

Relicensing Study 3.3.19

EVALUATE THE USE OF AN ULTRASOUND ARRAY TO FACILITATE UPSTREAM MOVEMENT OF AMERICAN SHAD AT TURNERS FALLS

Updated Study Report Summary

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

Prepared for:



Prepared by:



SEPTEMBER 2015

1.1 Study Summary

An evaluation of the use of an ultrasound array to keep shad out of the Cabot Station tailrace and facilitate upstream movement of American shad to Turners Falls Dam will be conducted in 2016 pending the results of Study No. 3.3.1 *Instream Flow Studies in Bypass Channel and below Cabot Station* and Study No. 3.3.2 *Evaluate Upstream and Downstream Passage of Adult American Shad*.

The goal of this study is to determine if an ultrasound barrier could be used to repel adult shad from the Cabot Station tailrace and guide them into the bypass reach.

The objective of the study would be to establish a high frequency sound (ultrasound) array across the entire Cabot Station tailrace and determine the effect of the ensonified field on upstream migrating radio-tagged shad moving past Cabot Station. This would be accomplished by monitoring the movements and passage of shad and the time shad spend in the tailrace area.

Evidence from many studies that have attempted to produce behavioral avoidance by adult shad suggests that ultrasound is an effective stimulus. Evidence suggests that shad and blueback herring may avoid the tailrace of Cabot Station if an ultrasound field were installed; however, simply repelling shad from the Cabot tailrace is not a satisfactory result. For this behavioral barrier to be successful shad would need to continue upstream, without delay, as opposed to dropping down below Cabot.

1.2 Study Progress Summary

Task 1: Ultrasound Deployment

This study would establish a high frequency sound (ultrasound) array across the entire Cabot Station tailrace and determine the effect of the ensonified field on upstream migrating shad moving by Cabot Station by monitoring shad behavior. Telemetry methods described in Study No. 3.3.2 will be utilized. Ultrasound testing will be initiated once telemetered shad arrive at Cabot Station. Two test treatments will be evaluated: array on and array off. A minimum of six replicates per treatment per flow condition will be targeted. The first “on” treatment will begin between 10am and noon and will last at least two hours and each “off” treatment will last at least three hours. Testing three days per week for at least two weeks is planned.

Task 2: Reporting

Data collected in Task 1 will be analyzed to determine the effect of the ensonified field on upstream migrating shad. The number of shad detected at the Cabot tailrace with the field on and off will be statistically compared ($p < 0.5$) and telemetry data will be analyzed to determine if the fish disperse upstream through the bypass reach or downstream. Environmental and operational data will be recorded and reported during each test period and used to analyze the data.

A final report will be completed by March 1, 2017 due to the level of effort for data analysis.

1.3 Variances from Study Plan and Schedule

To date, there are no variances from the study plan or schedule.

1.4 Remaining Activities

- Conduct the study in Spring of 2016