



FERC Proposed Study Plan Meeting

May 21, 2013

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





Agenda

May 21: 9 am to 4 pm

3.3.2 Evaluate Upstream and Downstream Passage of Adult American Shad

3.3.19 Evaluate the Use of an Ultrasound Array to Facilitate Upstream Movement to Turners Falls Dam by Avoiding Cabot Station Tailrace

3.3.8 Computational Fluid Dynamics Modeling in the Vicinity of the Fishway Entrances and Powerhouse Forebays

3.3.9 Two-Dimensional Modeling of the Northfield Mountain Pumped Storage Project Intake/Tailrace Channel and Connecticut River Upstream and Downstream of the Intake/Tailrace.

3.3.12 Evaluate Frequency and Impact of Emergency Water Control Gate Discharge Events and Bypass Flume Events on Shortnose Sturgeon Spawning and Rearing Habitat in the Tailrace and Downstream from Cabot Station



Cight[®] Study 3.3.2: Upstream and Downstream Passage of Adult American Shad

Objectives:

 Identify the effects of the Turners Falls and Northfield Mountain Projects on adult shad migration including delays, upstream and downstream route selection, and spillway ladder efficiency.

Geographic Scope:

• Holyoke Dam to Vernon Dam.



FirstLight Study 3.3.2: Upstream and Downstream **Passage of Adult American Shad**

Task 1: Review Existing Information

- Review data collected at TF Project.
- Review data collected from full river study.

Task 2: Develop Study Design In consultation with agencies and NGOs

- Elements:
 - Sample size
 - Monitoring stations
 - Plan and schedule for flow releases

Task 3: Evaluation of Route Selection and Delay

- Radio telemetry tracking
- Video monitoring

Task 4: Evaluation of Mortality Sensor tags



FirstLight Study 3.3.2: Upstream and Downstream **Passage of Adult American Shad**

Proposed Monitoring Locations, generally consistent with recent FWS study in the vicinity on the Projects:

- Sunderland
- Montague
- Cabot Station
- Cabot Ladder
- Rawson Island (bypass reach)
- Spillway ladder
- Turners Falls Dam
- Upstream and Downstream of Northfield Mountain
- Upstream near Northfield Mt. Hermon School





FirstLight Study 3.3.2: Upstream and Downstream Power Resources Passage of Adult American Shad



GDF SVez





GDF SVez





GDF SVez



FirstLight Study 3.3.19: Evaluate Ultrasound Array

Objectives:

- Establish a ultrasound array across the Cabot Station tailrace and determine the effect of the field on upstream migration by monitoring movements of radio-tagged American shad.
- Alosines hear in the 120 to 130 kHz range, most other fish < 10kHz, SNS around 1 kHz

Geographic Scope:

• Cabot Station tailrace.



Light Study 3.3.19: Evaluate Ultrasound Array

Proposed as a Year 2 study

Task 1: Ultrasound Deployment

- Establish array across Cabot Station tailrace
- Determine ensonified field effects on migrating radio tagged American shad
- Consult with agencies to determine schedule to turn array on and off

Task 2: Reporting

• Determine if ensonification is a successful deterrent mechanism



Study Purpose: Use Computational Fluid Dynamics (CFD) modeling to evaluate the fishway entrances' and powerhouse forebays' flow field conditions.

The model results will provide information to help:

- a) Assist in designing effective upstream fishways for upstream migrating trust species
- b) Reduce down migration impingement, entrainment and delay
- c) Maximize downstream migrating trust species' use of the weir and bypass
- d) Maximize up migration use of the fishway entrances



Six study objectives have been identified (some paraphrasing):

- 1) Conduct bathymetric surveys at the Spillway latter, Cabot ladder, Station No. 1 intake and Cabot intake.
- 2) Develop three-dimensional CFD models of the Station No. 1 intakes, Cabot Station intakes and the Cabot and spillway fishway entrances.
- 3) Conduct production runs to evaluate the hydraulic impacts from changes to fishway attraction flows, turbine operations and spill gate operations
- 4) Develop velocity maps at select discharges. For upstream passage, show approach velocities and fish response fields
- 5) Couple modeling results with telemetry study results and fishway passage counts to evaluate favorable passage conditions
- 6) Evaluate flow fields in front of powerhouse intakes and assess if fish are directed to the Cabot Station surface bypass weir.







Task 1: Bathymetric Survey of the Study Area

• Water surface elevations, water depths, and velocities will be collected





Task 2: Compile Model Input Datasets in CAD

• 3D surfaces of study area river beds will be constructed

Task 3: Construct 3D Model

- CAD files from Task 2 will be used to build 3D (FLOW3D) hydraulic models
- Test scenarios will be run using bathymetry data from Task 1





Task 4: Execute Model Production Runs

 Once calibrated and validated, production runs will be developed and executed to understand potential fish barriers at various flows, river conditions and other hydraulic influences





Study Purpose: Assess Northfield Mountain Project operations (pumping and generation) on flow field conditions in the Turners Falls Pool around the Northfield tailrace

This study will help to assess Project impacts on migratory fish including:

- a) Velocity barriers
- b) Undesirable "false" attraction zones (potential entrainment or delay)
- c) Interactions with Vernon operations
- Flow characteristics under alternative Project operation scenarios (developed in consultation with stakeholders after initial study results are complete)





The study area will include an approximately 2-km long reach of the Turners Falls impoundment around the Northfield tailrace.





- Task 1: Review Existing Data and Identify Data Gaps
- Input existing bathymetric data and review
- Supplement with newly collected data if needed
- Task 2: Bathymetric Survey Update & Post Processing
- Collect new bathymetric data for NM tailrace, including water surface elevations, depths, and velocities.





Task 3: Build and Calibrate 2D Model

- River2D software
- Calibrate within <u>+</u> 0.15 ft.





Task 4: Conduct and Analyze Production Runs

• Runs will reflect steady-state hydraulic conditions



Graphic Source: Delaware River IFIM Study Report (Bovee et al. 2007)

5/21/2013

FirstLight Study 3.3.12: Evaluate Emergency Water Control Gate and Bypass Flume Discharge Events on Shortnose Sturgeon

Objectives:

• Determine the frequency that the emergency water control gates are operated, understand the operation of the bypass flume and evaluate the impact of events on sediment transport and bottom velocities within the shortnose sturgeon spawning and rearing habitat below Cabot Station.

Geographic Scope:

• The Cabot Station tailrace and downstream areas.

FirstLight Study 3.3.12: Evaluate Emergency Water Control Gate and Bypass Flume Discharge Events on Shortnose Sturgeon



FirstLight Study 3.3.12: Evaluate Emergency Water Control Gate and Bypass Flume Discharge Events on Shortnose Sturgeon

Task 1: Analysis of Existing Data and Scenario Development

• Examine frequency of gate and flume events from 2008-2012

Task 2: Field Verification of Conditions

- Simulate events at rates found in Task 1
- Field verify bottom velocity and sediment movement

Task 3: Data Analysis and Reporting

 Using linear regression and analysis of variance determine whether conditions measured at SNS spawning and rearing sites are correlated with different spill levels and whether river flow or spillway operations affect results