DEERFIELD RIVER CHAPTER

10 Old Stage Road
Wendell, MA 01379

July 15, 2013

Updated Study Plan Comments
FERC Nos. 1889 and 2485

Kimberly D. Bose, Secretary
FERC
888 First Street, NE
Washington, DC 20426

Dear Secretary Bose,

Following are Trout Unlimited's comments concerning FirstLight's updated study plans dated June 28, 2013.

General Comments

At multiple meetings with FirstLight, FirstLight's consultants, stakeholders and FERC staff the lack of details in the initial study plans was cited as a problem and that specificity was required in subsequent plans to ensure that all parties knew what each plan would involve before the study began. Most of the study plans reviewed below still lack detail which gives concern as to nature of the plans to be filed with the FERC in August and with the ability of FirstLight to satisfactorily complete and report the studies.

Specific study plans:

3.3.1 *Conduct Instream Flow Habitat Assessment in the Bypass Reach and below Cabot Station*

Project Nexus

The river immediately below the Cabot Station is not a shortnose sturgeon overwintering area.

Task 1: Consult with Agencies and Interested Stakeholders to Determine Study Area, Study Reaches, and Habitat Suitability Index Curves

The July site visit is canceled.

Study Reaches and Transect Selection

The description of reach 1 states that from the dam to below the Fall River the bypass reach is wider than other reaches and that it narrows just upstream of Station No. 1 tailrace. The reach narrows a little over a quarter mile downstream of the dam.

Lengths of reaches 3, 4 and 5 should be included in the description.

Habitat Suitability Index Criteria

Figure 3.3.1-4 shows seven shad spawning locations. Study plan 3.3.6 states that there are fifteen previously identified shad spawning locations. All locations should be plotted.

Table 3.3.1-1 should include juvenile and adult shortnose sturgeon habitat as well as overwintering in reach 4 and all should be included in reach 5. Sea Lamprey spawning, incubation, and zone of passage should be added to Reaches 1 and 2.

Burbot (*Lota lota*) may be able to be included in a guild but their specific life history may require HSI criteria. This species is not addressed in the study plan. It is a state species of special concern and has been identified as inhabiting the bypass reach.

In addition to using HSI criteria for host species of fish for an evaluation of mussel habitat, the model should develop a measure of shear stress for the bypass reach.

As the locations of shad spawning are significant, transects in the IFIM study should be located at each spawning location in reaches 3, 4 and 5. If after the shad spawning survey is completed, there are additional spawning locations identified a transect should also be placed at each location.

3.3.2 *Evaluate Upstream and Downstream Passage of Adult American Shad*

This study plan is inadequate. It does not contain specifics, relying on later analysis of telemetry data from 2011 and 2012 studies and further consultation with the stakeholders to develop a plan. During meetings with FirstLight, FirstLight's consultants, FERC staff, and stakeholders after the initial study plans were filed, it was made abundantly clear that more specificity was needed in many of the study plans, including this one.

A detailed study plan should be developed for filing with the FERC by August 12, 2013.

Study Goals and Objectives

The last bullet should include time of passage, or no passage, in the canal in addition to passage rates, routes, and Cabot fish bypass effectiveness.

Methodology

A detailed study plan should be developed by August 12th which can be amended or added to subsequent to the analysis of 2011 and 2012 telemetry data. As currently written the study plan is a plan to develop a study plan. If analysis of telemetry data from 2011 and 2012 indicate that changes to the plan are appropriate a revised study plan can be coordinated with the stakeholders and filed at the FERC.

Task 1: Review Existing Information

Again, FirstLight proposes to develop a study plan after filing the final study plan in August and after the FERC issues a Study Plan Determination. Study plans have been described as a contract between the licensee and the stakeholders. A study plan details specifically what the licensee will do, when it will be done, and how it will be done. A study plan is developed after the FERC Study Plan Determination leaves little or no recourse to stakeholders if the licensee's plan is not acceptable.

The study plan states that substantial data has already been collected at the Turners Fall Project from multiple years of passage assessments. It can, and should be, used to inform the current study plan. It is highly unlikely that the 2011 and 2012 telemetry data will rewrite the record of passage at the project. As noted before, if new information is available it can be incorporated into a modified plan.

Task 2: Develop Study Design

Again, this is a plan to develop a plan which is exactly the title of this task. It is suppose to be the plan. The goals and objectives of the study are listed. The plan should be the specific means by which those goals and objectives will be met.

Task 3: Evaluation of Route Selection and Delay

The study plan lacks detail. It should include:

- Description of radio and PIT tags (size, life expectancy, pulse interval, frequencies, mortality identification, and any additional features to be incorporated, etc.)
- Description of fish capture, handling, tagging, and transport methods
- Description of release locations
- Number of fish to be tagged and intervals of tagging
- Location of telemetry antennas and receivers and description of receivers and antenna arrays
    - This should include identifying how multiple frequencies will be detected simultaneously
- Location of PIT antennas
- Location of video cameras
- Description of bypass flows to be tested and the intervals and duration of each flows release
- Where and how frequently water temperatures will be taken.

Manual tracking should be more frequent than twice a week. From the Holyoke dam to Cabot station is over thirty miles of river. From the Turners Falls dam to the Vernon dam is nearly twenty miles. The lower reach should be tracked at least two times per week and from Turners Falls to above the Northfield project at least three times per week as there are far fewer fixed telemetry locations to identify Northfield Mountain project effects.

Task 4: Evaluation of Mortality

No description of the mortality sensor tags, name of the manufacturer, or how the tag works is provided. The statement that the tags "… will give researchers an indication of passage induced mortality." states that project induced mortality will not be definitively assessed. The specifics of the tags and information on how the mortality sensor work and will be programmed should be provided. Information about prior use of the mortality tags and their efficacy should be provided.

Mortality of tagged fish should be assessed at all telemetry locations and during mobile tracking and not just at the tailraces of Cabot Station and Station #1 and the spillway.

Task 5: Reporting

All data used to develop the report should be provided to the stakeholders in a digital form including all telemetry, PIT tag, and manual tracking data.

Study Schedule

Lifting at the Holyoke project begins April 1 if river conditions permit.

The study plan recommends that a second year of study be conditioned based on the results of the 2014 study. How the results of those studies would determine the need for a second year of study is not described. A specific set of criteria should be listed that FirstLight feels would justify not doing a second year of study.

Study Plan Recommendations

The study should be done in 2014 and 2015. Evaluation of a single year of river conditions is not sufficient to understand fish movement and behavior in a complex river environment. Environmental conditions vary year to year in any river and a one year study cannot capture this variation.

Number of fish to tag:

To achieve a sufficient number of fish for evaluation of:

- multiple flows in the bypass reach, the effectiveness of the spillway ladder entrance under different spill conditions,
- how the operations of the Northfield Mountain Project affect shad moving both up- and downstream,
- assess downstream passage routes with different levels of spill,
- determine shad behavior in the canal while outmigrating,

- assess the effectiveness of the current downstream passage facilities at the Cabot Station, and
- assess mortality of shad passing through the Cabot Station and Station #1,

will require a tagging at least 300 shad for release at Holyoke and 100 for release above the Turners Falls dam.

The large number of fish released at Holyoke is to ensure that sufficient fish approach the Cabot station. A drop-back rate of 40% or greater (common with telemetry tagging of American shad), coupled with shad that move upriver but spawn below the Cabot Station, will significantly reduce the number of fish approaching the Turners Falls project. Poor passage at the Cabot, Spillway and Gatehouse ladders will further reduce shad available for evaluation of Northfield Mountain project impacts and assessment of downstream passage necessitates the release of additional fish above the Turners Falls dam.

After TransCanada tags their first fish, telemetry receivers should be set to detect outmigrating shad from the TransCanada telemetry study. This will increase the number of down running shad that can be evaluated for route selection.

Telemetry stations:

Red Cliffe Canoe Club – full river width
Sunderland Route 116 Bridge – full river width
Montague Wastewater – full river width
Deerfield River Confluence – full river width
Cabot Station Tailrace
- Radio telemetry antenna coverage of the full tailrace
- Radio telemetry antenna coverage of the area immediately in front of the fishway entrance
- Below the Cabot Station – full river width

Cabot Station Forebay
- Radio telemetry antenna at Conte fish passage building
- Radio telemetry antenna at Cabot forebay – general area

PIT antenna and radio telemetry dropper at bypass entrance
Cabot Fish Ladder
- PIT antenna and radio telemetry dropper at entrance
- PIT antenna and radio telemetry dropper at exit

Radio telemetry antenna to detect fish within the tailrace
Rawson Island
North and south channel
Station #1 Forebay
Station #1 Tailrace
- Radio telemetry to identify fish in close proximity to the tailrace

Radio telemetry upriver of Station 1 to identify when fish pass the station
Spillway Ladder
- PIT antenna and radio telemetry dropper at entrance
- PIT antenna halfway between entrance and first turn pool
- PIT antennas at turn pool exits
- PIT antenna halfway up straight section below counting window

PIT antenna and radio telemetry dropper at exit

Below Turners Falls Dam – full river width to detect fish approaching dam
Gatehouse Entrance
- PIT antenna and radio telemetry dropper at new entrance
- PIT antenna at first vertical slot
- PIT antenna at last vertical slot

PIT antenna and radio telemetry dropper at viewing window
Upstream end of canal – antenna for fish entering the canal from upstream
Turners Falls Impoundment
NMPSS Gill Bank – full river width
NMPSS Intake
- Area antenna
- Dropper antennas at entrance to ensure full depth coverage

NMPSS Upper reservoir
Shearer Farm – full river width
Northfield Mount Herman Boathouse – full river width

Receivers:

All receivers should be able to detect all frequencies and codes simultaneously. Between fish tagged for FirstLight and TransCanada there will likely be over 500 tagged fish on multiple channels. Cycling through frequencies and antennas is likely to miss fish with the probability of missed detections increasing with the number of fish tagged.

To better enable removal of spurious codes and to facilitate data analysis, all detections should be logged individually.

Video camera locations:
- Entrance to the spillway ladder
- Spillway ladder viewing window
- Entrance to the Cabot ladder
- Cabot ladder viewing window
- Gatehouse ladder viewing window

Bypass flows:

Three test flows – 2,500, 4,400 and 6,300 cfs during the sturgeon spawning season
Two test flows after spawning – the lower flow would cover and provide flow over the gravel bar downstream of the tailrace and any other area where sturgeon eggs or larvae may be located; the other flow would be between the lower flow and 2,500 cfs.

Each of the three bypass flows during the sturgeon spawning period should be done for three days each (4 replicates = 36 days) alternating between flows after each three day period. After sturgeon spawning, the two lower flows should alternate for four days each until the end of the passage season.

Reporting:

The report should include:
- Release numbers, locations and dates

- Fish vitals (length and sex)
- River temperature at Northfield, canal, bypass, and below Cabot Station
- Details of all manual tracking detections
- Movement times for all fish radio telemetry and PIT antenna – station to station
- Graphic description of movements of all fish

Turners Falls

- Upstream passage efficiency (proportion of fish passing upstream of the dam) for:
  - Fish detected at the Montague Waste Water Treatment Plant (MWWTP)
    - Fish in the tailrace at Cabot Station
    - Fish detected at the base of the Turners Falls dam
- Fishway attraction effectiveness – proportion of fish entering each of the three fishways that pass the fishway
- Behavior of fish that do not pass the project
- Number of forays fish made into each fishway
  - Successful and unsuccessful
- Number of forays upstream from MWWTP
- Number of forays into the bypass reach at each flow
- Analysis of how project operations affect upstream movement and entry into fishways
- Graphic description of the movement of each fish

Downstream:

- Approach route and route of passage
- Analysis of delay at each barrier (gatehouse, station #1, Cabot Station, and dam)
- Proportion of fish that use:
  - Bypass, Cabot Station, Station #1, or pass over the dam in spill
  - Survival of fish using each route
- Overall successful project passage
- Graphic description of the movement of each fish

Northfield Mountain:

- Number of fish within the Northfield zone of influence
- Number of fish entrained
- Delay at the Northfield project
- Description of movement patterns in the vicinity of Northfield Mountain
- Number of fish detected at stations upstream of Northfield

Should insufficient data be collected in 2014 to determine downstream mortality of adult shad, a directed mortality study (Hi-Z tags) should be performed in 2015.

3.3.3 *Evaluate Downstream Passage of Juvenile Shad*

Task 1: Evaluate Timing of Downstream Migratory Movements

In addition to the hours of pumping, the hour before pumping at Northfield Mountain should be evaluated to assess fish within the zone of pumping influence prior to the start of pumping.

Task 2: Evaluate Route of Passage Choice, Delay and Spill Survival

Additional detail of the receivers, the location and description of antennas, tags, and the manufacturer of tags is needed.

Fish should be released far enough upstream that they can select the 'normal' approach to the project so as not to bias the results. Fish released upriver of Barton Cove are constricted at two locations prior to reaching the dam which should be sufficient for them to select a normal approach to the dam.

Sample sizes for the releases should be determined for the filing in August. If fewer fish are available, the release numbers should be discussed with all stakeholders when that information becomes available.

A schedule for spill releases should be provided in the final study plan. This should ensure that all bascule and Taintor gates are tested. Testing of route selection should not be done during the canal shutdown as the only choice of route selection is spill. It is important to know which route fish chose when both generation and spill are occurring in able to assess overall project survival.

Neither Task nor 2 addresses the goal of determining the rate of entrainment at the Northfield Mountain project. Task 1 will hopefully identify the number of juvenile shad entrained at the Northfield Mountain project but it cannot determine the rate of entrainment. The rate of entrainment is the number of fish entrained divided by the population passing the project. Hydroacoustics, assuming complete and accurate data, will only provide the numerator of the equation.

The rate of entrainment can be achieved by releasing radio tagged fish above the Northfield Mountain project and monitoring the proportion of those fish entrained.

Task 4: Reporting

The report should include a graphical illustration of the movement of each fish. It should report the volume of spill at each gate throughout the testing period. Spill data for the period of out migration should be summarized for the full period of digital records so that an analysis of spill potential can be included in an overall project passage analysis. All data used to develop the report should be provided to the stakeholders in a digital form.

Study Plan Recommendations:

Survival of fish passing over the bascule and through the tainter gates should be evaluated with the Hi-Z Turb'N tags. The landing zone for each of the bascule gates is different which will result in different rates of survival. Twenty five fish should be released over each bascule gate and twenty-five fish through a tainter gate

Evaluate the hydroacoustic data at the Northfield Mountain project the hour before pumping.

A telemetry study of entrainment at the Northfield Mountain project is needed. As noted above, it is not possible to determine the rate of entrainment with the current study plan. Radio tagged fish should be released above the Northfield Mountain project. Fish should be released two river bends upstream of the Northfield project to allow them time to move downstream in a normal manner.

Telemetry stations:

Shearer Farm – full river width
NMPSS Intake
- Area antenna
- Dropper antennas at entrance to ensure full depth coverage

NMPSS Upper reservoir
NMPSS Gill Bank – full river width
Turners Falls Impoundment – full river width at boat buoys.
Gatehouse
- Upstream
- Downstream/canal

Dam
- Across and above bascule gates
- Across and above tainter gates

Below the dam – full river width
Station #1 – full river width
Station #1 forebay
Canal
- Conte fish passage building
- Cabot station forebay
- Cabot bypass – multiple droppers, one receiver

Cabot station tailrace
Montague Waste Water Treatment Plant – full river width

Receivers:

All receivers should be able to detect all frequencies and codes simultaneously. Both FirstLight and TransCanada will be tagging juvenile shad during the fall. Information at FirstLight projects can be augmented by collecting data from fish tagged by TransCanada. Cycling through frequencies and antennas is likely to miss fish with the probability of missed detections increasing with the number of fish tagged.

To better enable removal of spurious codes and to facilitate data analysis, all detections should be logged individually.

3.3.4 *Evaluate Upstream Passage of American Eel at the Turners Falls Project*

Study Goals and Objectives

The first objective is to identify eel concentrations where they occur in the project area. The first bullet limits locating concentrations to pools and wetted structures.

Project Nexus

The investigation should be the entire project area including the downstream passage discharge

Task 1: Systematic Surveys

The discharge of the downstream passage (log sluice) should be included in the survey areas. It passes 200 cfs continuously from June 1 to November 15 for passage of American shad. The volume and plunging nature of the flow will likely attract eels moving upstream along the bank.

The Cabot fishway should be evaluated with the addition of some attraction water. Should eels be attracted to the fishway it would be a secure location to deploy a trap in a location (tailrace) to which eels will likely be attracted. Without attraction water it is unlikely that many eels will enter the fishway.

If the spillway fishway attraction water system is not used to provide minimum flow after the upstream passage season the stilling basin should be evaluated with attraction water.

The entrance to the spillway ladder and the lower pools of the fishway should be surveyed.

Task 2: Trap Collections

Stakeholders should be consulted in determining additional trap locations beyond the three listed.

Eel ramps should be covered with plywood to prevent avian predation.

Traps should be check the day after periods of rain or other events that would precipitate eel movement to prevent overcrowding and mortality.

Study Plan Recommendations:

Surveys of eel concentrations should be done in 2015 as conditions in the field may change, the number of eels present will likely change, and the conditions that stimulate eels to move upstream are episodic. By surveying a second year the likelihood of surveying when eels are migrating is increased.

The eel ramps are described as being 12 inches wide. This is insufficient width to accommodate two substrates. Each substrate should be at least 12 inches wide. Substrate selection should be described for use by smaller and larger eels.

Length and weight data should be collected for all eels captured in 2015. Environmental conditions should also be recorded including: water temperature, turbidity, moon phase, discharge, station operations, etc.

Location and number of eel ramps should be determined in consultation with the stakeholders.

3.3.5 *Evaluate Downstream Passage of American Eel*

Task 1: Evaluate Timing of Downstream Migratory Movements

In addition to the hours of pumping, the hour before pumping at Northfield Mountain should be evaluated to assess fish within the zone of pumping influence prior to the start of pumping.

Task 2a: Northfield Mountain Route Selection

Antennas should be located up- and downstream of the project as well as at the intake.

The sample size should be included in the Study Plan filing due August 12, 2013. It is not anticipated that additional information that would inform the decision will be available after that date and prior to the study.

A release schedule with times of day/night should be proposed. While it may be advantageous to release eels prior to conditions that might initiate movement, waiting for these conditions should not be permitted to delay tagging and release. In a similar study at the Muddy Run Pumped Storage Station on the Susquehanna River, tagged eels that were detected at the station, moved from the release site 1 mile above the station to the station in less than 3 days. All eels were detected moving from the release site in less than 10 days.

Fish should be released far enough upstream that they can select the ‘normal’ approach to the project so as not to bias the results.

Task 2b: Turners Falls Route Selection Study

Similar to Task 2a, a release schedule for times of day/night should be proposed.

Specific locations for telemetry should be listed in the August 12 filing.

The specifics of the tags and information on how the mortality sensor work and will be programmed should be provided.

Fish should be released far enough upstream that they can select the 'normal' approach to the project so as not to bias the results.

Task 3: Data management and Analysis

The report should include a graphical illustration of the movement of each fish. All data used to develop the report should be provided to the stakeholders in a digital form.

Task 4: Turbine Survival

HI-Z Turb'N tags should be used to assess mortality of eels passing in spill. Eels can be expected to use spill for passage during high water periods utilized for outmigration.

Study Plan Recommendations:

The study should continue until all eels have been determined to pass the Turners Falls project, died or until water temperature reaches 5º C.

Releases above the Northfield Mountain project and project operations should ensure, as much as possible, that eels encounter as many pump combinations as possible, including all four units pumping.

For the Northfield Mountain project fish should be released two river bends upstream of the project to allow them time to move downstream in a normal manner. At the Turners Falls project fish released upriver of Barton Cove are constricted at two locations prior to reaching the dam which should be sufficient for them to select a normal approach to the dam.

Evaluate with the intake area of the Northfield Mountain project with hydroacoustics the hour before pumping.
Survival of fish passing over the bascule and through the tainter gates should be evaluated with the Hi-Z Turb'N tags. The landing zone for each of the bascule gates is different which will result in different rates of survival. Twenty five fish should be released over each bascule gate and twenty-five fish through a tainter gate.

At least 75 eels should be released above the Northfield Mountain project to ensure a reasonable number passing the project during the different pumping scenarios. An additional 50 eels should be released above the Turners Falls project to determine route of passage past that project.

Telemetry stations:

Shearer Farm – full river width
NMPSS Intake
- Area antenna
- Dropper antennas at entrance to ensure full depth coverage

NMPSS Upper reservoir
NMPSS Gill Bank – full river width
Turners Falls Impoundment – full river width at boat buoys.

Gatehouse
- Upstream
- Downstream/canal

Dam
- Across and above bascule gates
- Across and above tainter gates

Below the dam – full river width
Station #1 – full river width
Station #1 forebay
Canal
- Conte fish passage building
- Cabot station forebay
- Cabot bypass – multiple droppers, one receiver

Cabot station tailrace
Montague Waste Water Treatment Plant – full river width

Receivers:

All receivers should be able to detect all frequencies and codes simultaneously. Both FirstLight and TransCanada will be tagging American eels during the fall. Information at FirstLight projects can be augmented by collecting data from fish tagged by TransCanada. Cycling through frequencies and antennas is likely to miss fish with the probability of missed detections increasing with the number of fish tagged.

To better enable removal of spurious codes and to facilitate data analysis, all detections should be logged individually.

Reporting

There is no task for reporting.

The report should include:
- Release numbers, locations and dates
- Fish vitals (length, weight, and morphometric criteria)
- River temperature at Northfield, canal, bypass and below Cabot Station
- Route selection
- All detections of fish
- Behavior of fish that do not pass the project
- Delay of fish: location and time
- Survival of fish passing each project facility
- Overall project passage effectiveness
- Analysis of how project operations affect upstream movement and entry into fishways
- Graphic description of the movement of each fish

3.3.6 *Impact of Project Operations on Shad Spawning, Spawning Habitat and Egg Deposition in the Area of the Northfield Mountain and Turners Falls Projects*

Study Goals and Objectives

The Route 116 bridge is in Sunderland.

The last bullet has change quantify to verify. The objective should be verify and quantify spawning activity. Task 2 Phase 1 (pg 3-152) states specifically that spawning "… will be observed and **quantified** by counting splashes …"

Project Nexus

The location of the fifteen known spawning areas should be better described to differentiate the first five areas from the other ten. There are two locations that describe the upstream boundary for the five locations in the first sentence of the second paragraph.

Task 1: Development of a Detailed Study Schedule

There does not appear to be any information in this section concerning development of a schedule which is the title of this task.

Data from the review of project operations at the Cabot Station and the USGS gage locations should be provided to the stakeholders in a digital format. Similarly, the water level data derived from the hydraulic model should be provided to the stakeholders in a manner that is comparable to the discharge data and the known and potential spawning areas.

The section on dewatered areas and deploying ichthyoplankton nets seems out of place either as a part of a schedule or review of historic or model data.

Task 2: Examination of Known Spawning Areas Downstream of Turners Falls Dam

The first sentence states that the field surveys will be based on information from Task 1. Task 1 is either development of a schedule or a review of historic operation data and water level changes from the hydraulic model. It is not clear how either will inform field surveys.

The last sentence in the first paragraph says that surveys "… below Cabot Station will concentrate on **the** five known spawning locations downstream of the Deerfield River confluence …" As there are 15 known spawning locations below the project, the specific five areas should be better described along with a justification for selecting these locations. Figure 3.3.1-4 shows two locations upstream of the Deerfield River Confluence. An explanation as to why the locations were not selected for study should be provided as they would seem to be the ones most likely to be affected by project operations.

Additionally this sentence, which identifies the specific locations for evaluation, contradicts the first sentence in the paragraph, which states that the field surveys will be conducted based on the information gathered in Task 1.

In Phase 1 the observation and quantification of spawning is, on the one hand, stated to occur for a 15-minute interval and, on the other, the time spent observing will be determined by the survey crew. It is also stated that the survey crew will observe all known spawning locations. As there are fifteen previously identified locations and potentially others, the number of areas to be observed in a single night should be better defined.

As spawning is not equally distributed over the period from sunset to 01:00h, the survey design should vary the time of night that each site is observed.

The evaluation of impacts of flow fluctuation should not be limited to locations that may become dewatered. [By definition and area that is dewatered will be unsuitable for spawning] The impact of flow fluctuations will, most likely, be observed at locations closer to the project.

Flow manipulations are stated to be done over a range of expected seasonal flow fluctuations and it is also stated that several discharge manipulations **may be** investigated. These are contradictory statements. Several discharge manipulations **will be** investigated.

The baseline rate of spawning should be spawning immediately before the flow changes. To determine if flow fluctuations alter spawning, the field crew should observe and count spawning splashes before the flow changes, during the change, and after the change has occurred. Spawning could be altered during both increases and decreases in flow. Both should be observed.

Deploying ichthyoplankton nets below suspected spawning sites as a means of assessing the occurrence of spawning does not seem to be particularly useful regardless of the likelihood of dewatering. Shad spawning sites can better be identified by observation of splashing. If an egg deposition site is dewatered, egg survival is assumed to be zero without evidence to the contrary.

Task 4: Examination of Identified Spawning Areas Upstream of Turners Falls Dam

Two projects can affect spawning in the reach from the Turners Falls dam to the Vernon Station. If spawning occurs within the zone of influence of the Northfield Mountain project, evaluation of project effects is possible by FirstLight. If spawning is upriver of Northfield Mountain, Vernon will be the project most likely to create flow fluctuations. As FirstLight does not operate the Vernon project it is unlikely that the manipulations described in Phase 2 can be done as the plan suggests.

Study Schedule

Bullet one – the IFIM for reaches 4 and 5 will not be done in 2013.

Field survey locations can be preliminarily selected prior to the spawning season but these should be selected in consultation with the stakeholders after the initial field identification of spawning sites. Changes in river conditions since 1977 may have altered spawning locations previously identified and new locations may exist.

Study Plan Recommendations

Site selection for Phase 2 should include the site closest to the project with a reasonable degree of spawning frequency and two sites downstream where fluctuations from the most extreme peaking are moderate. Sites to be selected with stakeholders based upon initial observations.

Egg netting below spawning sites before and after flow change.

Temperature should be recorded continuously at the upper and lower most spawning sites selected for manipulation evaluation.

Year 1:

- Identify all spawning locations below Cabot Station and above Route 116 using Layzer and Kuzsmeskis as initial guides.
    - Telemetered fish can be used to assist spawning locations as well as be included in the manual tracking shad database for study 3.3.2
- Select three sites for flow manipulation evaluation
    - Close to Cabot Station
    - Two downstream
    - Specific sites to be determined with stakeholder
- Evaluate sites at multiple levels of flow fluctuation
    - Initial evaluation at the site closest to the station with the greatest fluctuation
    - Observe and collect data before, during and after manipulation
    - Identify effect: spawning frequency, location, etc.
    - Evaluate both increases and decreases in flow
- Identify spawning locations upstream of the Turners Falls dam
- Observe changes in spawning if flow changes occur

Year 2:

- If year one study identifies flow fluctuations as causing alteration in spawning behavior and spawning is identified in the zone of influence of Northfield Mountain, develop study plan for manipulation of flows from Northfield Mountain and observe and evaluate the effects of those manipulations
- Repeat year one study below Cabot if year one study is incomplete
    - One example of an incomplete study would be if an effect of flow change was identified at the uppermost site but the effect of similar changes at the lower sites was not able to be evaluated.

3.3.7 *Fish Entrainment and Turbine Passage Mortality Study*

Task 3: Estimate of Turbine Mortality

As noted in comments for Study Plans 3.3.3 and 3.3.5, entrainment rates, to be determined with a telemetry study for both juvenile shad and American eels, will be needed to estimate entrainment loss..

Task 4: Reporting

A long term history of pumping (number of units per hour) should be provided by month for April through November should be provided in tabular form similar to Tables 2.3-1 and 2.3-2 in the Exelon Muddy Run RSP 3.3 for eels or shad (FERC # 2355).

The list of sections in the table of contents for the report is noted as 'tentative'. As this is supposed to be the plan, the list, that **will** be included in the report, should be defined.

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*

Existing Information and the Need for Additional Information

Spill data for the period of sturgeon spawning and incubation 2013 should be available for analysis.

For 5 years of the ten years surveyed between 1993 and 2007, adult sturgeon were present at the Rock Dam prior to leaving the Rock Dam and spawning at Cabot Station. During the five years sturgeon were present, the mean number of adults was 10.4 (range, 3 – 25) (pers. com. M. Kieffer and B. Kynard).

Methodology

In this section the evaluation will be conducted in the fall. In the Study Schedule section it will be conducted in the summer.

Task 1: Preliminary Study: Analysis of Existing Data

The results of the analysis of historic gate opening data should be presented to all stakeholders. All stakeholders should be consulted to determine if further study is needed. As impacts of gate openings have been documented to release large quantities of debris and sediment during the sturgeon spawning and incubation period it is likely that the full study will need to be completed.

The analysis of gate openings should include emergency openings so that the frequency and magnitude of these events is understood regardless of the ability to alter the timing of emergency events.

The causes of emergency gate openings and the reasons for non-emergency openings should be included in the analysis of gate openings.

Task 2: Scenario Development

The spillage scenarios should be done for the three bypass flows to be tested in the shad telemetry study (3.3.2).

As the purpose of the study is to evaluate the effect of spill on sturgeon spawning and rearing, the highest spill discharge (emergency or non-emergency) combined with the low bypass and generation flows should be included in the spillage scenarios.

Task 3: Field Verification of Conditions

As the number of strata has not yet been determined, the number of velocity measurement locations should be stated as locations per strata. There should be at least 4 locations per strata.

Velocity measurements should be made for 60 seconds or until the velocity reading stabilizes.

Soak time for the sediment samplers should be determined in collaboration with all stakeholders.

Sediment size should be sampled to determine size (modified Wentworth) and ratio of sizes in addition to a visual inspection and a general categorization.

Task 4: Data Analysis and Reporting

Emergency protocols should be included in both the initial analysis and the final report.

A final report will be completed if river conditions are suitable for study in 2014. There is no description of how the report will be completed if conditions are not suitable in 2014.

Study Schedule

In this section the evaluation will be conducted in the summer. In the Methodology section it will be conducted in the fall.

3.3.15 *Assessment of Adult Sea Lamprey Spawning within the Turners Falls Project and Northfield Mountain Project Area*

Study Goals and Objectives

The goals and objectives listed in the study plan do not address the first goal and objective in the NOAA study request which was to "…determine whether the operations of the Projects are affecting the success of this activity [spawning] to occur."

Task 1: Field Data Collection

It is unclear what will be the extent of delineation of suitable areas for lamprey spawning, how lamprey redds will be located, and what reaches of the river will be searched for redds.

The proposed methodology for evaluating redd success is inadequate. It is unclear if there is a definition of success in this plan by which the lack of success could be measured.

The plan notes that the subsample will be divided among different large scale locations. Some of the possible locations are stated but a total list is not provided. A complete list with a plan for how each location will be evaluated is needed. The bypass reach is not affected by peaking and it may be possible touse it as a reference for redds affected by peaking flows.

Spawning success cannot be documented merely by the presence of redds or of the condition of redds prior to and after peaking events. Rather, it should be documented with an evaluation of eggs in redds. Redds in areas that are highly impacted by peaking flows should be compared to redds in low impact areas to determine if eggs are present in redds. Similar or a significant difference in the frequency of redds with eggs in the high and low impact areas would be an indicator of spawning success.

Similarly the difference in alteration of redds after a peaking event between the high and low peaking impact areas would be an indication of impacts by the project.

Task 2: Data Analysis

Data entry and mapping are insufficient data analysis to explain the influence of project operations.

Study Plan Recommendations

Since 2000, 20.5% of sea lamprey passed at Holyoke have passed the Gatehouse fishway with a maximum passage of 56.8% in 2008. Fifty lamprey should be radio tagged at the Holyoke fishlift to assist in location of suitable spawning habitat. Tagging fifty lamprey should ensure a sufficient number of lamprey below the Turners Falls dam. As lower than 5% of lamprey passed Gatehouse in 2011, an additional twenty lamprey should be tagged at the Gatehouse fishway to ensure a sufficient above the dam.

Tagged lamprey will provide specific redd locations and the ability to determine in real time the impact of flow alterations.

Data collection should include

- Mean column velocity at the redd site
- Embeddedness
- Water depth

- Presence or absence of eggs in redds

An evaluation of nest abandonment should be made after a high water event only for redds that had sea lamprey present immediately before the high water event.

Tags should be compatible with shad telemetry equipment.

Mobil tracking used to locate lamprey.

Determine discharge/stage during observations.

The 'before and after' events should be statistically evaluated.

3.3.18 *Impacts of the Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms*

Task 1: Conduct Aquatic Organism Survey of Canal During 2014 Drawdown

The method of systematically traversing each of the zones to be surveyed should be described. Based upon the 2011 survey report which is referenced as being, with minor modifications, adequate to met this studies objective, the technique of surveying could best be described as 'walked around and looked'.

The plan describes the wetted area in zone 7 as appearing to provide adequate flow and depth to support aquatic species over the short term. This report should verify that supposition.

If areas other than zones 2-4 have ammocetes or mussels, those numbers should be evaluated with sub-sampling and total counts estimated based upon the subsample.

The method of random sampling should be described.

A definitive number of samples in each area of concentration of mussels or ammocetes should be provided. "Up to 10 randomly selected 1-m by 1-m quadrates…" is insufficiently specific to ensure that the survey is properly conducted.

A description of how the pools and wetted areas will be mapped should be provided.

Study Plan Recommendations

Temperature in zone 7 should be logged on an hourly basis at each end of the zone prior to, throughout the drawdown period, and while the canal is being refilled.

Dissolved oxygen should be measured in zone 7 after the canal is initially drained, mid-way through the drawdown, and at the end of the last day of the drawdown.

Depending on where the Keith Drainage Tunnel is located (no location description is provided) temperature and dissolved oxygen should also be measured downstream of the tunnel as well as at the upper and lower end of zone 7.

The frequency of drawdowns should be listed as a potential measure of mitigation in Task 2.

As the pools change over time, additional surveys of the size, water temperature and dissolved oxygen in pools in zones 1 to 6 should be made at least two times in addition to the initial survey. One survey should be the last day prior to refilling.

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

General Description of Proposed Study

In this section and in the Study Schedule section, the study is predicated on the results of prior studies (shad telemetry and the bypass IFIM). How the results of those studies would influence conducting this study is not described. Specific criteria should be described.

It is highly unlikely that all shad under all conditions in 2014 will move directly past the Cabot Station to the dam. As such it will be necessary to conduct the ultrasound study in 2015. As the shad telemetry study should/will be done it 2015 it will be possible to conduct the ultrasound study in 2015 in conjunction with fish tagged for study 3.3.2.

Task 1: Ultrasound Deployment

This section describes a plan to develop a plan as opposed to providing an actual plan. As noted several times above, this is not adequate.

FirstLight should provide:

- Details on the equipment to be used and how it will be deployed
- A proposed schedule for utilizing the ultrasound array.
- Intensity of ultrasound
- A description and a graphic of the expected field of ensonification
- The period of time over which the ensonification will occur
- A schedule for ensonification
- Flows in the bypass during the trials

Task2: Reporting

This section does no more than state that data will be analyzed and a report will be provided. Specifics should be provided as to the method of determining successful or unsuccessful deterrence away from the Cabot Station and subsequent movement if movement occurs.

Study Plan Recommendations

The array should be tested in an on/off manner beginning with the arrival of telemetered shad at the Cabot Station.

Testing should occur with two hour on and three or more hour off segments two times during the day beginning after 9:00 and before 11:00 to ensure that sufficient shad are present in the tailrace when the first and last 'on' tests begin.

Alternative testing schedules may be appropriate after initial trials. Any change in the testing schedule should be done only after consultation with the stakeholders. After the first week of testing an interim report should be provided to the stakeholders describing the results of the ensonification including: the behavior of fish when the ultrasound is turned on, the movement of the fish up- or downriver, how long fish remain away from the tailrace if they do move away, etc.

Testing should occur three days per week for at least four weeks.

Hydroacoustics should be employed to assess how the population of fish responds to ultrasound. This will allow evaluation of a larger population of fish than the telemetry fish or video monitoring (below).

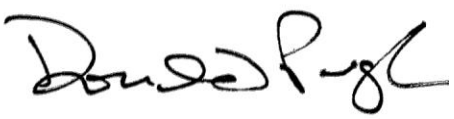
Video monitoring should be installed at the entrance to the Cabot fishway both inside the fishway and outside the entrance. This will provide data on fish that are not radio tagged. Telemetry data will be used to determine the direction that the fish move after the array is turned on.

Telemetry locations:

The telemetry locations described in the Study Plan Recommendations for Study Plan 3.3.2 should be sufficient to evaluate movement in the area of the Cabot Station. They will detect fish approaching the station, fish in the general tailrace area, fish in the immediate vicinity of the Cabot fishway entrance, and fish moving upstream past Rawson Island. Movement of fish after ensonification either upstream of downstream will be detected as will the lack of movement away from the tailrace.

Thank you for the opportunity to comment on the proposed study plans. I can be reached at the above address, don.pugh@yahoo.com, or at 978 544 7438 if there are any questions.

Sincerely,



Donald Pugh

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