona, Tucson, AZ

Assistant and Associate Professor (tenured) of Fisheries, Dept. of Watershed Mgmt.

Introduction to Fisheries, lecture, 3 hr, 1973-77.
Advanced Fisheries Science, lecture, 4 hr, 1974-78.
Natural Resource Measurements, lecture, 1 hr, 1974-78.
Fish Behavior, Fish Speciation, Fish Ecological Genetics, Desert Fisheries-seminars, 1 hr/yr, 1974-78.

University of Massachusetts, Amherst, MA

Associate Professor (Adjunct), Dept. of Forestry and Wildlife and Dept. of Zoology.

Fisheries and Wildlife Program Seminar, 1 hr/yr, 1978-79.
Migratory Fish Biology and Management, lecture, 3 hr/wk, 1981-1997).
Anadromous Fish Biology & Restoration, 1 hr lect./yr, 1978-1999.

Extension and Public Service

University of Arizona

* **Fisheries Sub-Group Planning Committee**, Member, Intermountain Region, U.S. Forest Service, 1976.

University of Massachusetts, USFWS, NBS, and USGS

* **Technical Committee for Restoration of Anadromous Fish to the Connecticut River**, Scientific Advisor, 1978-88.
* **American Shad Committee (Conn. River Technical Committee)**, Member, 1981-2007.
* **Represented USFWS on restoring anadromous fish to the Susquehanna River,** Federal Energy Regulatory Commission hearings, Washington, DC, Expert Witness, 1981-83.
* **Downstream Passage Sub-committee of Conn. River Technical Committee),** member, 1982-89..
* **Shortnose Sturgeon Recovery Team,** NMFS, Member, 1986-1998.
* **Shortnose Sturgeon Protocol Development Team,** NMFS, Member, 1998-1990.
* **Expert Advisor**, USFWS RO-5, James River, VA, Instream Flow Study for passing anadromous fish, 1992.
* **Hudson River Foundation**, Expert Advisor on sturgeon research program, 1992.
* **USFWS Representative & Advisor to China for Sturgeon Telemetry Research**, 1993.
* **IUCN Sturgeon Committee, Member**, (1994-2002; 2012 to present).
* **Expert Advisor on sea lampreys,** Great Lakes Commission, 1995.
* **Expert Advisor on fish passage**, CEMIG (state hydropower co.), MG, Brazil, 1996-2004.
* **Expert Advisor on sturgeon passage**, Danube Delta Institute, Romania, 1996-2012.
* **Instructor**, USFWS Fish Passage and Diversions Course, Fisheries Academy, 1989-2004.
* **Connecticut River Shortnose Sturgeon Workgroup**, Member, 2000-2004.
* **USFWS Diplomatic Team to Amur River, Russia Workshop on Biodiversity,** Member, 2002.
* **Expert Advisor on sturgeon passage on Danube River,** World Wildlife Society, 2003.
* **Expert Advisor on upstream and downstream fish passage to Australia,** 2003 & 2006.
* **Expert Advisor on sturgeon passage to World Sturgeon Society,** Po River, Italy. 2006.

Grants and Contracts (Academic and Private Business)

University of Arizona

* Use of electricity to immobilize fish. University of Arizona Foundation, $2,000 for 1974.
* Apache Trout: Biology and effects of logging on habitat. McIntyre - Stennis Forestry Research Program, $42,000 for 1974-78.
* Potential effects of anti-transpirants on aerial insects, rodents, nesting birds, and fish. U.S. Department of Interior, Office of Water Resources Research, $78,000 for 1975-78.
* Effect of riparian vegetation in reducing siltation in endangered trout habitat. U.S. Forest Service, $4,500 for 1977.
* Biology and protection of desert pupfish on Organ Pipe Cactus National Monument. U.S. Park Service, $11,500 for 1976-78.

University of Massachusetts, USFWS, NBS, USGS

*Population estimate for shortnose sturgeon in the Connecticut River; Atlantic salmon smolt movements at Holyoke Dam; Adult and juvenile American shad and blueback herring movement past Holyoke Dam; Evaluation of fish lifts at Holyoke Dam; Development of a prototype by-pass

for downstream migrant American shad -- Northeast Utilities Service Company, $355,000 for 1979-85.
* Potential effects of low-head hydro turbines on anadromous fish and effects of flow regulation by hydro dams on fish. U.S. Department of Energy, $375,000 for 1980-82.
* Behavioral interactions between juvenile rainbow trout and Atlantic salmon. U.S. Fish and Wildlife Service, $30,000 for 1980-82.
* Behavior of adult sea lampreys; Movements of sub-adult striped bass; Behavior of adult shortnose sturgeon; Artificial rearing and behavior of larval and juvenile shortnose sturgeon; * Development of a riverine migrant trap for Atlantic salmon smolts; Movements of salmon smolts in relation to hydro-dam operations; Vertical distribution of adult American shad and blueback herring during riverine migration; Vertical distribution of juvenile shad and blueback herring during migration; Evaluation of Atlantic salmon fry stocking habitat on fry survival and production. Anadromous Fish & Wallop-Breau Federal Aid-Massachusetts Division of Fisheries and Wildlife, $325,000 for 1980-1992.
* Occurrence and movements of shortnose and Atlantic sturgeons in the Merrimack and Taunton Rivers, National Marine Fisheries Service Federal Aid and contributed state funds, $120,000 for 1987-93.
* Effect of road building on reproductive success of shortnose sturgeon. Massachusetts Highway Department, $60,000 for 1992-95.
* Research & development of fish passage facilities for lake sturgeon in two Wisconsin rivers. Menominee Indian Tribe, USFWS, Wisconsin DNR, $8,000 for 1996.
* Spawning of Chinese sturgeon in the Yangtze River, Three Gorges Corp. and Yangtze River Fisheries Institute, $100,000 for 1994-1999.
* Impact of Holyoke Dam on shortnose sturgeon migration, Northeast Utilities Service Co. and Holyoke Gas & Elect. Co., $230,000 for 1997- 1999..
* Migration and habitat of Danube River sturgeons, World Bank & Danube Delta Institute, $220,000 for 1997-2000.
* Development of a prototype fishway for lake sturgeon and Great Lakes fishes. Great Lakes Foundation, $135,000 for 1999-2000.
* Migration and fish passage of Brazilian migratory fishes, CEMIG (hydropower co.), Minas Gerais, Brazil. $190,000 for 1999-2002; $240,000 for 2003-2007.
*Behavior of juvenile pallid sturgeon in a fish ladder environment. US Corp. of Eng., $37,000 for 2001-2002.
* Downstream migration and behavior of pallid sturgeon early life stages. US Corps of Engineers, $90,000 for 2002.
* Seasonal movements and habitats of Potomac River shortnose sturgeon, U. S. Nat. Park Serv. $320,000 for 2003-2005.
* Seaward migration of Chinese sturgeon using pop-up tags, S. China Sea Fisheries Inst., Shanghai, $70,000 for 2005-2006.
* Ontogenetic behavior, dispersal, and habitat preference of Kootenai R. white sturgeon, Idaho Fish & Game, $37,000 for 2005.
*Life history of early life stages of Kootenai R. white sturgeon & field studies on forage and habitat in river, Kootenai Tribe of Idaho, $700k for 2006-2014.

BK-Riverfish, LLC: Consulting

*** Design of fish behavior-passage research facility for Iron Gates Dam, Danube River, Romania**, 2006-2010.
* Biological Assessment of impacts of power plants and construction projects on sturgeons & diadromous fishes (Sierra Club, 2007 and 2016).

* Kootenai Tribe of Idaho: Lab and field research on behavior of Kootenai white sturgeon early life stages and their river environment, particularly during wintering -- 2008-2014.

* Two bridge construction companies: sturgeon protection at two Merrimack Bridge renovation & replacements – 2010 and 2014-2016

* CEMIG Power Company, Brazil: Development of fish passage for new dam in Brazil & design of a river research laboratory – 2010-2016.

* SAE Power Company, San Paulo, Brazil: Development of fish passage for new dam in Brazil and design of a river research lab – 2009-2016

*The Sierra Club: Impact of an electric generating facility on shortnose sturgeon in Potomac R. ─ 2013

* The Sierra Club: Evaluation of NOAA ruling on critical habitat of Atlantic sturgeon – 2016

* Yangtze River Fisheries Research Institute: Design of fish passage facility for new dam – 2015

* South China Sea Research Institute: Telemetry of mitten crab in Yangtze Estuary – 2015

* Design of the first fish lift in China (Huangdeng) on upper Yangtze River, Ecofish Research LTD – 2015

* Hudson and Delaware Riverkeepers: Impact of electric generating facilities on sturgeon – 2016-2017

* Tetra Tech LLC: Sub-contract on USACE project on EIS and design of pallid sturgeon fish passage on Lower Yellowstone Intake Diversion, Yellowstone R., MT – 2015-2016

* Eversource Power Co.: Evaluation of Owens Pond fishway, Amherst ─ 2015-2016

* Southern Environ. Law Center: Evaluation of James R. Chesterfield power plant effects on Atlantic sturgeon – 2017-2020.

* R & D to develop a new modular fishway design for Stockdale Mill Dam, Eel River, IN (USFWS & Manchester University partners) – 2014-2018.

* USPS & Duke Law Center: Evaluation of a power line across the James River on Atlantic sturgeon (– 2018.

* Battelle Memorial Institute: Sturgeon passage expert, member of team to evaluate fish passage planned by USACE at Savannah Bluff Lock & Dam, Savannah River – 2019.

* European Bank: Sturgeon life history expert to evaluate the status of sturgeons in the Rioni River and effects of two new dams proposed in the Rioni River, Georgia, on sturgeons – 2019-2020.

* Biocitizen, Inc. (NGO): Research instructor for youth environmental education—taught students methods to study Connecticut River fish ecology, conservation & fish passage -- 2018-2019; 2021.

* Southern Environ. Law Center: sturgeon expert to evaluate impact of James River, VA, Chesapeake Power Station on Atlantic sturgeon –2019-2020.

* Southern Environmental Law Center: fish passage expert on team to develop fish passage for Savannah R. New Savanah Bluff Lock and Dam, GA. 2020-present.

*R&D in the BK-Riverfish hydraulic/fish behavior lab in Erving, MA, to develop a new type of modular fish ladder for diverse diadromous and potamodromous (freshwater) fishes (US Patent #11,168, 453 granted November 2021; Canadian Patent CA 29892333 granted 8/7/2023. Prototype fishway installed at Stockdale Mill Dam, Eel River, IN in 2017 with cooperation from dam owner (Stockdale Mill Foundation), Manchester Univ., and the US Fish and Wildlife Serv. Presently designing three additional fishways one each in Illinois, Massachusetts, and Puerto Rico. See website: bkriverfish.com for more information.

Presentations (2000 to present)

Kynard, B. M. Kieffer, M. Burlingame, and P. Vinogradov. 2000. Effect of Holyoke Dam on the up- and downstream migration of Connecticut River shortnose sturgeon, Annual meeting of American Fisheries Society, St. Louis, MO.

Kynard, B., and A. Haro. 2001. Up- and downstream passage of American shad at dams: A review. International Shad Symposium, Baltimore, MD.

Kynard, B., M. Kieffer, M. Burlingame, and P. Vinogradov. 2001. Effect of Holyoke Dam on the population structure of Connecticut River shortnose sturgeon. Annual meeting of American Fisheries Society, Phoenix, AZ.

Kynard, B., D. Pugh, E. Henyey, and T. Parker. 2002. Behavior of lake and pallid sturgeon in fishway environments: a new paradigm for developing fish passage. Annual meeting of American Fisheries Society, Baltimore, MD.

(Invited) Kynard, B. 2002. Fish behavior important to development of fish passage facilities. International Workshop on Natural Bypasses and Dam Removal. October 2002, White Mountains, NH.

(Invited) Kynard, B. 2003. Fish passage and habitat protection for riverine migratory fish in the Northeast United States. Symposium on Fish and the Environment, Shanghai, China.
(Invited) Kynard, B. 2003. Downstream protection of migratory fishes in the United States. First Workshop on Downstream Fish Passage, Canberra, Australia.

(Invited) Kynard, B. 2005. Life history migrations and upstream fish passage development in North and South America. Workshop on the Ord River, Western Australia, Kunnunara, Australia.

(Invited) Kynard, B. 2005. Restoration of sturgeon populations using fish passage. Workshop on Danube R. sturgeons, Petrocelli, Austria.

(Invited) Kynard, B. 2006. Passage of sturgeons and other large fishes in fish lifts: basic considerations. World Sturgeon Society, Piacenze, Italy.

(Invited) Kynard, B. 2006. Diadromous fish migrations that connect river and estuary: importance and need for study. Int. Symp.on Aquatic Biodiversity and Environ. Restoration of Estuarine and Coastal areas. Shanghai.

(Invited) Kynard, B. 2008. Behavior of fish and fish passage in China and Brazil. SE Chapt. AFS

(Invited) Kynard, B. 2008.Fish behavior and fish habitat protection. Forum on fisheries, Shanghai.

(Invited) Kynard, B., D. Pugh, and T. Parker. 2009. Lake sturgeon use of a spiral fishway. SE Chapt. AFS.

Kynard, B., D. Pugh, and T. Parker. 2010. Lake sturgeon use of a spiral fishway. NA Chapt. World Stur. Cons. Soc., Chico, MT.

Kynard, B. and M. Horgan. 2011. Life history and fish passage of sea lamprey in the Connecticut River, Massachusetts. Nat. AFS meeting, Seattle, WN.

Kynard, B., R. Junco, A. Godinho. 2011. A conceptual model for designing bypass fishways for neotropical rivers. Nat. Conf. on Engineering and Ecohydraulics for fish passage, Univ. of MA, Amherst.

Parker, E., B. Kynard**,** B. E. Kynard, and M. Horgan. 2012. Substrate and water velocity selection by early life stages of Kootenai R. White Sturgeon. Internat. Meeting, World Sturgeon Cons. Soc., Nanaimo, BC, Canada.

Kynard, B., D. Pugh, and T. Parker. 2012. Impingement and entrainment of shortnose sturgeon at a vertical bar rack with and without a bypass orifice. National Fish Passage Conf., Univ. Mass, Amherst.

Kynard, B., B. E. Kynard, and M. Horgan. 2013. Velocity selection by young Kootenai R. white

sturgeon. Internat. Symp., World Sturg. Cons. Soc., Nanaimo, BC, Canada.

(Invited) Kynard, B. and M. Horgan. 2014. Fish passage and life history of Connecticut R. sea lamprey. Internat. Conf. on Lampreys, York, England.

(Invited) Kynard, B. 2014. Early life of sturgeons: the key to successful restoration programs. Keynote Address, Southern Div. Amer. Fish. Soc., Charleston, SC.

(Invited) Kynard, B. 2014. Importance of fish behavior to fish conservation and management. Keynote Address, Annual meeting of Chinese aquatic research biologists, Yichang, China.

Kynard, B., E. Parker, B. E. Kynard, and M. Horgan, 2014. Activity of young-of-the-year Kootenai River white sturgeon and Connecticut River shortnose sturgeon in response to winter temperature cycles. Annual AFS meeting, Quebec City, Canada.

(Invited) Kynard, B. 2015. Upstream passage of sturgeons at dams. Intern. Conf. on Fish Passage – 2015, Groningen, The Netherlands. + Moderated a Session on passage for Danube sturgeons at Iron Gates Dams.

Kynard, B., B. E. Kynard, C. Morgan. 2016. Evaluation of the Owens Pond fishway, Amherst, Ma. Intern. Conf. on Fish Passage, UMass Amherst, USA.

Kynard, B., B.E. Kynard, G. Hoffman. 2017. Activity during the winter temperature cycle by YOY of two North American sturgeon species: implications for river warming to affect YOY. World Sturgeon Conserv. Soc. ISS8 meeting, Vienna, AU.

Kynard, B., B,E. Kynard, E, Parker, M. Horgan. 2017. Activity of year-0 Connecticut River juvenile shortnose sturgeon during winter. Meeting of Connecticut River Anadromous Fish Restoration Program, Hadley, MA.

Kynard, B., B. E. Kynard, J. Sweeten, D. Henry, and C. Root. 2018. Development and performance of a new type of fish ladder for riverine fishes. Ohio River Conference, Wilder, KY.

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Kynard, B. and 6 coauthors. 2024. The Kynard Alternating Side-Baffle Fishway: A Technical

Upstream Fishway that Passes Diverse Diadromous and Potamodromous Fishes with Small and Large Bodies. Presentation at International Symposium of Fish Passage, Quebec City, Canada.

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2. Kynard, B. 1972. Breeding behavioral ecology of male lateral plate phenotypes of threespine sticklebacks, *Gasterosteus aculeatus*. Ph.D. Dissertation, 98 pp.

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*4. Kynard, B. 1974. Measuring Fisheries Resources, Chapter 12, pp. 241-354. Natural Resource Measurements, ed. T. E. Avery, McGraw-Hill.

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24. Moffitt, C. M., and B. Kynard. 1980. Passage of anadromous fish at Holyoke and Turners Falls Dams in 1980. Fed. Aid Dept. Proj. 4-F-R. 39 pp.

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Louisiana State University

1. Bradley Wood. PhD student studying swimming/anatomy relationships of Connecticut River Sea lamprey. Member of committee (2014-2020).

EXHIBIT C

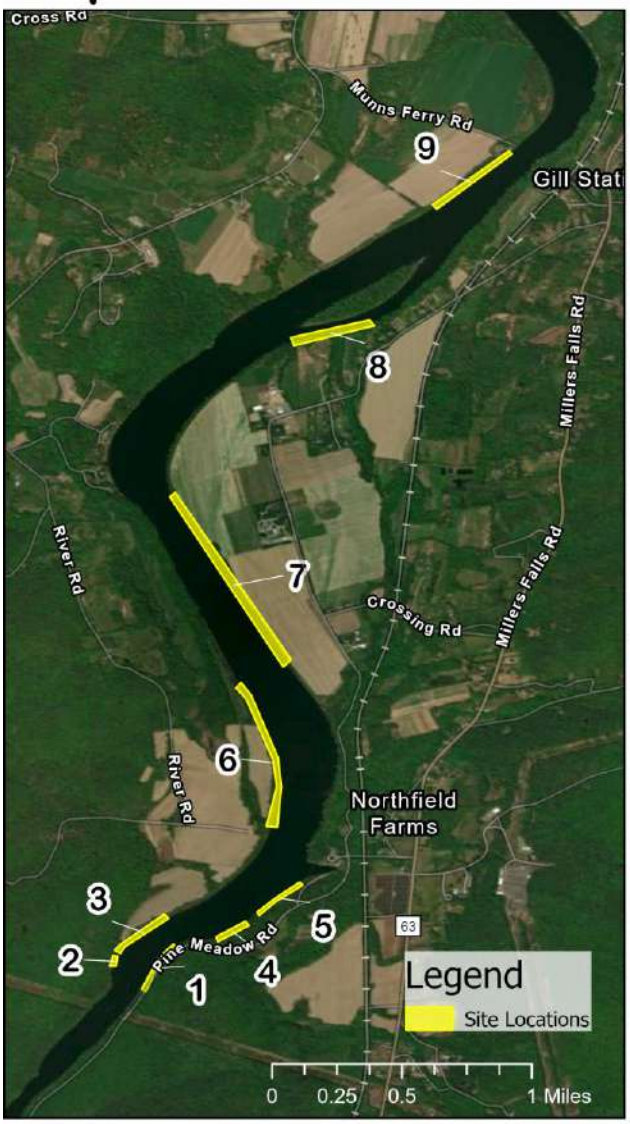
CRC Erosion Photo Log

On September 25, 2024, CRC staff toured the Connecticut River from Turners Falls Dam to just upstream of the MA/NH/VT state line. The photos below were grouped by "sites" of varying lengths with locations shown below on the map. Photo numbers increase from downstream to upstream.

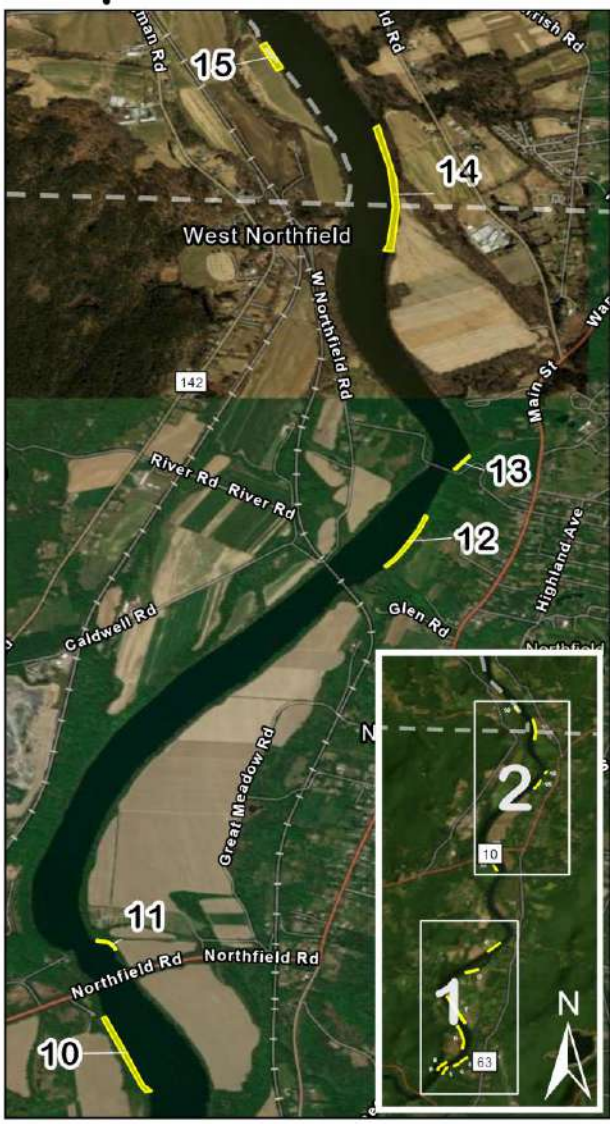
More than ten photos were taken at each of the fifteen sites. The photos indicate extensive erosion along much of the Connecticut River, with frequent notching at the typical level of water fluctuations. The hypothesis that erosion is largely caused by high flow events does not seem logical based on observation of the banks.

This report highlights a few photos from each site as examples and the rest of the photos are available to DEP to assess.

Map 1



Map 2



F. Ryan O'Donnell, Connecticut River Conservancy
February 24, 2025

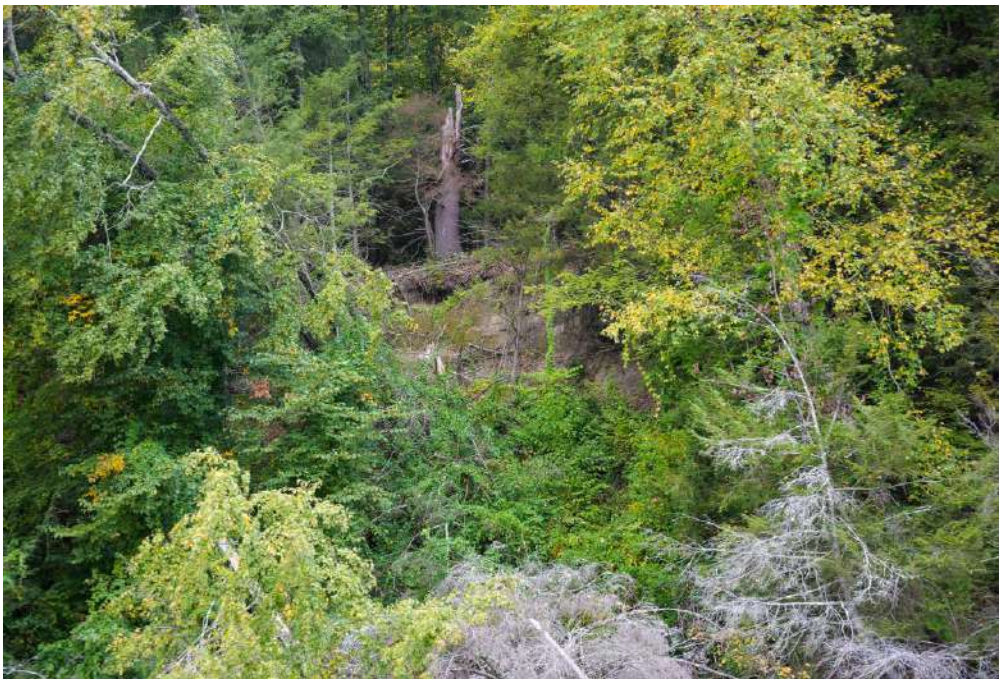
Site 1

2024 CRC Site 1 (16)
Notching, creating a shelf of vegetation above rocks

2024 CRC Site 1 (18)
Exposed roots above water fluctuation zone

2024 CRC Site 1 (29)
Undercutting, leading to erosion in the bank above

Site 2

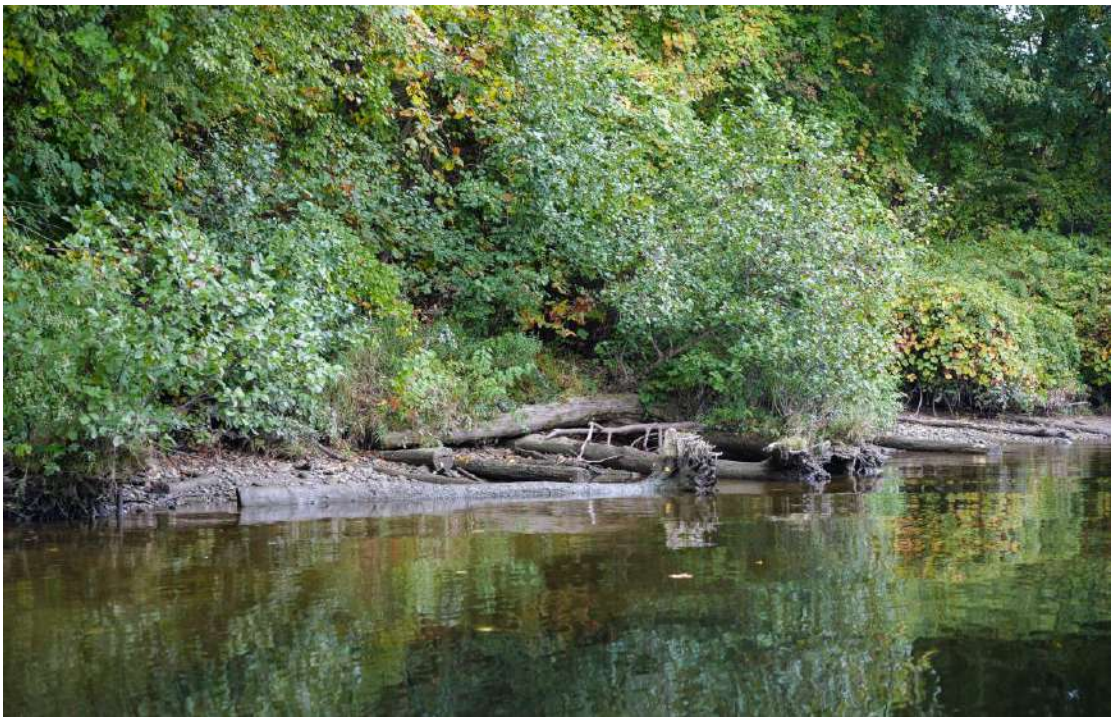


2024 CRC Site 2 (9) : Landslide

2024 CRC Site 2 (12): Landslide

Site 3

2024 CRC Site 3 (10) :
Notching, creating a shelf of vegetation above rocks



2024 CRC Site 3 (2): Old restoration project that is no longer intact

Site 4

2024 CRC Site 4 (2) : Immense Landside of riverbank into the river

2024 CRC Site 4 (5) : Unstable Bank eroding with exposed dirt

2024 CRC Site 4 (7) : Exposed roots in water fluctuation zone

Site 6

2024 CRC Site 6 (24) :
Previous restoration site with fully exposed logs,
meaning the restoration mitigation failed

2024 CRC Site 6 (28):
A little further north at the same site, the
logs are less exposed, but still exposed

Site 7 – River left, upstream of Shearer property

2014 FRR LB1831

2024 CRC Site 7 (27)

In 2014, the banks were eroded but obscured by hanging trees.
In 2024, erosion more evident. Bittersweet vines are prominent.

2024 CRC Site 7 (18)
Undercutting

2024 CRC Site 7 (27)
Bank erosion, growth of bittersweet

2024 CRC Site 7 (30)
Undercutting

Site 8 – River left across from Kidd's Island

2014 FRR LB1688

2024 CRC Site 8 (13)

Small tributary helps match site photos above, from 2014 FRR to 2024 CRC survey.
In 2014, restoration site upstream of stream confluence had re-vegetated, but fabric was loose. In 2024, site had changed with addition of fencing and chairs. Bank was becoming vegetated with Japanese knotweed (below). Site photo numbers increase from downstream to upstream.

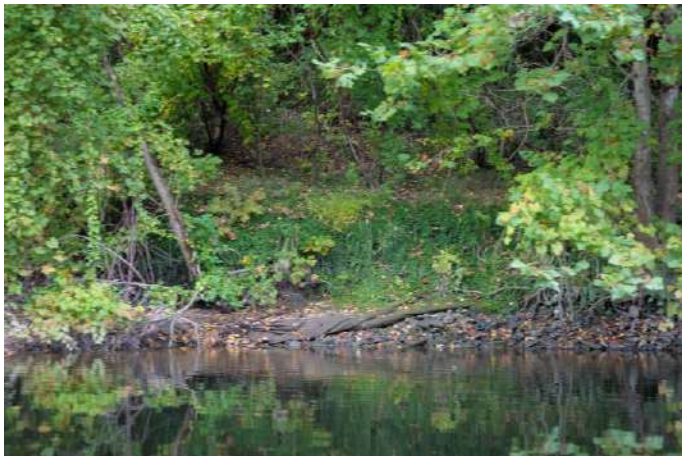
2014 FRR LB1686

2024 CRC Site 8 (15)

2024 CRC Site 8 (19)
Notching continues near repaired toe

2024 CRC Site 8 (20)
Loose fabric and erosion uphill

Site 8 – River left across from Kidd's Island



2024 CRC Site 8 (24)
Various levels of erosion happening on the bank

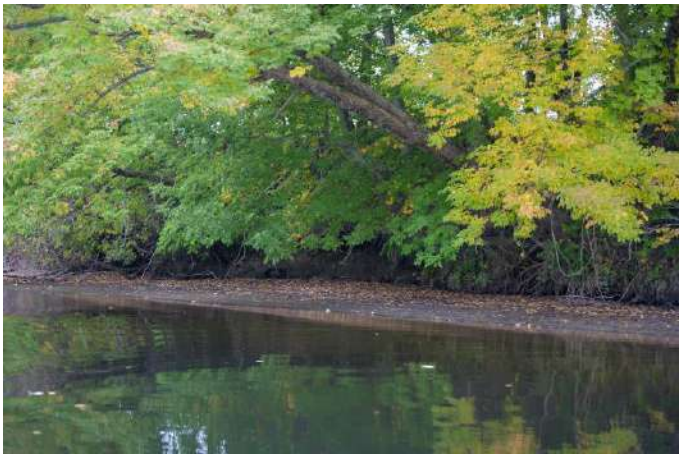
2024 CRC Site 8 (25)
Notching forming above protected toe – this demonstrates the concern about holding the impoundment at higher average elevations than in the past.

2024 CRC Site 8 (31) – knotweed overtaking repaired section

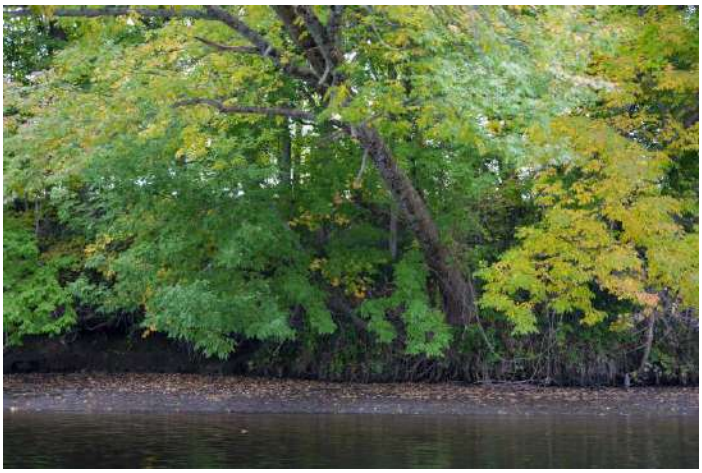
2024 CRC Site 8 (33)

Site 9 – River right

2024 CRC Site 9 (5)
Erosion at bank toe is causing trees to fall in



2024 CRC Site 9 (17)
Exposed roots at bank toe



2024 CRC Site 9 (18)
Exposed roots at typical fluctuation zone.

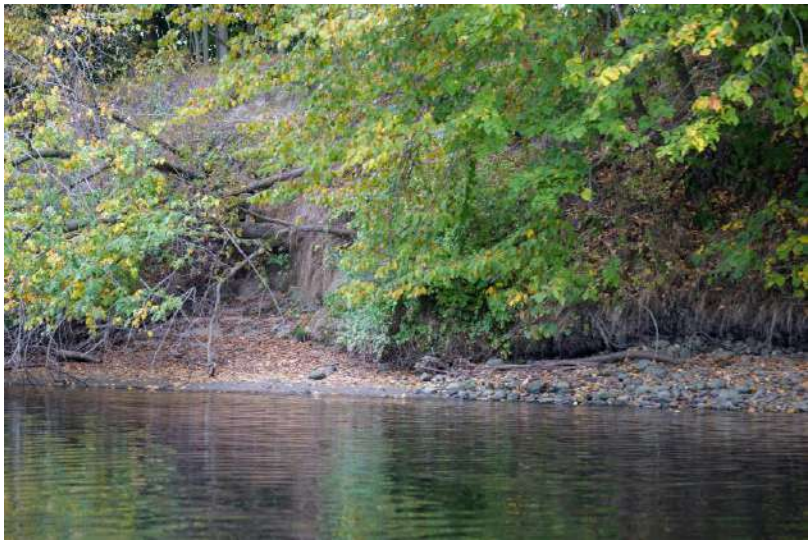
2024 CRC Site 9 (21)
Close-up of eroded area

Site 10 – River Right along Bennett Meadow

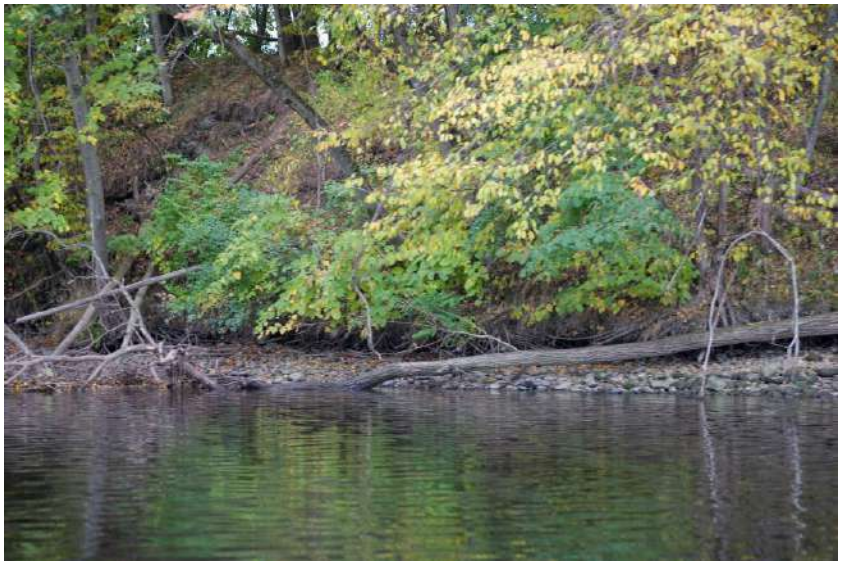
2014 FRR RB0987

2024 CRC Site 10 (14)

In 2014, the banks were eroded but obscured by hanging trees.
In 2024, erosion more evident.

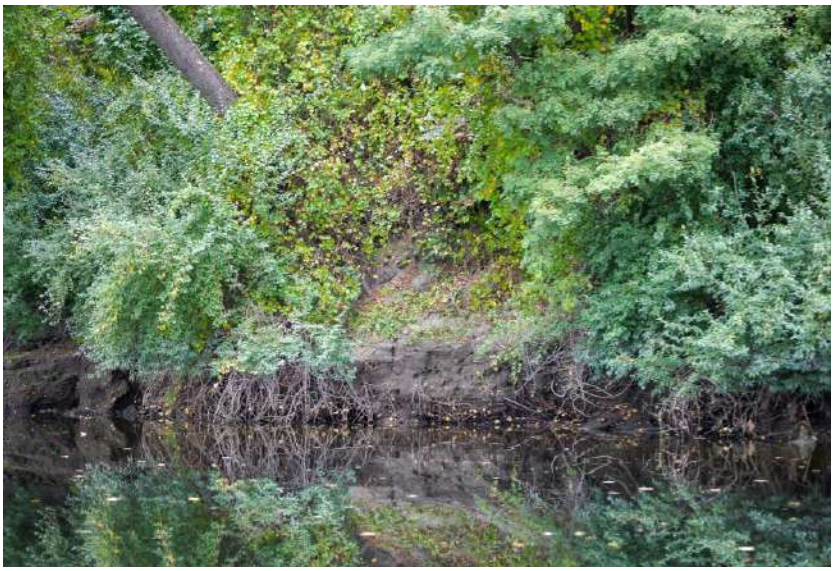


2024 CRC Site 10 (18)
Exposed roots at the fluctuation zone, leading to tree failures on the left



2024 CRC Site 10 (22)
Exposed roots at the fluctuation zone, leading to slump in upper left

Site 11



2024 CRC Site 11 (10) : Exposed roots and collapsing riverbank in water fluctuation zone

2024 CRC Site 11 (19) : Undercutting of soil in water fluctuation zone

2024 CRC Site 11 (21) : Immense Landside of riverbank into the river

Site 12

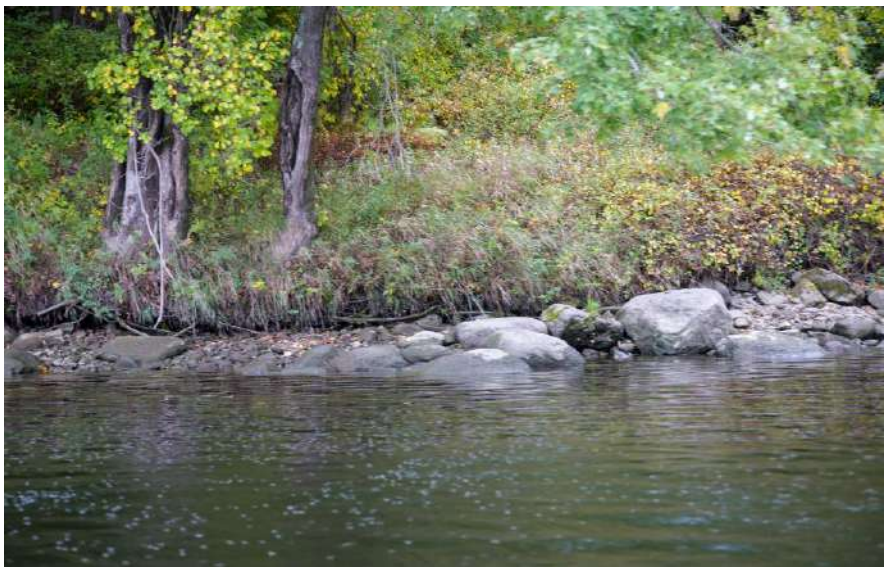
2024 CRC Site 12 (5) :
Previous restoration site where vegetation is unable to grow in the water fluctuation zone

2024 CRC Site 12 (7):
Previous restoration site with unsightly material trying to hold the riverbank together

Site 13

2024 CRC Site 13 (1) : Exposed roots and collapsing riverbank in water fluctuation zone

2024 CRC Site 13 (10) : Notching, creating a shelf of vegetation above rocks



2024 CRC Site 13 (12) : Notching, creating a shelf of vegetation above rock

Site 14

2024 CRC Site 14 (19) : Severe notching and undercutting, of trees in a vegetative line that are on a trajectory to collapse into the river

2024 CRC Site 14 (15) : Eroded riverbank caused by landslide and creates steep edge

2024 CRC Site 14 (17) : Wider pan view exhibiting notching and landslides next to one another

Site 15

2024 CRC Site 15 (6) :
Vegetation unable to grow in the water fluctuation zone from pumping

Nina Gordon-Kirsch
MA River Steward
Connecticut River Conservancy
15 Bank Row | Greenfield, MA 01301

EXHIBIT D

RE: Comment on Water Quality Certification with Conditions
FirstLight Hydroelectric Project
FERC License Nos. 1889 (Turners Falls) and 2485 (Northfield Mountain)

February 24, 2025

Dear Ms. Gordon-Kirsch,

Princeton Hydro LLC (Princeton Hydro) was retained by the Connecticut River Conservancy (CRC), a stakeholder and participant in the re-licensing process of the Federal Energy Regulatory Commission (FERC) for two hydropower facilities owned by FirstLight Power Resources Inc. (FirstLight) on the Connecticut River, to provide a technical review of the components of the Draft 401 Water Quality Certification (WQC)[1] related to bank stability and monitoring for the reach of the Connecticut River known as the Turners Falls Impoundment (TFI). FirstLight MA Hydro LLC and Northfield Mountain LLC (collectively FirstLight or the Applicant), respectively, filed applications for new major licenses to operate the 62.0-megawatt Turners Falls Hydroelectric Project (Turners Falls Project; FERC No. 1889) and the 1,166.8-MW Northfield Mountain Pumped Storage Project (Northfield Mountain Project; FERC No. 2485).

Introduction and Background

As part of the relicensing process, FERC regulations required FirstLight to file with the Massachusetts Department of Environmental Protection (MassDEP) its 401 Water Quality Certificate Application. FirstLight filed a single 401 Application with MassDEP for

[1] Mass DEP, (Draft) Water Quality Certification with Conditions, 2025. FirstLight Hydroelectric Project, FERC License Nos. 1889 (Turners Falls), 2485 (Northfield Mountain), dated January 24, 2025.

both Projects on April 22, 2024. The submission of the 401Water Quality Application is an essential part of the relicensing process as it must receive the approval of Massachusetts. Under Section 401 of the Clean Water Act (CWA), a federal agency may not issue a permit or license to conduct any activity including Federal Energy Regulatory Commission (FERC) licensed hydropower facilities unless a Section 401 WQC is issued by a state, or certification is waived. It is also important to acknowledge that the WQC review process seeks to ensure that the project, in this case FirstLight's relicensing of the Turners Falls Project and the Northfield Mountain Project, will not continue to negatively impact the water quality of the Connecticut River as set forth in Massachusetts's surface water quality standards. A "WQC" under the Clean Water Act enables states to participate in a federal approval process such as the FERC relicensing of FirstLight's hydropower facilities to protect water quality in a water body such as the Connecticut River by allowing states to regulate and potentially deny permits for projects that could worsen the condition of any water body including already impaired waters. In this context the WQC process must be shown by FirstLight to be consistent with the designated water quality standards for relevant segments of the Connecticut River. The stretch of the Connecticut River associated with the Turners Falls Dam and the Northfield Mountain Pumped Storage Project is listed as Class B waters, which are designated in accordance with 314 CMR 4.05(3)(b) "as habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation." Importantly, and of relevance to the pending 401 application, the entire Massachusetts part of the Connecticut River upstream of the Turners Falls Dam is listed as impaired in the 2022 Massachusetts Integrated List of Waters. The stated impairments in the upper 3.5-mile section of the

Turner Falls Impoundment (TFI) are indicated to be due, at least in part, to "alteration in streamside or littoral vegetative covers" and "flow regime modification".[2] Similarly, the segment of the Connecticut River from the Route 10 bridge to the Turners Falls dam is also considered to be impaired, in part, for the same reasons "alteration in streamside or littoral vegetative covers" and "flow regime modification".

The combination of the two causes of impairment identified above are not commonly designated in Massachusetts and would appear to be specific to the Turners Dam impoundment and pumped storage project operations. The role of First Light's operations on erosion has been consistently identified in comments by various experts indicating that project operations contribute or exacerbate erosion in the TFI. However, FirstLight's application for this WQC states that "[a] consistent finding throughout all the erosion evaluations conducted during relicensing is that the dominant causes of erosion in the TFI are high flows/floods and, in the Barton Cove area, boat waves. Project operations is not a *dominant* cause of erosion at any locations in the TFI but is a contributing cause of erosion in the following locations of the TFI in Massachusetts: in: (1) an approximately 21,600-foot-long reach from the exit of Barton Cove to the French King Gorge (both sides of the river), and (2) an approximately 4,700-foot-long reach on river right upstream of the Northfield Mountain tailrace."[3] Based on work done on an earlier report by Princeton Hydro[4] and review of other reports regarding the TFI including reports

[2] Final Massachusetts Integrated List of Waters for the Clean Water Act 2018/2020 Reporting Cycle. November 2018-2021. Watershed Planning Program.
http://www.mass.gov/eea/agencies/massdep/water/watersheds/total-maximum-daily-loads-tmdls.html
[3] FirstLight. April 22, 2024. Prepared for: FirstLight. Northfield, MA: Author. April 22, 2024. Turners Falls Hydroelectric Project (FERC No. 1889) Northfield Mountain Pumped Storage Project (FERC No. 2485) 401 Water Quality Certificate Application.
[4] Wildman, L., Woodworth, P., & Daniels, M. (October 2016). Peer-Review of Relicensing Study 3.1.2 Northfield Mountain / Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability Study Report.

by the US Army Corps of Engineers (1979)[5], Field Geology Services[6] (2007) and, most recently, Dr. Evan Dethier (2024)[7] we remain unconvinced that FirstLight's position indicating that operations do not have a significant or dominant role in the impoundment's erosion issues is accurate. Dethier (2024) states that "There is substantial evidence of erosion in the Turners Falls Impoundment (TFI), much of it consistent with fluctuations in water level due to dam operations. Several reports and memos, including by the US Army Corps of Engineers, Field Geology Services, and Princeton Hydro, have already established that water level fluctuations in the TFI can, and do, enhance erosion in the reservoir."

Impacts on bank stability and water quality associated with the operations of pumped storage facilities such as TFI have been documented for many years. For example, in a 1982 document by the US Army Corps of Engineers states "[o]perating a reservoir in a peaking mode, that is, controlling releases to match peak energy demands, creates another level of impacts within the reservoir and downstream of the dam. Reservoir fluctuations cause many biological impacts in addition to the aesthetic and recreational nuisance of the exposed drawdown zone."[8] This publication goes on to state "**[l]arge seasonal or diurnal fluctuations in water level primarily affect the stability of the shoreline substrate and water quality** (emphasis added)."[9] A 1981 report by Dames

[5] U.S. Army Corps of Engineers, 1979, Report on Connecticut River Streambank Erosion Study: Massachusetts, New Hampshire and Vermont: Department of the Army New England Division Corps of Engineers: Waltham, MA, 185 p.
[6] Field (Field Geology Services), 2007, Fluvial geomorphology study of the Turners Falls Pool on the Connecticut River between Turners Falls, MA and Vernon, VT: Unpublished report prepared for Northfield Mountain Pumped Storage Project, 131 p
[7] Dethier, Evan May 19, 2024, Review of Erosion in the Turners Falls Impoundment Prepared for the Connecticut River Conservancy and Franklin Regional Council of Governments. 53 pages
[8] United States Army Corps of Engineers. March 1982. National Hydroelectric Power Resources Study, Environmental Assessment. Institute for Water Resources, Kingman Building, Fort Belvoir, Virginia 22060. Page 3-7.
[9] id

and Moore describes the adverse effects of reservoir water-level fluctuations during hydropower operations and indicates impacts such as "**degradation of wetland habitats above the dam; with bank erosion".**[10] In a more recent 2020 publication by Saulsbury, he states "[b]oth open-loop and closed-loop PSH (pumped storage hydropower) pumping and generating operations may affect geology and soils primarily due to large and frequent reservoir water-level fluctuations and resulting shoreline erosion. These impacts may be higher at open-loop projects such as Northfield Mountain, including add-on projects where the lower reservoir was already constructed for other purposes, because of the potential effects of their shoreline erosion and resulting sedimentation on the naturally flowing water bodies to which they are connected. [11] Evan Dethier stated that "[t]he current project operational range for reservoir levels exacerbates erosion relative to a narrower range by exposing a large swath of the reservoir banks to erosive properties and raising the "base-level" for natural flooding, adding to flood heights and thus erosive power."[12]

It is, however, interesting that the operations of other pumped storage facilities are often linked to erosion, but FirstLight asserts that the TFI is somehow not. FirstLight's claim that the predominant impacts on riverbank stability stems from "natural" high flows and boat traffic wake is questionable. There is nothing natural about the TFI. The simple existence of the TFI and pumped storage operation already creates a baseline of

[10] Dames and Moore. 1981. *An Assessment of Hydroelectric Pumped Storage*. In *National Hydroelectric Power Resources Study*. Volume X. Prepared for the U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia. https://www.iwr.usace.army.mil/portals/70/docs/iwrreports/iwr019-000001-000517.pdf

[11] Saulsbury, J.W. A Comparison of the Environmental Effects of Open-Loop and Closed-Loop Pumped Storage Hydropower; Pacific Northwest National Lab. (PNNL): Richland, WA, USA, 2020.

[12] Dethier, Evan May 19, 2024, Review of Erosion in the Turners Falls Impoundment Prepared for the Connecticut River Conservancy and Franklin Regional Council of Governments. Page 52.

complex anthropogenic impacts to the hydrology of the Connecticut River that has little in common with a natural river system. The artificial elevation of the river correspondingly elevates the adjacent groundwater all along the TFI, while the Northfield Mountain pumped storage system adds the variability of the water surface elevations in the TFI daily. At a minimum, these artificial elevations of the TFI section of the Connecticut River influence every instance of bank failure.

We commend MassDEP on its understanding and recognition of the issues associated with operations and erosion in the TFI as indicated in the following statement:[13]

> "…it is clear that project operations will continue to contribute to erosion in the TFI. It is difficult, however, to quantify the extent of that contribution. It is therefore necessary to establish erosion-related measures in the WQC to address the existing impairments and to ensure compliance with the SWQS. The measures are intended to balance the limitations and difficulties of precisely determining erosion causation in the TFI with the need to address existing erosion and impairments and monitor for and address any future erosion. The SWQS require that the existing and designated uses and the necessary water quality be maintained and protected and that they be free from solids, color, and turbidity that would be aesthetically objectionable, impair any use, or impair the benthic biota or degrade the chemical composition of the bottom."

[13] Mass DEP, (Draft) Water Quality Certification with Conditions, 2025. Page 41 of 117.

It is in this light that our comments focus on the issues associated with reliance on a dated erosion and sediment control plan, the 2013 Full River Reconnaissance (FRR) Quality Assurance Plan[14]. It is also important to acknowledge that the 2013 FRR avoids the identification of issues related to operations such as the absence of vegetation and bank instability as contributing to water quality impairment.

We have significant issues concerning the Draft WQC and the proposed use of the 2013 Full River Reconnaissance Report (2013 FRR) and the associated Quality Assurance Project Plan (QAPP) to guide Special Condition 25, which is detailed in Appendix F, of the Draft 401 WQC. Failure to use objective, quantitative metrics to determine the causes of bank instability and loss of shoreline vegetation will not contribute to the development of consistent water quality improvements. Specifically, our concerns are summarized below and then described in more detail in the following pages.

1. **The methods in the 2013 FRR and its QAPP warrant an update, especially considering MassDEP's understanding that operations play a key role in the erosion as well as bank instability and the absence of shoreline vegetation within the impoundment.** Since 2013, technology has advanced and reduced survey and monitoring costs. For example, unmanned aerial vehicles (UAV) or helicopter LiDAR surveys can accurately survey and provide repeatable, defensible documentation. This technology would provide a complete survey of the entire impoundment; including the measurement of elevations with as

[14] Simons & Associates and New England Environmental (2012), Quality Assurance Project Plan, 2013 Full River Reconnaissance Turners Falls Impoundement of the Connecticut River, October 29, 2012.

small an interval as several inches and can document and calculate vegetative cover.

2. **The 2013 FRR is too focused on visual indicators of erosion and fails to place much, if there is any, emphasis on bank instability that is more related to operations.** Appendix D of the 2013 QAPP proposes to use reference photographs to estimate bank heights, slopes, soils/sediment types, vegetative cover, and erosion. However, as will be discussed, the proposed use of photographs, and subjective and inconsistent metrics which will only provide inaccurate/inconsistent judgements of the condition of the slopes. While the conditions for "erosion" are noted, they do not include global stability and deep-seated failures, such as slides, that are clearly shown in the photographs but downplayed in the descriptions.

3. Because the FERC license has a 30 to 50-year life span, **the Final WQC must have provisions to update survey methods as technology is developed to further improve the accuracy, repeatability, and defensibility of data collected.**

4. **The formation of a panel of experts, with equal voting rights, must be included as a requirement of the Final WQC to evaluate developing trends in surveying, monitoring, and mitigation techniques and technology**. At a minimum, the panel would consist of representatives from MassDEP, FirstLight, Franklin Regional Council of Governments, CRC, Connecticut River Streambank Erosion Committee, and their respective experts to evaluate the progress of monitoring, conditions of the river and its banks, and make recommendations to ensure protection of the water quality of the Connecticut River.

5. In Appendix F of the Draft 401 WQC, the determination of how much bank stabilization needs to be completed is vague, at best, and from what we can interpret of **the requirement to repair 5% of a failed riverbank will be meaningless regarding protecting water quality.**
6. In Appendix F of the Draft 401 WQC, MassDEP is proposing that FirstLight repair newly eroding sites. **The provision to allow five (5) years to implement bank stabilization measures provides permission for FirstLight to violate the MA Water Quality Standards for that period, when sediment and nutrients contained in the sediment will continue to discharge to the Connecticut River.**

Comments on <u>Monitoring</u> within the Draft WQC Appendix F, Erosion, Stabilization, and Monitoring Plan

After a thorough and thoughtful review of all the documents and comments submitted regarding FirstLight's application for 401 Water Quality Certification, MassDEP

> "finds it necessary to impose the erosion-related measures in Special Condition 25 for the Projects to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law. Accordingly, MassDEP imposes Special Condition No. 25."

Special Condition 25 relates to the Erosion Mitigation, Stabilization, and Monitoring Plan located at Appendix F of the Draft 410 Water Quality Certification. A comprehensive and current plan to address shoreline issues within the impoundment is essential to MassDEP's goal of improving impoundment water quality. It is vitally important that monitoring and

the resulting mitigation and stabilization measures be based on highly repeatable, defensible, and precise measures for determining the causation of shoreline and riverbank erosion and instability. Appendix F of the Draft 401WQC is relying upon the 2013 FRR in Study No, 3.1.1.[15] Appendix F of the Draft WQC and the 2013 FRR rely on metrics and methodologies that are dated in terms of the available remote survey technologies. In fact, the 2013 QAPP to Study 3.1.1 (included as Appendix D in the study report to 3.1.1) relies upon references photographic/video georeferencing and global positioning systems (GPS) equipment that has been surpassed in technological development.

Frequency of Observations

One area for which we mostly agree with the proposed monitoring plan is the frequency of field observations. According to the 2013 QAPP, FERC requires FirstLight to conduct FRRs every 3- 5 years[16], however, the Draft WQC states that Erosion Monitoring Surveys will be conducted in years 2, 10, 20, and 30[17], while Boat-Based Inspections are to be conducted in years 4, 6, 8, 12, 15, 25, 35, and 45[18]; leaving a 10 year gap between years 35 and 45, and no inspections at year 50. MassDEP would be better served by requiring inspections at consistent intervals, with three (3) years for the life of the FERC License as the standard for scheduled surveys. Such consistency will allow for the identification of riverbank change over time. As will be described below for improvements to monitoring, in addition to the years specified above (whichever is determined to be correct), a baseline survey must be completed in the first year of the issuance of the FERC license, and it would be beneficial to provide additional FRR surveys

[15] Simons & Associates and New England Environmental (2012).
[16] Simons & Associates and New England Environmental (2012). Page 5 of 38.
[17] Mass DEP, (Draft) Water Quality Certification with Conditions, 2025. Page 107 of 117.
[18] Mass DEP, (Draft) Water Quality Certification with Conditions, 2025. Page 108 of 117.

following major storm induced flooding, such as those caused by hurricanes, tropical depressions, and other major flooding events. In addition to consistent frequency of surveys, It is imperative that these surveys are conducted at a level as to be accurate, replicable, and defensible in the eyes of MassDEP, using modern methods (further described below). Without this, the proposed FRR monitoring plan is unenforceable due to the vagueness and lack of detail to be obtained.

Equipment included in the 2013 QAPP

None of the equipment and observation methodology described in the 2013 QAPP is adequate for accurately determining the progression of bank failure when it occurs. The proposed equipment to be used in the assessment of the TFI's riverbank conditions only provide support for the location where qualitative and subjective (see below for comments on the bank condition classification system) observations are made and are not repeatable in terms of understanding monitoring of the changes in topography are made, especially to those movements that would otherwise reveal that a slope is mobilized.

Trimble Geoxt Sub-Meter GPS Specifications – Appendix A of the QAPP specifies a Trimble submeter accurate GPS product, and the version of this model from 12 years prior. Due to reductions in cost of equipment and increased access to reference GPS stations, submeter accuracy systems have been supplanted by sub-centimeter/survey grade Real Time Kinematic (RTK) GPS equipment to allow for detailed surveys rather than simple locating of points of observations. Current technology allows for the collection of sub-centimeter accuracy elevations to be collected directed on the slopes with relative ease. This would provide MassDEP with a clearer

understanding of how the riverbanks are responding to hydropower operations.

Laser Range Finder Equipment Specifications – Appendix B of the QAPP includes a product brochure for a LTI TruPulse 360B range finder. These range finders are handheld and subjective in terms of where on a slope, for example, a distance is measured. The manufacturer's specifications included in this appendix state that the accuracy of the device is +/- 1 ft (this means that a distance could be 2 feet off), with an inclination and azimuth accuracy of +/-0.25 degrees and +/-1 degree, respectively. The accuracy combined with the inconsistent measurement points chosen on a slope at each event, will not provide useful information on changes in elevations and slopes, especially where a slope is already failing, but in slow progression between survey events.

Red Hen Systems - A quick search on the internet for the "Red Hen Systems Geo-Referenced Video Mapping" equipment included as Appendix C of the QAPP, reveals the latest website reference to this equipment is dated 2016. It is not clear that this equipment can be purchased or serviced/calibrated by Red Hen Systems, if they are no longer in business. This equipment may have been made obsolete with the advent of georeferenced smart phone photographic technology, but even then, all these systems provide is a location for where the photographs were taken.

Riverbank Classification Reference Photographs

Appendix D of the 2013 QAPP includes a proposed classification system to assess the Upper Riverbank Slope, Lower Riverbank Sediment, Upper Riverbank Height, Upper Riverbank Vegetation, Lower Riverbank Vegetation, and Extent of Current Erosion. On the last page of Appendix D (and of the entire document) it states:

> *NOTE: All quantitative classification criteria (e.g., slope, height, vegetation, extent, etc.) will be based on approximate qualitative estimates made during field observations of riverbanks. The FRR is a reconnaissance level survey that will not include quantitative field measurements of characteristics. Photographs contained in this appendix will be used for reference checking in the field to ensure consistent and accurate data classification.*

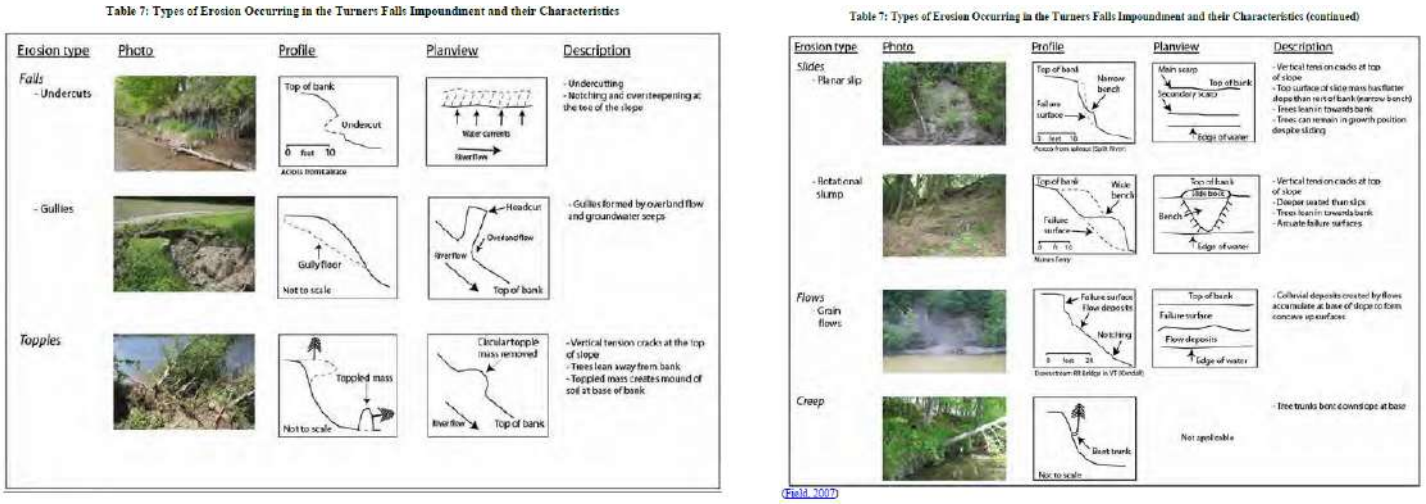


Figure 1 Table (sic) 7 from the 2013 QAPP. While labeled as erosion, it is actually depicting bank stability and failure mechanisms, both caused by erosion, as well as other factors such as loss of vegetation and rapid drawdown of the impoundment.

This statement is contradictory in that it claims to be "quantitative," but subsequently qualifies that word using the phrase "approximate qualitative estimates" (each of these three words used are subjective). This note goes further to admit that the "…FRR is a

reconnaissance level survey that will not include quantitative field measurements of characteristics." **There will be absolutely no way to determine if there has been any degradation of riverbanks, unless there are massive changes or catastrophic failures that would by then negatively impact water quality by introducing significant quantities of sediment to the river.** There is the potential for significant variation in observations, both from the same individual over time, and from different individuals conducting the surveys. **Human errors must be eliminated in the documentation as much as possible. Based on current technology, these surveys should be done more rigorously and with repeatability/replicability.**

Additionally, while mass failures of the slopes were depicted within Table 7 of the 2013 QAPP (Figure 1), none of these failure mechanisms were included as one of the parameters in the classification photographs in Appendix D of the QAPP.

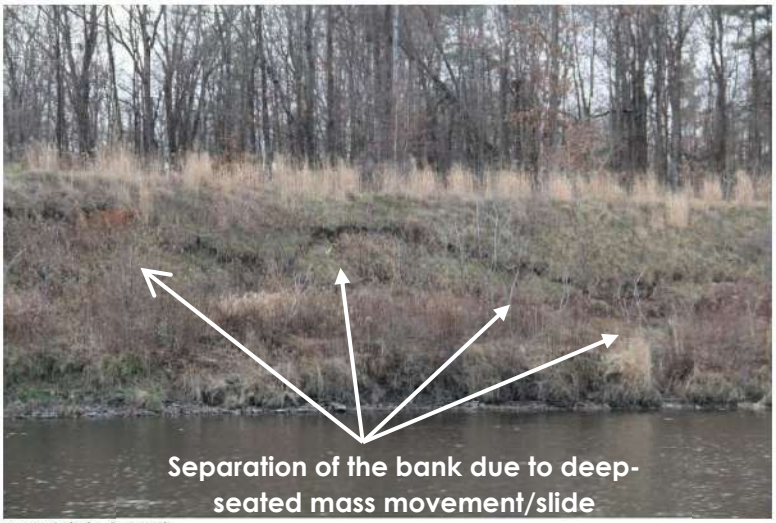


Figure 2 "Extent of Current Erosion" identified as "none/little (<10%)" in Appendix D of the QAPP. Arrows pointing to surface evidence of separation, and circle illustrates the portion sliding into the river. "rotational slump" per Table 7 (See Figure 1, above).

The example photographs and their corresponding "classification" focus on erosion and not mass failures of the riverbanks. A prime example of the inconsistency in the example photographs included in Appendix D, is illustrated in Figure , where the "Extent of Current Erosion" is identified as "none/little (<10%)". This figure

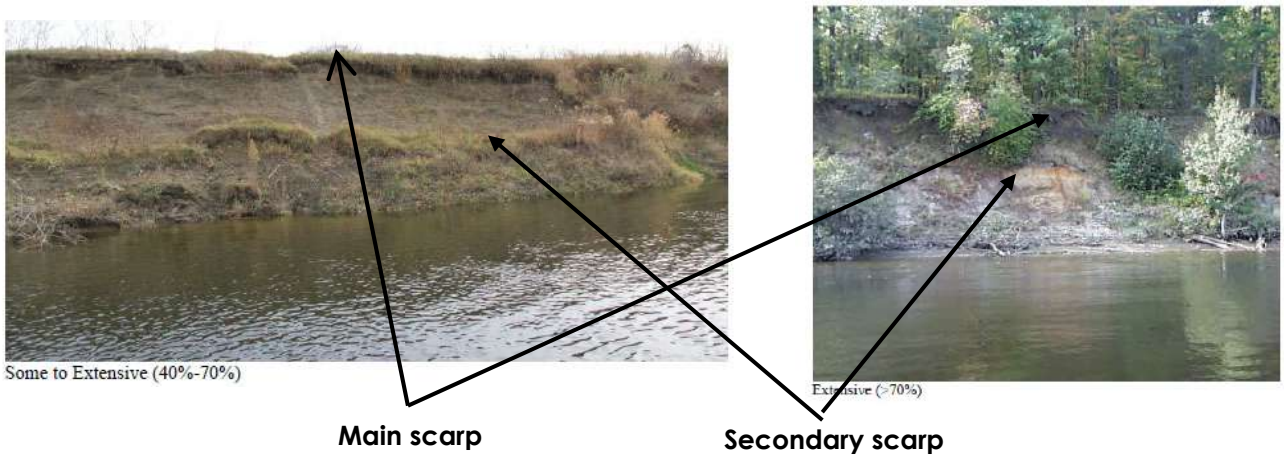


Figure 3 Two photographs depicting "planar slip" as per Figure 1 above. These two have the same failure mechanism and would both be considered "extensive" by this author. It is unclear as to how the preparer of the QAPP determined which one was more extensive, unless they based it on vegetative cover, which would be a different category.

clearly shows the initiation of a deep-seated bank failure as shown in the arch shaped separation, highlighted. This bank should have been identified as "extensive."

Another example is illustrated in Figure 3, wherein the failure mechanisms are identical, yet having various levels of severity for the same condition illustrate the additional confusion that will result when the surveys are completed, and MassDEP will be tasked with enforcement of the WQC.

Updated Requirements of Technology for Use in Monitoring, combined with Modeling

The subjectivity and outdated survey methods proposed in the 12-year-old FRR and its QAPP must be updated and improved to accurately define the existing conditions of the Connecticut River's banks. Otherwise, MassDEP will not have the data and information to adequately enforce the requirements of the WQC and improve the state's water quality.

Due to the advancement and cost efficiency of LiDAR technologies for use in the monitoring of rivers and bank stability, obtaining riverbank topographic data and vegetative cover, even over an impoundment as long as one behind the Turners Falls Dam, is strongly recommended. Such data to be collected will be an initial baseline flyover via drone or helicopter survey to collect the above and below water surface slope

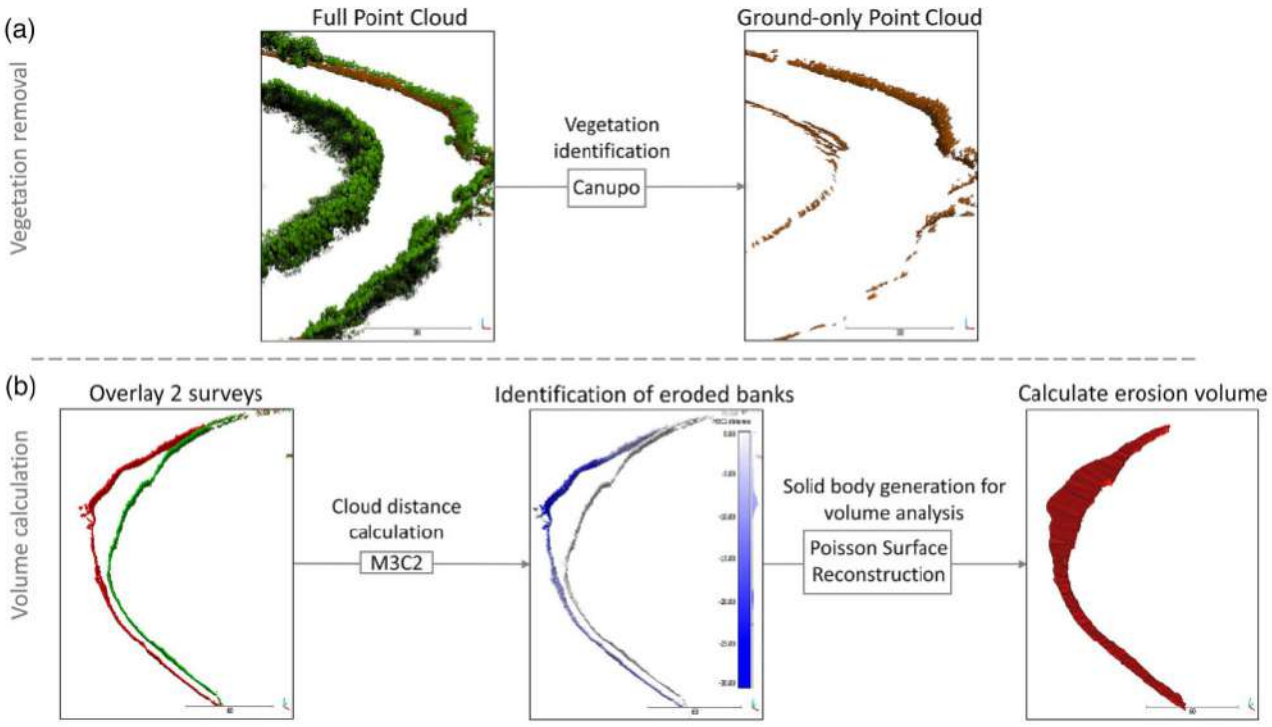


FIGURE 2 Schematic overview of the data processing workflow. Note that the bank segment shown in figure (a) (vegetation removal) differs from the bank segment shown in figure (b) (volume calculation) because areas with considerable bank erosion are generally near-vertical banks without vegetation cover—thus, different segments are best used to illustrate the two steps. [Color figure can be viewed at wileyonlinelibrary.com]

Figure 4 Illustration of the ability of the use of LiDAR to accurately assess vegetation cover and slope/volume changes of riverbanks.

Haddadchi, A., Bind, J., Hoyle, J., & Hicks, M. (2023). Quantifying the contribution of bank erosion to a suspended sediment budget using boat-mounted lidar and high-frequency suspended sediment monitoring. *Earth Surface Processes and Landforms*, 48(14), 2920–2938. https://doi.org/10.1002/esp.5667

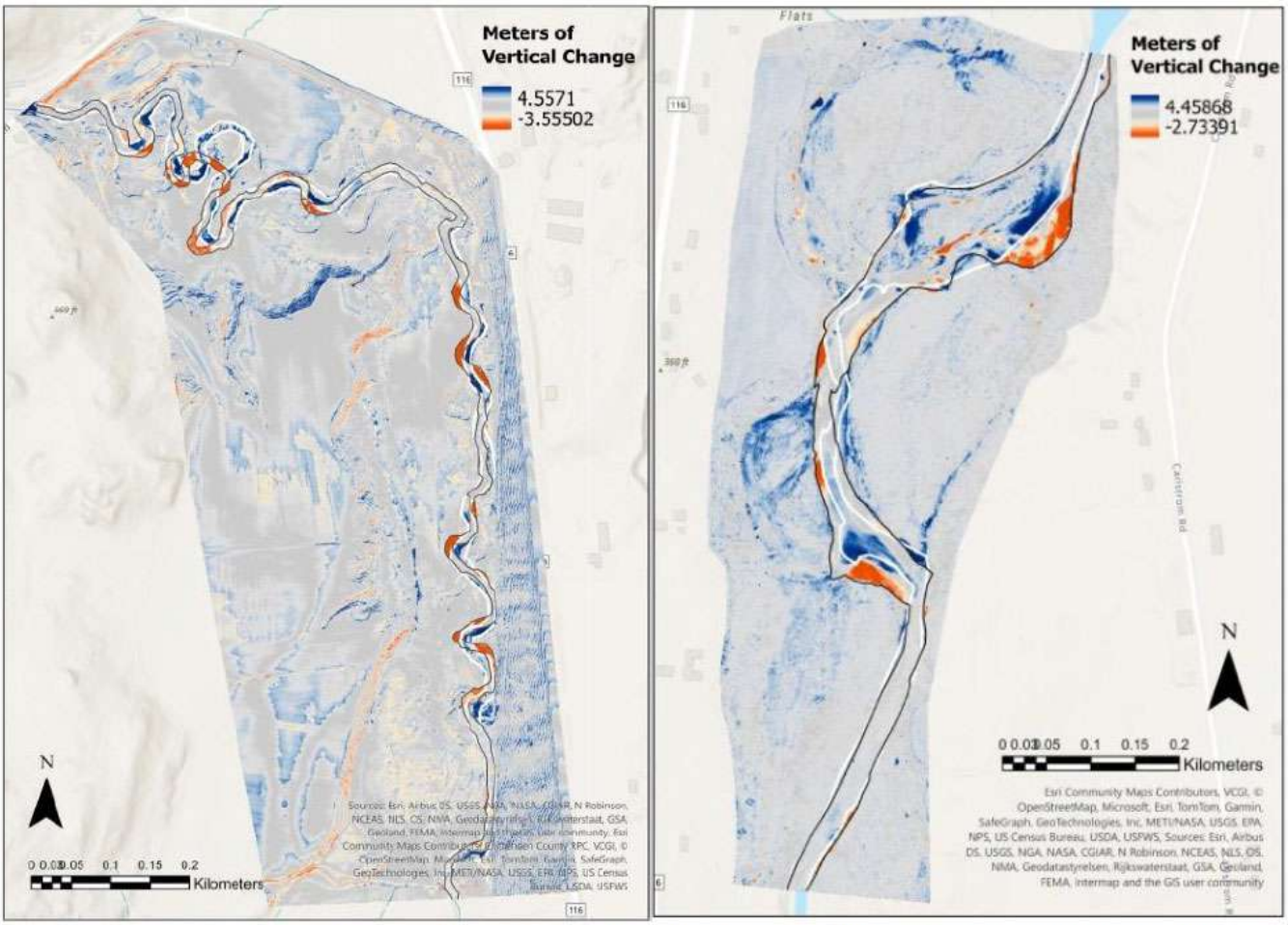


Fig 3. The Lewis Creek DoD (left) and New Haven River DoD (right). The black outline represents the 2023 stream channel boundary, and the white outline shows the older channel boundary. Polygons representing the extent of bank erosion were drawn in between the channel boundaries where the new channel was outside the older channel.

Figure 5 Another illustration of the ability of the use of LiDAR to accurately assess vegetation cover and slope/volume changes of riverbanks.
Flanzer, Zoe C., "Examining Variability in Streambank Erosion Rates in the Lake Champlain Basin, Vermont" (2024). *UVM College of Arts and Sciences College Honors Theses*. 129. https://scholarworks.uvm.edu/castheses/129

conditions. Such data can be used to identify existing slope movements and vegetative covers. Such a survey would be completed at the same frequency as the "Boat-Based Inspections" and the "Erosion Monitoring Surveys." It is also strongly recommended that the LiDAR survey be conducted on or about the effective date of the renewed FERC

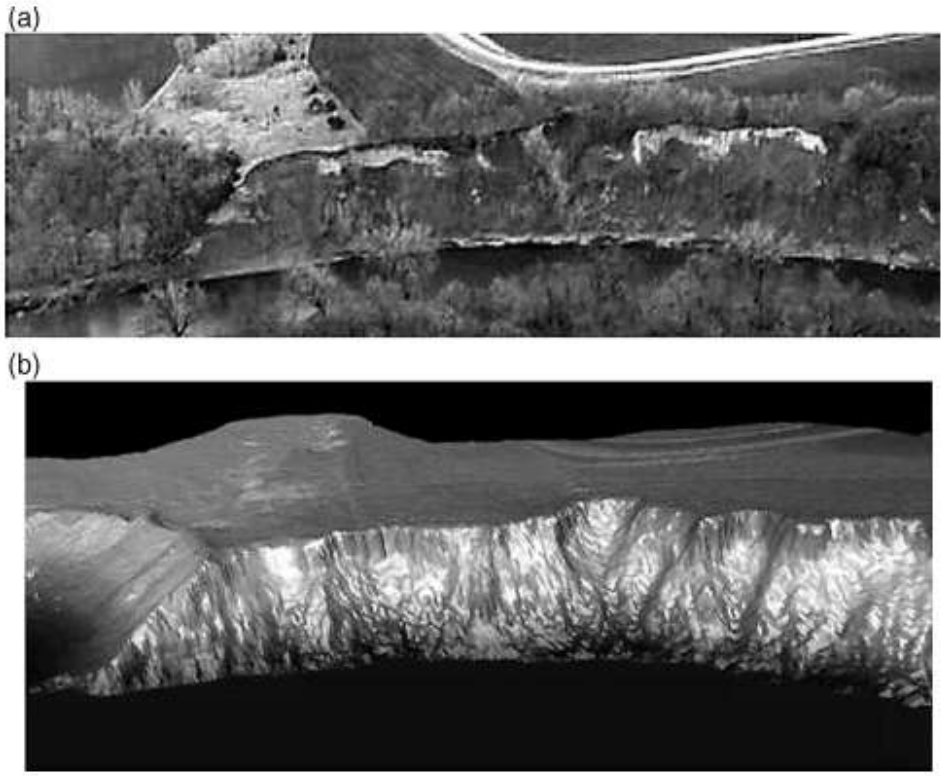


Fig. 2. (a) A severely eroded site along the Blue Earth River photographed at an oblique viewing angle from the air, and (b) rendered as a bare-earth elevation model from the LIDAR data. Vegetation was filtered and points gridded to a 1 m interval in the LIDAR image to create the model. Note gravel road passing through fallow field for scale in both figures.

Figure 6 The use of LiDAR from oblique angles to evaluate the overall stability and areas of failures on riverbanks.

Thoma, D. P., Gupta, S. C., Bauer, M. E., & Kirchoff, C. E. (2005). Airborne laser scanning for riverbank erosion assessment. *Remote Sensing of Environment, 95*(4), 493–501. https://doi.org/10.1016/j.rse.2005.01.012

license to obtain baseline conditions, and after significant flooding events such as flooding caused by tropical storms, nor'easters, or summer catastrophic storms such as have occurred over New England in the last two years. Subsequent years can be precisely overlain over prior years to calculate changes in slope elevations to evaluate if there is displacement or erosion of the riverbanks, as well as understanding the volume of sediment that is discharging into the TFI. Especially following significant flooding, the impacts between regional storm events versus bank instability caused by operations can be distinguished. The accuracy of LiDAR surveys is impressive, and can collect elevation

data, accurate to within 0.06 meters[19], and would be much more reliable than simple, subjective observations (Figure 4, Figure 5, and Figure 6). In fact, the LiDAR technology can obtain topographic data to depths of up to 15 meters, depending on water clarity, which would provide a more complete understanding of erosion and stability occurrences.[20] The ability to obtain topographic data below the water surface would allow for the comparison of surveys over time, regardless of the water depth.

In consulting with remote sensing/survey firms who conduct such services, each survey, including analysis and reporting can be completed for less than $50,000 in 2025 dollars, providing MassDEP and the public with a more comprehensive, quantitative assessment of the stability of the riverbanks and the vegetative cover that adds to river stability. Such a cost would be comparable, if not less costly than ground surveying the limited number of river sections previously completed to determine the overall stability of slopes within the subject impoundment.

In addition to monitoring using remote sensing technology, the causation of loss of vegetation, bank instability, and erosion can be corroborated by using a 2-dimension model such as the US Army Corps of Engineers, Hydraulic Engineering Center, River Analysis System (HEC-RAS).[21] This model, which is free to the public, and a universal modeling software of river hydraulic modelers, would be used to evaluate river flow patterns because of baseflow, natural flooding, and hydropower operational changes

[19] Tamimi, Rami & Toth, Charles. (2024). Accuracy Assessment of UAV LiDAR Compared to Traditional Total Station for Geospatial Data Collection in Land Surveying Contexts. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences. XLVIII-2-2024. 421-426. 10.5194/isprs-archives-XLVIII-2-2024-421-2024.

[20] LiDAR survey below the water surface is also referred to as "blue LiDAR", referring to the blue-green wavelengths used to obtain below water surface data.

[21] U.S. Army Corps of Engineers. HEC-RAS River Analysis System, Version 6.6: User's Manual. Davis, CA: Hydrologic Engineering Center (HEC), 2024.

in flow patterns to compare to areas where there is found to be riverbank instability. The comparison of the model to the surveys would allow for a significantly higher level of accuracy and precision in determining whether a riverbank failure is caused by operation of FirstLight's projects or natural processes.

Comments on Stabilization and Mitigation within the Draft WQC Appendix F, Erosion, Stabilization, and Monitoring Plan

Repair & Stabilize Certain 2013 FRR Sites

The proposed plan indicates that "within 6 years of license issuance, the Licensee shall repair and stabilize all previously stabilized sites in the TFI where the 2013 Full River Reconnaissance (2013 FRR) identified erosion, and the sites have not already been repaired since 2014. These sites include bank segments 14, 371, 65, and 478 that were delineated during the 2013 FRR, equaling approximately 429 linear feet." Although we concur that the repair of existing stabilization sites is important to improving water quality in the impoundment, stabilization projects should be reviewed by an expert panel that includes key stakeholder groups as well as FERC and MassDEP, to minimize the chance of future failures. As indicated by MassDEP "hydropower operations contribute to erosion by raising and lowering the water surface elevation more frequently and significantly than natural fluctuations." It is related to the additional stress associated with operations that may make certain types of streambank stabilization unsuitable for TFI. For example, daily water surface fluctuations can create a stressful environment for vegetation and thus preclude the colonization and successful establishment of stabilizing vegetation. The lack of vegetation at the toe of the bank or the lower bank within the impoundment may be directly associated with stresses associated with daily water surface fluctuations.

The lower bank is typically a flat, beach-like feature that in many ways is like that of a tidal marsh where the absence of vegetation is related to the duration of inundation. As such, reliance on plant material to stabilize or assist in the stabilization of the banks of the impoundment may not, at least in some areas of the impoundment, be a viable option. **A thorough and objective understanding of the causes of erosion at a particular location is essential for the development of future designs that will provide long term stability and improve water quality.**

Additional New Sites to be Stabilized

The proposed draft certification indicates that "[i]n addition to the completed stabilization projects noted above, within 6 years of license issuance, the Licensee shall implement stabilization or preventative maintenance projects at three additional sites within the TFI, which equate to an additional 667 linear feet. These sites were identified during the 2013 FRR as having the most erosion of the banks within Massachusetts that had not already been stabilized. These sites include bank segments 90, 87, and 119 that were delineated during the 2013 FRR, equaling approximately 667 linear feet."

We concur that the stabilization contemplated for previously unrestored highly eroded banks is important to the water quality of the impoundment banks. We continue to be concerned that the design will be appropriate for the long-term stability of the banks in the face of the highly modified hydrology of the TFI. As indicated in the previous comment, it is our recommendation that MassDEP and First Light establish a stakeholder group to provide feedback on any stabilization design contemplated for the highly eroded section of the impoundment.

Future New Stabilization Sites

The proposed draft certification indicates that [s]ites that are newly identified after issuance of the license as exhibiting 'Some to Extensive' or 'Extensive' erosion based on the definitions contained within the 2013 FRR and which were not previously repaired or stabilized by anyone nor identified above in Table 1, shall be repaired and stabilized by the Licensee within 5 years of their discovery during the Erosion Monitoring Surveys or the Boat-based Site Inspection, subject to the following "limitations."

The limitations of this condition will be discussed later. The identification of newly identified erosion areas exhibiting "some to extensive" or "extensive erosion" based on definitions created in the 2013 Full River Reconnaissance Study and Quality Assurance Project Plan (2013 FRR)[22] limits the types of newly eroded banks to those that have substantially more than a minimal amount of erosion and more realistically define bank failure. Based on the definitions referred to in the 2013 FRR, "Some to Extensive" erosion is assigned to those riverbanks "where the total surface area of the bank segment has approximately 40-70% active erosion present" (see Figure 3) while riverbanks with extensive erosion is assigned to those banks "where the total surface area of the bank segment has approximately more than 70% active erosion present" (See Figure 3) . This would seem to indicate that the newly identified areas erosion subject to this component of the plan would, at a minimum, fall into the 40-70% active erosion class to qualify as new and require stabilization within 5 years of their discovery. Both the "some to

[22] 2013 FirstLight Full River Reconnaissance Study and Quality Assurance Project Plan. August 14, 2013. Prepared by: Simons & Associates and New England Environmental. Prepared for: FirstLight Power Resources Services, LLC c/o FirstLight Hydro Generating Company 99 Millers Falls Road Northfield, MA 01360. https://www.northfield-relicensing.com/content/Documents/RSP%20Volume%202%20-%20Appendix%20D.pdf

extensive" and "extensive" erosion categories shown as examples in the FRR represent areas of substantial bank instability. lin order to improve the water quality of the impoundment areas of significant bank failure and erosion should not have to wait up to five years to be stabilized and warrant prioritization for stabilization.

The Draft WQC indicates one of the limitations related to the stabilization of new erosion areas is related to the amount of stabilization required and the time in which it is to be done. The draft certification states that "[t]he Licensee shall be responsible for repairing 5% of the total new bank segments identified in the intervals between each of the Erosion Monitoring Surveys (Years 2, 10, 20, and 30), regardless of whether they were identified during the above Boat-based Inspections or the Erosion Monitoring Surveys. New bank segments revealing 'Some to Extensive' or 'Extensive' erosion includes any segment not previously stabilized or in Table 1. Following each Erosion Monitoring Survey, the Licensee shall quantify the total linear feet of new bank segments that were identified either during the Erosion Monitoring Survey or during preceding Boat-based Site Inspections as exhibiting 'Some to Extensive' or 'Extensive' erosion. First, the requirements for stabilizing new erosion sites are limited to requiring the stabilization of only 5% of newly eroded riverbank. So, does this mean if a 100-foot section of extensive erosion is identified FirstLight is only responsible for stabilizing 5 feet of riverbank? If the section of riverbank identified as having extensive erosion is 1,000 feet long is the stabilization limited to 50 feet? If these examples, based on how this percentage of eroded riverbank to be stabilized is to be interpreted, then it must be understood that the remaining 95% of these eroded segments of riverbank would lack stabilization and continue to be a source of pollutants to the impoundment. With this approach it seems doubtful that improved water quality in the impoundment is attainable.

Although the Draft WQC includes a caveat the allows MassDEP to determine whether the linear foot equivalent of 5% will not provide a significantly improved stream bank condition, they may reserve the equivalent linear feet for use in the future. This approach would thus be more significant in those cases where longer sections of severe bank erosion are to remain unstabilized and serve as a continued source of sediment into the impoundment. This does not seem like an appropriate solution to improving the water quality of the impoundment.

Need for Connecticut River Stakeholder Panel

It is important that, especially as this next FERC license will be in effect for the next 50 years, periodic reviews of the latest technological advances for monitoring riverbank stability, and reviews of the effectiveness of the stabilization and mitigation measures be conducted. It is strongly recommended that a panel of stakeholders be established that would include MassDEP, FirstLight, Franklin Regional Council of Governments, CRC, Connecticut River Streambank Erosion Committee, the affected towns, their respective experts, and other parties that may be warranted. The panel would meet to coincide with monitoring events to review the current conditions of the impoundment water quality, bank stability, and erosion, and have discussions on the implementation of "state of the art" technology to ensure that the monitoring program is following.

Conclusion

As previously stated, we commend MassDEP for its understanding of the issues associated with operations and erosion in the TFI. MassDEP's inclusion of project operations as a contributing element to erosion in the TFI is important. However, compliance with the SWQS should not be based on an outdated erosion and sediment

control plan, the 2013 Full River Reconnaissance (FRR) and its Quality Assurance Project Plan. This plan is qualitative in nature and avoids the identification of issues related to operations such as the absence of vegetation and bank instability that contribute to water quality impairment. The need to implement a viable plan to address erosion and bank instability in the TFI is related to MassDEP's stewardship of the water quality within the impoundment. MassDEP's position that "project operations will continue to contribute to erosion in the TFI" is important to any plan designed to improve the water quality of this currently impaired waterbody in the future. Although MassDEP acknowledges that it is difficult to definitively quantify the causes of erosion in the TFI the Draft WQC also concludes that it is nonetheless "necessary to establish erosion-related measures in the WQC to address the existing impairments and to ensure compliance with the SWQS." The draft certificate states "SWQS require that the existing and designated uses and the necessary water quality be maintained and protected and that they be free from solids, color, and turbidity that would be aesthetically objectionable, impair any use, or impair the benthic biota or degrade the chemical composition of the bottom." However, the key to improving water quality in the impoundment in the future is related to the design and implementation of a new plan that addresses all the riverbank issues related to bank instability, lack of riparian vegetation and erosion.

The following changes and improvements must be made to ensure that the causes of riverbank instability and impacts to the water quality of the Connecticut River are understood, or the application for the MA Water Quality Certificate must be denied.

1. Develop an updated Erosion Control Monitoring Plan and QAPP that has, at a minimum, the following components:
    a. the use of modern equipment, high accuracy survey techniques, such as LiDAR (upland survey and bathymetry[23]) to replace the subjective river observation techniques in the 2013 QAPP.
    b. a process for MassDEP to require updated survey equipment and methods as technology and riverine processes are advanced over the next 50 years.
    c. methods and clearer references to document observed erosion features and bank stability features.
    d. require full impoundment surveys using LiDAR obtained via UAV or helicopter surveys, with follow up localized land-based observations and surveys to further analyze areas suspected of becoming destabilized. This survey would be used to provide accurate, or at least, precise physical measurements to supplement the boat-based photo surveys, which as we described above, are subjective and inconsistent in their categorization in the existing form of the 2013 FRR QAPP. While not discussed above, in the alternative, there is boat-based LiDAR technology that could be used to

[23] Bathymetry is defined as the measurement of underwater topographic surfaces.

survey the riverbanks, which would provide additional detail of areas where the toe of the slope has been undercut/undermined.

e. in addition to the already established history of the cross sections monitoring, there must be an ability to add cross sections when new areas of bank failure appear imminent or in process..

f. require consistent survey frequency of 3 years for the life of the FERC License, and add surveys following major flooding events, such as after hurricanes, tropical storms, nor'easters, and local storms that cause severe flooding in the TFI.

g. to corroborate the causes of erosion, use a HEC-RAS 2-D model that is calibrated to natural and operational flow impacts to areas identified as becoming destabilized during the surveys.

2. Ensure that the definition of "new erosion" in the Erosion Control Monitoring Plan is clear and expand the insignificant requirement of only requiring the stabilization of 5% of "newly eroded areas". Additionally, the surveys would be more appropriately conducted by a third-party survey/consulting firm, with expertise in fluvial geomorphology, hydraulics, and geotechnical engineering, be selected by a stakeholder panel (see recommendation 3, below) to ensure that a balanced collection of data is obtained to evaluate the causes of erosion and riverbank failure.
3. Create a stakeholder panel of experts, including MassDEP, FirstLight, Franklin Regional Council of Governments, CRC, Connecticut River Streambank Erosion Committee, the affected towns, their respective experts, and other parties, to review the results of surveys, recommend improvements to survey and modeling

methods, evaluate mitigation measures, and review how operations are affecting the goals of the MassDEP Water Quality Standards.

Thank you for the opportunity to comment on behalf of the Connecticut River Conservancy.

Sincerely,

Geoffrey M. Goll, P.E.
President
Princeton Hydro, LLC

Mark Gallagher
Vice President
Princeton Hydro, LLC

cc : FRCOG

EXHIBIT E

Franklin Regional Council of Governments

February 24, 2025

Elizabeth Stefanik,
MassDEP Bureau of Water Resources
100 Cambridge Street, Suite 900
Boston, MA 02114

Re: Northfield Mountain Pumped Storage Project No. 2485-071
Turners Falls Project No. 1889-085
Comments on FirstLight's 401 Draft Water Quality Certificate

Sent electronically via email to dep.hydro@mass.gov

Dear Ms. Stefanik and the MassDEP team,

The Franklin Regional Council of Governments (FRCOG) hereby submits comments on the January 24, 2025, draft 401 Water Quality Certification (WQC) for the Turners Falls Hydroelectric Project ("Turners Falls Project") owned by FirstLight MA Hydro LLC and Northfield Mountain Pumped Storage Project ("Northfield Mountain Project") owned by Northfield Mountain LLC. Collectively, we refer to the two facilities as "Projects" and the owner and operator as "FirstLight" or "Licensee." The issuance of a 401 WQC for the Projects is a critical step in this process that began over a decade ago when the FERC relicensing process started with the filing of the Pre-Application Document (PAD) on October 31, 2012. There is no existing 401 WQC for the projects and this 401 WQC will be in place for 50 years, a very long time.[1] Massachusetts Department of Environmental Protection (MassDEP) has broad authority under section 401 of the Clean Water Act to maintain or restore water quality to protect the existing and designated uses of the Connecticut River. It is critical that MassDEP issue a strong 401 WQC that will be relevant for operational patterns over many decades, and protective of habitat and water quality for the duration of the license.

FRCOG is a statutorily created regional service organization comprised of and serving the 26 municipalities of Franklin County, Massachusetts. The Connecticut River bisects Franklin County and is a major economic, recreational, and environmental resource for the residents of our member towns. For almost three decades, FRCOG (and its predecessor organization, the Franklin County Commission) and its Connecticut River Streambank Erosion Committee (CRSEC) have been actively involved with landowners and organizations concerned about the ongoing and extensive erosion in the Turners Falls Power Pool. The Federal Energy Regulatory Commission (FERC) recognized FRCOG's CRSEC in 1999 as an Ad Hoc Committee that would work with the power company to develop and

[1] We are aware that FERC can issue a license for a length of 30-50 years, and for the sake of brevity we are referring to the *proposed* license duration.

implement bioengineering bank stabilization projects pursuant to an Erosion Control Plan ordered and approved by the FERC.

FRCOG and municipalities in Franklin County have a significant stake in protecting the water quality of the Connecticut River and in ensuring that FirstLight's operation of the Projects meet water quality standards. Collectively, our communities have invested untold amounts of time and resources to protect and improve water quality through treating and managing stormwater and municipal wastewater, regulating the use of land, restoring habitat, and both regulating and educating our citizens to prevent pollution of the River. The Connecticut River is the lifeblood of our region and is vital to our economy and quality of life. We ask that MassDEP acknowledge and respect the role of local governments in protecting and improving the quality of the River in our corner of Massachusetts (particularly related to municipal wastewater treatment requirements), and to demonstrate the Commonwealth's shared commitment to the health of the Connecticut River by holding FirstLight accountable to operating the Projects in compliance with water quality standards.

Regulatory Framework

Massachusetts General Law (MGL) c. 21, §§ 26 through 53 charges MassDEP with the duty and responsibility to protect the public health and enhance the quality and value of the water resources of the Commonwealth. It directs MassDEP to take all action necessary or appropriate to secure to the Commonwealth the benefits of the federal Clean Water Act (CWA), 33 U.S.C. § 1251 et seq. The objective of 33 U.S.C. § 1251 et seq. is the restoration and maintenance of "the chemical, physical and biological integrity of the Nation's waters" 33 U.S.C. § 1251(a). To achieve the requirements, MassDEP has adopted the Massachusetts Surface Water Quality Standards that designate the most sensitive uses for which the various waters of the Commonwealth shall be enhanced, maintained and protected.

Under the Massachusetts Surface Water Quality Standards, 314 CMR 4.06, the Connecticut River from the Vermont, New Hampshire, and Massachusetts state line to the Turners Falls Dam is designated as a Class B warm water river. 314 CMR 4.05 (b) states that Class B "…waters are designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation… These waters shall have consistently good aesthetic value."

Section 305(b) of the CWA requires states to assess waters with respect to their attainment of designated uses such as habitat for fish, other aquatic life and wildlife, fish and shellfish consumption, and primary (e.g., swimming) and secondary (e.g., boating) contact-recreation. Section 303(d) of the CWA requires states to identify those waterbodies that are not expected to meet surface water quality standards. MassDEP fulfills those obligations by preparing an "integrated" list of waters. In the Massachusetts Year 2022 Integrated List of Waters, there are three different segments that make up the Turners Falls impoundment (TFI). All three are listed as impaired, as follows:

- **Segment 34-01** is the 3.5-mile segment between the Vermont/New Hampshire/Massachusetts state line and the Route 10 bridge. This segment is listed as impaired for alteration in streamside or littoral vegetative covers, flow regime modification, and PCBs in fish tissue.

- **Segment 34-02** is the 11.4-mile segment between the Route 10 bridge and the Turners Falls Dam, excluding Barton Cove. This segment is listed as impaired for alteration in stream-side or littoral vegetative covers, flow regime modification, water chestnut, and PCBs in fish tissue.

- **Barton Cove is MA34-122**, a 160-acre cove of the Connecticut River upstream of the Turners Falls Dam, is listed as impaired for curly-leaf pondweed, Eurasian water milfoil (*Myriophyllum spicatum*), fanwort, water chestnut, Escherichia coli (*E. coli*), and PCBs in fish tissue.

Appendix 15 to the 2018-2020 Massachusetts Integrated List, which is the most recent detailed analysis of the attainment status for waters in the Connecticut River basin, states that these segments are "not supporting" the "Fish, other Aquatic Life and Wildlife Use" because of the impairments described above, listed in that document as "stream bank alteration," and "flow modification."

314 CMR 4.03(3)(b) states, "When the Department issues a 401 Water Quality Certification of an activity subject to licensing by the Federal Energy Regulatory Commission, flows shall be maintained or restored to protect existing and designated uses." The designated uses that must be legally protected are "habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation." Primary and secondary contact recreation includes swimming, fishing, and boating.

What is at Stake

The Connecticut River is the largest river system within New England and has offered sustenance to animals and humans for thousands of years. In 1947, the U.S. Geological Survey produced a paper in cooperation with the Commonwealth of Massachusetts Department of Public Works, looking at the geologic features of the Connecticut River valley in Massachusetts, relative to the floods of 1936 and 1938.[2] Though these devastating floods broke all flow records in Massachusetts, this report on page 2 stated that, "In the Connecticut Valley heavy, destructive river scour on fertile flood plains and terraces occurred at points of extraordinary floodwater concentration. *Strong bank erosion was confined to the outer margins of two bends; the stabilizing influence of vegetation was effective at all other places*." (italics ours)

Northfield Mountain has been operating for the last 53 years, and the impacts on the Connecticut River and its banks in the TFI have been catastrophic. Gone are the terraces that were described in

[2] U.S. Geologic Survey, 1947. Geologic Features of the Connecticut Valley, Massachusetts as Related to Recent Floods. By Richard H. Jahns. Prepared in Cooperation with the Commonwealth of Massachusetts Department of Public Works. Online at https://pubs.usgs.gov/wsp/0996/report.pdf

1947. Trees have fallen and are actively falling into the river along the entire impoundment. Bank erosion is universally present, no matter whether at the inside or the outside of river bends. Banks have retreated in excess of 25 feet in places. Aquatic habitat has degraded and Barton Cove has filled with sediment.

Photos such as the two provided below, taken by the Connecticut River Conservancy in September of 2024, are illustrative of what is happening wherever there is no bedrock to prevent erosion: **erosion begins at the toe of the bank, where the water fluctuates every day or more than once day, and this leads to failure of the riverbank**.[3]

Figure 1. Photo taken by Connecticut River Conservancy in September 2024 on eastern bank at a location roughly 4,000 feet downstream of the Northfield Mountain tailrace. Note the exposed roots due to loss of bank material in the area that experiences daily river fluctuations.

[3] Please refer to the Connecticut River Conservancy's comment letter on the draft 401 WQC for more photos of eroding river banks in 2024.

Figure 2. Photo taken by Connecticut River Conservancy in September 2024 on western bank at a location along Bennett Meadow downstream of the Route 10 Bridge. Note undercutting of toe of bank slope and progression of erosion cycle. Notching at the toe leads to bank slumping, loss of bank material and loss of mature riparian trees, and lateral retreat of the banks. Exposed soil and roots are visible at the top of the bank. All this is occurring despite the presence of a forested riparian area in this location.

Our concerns about this erosion were outlined in FRCOG's Motion to Intervene filed with FERC on April 11, 2024, and they include the following:

- Sedimentation
- Loss of aquatic and riparian habitat
- Loss of prime farmland
- Loss of traditional cultural properties and archaeological sites
- Destruction of natural resource areas
- Damage to repaired areas
- Impacts on recreation, municipal infrastructure, and our local economy

Summary of FRCOG's Concerns with the draft 401 WQC

Given the significant length of time that the license will be in place, the inability of the Commonwealth of Massachusetts to make changes for the duration of the license, and the impaired condition of the affected waters, FRCOG has substantial concerns with the draft 401 WQC. As noted by MassDEP, FirstLight has not provided the Department with sufficient information to determine whether its proposed operations will improve and then protect the quality of the Connecticut River. FRCOG appreciates that the draft 401 WQC, and related license conditions as proposed in the 2023 Flow and Fish Passage Settlement Agreement (FFP), will provide important improvements to water quality *below* Turners Falls dam. The 401 WQC as drafted will, however, allow FirstLight to continue to operate the Northfield Mountain Project in a manner that degrades the already impaired water quality above the dam in the Turners Falls impoundment (TFI) both downstream and upstream of FirstLight's pumped storage facility. Remarkably, the draft 401 WQC would allow FirstLight, largely at its own discretion, to fluctuate the levels of the impoundment well outside of the current typical operating levels – fluctuations that have already resulted in significant water quality impairment. Even more concerning, during certain instances, MassDEP proposes to *eliminate all limits*, which even FirstLight has not proposed. FRCOG asks that MassDEP impose operating conditions that significantly *reduce* fluctuations sufficient to ensure that water quality standards will be met in this 20-mile-long segment of the CT River.

We encourage MassDEP to exercise its basic mandate and revise the draft 401 WQC to ensure that operations of the Projects do not continue to cause erosion, and the sections of the river impacted by the two projects are restored, as necessary to ensure that MA WQS are attained and to meet the requirements of state and federal clean water laws.[4] Most relevant to FRCOG's comments, and as noted on page 7 of the draft 401 WQC, is that FirstLight's current operations are causing or contributing to impairment of Massachusetts Surface Water Quality Standards ("SWQS") due to "Alteration in streamside or littoral vegetative covers" and "flow regime modification" in the segments of the Connecticut River most directly impacted by the operation of the Northfield Mountain Project. **MassDEP can and must do more than the conditions in this proposed water quality certification to address the causes of this impairment as necessary to ensure that the Massachusetts Surface Water Quality Standards are met.**

FRCOG has been involved in the relicensing of the two projects since 2013 and we submitted extensive comments on the 401 Water Quality Certification process on June 3, 2024. In those comments, FRCOG provided technical information from Dr. Evan Dethier clearly demonstrating project impacts on riverbank erosion, providing justification for limiting impoundment fluctuations. In this letter, we provide MassDEP with new information that, among other things, provides concrete suggestions for requiring modern monitoring technologies to avoid the bias and subjectivity that has plagued analysis of riverbanks and water quality for the past 30 years.

[4] Massachusetts Clean Waters Act, M.G.L. c21, §§ 26-53; Federal Water Pollution Control Act, 33 U.S.C. 1251 et seq.; and Massachusetts Surface Water Quality Standards, 314 CMR 4.00 et seq.

We are pleased that the draft 401 WQC included conditions related to our four primary recommendations, which are listed again below.

- MassDEP's goal should be to bring Project operations into compliance with WQS and other appropriate requirements of state law and assure compliance over the license term.
- License conditions must be set to bring the Projects into compliance. Reducing the range of river level fluctuations will reduce project impacts.
- FirstLight should provide good stewardship of a vegetative riparian buffer the Connecticut River.
- FirstLight should conduct and make public more and better monitoring of project operations and river conditions.

The draft 401WQC provides for good stewardship of riparian areas but falls short in addressing the other three recommendations. **Not only do the draft conditions not adequately address existing impairments, fail to reach attainment, and prevent further degradation, these draft conditions allow the impairments to persist over the next 50 years.** Further, the Special Conditions rely on many plans that have yet to be written and so require a leap of faith that these plans will be strong enough to bring about improvements. That is why we urge MassDEP to strengthen monitoring requirements to avoid the introduction of bias, and adopt modern technologies that can accurately track habitat and water quality trends.

Given these concerns, FRCOG is submitting detailed comments on several of the Special Conditions in the draft 401 WQC, and they center around three key points, as summarized below.

1. **MassDEP can and must do more to ensure water quality standards are met.**
   Section 401 of the Clean Water Act gives the Commonwealth of Massachusetts both the authority and responsibility to protect a public trust, the Connecticut River. MassDEP should only certify these projects as meeting water quality standards if the projects can, if operated under the conditions of the certification, actually meet water quality standards. It is not sufficient to limit the conditions such that the new license maintains the status quo or allows TFI fluctuations with greater frequency and/or intensity. MassDEP has not demonstrated that water quality conditions can be met and appears to contemplate the likelihood that water fluctuations will increase. This is unacceptable and must be changed in the final 401 WQC. Our comments on the following Special Conditions fall under this key point:
   - Special Condition 10 – TFI water level management
   - Special Condition 26 – Water quality monitoring
   - Special Condition 27 – Invasive Species Management Plan

2. **Quality Assurance Project Plans must ensure scientific rigor and encourage modern monitoring technologies.**
   We applaud MassDEP's monitoring requirements to look at trends in erosion, water quality and sediment management over the license term. FRCOG offers specific recommendations related to the erosion monitoring QAPP in order to ensure that project impacts, or

improvements, are adequately documented. We recommend the development of new QAPPs that are regularly updated and include 1) the use of modern technology and scientifically sound and replicable methodologies, 2) precise definitions, and 3) clear decision matrices. Flawed erosion survey methods from the 2013 QAPP for the Full River Reconnaissance, for example, should not be used. Our comments on the following Special Conditions fall under this key point:

- Special Condition 25 – Erosion Monitoring Plan
- Special Condition 26 – Water quality monitoring
- Special Condition 30 – Sediment Management Plan

3. **MassDEP must allow public access to required plans and reports, and recognize the input of members of the public and the Connecticut River Streambank Erosion Committee.** Most of the progress on bank stabilization and protection has happened because of the people who live and work along the river on a regular basis and have long been involved in observing the operations of Northfield Mountain Pumped Storage Project. MassDEP will benefit by allowing public comment periods for the plans it requires and reviews. Final plans and required reports must be publicly posted so that individuals and organizations do not have to repeatedly file Freedom of Information Act (FOIA) requests. Additionally, the Connecticut River Streambank Erosion Committee (CRSEC) is an ad hoc group that has been involved for more than 25 years, and its members are interested in continuing its collaborative role. MassDEP and FERC should continue to recognize this group. Our comments on the following Special Conditions fall under this key point:
    - Special Condition 8 – Flood Flow Operations
    - Special Condition 12 – TFI impoundment reports
    - Special Condition 25 – Erosion Mitigation, Stabilization, and Monitoring
    - Special Condition 26 – Water Quality monitoring
    - Special Condition 27 – Invasive Species Plan
    - Special Condition 28 – Riparian Management Plan
    - Special Condition 30 – Sediment Management Plan

Detailed Comments on Draft 401 Conditions

FRCOG's comments filed in this letter and its attachments focus on the issue of streambank erosion and the connection to Massachusetts Surface Water Quality Standards. We include a memorandum as Attachment A, prepared by Princeton Hydro and addressed to the Connecticut River Conservancy. CRC contracted with Princeton Hydro to review technical elements of the draft 401 Water Quality Certificate related to erosion. Funding for this contract was provided by the CRC, FRCOG, and the towns of Gill, Northfield, and Montague.

Below, we list our comments and recommendations by Special Condition of the draft 401 WQC.

Special Condition 8: Flood Flow Operations

Special Condition 8 requires the Licensee to operate the Project "in accordance with its existing agreement with the U.S. Army Corps of Engineers (USACE)." This agreement with the Army Corps has repeatedly been mentioned in relicensing documents, but the agreement itself has never been appended and available to the public. This leaves MassDEP in a precarious position with a special condition that is unknown and unenforceable. [5]

This comment also relates to Key Point #3, the need for full public engagement and transparency.

Recommendation for Special Condition 8

FRCOG recommends either attaching the USACE agreement to the final 401 WQC or writing in the actual conditions to clearly denote what part of the flood operations are actual 401 conditions.

Special Condition 10: Turners Falls Impoundment Water Level Management

Special Condition 10 proposes to amend FirstLight's Proposed Article A190. Whereas FirstLight proposed to continue to be able to fluctuate the impoundment between 176 and 185 feet as measured at the Turners Falls Dam, MassDEP proposes a requirement to maintain water levels between 178.5 and 185 feet, except under discretionary and nondiscretionary circumstances. Combined, these exceptions swallow the rule and allow FirstLight to increase the level of impoundment fluctuations beyond their current operations, which are already known to be causing water quality impairments. The nondiscretionary circumstances remove an absolute operating range limit and are particularly worrisome.

MassDEP has sidestepped erosion-related impairments in this Special Condition, despite listed impairments, more than four decades of advocacy around Northfield Mountain's erosion impacts, and numerous peer reviews of the work of consultants hired by the licensee.

MassDEP's proposed condition would allow FirstLight to violate the surface water quality standards including the anti-degradation provisions and to further degrade the Connecticut River.

FRCOG supports limits placed on impoundment water level management, but MassDEP has not demonstrated that operations under the proposed Special Condition will meet water quality

[5] Page 66615 of the 401 Rule Preamble states, "However, for certifications with conditions, it is important to clearly indicate what information is merely background or supplementary information as opposed to the actual conditions that must be incorporated into the Federal license or permit. For example, when EPA acts as the certifying authority it clearly denotes which aspects of the certification with conditions are general information versus the actual certification conditions. Clearly parsing out this information in the decision document ensures project proponents are best positioned to understand and comply with certification conditions . . . "

standards. In fact, FRCOG believes the conditions will do little to safeguard water quality and may further degrade water quality.

MassDEP determined that "the entire Massachusetts part of the river upstream of the Turners Falls Dam is listed as impaired" as described in the draft 401 WQC.[6] The causes of the impairment include the alteration in streamside or littoral vegetative cover and flow regime modification.[7] FirstLight's operation of the Northfield Mountain Project is the primary cause of these impairments.[8]

Given this context, FirstLight has the burden of showing that its operation will not violate water quality standards. Yet, FirstLight has not met its burden, but instead has provided inadequate information in support of its application for a 401 WQC, as described in FRCOG's initial comments. MassDEP correctly concluded that,

> "FirstLight failed to provide sufficient information for MassDEP to determine that operating in the range of 176-179 without sufficient limitations would comply with the SWQS",
> …
> "FirstLight failed to provide sufficient information to determine that allowing unlimited impoundment levels in the full range of 176-179 feet would comply with the anti-degradation rule",
> …
> "Using the full range of 176-179 without limitations would decrease flows in the [Turners Falls Impoundment], leaving expanses of land under water exposed, and would not protect existing and designated uses such as aquatic life and its habitat and water-related recreation. FirstLight failed to present any evidence to the contrary,"

and

> "The alterations caused by unlimited fluctuations between 176-179 would likely adversely affect the physical or chemical nature of the bottom, interfere with the propagation of fish or shellfish, and adversely affect populations of nonmobile or sessile benthic organisms. FirstLight failed to present any evidence to the contrary,…"

Draft 401 WQC at pages 25-27.

Similarly, FirstLight did not provide any information in its application, and no finding is provided in the draft 401 WQC, supporting a determination that this amount of impoundment variability is necessary and unavoidable.

[6] Water Quality Certification with Conditions First Light Hydroelectric Project FERC License Nos. 1889 (Turners Falls) 2485 (Northfield Mountain) (DRAFT-1-24-25) at pages 7-8.
[7] Id.
[8] See Section 2 of "Review of Erosion in the Turners Falls Impoundment" prepared by Dr. Evan Dethier, submitted together with FRCOG's June 3, 2024, comments.

Despite these conclusions, MassDEP decided to only limit excursions below 178.5 ft, and did not explain how this limit will comply with the SWQS. In the absence of sufficient information from FirstLight, MassDEP has only two options:

1. deny the 401 WQC and require FirstLight to submit the information that the department needs to ensure compliance with SWQS; or
2. include stringent operational requirements with a sufficient margin of safety to ensure that the fluctuations will not continue to contribute to erosion and impairment of the Connecticut River as necessary to address the causes of the current impairments, reach attainment (as evidenced by comprehensive and scientifically defensible monitoring), and protect uses for the next 50 years.

To obtain the benefits of an updated FERC license with new conditions, FRCOG encourages MassDEP to take the second option. **As currently written, Special Condition 10 does not, however, provide the level of operational limits necessary for the Turners Falls impoundment to meet surface water quality standards.** For instance, if MassDEP has determined that elevations below 178.5 ft are detrimental to existing uses of the Connecticut River, there should be no reason to have discretionary events at all. **Meeting water quality standards should not be optional**. Moreover, the discretionary events, if used to the maximum extent, add up to 420 hours (4.7% hours in a year), which would allow incursions into this low range *more than double* the amount of time they have been under current conditions.[9]

FRCOG agrees that there may be nondiscretionary events requiring deviations – we incorporated such a concept in our June 3, 2024, comments. MassDEP's proposed conditions, however, are particularly dangerous -- they **do not include a lower or upper limit at all.** During these nondiscretionary events, MassDEP proposes conditions in which the licensee "could deviate from the operating range of 178.5-185." This language includes no mention of a floor or ceiling for water surface elevations during these nondiscretionary events. FRCOG recommended in our June 3, 2024, comments an allowed range of 179-184 feet as measured at the dam, and FL has requested a range of 176-185 feet.

FRCOG also notes that typical fluctuation patterns associated with current project operations are important drivers of erosion, causing the river segments above the dam to not meet aquatic life uses.[10] Daily operations include fluctuations that can range over 4.8 feet, but more typically range 1.2 to 1.6 feet, measured at Turners Falls Dam. MassDEP included two figures in Appendix B of the draft 401 WQC, showing current and proposed future conditions (FFP Settlement

[9] Page 25 of the draft WQS cites a FirstLight study that states that "For existing operations, FirstLight operates at or above 178.8 feet approximately 98% of the time."

[10] See Appendix 15 to the 2018-2020 Massachusetts Integrated List of Waters, page 22, which said "Aquatic Life Use of this Connecticut River AU (MA34-01) will continue to be assessed as Not Supporting. Although the water quality data collected were indicative of good conditions the historical impairments 'flow modification' and 'stream bank alteration' due to issues with bank erosion and the operation of multiple hydroelectric generating facilities along the Connecticut River are being carried forward."

Agreement). These graphs, which did not include a date range or information about whether existing conditions were modeled or actual values, do not show typical daily fluctuation ranges, only the mean and extreme high and low frequencies by month. Our comments dated June 3, 2024, on pages 8 and 22 recommended **a stepped approach based on what we know of actual operational patterns**. FRCOG's recommendations were based on actual, measured impoundment patterns as reported by FirstLight, not modeled results for a range of years that is not representative of the current climate patterns or the presence of Northfield Mountain.[11]

Typical operations are having an effect on erosion – the notching and undercutting of the bank toe at the water line instigates the sequence of erosion illustrated in Figure 30 of Field Geology's 2007 report on the TFI, included as Attachment B to this letter.[12] Notching or undercutting destabilizes the entire bank, resulting in lateral and vertical bank retreat and significant sediment loading to the river. See also Recommendation 20 in Princeton Hydro's peer review of Study 3.1.2 dated December 16, 2016.[13]

MassDEP appears to have also concluded that FirstLight's proposed operating conditions will allow an increase in the fluctuations of the Turners Falls Impoundment levels. On page 22 of the Narrative, MassDEP explains that there is a small occurrence of the state-listed plant, the tufted hairgrass, in the TFI, but "MassWildlife does not anticipate long-term persistence of this subpopulation **under the anticipated increase in impoundment variability** needed to help FirstLight naturalize flows downstream of Cabot Station." (emphasis ours) While in the course of negotiating the FFP Settlement Agreement, MassWildlife may have been comfortable trading off the survival of this plant for improvements downstream of the dam, but MassDEP may not allow FirstLight to increase the impoundment variability and continue to degrade water quality, in violation of the SWQS.

By focusing only on a recreational use impairment under low impoundment conditions in their Appendices C, D, and E and justification for this Special Condition, MassDEP left the impairment of the aquatic life use unaddressed.

The SWQS, and particularly the anti-degradation provisions of 314 CMR 4.04, require protection of all existing and designated uses of water bodies, and maintenance of the level of water quality needed to protect those uses. MassDEP's proposed Special Condition 10 fails to protect existing and designated uses because it does not protect against extreme Turners Falls Impoundment (TFI) variability or regular sub daily fluctuations, both of which lead to bank instability and erosion-related impairments.

[11] According to personal communication to FRCOG from FirstLight's consultants dated 2/19/2025, Appendix B to the draft 401 WQC includes modeled results for the period 1962-2003.
[12] Field Geology Services, 2007. Fluvial Geomorphology Study of the Turners Falls Pool on the Connecticut River Between Turners Falls, MA and Vernon, VT. Prepared for Northfield Mountain Pumped Storage Project by Field Geology Services, Farmington ME, November 2007.
[13] This letter was part of **Attachment 3** to FRCOG's comments submitted to MassDEP on June 3, 2024.

Impoundment fluctuation restrictions are necessary

Operation of the Northfield Mountain pumped storage project during the current FERC license has caused or contributed to the current listed impairments of "alteration in streamside or littoral vegetative covers" and "flow regime modification" in the Connecticut River segments 34-01 and 34-02. During this time, while water surface elevations lower than 178.5 ft at the dam have been rare (less than 2% of the time), fluctuations in the range of 1 to 3 feet as measured at the dam have been happening on a sub daily and daily basis. This operation pattern has contributed to a lack of vegetation in this fluctuation zone, leading to notching at the toe (bottom) of the bank and increased rates of erosion. The 1979 Army Corps report recognized that limiting pool fluctuations and encouraging growth of vegetation on the banks could reduce the bank erosion problems.[14] The 401 WQC and new FERC license represent the first opportunity to address this problem since 1968. The conditions MassDEP has drafted will not limit a wider typical daily range of fluctuations, and the impairments could get worse.

In Appendix B of the draft 401 WQC, modeled FFP conditions appear to show that the median impoundment levels will be 1 foot higher in the months of April, May, July, and August, and 1 foot lower in September than under modeled "current conditions." A fluctuation zone centered around a different elevation than the patterns established during the first 50 years of project operations could lead to an increase instability. As noted by our consultant Dr. Evan Dethier, on page 8 of his report appended to our June 3, 2024, comment letter, increased water saturation due to reservoir inundation can enhance erosion processes. Changes in average water levels will change the area of riverbank currently subject to cycles of wetting (saturation) and drying (water draining out of the soil column) increasing bank instability and bank erosion. When the dam was raised and the pumped storage facility brought online in 1972, the river had a catastrophic response, with thousands of feet of bank eroded. A similar response should be expected if a new "shock" to the system is allowed.

FRCOG's comments filed on June 3, 2024, expressed concern about future conditions that may affect operations and operational patterns at Northfield Mountain. In November of 2024, Governor Maura Healey signed a sweeping new climate law that includes a provision for long term contracts for storage, allowing existing storage facilities to be included.[15] This may incentivize the operation of Northfield Mountain even when energy prices are not competitive, thereby causing Northfield Mountain to operate more than it has been during the period modeled for the relicensing studies.

As we have been participating in relicensing, we have attempted to understand current operational patterns and proposed (likely) patterns. The licensing documents have been based on different data sets that are not comparable to one another and make it difficult to understand

[14] Page v of Connecticut River Streambank Erosion Study: Massachusetts, New Hampshire, and Vermont. Prepared by D. B. Simons et al. for the U.S. Army Corps of Engineers, 1979. Contract No. DACW 33-78-C-0297.
[15] *An Act promoting a clean energy grid, advancing equity, and protecting ratepayers.* See Section 98 for storage procurement.

current vs. proposed conditions. Moreover, as described in the previous paragraph, we believe any attempts to predict future patterns are likely inaccurate because of climate change and a changing electric market. Through communication with FirstLight's consultants, we have learned that the graphs in Appendix B in the draft 401 WQC are based on modeled hourly data for a period 1962-2003 under baseline (existing modeled) conditions and under the Flows and Fish Passage Settlement Agreement conditions.[16] The BSTEM modeling results, on the other hand, represent modeled baseline (existing) conditions and FFP conditions from 2000-2014. Data provided in the Pre-Application Document (PAD) and other relicensing study reports presented actual conditions. All of this uncertainly reinforces our opinion that strict operational controls based on what we know about actual (not modeled) conditions are essential in the 401 WQC.

Setting license terms for impoundment levels at a single location is not adequate

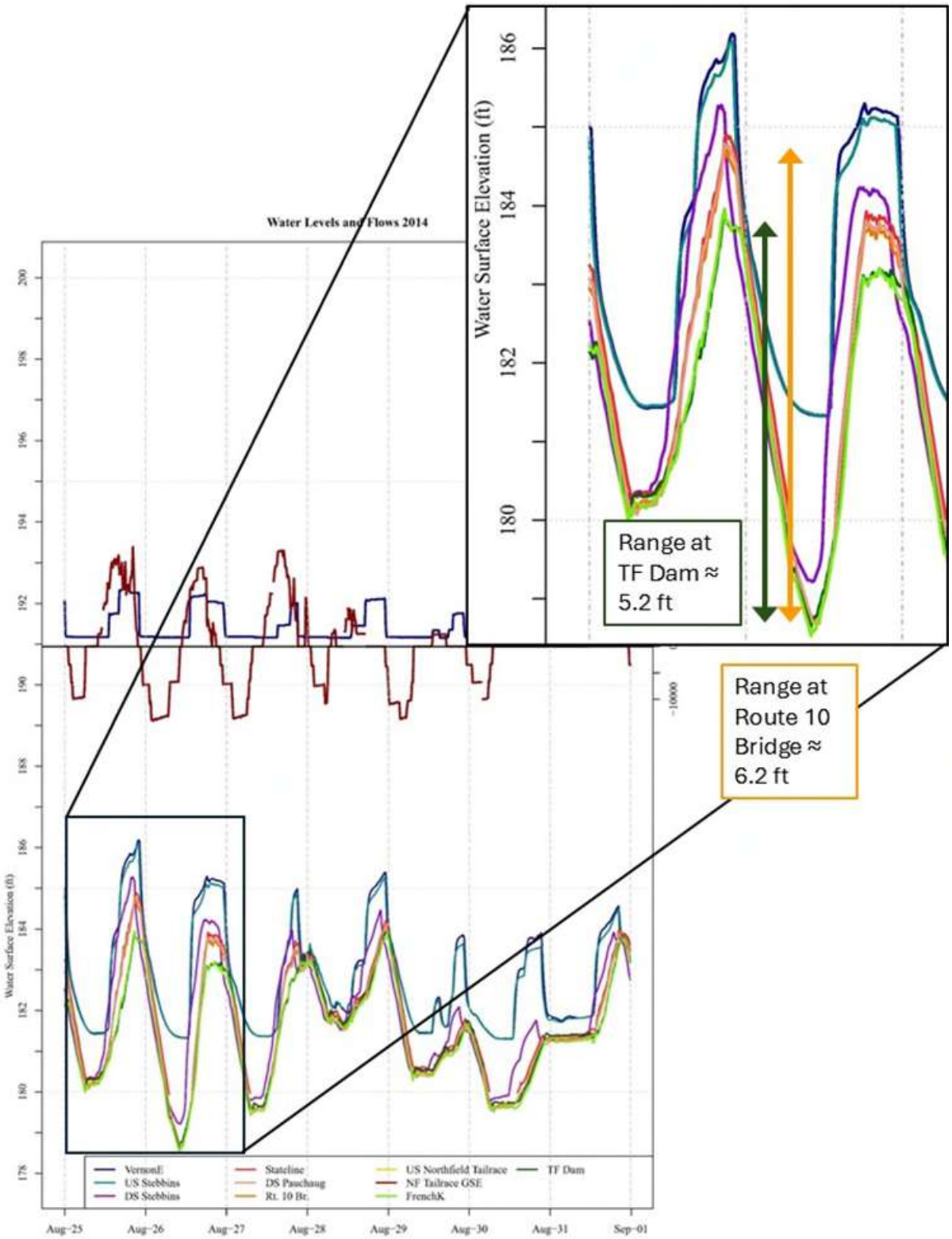
Measuring water surface elevations (WSEs) at a single location, at the dam, has been a major problem in the existing license. There is no need to continue using this flawed approach for the next 50 years. Equally important is how other locations in the TFI upstream of the French King Gorge react to fluctuations, sometimes more severely.

FRCOG adds here an important point of clarification regarding MassDEP's statement on page 26 of the draft Narrative: *the Turners Falls Dam location does not represent the location where fluctuations are the most extreme*. On page 26 of the draft Narrative, MassDEP says that Saco Lane in Gill, six miles upstream of the Dam is "where the impacts of drawdowns should be less than impacts at points close to the dam, such as Barton Cove." Relicensing Study Report 3.2.2, the Hydraulic Study, demonstrated this assumption to be false. **Locations upstream of the Northfield Mountain tailrace, downstream of the MA-VT-NH state line, can experience wider daily fluctuation ranges in a 24-hour period than at the dam.**

The Turners Falls Dam, after all, has several ways to control river levels: a gatehouse that sends water into the power canal, bascule gates, and Tainter gates. There are no such controls upstream, where Northfield Mountain withdraws and then discharge enormous amounts of water, often in excess of the flow of the mainstem river. A figure taken from page 171 of Study Report 3.2.2 shows, for example and shown below as Figure 3, river levels at various loggers in August of 2014. **The logger at the dam showed a 5.2-foot drop in water surface elevation overnight on August 25-26, 2014, whereas the logger at the Route 10 bridge in Northfield showed a 6.2-foot drop during the same period**. Both loggers recorded a low elevation of approximately 178.5 ft, despite the Route 10 bridge being located almost 11 miles upstream and therefore starting at a higher elevation.

[16] Northfield Mountain came online in 1972, so the model represents a fictional scenario that assumed the facility was operating during the flow conditions of that time.

Figure 3. Page 171 from relicensing Study 3.2.2, with August 25-27, 2014, time period zoomed in and fluctuation range emphasized.



Recommendations for Special Condition 10

1. Unless MassDEP chooses to deny a 401 Water Quality Certificate to the Northfield Mountain Pumped Storage Project, FRCOG believes **the only way to bring Northfield Mountain's operations into compliance with water quality standards would be to limit water surface elevation fluctuation patterns**. Our June 3, 2024, comments explained our concept of a **target elevation and target bandwidth (based on actual conditions), as measured both at the Turners Falls Dam and the USGS gage at the Route 10 bridge in Northfield**. We refer to our original recommendations.
2. FRCOG's June 3, 2024, recommendations included two locations to measure compliance with impoundment fluctuation limits. FRCOG continues to stress the importance of establishing two points, and for this reason we emphasize that funding for the USGS gage location at the Route 10 bridge is critical for understanding fluctuation patterns in the next license period.

Special Condition 12: Flow Notification and Website

FRCOG supports MassDEP's additional requirement of part (d), which requires quarterly reports regarding operational data, and part (e), which requires an annual report detailing impoundment fluctuation extremes. MassDEP did not specify to whom FirstLight will provide these quarterly reports. FRCOG recommends that these reports be posted so that the public will not have to repeatedly request access via the Freedom of Information Act (FOIA).

Recommendations for Special Condition 12

FRCOG offers the following recommended edits to tighten up the requirement. Suggested new text is underlined; no change is proposed to the rest of this Special Condition after the second bullet.

(d) For the life of the license, quarterly reports will be submitted to MassDEP, FERC, and the CRSEC, by the end of the second month following each quarter that include data concerning the following:

- Continuous hydrographs showing hourly impoundment levels for three locations: the Turners Falls Dam, the Northfield Mountain tailrace, and the USGS gage at the Route 10 bridge. The hydrographs will show the three locations superimposed on the same graph with the elevation shown in feet on the x-axis and the hour and date on the y-axis.
- Weekly and monthly statistics on the impoundment levels in feet mean sea level as measured at the Turners Falls Dam and at the USGS gage located at the Route 10 bridge, as follows: average impoundment elevation with standard deviations; median impoundment level; maximum elevation; minimum elevation; average daily elevation change with standard deviations; number of elevation changes that exceed 2 feet/day; average and maximum rates of change in elevation, both increases and decreases; and average number of hours impoundment level rises vs. falls.

Special Condition 25: Erosion, Mitigation, Stabilization and Monitoring

MassDEP proposes to include a requirement of an Erosion Mitigation, Stabilization, and Monitoring Plan as outlined in Appendix F of the draft 401 WQC. FRCOG supports the inclusion of a requirement that the Licensee prepare and carry out efforts to monitor, mitigate, and stabilize riverbank erosion. Though the basic ideas of many of FRCOG's recommendations in our comment letter dated June 3, 2024, were adopted, we caution that without clear requirements in the 401, bringing the project into compliance will be hindered by the same lack of data that has plagued this work for the last 50 years.

We stress to MassDEP that the effectiveness of this requirement will be in the details. Monitoring efforts should be scientifically rigorous, defensible, and replicable. Monitoring should be strong enough to be able to understand trends through the life of the next license and to inform decisions on bank repair and stabilization and to improve water quality. Our comments and recommendations in this section are geared to making this Special Condition more scientifically sound and effective.

Repair of Eroded Banks

MassDEP includes a requirement for FirstLight to repair sites described in Table D-1 within 6 years of license issuance.[17] By the time the license is issued, the project will have operated for 60 years with no 401 WQC. Requiring approximately 1,000 feet of bank repair (667 ft of new sites and 429 ft of previously stabilized sites) in 6 years, after what has been effectively a 10-year license extension, is inadequate. The licensee should be able to complete this work in 2 years given they will have ample time to prepare designs after the final 401 WQC is issued. MassDEP could refer to years of project compliance reports for the current FERC license to see the length of and schedule for bank stabilization projects that the licensee had been able to achieve in the past.

Table D-1 does not indicate whether the bank described is on the east (river left) or west (river right) bank, but it appears that DEP has chosen the segments that were identified as having "extensive" erosion in the 2013 Full River Reconnaissance (FRR) report.

FRCOG cautions against relying on these FRR designations as an indicator of what banks were eroding in 2013, and this caution also relates to using these same methods for future assessments and decisions about bank repair. We refer to the letter prepared by the Connecticut River Streambank Erosion Committee dated November 14, 2014, that was included as FRCOG's attachment 11 to our June 3, 2024, comments to MassDEP. Please note comments 3, 4, and 5 of that letter especially. A relevant portion of that letter is copied again here below in italics. The key reason for copying this excerpt is to stress that **the amount of eroding banks in 2013 far exceeded the 667 feet of new sites that MassDEP is proposing the licensee stabilize in the first**

[17] We note that possibly this Table should be named F-1, since it is within Appendix F.

six years of the license. As you will see in the photos below, segments of bank classified as having "little/none" erosion were in fact exhibiting severe erosion in photos .

…"many areas of erosion were missed, and some were incorrectly categorized. Some examples of areas that were missed are shown below.

Cropped version of FirstLight photo DSC_1164. Shot November 2013. Located along segment 513, classified as ***none/little*** *extent of erosion.*

*Cropped version of FirstLight photo DSC_1192. Shot November 2013. Located along segment 515, classified as **none/little** extent of erosion.*

*Cropped version of FirstLight photo DSC_1203. Shot November 2013. Located along segment 515, classified as **none/little** extent of erosion.*

…

It is clear to us that splitting the riverbank into segments based on features other than erosion observations and then assessing the overall erosion in each segment is not a way to truly identify the extent of erosion along the banks. Therefore, the percentage numbers in 2013 and 2008 are meaningless, and in reality, using their methodology, no determination can be made about the extent of erosion and whether or not the riverbanks are getting more or less eroded over time. "

Erosion Monitoring

MassDEP proposes to require an **Erosion Control Monitoring Plan** to be developed within one year of license issuance, and after consulting with MassDEP. There are two main components of the Erosion Control Monitoring Plan. MassDEP proposes to require **Erosion Monitoring Surveys** in years 2, 10, and 30. The surveys are required, at a minimum, to comply with the 2013 QAPP and must include a boat-based survey and delineation of bank features, with a report due to MassDEP in the first quarter of the year following the survey. MassDEP also proposes to require **boat-based inspections** in the TFI in years 4, 6, 8, 12, 15, 25, 35, and 45. This survey will include visual observation with geo-referenced video recordings and a summary memorandum, along with a repair and maintenance plan for sites requiring repair and preventative maintenance.

Public review and input should be incorporated

Throughout Appendix F, an important component is lacking: input from the public, from the Connecticut River Streambank Erosion Committee and its members, and Conservation Commissions of Gill, Northfield, and Montague. The 1999 Erosion Control Plan came about only after years of local advocacy and many meetings coordinated by FRCOG's predecessor organization, the Franklin County Commission. All projects completed under the 1999 Erosion Control Plan until 2013 when relicensing began were done with consultation and input from the Connecticut River Streambank Erosion Committee (CRSEC) and several were supported by funding secured by the FRCOG from MassDEP's s.319 Nonpoint Source Pollution grant program. This group, as well as residents who live along the river, are the eyes and ears of the Connecticut River, and MassDEP's work with the licensee into the next license will be enhanced by ideas and input from the public who care so deeply about the River. We recommend that a review committee that includes CRSEC be established and incorporated into the 401 WQC to oversee all parts of this Special Condition.

A new QAPP must be prepared and should be regularly updated

FRCOG is supportive of the requirement of a QAPP to be approved by MassDEP; in fact, we long requested that a QAPP be prepared to eliminate bias and require replicable methods for conducting the previous FRRs. **We recommend MassDEP require a new QAPP and updates of this QAPP be completed at least every 10 years**. We are <u>not</u> supportive of using the 2013 QAPP for the initial survey in year 2. We need to break the cycle of inadequate data collection for this impaired waterbody. The 2013 QAPP included in the relicensing study did not include signature lines for MassDEP staff so it is unclear if MassDEP reviewed and approved the QAPP. CRSEC comments on the 2013 draft QAPP dated January 25, 2013, were submitted as Attachment 19 to our comments dated June 3, 2024. We refer to this Attachment again as a reminder of our concerns about the adequacy of this document.

In Appendix F to the draft WQC, MassDEP has included reference to the recommendations and protocol developed by Dr. John Field dated July 2011 in a report commissioned by several landowners along the Connecticut River titled, "Detailed analysis of the 2008 Full River Reconnaissance of the Turners Falls Pool on the Connecticut River, Prepared for Landowners and Concerned Citizens for License Compliance Turners Falls Pool." FRCOG supports these recommendations, specifically those related to the types and stages of erosion, and we recommend survey methods that reduce reliance on subjective measures, which introduce bias and reduce the ability to compare the results against subsequent river surveys. This is especially critical over the term of a 50-year license. We note that the 2013 QAPP did not follow Dr. Field's recommendations and allows for the bias these recommendations attempted to avoid.

Survey methods should be modernized and made less subjective and qualitative

The FRCOG and the CRSEC have long been concerned that the FRR methods are subjective, non-reproducible, and lack scientific rigor. The technology now exists to do regular surveys using

LiDAR that would be more quantitative and would remove subjectivity and bias from the process. Please see comments prepared by our consultant, Princeton Hydro, for more details on recommended survey methods included in Attachment A. Special consideration should be given to observing and recording erosion occurring at the toe of the bank where water levels fluctuate due to project operations.

Additionally, we have long recommended that regulators create a mechanism for hiring 3rd party consultants to carry out monitoring and reporting. If MassDEP includes this requirement, it will provide a level of assurance to regulators and stakeholders that sound data is driving the decision-making for and stewardship of this public trust resource.

Long term cross-section surveys should be continued

FRCOG recommends that the long-term cross-section monitoring be continued. These surveys have been happening on an annual basis for more than 20 years and represent an important data set that should not be cast aside. Please see FRCOG Condition 3(c)(a) from our comments dated June 2, 2024, for suggested ways to improve the reporting of the cross-section surveys.

Surveys need to supplement clear decision matrix on sites to be stabilized

The Erosion Control Monitoring program must clearly inform decisions on sites to be stabilized. There is no discussion in Appendix F about project designs and standards. FRCOG recommends such details be included in the QAPP and/or Plan, and that the CRSEC, Conservation Commissions and landowners be consulted during the design phase of any stabilization projects.

<u>Repair of Previously Stabilized Sites</u>

FRCOG supports the requirement that the licensee repair previously stabilized sites. We are not clear whether this requirement impacts new sites that are fixed in say, year 10, and would need repair later in the license. We assume this requirement would include those sites and recommend that this is clearly laid out in the permit.

We also note that the impact of some ice events is exacerbated by project operations. Bank scouring from blocks of ice floating downstream would not be a project effect, but large chunks of ice that froze along the banks and then broke off the bank when the river level dropped, taking rocks and soil with it, would be a project effect.

<u>Stabilization of New Sites</u>

MassDEP proposes that 5% of the sites that are newly identified after issuance of the license as exhibiting "some to extensive" or "extensive" erosion based on the definitions contained within the 2013 FRR and which were not previously repaired or identified in Table 1 of Appendix F shall be repaired.

MassDEP has not explained its choice of 5% or how this will ensure that the Connecticut River will meet water quality standards, although there is a provision that if MassDEP determines the 5% will not provide a significantly improved stream bank condition, MassDEP "may reserve the equivalent linear feet for use in the future." It is not clear what "for use" means. If MassDEP is reserving the right to require more than 5% of repairing in the future, it should choose wording that clarifies.

We re-iterate our concerns from CRSEC's comment letter dated November 14, 2014, on the FRR. Comments #3 and 4 showed that the definitions and the chosen length of river segments lead to many eroding banks being identified as having "none/little" erosion. MassDEP must ensure a data collection process (new QAPP) that eliminates bias in identifying the type and stages of erosion and potential bank stabilization and aquatic habitat projects that will improve and protect water quality.

MassDEP exempts the licensee from needing to repair sites that exhibit unique conditions and list several criteria. It is not clear if these types of conditions are exempt from being part of the 5% that are repaired, or if the linear feet of erosion of this type will be subtracted from any calculation of "new" sites. We support allowing eroded areas to remain eroded that offer habitat for sensitive wildlife receptors like bank swallows and belted kingfishers. As for the other areas that are proposed to be exempt, MassDEP should be aware that FirstLight has their own permitting program for irrigation withdrawals and docks within the Turners Falls impoundment, separate from the MA Water Management Act and Chapter 91 licensing. MassDEP should review FirstLight's permitting program in light of this Special Condition to see if it is truly appropriate to exempt the Licensee. Additionally, we have long stated that boat wakes are a secondary project effect.

2-mile long no-wake-zone near the Dam

MassDEP has proposed that FirstLight work with the appropriate state and federal agencies to implement a no-wake zone from the Turners Falls Dam upstream to approximately the property of the Scheutzen Verein Club in Gill, a distance of 11,000 feet or **2 miles**. This is a recreation requirement, so we will refrain from detailed comments because we signed the Recreation Settlement Agreement. MassDEP should note that such a provision is not in the Recreation Settlement Agreement, and we recommend MassDEP discuss the logistics of enforcement with the Environmental Police before finalizing this requirement, if they have not done so already.

Recommendations for Special Condition 25

1. Repair of Eroded Banks:
    a. An initial round of bank repair of new and previously stabilized sites, as identified by MassDEP, should be constructed within the first two years after license issuance.

b. The length of and schedule for bank stabilization projects should not be arbitrarily decided or based on the results of the flawed 2013 FRR and QAPP. Instead, the length of and schedule for bank stabilization projects should be specifically tied to the findings of the surveys conducted as part of a new Erosion Control Plan.

2. Erosion Monitoring:
    a. A review committee should be established that includes the Connecticut River Streambank Erosion Committee (CRSEC) to oversee all components of Special Condition 25 and ensure that public review and input is incorporated.
    b. A new Quality Assurance Project Plan (QAPP) must be developed and be regularly updated on a schedule at least every 10 years.
    c. Survey methods in the QAPP must be state-of-the-science and reduce reliance on subjective measurements, which introduce bias and reduce the ability of MassDEP and stakeholders to compare the results against subsequent river surveys. See specific survey recommendations in Attachment A.
    d. Require the hiring of a 3rd party contractor to carry out monitoring and reporting. This will provide a level of assurance to MassDEP and stakeholders that sound data is driving the decision-making process and stewardship of this public trust resource for the next 50 years.
    e. Monitoring of the long-term cross-sections should be continued. See FRCOG Condition 3(c)(a) from our June 2, 2024, comment letter for suggested ways to improve the reporting of the cross-section surveys.
    f. Monitoring and surveys need to inform clear decision matrices for bank stabilization projects. FRCOG recommends that project designs and standards be included in the QAPP and/or Erosion Control Plan and the CRSEC, town Conservation Commissions and landowners be consulted during the design and construction phases of any bank stabilization or habitat restoration projects.
3. Repair of Previously Stabilized Sites: FRCOG recommends that MassDEP specify that this requirement applies to sites repaired under the current FERC license and those repaired under the new FERC license.
4. Stabilization of New Sites: FRCOG disagrees with the entirety of this section of Special Condition 25, aside from the concept of a continued obligation to repair eroding banks. The length of and pace of bank stabilization work should be based on the data collection, monitoring and decision matrices in the new Plan and QAPP. See also 2f above.

Special Condition 26: Water Quality Monitoring

Though we did not request it in our comments dated June 3, 2024, FRCOG generally supports the requirement of long-term water quality monitoring program for the life of the license to better understand license compliance, and to determine operational impacts on water quality over several decades. We support the requirement of a QAPP to be updated for approval every five years.

Recommendations for Special Condition 26

1. A clear purpose for each monitoring requirement must be articulated.

2. The monitoring design and QAPP should have a public comment period in which the public could provide input on monitoring methods and locations.

3. Because the impairments listed in the Connecticut River segments above Barton Cove are not specifically due to chemical contaminants (see Regulatory Framework section earlier in this letter), it is critical that this Special Condition be rewritten to adequately track water quality status with regard to project operations and existing impairments.

4. The water quality, erosion, and riparian plans (and their associated QAPPs) should be interconnected to track progress towards meeting water quality standards.

5. Biological monitoring. Because the Connecticut River in the TFI is not supporting the Aquatic Life Use, we recommend that MassDEP require biological sampling. In MassDEP's 2022 Comprehensive Assessment and Listing Methodology (CALM), DEP includes an Index of Biotic Integrity (IBI) for wadable streams in Massachusetts. Presumably, the Connecticut River does not fall into the "wadable" category in most areas, but the TFI section of the Connecticut River is habitat for state-listed odonate species, and understanding trends of odonates in this stretch would be an important thing to keep track of. It is not clear if MassDEP ever moved forward with the work of Yoder et al. (2009) in developing an IBI for the Connecticut River.[18] We recommend that MassDEP include a biological monitoring requirement looking at species that use the littoral zone of large river systems (with input from the USFWS Connecticut River Coordinator's office and MassWildlife) to track improvement toward meeting water quality standards, or track declines. Juvenile shad surveys conducted by agency staff should also be summarized and migratory fish numbers tracked as part of this requirement, so that project operations and erosion can be assessed together with biological surveys.

6. Monitoring to understand attainment of littoral zone impairment. Submerged aquatic Vegetation (SAV) is the term used for a rooted aquatic plant that grows completely under water. These plants occur in both freshwater and saltwater systems and are important habitat for fish because it provides them with a place to hide from predators and it hosts food sources such as small invertebrates and other prey. SAV essentially forms a canopy, much like that of a forest but underwater.

   In February 2016, FirstLight published Study 3.5.1, Baseline Inventory of Wetland and Littoral Habitat in the Turners Falls Impoundment and Assessment of Operational Impacts on Special Status Species. As part of this study, FirsLight surveyed and mapped

[18] Fish Assemblage and Habitat Assessment of the Upper Connecticut River: A Preliminary Report and Presentation of Data, 2009. https://www3.epa.gov/region1/npdes/merrimackstation/pdfs/ar/AR-650.pdf

submerged aquatic vegetation (SAV) in the study area, which included the TFI. One map in the vicinity of the Northfield Mountain tailrace is copied below as Figure 4.

Study report 3.5.1 provides an important baseline survey of SAV. The New York State Department of Environmental Conservation has a webpage explaining SAV surveys of the Hudson River between 1997 to 2018, and they have a GIS map showing the SAV beds.[19] A monitoring and mapping program like this could be an important way of monitoring progress toward water quality goals.

FRCOG recommends that MassDEP include a requirement that FirstLight conduct an SAV survey of the TFI every 5-10 years for the duration of the license. MassDEP should develop goals for what amount of SAV would meet water quality standards prior to the completion of the monitoring plan, and the sampling would track the path toward attainment.

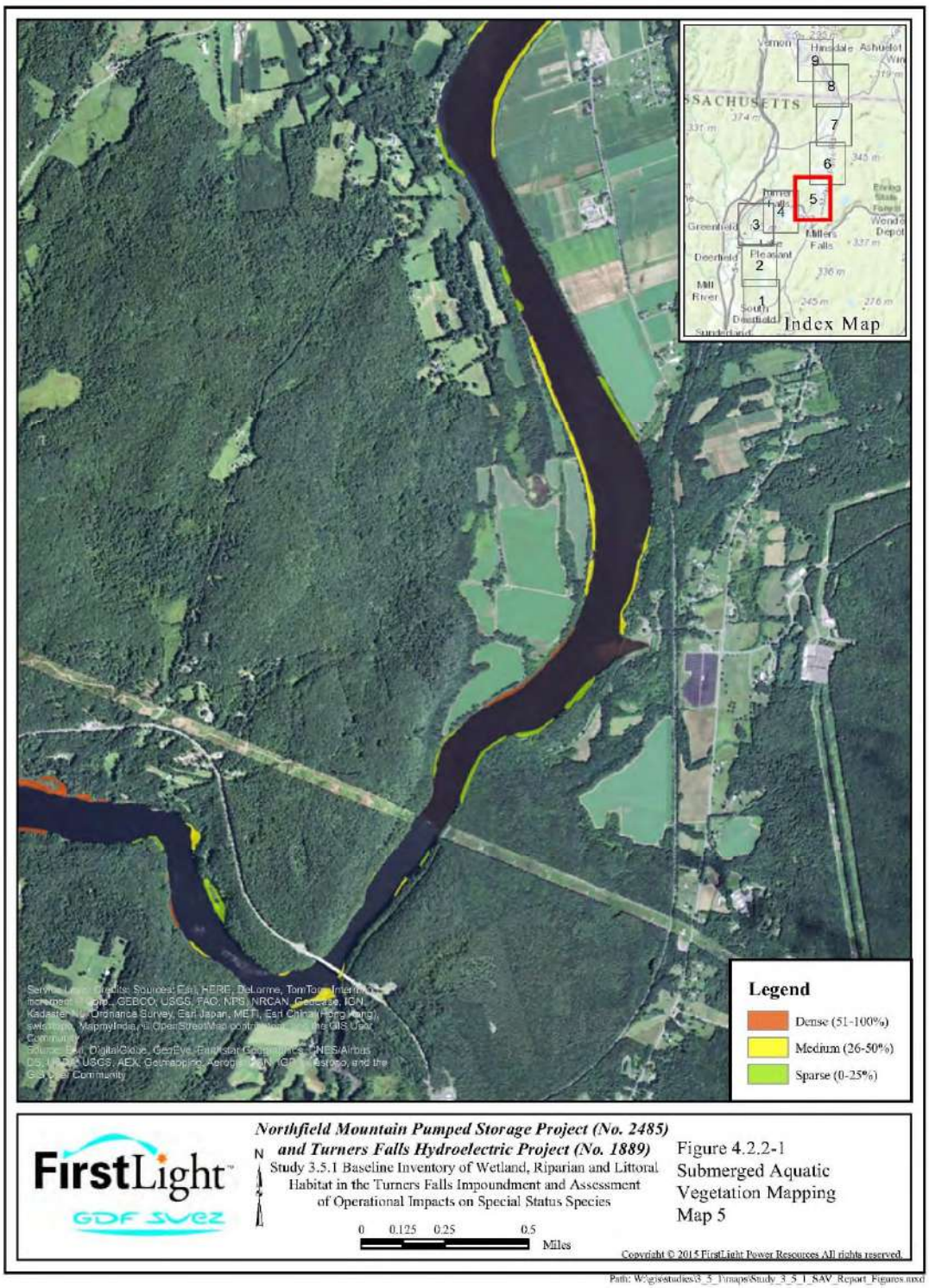
7. Surface water temperature. We urge MassDEP to adopt modern monitoring technologies that remove sample design problems and bias. For example, Gerald Szal submitted comments to FERC dated December 17, 2024 (accession number 20241217-5091). Mr. Szal has no affiliation with FRCOG, and our understanding is that his comments were submitted on his own behalf. In Mr. Szal's letter, he used satellite infrared imagery to demonstrate his concerns about the impact of Northfield Mountain on water temperature in the Connecticut River. MassDEP is proposing to require water temperature monitoring. Though any QAPP would need to set quality assurance parameters of satellite imagery, the imagery provided in Mr. Szal's comments offer a much more comprehensive view of water temperatures than the few locations suggested by MassDEP.

8. Nutrients. It is not clear from the draft 401 WQC if MassDEP has been collaborating with the partners working on the Nitrogen Reduction Strategy for Long Island Sound.[20] We recommend careful collaboration with USGS and other partners to make any nutrient monitoring as useful as possible.

[19] NYSDEC Hudson River SAV monitoring program described online here: https://dec.ny.gov/nature/waterbodies/oceans-estuaries/hudson-river-estuary-program/aquatic-habitats/submerged-aquatic-vegetation and map is online here: https://data.gis.ny.gov/datasets/nysdec::hudson-estuary-submerged-aquatic-vegetation/explore?location=42.136608%2C-73.856602%2C12.00

[20] More information at https://longislandsoundstudy.net/our-vision-and-plan/clean-waters-and-healthy-watersheds/nitrogen-strategy/

Figure 4. One of several maps showing the SAV survey from Study 3.5.1. This map shows the river segment that includes the location of the Northfield Mountain tailrace.



9. Total Suspended Solids (TSS). Rivers with impoundments are often thought of as "sediment starved" because dams reduce the movement of sediments downstream.[21] Movement of TSS can be important for river health, but it can also be a pollutant. MassDEP should establish a management goal for desirable sediment transport in the Connecticut River system, and figure out how this 401 Water Quality Certificate fits into the goal.

   Vernon Dam lies just upstream of the TFI, and there are hundreds of miles of river, with many more dams upstream, that can contribute TSS in the Connecticut River. The Connecticut River can often contain TSS washed downstream from storms far upstream. The sampling regime should be designed to help us understand whether MA 34-01 and 34-02 are meeting the standards for "flow regime alteration" or "stream-side or littoral vegetative covers. The proposed frequency (twice monthly) of sampling of TSS, limited to the months only of June-September, at the river segment between the Route 10 bridge and the dam (but not in segment MA34-01 upstream of the project), the Northfield Mountain tailrace, and the river below Cabot Station, is insufficient to inform our understanding of the effects of erosion from the Northfield Mountain Project. Section 4.2 of Study Report 3.1.3 demonstrated that TSS levels spiked when there were high flow events in the Connecticut River and looked at operational effects on TSS at lower flows. We are unsure what to recommend to improve this requirement without understanding better MassDEP's purpose. At a minimum, the Sediment Management Plan should be tied in to this requirement.

We encourage MassDEP to reach out to their federal and state partners and to work with FirstLight to develop a water quality monitoring plan that is related to best understanding long-term trends with regard to project effects and water quality impairments.

Special Condition 27: Invasive Species Management Plan

FRCOG supports the requirement of an Invasive Species Management Plan to address a listed impairment.

Recommendations for Special Condition 27

1. FRCOG requests that MassDEP add mention of a required public comment period on the draft Invasive Aquatic Plant Monitoring, Treatment, and Control Implementation Plan, and that all relevant agencies and organizations involved in aquatic invasive species be allowed to comment.

   There are a large number of watershed state agencies and nonprofits that have worked collaboratively on invasive species management in the Connecticut River through the

[21] See, for example, this post by American Rivers: https://www.americanrivers.org/2023/08/sedimentation-and-dam-removal-bringing-a-river-back-to-life/

Northeast Aquatic Nuisance Species Panel.[22] [23] Massachusetts Department of Conservation and Recreation's Lakes and Ponds program has focused on aquatic invasive plants and is inexplicably not mentioned as a consulting agency. MassDEP will benefit from other agency input, especially since this plan will be in force for 50 years.

The survey reports should be similarly distributed to these agencies and organizations, as well as the public, for their comment before the February 1 deadlines and agency meetings.

2. FRCOG continues to believe that rapid identification and response may someday be needed for non-plant aquatic invasives that may spread or become established due in part to project operations. The Plan should be adaptable to include other invasive aquatic species in the future.

3. Throughout Attachment G, the Turners Falls power canal should be mentioned as a location of rapid response, monitoring, and control of aquatic invasive species.

4. Attachment G, Section 2, paragraph 2 states that the licensee will not be responsible for treatment measures outside Barton Cove. The Turners Falls power canal should certainly be included in the areas that the licensee is responsible for. Additionally, there has been a small patch of water chestnut in the river channel just upstream of Barton Cove that FirstLight has long managed and monitored, and responsibility could continue. Given that the impoundment is 20 miles long, the justification for limiting FirstLight's responsibilities is not clear and appears unwarranted.

5. Section 2 requires the Licensee to allocate internal funds for the "treatment" of aquatic plants. The word "treatment" is not defined, and FRCOG recommends the definition not be limited to chemical treatment. Some aquatic invasives can be reduced or eliminated through hand or mechanical removal, which is preferred over the use of chemicals, if effective.

Special Condition 28. Riparian Management Plan

FRCOG supports the requirement of a Riparian Management Plan to address listed impairments.

MassDEP proposes to require FirstLight to maintain a 75-foot vegetated riparian zone on properties owned by the Licensee. MassDEP did not provide a rationale for 75 feet in their Findings. The 1996 Massachusetts Rivers Protection Act provides protection to rivers by regulating activities within the Riverfront Area, which is a 200-foot-wide corridor on each side of a perennial river or stream, measured from the mean annual high-water line of the river. The requirements of the Rivers Protection Act have been incorporated into the Wetlands Protection

[22] https://www.northeastans.org/index.php/home-page/
[23] See the 2019 report titled "Mapping of Invasive Aquatic Species in the Connecticut River with a focus on Hydrilla verticillata & Trapa natans Agawam to Turners Falls, MA," conducted for the MA Department of Conservation and Recreation which had survey locations within the project areas up to the French King Bridge. https://www.northeastans.org/docs/meetings/201906/files/Hydrilla%20workshop%20Straub.pdf

Act regulations, 310 CMR 10.00. The Wetlands Protection Act establishes a buffer zone of 100 feet around other types of wetlands.

Parts (a), (b), and (d) of Special Condition 28 introduce unnecessary confusion over what lands fall under the Riparian Management Plan's requirements. In part (a), the riparian zone is described as property "owned by Licensee along the Connecticut River, where feasible (as determined by MassDEP)." Then in part (b), it states that the plan shall include "all lands owned in fee by the Licensee abutting the Connecticut River other than those used for the Specific Project Purposes identified above." It then lists specific project purposes identified below. These first two definitions are similar but not exactly the same, and the lands covered in the plan may or may not be ultimately decided by MassDEP. If FirstLight acquires any new land in fee during the license period, that land should fall under this requirement. Finally, in (d), it states that if the Licensee sells any land, all purchasers shall be given a copy of the Plan prior to sale.

Finally, Special Condition 28 unreasonably limits the scope of the plan to "lands that the Licensee owns in fee along the Connecticut River shoreline other than those used for the Specific Project Purposes of power production and Project recreation facilities." FirstLight may not, however, currently own all of the land in fee that is within the FERC Project Boundary and subject to erosion as a result of the operation of the Northfield Mountain Project. According to the maps in Study Report 3.6.5, revised dated May 31, 2016, there are significant parcels of land within the FERC Project Boundary that are not owned in fee by FirstLight but instead are subject to "flowage rights, leases, easements, etc." Many of these parcels are likely to be in active agricultural use, be designated as Prime Farmland, and/or are permanently protected by agricultural or other conservation easements. These lands should not be summarily excluded from the Riparian Management Plan.

Recommendations for Special Condition 28

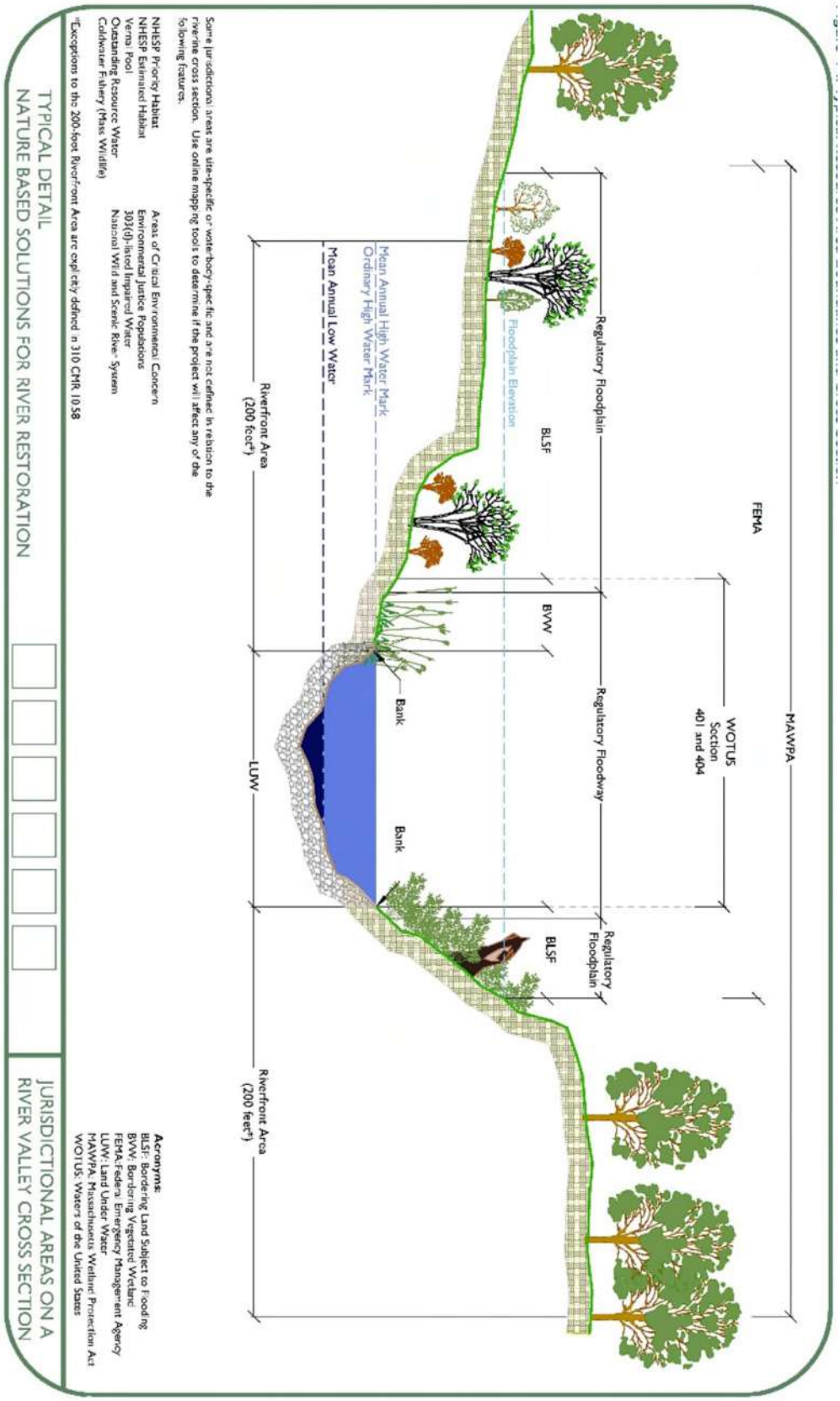
1. MassDEP should require a managed riparian area that is relevant to Massachusetts laws and regulations relating to rivers. FRCOG recommends that regulated resource areas (shown below) be referenced in the 401 WQC as illustrated below in Figure 5.
2. FRCOG strongly recommends targeted elimination, management, and treatment of priority riparian invasive plants within the riparian management plan. A healthy and diverse riparian habitat will be significantly impaired if taken over by oriental bittersweet. For more information, please see our comment letter dated June 3, 2024.
3. FirstLight should not be able to sell land along the Connecticut River, if that land will continue to be covered by the requirements of the FERC license and the 401 WQC including the Riparian Management Plan.
4. FRCOG recommends that part (c) be amended to incorporate review and approval of the draft plan by the New Hampshire Department of Environmental Services (NHDES) and Vermont Department of Environmental Conservation (VT DEC), as this provision appears to and should involve FirstLight's riparian lands in New Hampshire and Vermont. FRCOG

also recommends amending this section to incorporate public review of a draft Plan, and public posting of the Final Plan, with a set of maps clearly defining the parcels involved.

5. For this reason and in order for the Riparian Management Plan to be effective, the Plan should extend to all lands subject to erosion within the FERC Project Boundary. As currently written, Special Condition 28 is incomplete. Unless revised to encompass all land subject to erosion, as opposed to just land owned in fee, neither MA DEP nor the public will have sufficient assurance that this Plan, once approved and implemented, will address the impacts of the Project on water quality.

6. For properties not owned by FirstLight in fee but subject to easements, MassDEP should require FirstLight to consult with the landowners and develop riparian management strategies that will prevent erosion and are complementary to the current use of the land, whether it be active agricultural use of permanently protected farmland, stewardship of conservation land, or some other use.

Figure 5. Typical regulated resource areas (taken from January 2025 draft version of FRCOG's "River Restoration Design and Permitting in Massachusetts: A Guide for Inland Rivers," in process)



Special Condition 29: Recreation Management Plan

FRCOG signed on the Recreation Settlement Agreement and fully supports MassDEP's adoption of the Recreation Management Plan into the 401 Water Quality Certificate.

Special Condition 30: Sediment Management Plan

FRCOG supports the requirement for the licensee to file a revised Sediment Management Plan and to file a report summarizing monitoring and disposal details after each dredging event.

Recommendations for Special Condition 30

1. We encourage MassDEP to expand this requirement for any dredging activities in the project areas.
2. Both the Plan and the reports should be publicly posted; the easiest way to require that would be to require the licensee submit the same documents to FERC, which maintains a publicly available project docket.
3. A regularly updated QAPP should be required for the Sediment Management Plan.

Conclusion

FRCOG urges MassDEP to address the water quality impairments in the Connecticut River upstream of the Turners Falls Dam. This section of river has undergone a large experiment for the last 50 years. The impacts have been significant, and this is the only opportunity to course correct and set appropriate conditions for the next 50 years.

Thank you for this opportunity to review and provide comments on this draft Certificate. If you have any questions, please do not hesitate to contact myself (lindad@frcog.org) or Kimberly Noake MacPhee (kmacphee@frcog.org).

Sincerely,

Linda Dunlavy
FRCOG Executive Director

ATTACHMENTS

A: Princeton Hydro memo dated February 24, 2025

B: Figure 30 in Field Geology Services (2007), Fluvial Geomorphology Study of the Turners Falls Pool on the Connecticut River Between Turners Falls, MA and Vernon, VT. Prepared for Northfield Mountain Pumped Storage Project by Field Geology Services, Farmington ME, November 2007.

cc:
FERC Secretary Debbie-Anne A. Reese
Senator Edward Markey
Senator Elizabeth Warren
Massachusetts Governor Maura Healey
State Senator Jo Comerford
State Representative Natalie Blais
State Representative Susannah Whipps
Bryan Smith, Town Administrator, Town of Erving, MA
Ray Purington, Town Administrator, Town of Gill, MA
Walter Ramsey, Town Administrator, Town of Montague, MA
Andrea Llamas, Town Administrator, Town of Northfield, MA
Nina Gordon-Kirsch, River Steward, Connecticut River Conservancy

Nina Gordon-Kirsch
MA River Steward
Connecticut River Conservancy
15 Bank Row | Greenfield, MA 01301

RE: Comment on Water Quality Certification with Conditions
FirstLight Hydroelectric Project
FERC License Nos. 1889 (Turners Falls) and 2485 (Northfield Mountain)

February 24, 2025

Dear Ms. Gordon-Kirsch,

Princeton Hydro LLC (Princeton Hydro) was retained by the Connecticut River Conservancy (CRC), a stakeholder and participant in the re-licensing process of the Federal Energy Regulatory Commission (FERC) for two hydropower facilities owned by FirstLight Power Resources Inc. (FirstLight) on the Connecticut River, to provide a technical review of the components of the Draft 401 Water Quality Certification (WQC)[1] related to bank stability and monitoring for the reach of the Connecticut River known as the Turners Falls Impoundment (TFI). FirstLight MA Hydro LLC and Northfield Mountain LLC (collectively FirstLight or the Applicant), respectively, filed applications for new major licenses to operate the 62.0-megawatt Turners Falls Hydroelectric Project (Turners Falls Project; FERC No. 1889) and the 1,166.8-MW Northfield Mountain Pumped Storage Project (Northfield Mountain Project; FERC No. 2485).

Introduction and Background

As part of the relicensing process, FERC regulations required FirstLight to file with the Massachusetts Department of Environmental Protection (MassDEP) its 401 Water Quality Certificate Application. FirstLight filed a single 401 Application with MassDEP for

[1] Mass DEP, (Draft) Water Quality Certification with Conditions, 2025. FirstLight Hydroelectric Project, FERC License Nos. 1889 (Turners Falls), 2485 (Northfield Mountain), dated January 24, 2025.

both Projects on April 22, 2024. The submission of the 401Water Quality Application is an essential part of the relicensing process as it must receive the approval of Massachusetts. Under Section 401 of the Clean Water Act (CWA), a federal agency may not issue a permit or license to conduct any activity including Federal Energy Regulatory Commission (FERC) licensed hydropower facilities unless a Section 401 WQC is issued by a state, or certification is waived. It is also important to acknowledge that the WQC review process seeks to ensure that the project, in this case FirstLight's relicensing of the Turners Falls Project and the Northfield Mountain Project, will not continue to negatively impact the water quality of the Connecticut River as set forth in Massachusetts's surface water quality standards. A "WQC" under the Clean Water Act enables states to participate in a federal approval process such as the FERC relicensing of FirstLight's hydropower facilities to protect water quality in a water body such as the Connecticut River by allowing states to regulate and potentially deny permits for projects that could worsen the condition of any water body including already impaired waters. In this context the WQC process must be shown by FirstLight to be consistent with the designated water quality standards for relevant segments of the Connecticut River. The stretch of the Connecticut River associated with the Turners Falls Dam and the Northfield Mountain Pumped Storage Project is listed as Class B waters, which are designated in accordance with 314 CMR 4.05(3)(b) "as habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation." Importantly, and of relevance to the pending 401 application, the entire Massachusetts part of the Connecticut River upstream of the Turners Falls Dam is listed as impaired in the 2022 Massachusetts Integrated List of Waters. The stated impairments in the upper 3.5-mile section of the

Turner Falls Impoundment (TFI) are indicated to be due, at least in part, to "alteration in streamside or littoral vegetative covers" and "flow regime modification".[2] Similarly, the segment of the Connecticut River from the Route 10 bridge to the Turners Falls dam is also considered to be impaired, in part, for the same reasons "alteration in streamside or littoral vegetative covers" and "flow regime modification".

The combination of the two causes of impairment identified above are not commonly designated in Massachusetts and would appear to be specific to the Turners Dam impoundment and pumped storage project operations. The role of First Light's operations on erosion has been consistently identified in comments by various experts indicating that project operations contribute or exacerbate erosion in the TFI. However, FirstLight's application for this WQC states that "[a] consistent finding throughout all the erosion evaluations conducted during relicensing is that the dominant causes of erosion in the TFI are high flows/floods and, in the Barton Cove area, boat waves. Project operations is not a *dominant* cause of erosion at any locations in the TFI but is a contributing cause of erosion in the following locations of the TFI in Massachusetts: in: (1) an approximately 21,600-foot-long reach from the exit of Barton Cove to the French King Gorge (both sides of the river), and (2) an approximately 4,700-foot-long reach on river right upstream of the Northfield Mountain tailrace."[3] Based on work done on an earlier report by Princeton Hydro[4] and review of other reports regarding the TFI including reports

[2] Final Massachusetts Integrated List of Waters for the Clean Water Act 2018/2020 Reporting Cycle. November 2018-2021. Watershed Planning Program.
http://www.mass.gov/eea/agencies/massdep/water/watersheds/total-maximum-daily-loads-tmdls.html
[3] FirstLight. April 22, 2024. Prepared for: FirstLight. Northfield, MA: Author. April 22, 2024. Turners Falls Hydroelectric Project (FERC No. 1889) Northfield Mountain Pumped Storage Project (FERC No. 2485) 401 Water Quality Certificate Application.
[4] Wildman, L., Woodworth, P., & Daniels, M. (October 2016). Peer-Review of Relicensing Study 3.1.2 Northfield Mountain / Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability Study Report.

by the US Army Corps of Engineers (1979)[5], Field Geology Services[6] (2007) and, most recently, Dr. Evan Dethier (2024)[7] we remain unconvinced that FirstLight's position indicating that operations do not have a significant or dominant role in the impoundment's erosion issues is accurate. Dethier (2024) states that "There is substantial evidence of erosion in the Turners Falls Impoundment (TFI), much of it consistent with fluctuations in water level due to dam operations. Several reports and memos, including by the US Army Corps of Engineers, Field Geology Services, and Princeton Hydro, have already established that water level fluctuations in the TFI can, and do, enhance erosion in the reservoir."

Impacts on bank stability and water quality associated with the operations of pumped storage facilities such as TFI have been documented for many years. For example, in a 1982 document by the US Army Corps of Engineers states "[o]perating a reservoir in a peaking mode, that is, controlling releases to match peak energy demands, creates another level of impacts within the reservoir and downstream of the dam. Reservoir fluctuations cause many biological impacts in addition to the aesthetic and recreational nuisance of the exposed drawdown zone."[8] This publication goes on to state "**[l]arge seasonal or diurnal fluctuations in water level primarily affect the stability of the shoreline substrate and water quality** (emphasis added)."[9] A 1981 report by Dames

[5] U.S. Army Corps of Engineers, 1979, Report on Connecticut River Streambank Erosion Study: Massachusetts, New Hampshire and Vermont: Department of the Army New England Division Corps of Engineers: Waltham, MA, 185 p.
[6] Field (Field Geology Services), 2007, Fluvial geomorphology study of the Turners Falls Pool on the Connecticut River between Turners Falls, MA and Vernon, VT: Unpublished report prepared for Northfield Mountain Pumped Storage Project, 131 p
[7] Dethier, Evan May 19, 2024, Review of Erosion in the Turners Falls Impoundment Prepared for the Connecticut River Conservancy and Franklin Regional Council of Governments. 53 pages
[8] United States Army Corps of Engineers. March 1982. National Hydroelectric Power Resources Study, Environmental Assessment. Institute for Water Resources, Kingman Building, Fort Belvoir, Virginia 22060. Page 3-7.
[9] id

and Moore describes the adverse effects of reservoir water-level fluctuations during hydropower operations and indicates impacts such as "**degradation of wetland habitats above the dam; with bank erosion".**[10] In a more recent 2020 publication by Saulsbury, he states "[b]oth open-loop and closed-loop PSH (pumped storage hydropower) pumping and generating operations may affect geology and soils primarily due to large and frequent reservoir water-level fluctuations and resulting shoreline erosion. These impacts may be higher at open-loop projects such as Northfield Mountain, including add-on projects where the lower reservoir was already constructed for other purposes, because of the potential effects of their shoreline erosion and resulting sedimentation on the naturally flowing water bodies to which they are connected. [11] Evan Dethier stated that "[t]he current project operational range for reservoir levels exacerbates erosion relative to a narrower range by exposing a large swath of the reservoir banks to erosive properties and raising the "base-level" for natural flooding, adding to flood heights and thus erosive power."[12]

It is, however, interesting that the operations of other pumped storage facilities are often linked to erosion, but FirstLight asserts that the TFI is somehow not. FirstLight's claim that the predominant impacts on riverbank stability stems from "natural" high flows and boat traffic wake is questionable. There is nothing natural about the TFI. The simple existence of the TFI and pumped storage operation already creates a baseline of

[10] Dames and Moore. 1981. *An Assessment of Hydroelectric Pumped Storage*. In *National Hydroelectric Power Resources Study*. Volume X. Prepared for the U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Virginia. https://www.iwr.usace.army.mil/portals/70/docs/iwrreports/iwr019-000001-000517.pdf
[11] Saulsbury, J.W. A Comparison of the Environmental Effects of Open-Loop and Closed-Loop Pumped Storage Hydropower; Pacific Northwest National Lab. (PNNL): Richland, WA, USA, 2020.
[12] Dethier, Evan May 19, 2024, Review of Erosion in the Turners Falls Impoundment Prepared for the Connecticut River Conservancy and Franklin Regional Council of Governments. Page 52.

complex anthropogenic impacts to the hydrology of the Connecticut River that has little in common with a natural river system. The artificial elevation of the river correspondingly elevates the adjacent groundwater all along the TFI, while the Northfield Mountain pumped storage system adds the variability of the water surface elevations in the TFI daily. At a minimum, these artificial elevations of the TFI section of the Connecticut River influence every instance of bank failure.

We commend MassDEP on its understanding and recognition of the issues associated with operations and erosion in the TFI as indicated in the following statement:[13]

> "…it is clear that project operations will continue to contribute to erosion in the TFI. It is difficult, however, to quantify the extent of that contribution. It is therefore necessary to establish erosion-related measures in the WQC to address the existing impairments and to ensure compliance with the SWQS. The measures are intended to balance the limitations and difficulties of precisely determining erosion causation in the TFI with the need to address existing erosion and impairments and monitor for and address any future erosion. The SWQS require that the existing and designated uses and the necessary water quality be maintained and protected and that they be free from solids, color, and turbidity that would be aesthetically objectionable, impair any use, or impair the benthic biota or degrade the chemical composition of the bottom."

[13] Mass DEP, (Draft) Water Quality Certification with Conditions, 2025. Page 41 of 117.

It is in this light that our comments focus on the issues associated with reliance on a dated erosion and sediment control plan, the 2013 Full River Reconnaissance (FRR) Quality Assurance Plan[14]. It is also important to acknowledge that the 2013 FRR avoids the identification of issues related to operations such as the absence of vegetation and bank instability as contributing to water quality impairment.

We have significant issues concerning the Draft WQC and the proposed use of the 2013 Full River Reconnaissance Report (2013 FRR) and the associated Quality Assurance Project Plan (QAPP) to guide Special Condition 25, which is detailed in Appendix F, of the Draft 401 WQC. Failure to use objective, quantitative metrics to determine the causes of bank instability and loss of shoreline vegetation will not contribute to the development of consistent water quality improvements. Specifically, our concerns are summarized below and then described in more detail in the following pages.

1. **The methods in the 2013 FRR and its QAPP warrant an update, especially considering MassDEP's understanding that operations play a key role in the erosion as well as bank instability and the absence of shoreline vegetation within the impoundment.** Since 2013, technology has advanced and reduced survey and monitoring costs. For example, unmanned aerial vehicles (UAV) or helicopter LiDAR surveys can accurately survey and provide repeatable, defensible documentation. This technology would provide a complete survey of the entire impoundment; including the measurement of elevations with as

[14] Simons & Associates and New England Environmental (2012), Quality Assurance Project Plan, 2013 Full River Reconnaissance Turners Falls Impoundement of the Connecticut River, October 29, 2012.

small an interval as several inches and can document and calculate vegetative cover.

2. **The 2013 FRR is too focused on visual indicators of erosion and fails to place much, if there is any, emphasis on bank instability that is more related to operations.** Appendix D of the 2013 QAPP proposes to use reference photographs to estimate bank heights, slopes, soils/sediment types, vegetative cover, and erosion. However, as will be discussed, the proposed use of photographs, and subjective and inconsistent metrics which will only provide inaccurate/inconsistent judgements of the condition of the slopes. While the conditions for "erosion" are noted, they do not include global stability and deep-seated failures, such as slides, that are clearly shown in the photographs but downplayed in the descriptions.

3. Because the FERC license has a 30 to 50-year life span, **the Final WQC must have provisions to update survey methods as technology is developed to further improve the accuracy, repeatability, and defensibility of data collected.**

4. **The formation of a panel of experts, with equal voting rights, must be included as a requirement of the Final WQC to evaluate developing trends in surveying, monitoring, and mitigation techniques and technology**. At a minimum, the panel would consist of representatives from MassDEP, FirstLight, Franklin Regional Council of Governments, CRC, Connecticut River Streambank Erosion Committee, and their respective experts to evaluate the progress of monitoring, conditions of the river and its banks, and make recommendations to ensure protection of the water quality of the Connecticut River.

5. In Appendix F of the Draft 401 WQC, the determination of how much bank stabilization needs to be completed is vague, at best, and from what we can interpret of **the requirement to repair 5% of a failed riverbank will be meaningless regarding protecting water quality.**
6. In Appendix F of the Draft 401 WQC, MassDEP is proposing that FirstLight repair newly eroding sites. **The provision to allow five (5) years to implement bank stabilization measures provides permission for FirstLight to violate the MA Water Quality Standards for that period, when sediment and nutrients contained in the sediment will continue to discharge to the Connecticut River.**

Comments on <u>Monitoring</u> within the Draft WQC Appendix F, Erosion, Stabilization, and Monitoring Plan

After a thorough and thoughtful review of all the documents and comments submitted regarding FirstLight's application for 401 Water Quality Certification, MassDEP

> "finds it necessary to impose the erosion-related measures in Special Condition 25 for the Projects to comply with the Federal Clean Water Act, the Massachusetts Surface Water Quality Standards, and other water quality-related requirements of state law. Accordingly, MassDEP imposes Special Condition No. 25."

Special Condition 25 relates to the Erosion Mitigation, Stabilization, and Monitoring Plan located at Appendix F of the Draft 410 Water Quality Certification. A comprehensive and current plan to address shoreline issues within the impoundment is essential to MassDEP's goal of improving impoundment water quality. It is vitally important that monitoring and

the resulting mitigation and stabilization measures be based on highly repeatable, defensible, and precise measures for determining the causation of shoreline and riverbank erosion and instability. Appendix F of the Draft 401WQC is relying upon the 2013 FRR in Study No, 3.1.1.[15] Appendix F of the Draft WQC and the 2013 FRR rely on metrics and methodologies that are dated in terms of the available remote survey technologies. In fact, the 2013 QAPP to Study 3.1.1 (included as Appendix D in the study report to 3.1.1) relies upon references photographic/video georeferencing and global positioning systems (GPS) equipment that has been surpassed in technological development.

Frequency of Observations

One area for which we mostly agree with the proposed monitoring plan is the frequency of field observations. According to the 2013 QAPP, FERC requires FirstLight to conduct FRRs every 3- 5 years[16], however, the Draft WQC states that Erosion Monitoring Surveys will be conducted in years 2, 10, 20, and 30[17], while Boat-Based Inspections are to be conducted in years 4, 6, 8, 12, 15, 25, 35, and 45[18]; leaving a 10 year gap between years 35 and 45, and no inspections at year 50. MassDEP would be better served by requiring inspections at consistent intervals, with three (3) years for the life of the FERC License as the standard for scheduled surveys. Such consistency will allow for the identification of riverbank change over time. As will be described below for improvements to monitoring, in addition to the years specified above (whichever is determined to be correct), a baseline survey must be completed in the first year of the issuance of the FERC license, and it would be beneficial to provide additional FRR surveys

[15] Simons & Associates and New England Environmental (2012).
[16] Simons & Associates and New England Environmental (2012). Page 5 of 38.
[17] Mass DEP, (Draft) Water Quality Certification with Conditions, 2025. Page 107 of 117.
[18] Mass DEP, (Draft) Water Quality Certification with Conditions, 2025. Page 108 of 117.

following major storm induced flooding, such as those caused by hurricanes, tropical depressions, and other major flooding events. In addition to consistent frequency of surveys, It is imperative that these surveys are conducted at a level as to be accurate, replicable, and defensible in the eyes of MassDEP, using modern methods (further described below). Without this, the proposed FRR monitoring plan is unenforceable due to the vagueness and lack of detail to be obtained.

Equipment included in the 2013 QAPP

None of the equipment and observation methodology described in the 2013 QAPP is adequate for accurately determining the progression of bank failure when it occurs. The proposed equipment to be used in the assessment of the TFI's riverbank conditions only provide support for the location where qualitative and subjective (see below for comments on the bank condition classification system) observations are made and are not repeatable in terms of understanding monitoring of the changes in topography are made, especially to those movements that would otherwise reveal that a slope is mobilized.

Trimble Geoxt Sub-Meter GPS Specifications – Appendix A of the QAPP specifies a Trimble submeter accurate GPS product, and the version of this model from 12 years prior. Due to reductions in cost of equipment and increased access to reference GPS stations, submeter accuracy systems have been supplanted by sub-centimeter/survey grade Real Time Kinematic (RTK) GPS equipment to allow for detailed surveys rather than simple locating of points of observations. Current technology allows for the collection of sub-centimeter accuracy elevations to be collected directed on the slopes with relative ease. This would provide MassDEP with a clearer

understanding of how the riverbanks are responding to hydropower operations.

Laser Range Finder Equipment Specifications – Appendix B of the QAPP includes a product brochure for a LTI TruPulse 360B range finder. These range finders are handheld and subjective in terms of where on a slope, for example, a distance is measured. The manufacturer's specifications included in this appendix state that the accuracy of the device is +/- 1 ft (this means that a distance could be 2 feet off), with an inclination and azimuth accuracy of +/-0.25 degrees and +/-1 degree, respectively. The accuracy combined with the inconsistent measurement points chosen on a slope at each event, will not provide useful information on changes in elevations and slopes, especially where a slope is already failing, but in slow progression between survey events.

Red Hen Systems - A quick search on the internet for the "Red Hen Systems Geo-Referenced Video Mapping" equipment included as Appendix C of the QAPP, reveals the latest website reference to this equipment is dated 2016. It is not clear that this equipment can be purchased or serviced/calibrated by Red Hen Systems, if they are no longer in business. This equipment may have been made obsolete with the advent of georeferenced smart phone photographic technology, but even then, all these systems provide is a location for where the photographs were taken.

Riverbank Classification Reference Photographs

Appendix D of the 2013 QAPP includes a proposed classification system to assess the Upper Riverbank Slope, Lower Riverbank Sediment, Upper Riverbank Height, Upper Riverbank Vegetation, Lower Riverbank Vegetation, and Extent of Current Erosion. On the last page of Appendix D (and of the entire document) it states:

> *NOTE: All quantitative classification criteria (e.g., slope, height, vegetation, extent, etc.) will be based on approximate qualitative estimates made during field observations of riverbanks. The FRR is a reconnaissance level survey that will not include quantitative field measurements of characteristics. Photographs contained in this appendix will be used for reference checking in the field to ensure consistent and accurate data classification.*

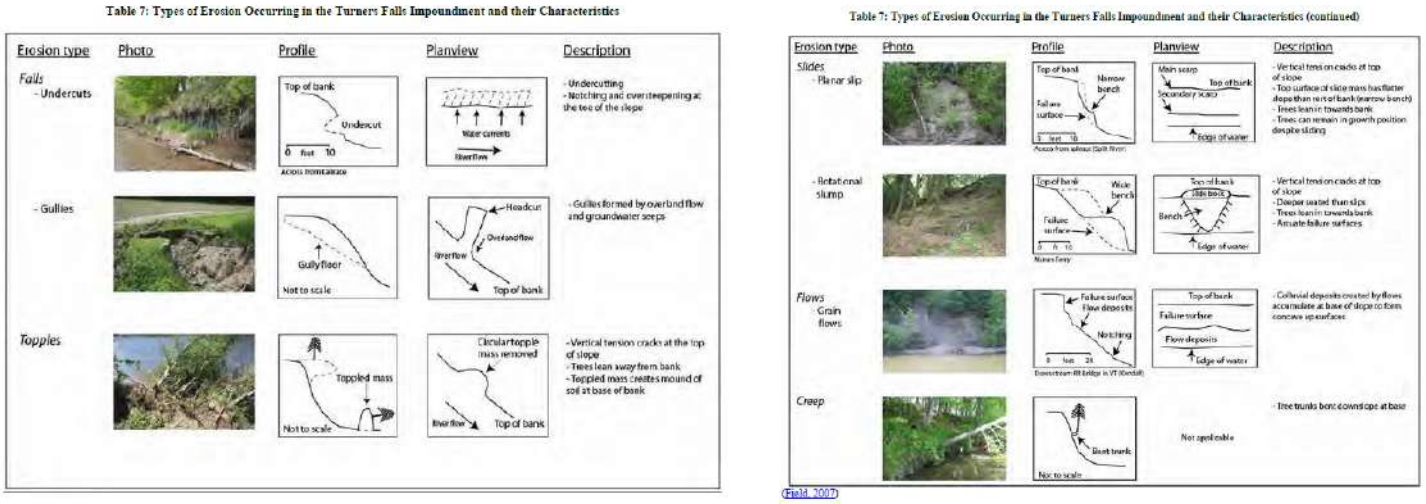


Figure 1 Table (sic) 7 from the 2013 QAPP. While labeled as erosion, it is actually depicting bank stability and failure mechanisms, both caused by erosion, as well as other factors such as loss of vegetation and rapid drawdown of the impoundment.

This statement is contradictory in that it claims to be "quantitative," but subsequently qualifies that word using the phrase "approximate qualitative estimates" (each of these three words used are subjective). This note goes further to admit that the "…FRR is a

reconnaissance level survey that will not include quantitative field measurements of characteristics." **There will be absolutely no way to determine if there has been any degradation of riverbanks, unless there are massive changes or catastrophic failures that would by then negatively impact water quality by introducing significant quantities of sediment to the river.** There is the potential for significant variation in observations, both from the same individual over time, and from different individuals conducting the surveys. **Human errors must be eliminated in the documentation as much as possible. Based on current technology, these surveys should be done more rigorously and with repeatability/replicability.**

Additionally, while mass failures of the slopes were depicted within Table 7 of the 2013 QAPP (Figure 1), none of these failure mechanisms were included as one of the parameters in the classification photographs in Appendix D of the QAPP.

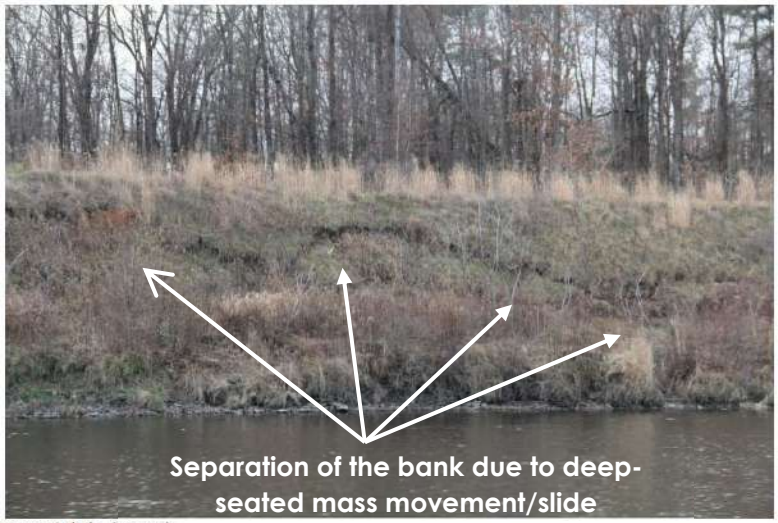


Figure 2 "Extent of Current Erosion" identified as "none/little (<10%)" in Appendix D of the QAPP. Arrows pointing to surface evidence of separation, and circle illustrates the portion sliding into the river. "rotational slump" per Table 7 (See Figure 1, above).

The example photographs and their corresponding "classification" focus on erosion and not mass failures of the riverbanks. A prime example of the inconsistency in the example photographs included in Appendix D, is illustrated in Figure , where the "Extent of Current Erosion" is identified as "none/little (<10%)". This figure

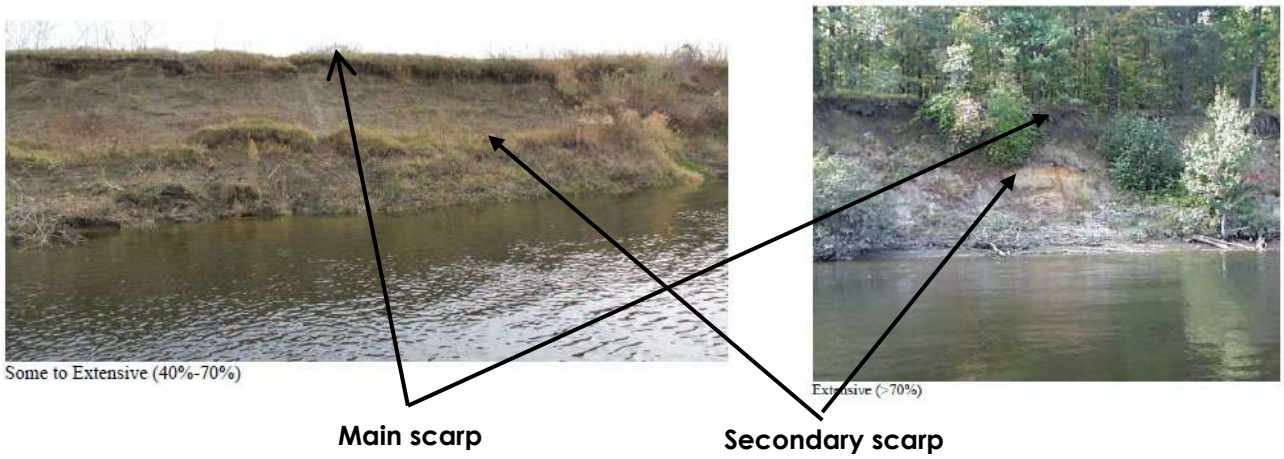


Figure 3 Two photographs depicting "planar slip" as per Figure 1 above. These two have the same failure mechanism and would both be considered "extensive" by this author. It is unclear as to how the preparer of the QAPP determined which one was more extensive, unless they based it on vegetative cover, which would be a different category.

clearly shows the initiation of a deep-seated bank failure as shown in the arch shaped separation, highlighted. This bank should have been identified as "extensive."

Another example is illustrated in Figure 3, wherein the failure mechanisms are identical, yet having various levels of severity for the same condition illustrate the additional confusion that will result when the surveys are completed, and MassDEP will be tasked with enforcement of the WQC.

Updated Requirements of Technology for Use in Monitoring, combined with Modeling

The subjectivity and outdated survey methods proposed in the 12-year-old FRR and its QAPP must be updated and improved to accurately define the existing conditions of the Connecticut River's banks. Otherwise, MassDEP will not have the data and information to adequately enforce the requirements of the WQC and improve the state's water quality.

Due to the advancement and cost efficiency of LiDAR technologies for use in the monitoring of rivers and bank stability, obtaining riverbank topographic data and vegetative cover, even over an impoundment as long as one behind the Turners Falls Dam, is strongly recommended. Such data to be collected will be an initial baseline flyover via drone or helicopter survey to collect the above and below water surface slope

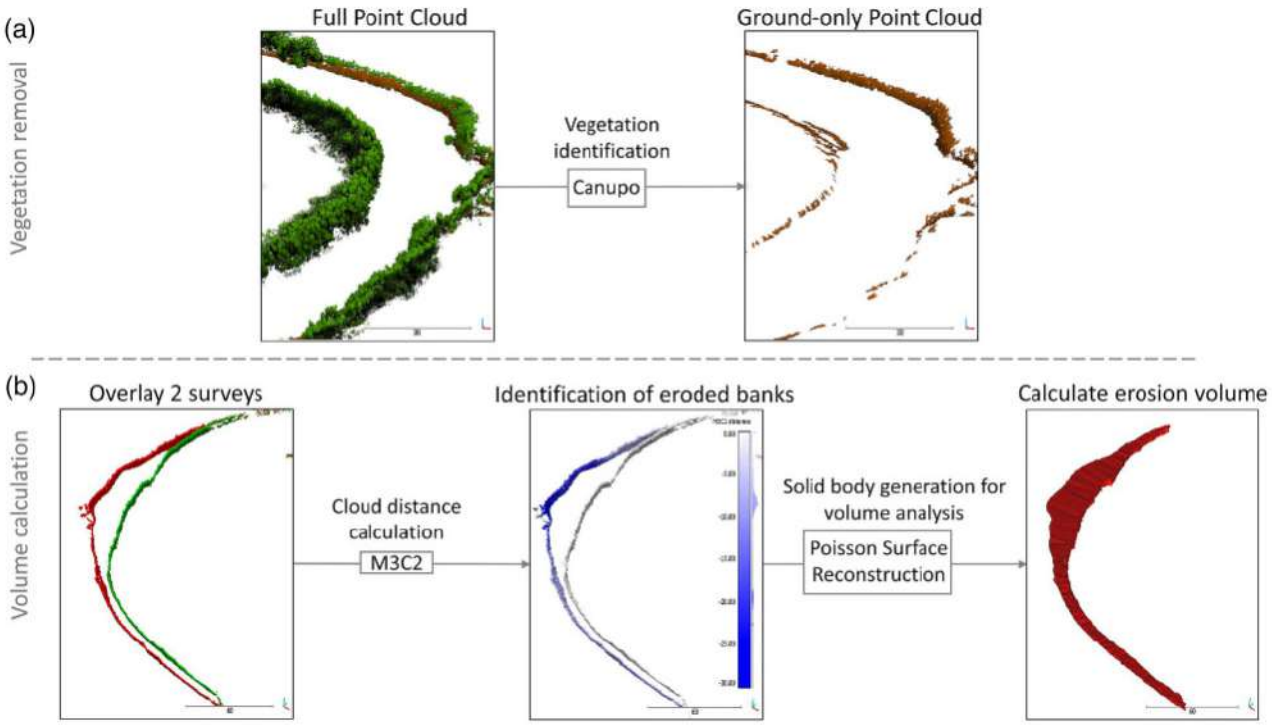


FIGURE 2 Schematic overview of the data processing workflow. Note that the bank segment shown in figure (a) (vegetation removal) differs from the bank segment shown in figure (b) (volume calculation) because areas with considerable bank erosion are generally near-vertical banks without vegetation cover—thus, different segments are best used to illustrate the two steps. [Color figure can be viewed at wileyonlinelibrary.com]

Figure 4 Illustration of the ability of the use of LiDAR to accurately assess vegetation cover and slope/volume changes of riverbanks.

Haddadchi, A., Bind, J., Hoyle, J., & Hicks, M. (2023). Quantifying the contribution of bank erosion to a suspended sediment budget using boat-mounted lidar and high-frequency suspended sediment monitoring. *Earth Surface Processes and Landforms*, 48(14), 2920–2938. https://doi.org/10.1002/esp.5667

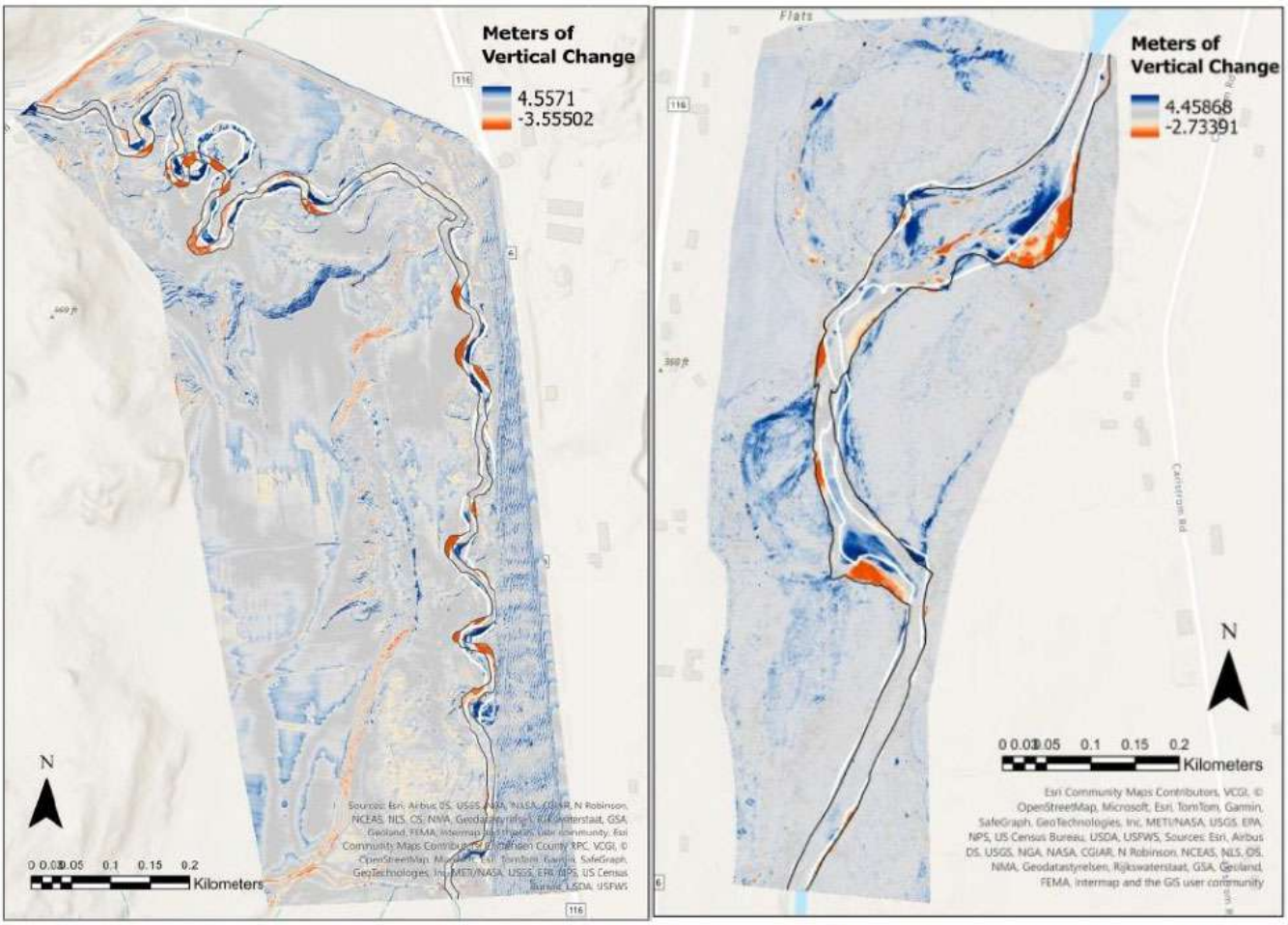


Fig 3. The Lewis Creek DoD (left) and New Haven River DoD (right). The black outline represents the 2023 stream channel boundary, and the white outline shows the older channel boundary. Polygons representing the extent of bank erosion were drawn in between the channel boundaries where the new channel was outside the older channel.

Figure 5 Another illustration of the ability of the use of LiDAR to accurately assess vegetation cover and slope/volume changes of riverbanks.
Flanzer, Zoe C., "Examining Variability in Streambank Erosion Rates in the Lake Champlain Basin, Vermont" (2024). *UVM College of Arts and Sciences College Honors Theses*. 129. https://scholarworks.uvm.edu/castheses/129

conditions. Such data can be used to identify existing slope movements and vegetative covers. Such a survey would be completed at the same frequency as the "Boat-Based Inspections" and the "Erosion Monitoring Surveys." It is also strongly recommended that the LiDAR survey be conducted on or about the effective date of the renewed FERC

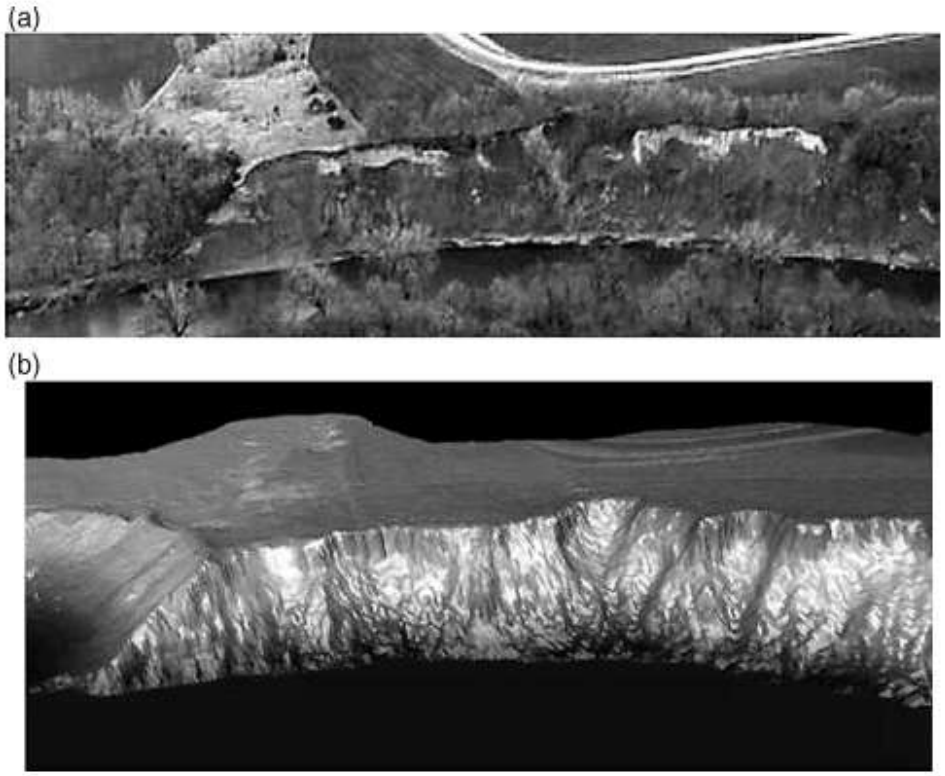


Fig. 2. (a) A severely eroded site along the Blue Earth River photographed at an oblique viewing angle from the air, and (b) rendered as a bare-earth elevation model from the LIDAR data. Vegetation was filtered and points gridded to a 1 m interval in the LIDAR image to create the model. Note gravel road passing through fallow field for scale in both figures.

Figure 6 The use of LiDAR from oblique angles to evaluate the overall stability and areas of failures on riverbanks.

Thoma, D. P., Gupta, S. C., Bauer, M. E., & Kirchoff, C. E. (2005). Airborne laser scanning for riverbank erosion assessment. *Remote Sensing of Environment, 95*(4), 493–501. https://doi.org/10.1016/j.rse.2005.01.012

license to obtain baseline conditions, and after significant flooding events such as flooding caused by tropical storms, nor'easters, or summer catastrophic storms such as have occurred over New England in the last two years. Subsequent years can be precisely overlain over prior years to calculate changes in slope elevations to evaluate if there is displacement or erosion of the riverbanks, as well as understanding the volume of sediment that is discharging into the TFI. Especially following significant flooding, the impacts between regional storm events versus bank instability caused by operations can be distinguished. The accuracy of LiDAR surveys is impressive, and can collect elevation

data, accurate to within 0.06 meters[19], and would be much more reliable than simple, subjective observations (Figure 4, Figure 5, and Figure 6). In fact, the LiDAR technology can obtain topographic data to depths of up to 15 meters, depending on water clarity, which would provide a more complete understanding of erosion and stability occurrences.[20] The ability to obtain topographic data below the water surface would allow for the comparison of surveys over time, regardless of the water depth.

In consulting with remote sensing/survey firms who conduct such services, each survey, including analysis and reporting can be completed for less than $50,000 in 2025 dollars, providing MassDEP and the public with a more comprehensive, quantitative assessment of the stability of the riverbanks and the vegetative cover that adds to river stability. Such a cost would be comparable, if not less costly than ground surveying the limited number of river sections previously completed to determine the overall stability of slopes within the subject impoundment.

In addition to monitoring using remote sensing technology, the causation of loss of vegetation, bank instability, and erosion can be corroborated by using a 2-dimension model such as the US Army Corps of Engineers, Hydraulic Engineering Center, River Analysis System (HEC-RAS).[21] This model, which is free to the public, and a universal modeling software of river hydraulic modelers, would be used to evaluate river flow patterns because of baseflow, natural flooding, and hydropower operational changes

[19] Tamimi, Rami & Toth, Charles. (2024). Accuracy Assessment of UAV LiDAR Compared to Traditional Total Station for Geospatial Data Collection in Land Surveying Contexts. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences. XLVIII-2-2024. 421-426. 10.5194/isprs-archives-XLVIII-2-2024-421-2024.
[20] LiDAR survey below the water surface is also referred to as "blue LiDAR", referring to the blue-green wavelengths used to obtain below water surface data.
[21] U.S. Army Corps of Engineers. HEC-RAS River Analysis System, Version 6.6: User's Manual. Davis, CA: Hydrologic Engineering Center (HEC), 2024.

in flow patterns to compare to areas where there is found to be riverbank instability. The comparison of the model to the surveys would allow for a significantly higher level of accuracy and precision in determining whether a riverbank failure is caused by operation of FirstLight's projects or natural processes.

Comments on Stabilization and Mitigation within the Draft WQC Appendix F, Erosion, Stabilization, and Monitoring Plan

Repair & Stabilize Certain 2013 FRR Sites

The proposed plan indicates that "within 6 years of license issuance, the Licensee shall repair and stabilize all previously stabilized sites in the TFI where the 2013 Full River Reconnaissance (2013 FRR) identified erosion, and the sites have not already been repaired since 2014. These sites include bank segments 14, 371, 65, and 478 that were delineated during the 2013 FRR, equaling approximately 429 linear feet." Although we concur that the repair of existing stabilization sites is important to improving water quality in the impoundment, stabilization projects should be reviewed by an expert panel that includes key stakeholder groups as well as FERC and MassDEP, to minimize the chance of future failures. As indicated by MassDEP "hydropower operations contribute to erosion by raising and lowering the water surface elevation more frequently and significantly than natural fluctuations." It is related to the additional stress associated with operations that may make certain types of streambank stabilization unsuitable for TFI. For example, daily water surface fluctuations can create a stressful environment for vegetation and thus preclude the colonization and successful establishment of stabilizing vegetation. The lack of vegetation at the toe of the bank or the lower bank within the impoundment may be directly associated with stresses associated with daily water surface fluctuations.

The lower bank is typically a flat, beach-like feature that in many ways is like that of a tidal marsh where the absence of vegetation is related to the duration of inundation. As such, reliance on plant material to stabilize or assist in the stabilization of the banks of the impoundment may not, at least in some areas of the impoundment, be a viable option. **A thorough and objective understanding of the causes of erosion at a particular location is essential for the development of future designs that will provide long term stability and improve water quality.**

Additional New Sites to be Stabilized

The proposed draft certification indicates that "[i]n addition to the completed stabilization projects noted above, within 6 years of license issuance, the Licensee shall implement stabilization or preventative maintenance projects at three additional sites within the TFI, which equate to an additional 667 linear feet. These sites were identified during the 2013 FRR as having the most erosion of the banks within Massachusetts that had not already been stabilized. These sites include bank segments 90, 87, and 119 that were delineated during the 2013 FRR, equaling approximately 667 linear feet."

We concur that the stabilization contemplated for previously unrestored highly eroded banks is important to the water quality of the impoundment banks. We continue to be concerned that the design will be appropriate for the long-term stability of the banks in the face of the highly modified hydrology of the TFI. As indicated in the previous comment, it is our recommendation that MassDEP and First Light establish a stakeholder group to provide feedback on any stabilization design contemplated for the highly eroded section of the impoundment.

Future New Stabilization Sites

The proposed draft certification indicates that [s]ites that are newly identified after issuance of the license as exhibiting 'Some to Extensive' or 'Extensive' erosion based on the definitions contained within the 2013 FRR and which were not previously repaired or stabilized by anyone nor identified above in Table 1, shall be repaired and stabilized by the Licensee within 5 years of their discovery during the Erosion Monitoring Surveys or the Boat-based Site Inspection, subject to the following "limitations."

The limitations of this condition will be discussed later. The identification of newly identified erosion areas exhibiting "some to extensive" or "extensive erosion" based on definitions created in the 2013 Full River Reconnaissance Study and Quality Assurance Project Plan (2013 FRR)[22] limits the types of newly eroded banks to those that have substantially more than a minimal amount of erosion and more realistically define bank failure. Based on the definitions referred to in the 2013 FRR, "Some to Extensive" erosion is assigned to those riverbanks "where the total surface area of the bank segment has approximately 40-70% active erosion present" (see Figure 3) while riverbanks with extensive erosion is assigned to those banks "where the total surface area of the bank segment has approximately more than 70% active erosion present" (See Figure 3) . This would seem to indicate that the newly identified areas erosion subject to this component of the plan would, at a minimum, fall into the 40-70% active erosion class to qualify as new and require stabilization within 5 years of their discovery. Both the "some to

[22] 2013 FirstLight Full River Reconnaissance Study and Quality Assurance Project Plan. August 14, 2013. Prepared by: Simons & Associates and New England Environmental. Prepared for: FirstLight Power Resources Services, LLC c/o FirstLight Hydro Generating Company 99 Millers Falls Road Northfield, MA 01360. https://www.northfield-relicensing.com/content/Documents/RSP%20Volume%202%20-%20Appendix%20D.pdf

extensive" and "extensive" erosion categories shown as examples in the FRR represent areas of substantial bank instability. lin order to improve the water quality of the impoundment areas of significant bank failure and erosion should not have to wait up to five years to be stabilized and warrant prioritization for stabilization.

The Draft WQC indicates one of the limitations related to the stabilization of new erosion areas is related to the amount of stabilization required and the time in which it is to be done. The draft certification states that "[t]he Licensee shall be responsible for repairing 5% of the total new bank segments identified in the intervals between each of the Erosion Monitoring Surveys (Years 2, 10, 20, and 30), regardless of whether they were identified during the above Boat-based Inspections or the Erosion Monitoring Surveys. New bank segments revealing 'Some to Extensive' or 'Extensive' erosion includes any segment not previously stabilized or in Table 1. Following each Erosion Monitoring Survey, the Licensee shall quantify the total linear feet of new bank segments that were identified either during the Erosion Monitoring Survey or during preceding Boat-based Site Inspections as exhibiting 'Some to Extensive' or 'Extensive' erosion. First, the requirements for stabilizing new erosion sites are limited to requiring the stabilization of only 5% of newly eroded riverbank. So, does this mean if a 100-foot section of extensive erosion is identified FirstLight is only responsible for stabilizing 5 feet of riverbank? If the section of riverbank identified as having extensive erosion is 1,000 feet long is the stabilization limited to 50 feet? If these examples, based on how this percentage of eroded riverbank to be stabilized is to be interpreted, then it must be understood that the remaining 95% of these eroded segments of riverbank would lack stabilization and continue to be a source of pollutants to the impoundment. With this approach it seems doubtful that improved water quality in the impoundment is attainable.

Although the Draft WQC includes a caveat the allows MassDEP to determine whether the linear foot equivalent of 5% will not provide a significantly improved stream bank condition, they may reserve the equivalent linear feet for use in the future. This approach would thus be more significant in those cases where longer sections of severe bank erosion are to remain unstabilized and serve as a continued source of sediment into the impoundment. This does not seem like an appropriate solution to improving the water quality of the impoundment.

Need for Connecticut River Stakeholder Panel

It is important that, especially as this next FERC license will be in effect for the next 50 years, periodic reviews of the latest technological advances for monitoring riverbank stability, and reviews of the effectiveness of the stabilization and mitigation measures be conducted. It is strongly recommended that a panel of stakeholders be established that would include MassDEP, FirstLight, Franklin Regional Council of Governments, CRC, Connecticut River Streambank Erosion Committee, the affected towns, their respective experts, and other parties that may be warranted. The panel would meet to coincide with monitoring events to review the current conditions of the impoundment water quality, bank stability, and erosion, and have discussions on the implementation of "state of the art" technology to ensure that the monitoring program is following.

Conclusion

As previously stated, we commend MassDEP for its understanding of the issues associated with operations and erosion in the TFI. MassDEP's inclusion of project operations as a contributing element to erosion in the TFI is important. However, compliance with the SWQS should not be based on an outdated erosion and sediment

control plan, the 2013 Full River Reconnaissance (FRR) and its Quality Assurance Project Plan. This plan is qualitative in nature and avoids the identification of issues related to operations such as the absence of vegetation and bank instability that contribute to water quality impairment. The need to implement a viable plan to address erosion and bank instability in the TFI is related to MassDEP's stewardship of the water quality within the impoundment. MassDEP's position that "project operations will continue to contribute to erosion in the TFI" is important to any plan designed to improve the water quality of this currently impaired waterbody in the future. Although MassDEP acknowledges that it is difficult to definitively quantify the causes of erosion in the TFI the Draft WQC also concludes that it is nonetheless "necessary to establish erosion-related measures in the WQC to address the existing impairments and to ensure compliance with the SWQS." The draft certificate states "SWQS require that the existing and designated uses and the necessary water quality be maintained and protected and that they be free from solids, color, and turbidity that would be aesthetically objectionable, impair any use, or impair the benthic biota or degrade the chemical composition of the bottom." However, the key to improving water quality in the impoundment in the future is related to the design and implementation of a new plan that addresses all the riverbank issues related to bank instability, lack of riparian vegetation and erosion.

The following changes and improvements must be made to ensure that the causes of riverbank instability and impacts to the water quality of the Connecticut River are understood, or the application for the MA Water Quality Certificate must be denied.

1. Develop an updated Erosion Control Monitoring Plan and QAPP that has, at a minimum, the following components:
    a. the use of modern equipment, high accuracy survey techniques, such as LiDAR (upland survey and bathymetry[23]) to replace the subjective river observation techniques in the 2013 QAPP.
    b. a process for MassDEP to require updated survey equipment and methods as technology and riverine processes are advanced over the next 50 years.
    c. methods and clearer references to document observed erosion features and bank stability features.
    d. require full impoundment surveys using LiDAR obtained via UAV or helicopter surveys, with follow up localized land-based observations and surveys to further analyze areas suspected of becoming destabilized. This survey would be used to provide accurate, or at least, precise physical measurements to supplement the boat-based photo surveys, which as we described above, are subjective and inconsistent in their categorization in the existing form of the 2013 FRR QAPP. While not discussed above, in the alternative, there is boat-based LiDAR technology that could be used to

[23] Bathymetry is defined as the measurement of underwater topographic surfaces.

survey the riverbanks, which would provide additional detail of areas where the toe of the slope has been undercut/undermined.

e. in addition to the already established history of the cross sections monitoring, there must be an ability to add cross sections when new areas of bank failure appear imminent or in process..

f. require consistent survey frequency of 3 years for the life of the FERC License, and add surveys following major flooding events, such as after hurricanes, tropical storms, nor'easters, and local storms that cause severe flooding in the TFI.

g. to corroborate the causes of erosion, use a HEC-RAS 2-D model that is calibrated to natural and operational flow impacts to areas identified as becoming destabilized during the surveys.

2. Ensure that the definition of "new erosion" in the Erosion Control Monitoring Plan is clear and expand the insignificant requirement of only requiring the stabilization of 5% of "newly eroded areas". Additionally, the surveys would be more appropriately conducted by a third-party survey/consulting firm, with expertise in fluvial geomorphology, hydraulics, and geotechnical engineering, be selected by a stakeholder panel (see recommendation 3, below) to ensure that a balanced collection of data is obtained to evaluate the causes of erosion and riverbank failure.
3. Create a stakeholder panel of experts, including MassDEP, FirstLight, Franklin Regional Council of Governments, CRC, Connecticut River Streambank Erosion Committee, the affected towns, their respective experts, and other parties, to review the results of surveys, recommend improvements to survey and modeling

methods, evaluate mitigation measures, and review how operations are affecting the goals of the MassDEP Water Quality Standards.

Thank you for the opportunity to comment on behalf of the Connecticut River Conservancy.

Sincerely,

Geoffrey M. Goll, P.E.
President
Princeton Hydro, LLC

Mark Gallagher
Vice President
Princeton Hydro, LLC

cc : FRCOG

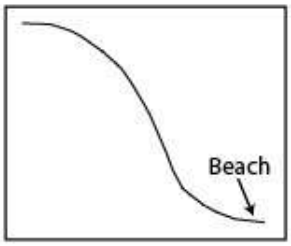
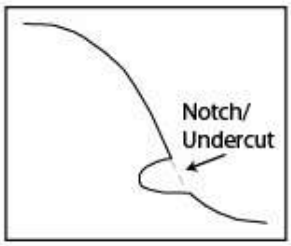
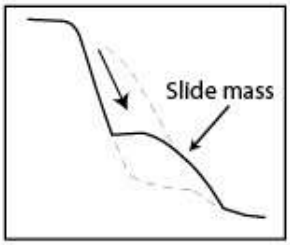
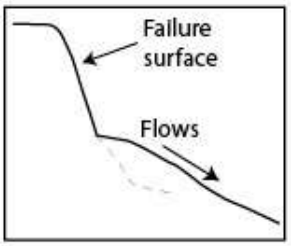
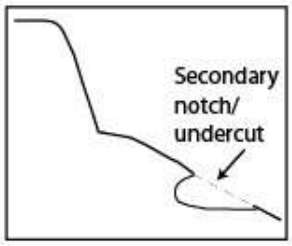
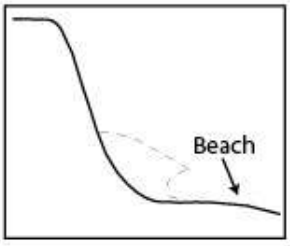
Stage	Profile	Photo	Description
a) Stable bank			- Rounded slope, concave up at base - Beach face protects slope from attack by currents
b) Notching or undercutting			- Bank toe oversteepened by notching or undercutting - Upper slope remains stable
c) Slide or topple			- Upper slope eventually destabilized by oversteppening at toe - Slide or topple mass remains intact with narrow bench at top
d) Flows			- Slide or topple mass becomes disaggregated at base and material flows to toe of slope
e) Secondary notching or undercutting			- Currents notch or undercut flow material to cause further collapse and flow of material
e) Bare bank			- Steep bare bank develops if flow material completely removed from base of bank - Beach development can protect the toe of slope from further current attack - If beach does not develop or persist, then erosion sequence can begin afresh

Figure 30: Model illustrating idealized sequence of erosion. Different stages of erosion can be occurring adjacent to each other along a long continuously eroding bank.