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Douglas Bennett
Director of MA Hydro Operations

November 8, 2018

VIA ELECTRONIC FILING

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

Re: FirstLight Hydro Generating Company, Turners Falls Hydroelectric Project (FERC No. 1889) and Northfield Mountain Pumped Storage Project (FERC No. 2485).
Shortnose Sturgeon in Turners Falls Impoundment

Dear Secretary Bose:

In its January 18, 2018 Order Denying Application for Temporary Amendment, the Federal Energy Regulatory Commission (FERC) cited information provided by the National Marine Fisheries Service (NMFS) that a federally-listed, endangered shortnose sturgeon had been found in the lower reservoir of the Northfield Mountain Pumped Storage Project (Northfield Mountain Project), referred to herein as the Turners Falls Impoundment (TFI).[1] FirstLight Hydro Generating Company (FirstLight) is in the process of relicensing its Northfield Mountain Project and Turners Falls Hydroelectric Project (Turners Falls Project) with FERC. In addition to finding that consultation with NMFS under Section 7 of the Endangered Species Act (ESA) would not be possible within the short timeframe necessary to approve FirstLight's request for a temporary amendment,[2] FERC's order expressed concern that:

> There is no information available on the number of shortnose sturgeon present in the reservoir, but, based on the recent capture, it is possible that more than one fish and more than one life stage of this species is present. As FirstLight has indicated, shortnose sturgeon overwinter in deep areas. Given that the project's intake structure is located in a deep channel, to the extent that the amendment would allow pumping and generation at times that would otherwise not occur, approving this action could affect sturgeon through entrainment or impingement.[3]

Further, FERC's order stated: "Commission staff's analysis of current operations at the project with regard to the potential for impingement and entrainment of sturgeon, as discussed above, warrants additional consideration as part of the broader relicensing effort."[4]

[1] *FirstLight Hydro Generating Co.*, 162 FERC ¶ 61,049 at PP 13-18 (2018).
[2] FirstLight, as in previous years, had requested a temporary amendment to exceed the minimum and maximum elevation limits in the Northfield Mountain Project upper reservoir in order to provide additional operational flexibility in anticipation of potential electric reliability challenges in the New England region during the winter.
[3] *FirstLight Hydro Generating Co.*, 162 FERC ¶ 61,049 at P 16.
[4] *Id*. at P 18.

Because the presence of a population of ESA-listed shortnose sturgeon in the TFI would have significant implications for the relicensing of the Northfield Mountain and Turners Falls Projects, as well as for ongoing operations of the Projects, FirstLight conducted an environmental DNA (eDNA) study to determine the presence or absence of a shortnose sturgeon population in the TFI. As described in detail in the enclosed study report,[5] eDNA testing provides a measure of species presence, density and distribution without having to collect the fish, and is a scientifically accepted method for detecting rare or endangered organisms. FirstLight worked with Genidaqs, the Genetics Lab of Cramer Fish Sciences, which has experience elsewhere in the United States in detecting the presence of sturgeon. Following the Genidaqs field collection procedures, FirstLight's consultant Kleinschmidt Associates collected water samples at defined intervals throughout the TFI.

Genidaqs then tested the samples for shortnose sturgeon DNA. As explained in the enclosed report, all 150 original samples tested negative for shortnose sturgeon DNA. Genidaqs also tested 30 random samples for smallmouth bass DNA to ensure the technique was working since smallmouth bass are abundant in the TFI. Twenty seven of those samples tested positive for smallmouth bass, confirming the test's validity.

After reviewing the results testing negative for shortnose sturgeon, FirstLight decided to take a second round of samples. Water samples were taken downstream of Turners Falls Dam where a population of shortnose sturgeon are known to reside as a "positive control" test. Additional samples were collected just downstream of Vernon Dam where the shortnose sturgeon referenced in FERC's January 18 order was reported to have been caught.[6] Some of the water samples collected downstream of Turners Falls Dam did test positive for shortnose sturgeon, as expected. None of the additional samples collected below Vernon Dam tested positive for shortnose sturgeon. Thus, the testing did not corroborate the previous reported catch of a shortnose sturgeon in this location. It is possible a single shortnose sturgeon was present and was within the test's five percent probability of detection error. It also is possible the previously reported shortnose sturgeon is no longer present in the TFI.[7] In any case, based on FirstLight's eDNA testing, the likelihood of a shortnose sturgeon population being present in the TFI is extremely low.

If you have any questions regarding the enclosed report, please call me at the number below.

Sincerely,

Douglas Bennett
Director of MA Hydro Operations

Enclosure

[5] *Environmental DNA Sampling for Shortnose Sturgeon* (November 2018).
[6] The Kleinschmidt Associates staff collecting water samples for the initial test reported that they may have seen a sturgeon swimming just below Vernon Dam, which was another reason to retest this area.
[7] FirstLight notes that other than a photograph of a shortnose sturgeon which an angler reported as having been caught in the TFI, FirstLight is aware of no direct or conclusive evidence of a shortnose sturgeon ever having been in the TFI.

ENVIRONMENTAL DNA SAMPLING FOR SHORTNOSE STURGEON

Study Report

Northfield Mountain Pumped Storage Project (No. 2485) and Turners Falls Hydroelectric Project (No. 1889)

Prepared for:

FirstLight Power Resources

Prepared by:

Kleinschmidt

NOVEMBER 2018

1 INTRODUCTION

In August 2017, an angler casting for walleye and bass reported catching and releasing an adult-sized sturgeon below the Vernon Dam in the upper-most reach of the Turners Falls Impoundment (TFI). The angler provided a photo which sturgeon researchers at the U.S. Geological Survey (USGS) Conte Lab identified as a Shortnose Sturgeon listed as endangered under the federal Endangered Species Act (ESA), according to an article by the National Marine Fisheries Service (NMFS).[1] According to the NMFS article, this was the first documented report of a Shortnose Sturgeon collected upstream of the Turners Falls Dam. The NMFS article explains that NMFS has three theories on how the fish may have ended up above the Turners Falls Dam. First, the fish ladders at the Turners Falls Project were built to pass anadromous fish upstream, which are monitored via video. This fish may have passed through the fish ladder undetected. Second, sturgeon may have used barge locks located at the Turners Falls Dam in the late 1700s to mid-1800s and this is a remnant progeny of a sturgeon that passed through the locks. Third, someone may have collected the sturgeon downstream of the Turners Falls Dam where they are relatively abundant and moved it or its ancestors upstream. According to the NMFS article, NMFS is fairly certain that steep falls like Great Falls, where the Turners Falls Dam was built, blocked sturgeon upstream access. Since being listed in 1967, the range of Connecticut River Shortnose Sturgeon has been considered as being from the mouth of the river to the Turners Falls Dam. The NMFS article states that after word of the captured sturgeon became public, NMFS was informed of other sturgeon sightings between the Turners Falls Dam and Vernon Dam, as well as between Vernon Dam and the upstream Bellows Falls Dam in Vermont These sightings have not been verified.

FirstLight Hydro Generating Company (FirstLight) is in the process of relicensing its Northfield Mountain Pumped Storage Project and Turners Falls Hydroelectric Project (Projects) with the Federal Energy Regulatory Commission (FERC). The existence of a population of ESA-listed sturgeon in the TFI could have implications for license conditions that FERC and/or NMFS may prescribe in the relicensing, as well as FirstLight's operation of the Projects. To answer the question of whether the potential single capture of a Shortnose Sturgeon indicates the presence of a population in the TFI, FirstLight investigated scientific methods which could determine the existence of such a population. Since Shortnose Sturgeon are federally endangered and collection requires an ESA Section 10 research permit, netting for sturgeon was not an option. However, environmental DNA (eDNA) is a sampling method for detecting aquatic species which can provide a measure of species presence, density and distribution without having to collect the fish. Fish release DNA into their surrounding environment via slime, scales, epidermal cells or feces. These eDNA indicators have been used to detect the presence of rare or endangered organisms including Green Sturgeon, Chinook Salmon, Asian Carp, and Slackwater Darter (Bergman et al. 2016).

FirstLight worked with Cramer Fish Sciences Genetics Lab, Genidaqs, which has experience elsewhere in the US in detecting the presence of sturgeon, to analyze the presence of sturgeon

[1] Julie Crocker, "Surprise Catch: First Shortnose Sturgeon Documented Above Dam in Connecticut River," NOAA Fisheries – Greater Atlantic Region (Oct. 24, 2017), https://www.greateratlantic.fisheries.noaa.gov/stories/2017/10/24_surprise_catch__first_shortnose_sturgeon_documented_above_dam_in_connecticut_river.html.

eDNA in the TFI. (Bergman et al. 2016)

2 METHODS

Water samples were collected every 350-meters along the TFI on July 18-19, 2018 resulting in a total of 150 water samples (one sample was also obtained above Vernon Dam). Sampling locations were documented with a Garmin Oregon GPS (Garmin Ltd.) (Figure 1). A second sampling effort took place on August 14, 2018 where 10 water samples were obtained downstream of the Turners Falls Project in Sunderland/Hatfield, MA. This location was selected as Shortnose Sturgeon are known to inhabit it during the summer. At the same time, an additional 10 water samples were collected just downstream of Vernon Dam (Figures 2 and 3).

Sampling protocols followed the Field Collection Procedure for Aquatic Environmental DNA Sample Collection and Analysis prepared by Genidaqs (Blankenship and Schumer 2017). For each sampling event, no more than two liters of water were directly filtered approximately 6 inches below the water surface using sterile Saint Gobain XL-60 silicon tubing (Tygon1; internal diameter 6.3mm), and a portable Masterflex1 L/S Easy-Load II peristaltic pump (Cole-Parmer1) powered by a cordless hand drill. Water samples were filtered through a Millipore Sterivex™-GP 0.22µm sterile filter unit (EMD Millipore). Filtration occurred directly on the boat at each site and no water was stored during sampling nor was any water transported between sampling sites. The filtered water was captured and measured in graduated flasks to verify the volume of each sample, then poured over the side of the boat after completion of sampling at each site. To eliminate cross contamination between sites due to equipment, tubing was used for one sample only and immediately disposed of after each use into a sealed trash bag. Individually wrapped filters were used to maintain sterility and were opened just prior to use. After filtration, the filters were capped at each end, labelled (location ID, volume of water filtered) and placed into a sterile container, sealed, and immediately placed on ice. All filters were kept on ice in a cooler for the duration of the sampling event until they were transferred to a -20°C freezer. The filters were stored within individually sealed containers until DNA extraction. To ensure that field equipment was free of contamination, field controls were taken each sample day. Each field control consisted of filtered ultra-pure water using the portable peristaltic pump used to take all samples using a new length of sterile silicon tubing. The field controls were then processed for the presence of sturgeon DNA in parallel with all samples. Since only one Shortnose Sturgeon has been documented in the TFI and the species' presence is assumed to be rare[2], 30 randomly selected samples were also assessed for smallmouth bass DNA to ensure the technique was working. Smallmouth bass were selected as they are abundant in the TFI.

2.1 Sample Processing

DNA extractions were conducted using PowerWater1 Sterivex™ DNA Isolation Kit (Mo Bio Laboratories, Inc.) following the manufacturer's recommended guidelines. A DNA extraction negative control was processed in parallel to ensure sample integrity throughout the extraction procedure. The DNA extraction control consisted of Sterivex™ filtered ultrapure water only. DNA

[2] The Kleinschmidt Associates staff collecting water samples for this study on July 19, 2018 reported that they may have seen a sturgeon swimming just below Vernon Dam.

extraction controls were processed using the same equipment utilized to extract DNA from all samples. Each sample and all controls were analyzed in triplicate for the presence of Shortnose Sturgeon COI mitochondrial gene using a qPCR primer.

Each 5 ul qPCR reaction was composed of 1x Applied Biosystems TaqMan Universal PCR Master Mix, No AmpErase UNG (Applied Biosystems ™), 900nm final primer concentration, 60nm final probe concentration, and 1 ul DNA template. Thermocycling was performed using a Bio-Rad CFX 96 Real time System (Bio-ad Laboratories, Inc.) with the following profile: 10 minutes at 95°C, 40 cycles of 15 second denaturation at 95°C and 1-minute annealing-extension at 60°C. Six template control (NTC) reactions were run on the plate with the samples template controls consisted of 1 ul of ultrapure water replacing DNA template within reaction volume.

Results of the qPCR reactions were analyzed using BioRad CFX manager v3.1 (Bio-Rad Laboratories, Inc.). A sample was considered positive for the presence of Shortnose Sturgeon DNA if any one of the three replicates showed logarithmic amplification within 40 cycles.

2.2 Probability Estimate

The probability that a species is present at a site, even though it was not detected can be calculated using the following formula:

$$Pr(z = 1|y = 0) = \frac{Pr(y = 0|z = 1)Pr(z = 1)}{Pr(y = 0)}$$

which is…

$$\frac{(1-p)^J \psi}{(1-p)^J \psi + (1-\psi)}$$

where:

z	True state of presence (z=1) or absence (z=0)
ψ	Pr(*z*=1), the occupancy or proportion of sites expected to be occupied by species
y	is the observed detection (*y*=1) or non-detection (*y*=0)
p	Pr (*y*=1 | *z*=1), the probability species is detected in a single survey at a site given it is present
J	is the number of times a site is surveyed

The probability of not detecting a fish even though it is present, for various ψ and *J*, assuming p = 0.5 is found in Table 1 below. We do not know the actual detection probability ψ, but we can assume that for a rare, threatened and endangered species, it is low.

Table 1. The Probability of Non-Detection When a Species is Present at the Site.

Pr (z=1 | y=0)									
	ψ								
Surveys (*J*)	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
1	0.05	0.11	0.18	0.25	0.33	0.43	0.54	0.67	0.82
2	0.03	0.06	0.10	0.14	0.20	0.27	0.37	0.50	0.69
3	0.01	0.03	0.05	0.07	0.10	0.14	0.18	0.25	0.35
4	0.01	0.02	0.03	0.04	0.06	0.09	0.13	0.20	0.36
5	0.00	0.01	0.01	0.02	0.03	0.04	0.07	0.11	0.22

For example, a site surveyed once (J=1) that has a low occupancy probability, there is a 5% chance the species is present even though there was a non-detect. For a site surveyed five times (J=5) that has low occupancy, there is a 0% chance the species is present even though there was a non-detect. Alternatively, there is an 80% chance a species is present but not detected in a single survey (J=1), when the occupancy probability is high. Further, there is a 22% chance a species is present at a high occupancy probability site even though it is not detected across five surveys (*J*=5).

3 RESULTS

No Shortnose Sturgeon DNA was detected in any of the 150 water samples collected on July 18 and 19, 2018. However, of the 30 samples tested for smallmouth bass DNA, 27 of the samples were positive for smallmouth bass. After reviewing the results and finding no detection of Shortnose Sturgeon, FirstLight decided to conduct another round of sampling with an additional 10 samples collected just downstream of Vernon Dam where the reported Shortnose Sturgeon in the TFI was originally detected and an additional 10 samples downstream in the Hatfield/Sunderland area of river where Shortnose Sturgeon have been known to inhabit in the summer to determine if Shortnose Sturgeon could be positively detected. No Sturgeon DNA was detected in the 10 samples collected just below Vernon Dam.

We could not collect Shortnose Sturgeon in the Hatfield/Sunderland area to ensure if and how many fish were present without a Section 10 ESA research permit prior to collecting the eDNA water samples. Therefore, we were uncertain how many, if any, Shortnose Sturgeon were present in this location when we sampled. However, results indicated that Shortnose Sturgeon DNA was detected in two of the ten samples collected in the Hatfield/Sunderland area. The two samples that reflected Shortnose Sturgeon eDNA were the northern most and southern most samples (*see* Figure 3). This would put the two Shortnose Sturgeon about 1.5 river miles apart and verified that Shortnose Sturgeon DNA can be and was detected.

The probability of a non-detection when a species is present was calculated based on data from Table 1. This table has varying probabilities depending on the proportion of the sites expected to be occupied by the species (ψ). Shortnose Sturgeon are not expected to be found in high numbers

in the TFI, therefore using the 0.1 (low occupancy probability) column with 1 sample collected, there is a 5% chance that Shortnose Sturgeon are present even though there was no eDNA detected at each sampling location.

4 DISCUSSION

A total of 170 water samples were filtered during the two surveys on July 18 and 19 and August 14, 2018. There were no Shortnose Sturgeon detected in the TFI, however they were detected downstream in an area that Shortnose Sturgeon are known to occupy in the summer. Based on the probability of non-detection when a species is present and a low expected occupancy probability, there is a 5% chance that there is a sturgeon present even though none were detected.

The samples taken below Vernon Dam did not detect the presence of a Shortnose Sturgeon and thus the testing did not corroborate the previous documented catch of a Shortnose Sturgeon. However, there is a possibility, as explained above, that a single Shortnose Sturgeon was present but was within the 5% probability of detection error. Considering that Shortnose Sturgeon were detected in the 10 water samples collected in the Hatfield/Sunderland area, but there were no detections in the 160 water samples collected in the TFI, the likelihood of a Shortnose Sturgeon population in the TFI is very low.

5 LITERATURE CITED

Bergman, P, G. Schumer, S. Blankenship, E. Campbell. 2016. Detection of Adult Green Sturgeon Using Environmental DNA Analysis. PLOS ONE |DOI:10.1371/ 0153500 April 20, 2016.

Blankenship, S. and G. Schumer 2017. Field Collection Procedure for Aquatic Environmental DNA Sample Collection and Analysis prepared by Cramer Fish Sciences-GENDAQS. 9 pages.

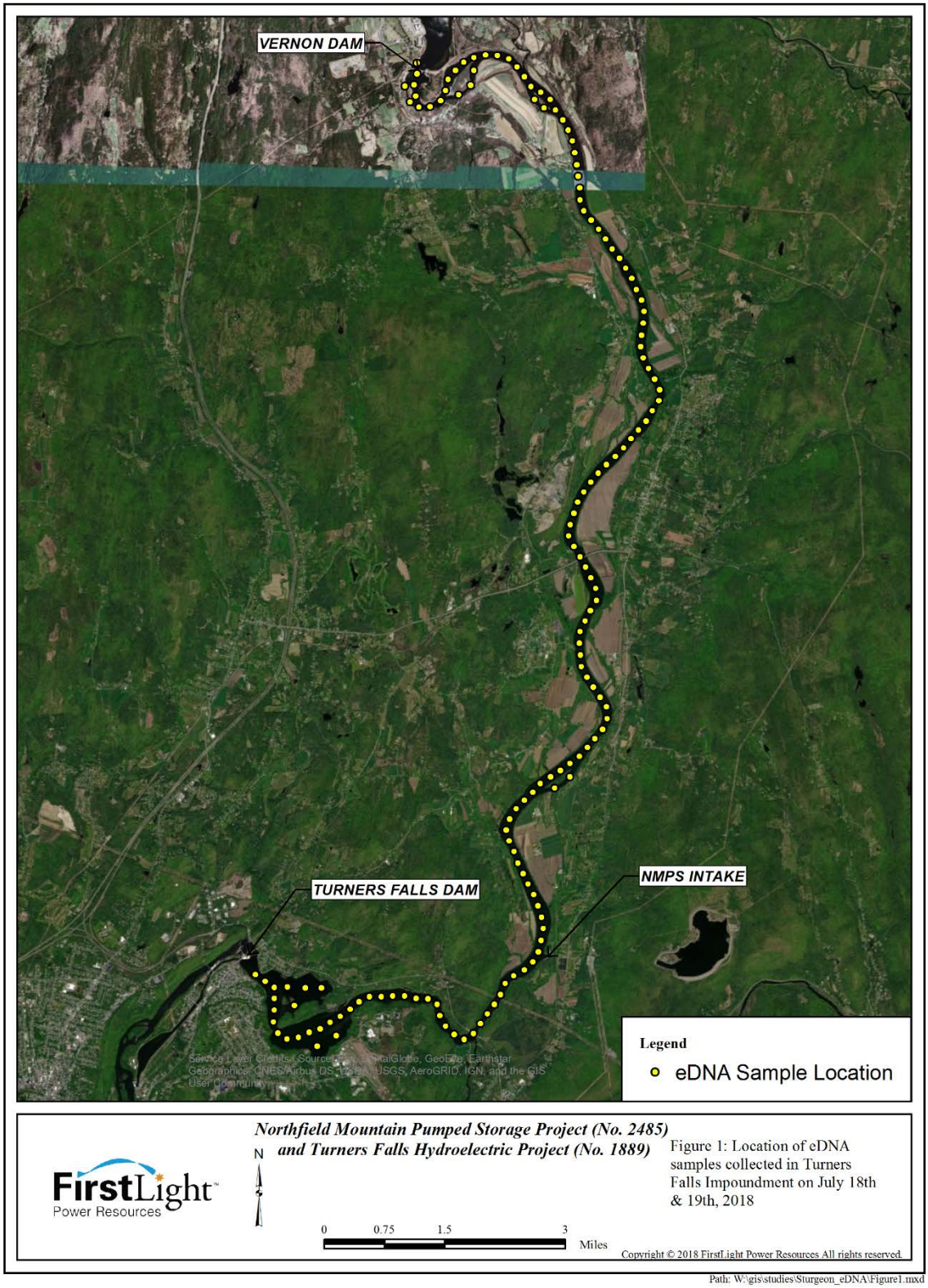
VERNON DAM
TURNERS FALLS DAM
NMPS INTAKE
Legend
eDNA Sample Location
Service Layer Credits: Source: DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
FirstLight Power Resources
Northfield Mountain Pumped Storage Project (No. 2485) and Turners Falls Hydroelectric Project (No. 1889)
N
0 0.75 1.5 3
Miles
Figure 1: Location of eDNA samples collected in Turners Falls Impoundment on July 18th & 19th, 2018
Copyright © 2018 FirstLight Power Resources All rights reserved.
Path: W:\gis\studies\Sturgeon_eDNA\Figure1.mxd

Figure 2: Location of eDNA samples collected below the Vernon Dam on August 14th, 2018

Figure 3: Location of eDNA samples collected downstream of Turners Falls Impoundment on August 14th, 2018

CERTIFICATE OF SERVICE

Pursuant to Rule 2010 of the Rules of Practice and Procedure of the Federal Energy Regulatory Commission, I hereby certify that I have this day caused the foregoing document to be served upon each person designated on the official service list compiled by the Secretary in this proceeding.

Dated at Washington, D.C., this 8th day of November, 2018.

/s/ *Mealear Tauch*
Mealear Tauch
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