

## Relicensing Study 3.3.2

# EVALUATE UPSTREAM AND DOWNSTREAM PASSAGE OF ADULT AMERICAN SHAD

## Initial Study Report Summary

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

*Prepared for:*



*Prepared by:*



SEPTEMBER 2014

## 1.1 Study Summary

The goal of this study is to identify the effects of the Turners Falls and Northfield Mountain Projects on adult shad migration. Telemetric techniques will be utilized to assess the potential impacts of project operations on the behavior, approach routes, passage success, survival, and delay of adult American shad during both upstream and downstream migrations.

The fieldwork portion of this study will primarily be conducted in 2015 as the Federal Energy Regulatory Commission (FERC) recommended a one-year delay in schedule due to the timing of the decommissioning of the Vermont Yankee Nuclear Power Plant located upstream of the Northfield Mountain Pumped Storage Project.

## 1.2 Study Progress Summary

### Task 1: Review Existing Information

FirstLight has been tasked with assessing the upstream and downstream migration of adult and juvenile American shad through the project. Between 2011 and 2012, the United States Fish and Wildlife Service (USFWS) in consultation with the United States Geological Service (USGS), conducted the Whole River (WR) telemetry study, which radio-tagged 364 fish and collected data at 28 receivers from Enfield, CT to Vernon Dam. Initial data reduction was performed by the USGS and upon receipt; the dataset (aggregation of 2011 and 2012) contained nearly 12 million records. Following the initial receipt of the WR dataset, it was apparent that false positives were still included in the information.

The USGS performed primary data reduction by removing detections from the recordset that did not match a list of released tags, had too low of a power, or that were detected before the tag was activated. Following the initial data reduction, FirstLight employed Beeman and Perry's (2012) Method C, which required two simultaneous detections within series to be considered a true detection, otherwise they were deemed false positive and removed from record. The initial data reduction record set was reviewed by USFWS and USGS; however, they believed that too much data was removed ([Appendix A](#)). Therefore, a new data reduction method based on a Naïve Bayes Classifier will be developed that will remove false positive detections probabilistically rather than making arbitrary distinctions. Once a dataset is reviewed by USGS and USFWS, analysis of existing information will continue.

### Task 2: Study Design and Methods

The study will be conducted in 2015 as required in the SPDL. Preliminary evaluations and range testing of proposed monitoring locations was conducted on July 15 and 16, 2014. The objective of the preliminary evaluations was to investigate the feasibility of using radio telemetry methods to monitor strategic locations as identified in the RSP. The evaluation included those proposed monitoring locations spanning large distances (i.e. wide sections of the river) to ensure that the proposed monitoring regime is adequate to document tagged study fish as they migrate through the study area. The range testing was conducted using a Lotek SRX 400 receiver and 4-element yagi antenna and a test tag with the following parameters:

- Frequency 149.320
- Width - 12mm
- Length - 40mm
- Mass - 8g
- Apparent mass in water - 3.5g

The test tag was deployed using a fishing pole and float to set the depth of the tag at approximately 5 feet (ft). Water quality data were collected at the time of the testing including temperature, dissolved oxygen (DO), pH and conductivity. Conductivity in particular affects the radio signal transmitted by the tag and will affect the range of the monitoring system. The conductivity of the Connecticut River was 139  $\mu\text{S/L}$  at the time of testing (July 15) and 88  $\mu\text{S/L}$  within the Deerfield River confluence (July 16).

Range testing was conducted at the following locations:

- Shearer Farms (RM 127.5),
- NMPS Intake (RM 127),
- NMPS Gill Bank (RM 126.5),
- Turners Falls Impoundment (RM 122),
- Station No. 1 Tailrace (RM 121),
- Rawson Island (RM 120.5),
- Cabot Station Tailrace (RM 120)
- Deerfield River Confluence (RM 119.5), and
- Montague Wastewater (RM 119.5)

The analysis of the range testing is ongoing, but a preliminary review revealed that the monitoring stations as proposed in the RSP will be adequate to monitor shad movement through the study area with one exception. An additional monitoring station at the Shearer Farms location will be necessary to monitor the full width of the river. This location will be monitored with two Lotek SRX 400 receivers and yagi antennas.

Though the monitoring location proposed at the Red Cliffe Canoe Club (RM 86.5, upstream of Holyoke Dam) was not tested in the evaluation, given the width of the river at the location (~1200 ft), it is anticipated that an additional receiver station, one on each side of the river, will be required to monitor the full width of the river. This area will be monitored using two Lotek SRX 400 receivers and yagi antennas.

Radio noise information is being collected in 2014 at Cabot Station to help determine which frequencies are best suited for use in the study. The exact frequencies used in the study will be based on availability and the results of the noise testing, and in cooperation with the TransCanada studies. Data collection for this effort is ongoing and it is anticipated that analysis of the data will be completed prior to purchasing tags.

#### Task 3: Evaluation of Mortality

Mortality data will be collected at all fixed telemetry stations and during mobile tracking. Mobile surveys to assess mortality will be conducted twice per week in the riverine section from Turners Falls dam (RM 122) to RM 93.

#### Task 4: Reporting

A final report will be completed in March 2016 per FERC's SPDL.

### **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 field study component in 2015.
- File Final Report.

# **Appendix A**

## **Correspondence Log**

From: Sprankle, Ken [ken\_sprankle@fws.gov]  
Sent: Friday, February 21, 2014 10:50 AM  
To: Kevin Nebiolo  
Subject: Re: Telemetry Data  
Attachments: 2012 RKM designations for RX Sites.xlsx

Hi Kevin,

I have not accessed the drop box but expect Ted could easily share if necessary. The database that has the attached table in is 434 megs - so can not email. Give me some site, and direction, and I will upload the dbase.

I don't know when/how much time in coming week I have for this given other work, but, will try and maintain some amount of effort.

Ken

On Fri, Feb 21, 2014 at 10:40 AM, Kevin Nebiolo <Kevin.Nebiolo@kleinschmidtusa.com> wrote:  
Ken,

You should be able to respond to this email address. Do you have access to the dropbox account that was set up by Ted? I am planning on uploading the script, data and report after I have run through the data reduction algorithms.

Looking forward to future collaboration,

Kevin Nebiolo  
Staff Scientist  
Kleinschmidt Associates  
P: 860-767-5069  
F: 860-767-5097  
35 Pratt St. Suite 201  
Essex, CT 06426

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Kenneth Sprankle  
Connecticut River Coordinator  
U. S. Fish and Wildlife Service  
103 East Plumtree Road  
Sunderland, MA 01375-9480  
<http://www.fws.gov/r5crc/>

phone (413) 548-9138 ext 121  
fax (413) 548-9622

From: Sprankle, Ken [ken\_sprankle@fws.gov]  
Sent: Wednesday, March 05, 2014 9:01 AM  
To: Kevin Nebiolo  
Cc: Robert.Stira@gdfsuezna.com; tcastrosantos@usgs.gov; Chris Tomichek  
Subject: Re: Preliminary Data Reduction

Hi Kevin,

Thanks for sharing this and for undertaking this work. It will be helpful as another approach to the more labor intensive screening process we are undertaking as you and discussed. I hope that we will be able to share the results of our effort with you soon and we can compare. In a quick review, many of the reductions seem intuitively logical relative to what fish are capable of doing for movement rates. Does not appear you were able to include mobile tracking data records - which if identified are 100% positive detections - and of course are at mostly between fixed receiver sites. We have yet to include that in Ted's plots, hope to crack into that this Friday. I think those data have important value to this screening effort.

One question, the X axis time series is hard for me to follow and sometime includes large spans when the fish is tagged "early" and in some cases shows only one date, making it hard to compare among a time scale pattern as you scroll through. Does that make sense? Ted's plots all have the same time scale for X axis.

Thanks again,

Ken

On Tue, Mar 4, 2014 at 6:26 PM, Kevin Nebiolo <Kevin.Nebiolo@kleinschmidtusa.com> wrote:  
Good evening,

Over the past few weeks I was able to run a preliminary data reduction script across the 2011 lower river fish. You can find methods in the attached memo, if anyone has any questions please feel free to respond. While talking with Bob today, we realized that I was still missing a chunk of the data. I was able to convert the remaining SAS data files to csv and am running through the script now.

- Kevin

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From: Sprankle, Ken [ken\_sprankle@fws.gov]  
Sent: Wednesday, March 05, 2014 10:03 AM  
To: Kevin Nebiolo  
Cc: Robert.Stira@gdfsuezna.com; tcastrosantos@usgs.gov; Chris Tomichek  
Subject: Re: Preliminary Data Reduction

Ok, thanks for the dates adjustment.

Your data file questions must be answered by Ted, I simply do not have that knowledge.

You say " Also, what was the file name for the mobile tracking data records, I do not want to import those into the data reduction script."

Ted has not included mobile tracking data in any of the files he sent you in ACCESS. These data are still in Excel spreadsheet files. You may have them, maybe not, Ted would not have sent them but I may have sent them to Kris. You say you do not want to import them into the "scripts" but are you not interested in having them included in the plots? I guess I am unclear on what exactly this means, I don't read this as a mutually exclusive thing statement, relative to using the data. Let me know.

Ken

On Wed, Mar 5, 2014 at 9:49 AM, Kevin Nebiolo <Kevin.Nebiolo@kleinschmidtusa.com> wrote:  
Ken,

I'll adjust the x-axis. Currently it is drawn to match the temporal extent of the record, but I can standardize so that it is drawn between a min and max season date.

I would love to share the results, I've done a lot to streamline the data, especially how it's handled in Access and the resultant database is robust. Just to make sure I am working with the correct data, I am currently only analyzing the whole river dataset(s). The gatehouse data will be a separate analysis. On the DVD provided there were three files:

- \* (1) a cleanradio.SAS7BDAT in 2011/Lower River,
- \* (2) a cleanradio.SAS7BDAT in 2012/Lower River,
- \* (3) a cleanradio.SAS7BDAT in 2012/Upper River.

I'm assuming that there is no "cleanradio" file for 2011 Upper River.

Were there any other files from the fixed receivers that could contain false positives?

Also, what was the file name for the mobile tracking data records, I do not want to import those into the data reduction script.

- Kevin

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Sent: Wednesday, March 05, 2014 9:01 AM  
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From: Castro-Santos, Theodore [tcastrosantos@usgs.gov]  
Sent: Friday, March 07, 2014 8:44 AM  
To: Kevin Nebiolo  
Cc: Robert.Stira@gdfsuezna.com; ken\_sprinkle@fws.gov; Chris Tomichek  
Subject: Re: Preliminary Data Reduction

All:

I've had a quick look at the rationale, methods and output. Great to see progress on this. I do have some concerns, notably that the method is discarding some points that weight of evidence approach might retain. This has important effects on duration of exposure etc. It's field season now, so I can't meet anytime soon, but I do think we should try to find a time (June?) to go over some of the methods and/or compare different approaches to the data. Again, not terribly concerned at this point, and I do like the approach of plotting original and cleaned data.

One quick thought is to use a broader criteria, e.g. 3 detections out of 10 possible to denote viable data. The other thing to be careful of is receivers with CRT0 enabled, which will tend to discard data (and not allow for identification of sequential detections).

Ted

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P.O. Box 796; One Migratory Way  
Turners Falls, MA 01376  
413-863-3838  
tcastrosantos@usgs.gov

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