



October 14, 2015

**VIA ELECTRONIC FILING**

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

Re: FirstLight Hydro Generating Company, FERC Project Nos. 2485 and 1889  
2015 Updated Study Meeting Summary

Dear Secretary Bose:

Pursuant to the regulations of the Federal Energy Regulatory Commission (FERC), Title 18 Code of Federal Regulations (18 C.F.R.) §5.15(f), FirstLight Hydro Generating Company (FirstLight) filed its Updated Study Report (USR) for the relicensing of its Turners Falls Hydroelectric Project (FERC No. 1889) and Northfield Mountain Pumped Storage Project (FERC No. 2485) on September 14, 2015. Pursuant to §5.15(f), on September 29-30, 2015, FirstLight held its USR meetings to discuss the study reports. Attached as Attachment A is FirstLight's meeting summary.

Several of the 2014 studies were completed with reports filed with FERC on September 14, 2015. For the completed studies, more detailed summaries were provided on the study findings at the USR meetings. Given that 2015 was the first field season for the majority of aquatic and water quality studies, and given the timing of the USR meetings, these studies are not yet complete with many having field data collection occurring through November 2015 and two occurring during the 2016 field season. At the USR meeting, FirstLight provided a status update on these studies.

In addition to the meeting summary, attached as Attachment B is the PowerPoint presentation made at the USR meetings.

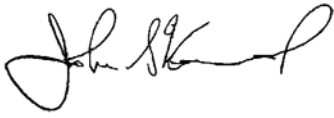
FirstLight is filing its USR meeting summary and PowerPoint presentation with the Commission electronically. To access the document on the FERC website (<http://www.ferc.gov>), go to the "eLibrary" link, and enter the docket number, P-1889 or P-2485, to access the document. FirstLight is also making the same available for download at the following website: <http://www.northfieldrelicensing.com>.

**John S. Howard**  
Director FERC Compliance, Hydro

FirstLight Power Resources, Inc.  
99 Millers Falls Road  
Northfield, MA 01360  
Tel. (413) 659-4489/ Fax (413) 422-5900/  
E-mail: [john.howard@gdfsuezna.com](mailto:john.howard@gdfsuezna.com)

If you have any questions, or need additional information, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "John Howard". The signature is fluid and cursive, with the first name "John" being more prominent and the last name "Howard" following in a similar style.

John Howard

Attachment A: Meeting Summary

Attachment B: PowerPoint Presentation

**Attachment A: Meeting Summary**

**Turners Falls Project (FERC No.1889) and  
Northfield Mountain Pumped Storage Project (FERC No.2485)  
FERC Relicensing  
Updated Study Report Meeting  
Meeting Notes Summary  
September 29 – September 30, 2015  
Northfield Mountain Visitor Center  
Northfield, MA**

**Day 1 – September 29, 2015**

**List of Attendees:** See Attachment A

**Introductions, Meeting Purpose, and Process Timeline**

Mark Wamser (Gomez and Sullivan) opened the meeting and welcomed everyone. Mark introduced members of the FirstLight relicensing team, and then recognized FERC staff at the meeting and asked them to introduce themselves. Mark noted that there were lots of studies to cover in just two days, so presentations would be summaries. He also noted that this meeting is a required ILP meeting to discuss the Updated Study Report (USR) that included studies completed and also updates on studies that are still ongoing. Mark explained that the primary objectives of the meeting were to discuss the progress on each study; discuss plans for studies in the upcoming year; and to discuss modifications to a few studies.

Mark reviewed the ILP process schedule, and noted that the USR and study summary were filed with FERC on September 14, 2015. Mark explained that stakeholders can comment on the study summary and studies completed thus far. He also noted that the Draft License Application would be filed in December, 2014 and the Final License Application would be filed in April, 2016.

Andrea Donlon (CRWC) indicated to FERC that she would like to discuss the revised ILP process plan. She noted that it looked like FERC had expected most of the studies to be completed by March 1, 2016, while in reality a number of studies will be filed after that, based on FirstLight's schedule. Brandon Cherry (FERC) explained that any remaining studies to be completed will have to go through the study review and modification process. He said FERC was reluctant to assign specific dates to those additional review and study determination steps, but that they would have a better idea of that schedule after March 1, 2016. However, he indicated that FERC anticipated having another study modification process after study reports are filed in March, 2016.

Mark Wamser then gave a quick overview of all the studies that are being conducted as part of the relicensing process. Mark also reviewed the agenda for the two days of the USR meeting. As there were no questions regarding the agenda, Mark introduced the first study and study presenter.

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

Brandon Kulik (Kleinschmidt) reviewed the status of the instream flow study. He reviewed the status of each of the study tasks, noting that the study was being conducted in consultation with the agencies and stakeholders, and that there had been site visits to the study reaches in 2013 and 2015 and the consultation regarding HSI curves was completed in 2013-2014. Brandon also noted that the HSI curve for mussels was still under development as part of the mussel study (3.3.16). Brandon reminded the group about the

methods that would be used to conduct the IFIM study, including the use of the two-dimensional (2D) hydraulic model. He noted that all field data had been collected for the model in reaches 2 through 4 and that remaining hydraulic modeling would be done over the winter. Bill McDavitt (NOAA) asked Brandon how the Deerfield River flow would be handled in the model. Brandon explained that during the field data collection they had a stable flow coming out of the Deerfield so inflows were relatively constant. Don Pugh (TU) asked Brandon about how and when they were going to do the flow/habitat assessment in the area below the dam (Reach 1). Brandon explained that the intent was to evaluate the preliminary results of the IFIM modeling work for the lower reaches, and use that information to develop a range of demonstration flows to be evaluated below the dam. He indicated that the week of October 5, and then actually schedule and conduct the flow demonstration (BOPSAR<sup>1</sup>) later in October.

Brandon then showed a slide of the bypass and downstream reaches that are the subject of the instream flow study, and described each of the reaches. He also showed some pictures of and described some of the field data collection techniques used, as well as an aerial view of the bypass showing the transect locations in reaches 1 and 2 and describing the hydraulic characteristics of the reaches, including a river profile graph. Finally, he described the model calibration flows and the range of flows the model would be capable of simulating. Karl Meyer asked about the river profile for the reach below Rock Dam. Brandon explained that he did not have a similar depiction of the river profile for that reach as it was being modeled with the 2D model. Brandon showed a couple of examples of 2D model simulations of velocity in Reach 3. Bill McDavitt noted that when he visited the area around Cabot Station it was clear that releases from Cabot Station have a backwatering effect to Rock Dam. Brandon agreed saying that under some bypass flow and generating scenarios they do expect the backwatering effect to show up in the modeling.

Brandon concluded with a summary of the study schedule variance and the work remaining. Andrea Donlon and Melissa Grader (USFWS) both asked Brandon to review the schedule for the flow demonstration work again. Brandon reiterated that he would be preparing a memo with preliminary results for reaches 2-3 in about 10 days, and that those results should be useful in determining the range of demonstration flows. Following that, the BOPSAR would be scheduled for late October or early November.

### **3.3.13 Impacts of the Turners Falls Project and Northfield Mountain Project on Littoral Zone Fish Habitat and Spawning Habitat (Kulik)**

Brandon Kulik reviewed the tasks associated with this study. He explained that Task 1, the literature review, was conducted in first quarter of 2015 to target spawning periods for fish species known to occur in the Turners Falls Impoundment (TFI), based on water temperature. He showed a slide of the literature review results indicating the spawning times for resident fish species and noting that there were two clusters of spawners – early non-nesting spawners and later nest builders. Brandon noted that they used this research to plan the field survey which was conducted in May and June, based on water temperatures. Early spawning work occurred May 4-6, 2015, and then field work for the latter group was conducted June 11-13, 2015. Brandon indicated that the field staff saw evidence of spawning during both periods. He noted that the data are now being incorporated into the GIS database and the report will be completed in June, 2016. Brandon concluded by indicating that there were no variances to the study plan, and that the work remaining on the study includes evaluation of water level fluctuations on habitat and littoral zone, which will be conducted as part of the study and included in the study report.

---

<sup>1</sup> BOPSAR- “Bunch of People Standing Along A River”

#### **3.3.14 Aquatic Habitat Mapping of Turners Falls Impoundment (Kulik)**

Brandon Kulik began by reviewing the tasks associated with this study. He noted that the first phase of Task I, which involved habitat delineation and mapping, was completed in 2014. The rest of the study was completed in 2015, and the report was filed with FERC as part of the USR in September, 2015. Regarding study findings, Brandon explained that there are two distinct types of littoral habitat in the TFI, more riverine habitat from Vernon down to French King Gorge, while the reach below the gorge is less riverine and the littoral zone is characterized more by steep bedrock with areas of near vertical walls and some embayments with good cover and fine-grained substrate. Brandon noted that there was a minor variance to the study plan involving the use of water level loggers rather than manual measurements. Regarding work remaining, Brandon reiterated that the Littoral Zone Study (3.3.13) will include an evaluation of the effect of water level fluctuations on habitat and the littoral zone.

Andrea Donlon asked if the water level loggers (WLL) used for this study were the same as those used for the hydraulic modeling work. Mark Wamser said that the WLL used for this study were specifically targeted to fish spawning habitat. Andrea noted that the analysis portion of study 3.3.14 was not included in the study report, and wondered how this would be handled. Mark Wamser indicated that there was no specific date for completing the water level analysis portion of this study, but suggested that the work and the results could be piggybacked with the water level analysis to be conducted as part of the littoral zone study.

Brandon then showed a map of the TFI and pointed out the study transect locations. He described some of the study findings regarding habitat conditions, and showed examples of littoral zone habitat transect figures. Andrea Donlon asked about the water level lines shown on the transect graphs. Mark Wamser indicated that the blue line was the median elevation of the TFI as measured at the dam (as computed from hourly data for the period 2000-2009). He noted that the line was provided as a marker to be used as a point of reference. Brandon clarified that the WLL and the actual surface elevation data will be used in the study analysis to look at water level effects in more detail. Don Pugh asked how actual water level effects on habitat will be shown in the final report, and whether it would include a graphic depiction of actual water levels and modeled elevation of the TFI at the transect locations. Mark explained again that lines shown on the presentation graphic are just reference lines, and that actual TFI elevations upstream can be higher than at the dam.

Melissa Grader asked if the study report would include information on how much of the river/impoundment each of the habitat transect lines represents. Brandon indicated that it would, based on the river reconnaissance work. Alex Haro (USGS) noted that the profiles along the transects shown by Brandon only go to a certain depth. Brandon indicated that was true, since the focus of the study work is the littoral zone and thus elevations always submerged by the impoundment were not surveyed. Alex also asked if the distribution of transects along the left and right banks were random. Brandon said that the transects were not randomly distributed on both sides of the river, but were instead chosen to represent areas of certain habitat types.

#### **3.3.11 Fish Assemblage (Kulik)**

Brandon described the tasks associated with the fish assemblage study. He noted that it was being done a little differently than the MCI "IBI" study of 2007. He explained that the same fish species were being detected, but that this study would have a better depiction of how fish species are spatially distributed. He

explained that the first fish assemblage survey occurred July 6-9, 2015, noting that collection was originally scheduled for June, but had to be pushed back due to high water. The second survey was conducted the week of September 21, 2015. Brandon showed a list of species collected in July, 2015. Melissa Grader asked Brandon about the variance related to beach seining, which was not employed. Brandon explained that the study plan required over 200 feet of unobstructed beach to effectively use the beach seine however the shoreline was too cluttered in most places to facilitate that. Instead, he explained, they chose shoreline areas with overall beach seining qualities (open shallow, relatively unobstructed bottom) for additional boat electrofishing. He further explained that they had experimentally duplicated one usable beach seine site with electrofishing and found that they were picking up more fish species with electrofishing than the seine had. Melissa then asked if they had yet compared the study results to the earlier species assemblage work. Brandon indicated that thus far they had done only a species list comparison, not any comparisons of abundance. He also noted that they had not collected any species not collected in the previous survey. Don asked if they had found any burbot. Brandon indicated that they had not. Alex asked if all the electrofishing was done during the day. Brandon said only the bypass was sampled in the day. Ken Sprankle (USFWS) asked about relative abundance and what other measurements were made. Brandon explained that length and weight information was collected for all fish, with the exception of very numerous shiners. It was also asked if the field team was able to distinguish other minnows from spottail shiners, and Brandon indicated that they were. Additional minnow specimens that were hard to field identify were preserved to be lab identified later.

### **3.3.17 Assess the Impacts of Project Operations of the Turners Falls Project and Northfield Mountain Project on Tributary and Backwater Area Access and Habitat (Apell)**

Bryan Apell (Kleinschmidt) reviewed the study status. He explained that the field surveys were completed in 2014. He noted that there are 19 tributaries to the project, of which 16 are very small streams. Data were collected on each of the tributaries. Bryan indicated that most of the stream's confluences were determined to provide suitable access for riverine fishes. Three of the small tributaries were found to have localized and temporary barriers to fish, due to such factors as seasonal sediment deposition and woody debris. Bryan noted that there was one study variance which related to delineation of the confluence areas, which was performed with GPS and LIDAR data in conjunction with field data, rather than GPS and aerial imagery as envisioned by the study plan. He explained that this was necessary because they found that they couldn't walk the tributary confluence areas due to soft bottom and lots of overhead cover. Also, because of the heavy vegetation, aerial imagery could not be used and they couldn't get a reliable GPS signal along the entire confluence length. So, instead, they went up to the upstream end of the confluence and then used LIDAR data to trace the elevation along the tributary confluence. Bryan wrapped up by noting that the study is completed and the report was filed with FERC as part of the USR in September, 2015.

Andrea Donlon had some questions about the maps provided in the report. She asked Bryan to interpret what she was looking at. Bryan explained that depicting the conditions at the confluences in the report figure is not easy as the areas are very dynamic. But he explained the color coding on the map figures and indicated that the colors are intended to show the upstream extent of the confluence in spring/summer/fall, and the conditions in those seasons. Andrea asked if there were any observed habitat impacts at the tributary confluences due to project operations. Bryan explained that they used depth as the indicator of whether a tributary was accessible to fish. But he acknowledged that the confluences are dynamic areas that probably change seasonally based on tributary flows and river flows. However, by and large, Bryan felt that habitat in the confluence wasn't influenced much by project operations – that

river flows and tributary inflows have much more of an effect. Andrea asked if they had observed any dewatered redds in the confluences during the spring surveys. Bryan responded that they had not. In response to a question about the water depth criteria used to determine if the confluence allowed fish passage, Bryan indicated that following the methods of Bovee<sup>2</sup> that they had used 2/3 body depth. For this project, Bryan said they had identified white sucker and fallfish to be a couple of the larger species that might use these very small tributaries, and on that basis applied the 2/3 body depth and came up with a body depth criteria of 4-inches. He noted that larger fish like shad do not use these tributaries.

Melissa Grader asked when the full range of conditions in the tributary confluences would be evaluated. Bryan responded that the study was designed to look at the full range of conditions, which is why the sampling was conducted seasonally, with one sampling occurring during a period of very low river flow. Melissa suggested that the study report should include figures that look like those prepared for a similar study done at the TransCanada Project by Normandeau Associates. She said those figures were much easier to interpret with respect to water level effects on fish passage and potential water depth barriers to fish. Bryan explained that in this study only 3 tributaries were found to have barriers to fish at the confluence, and for those tributaries they collected depth data across each transect in the vicinity of the observed barrier. Don Pugh asked a question about using the hydraulic model to evaluate flow and elevation conditions in the TFI, which prompted a general discussion about how elevation changes in the confluence areas associated with river flows and project operations would be evaluated. After much discussion, Tom Sullivan (Gomez and Sullivan) summarized the discussion by saying that he understood that the study analysis should cover a range of water surface elevation and flow/operating conditions, and that they would go back to the hydraulic models and look at the elevations in the vicinity of the confluences that were observed to have barriers during the sampling events. Tom indicated that he did not know what form this analysis would take, but that it would probably be addressed in the license application.

### **3.3.2 Evaluate Upstream and Downstream Passage of Adult American Shad (Apell)**

Bryan reviewed the tasks associated with this study. He noted that the data collection and review task was conducted jointly with the Conte Lab. The joint effort led to an attempt to create a more rapid telemetry data reduction technique, still in development. Bryan then described the methods used for the study, which was conducted in 2015. He explained that the study involved almost 800 adult shad, most of which were collected at Holyoke. The fish were collected and tagged over 12 separate days. About half the fish were radio and PIT tagged, and the other half only PIT-tagged. He showed a table that summarized the capture, tagging and release locations of the fish used in the study.

Bryan described that fish were tracked at 30 telemetry stations and PIT tag stationary locations from Sunderland Bridge to Vernon. Fish were also tracked with mobile receivers. He noted that the tracking was done in cooperation with Normandeau, which was tagging shad at the TransCanada projects. He explained that the radio tags were mortality tags, set to send a mortality signal when the tagged fish became dormant for a certain period of time. Bryan noted that the tag settings used to denote mortality appeared to function as designed, and that the tags yielded credible data.

---

<sup>2</sup> Bovee, K.D. (1982). A guide to stream habitat analysis using the instream flow incremental methodology. Office of Biol. Service FWS/OBS-82-26). Washington, DC: USFWS, U.S. Dept. of Interior.



Regarding next steps, Bryan explained that the study had resulted in reams of telemetry data which would have to be run through the data reduction program, then analyzed. He indicated that it was anticipated that FirstLight would hold a workshop this winter to review the study results. He noted that the report would be completed by September 1, 2016. Regarding variances, Bryan indicated that the only variance was a change in the number of shad collected at the Cabot fish ladder and released to the TFI (132 vs the originally planned 100).

Bill McDavitt noted that the study should look at how long the fish remained in the bypass reach. Don Pugh asked Bryan how they determined the settings for the tag mortality signal. Bryan explained that he had worked with Ted Castro-Santos (USGS) because of Ted's prior experience with tagging studies. Don asked if Ted had published that work, and if not how the mortality setting methodology used in this study would be documented. Bryan indicated that he didn't think Ted had published the work, but indicated he would check on how best to document Ted's methodology, and to include that documentation in the report.

Alex Haro asked how well they had been able to achieve the study plan approach for capturing, tagging and releasing fish. Bryan explained that overall the study had gone very well. He said that there was a high flow event that shut down the Holyoke lift for a week. But other than that one event, they were able to capture, tag and release fish as planned in the study plan. Alex suggested that maybe the week-long high flow event should be considered a variance from the study plan, as should any down-time for receivers and/or PIT tag readers that were encountered over the course of the study. Bryan indicated that these would be discussed in the report, but that they were more adaptations to study conditions than variances.

Melissa Grader (USFWS) commented that a lot of the studies being discussed are still ongoing and the information being provided is more of an update rather than a study report. She asked FERC if they could discuss the timing of the reports yet to be completed, and when the agencies should comment on the need for additional studies. This prompted further discussion of the schedule and Brandon Cherry explained again that the stakeholders would be provided the opportunity to comment on all the study reports, and that if further information is still needed after studies are completed and the license application has been filed, FERC would require that FirstLight provide additional information before FERC would accept the license application as complete.

Ken Sprankle (USFWS) commented that the agencies are interested in understanding how different flow regimes and different operations may affect fish migration and passage and that this is information that needs to be included in the report. He also indicated that the report should include information on what the conditions (operating and flow) were during the course of the field work. Chris Tomichek indicated that conditions could be discussed at the planned workshop this winter, and that flow and operational information could be added to the summary table. John Warner asked if the condition information could be provided to the stakeholders before the workshop to enable the agencies to do a preliminary analysis of the data. Bryan indicated that the study did cover all the operating/flow scenarios that the study was designed to cover. Bob Stira volunteered that the fishway count data for the study period could also be provided to supplement the data collected from tagged fish.

Karl Meyer asked if movements of tagged fish could be tracked by anyone else. Bryan indicated that any receiver capable of receiving the band width of the radio tags could be used to track the fish. He also described that individual fish were tracked with mobile receivers. Don asked again about the plans for the

telemetry data reduction. Kevin Nebiolo (KA) explained that they had completed the data reduction program in August, and were currently working through the data and reviewing the data reduction results. He anticipated that the dataset would be available in December, but that no real analysis of fish movement would have been completed by that time. Based on this response, it was suggested that FirstLight consider holding a second workshop after Kleinschmidt completes more analysis of the data set.

Melissa Grader asked about the schedule for requesting additional study work in this area. This prompted more discussion about the study and comment schedule. Brandon Cherry reiterated that agencies would be provided opportunity to comment on studies and/or request “second year” studies once the study reports were complete. John Warner asked if it was necessary for the agencies to file a “placeholder” comment with FERC indicating that they were reserving their comments and/or requests for additional study work until after the final study report was completed. Brandon said it was not necessary for the agencies to file “placeholder” comments, and that he anticipated that there would be another study review/comment meeting, after studies scheduled for completion in September, 2016 had been filed.

Circling back to the discussion on study conditions, Ken Sprankle asked that water temperature time series be included in the condition information for the study period. This will be done per the study plan.

### **3.3.15 Assessment of Adult Sea Lamprey Spawning within the Turners Falls Project and Northfield Mountain Project Study Area (Apell)**

Bryan Apell reviewed the status of the lamprey study. He explained that 40 lamprey were collected, tagged and released at two locations: Sunderland Bridge and just upstream of the Turners Falls Dam during early and mid-portions of their run. The lamprey were mobile-tracked twice weekly. A total of 30 redds were located in five distinct regions of the project. Bryan showed a table summarizing the number and location of redds located. He explained that a few of the redds were capped to capture of emerging larvae. The capped redds were checked 12- 17 days later to look for emergence. Evidence of emergence was confirmed at least two locations: Hatfield S curves and within the Fall River. He noted that there were no variances in the study plan and that the remaining work was to complete the data analysis and prepare the report, scheduled for completion in June, 2016.

Melissa Grader asked how many radio-tagged fish were successfully followed to redd locations, and if redds were looked for in other locations, as well. Bryan stated that some of the radio-tagged fish were detected in spawning areas, but didn't know how many. He explained that the study team looked for lamprey redds in other areas as well, and found some.

Don Pugh asked about the redd caps and their success in obtaining emerging lamprey, since Bryan had indicated that some of the traps had gotten silted-up. Bryan explained that the field crews work diligently to keep the redd caps free of silt, and that only one of the five caps was lost entirely to sediment. Andrea asked if the field crew had looked for lamprey redds in the Deerfield River. Bryan explained that they had surveyed the Deerfield River up to the confluence with the Green River. They saw redds, but did not cap any. Bryan also noted that a radio antenna/receiver was set up in the Deerfield River to detect radio-tagged fish in the river.

### **3.3.4 Evaluate Upstream Passage of American Eel (Apell)**

Bryan Apell reviewed the eel study reminding the group of the work that was conducted in 2014 to identify potential eel pass locations. He explained that information was used to determine sites for temporary passage locations; and that after a site visit with agencies in May, 2015, eel ramps/traps were

located at the spillway and Cabot Station fishways, and at the Cabot emergency spillway. Also, medusa traps were located near the Station No. 1 discharge. Bryan noted that the Fishway and emergency spillway eel traps were monitored 3 days/week from June until October, 2015, and that the traps were successfully catching eels and functioning correctly. When asked, Bryan indicated that the spillway fish ladder trap is producing the most eels, however he could not provide trap numbers as data analysis has not yet begun. Regarding study variances, Bryan noted that in addition to some minor variances during 2014 work, in 2015 the target was to install the eel ramps with a 35 degree angle, but that the actual angle of the ramps when installed varied between 38-43 degrees, due to location and site characteristics.

Bob Stira asked Bryan if he could provide a rough number of eels collected. Bryan noted that the best night produced 783 eels at the spillway trap, while in a night earlier in the season a couple hundred eels were captured at the spillway, and maybe 10 elsewhere. In response to a question from Andrea Donlon, Bryan explained that the study report will incorporate information about river flow and project operating conditions during the eel collection dates. Don Pugh asked if any eels had been caught in the Medusa traps at Station No. 1. Bryan replied that none had been caught yet, but that the traps were still operating. Alex Haro asked if Kleinschmidt had been checking for eels that might have been trapped upstream of the fishway traps. Bryan indicated that he had asked the field crews to check the fishways, but that he would confirm whether the fishways had been checked. This led to a brief discussion about the configuration of the eel ramp/traps, and the use of attraction water.

Melissa Grader noted that in the Pre-Application Document (PAD), FirstLight had indicated that there could be some changes to the Northfield Mountain or Station No. 1 generating plants. She wondered at what point those any changes to project configuration or operation have to be clarified and the potential impacts evaluated. Brandon Cherry (FERC) explained that if any change proposed by FirstLight is substantial and FERC determines that the studies have not produced sufficient information to evaluate the resource impacts associated with the proposed changes, then an additional information request (AIR) may be issued by FERC in order to get the needed information.

#### *Lunch Break*

### **3.3.3 Evaluate Downstream Passage of Juvenile American Shad (Apell)**

Bryan gave an overview of the study status. He reminded the group that the timing, duration and magnitude of the juvenile shad migration is being evaluated using split beam sonar, which was installed and tested in July, 2015. Data collection began August 15, 2015, and will continue through October. He described that there are four units at Cabot Station (2), in the Turners Falls power canal (1), and at the Northfield tailrace (1).

Regarding route of passage, Bryan explained that 200+ radio-tagged juvenile shad were being released this fall, and the tagged juveniles would be tracked with 13 antenna locations located throughout the project. He noted that fish will be released in two locations; about two miles upstream of the Northfield Mountain tailrace, and about one mile upstream of the Turners Falls Dam.

Regarding juvenile shad survival, Bryan described that survival would be evaluated using Hi-Z Turbine tags (balloon tags). He explained that the balloon tags would be used to evaluate survival after passage through the turbines at Cabot Station and Station No. 1, as well as after passage over bascule gates at Turners Falls Dam. He noted that they were working closely with Paul Heisey at Normandeau on the details of the study and tagging/release procedures to be used. Bryan reported no study findings, as the

study is still ongoing. He noted there were a few variances to report, including changes in tag specifications, the addition of monitoring stations, and the number of tagged fish to be released at bascule gates 1 and 4. He also noted that they proposed to test shad passage through Station No. 1 units 2 and 3 together, due to the shared penstock.

Don Pugh noted that the telemetry component of the study plan calls for evaluating the route of passage under different spill configurations. Bryan agreed, noting that he wanted to get agency input on what spills to evaluate. He said that currently they were considering evaluating a flow range of 1000-2000 cfs, and proposing to test a bascule flow of 1500-2000 cfs, and maybe 2,500 cfs. He reiterated that they would like to get additional agency input on the flow ranges to be tested. John Warner expressed concern about the routing study if only the bascule gates are passing water due to low flows. Bryan indicated that based on the weather forecast, they were hopeful that river flows may rise and be higher over the course of the study. Ken Sprankle noted that a river flow of 6,000-7,000 cfs was close to the long term mean, and that at that flow, with 1,500 cfs being released through a bascule gate at the dam, there would still be water going down the canal. This led to a more general discussion about river flows and apportioning the available water through the canal versus bascule gates. After much discussion, Tom Sullivan reminded the group that FirstLight would be getting out memo on the preliminary IFIM results and having a call week of October 12, and wondered if that information could be used to determine flow apportionment scenarios to be tested for this study. Bryan reminded the group that the fish to be used for this study were coming in later in the week, so a decision on the flow apportionment would have to be made in the next day or two. This led to further discussion about where and when fish would be released, which produced suggestions that fish be released at two locations, rather than do staggered releases, and also that fish be released around dusk, since the fish like to move in the dark. Bryan noted both of these suggestions.

It was also suggested that 20 fish be released in the canal at the start of the planned maintenance drawdown to see if the fish are able to escape the canal. Bryan described his preliminary plans for releasing the tagged fish, including releasing a first group upstream and a second group in the canal

Ken Sprankle asked some questions about the receivers being utilized to track downstream passage. He also asked Bryan some technical questions about the DIDSON sonar unit installed in the power canal, and how it worked. Bryan explained the advantages of the DIDSON unit, and its function in the canal, noting that it will be used to evaluate timing, duration and magnitude of the out-migrating shad run in addition to data collected by the split beam monitoring system, and that it works like an ultrasound with wider field of view. He also noted that DIDSON should be good for picking up eels in the canal.

Melissa Grader asked Bryan to clarify the start and end periods for the various monitoring components of the downstream shad passage study. She noted that USFWS had requested that the hydroacoustic monitoring continue through November 15. Bryan indicated that he would check the study plan schedule, but that he believed the monitoring would continue through October. FirstLight agreed to continue data collection through November 15, 2015.

John Warner asked Bryan about the plans to test combined unit 2 and 3 survival at Station No. 1. Bryan explained again the reasoning regarding the single, bifurcated penstock serving units 2 and 3, and why it would be best to test those units in a combined fashion, particularly since FirstLight had confirmed that they never run units 2 or 3 separately. After further discussion about this issue, it was generally agreed that testing units 2 and 3 together made sense.

Returning to the issue of survival testing and spill scenarios to be tested, John Warner recommended testing gate passage survival (Hi-Z tag test) at 1,500, 2,500, and 5000 cfs and he will send an email with specifics.

This proposal was followed by additional discussion about how Station 1 operates. The discussion concluded with general agreement on the testing scenarios proposed by USFWS.

### **3.3.5 Evaluate Downstream Passage of American Eel (Apell)**

Bryan Apell described the tasks associated with this eel study. He explained that silver eels (adults) will be tagged and released at several points in the TFI and in the power canal. He described that the 1,200 adult eels to be used in the study are coming from Canada, and that the eel work is being coordinated with what Normandeau is doing at the TransCanada projects. Bryan explained that the timing, duration and magnitude of the eel run will be recorded primarily through the DIDSON camera located in the canal, which has been installed and running 24 hours a day-7 days a week since August 1. The study will also utilize the split beam hydroacoustics located at Cabot Station, in the Northfield Mountain tailrace and in the canal for eel monitoring, as well as for shad.

Regarding the radio telemetry component of the study, Bryan explained that radio tagged eels will be released at three locations; 1 mile upstream of the Northfield Mountain tailrace; 1 mile upstream of Turners Falls Dam; and in the canal (but not during drawdown). Radio tagged eels will be tracked via 19 radio telemetry monitoring stations located throughout the project area, covering approximately 8 miles of river. He explained that mobile tracking that would also be used, in river reaches between release sites and 5 km downstream of Cabot Station. Mobile tracking will be conducted two times per week and will continue until tagged eels have left the project area or until river water temperature drops below 5 degrees C. Bryan noted that the only variance to the study is that they will evaluate turbine survival at Station No. 1 the same way they have proposed for shad, because of the shared penstock between units 2 and 3.

In response to several questions about the timing of the study, Bryan noted that the study eels must be held in Canada for pathogen testing which takes up to four weeks, but that they anticipate receiving the customs approvals for the eels and the permits to conduct the study later in October, and for the study to commence before the end of the month. Alex Haro noted that late October is late in the season and suggested that Bryan do what he could to get the eels and commence the study as soon as possible. Alex asked some additional questions about the DIDSON, and how it is configured, and also reiterated that extending the hydroacoustic data collection season through November 15 is a good idea. There was some additional discussion about the DIDSON and how it has been operating since its deployment, and the consensus was that while there has not been much water or many fish in the canal recently, due to low river flows, the DIDSON appears to be operating well. Bryan noted that all the hydroacoustics and DIDSON are connected to a Wi-Fi hot spot, which allows him to check them with his PC. In response to another question from Don Pugh about the DIDSON, Bryan explained that the unit is programmable to change frequency between low and high, but noted that it is very data intensive, and creates very large data files which are stored on an external hard drive. In response to another question from Don Pugh, Bryan noted that the eel tags being used are mortality tags.

Melissa Grader asked whether the eel telemetry study required that the study be conducted under two Northfield Mountain pumping scenarios. Bryan explained that the two scenarios planned for the study were for 3 and 4 pump cycles. Ken Sprinkle noted that at the Vernon Project, the release locations are staggered across the river, and Rick Simmons (Normandeau) confirmed that they were using three release

locations across the river in order to get the fish into different flow fields. Bryan opined that for the upstream study releases he did not think the release locations would matter because the fish would be released far enough upstream to be redistributed naturally within the river prior to interacting with the intakes. John Warner and Ken Sprankle agreed that staggered release locations were probably not needed for the upstream studies.

### **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 (Tomichek)**

Chris Tomichek (Kleinschmidt) updated the group on the status of the shad spawning study. She reviewed the tasks associated with the study, which commenced in early 2015 after consultation. She described that the study involved observation of known spawning areas from Cabot Station downstream to the Route 116 Bridge, as well as identification of spawning areas in the TFI, the bypass and the canal. She noted that the field work was complete, but that they were still doing data analysis, so the findings thus far are limited. She described a few key preliminary findings: there was minimal shad spawning activity in the canal, thus no canal spawning areas were identified for more detailed observation; there was very little spawning activity in the bypass reach; the largest concentrations of spawning occurred between Cabot Station and the Route 116 Bridge; and the largest spawning area in the TFI was in the vicinity of Stebbins Island. In response to a question, Chris explained the “splash count” technique used to identify and count spawning activity.

Ken Sprankle asked Chris to ensure that the report describes the areas in bypass that were observed as part of the study and those that were not accessed. He also noted that the report should include information on Vernon project operations and released flows during the counting events. Don Pugh asked why some spawning observations were cancelled due to high water. Chris indicated that the cancellations were based on safety concerns. Alex Haro asked Chris if she had any egg sample results yet. Chris indicated that the data analysis and counting results were not complete, but that there were definitely shad eggs found in some of the samples.

Chris noted a minor schedule variance, and stated that the study report was scheduled to be completed by March 1, 2016.

### **3.3.18 Impacts of the Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms (Tomichek)**

Chris Tomichek described the tasks associated with this study and reviewed the study status. She reminded the group that field work for this study was completed between September 29 and October 2, 2014. She noted that there were no variances to the study plan and that the final study report was filed with FERC as part of the USR in September, 2015. Regarding findings, Chris said that generally they did not find many stranded fish during the canal drawdown, but that they did have some recommendations for future canal maintenance drawdowns that were included in the report. For example, Chris said the report recommends that FirstLight place cones in the canal during the drawdown so that vehicle traffic would disturb as little of the canal bed as possible.

Ken Sprankle noted that the methods section of report discussed taking observations between the sample sites, but that the report didn't really report the observations made. Kevin Nebiolo explained that they had observed a few incidences of stranding in the field, but overall not a lot of stranding of fish was observed. However, he noted that they may be able to include additional observations in the study report. Andrea Donlon noted that the report includes some photos showing stranding, and said that the species

concentration of stranded fish varied, but that the report didn't seem to include any information about what fish species were observed to be stranded. Ken Sprankle suggested that the report include a table listing all species stranded, along with relevant statistics (e.g., standard error). Bryan Apell noted that most of the stranded fish were juvenile shad and centrarchids. Ken made some further suggestions for reporting to show some relationship between longitudinal zones and cross-sectional zones, to see if there are significant differences. Kevin Nebiolo explained that the canal has both linear and longitudinal pools, and that the large pools are all connected by a river trickle. Ken suggested that the hydrological connectivity observed during the study should be discussed further in the report. He also commented on other observations between quadrants that were never discussed and should be. Ken also noted some concern regarding observations of dead fish. He noted that most dead fish don't float, so observations of dead fish based on those floating in pools may not accurately depict fish mortality. Bryan Apell replied that they were quite confident that the fish observed in the pools survived much better than expected. Karl Meyer asked if all of the dewatered areas of the canal were observed for potential stranding, and Bryan indicated that they were. Don Pugh asked about the random sampling used in the canal assessment, and in response Kevin Nebiolo explained the stratified sampling method used. In response to a follow-up question from Don, Kevin confirmed that all of the sampled quadrants were completely dug. Mark Wamser (Gomez and Sullivan) reminded the parties that the 3.3.18 report has been completed and available for review since March, 2015.

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

Chris Tomichkek gave a brief update on the status of this study. She noted that currently FirstLight was working with Steve Amaral at Alden Labs who has done a lot of ultrasound work, to consider how an effective ultrasound study might be implemented at the Turners Falls Project. She said that currently they were trying to determine if they could establish an effective ultrasound array in the vicinity of Cabot Station, but noted that it is a tricky location. Chris noted that depending on the input they get from Alden, that they hope to be getting a draft study plan out fairly soon, with time for stakeholders to comment.

### **3.3.7 Fish Entrainment and Turbine Passage Mortality Study (Nebiolo)**

Kevin Nebiolo reviewed the tasks associated with this study. Under Task 1 he noted that a preliminary, qualitative assessment of impingement and entrainment of resident species based on earlier species lists was completed, but that the qualitative assessment needed to be revisited once the updated species list and other data from Study 3.3.11 were available. Regarding Task 2, Kevin reminded the group that quantification of shad entrainment and eel entrainment were being studied in detail under studies 3.3.3 and 3.3.5, which have not yet been completed. With respect to Task 3, Kevin similarly reminded the group that turbine mortality for juvenile shad and adult eel were being studied in October, and November 2015. Because much of the work associated with this study is still ongoing, the study report is not complete, but is expected to be completed by October 1, 2016. Kevin noted that there were no variances associated with this study.

Andrea Donlon asked about a recent filing with FERC regarding turbine mortality. John Howard (FirstLight) explained that FirstLight had notified FERC that they were going to need to take Northfield Mountain Unit 1 out of service for maintenance. He noted that the unit was scheduled to be out of service until mid-February. Upon hearing this, several stakeholders pointed out that having a unit out of service at Northfield Mountain during this fall would mean that they would not be able to test a 4-pump scenario as part of the juvenile shad and eel studies planned for this fall. FirstLight acknowledged that the studies planned for this fall would have to evaluate 2 pump and 3 pump scenarios and would not be able to

evaluate a 4 pump scenario. After some discussion amongst the group about this situation, it was suggested that FirstLight identify this change in operations and test scenarios as a variance to the juvenile shad and adult eel studies.

Regarding the report schedule for this study, Don Pugh asked why this report needs another year to complete. Chris Tomichek and Kevin agreed that they would revisit the schedule and reconsider how much time is needed to complete the report.

### **3.3.20 – Study to Evaluate Entrainment of Ichthyoplankton at the Northfield Mountain Pumped Storage Project (Nebiolo)**

Kevin Nebiolo reviewed the tasks associated with this study and began by explaining the entrainment sampling configuration. He explained that they will test the sampling by correlating samples collected in the devices with off shore samples taken. He described the sampling schedule and showed a table of actual sampling dates. He then provided a description of how the samples were being processed, including the QA/QC program. Regarding data analysis, Kevin explained how the estimates would be made for entrainment, by using a volumetric ratio and summing weekly estimates derived from the samples. They would then use egg and larvae entrainment estimates and convert those to adult equivalents to determine the population impact. Kevin said that there were no variances for this study and that the report would be completed by March 1, 2016.

Ken Sprankle reminded Kevin that the Study Plan determination (SPD) notes that the study should include an examination of the relationship between entrainment and river flow conditions. He indicated that he would like to understand if the relationship between pumping flows and entrainment is linear. He also asked some clarifying questions about the sampling schedule table that Kevin had shown. Kevin clarified that Rep means repetitions. Ken noted that there were no 3-sample events per night. Kevin confirmed that, and explained that each sample took at least 2 hours, and that the most samples they had been able to complete in a single pump-back event was two.

Melissa Grader asked Kevin to explain again about how the samples will be validated. Chris explained that densities calculated from samples collected in the river in front of the plant intakes would be compared to densities in the entrainment samples. Ken Sprankle noted that he was also interested to see if there were any water temperature effects on entrainment rates. Kevin noted that water temperature data was collected for each of the sampling scenarios. In response to a question from Don Pugh about the estimated adult equivalents, Kevin explained that they will obtain local data on the age of spawning shad returning to the project area, and they would use either the average age or range of ages and their relative proportion as the expected spawning return age (Adult Equivalent). Alex Haro asked if the only focus of the study was American shad. Kevin confirmed that it was. Melissa Grader asked if their ability to only complete two sample collections a night was a result of unusual pumping conditions. John Howard responded that he felt that 2015 was a fairly representative year for pumped storage operations at Northfield Mountain.

### **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 (George)**

Jason George (Gomez and Sullivan) reviewed the status of this study. He reminded the group of the goals of the study and described the study tasks. He also reminded the group that most of the study results were presented a year earlier in the Initial Study Report (ISR) meeting. He noted that at the ISR meeting there



had been some questions raised about the study, and that FirstLight had met with stakeholders in March, 2015 to discuss some additional analysis to be included in the report. Jason noted that Task 1 is now essentially complete. Regarding Task 2, Jason explained that at the meeting in March, the group had come up with a different proposal for conducting the analysis, and that it was agreed that the 2D model would be used for evaluating the flow being discharged from the emergency spillway gates, and so no additional field work is needed for Task 2. Regarding Task 3, Jason explained that the 2D model developed for the IFIM study would be used to evaluate spillway flow impacts, but that analysis is not yet complete. In response to a question about the substrate at the base of the spillway, Jason showed a picture of the toe of the emergency spillway. Jason concluded by noting that the only variance to the study was the proposed use of the 2D model to assess potential impacts, in lieu of additional field data collection. He indicated that the study report would be completed by March 1, 2016.

Don Pugh noted that the important metric for this study was the volume of flow coming from the spillway gates, not the number of gates open, per se. Jason agreed, saying that the study would be looking at gate discharge and the frequency of that discharge during the critical spawning periods. Andrea Donlon noted that it would be important for the study to consider which of the flow releases are emergency versus non-emergency events, and also the potential for sediment re-suspension. Alex Haro also commented regarding sediment deposition and scouring, and suggested that these were important parameters for the study to consider as well. Jason confirmed that those were parameters that would be evaluated in the study report.

Jeff Murphy (NMFS) asked if any field verification of the 2D model was being done. Jason and Mark Wamser explained that hydraulic model calibration and verification for water depths and velocities was being done as part of the 2D modeling effort, but noted that there would not be detailed calibration data just downstream of the spillway gates that would allow for calibration of sediment movement or scour.

### **3.2.1 Water Quality Monitoring Study (George)**

Jason George updated the group on the water quality monitoring study. He explained that field data collection was underway and that they were collecting baseline temperature and dissolved oxygen (DO) conditions in the TFI, at Cabot Station, Station No. 1, and at Northfield Mountain. He noted that there were 18 DO/temperature continuous monitoring sites, and that monitoring began in April. He said they started just monitoring temperature, because they didn't want to lose the DO monitors to high river flows, and only temperature was required per the RSP until June 1. DO monitoring began once flows subsided in mid-May and will continue through at least September 30. Jason explained that the data collection also included three DO/temperature profile sites in deeper locations in the TFI. Jason noted a few minor variances to the study thus far. Jason then showed some figures showing the locations of the monitoring stations and some graphs showing some preliminary results. He showed a hydrograph for 2015 in comparison to long-term flows and noted the high flows that occurred in April and June. He also showed some depth profile data demonstrating that the TFI does not stratify and that DO concentrations remained high through the summer and nearly uniform from top to bottom. Jason concluded by saying that the operational effects of the projects on water quality have yet to be evaluated, but that the study report would be completed by March 1, 2016.

Alex Haro asked Jason if they had yet calculated DO percent saturation, and if so what the preliminary results were. Jason replied that based on a preliminary look, most DO values were pretty close to saturation, and in the bypass reach tended to be around 100%. Alex followed up by asking if any evidence of super saturation was observed. Jason noted that there may be some observations of more than

100% saturation, but it appeared to be a result of a diurnal photosynthetic cycle, rather than as a result of project operations. John Baummer (FERC) asked again if there were any evidence of thermal stratification in the deepest site in the impoundment, to which Jason replied, none.

*End of Day 1*

**Day 2: September 30, 2015**

**List of Attendees:** See Attachment A

Mark Wamser (Gomez and Sullivan) commenced the meeting at 9:00 AM.

### **3.3.10 Assess Operational Impacts on Emergence of State-Listed Odonates in the Connecticut River (Nedeau)**

Ethan Nedeau (Biodiversity) described the study purpose and goals of the study and then summarized the study tasks and status. He reminded the group that this was a 2-year study (2014-2015) and that he had previously reported on the 2014 qualitative (phase 1) portion of the study. He noted that phase 2 (Task 4) of the study was the quantitative survey conducted in 2015. He explained that the quantitative surveys were conducted in 2015 and included bi-weekly sampling from late May to early September at five sites in the Connecticut River from Barton Cove to the Route 116 Bridge, including a site at Rock Dam in the bypassed reach. Regarding Task 5, an evaluation of water level fluctuations, Ethan explained that water level loggers (WLL) were installed at most of the sampling locations, and that this data, as well as the data from the permanent USGS gages would be used to assess water level effects on odonate emergence. Ethan then reviewed some preliminary findings but emphasized that the analysis was still ongoing for the quantitative effort. Regarding study variances, Ethan explained that because of the wet weather conditions in June, they had added 7 additional sampling days in June, July and August, in order to increase the sample size and potentially find more larvae. He concluded by reiterating that the work remaining was the data analysis, and the report would be completed by March 1, 2016.

In response to a question about the number of emergence observations made, Ethan described that they had collected about 600-800 individuals, but not all were caught during emergence. However, he noted that he had used a Go-Pro camera to capture video of emerging adults.

### **3.3.16 Habitat Assessment, Surveys, and Modeling of Suitable Habitat for State-listed Mussel Species in the Connecticut River below Cabot Station (Nedeau)**

Ethan Nedeau (Biodiversity) updated the group on the mussel study. He noted that it was a two-phase study and that the first phase, the mussel survey, had been conducted in 2014, and the findings reported on and posted to the relicensing website in January, 2015. He described that the second phase of the study (Task 3) was the development of habitat suitability index (HSI) curves for state-listed mussel species documented in the project area. He explained that the development of HSI curves would be done as a Delphi process, and that he had established his panel of experts for this work. He also noted that the three target species for the HSI curves were Yellow Lampmussel, Tidewater Mucket, and Eastern Pondmussel. He said that the HSI curves would be developed over the next few months and would then be used as part of the instream flow study to model flow effects on mussel habitat in the bypassed reach. Ethan reviewed some of the findings of the mussel survey. He noted that no live state-listed mussels had been found in the survey areas, and that one relic yellow lampmussel had been found. Ethan concluded

by indicating there were no variances to the study plan, and the study report would be completed by March 1, 2016.

In response to a question, Ethan said the Delphi panel for the HSI development includes Dave Strayer (Cary Institute of Ecosystem Studies), Heather Galbraith (USGS), Barry Wicklow (professor at St. Anslem College), Cyndi Loftin (USGS Maine Cooperative research Unit), Peter Hazelton (MA NHESP) and a couple of graduate students. Don Pugh asked what criteria would be looked at for the HSI curves. Ethan replied that not all the criteria had been identified yet, but that he expected they would include basic criteria like water depth, sheer velocity, and substrate; although he noted that it may be that the target mussel species may not be all that sensitive to these criteria, as all three species inhabit both ponds and rivers.

Don followed-up with a question about what physical measurements were available to work with in developing the HSI curves. Ethan responded that there was both some previous data as well as some new data from a diving study at Holyoke that gathered specific physical conditions for observed yellow lampmussel and tidewater mucket. This prompted some additional discussion about how mussel habitat data are collected and verified. In response to a question regarding temperature, Ethan said that water temperature could be considered, but that water temperature data was not specifically collected as part of the mussel survey. However, it was noted that there is plenty of water temperature data being collected throughout the project, which could be used to evaluate temperature. However, Ethan noted that he was not sure how valuable temperature would be as a criteria for the HSI curves since water temperatures are seasonally variable, but project-wide are probably relatively uniform. Melissa Grader asked if the HSI criteria would be shared outside the Delphi panel once their work was completed. Ethan explained that it would, and that it would be provided to the Natural Heritage Program, as well.

### **3.4.1 Terrestrial – Baseline Study of Terrestrial Wildlife and Botanical Resources (Knapp)**

Steve Knapp (Kleinschmidt) reviewed the tasks associated with this study, noting that most of the tasks were completed in 2014, including the habitat mapping, mapping of invasive species, and lists of plants and wildlife observed. Steve explained that in September of 2015, they had collected NHESP vegetation plot transect data, and that they were going to use the resulting transect data to refine the earlier habitat map that was created from aerial photos. Regarding study findings, Steve described that invasive species do occur at the project, but that they are not widespread. He noted that the only invasive species that is fairly abundant is Japanese knotweed. Steve concluded his review by noting that the only variance to the study was the completion of the NHESP forms in 2015, and that study report would be completed by December 31, 2015.

Don Pugh (TU) asked where the botanical surveys took place. Steve explained that some of the surveys occurred within 200 feet of the project boundary, but that most were at the top of bank. He also explained that they selected the location of the plots to be representative different habitat types, and that locations were sometimes tweaked to get the specific habitat type they wanted the location to represent. In response to another question about the number of transects, Steve indicated that he would need to confirm the actual number of transects created. He also noted that the surveys followed basic NHESP protocols.

Don Pugh asked Steve if they had specifically looked for rare plants as part of the study. Steve explained that they had, and that those efforts would be covered under study 3.5.1. Andrea Donlon noted that the study covered the TFI, the bypass reach and downstream to Sunderland Bridge, and she asked if there were any notable differences in rare species distributions in the bypass and downstream compared to the

TFI. Steve indicated that the rare species would be discussed more in study 3.5.1. Jesse Leddick (NHESP) asked if they had found any other state-listed species or surprises. Steve indicated that he did not think so, but that he could check with the field staff to see if they had collected or found anything new in the more recent surveys.

### **3.4.2 Effects of Northfield Mountain Project-related Land Management Practices and Recreation Use on Terrestrial Habitats (Knapp)**

Steve Knapp (Kleinschmidt) reviewed the status of the study. He described that work on Tasks 1-5 was all completed in 2014. He summarized some of the findings, noting again that invasive species were found at the project, but were not widespread, and not common along the Northfield Mountain hiking trails. He showed a table summarizing the results of the vernal pool assessments. He said that there were no variances to the study, and that the study report was filed as part of the USR in September, 2015.

John Warner (USFWS) asked if the study report included any information on bats and if any bat surveys were done as part of the study. Steve explained that the report documents the habitat types that would be available for bats, such as hardwood forests, but that no bat surveys were done. John Warner noted that Northern Long-eared Bat (NLB) might be a species of interest, although the status determination is not yet final. He also stated that depending on the future NLB listing status, which is expected in March, it might be a species that would have to be considered in the relicensing. John Warner then asked about any forest management practices undertaken by FirstLight at the projects. John Howard (FirstLight) explained that FirstLight does some forest management and tree cutting around some of the access roads and for trail maintenance. Steve Knapp noted that successional hardwood forest is the most common habitat type at the projects. John Warner noted that hardwood forests provide summer roost habitat for bats in cavities, crevices or under peeling bark.

### **3.5.1 Baseline Inventory of Wetland Habitats, Riparian and Littoral Habitat in the Turners Falls Impoundment, and Assessment of Operational Impacts on Special Status Species (Knapp)**

Steve Knapp gave an overview of the study status noting that much of the work was completed in 2014, including the littoral zone and SAV mapping. This year, Steve noted that they conducted the field work for the sensitive plants surveys. He described the basic survey methods used, and noted that they collected additional data along detailed transects. He explained that once the plant surveys were complete that the study would utilize the hydraulic model results to evaluate the effects of water level fluctuations on the plants, but that this work was just under way. Steve noted a variance to the study plan was the conduct of the fine plant survey work in 2015 rather than 2014. He concluded by stating that the report would be completed by December 31, 2015.

Melissa Grader asked whether there were any water level loggers deployed at the study transects, or if there were WLLs being used for other studies close to the transects. Steve explained that the transect locations were based on the location of the species of interest, but that the hydraulic model will be used to model water surface elevations throughout the project. Melissa also asked if invasive plants were part of this study. Steve explained that invasives were included in the study plan, but the actual field work to identify and locate invasives was done as part of the other study (3.4.1), where the plants were mapped as point locations or polygons. This led to some discussion about the location of water chestnut in the TFI, about which Steve noted that the water chestnut is still in the same location, just upstream from Turners Falls Dam. Jesse Leddick asked if the transect for the Rainbow Beach north bank was also examined for cobblestone beetle, as well as plants. Steve indicated that he wasn't sure, and would have to check with the field staff. Jesse also noted that in reviewing the report that he did not see any table or listing of all of

the state-listed species that were found and where they were located. Steve explained that the species lists and location data would be provided in the final report, and could be provided separately, as well, if needed.

### **3.2.2. Hydraulic Study of Turners Falls Impoundment, Bypass Reach and below Cabot Station (Wamser)**

Mark Wamser presented the status of the hydraulic modeling study, and began by stating that John Hart (on the phone) had done the modeling work for this study. Mark explained that essentially all of the work for this study had been completed, and that the study report was posted to the website in June, 2015 and filed with FERC as part of the USR in September, 2015. Mark reviewed the variances to the study plan, including changes to the water level loggers, and a modification to the extent of the downstream river reach modeled. He noted that there were no new variances to the study.

Mark then reviewed some of the results of the hydraulic modeling, including some of the calibration results. Mark showed that in general, the model calibrated very well, particularly at lower flows. At higher flows he showed that there was more of an elevation gradient in the impoundment above and below French King Gorge, which acts as a hydraulic control during higher flows. Mark showed examples of model calibration results for water surface elevation (WSE) at Vernon tailrace and downstream of Stebbins Island. He also showed some examples from downstream of French King Gorge. He explained that they had used 14 years of operational data to model 14 years of simulations, and as a result have developed hourly WSE at all transects for 14 years.

Ken Sprankle (USFWS) asked if the model had calibrated well even under high flow, spring conditions. John Hart explained that they had calibrated the model to high flows, which he recalled was about 30,000 cfs from Vernon. He noted that the report contains the results of both the high and low-flow calibrations. Karl Meyer asked Mark if the 14 years of operational data and model simulations begins around the year 2000. Mark indicated that was about right. In response to a question from Melissa Grader about Vernon project flow influences, Mark noted that at low river flows the greatest influence on impoundment elevation is based on TransCanada's operations and the flows from Vernon; but at higher river flows French King Gorge backs up and influences upper impoundment elevations as well. John Ragonese (TransCanada) asked Mark why they don't include Turners Falls operations in the model. Mark explained that they modeled the effect of Turners Falls operations by using data from the water level logger at the Turners Falls Dam – that is the water level at the dam reflects the operation of Turners Falls. John Ragonese also asked whether the model simulation considered pumped storage operation as being independent of the operation of the Vernon operation and the Turners Falls operation. He noted that they observe up to a 3.5 ft difference in elevation between generation and minimum flow, and are not sure if that difference is due to Northfield Mountain pumping operations, or the operation of Turners Falls, or minimum flow releases. This led to further discussion about the interaction of the projects in the model, and Mark indicated that they could go back and review the modeled flows at Turners Falls.

In response to a question from Andrea Donlon, Mark Wamser clarified where in the report information on where and when water level loggers were installed and removed could be found. He also noted that the study plan required that water level loggers be installed and used upstream of the dam, but not downstream. Andrea Donlon also noted that two of the years in the report look very different, and Mark agreed that there is much hydrologic variation from year to year, and that it is hard to say what constitutes average operating conditions, but pointed out that the report shows that calibration of water surface elevation is representative of the range of hydrologic conditions.

After a brief break, Mark went on to review the lower river model. He explained the use of the existing FEMA study modeling in combination with data collected at the USGS gage locations. He described how the model was used to simulate the water surface elevation under the range of impoundment fluctuations permitted by the Holyoke Project's FERC license. Mark then showed some examples of lower model calibration results, pointing out that under certain flow conditions, the Holyoke impoundment elevation has no effect on observed water surface elevations in the lower model reach. He also noted that for this model the pattern of the observed data versus the calibration data matches well, but the magnitude does not. He explained that some of the differences may be due to the FEMA cross sections which are not as detailed or sensitive as the data collected for the TFI. Mark showed a couple of calibration examples. Andrea asked if the calibration discrepancies shown at the Montague gage are related to the Deerfield River. Mark said the location is below the Deerfield and the difference is more likely do to the fact that the FEMA cross sections were taken only every mile and are not that detailed, and so do not produce as accurate a simulation.

John Ragonese asked a question about whether the model could be improved with the IFIM cross-sectional data. This led to a broader discussion about how and if the model could be improved. After further discussion, Mark Wamser reminded the group that the intended purpose of the lower river model is to give an idea of what Turners Falls peaking operations are doing to elevations downstream. Tom Sullivan (Gomez and Sullivan) also reminded the group that IFIM modeling of river reaches 3 and 4 will provide more detailed hydraulic conditions and therefore better calibrated models for use in the IFIM study.

Bill McDavitt (NMFS) asked how the HEC-RAS model will be used to develop flows and flow effects on habitat through the IFIM. Mark explained that HEC-RAS simulated flows will be used to look at habitat duration or through the development habitat time series plots or persistent habitat maps. Returning to the impoundment hydraulic model, John Ragonese stated that Mark had not discussed the unsteady portion of the model. Mark clarified that the 14 years of model simulated impoundment conditions were modeled with unsteady conditions – time variable inflow.

Kimberly MacPhee (FRCOG) asked if any model runs were made for the temporary amendment condition for Northfield Mountain. Mark indicated that model runs were made for the period 2000-2014 and so would have captured any temporary amendment condition in place during that time period. Kimberly also asked about the percentage of data that failed to meet the QA/QC standards. Mark said that he did not know off the top of his head, but that it was a very small percentage of the data collected, and most of it was water level data recorded by water level loggers that became exposed as river flows and impoundment water levels subsided. In response to another question from Kimberly, Mark confirmed that the time step used in the figures in the report are every 15 minutes. Kimberly also asked about impoundment fluctuations when Northfield Mountain is operating, noting that in the report ranges are sometimes provided and other times not. She wondered if the average fluctuations reported are over some period of time. In response, Mark explained that the causation study looks at water levels, and that a duration analysis could be done on the water levels which would tell how frequently water levels are at that elevation. The discussion about how to show the frequency of water level fluctuations continued, and concluded with Tom Sullivan and Mark Wamser reiterating that there are several resource studies being conducted that will look at modeled flow duration and/or water elevation duration effects on resources. Adam Beeco (FERC) asked if the impoundment model would be used to look at potential impacts on recreation facilities and use. Mark responded that it would. Andrea Donlon asked about the influence of

the Deerfield River projects and flows on the model results, and whether it would be accounted for in the model analysis. Mark confirmed that the Deerfield River is included in the model, and John Hart explained that the contribution from the Deerfield is small compared to the Connecticut River, so it is not likely to have much of an impact.

### **3.3.8 Computational Fluid Dynamics (CFD) Modeling in the Vicinity of the Fishway Entrances and Powerhouse Forebays (Lemay)**

Gary Lemay (Gomez and Sullivan) provided an update on the status of the CFD modeling effort. He reminded the group that they were doing CFD modeling in four locations: Station No. 1 forebay; Cabot Station forebay; the spillway fish ladder; and the Cabot Station fish ladder. He noted that the field work and data collection needed for the models was completed in 2104. He explained that the CAD drawings for all 4 models are complete, and the modeling is underway. He then showed some of the preliminary modeling results, and noted that some preliminary results were also provided in the USR summary report. Gary also reviewed the variances from the study, focusing primarily on the decision to use a 1-foot mesh in front of the intake racks to calculate approach and sweeping velocities. He explained that this was found to be necessary due to practical limitations on model run times. This prompted several questions from the group and further discussion about whether a mesh finer than 1-foot (perhaps in the 0.5 to 0.75 foot range) in the intake rack area would be justified. Tom Sullivan summarized the discussion by reiterating that they had found it necessary to go to a 1-foot mesh in front of the racks, but that the 1-foot mesh should be more than sufficient for looking at and simulating intake velocities, which are the important factor in considering fish entrainment. Ken Sprankle reiterated that the objective of the CFD modeling is to look at the intake approach velocity and flow fields that fish encounter. Gary noted that the first iteration of the model used a 2-foot mesh in front of the racks, which was then refined to a 1-foot mesh. Tom Sullivan concluded that the 1-foot mesh seemed like a reasonable place to be given computational problems and computing demands associated with trying to model any closer to the racks.

Gary then showed some sample results of the CFD modeling including the geometry input for the Cabot forebay CFD model; preliminary results for the Station No. 1 forebay CFD model; and the Cabot Forebay sluice entrance. He explained what each of the figures was showing and how each highlights the areas of high flow velocity. Gary then answered several questions about the sample results shown, including questions about the operational scenarios modeled, and what each figure was showing. John Warner opined that he thought the best way to view the CFD modeling results was like that shown in the Station No. 1 run 1-3 example that Gary had provided. This produced additional discussion on how best to present the CFD model results in the study report, which in turn led to the suggestion that those interested in the CFD modeling results should get together with Gomez and Sullivan modeling staff and review the model results and figure out how to present the results in the report. Tom Sullivan suggested that it might be best to let Gomez and Sullivan produce the report, with model results depicted as they judged best, and then sit down with the group to review the report in detail and make any adjustments and/or additional production runs deemed necessary. John Warner expressed his general agreement with that approach. Bill McDavitt suggested that it would be useful to model the operational scenarios that are occurring when the juvenile fish being used in the telemetry studies are released. Tom Sullivan acknowledged that they were trying to figure out how best to use the CFD modeling tool in conjunction with the radio telemetry studies to see if there are any discernable trends in fish movement related to CFD model. This was followed by more discussion about how best to use the CFD modeling tool interactively with the telemetry studies, including the possible use of a time-varying covariate matrix suggested by Ted Castro-Santos. Tom Sullivan wrapped up the discussion stating that Gomez and Sullivan staff will need to meet with the agencies to figure out how to look at the CFD modeling and telemetry study data together.

### **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 (Wamser/Lemay)**

Mark Wamser (Gomez and Sullivan) reviewed the study status, noting that the study and model were complete and that the report would be completed by December 31, 2015. Mark then showed a list of the 2D modeling scenarios that were included in the study plan. He also showed slides of some sample modeling results, including depth maps and velocity vector maps. Mark noted that with respect to velocity, in some of the modeled scenarios, the velocity vectors show water moving upstream from the Northfield Mountain tailrace area.

Bill McDavitt asked Mark if he could see changes in water surface elevation with Northfield Mountain generating. Mark responded that elevation changes can be seen with the 2D model, but that you can actually see elevation changes better in the hydraulic model (when running an unsteady simulation). Andrea Donlon asked if the velocity vector represented the surface condition. Mark explained that it was the mean water column velocity. In response to another question from Andrea, Mark explained that the dotted line shown in one of the figures near the Northfield Mountain tailrace is the existing fish barrier net.

### **3.8.1 Evaluate the Impact of Current and Potential Future Modes of Operation on Flow, Water Level and Hydropower Generation (Wamser)**

Mark Wamser (Gomez and Sullivan) updated the group on the status of the HEC ResSim modeling. He noted that not much has changed since the ISR meeting a year ago. He reminded the group that the project operations modeling would be done using the HEC ResSim which had been developed for the entire Connecticut River basin and modified to look in more detail at the Northfield Mountain and Turners Falls projects. He explained that the model was updated to reflect an hourly time step and to better simulate Northfield Mountain pumping/generating cycles. Mark then described that the calibration of the model was complete and that the calibrations were generally good. He also noted that he would like to validate the model with more updated hydrologic data, but that it hasn't been done yet. He also noted that they had done some internal production runs, but that the model had not yet been used for any analysis of study results. For example, Mark described that they need the results of the IFIM study before they can use the model to do the habitat time series. Mark also explained that the HEC ResSim model will be used to look at flows and generation impacts. He stated that the model study report will not be completed until March 1, 2017.

Kimberly MacPhee noted that based on the list of studies that include a water level component it is clear that there are competing resource interests, and wondered how the model will be used to sort them out. Mark explained that each resource and the water level effects on each resource has to be looked at independently and then brought together to consider the overall impacts. This led Kimberly to then ask how things are prioritized when looking at conflicting resource effects. Mark responded that FirstLight will need to talk to stakeholders about what it all means and what gets the priority. Bill McDavitt asked if the temporary amendment condition could be simulated with the HEC ResSim model. Mark answered yes, noting that it was done last year for the previous temporary amendment application.

John Warner asked a question about the commenting procedure, noting that some reports are updates, some reports completed, and for some other studies, new variances have been identified. He asked FERC if there was a difference between how they should comment on the various reports, and on which reports



comments are necessary. Brandon Cherry explained that FERC would review all comments regardless if the comments were made on a status report or a completed report. He also indicated that there was a difference in comments made about existing studies, such as a variance or some additional information or analysis needed, and an entirely new study request. For a new study, Brandon explained “good cause” must be shown, unless the completed studies have already been subject to a study plan determination, in which case extraordinary circumstances must be shown. This led to further discussion among the stakeholder and FERC regarding the commenting process, with Brandon Cherry reiterating that FERC would look at all comments, but that there was a difference between comments on an existing study and variances or modifications to that study, and new study requests.

### *Lunch Break*

#### **3.1.1 Full River Reconnaissance Study (Simons)**

Bob Simons (Simons and Associates) reviewed the Full River Reconnaissance (FRR) study status. Bob noted that all the study tasks have been completed, that there were no variances to the study, and that there is no work remaining. The final study report was filed with FERC as part of the ISR in September, 2014. Bob explained that there were some additional activities undertaken in 2015 in response to comments on the original study report, including a riverbank segment QA comparison and a 2007 to 2014 photo comparison. He noted that the report addendum was filed in April 2015.

In response to a question from Kimberly MacPhee (FRCOG), FERC confirmed that the stakeholders can still file comments on the FRR report addendum.

With regard to the Erosion Control Plan, Kimberly also pointed out an error on one of the slides shown by Bob Simons, noting that that FRCOG had made its request in May, not March, of 2015, for FERC to review FirstLight’s list of sites proposed for bank stabilization and preventative maintenance and determine compliance with the erosion control plan. Kimberly concluded by stating that FRCOG will be providing comments to FirstLight on the Phase IV sites. Also regarding the Phase IV sites, Andrea Donlon asked Bob if he had any idea when FERC would approve the Phase IV sites. Bob responded that the question of the Phase IV sites is an issue that is outside the FRR relicensing study, which is complete.

#### **3.1.2 Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability (Simons)**

Bob Simons (Simons and Associates) reviewed the status of the tasks that comprise this study which is also known as the “Causation Study”. With respect to Task 1, data gathering, Bob noted that existing data was compiled and provided to stakeholders and FERC between 2014 and 2015, and the task was complete. Task 2, geomorphic understanding of CT River, is also substantially complete, with only one outstanding piece, which is to look at historic aerial photographs. Regarding the historic photos, Bill McDavitt asked Bob if he was using the photos to try to identify the changes in the riverbank. Bob explained that the idea was to do a visual comparison of the river bank over time. But he noted that determining the same location of banks is difficult because a) the water level has changed over time with the raising of the Turners Falls Dam and b) the water level changes due to project operations. Bill McDavitt also asked about the resolution of the old photos. Bob responded that the resolution was variable as was the season in which the old photos were taken (Bob noted the newer photos have better resolution). Nonetheless, Bob stated that he was trying to extract as much useful information as he could

from the old photos. In response to a question about whether the photos could be used in determining the top of the bank, Bob noted that often the top of the bank cannot be seen due to canopy cover.

Bob then reviewed Task 3 which is an evaluation of the potential causes of erosion. For this task, Bob explained that some of the potential causes of erosion being looked at were hydrology and seasonal hydrologic patterns, as well as hydraulics and water level fluctuations. He noted that all of these will be evaluated and included in the final report.

Bob then discussed the status of Task 4, noting that new information for use in this task is coming in, as the field studies were started in 2014 and were continued this year. He explained that the field data collection was focused on the geotechnical properties of the river banks, erodibility and vegetation; and that samples were collected from representative locations, included root structure density, soil tests, etc. Bill McDavitt asked some clarifying questions about the root density sampling. This led to further discussion about how to use the old photos to develop the initial conditions that go into the model. Bob wrapped up the Task 4 discussion by saying that the field studies are basically complete except for ice, which will be done this winter.

Bob described one variance with the study, which was the collection of supplemental boat wave data collection and analysis. He explained that boat wave data was collected at 3 locations, using video cameras to record the number of boats, and sensitive wave instruments that were used to collect short term water level fluctuations due to boat wakes. Andrea Donlon commented that none of the study updates provided thus far had mentioned the boat wave data and she asked Bob to describe the data collection locations and methods more thoroughly. In response Bob explained that boat wave data was collected at 3 locations; French King Bridge; Route 10 Bridge; and between Pauchaug and Schell Bridge. He said these sites were selected as being representative locations for boat traffic. He explained again how video documentation was used to record the number of boats, and that wave instruments at each location were used to collect detailed water level data, over a short period of time.

Regarding Task 5, analysis of data, Bob noted that the analysis was ongoing. Bill McDavitt made a comment about the temporary amendment request, noting that it was creating a messy procedural situation to have FERC considering an amendment in the middle of the relicensing process. He pointed out that when studies were requested, no one was expecting a temporary amendment and a higher upper reservoir elevation. He asked how stakeholders and FirstLight were to proceed with the causation study analysis in the face of the amendment. Mark Wamser stated that the causation study was designed to look at the past 14 years, and that it will still answer the question about how operations may have affected bank erosion. He stated that the potential for expanded operation of the Upper Reservoir had been mentioned in the PAD and also that FERC had granted prior approval for expanded operation several times in the past 14 years. This led to further discussion about the amendment requested for Northfield Mountain, and how its effects could be considered in the causation study.

Returning to Task 5, Bob asked Jennifer Hammond (Cardno) to explain the status of the BSTEM model. Jennifer noted that the data input and calibration of the BSTEM model was ongoing, and that they are currently working on incorporating the boat wave data and historical boat use trends. She estimated that they were about half way through the calibration process. Bill McDavitt asked another question about the boat wave data which prompted further discussion about how the wave data is being incorporated into model. Bill McDavitt also asked if the BSTEM model would include ice. Jennifer and Bob explained that BSTEM looks at flow, sheer stress, and water level fluctuations, and that ice is being handled

separately. Bill McDavitt then asked if BSTEM can look at upstream movement of water. Bob indicated it could not, but noted that water surface elevations are included in the BSTEM model. Kimberly asked about the time interval used in the model, which Mark explained is hourly, since the water level data being used is only available hourly. Mark indicated that he would have to look into how the boat wave data is handled in the model, since those changes are less than hourly. Mark said he would provide that information back to the group.

Bill McDavitt asked about existing hydrology, and how scenarios for alternative operations would be evaluated. Bob explained that they were using 14 years of hourly data to calibrate the model. Andrea Donlon asked if photos were taken of the river bank in the areas where the wave data loggers were located. Bob indicated that they collected the wave data and video recordings of boats.

Bob then showed some photos of the field data collection, including photos of erosion jet testing and root density testing. Regarding the root testing, Kimberly MacPhee asked if the root measurements were also made on roots covered with soil. Bob explained that root measurements were only made on trees with live roots that were readily accessible. Kimberly raised a concern about using water level as a “control point”, noting that when she looks at the historic photos, the riparian vegetation seems to be absent or only visible in a thin strip. She stated that using the top of bank to evaluate how a site has changed over time would make more sense. Bob Simons replied that using top of bank as a reference point only works if you can actually see the top of bank. This led to further discussion about using the top of bank for evaluating erosion impacts.

Kimberly commented that her office has access to historic aerial photos that they plan to look at themselves. She explained that is why she had requested the Exhibit K data layers for the project. But she stated that the Exhibit K data layer they had received was not useful as a stand-alone piece of information. She requested that the Exhibit K data showing the project boundary be sent to her again, in a more useful format. After further discussion about the Exhibit K information, Tom Sullivan noted that the study plan included provisions for looking at historic information to provide some longer term context for what has happened in the river and along the shoreline over time. But he pointed out that they were still evaluating the usability of the historic data for this purpose and suggested that it was premature to revise the methodology. Instead, Tom suggest that they finish the study report which is due to be completed in 2<sup>nd</sup> quarter of 2016, and then use the study report to consider additional work that might need to be done. Kimberly asked Brandon Cherry if she should make her request for Exhibit K data now or wait until after the study report is filed in 2016. Brandon suggested that she make the request now, but noted that FERC may not act on the data request until after the study report is complete. Tom Sullivan encouraged Kimberly to talk to him about the data request and GSE will see if they can provide what she is looking for.

The discussion of the FRR study report concluded with Mark Wamser noting that the schedule for this study report incorrectly stated in the USR cover letter that the report would be done by March 1, 2016, but that the report will be done by the end of the 2<sup>nd</sup> quarter of 2016.

### **3.1.3 Northfield Mountain Project Sediment Management Plan (Tim Sullivan)**

Tim Sullivan (Gomez and Sullivan) provided an update on the sediment management study. He summarized the tasks completed thus far including continuous sediment monitoring, grab samples of suspended sediment, and annual bathymetry surveys conducted between 2011 and 2014. He explained that ongoing work included completion of the hydrodynamic sedimentation model of the upper reservoir,

the fluid dynamics model of the Northfield Mountain tailrace, and the physical model of the tailrace. He also noted that the pilot dredge program was ongoing in the upper reservoir. Tim then described the variances to the study plan including changes to the continuous monitoring program and grab sampling programs, and expansion of the study to include the pilot dredge, and mathematical and physical modeling efforts. He noted that the final study report would be completed by September 1, 2016.

Tim then presented a slide showing the continuous monitoring and grab sample locations. He also showed the location of x-section data collection along the Route 10 Bridge which he explained was done to see if the stream side data collection was representative of the site. Bill McDavitt asked Tim if he had seen any variation in sediment levels based on project operations. Tim responded that he had not fully analyzed that issue yet. Andrea Donlon asked how they would determine if the stream-side units at the tailrace were representative. Tim explained that two years ago, they did look at representativeness of the stream side instruments, and were able to demonstrate that the stream side instruments were representative. Tim then described the computational and fluid dynamics modeling efforts in more detail, and also provided a more detailed description of the physical model and a map showing the areal extent of the physical model.

Tim next discussed the upper reservoir pilot dredge effort. He noted that the dredging had commenced in April 2015, and was scheduled to be completed in the fall of 2015. He reminded the group that the purpose of the pilot dredge is to determine whether a deep water hydraulic dredge is a viable option for removing excess sediment in the upper reservoir. He showed the area where the dredging is occurring within and immediately upstream of the intake channel. He also pointed out some of the other features of the dredge operation including temporary storage and dewatering areas. He reiterated that the pilot dredge would be completed later this fall.

Tim also reviewed the upper reservoir bathymetry work that began in 2011. He then discussed the suspended sediment monitoring analysis work that was being done. He explained that suspended sediment data were analyzed to identify certain patterns in sediment in relation to flow, as well as in relation to operating conditions at Vernon and Northfield Mountain. He noted some preliminary findings including that suspended sediment concentrations are correlated with river flow, and that there were no discernable patterns of suspended sediment concentrations associated with Vernon peaking. With respect to Northfield Mountain operations, he explained that when the project was operating during high and moderate river flow the suspended sediment concentrations being discharged from the plant was less than the suspended sediment concentrations in the mainstem river. But, when the project was operating during periods of lower river flows, the suspended sediment concentrations in the discharge were generally the same or less than in the mainstem river. He showed some graphs showing this relationship and noted that this demonstrates that there is no net deposition of sediment associated with project operations, and no discernable impact on suspended sediment concentrations when generating. There were no further questions on this study.

### **3.6.1 Recreation Use/User Contact Study (Seiders)**

Heather Seiders (TRC) reviewed the tasks associated with this study including study preparation, field work, data entry and statistical analysis. She explained that the field work for the study had occurred throughout 2014, and that all of the data had been entered into electronic spreadsheets and QA/QCed. She noted that analysis of the data was underway as was development of the study report, which would be completed by December 31, 2015. She also explained that use and user information for the Northfield Mountain Tour and Trail Center (NMTTC) had been analyzed and the results of that assessment reported

separately in the report for study 3.6.7 that was filed with FERC as part of the USR report in September, 2015. Heather noted that there were no variances from the study plan or schedule during the second year of the study.

Andrea Donlon noted that it would be interesting to see if the boat use data collected through video cameras as part of the erosion study could be used in the recreation use report somehow. This led to a brief discussion about the video based boat data, and how it might be used. The discussion concluded with Sarah Verville (TRC) indicating that they would look at the video boat count data and see if it could be meaningfully incorporated into the 3.6.1 study report.

### **3.6.2 Recreation Facilities Inventory and Assessment (Seiders)**

Heather Seiders (TRC) noted that this study was completed, and that the study report had been submitted to FERC as part of the ISR. She went on to explain that in response to FERC's determination letter issued for the ISR, that additional inventory work was conducted and an addendum report prepared. She outlined what work was included in the addendum report, including an inventory of the climbing areas within the project boundary, and an inventory of the informal put-in site immediately downstream of Turners Falls Dam. She noted all of the other additions and clarifications that were included in the addendum report, which was filed with FERC on June 15, 2015. Heather then showed a table of recreation sites included in the inventory and inventory addendum report, as well as a map showing the location of all the sites.

Regarding the study addendum, Norm Sims (AMC) asked if the put-in site included in the inventory addendum was the one located below Turners Falls Dam that had been used as part of the whitewater boating study. Heather indicated that it was. Norm responded that the inventory should also include the put-in on river left which is just slightly downstream of the one immediately below the Turners Falls Dam. Sarah Verville reminded Norm that the inventory was intended to look at existing recreation sites, not to consider potential new sites or informal use areas. Tom Christopher (New England Flow) asked if the take-out location near the Deerfield River had been included in the inventory addendum, as they had requested. Sarah replied that that site was not assessed, as FERC did not require it in its SPD, which she noted was outside the project boundary.

Bob Nasdor (AW) asked some questions about the description of the portage routes, noting that there were three different portage routes described in study 3.6.4. He wondered if all of the portage routes should have been included in the inventory addendum. Heather and Sarah noted that the 3.6.2 inventory included only the existing vehicular portage, but that the other routes had been evaluated as potential portage alternatives as part of the 3.6.4 study report.

### **3.6.3 Whitewater Boating Evaluation (Verville)**

Sarah Verville (TRC) provided an overview of the whitewater boating study. She explained that she wasn't going to go through the details of the field study and how it was conducted in July, 2014, since most of the group were familiar with, and many had participated in the field study. She summarized the study effort noting that 6 boating flows were evaluated by about 42 participants who boated the bypass reach in a variety of watercraft. Participants were surveyed about their boating experiences after each flow and then in a comparative way at the conclusion of all the test flows. Sarah also noted that there was post-evaluation discussion at the end of each day, and notes from those discussions were used as part of the evaluation and analysis. Sarah concluded by noting that the study was complete, and that the study

report was filed with FERC as part of the USR in September, 2015 and had been posted on the relicensing website in March 2015.

Tom Christopher (NE Flow) reiterated some of what Sarah had explained about the discussion held at the end of each day to talk about experiences. He indicated that this was an important part of the study because unlike many other boating studies, almost nothing was known about the Turners Falls bypass as a whitewater resource going into the study.

Sarah highlighted some of the study findings, explaining that the study found that there were acceptable whitewater boating opportunities provided for at least some of watercraft types at all of the flows tested (2,500 to 13,000 cfs). She noted that overall flows in the range of 5,000-8,000 cfs provided the most optimal conditions for most watercraft types. She also reviewed the boater classification of the whitewater provided across the range of flows, noting that the overall classification ranged from II-IV, although the class IV rating was attributed to a single feature, Rock Dam. Overall, Sarah concluded the results of the boating study demonstrate the bypass reach provides whitewater opportunity for a range of watercraft and skill levels, over a range of flows. Sarah did note, however, that post-study discussion input suggested that there were some other factors that might affect overall boater satisfaction with the reach, including aesthetics and the urban setting. She also noted that there were some comments regarding the reach only being boatable by novice boaters at the lower flow levels.

Bob Nasdor (AW) commented that he did not agree with some of the conclusions in the report, including the suggestion that factors such as the urban setting were actually factors that study participants had raised as an issue. He asked if he could get a copy of the raw data in next few weeks so that AW can review the survey and discussion results and provide their own comments and conclusions about what participants said. He said that AW would like to have the raw survey forms or if the data had been entered into a spreadsheet, a copy of the spreadsheet. He noted that it seemed like the study report had cherry picked the negative comments about the bypass reach as a boating run, since these conclusions seemed inconsistent with the survey results. Sarah indicated that the study survey data could be provided to AW.

Norm Sim (AMC) commented that he disagreed with the idea that the run is not suitable for novice boaters. He explained that there are ways around some of the more difficult ledges in the upper reach and around Rock Dam. Tom Christopher commented that the appeal of the bypass reach as a boating run was clearly demonstrated by the fact the most of the boaters indicated that they would return. He reiterated Norm's concern that the report narrative seems to emphasize the negative and does not clearly reflect the actual results. Sarah, responded that report was written to show both the positive and the negative, based on the actual study results and comments collected. She noted that others were free to make their own interpretation of the study results.

Andrea Donlon (CRWC) asked a question about the other regional whitewater boating opportunities included in the report, which prompted a more general discussion of regional whitewater boating opportunities. Bob Nasdor, Tom Christopher, and Norm Sims all indicated dissatisfaction with the way the study report characterized some of the regional boating opportunities, noting, for example, that flow releases on the Miller and West Rivers are only single day releases that occur only in the fall, that thousands of people show up to run. They explained that the only real scheduled whitewater releases in the region are those on the Deerfield River, which are crowded and over-used. Sarah acknowledged their concerns, but reminded the group that study plan required FirstLight to look at all the regional boating opportunities, including both scheduled and unscheduled flows. The discussion continued regarding

regional demand for whitewater boating, with Bob Nasdor noting his disagreement with the study reports' conclusions regarding demand. He cited the Deerfield River again, which he explained is used by thousands of boaters, as a good indication of the demand for scheduled whitewater boating opportunities in the region. Sarah acknowledged Bob's point, but reiterated that the study report did include an assessment of regional demand.

The discussion then turned to the flow duration plots Sarah had shown demonstrating how frequently there would be boatable flows in the Turners Falls bypass reach. Tom Christopher (Flow) noted that the flow duration curves do demonstrate that there are boatable flows that occur in the bypass, but that since these flows are unscheduled, and to some degree unregulated, no one can predict when they will occur and there is no way to readily access information regarding spill conditions and flows in the bypass. As a result, Tom concluded, the flow events that do create boatable conditions in the bypass mostly go unused. Bob Nasdor suggested that in addition to showing the number of boatable days under the current mode of operation, the study report should examine the number of boatable days that would occur under "natural conditions". Sarah asked if by "natural conditions" Bob meant "absent the dam". Sarah explained that Bob's request was akin to asking the study to examine pre-project conditions, which, she noted, FERC does not require. Adam Beeco (FERC) noted that the Connecticut River flows are generally above 2,500 cfs year round so no analysis of the duration of boatable flows absent the dam would be required anyway. However, Adam acknowledged that the study could look at other modes of operation that might be proposed by FirstLight, and how those proposals might affect the occurrence of boatable flows in the bypass reach. Mark Wamser noted that no alternative operational proposal have yet been put forward by FirstLight and Tom Sullivan reminded the group that there were many studies and resource assessment that had to be completed before discussion of alternative operations could begin.

Sarah next reviewed the bypass reach access portion of the study report, which prompted several questions from the boating interests. Norm noted that the access conditions described in the report assumes that conditions would remain as they are now. Norm stated his particular concern with the description of conditions of the Cabot Woods access area which provides boaters access to Rock Dam. He opined that Cabot Woods is the best location for providing boaters with access to Rock Dam, and that FirstLight should want boaters to use this access area. He noted that there had been a stairway at the site, which had been removed and as a result made access more difficult. He acknowledged that he understood that FirstLight's reason for removing the stairway was to discourage swimming at the site, but noted that in the process they had made that access more difficult for use by "park and play" boaters. He also stated that Cabot Woods could be an important emergency access location, which is a necessary feature for boating safety. Norm also indicated that the Poplar Street take-out area should be assessed based on likely improvements that would be made at that site as part of the canoe portage trail.

Tom Christopher concluded his comments on the boating study by indicating that overall the boating interests felt the study was well-conducted, but that they had serious questions and concerns about how the results were interpreted and presented in the study report. Norm commented that he felt the study report conclusions statement highlighted on the presentation slide is inappropriate, noting that he particularly disagrees with the conclusion that there is no significant demand. He asked FERC what weight they give to study conclusions that are not supported by the data, or whether FERC will make the study authors go back and change the conclusions. Adam Beeco responded that the study authors can provide their conclusions in the report, and that stakeholders can provide their conclusions in their comments on the study report, and then FERC can evaluate the study results and make their own

determination regarding the conclusions. He noted that this was reflective of the normal relicensing study and review process.

#### **3.6.4 – Assessment of Day Use and Overnight Facilities Associated with Non-motorized Boats (Verville)**

Sarah Verville (TRC) reviewed the status of the tasks that comprise this study, noting that all of work was complete, and study report was filed with FERC as part of the USR in September, 2105. She reminded the group that the primary purpose of the study was to determine the number of existing access sites and campsites, as well as to identify potential locations for additional access and campsites, if needed in the future. She also explained that this study included an evaluation of alternative portage routes that are not vehicle dependent. At Mark Wamser's suggestion given time constraints, Sarah noted that since most of the group was familiar with study and results, that she could skip showing the slides which highlighted the study results and conclusions, and open it up to questions. There was general agreement to skip the study summary slides.

Norm Sims opened the questions with a general comment regarding his concern with the study conclusions. He indicated that he felt that the study did not consider the condition of the existing access areas and campsites, but instead focused only on the number of campsites. Sarah noted that the spacing of the campsites and access sites was also an important part of the study. Norm asked if the commercial campsites were included in the campsite count and survey. Sarah indicated that they were. Bob noted his disagreement with using the commercial campsites as part the study assessment. Norm also raised some concerns regarding the suggestion of a canoe portage along the canal-side trail bike path. He suggested a better solution would be to take-out on river left near Unity Park, and then follow the paved pathway down and put-in down below the ledges, on the downstream side of the dam. He suggested that the reason FirstLight did not consider this as an alternate canoe portage route was because it would mean that a flow of at least 2500 cfs would be needed in the bypass to make it boatable. Norm concluded his comments by reiterating his overall disagreement with the study conclusions about the need for additional access and campsites.

Bob Nasdor (AW) agreed with Norm, adding that at some point in the process there is a need to start talking about minimum flows. Sarah responded that as Tom Sullivan had indicated earlier, until all the studies are done, it is premature to start discussing minimum flows. Tom Christopher suggested that Norm's proposed portage route be considered as an alternative in the study report.

Andrea Donlon questioned the report's conclusion that access and the spacing of access is adequate. She noted that two of the sites listed as access sites, Riverview and Cabot Camp, are sites that she does not consider to be access points. Sarah explained that the two sites were included because they do provide access to the impoundment for paddlers. She acknowledged that there were no improvements at either site specifically to accommodate carry-in boat use, but that both sites are available for non-motorized boaters to put-in or take-out. Adam Beeco noted that the Bennett Meadows Wildlife Management Area (WMA) was assessed as a possible campsite, but that the Pauchaug WMA was not, and he wondered why. Sarah indicated that she was not sure why Pauchaug WMA was not considered a potential campsite location, but noted that she would check the study plan and the survey results to see if she could determine the reason.

#### **3.6.5 Land Use Inventory (Seiders)**



Heather Seiders (TRC) gave a quick overview of the study status. She reviewed the tasks noting that most of the tasks involving data collection and GIS mapping had been completed and that the report was being drafted. She noted that as part of the report, consolidated land use classifications had been developed and preliminary land use maps prepared. She stated that the report would be completed by December 31, 2015. There were no questions or comments on this study.

### **3.6.6 Assessment of Effects of Project Operation on Recreation and Land Use (Seiders)**

Heather Seiders (TRC) updated the group on the status of this study. She explained that a number of the studies that are needed to conduct the assessment of project operation effects on recreation and land use are not yet complete. She noted that report would be completed by June, 2016.

### **3.6.7 Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use (Seiders)**

Heather Seiders (TRC) gave a quick update on the status of this study. In the interest of time, Heather offered to skip over review of the study details and open it up to questions and comments. Bob Nasdor (AW) asked if the study had looked at the costs associated with the use of some of the Northfield Mountain Tour and Trail Center (NMTTC) facilities, and whether the fees are impediments to use. Heather responded that the study did not look at fees, to which Bob suggested that it should. John Howard (FirstLight) noted that FERC allows licensees to charge fees for recreation facilities and use to cover the cost of administering and managing the facilities. Bob asked if the fees charged by FirstLight at the NMTTC covers the costs of operating and managing those facilities. John responded that it was not even close, by orders of magnitude.

Andrea Donlon noted that in the 3.6.7 study report, the assessment of use trends utilized 2005 use information for comparison, and she wondered why. Heather explained that 2005 was used for comparison to consider longer term trends in use rather than short-term. Andrea Donlon also said she was surprised that the report indicated that the QII boat tours run Wednesday through Sunday. She noted that the QII used to run Wednesday through Sunday, but she believes it now only runs Friday through Sunday. Sarah Verville indicated that TRC would check on that and make any corrections needed. Andrea also noted that the 3.6.7 study report included information use for the NMTTC trail system, the QII boat rides, and other programs, but not the canoe and kayak rentals at Barton Cove. Heather explained that the canoe and kayak rentals will be covered in the 3.6.1 study report.

### **3.7.2 Survey and Evaluation of Historic Architectural Resources (Rankin)**

Ellen Rankin (TRC) gave a very brief overview of this study. She noted that all the research and field work had been completed and that the study reports were submitted to the state SHPOs in December, 2014. She explained that the NH SHPO had indicated that no further study was needed. The Massachusetts SHPO had requested some additional study work, which Ellen explained was completed during the summer of 2015. She noted that the report on the additional work was currently in preparation. There were no comments or questions on this study.

### **3.7.3 – Traditional Cultural Properties Study (Verville)**

Sarah Verville (TRC) gave a brief update on the status of this study on behalf of Rick Will (TRC) who was the lead ethnographer for the study. She noted that despite considerable effort, TRC and FirstLight did not have much success engaging the Native American tribes on this study. She explained that the

report documents all of the consultation efforts, along with the results of background research that was done to identify eligible traditional cultural properties (TCP) in project APE. She noted that the research had identified one TCP site in the Project vicinity but the site was outside the APE. She stated that the TCP study report was completed in March, 2015.

Rich Holschuh (Nolumbeka/Citizen) asked Sarah if any Vermont tribes were contacted about the relicensing process or this study. Sarah Verville responded that she did not believe that Vermont tribes had been identified or contacted. Rich asked if there had been any effort to communicate with or invite Vermont tribes to participate in the TCP study. Adam Beeco (FERC) explained that at the outset of the relicensing process the Licensee sends letters out to all tribes that are in any way affiliated with the project. Adam noted that he understood that all the tribes were covered by FirstLight. Rich indicated that he was not speaking on behalf of the Cowasuck group of the Western Abenaki Tribe of Vermont, but explained that he did not think the tribe was sent a letter. Brandon Cherry and Sarah Verville both agreed to look into which tribes had been sent letters.

### **3.7.1 Phase 1A, 1B, and II Archaeological Surveys (Sara)**

Tim Sara (TRC) reviewed the archaeological survey conducted at the hydropower projects. He noted that the Phase I archaeological report was separated into two reports; a combined VT/NH report, and a separated report for MA. He explained that this was done at the request of the state SHPOs, based on their differing survey reporting requirements. Tim reviewed the Phase IA work that had been conducted, including background research and field reconnaissance which was completed in 2014. He noted that the field reconnaissance had identified three previously recorded Precontact period sites and six unrecorded sites in the project area of potential effect (APE). He noted that the Phase IA reports were provided to the respective state SHPOs in December, 2014; and that responses for two of the three states have been received. Tim noted that there were no variances to the study plan, and that the work remaining included possible Phase IB surveys, possibly followed by Phase II evaluation studies. Tim also noted that they were awaiting the results of the causation study to see if a determination of the causes of erosion can be made.

Rich Holschuh (Nolumbeka/Citizen) repeated his earlier question about which, if any Vermont tribes were contacted or consulted with for this study. Sarah Verville responded that she did not believe they had. Rich noted that on the list of consultation contacts for the Phase IA archaeology report is the Massachusetts Commission on Indian Affairs (MCIA). Tim Sara acknowledged that they were, as well as the Institute for American Indian Studies, and tribal historic preservation officer (THPO) for several tribes. Tim noted that these entities were contacted and consulted with as part of the background research conducted for the Study. Rich asked specifically if the Abenaki Tribe of Vermont, the Vermont Commission on Indian Affairs, or the New Hampshire Commission on Native Americans were consulted. Tim indicated that none of those entities or tribes had been consulted, but noted that there are no federally recognized tribes in Vermont, which may explain why they were not contacted. Rich reminded the group that Section 106 regulations require that a good faith effort should be made to contact to any tribe. Brandon Cherry (FERC) noted that he had tried to reach the FERC cultural resources lead by phone, but could not reach him. He recommended to Rich that he file a letter with FERC asking that the tribes and tribal entities that he had asked about be added to the consultation and service lists for the projects.

Andrea Donlon asked Tim Sara to clarify the number of previously recorded sites that were in the project APE that had been relocated during the study. Tim explained that the Phase IA surface reconnaissance

had identified three (3) previously recorded sites, based on observed surface artifacts. There were no further questions on the study.

Mark Wamser adjourned the meeting at 4:45 PM

**Appendix A**  
**Initial Study Report Meeting**  
**Attendance List**

*Attendees Day 1 (September 29, 2015):*

John Howard - FirstLight	Brandon Cherry- FERC	Melissa Grader – USFWS
Bob Stira – FirstLight	Bob Nasdor - AW	Laila Parker – MADEP
Mark Wamser – Gomez and Sullivan	Nick Ettema FERC (on phone)	Caleb Slater – MADFW
Jason George – Gomez and Sullivan (phone)	Julie Crocker – NMFS (on phone)	Jen Griffin – TransCanada
Chris Tomichuk – KA	John Baummer FERC (on phone)	Katie Kennedy – TNC
Bryan Apell – KA	Norm Sims – AMC (on phone)	Rick Simmons – Normandeau
Kevin Nebiolo – KA	Jeff Murphy – NMFS (on phone)	Tom Christopher – Flow
Brandon Kulik – KA	Don Pugh – TU	John Ragonese – TransCanada
Bryan Apell – KA	Alex Haro – Conte Lab	Bill Connelly – FERC
Julia Wood – VNF	Ken Sprankle – USFWS	Patrick Crile- FERC
Mike Swiger – VNF	John Warner – USFWS	Andrea Donlon - CRWC
Patrick Crile- FERC		John Baummer – FERC
Steve Kartalia - FERC		Karl Meyer - Greenfield
Bill Connolly -FERC		

*Attendees Day 2 (September 30, 2015):*

Nick Ettema – FERC (on phone)	Bob Nasdor – AW	Commission/Franklin Conservation District
Michael Watts – FERC (on phone)	Andrea Donlon – CRWC	Heather Seiders – TRC
Amy Chang – FERC (on phone)	Laila Parker – MADEP	Sarah Verville – TRC
Jeff Murphy – NMFS	Caleb Slater – MADFW	Wendy Bley - TRC
Jesse Leddick - NHESP	Jen Griffin – TC	Adam Kahn – Foley Hoag
Steve Knapp – KA	Melissa Grader – USFWS	Ellen Rankin – TRC (on Phone)
Adam Beeco – FERC	Kimberly MacPhee – FRCOG	Tim Sara – TRC (on Phone)
Bill Connelly - FERC	Ted Castro-Santos- USGS	Jennifer Hammond – Cardno
Steve Kartalia – FERC	Bob Stira – FL	Bob Simons – Simons & Associates
Patrick Crile – FERC	Bill McDavitt – NMFS	Tim Sullivan – GSE (on phone)
Tom Christopher – Flow	Katie Kennedy – TNC	Gary Lemay – GSE (on phone)
Karl Meyer - Greenfield	Don Pugh- TU	
Julianne Rosset - USFWS	Tom Miner – CRSEC	
	John Bennett – Windham Regional	

Steve Knapp – KA (on  
phone)  
Ethan Nedeau – BioDiversity  
Mike Swiger- VNF  
Julia Wood-VNF  
Rich Holschuh –  
Nolumbeka/Citizen  
Lisa McLoughlin –  
Nolumbeka Project  
Norm Sims – AMC  
Chuck Momnie – FLPR  
Ed Hathaway - FLPR

**Attachment B: PowerPoint Presentation**



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

**2015 Updated Study Report**

September 29-30, 2015





## Purpose of Updated Study Report Meeting [18 CFR 5.15(c)(2)]

Per Regulation.....

Within 15 days following the filing of the Updated Study Report (September 14, 2015), the Applicant shall hold a meeting with licensing participants and Commission staff to discuss the study results and the potential applicant's and/or other participant's proposals, if any, to modify the study plan in light of the progress of the study plan and the data collected.

- Discuss the progress of the relicensing studies to date
- Discuss any upcoming study activities
- Discuss any proposed study modifications (variances)



## Updated Study Report Meeting (All Stakeholders and FirstLight)

- September 29-30, 2015

## Updated Study Report Meeting Summary Filed (FirstLight)

- October 14, 2015

## Disagreements/Modifications to Study/Propose New Study (All Stakeholders)

- November 13, 2015

## Filing of Draft License Application

- December 4, 2015

## File Responses to Disagreements (All Stakeholders)

- December 14, 2015

## Last date for the Director to resolve disagreements and amend the approved study plans (FERC, if necessary)

- January 12, 2016

## Comments due on Draft License Application

- March 3, 2016

Total of 39 studies

- 2 studies previously filed with FERC and complete (3.1.1 Full River Reconnaissance and 3.6.2 Recreation Facilities Inventory)
- 2 studies previously filed with FERC, but further work needed (3.7.1 Archaeological Survey, 3.7.2 Historic Structures Survey)
- 9 study reports filed with FERC on 9/14/2015
- 26 study summaries filed with FERC on 9/14/2015
- 
- 2 studies slated for 2016 (3.3.5 Eel Downstream Passage- Yr 2, 3.3.19 Ultrasonic Array)

## September 29, 2015 (17 Studies)

Times	Study
9:00-9:30 am	Introductions, Review of Meeting Purpose, Meeting Objectives, Schedule
	<b>Fish and Aquatic</b>
9:30 am-Noon	3.3.1- Instream Flow Study
	3.3.13- Impacts of the Turners Falls Project and Northfield Mountain Project on Littoral Zone Fish Habitat and Spawning Habitat
	3.3.14- Aquatic Habitat Mapping of Turners Falls Impoundment
	3.3.11- Fish Assemblage
	3.3.17- Assess the Impacts of Project Operations of the Turners Falls Project and Northfield Mountain Project on Tributary and Backwater Area Access and Habitat
	3.3.2- Evaluate Upstream and Downstream Passage of Adult American Shad
	3.3.15- Assessment of Adult Sea Lamprey Spawning within the Turners Falls Project and Northfield Mountain Project Area
	3.3.4- Evaluate Upstream Passage of American Eel
Noon-1:00 pm	<b>Lunch on your own</b>
1:00-5:00 pm	3.3.3- Evaluate Downstream Passage of Juvenile American Shad
	3.3.5- Evaluate Downstream Passage of American Eel
	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
	3.3.18- Impacts of the Turners Falls Canal Drawdown on Fish Migration and Aquatic Organisms
	3.3.19- Evaluate the Use of an Ultrasound Array to Facilitate Upstream Movement to Turners Falls Dam by Avoiding Cabot Station Tailrace
	3.3.7- Fish Entrainment and Turbine Passage Mortality Study
	3.3.20- Study to Evaluation Entrainment of Ichthyoplankton at the Northfield Mountain Pumped Storage Project
	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
	<b>Water Quality</b>
	3.2.1-Water Quality Monitoring Study

**NOTE: this agenda is subject to change pending the pace of reviewing the USRs at the meetings.**

September 30, 2015 (22 Studies)

Times	Study
	<b>Fish and Aquatics</b>
9:00 am-Noon	3.3.10-Assess Operational Impacts on Emergence of State-Listed Odonates in the Connecticut River
	3.3.16-Habitat Assessment, Surveys, and Modeling of Suitable Habitat for State-listed Mussel Species in CT River below Cabot Station
	<b>Botanical</b>
	3.4.1-Baseline Study of Terrestrial Wildlife and Botanical Resources
	3.4.2-Effects of Northfield Mountain Project-related Land Management Practices and Recreation Use on Terrestrial Habitats
	3.5.1-Baseline Inventory of Wetland, Riparian and Littoral Habitat in the Turners Falls Impoundment, and Assessment of Operational Impacts on Special-Status Species
	<b>Hydraulic Modeling</b>
	3.2.2-Hydraulic Study of Turners Falls Impoundment, Bypass Reach and below Cabot Station
	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.
	<b>Operations Model</b>
	3.8.1-Evaluate the Impact of Current and Potential Future Modes of Operation on Flow, Water Elevation and Hydropower Generation
Noon-1:00 pm	<b>Lunch on your own</b>
	<b>Geology and Soils</b>
1:00-5:00 pm	3.1.1-2013 Full River Reconnaissance
	3.1.2-Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability
	3.1.3-Northfield Mountain Project Sediment Management Plan
	<b>Recreation</b>
	3.6.1-Recreation Use/User Contact Survey
	3.6.2-Recreation Facilities Inventory and Assessment
	3.6.3-Whitewater Boating Evaluation
	3.6.4-Assessment of Day Use and Overnight Facilities Associated with Non-motorized Boats
	3.6.5-Land Use Inventory
	3.6.6-Assessment of Effects of Project Operation on Recreation and Land Use
	3.6.7-Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use
	<b>Cultural Resources</b>
	3.7.1-Phase 1A, 1B, and II Archaeological Surveys
	3.7.2-Survey and Evaluation of Historic Architectural Resources
	3.7.3-Traditional Cultural Properties Study

**NOTE: this agenda is subject to change pending the pace of reviewing the USRs at the meetings.**

# **Fish and Aquatic Resources Water Quality Resources**

## 3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station

### **Study Progress**

#### Task 1: Consult with Agencies and Interested Stakeholders to Determine Study Area, Study Reaches and HSI Curves

- Site visit to reaches 1, 2 and 3 conducted September 2013
- Consultation regarding HSI Curves completed during 2013 and 2014
- Site visit to Reach 4 conducted August 2015

#### Task 2: Method for Assessing State and Federally Listed Mussels

##### Task 2a: Screening Level Mussel Assessment

- Delphi panel established
- This task will occur once the HSI criteria are complete

##### Task 2b: Detailed 1D HEC-RAS Modeling

- Contingent on results of screening assessment

#### Task 3: Field Data Collection

- Hydraulic, substrate, bed profile data collected in reaches 1-3 during summer 2014

#### Task 4: Hydraulic Modeling (Reaches 1-4)

- Reaches 1-2 1-D data entered, reviewed and calibrated during December 2014 – March 2015
- Reaches 2-3 2-D data entered, reviewed and calibrated during January-July 2015

#### **Study Progress**

##### Task 5: Hydraulic Modeling (Reach 5)

- Contingent on results of screening assessment

##### Task 6a: Habitat Modeling (Reaches 1-4)

- Raw Weighted Usable Area (WUA) calculations for reaches 1-3 modeled; output is undergoing QA/QC
- Reach 2's 1-D and 2-D model output to be integrated
- Reach 3 raw output calculated and under review

##### Task 6b: Persistent Potential Habitat Modeling [Reach 4, if necessary, and Reach 5, mussels only]

- Not yet conducted

##### Task 7: Habitat Time Series (Reaches 3 and 4)

- Not yet conducted

##### Task 8: Persistent Habitat Analysis and Mapping (Reach 3) and Dual Flow Analysis (Reach 4)

- Not yet conducted

##### Task 9: Study Report

- Not complete

### 3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station





### 3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station



# 3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station

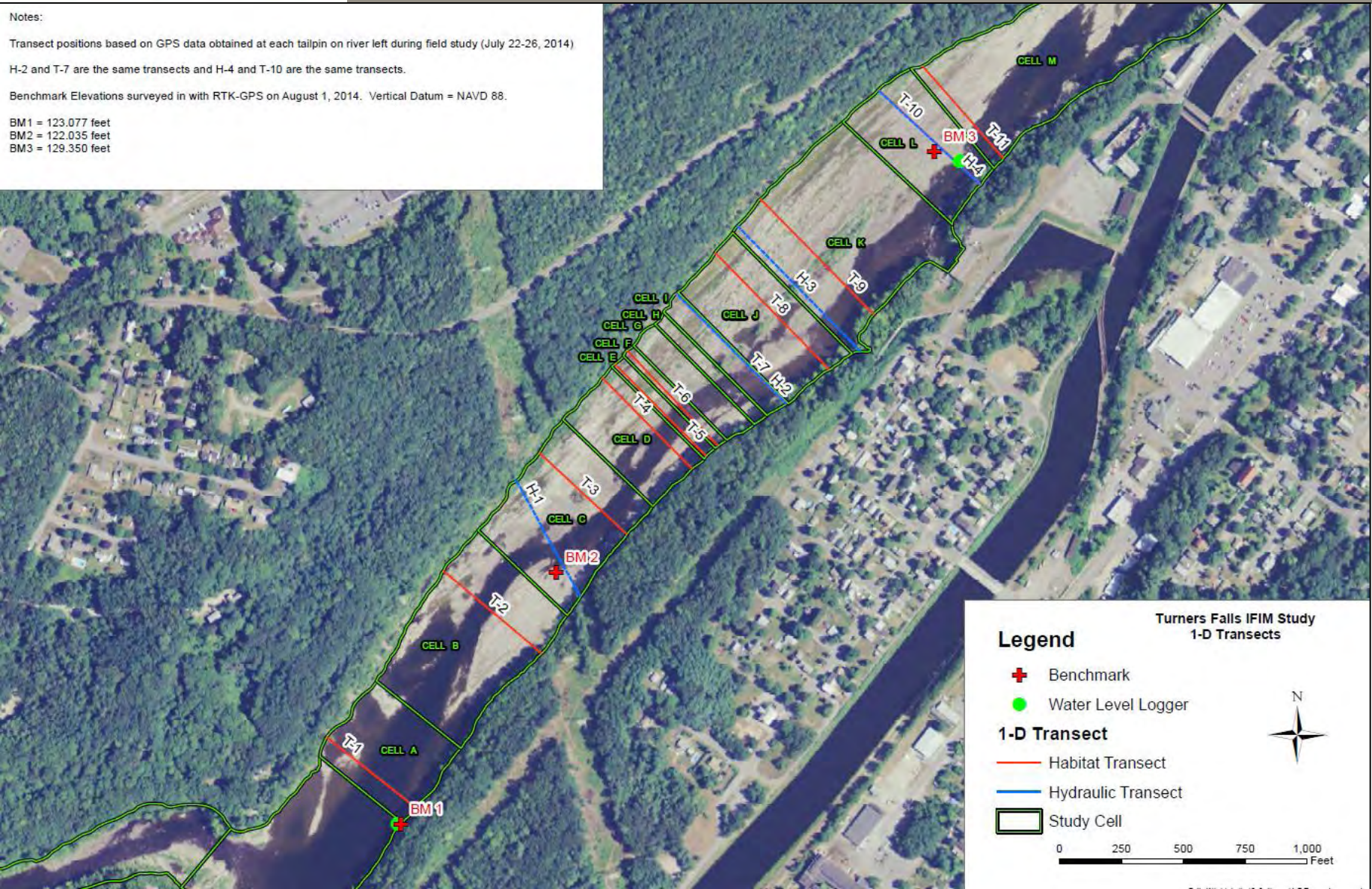
**Notes:**

Transect positions based on GPS data obtained at each tailpin on river left during field study (July 22-26, 2014)

H-2 and T-7 are the same transects and H-4 and T-10 are the same transects.

Benchmark Elevations surveyed in with RTK-GPS on August 1, 2014. Vertical Datum = NAVD 88.

BM 1 = 123.077 feet  
 BM 2 = 122.035 feet  
 BM 3 = 129.350 feet



# 3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station

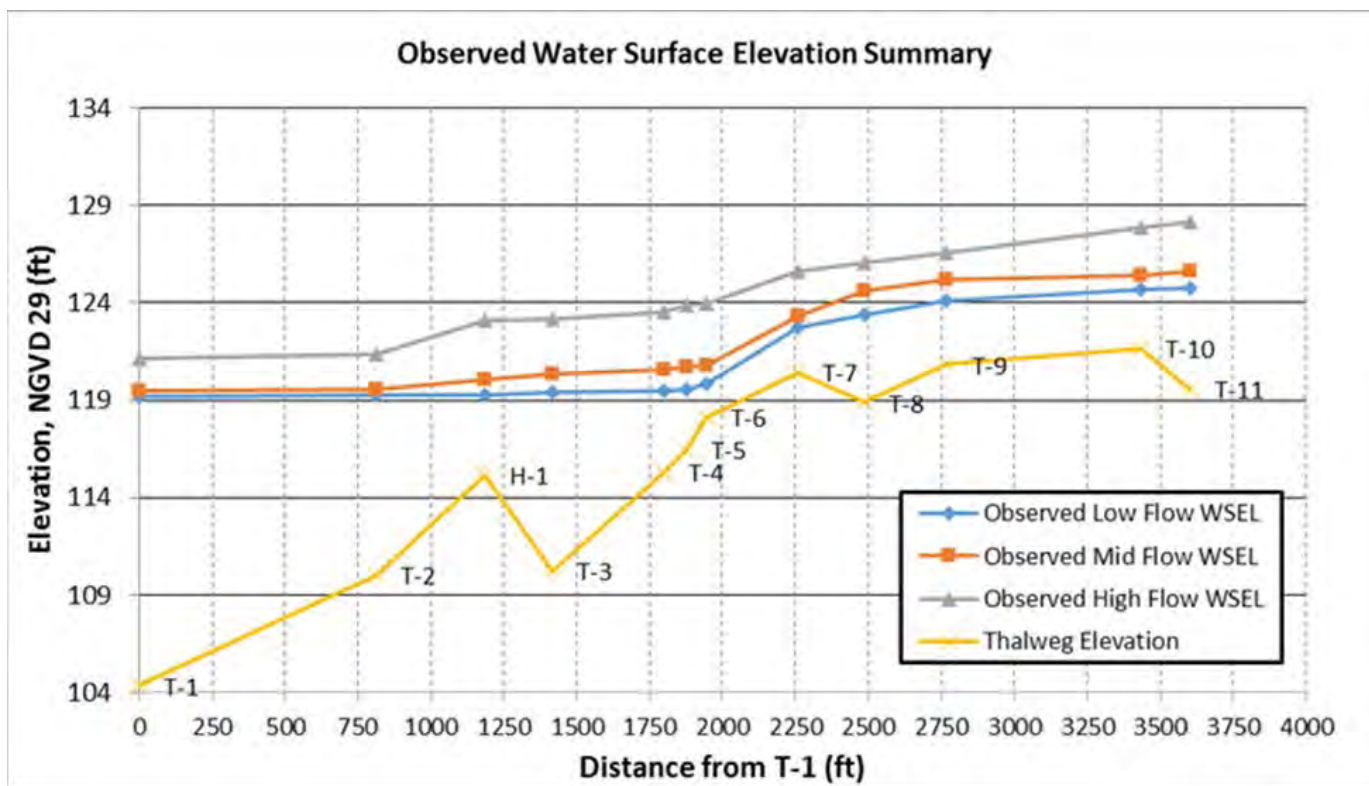
**Findings** Reach 1-2: Model successful at simulating flow and habitat throughout targeted flow range

Above Station No. 1

Calibration flow set	Discharge	Simulation range
Low flow	210 cfs	120-400 cfs
Medium flow	626 cfs	400-1,400 cfs
High flow	3,904 cfs	1,600-10,000 cfs

Below Station No. 1

Calibration flow set	Discharge	Simulation range
Low flow	293 cfs	120-400 cfs
Medium flow	720 cfs	400-1,400 cfs
High flow	4,000 cfs	1,600-10,000 cfs



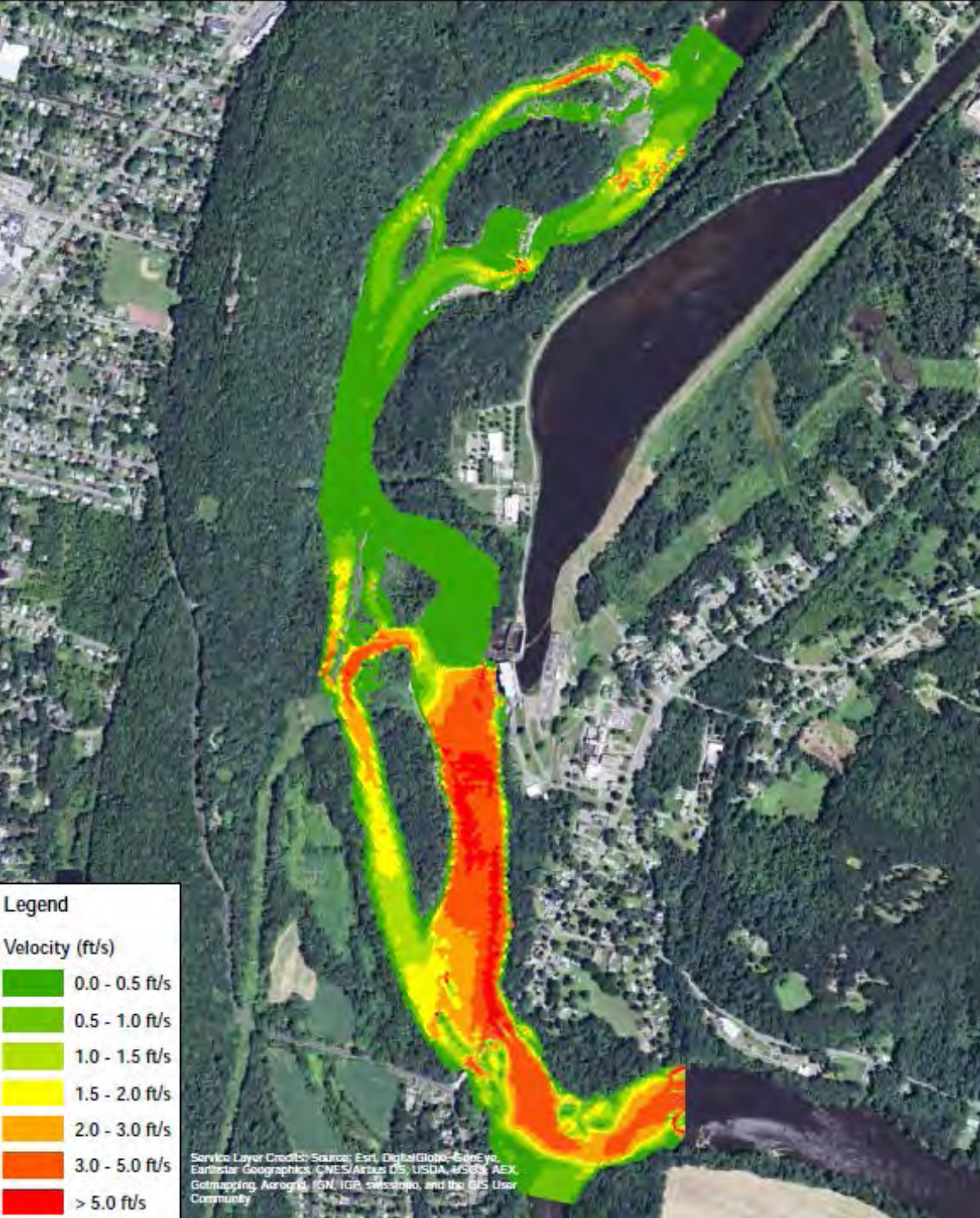
### 3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station



#### Velocity Map Reach 3

Bypass:	1,600 cfs
Cabot:	0 cfs
Deerfield:	200 cfs

### 3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station



#### Velocity Map Reach 3

Bypass:	2,000 cfs
Cabot:	13,728 cfs
Deerfield:	1,445 cfs

### 3.3.1-Conduct Instream Flow Habitat Assessments in the Bypass Reach and below Cabot Station

#### **Variance (if any)**

- Schedule- originally were planning on conducting work in Reaches 1-3 in 2013 and Reaches 4-5 in 2014.

#### **Work Remaining**

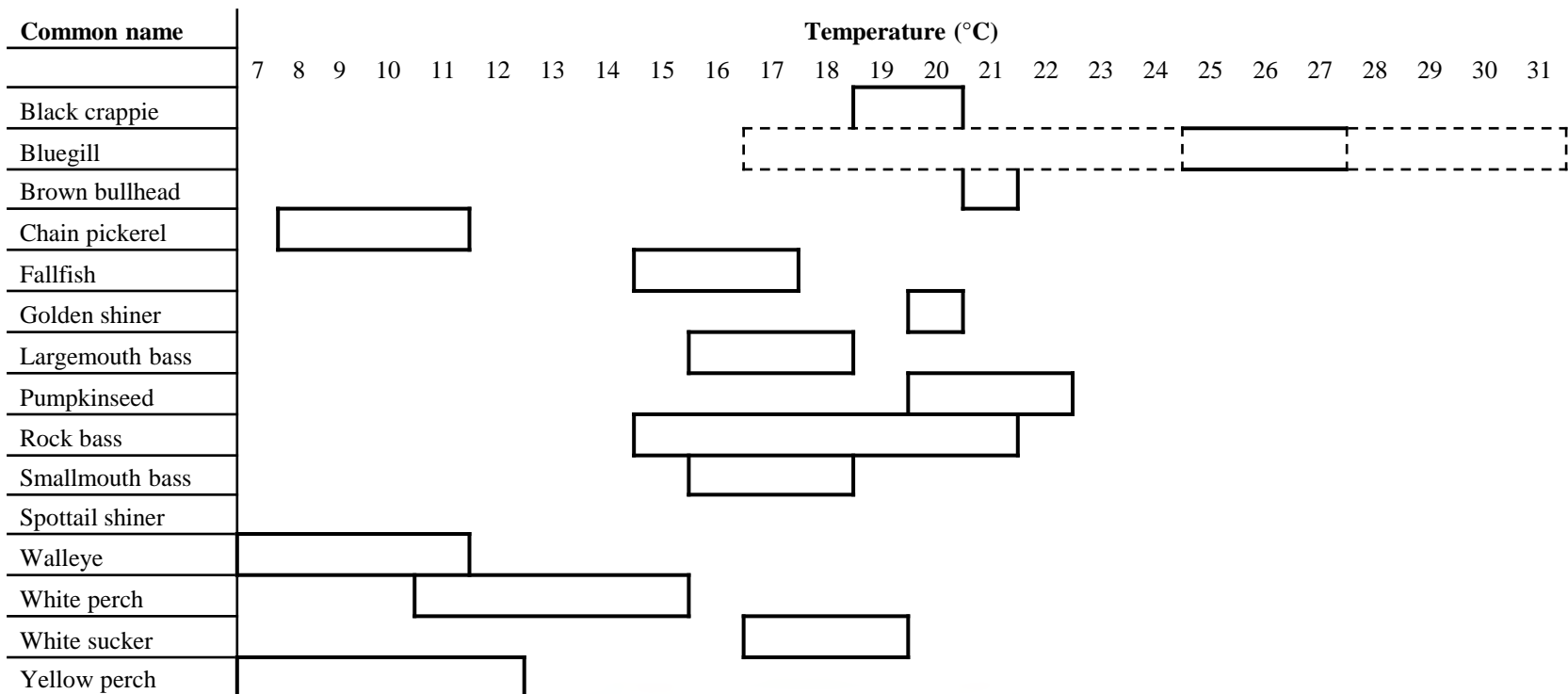
- Review Reaches 1-4 WUA output with stakeholders
- Determine need for persistent habitat and time series analysis of WUA output with stakeholders
- Conduct Flow Demonstration (“BOPSAR”) in Reach 1 riffle with stakeholders
- Report to be completed by 9/1/2016.

### 3.3.13- Impacts of the Turners Falls Project and Northfield Mountain Project on Littoral Zone Fish Habitat and Spawning Habitat

#### Study Progress

##### Task 1: Literature Review

- Literature review conducted in first quarter 2015 to target spawning periods for fish species known to occur in the impoundment, based on water temperature. Historic temperature data reviewed to target approximately date ranges





## 3.3.13- Impacts of the Turners Falls Project and Northfield Mountain Project on Littoral Zone Fish Habitat and Spawning Habitat

### Task 2: Field Survey

- Two fish surveys (early spring and early summer) were conducted on May 4-6 and June 11-13 to identify spawning area.

### Task 3: Reporting

- Data analysis is underway. Report will be completed on June 1, 2016.

### **Findings (if any)**

- Two distinct littoral zone types due to varying river geomorphology

### **Variances (if any)**

- None.

### **Work Remaining**

- Littoral Zone Study (No. 3.3.13) will include evaluation of water level fluctuations on habitat and littoral zone, the Aquatic Habitat Mapping Report (No. 3.3.14) provides a baseline inventory of habitat conditions in the Turners Falls Impoundment. Water level fluctuation assessment will be conducted as part of Study No. 3.3.13.



### **Study Progress**

#### **Task 1a: Delineation and Task 1b: Microhabitat**

- Field work for the delineation and microhabitat mapping completed in 2014.

#### **Task 2: Analysis and Report**

- Posted to relicensing website on 6/30/2015 and filed with FERC on 9/14/2015.

### **Findings (if any)**

- Two distinct littoral zone types due to varying river geomorphology.
- Upstream segment is relatively uniform, alluvial substrates and channel forms, limited object cover.
- Downstream bedrock controlled with alternating vertical ledge (minimal littoral zone) and embayment, good object cover.

### **Variances (if any)**

- 2014: Water level loggers, rather than a benchmark survey, were used to monitor changes in the water elevation and to acquire the water surface elevation at the beginning of the survey.

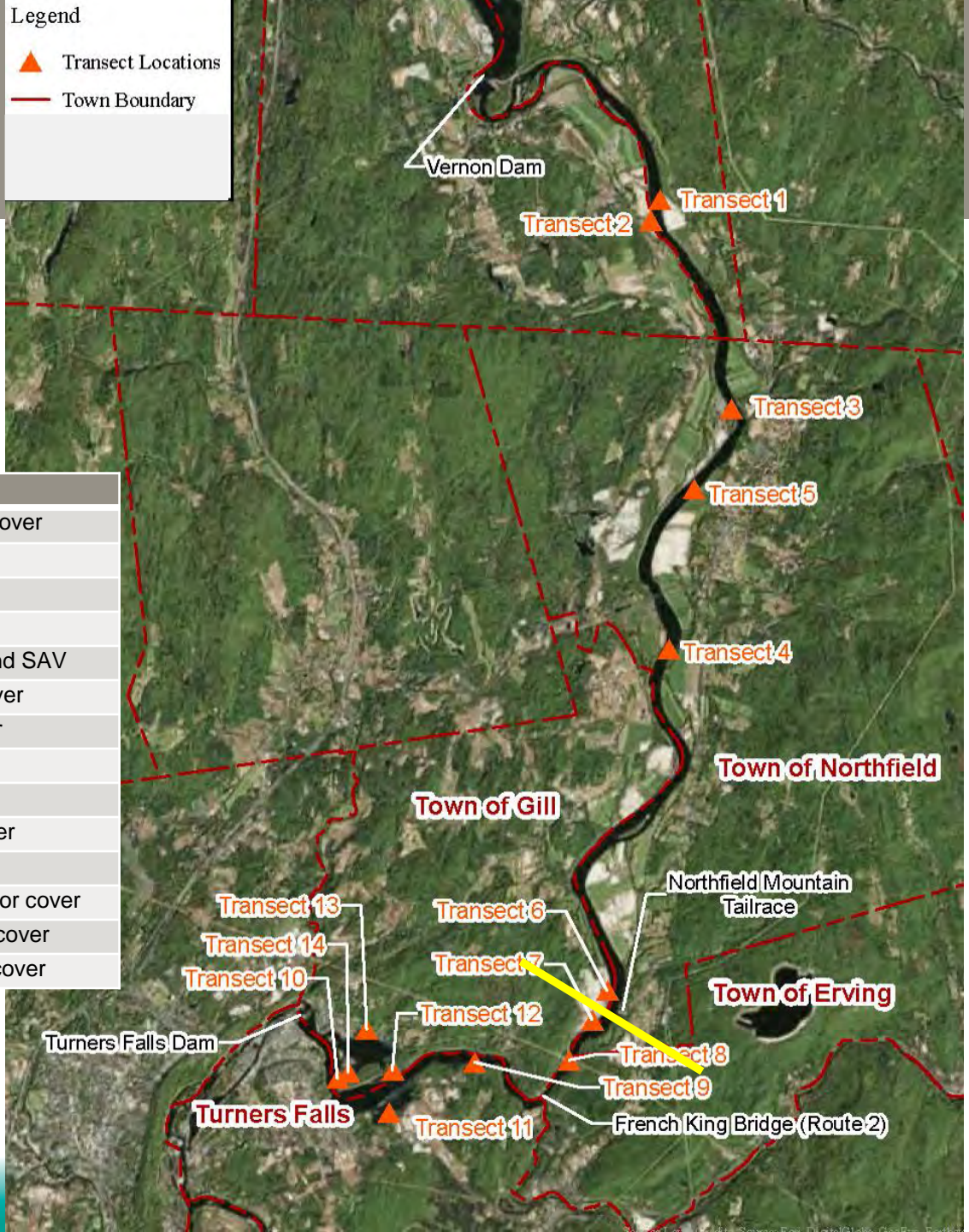
### **Work Remaining**

- Littoral Zone Study (No. 3.3.13) will include evaluation of water level fluctuations on habitat and littoral zone, the Aquatic Habitat Mapping Report (No. 3.3.14) provides a baseline inventory of habitat conditions in the Turners Falls Impoundment. Water level fluctuation assessment will be conducted as part of Study No. 3.3.13.

Legend

- ▲ Transect Locations
- Town Boundary

- Phase 1: major habitat and shoreline types classified.
- Phase 2: detailed microhabitat data collected at representative transects.
- Two distinct littoral reaches (Upper and Lower Reach).

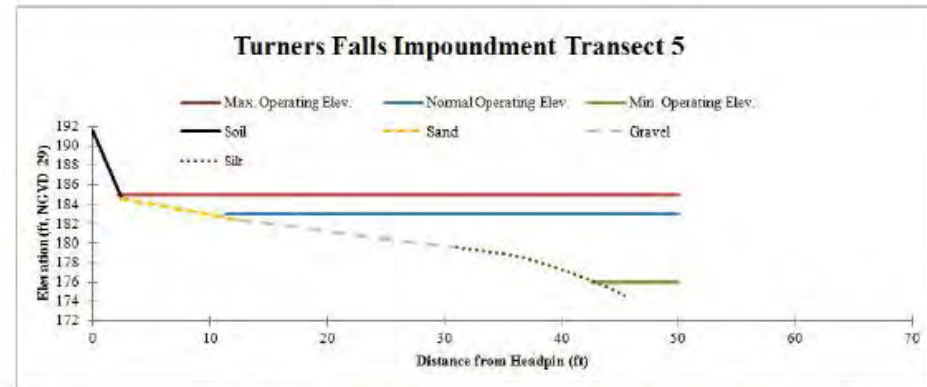


TRANSECT	HABITAT DESCRIPTION
1	Steep-sloped, dominated by cobble and gravel, no cover
2	Shallow-sloped dominated by fines, no cover
3	Steep-sloped, cobble and boulder cover
4	Moderate-sloped, dominated by fines, no cover
5	Moderate-sloped, cobble, scattered woody debris and SAV
6	Moderate-sloped, cobble and sand substrate, no cover
7	Moderate-sloped, cobble and silt substrate, no cover
8	Steep-sloped, bedrock, boulder and crevasse cover
9	Sand and silt shoal, some SAV beds provide cover
10	Sand and silt shoal, some SAV patches provide cover
11	Moderate-sloped, sand substrate, poor cover
12	Shallow-sloped dominated by fines, with EAV beds for cover
13	Embayment with sand and silt shoal area with SAV cover
14	Embayment with silt shoal area with SAV and EAV cover

### 3.3.14-Aquatic Habitat Mapping of Turners Falls Impoundment

#### Upstream reach (~13 mi):

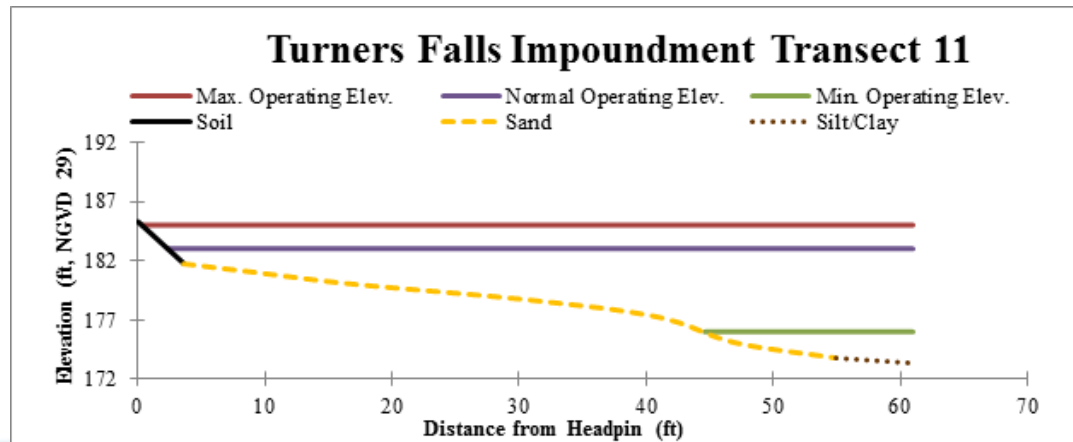
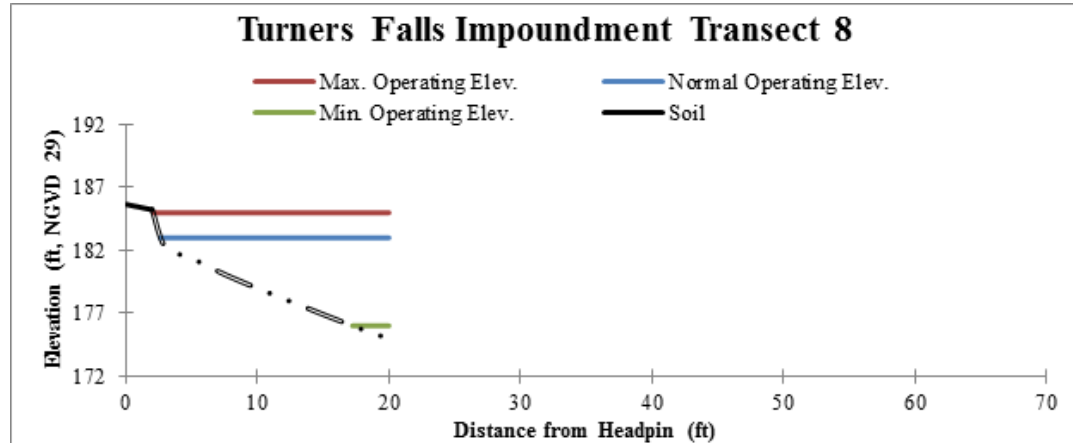
- From 1 mi below Vernon Dam to ~ Northfield Mountain tailwater.
- Relatively uniform and located within a broad floodplain.
- Substrates comprised of alluvial materials such as gravel, cobble and fines.
- Object cover limited to scattered patches of SAV and woody debris.



### **Downstream reach(~ 5 mi):**

- From Northfield Mountain tailrace to the Turners Falls dam.
- Bedrock controls much of the stream geometry and substrate features; no floodplain.
- Littoral zone absent in some locations due to vertical bedrock cliffs.
- French King gorge (1.5 mi), a high banked, narrow, steeply sloped, littoral zone confined to a narrow, almost vertical zone.
- Immediately downstream from the gorge, impoundment follows a meandering course.
- Lower impoundment geometry is complex, and defined by both bedrock and depositional features:
  - embayment, points, coves, islands and wide range of substrates
  - shallow lacustrine littoral habitat adjacent to a deeply incised thalweg
  - broad horizontal shoals composed of gravel, sand or other fines in embayed sections
  - localized dense patches of SAV and wetlands, emergent aquatic vegetation (EAV)

# 3.3.14-Aquatic Habitat Mapping of Turners Falls Impoundment



### **Study Progress**

#### **Task 1: Sampling Location Selection**

- Consulted with USFWS, MADFW and NMFS on fish assemblage sampling locations. No sampling in bypass reach for first survey due to shortnose sturgeon concerns.

#### **Task 2: Fish Capture**

- First survey completed July 6-9 (Midwest Biodiversity Institute) involved, was initially slated for week of June 22, but abandoned due to high flows. Second survey conducted week of September 21, both impoundment and bypass reach.

#### **Task 3: Data Analysis and Reporting**

- Not complete.

### **Findings (if any)**

- Based on first survey, a total of 23 fish species captured (provisional data attached).

### **Variances (if any)**

- There were no suitable shorelines available for beach seining. Areas that were adequately free of woody debris, boulder or vegetation were insufficient for net deployment. As an alternative, two shoreline areas were selected (one in Barton Cove and another near the TF yacht club) and boat electrofished, each for 500 seconds.

### **Work Remaining**

- Report to be completed by 3/1/2016.

**Fish species collected in the Turners Falls impoundment during the June and July 2015 fish assemblage survey (*provisional information*).  
Species listed in declining order of numeric abundance**

Spottail Shiner	Largemouth Bass
White Sucker	Golden Shiner
Yellow Perch	Black Crappie
Smallmouth Bass	Channel Catfish
Bluegill Sunfish	Brown Bullhead
Fallfish	Common Carp
Rock Bass	Chain Pickerel
Pumpkinseed	Sea Lamprey
Sunfish	Mimic Shiner
Tessellated Darter	Northern Pike
Walleye	American Shad
Common Shiner	
American Eel	



### 3.3.17-Assess the Impacts of Project Operations of the Turners Falls Project and Northfield Mountain Project on Tributary and Backwater Area Access and Habitat

#### **Study Progress**

##### Task 1: Field Data Collection

- Spring, Summer and Fall Surveys completed in 2014.

##### Task 2: Evaluation of Fluctuation Range

- If fluctuations create barriers to fish movement, hydraulic model would be used to determine if changes in the fluctuation range would mitigate impact.

##### Task 3: Data Analysis and Reporting

- Report posted to relicensing website on 6/30/2015 and filed at FERC on 9/14/2015.

#### **Findings (if any)**

- Outflow from the three large tributaries is controlled by dams upstream of the confluence with the Connecticut River.
- The 16 small, low order tributaries exhibit natural seasonal flow variability, which affects the character (depth, flow, water velocities, substrate, sediment deposition, erosion, scour, etc.) of the streams and their confluences.
- Most confluences were determined to provide suitable access for riverine fishes.
- For the three with observed restrictions, it was found that barriers were localized and temporary resulting from factors such as sediment deposition and woody debris accumulation.
- Overall, the study results indicate that the effects of Project-related water fluctuations on tributary access and aquatic habitat conditions are minimal.



#### **Variations (if any)**

- As reported in 2014, although the RSP envisioned that surveys would be performed with a sub-meter accuracy GPS and aerial imagery, delineation of the perimeter was hindered by extensive mud deposits, and dense canopy over the tributaries reduced the accuracy and connectivity of the GPS and obscured the tributary in aerial photos.
- The study team therefore delineated the upstream extent of the confluence with sub-meter GPS and LiDAR data in conjunction with field data to map the confluence perimeters.

#### **Work Remaining**

- None.

## 3.3.2-Evaluate Upstream and Downstream Passage of Adult American Shad

### Study Progress

#### Task 1: Review Existing Information

- Review of the data has led to a collaborative effort between Conte Lab and FL to develop more rapid telemetry data reduction techniques.

#### Task 2: Study Design and Methods

- Adult shad used in the evaluation were collected at the Holyoke fish lift and within the Cabot Ladder at Turners Falls using the existing fish trapping facilities.
- Tagging occurred on 12 days in the months of May and June, 2015 with approximately half of the shad tagged with radio and PIT tags (double tagged) (n=397) and half tagged with PIT only (n=396).

Date of Collection/Release	Collection Location	Release Location	Number of Double Tagged Shad	Number of PIT only Shad	Total Tagged and Released
5/6/15	Holyoke	Holyoke	72	1	73
5/7/15	Holyoke	Holyoke	0	72	72
5/12/15	Holyoke	Holyoke	48	1	49
5/13/15	Holyoke	Holyoke	0	47	47
	Cabot	Canal	25	25	50
5/15/15	Holyoke	TFI	33	29	62
5/16/15	Cabot	TFI	33	33	66
5/18/15	Cabot	Canal	0	25	25
5/19/15	Holyoke	Holyoke	48	48	96
	Cabot	Canal	25	0	25
5/22/15	Holyoke	Impoundment	33	33	66
5/23/15	Cabot	TFI	33	33	66
5/26/15	Holyoke	Holyoke	24	24	48
6/8/15	Holyoke	Holyoke	23	25	48
<b>Totals</b>			<b>397</b>	<b>396</b>	<b>793</b>

## 3.3.2-Evaluate Upstream and Downstream Passage of Adult American Shad

### Task 2: Study Design and Methods (cont)

- Tracking occurred at 30 telemetry and PIT tag stationary locations.
- Mobile tracking of radio tagged shad was conducted weekly between Holyoke and the Mount Herman School. A second day of weekly tracking concentrated on the area between the Hatfield S curve and Cabot Station.
- A total of 21 days of mobile tracking were conducted between May 15 and July 7, 2015.

### Task 3: Evaluation of Mortality

- Mortality was assessed using mortality tags from Sigma Eight. All shad were tagged with Pisces Transmitter (tags) operating on five frequencies

### Task 4: Reporting

- A workshop will be scheduled this winter with stakeholders to review results and accept input before final report is written.
- A final report will be completed by September 1, 2016.

### **Findings (if any)**

- Data Analysis in Progress

### **Variances (if any)**

- 100 shad were to be collected at the Cabot fish ladder and released into the TFI. However, due to a miscommunication 132 shad were collected at the Cabot ladder and released into the TFI. Thus a greater number of shad were collected at Cabot and released in the TFI and fewer fish were collected and released at Holyoke than planned. This reduction represented 6% of all the fish released at Holyoke.

### **Work Remaining**

- Report to be completed by 9/1/2016.



### 3.3.15- Assessment of Adult Sea Lamprey Spawning within the Turners Falls Project & Northfield Mountain Project Area

#### Study Progress

##### Task 1: Field Data Collection

- 40 adult sea lamprey were collected from the Holyoke fish lift and transported to two locations (Rt.116 Bridge in Sunderland and the Turners Falls Impoundment) where they were radio-tagged and released. Half the lampreys (20) were tagged and released during the early portion of their run (5/21/15); ten of the 20 were released at the Rt. 116 Bridge and ten were released upstream of Turners Falls Gatehouse. The other half was released during the mid-portion of their run (5/28/15) at the same two release locations.
- Sea lamprey were mobile-tracked twice weekly; tracking was conducted by boat using a Lotek receiver and a 3-element yagi antenna. Weekly tracking was first conducted from Holyoke Dam to the Mount Herman School and second from the Hatfield S curve to Cabot Station. A total of 17 days of mobile tracking occurred between 6/3/15 & 7/7/15.
- A total of 30 redds were GPS located in five (5) distinct regions of the Project

Project area	Number of GPS located redds	Number of Capped redds
Above Turners Falls Dam, Connecticut River mainstem within close proximity of Vernon Dam (both sides of Stebbins Island)	7	1
Above Turners Falls Dam, Ashuelot River confluence with the Connecticut River	11	1
Above Turners Falls Dam, Millers River confluence with the Connecticut River	5	1
Below Turners Falls Dam in bypass, Fall River confluence with the Connecticut River	2	1
Below Turners Falls Dam and Cabot Station, Hatfield S curve below Rt. 116 Bridge	5	1
<b>Totals</b>	<b>30</b>	<b>5</b>

## 3.3.15- Assessment of Adult Sea Lamprey Spawning within the Turners Falls Project & Northfield Mountain Project Area

### Task 1: Field Data Collection (cont.)

Each of the GPS located redds was monitored every third day for several parameters including substrate, depth, water velocity and water quality (temperature, dissolved oxygen (DO), turbidity, pH, conductivity). Five of the 30 redds were capped using a 4x4ft, weighted PVC framed collection net (1mm mesh) funneling into a collection jar on the downstream end in order to capture emerging larvae.

### Task 2: Data Analysis

All radio telemetry and redd data were compiled, entered into a database, assured for quality, and archived. Data analysis and reporting are in process.

### Task 3: Report

- A final report will be completed by June 1, 2016.

### **Findings (if any)**

- None yet

### **Variances (if any)**

- No variances

### **Work Remaining**

- Data Analysis
- Report

## 3.3.4- Evaluate Upstream Passage of American Eel (Year 2 of 2 Year Study)

### **Study Progress**

#### Task 1: Systematic Surveys (2014)

- Completed in 2014.
- Year 1 Study Report uploaded to relicensing website on 3/31/2015 and filed with FERC on 9/14/2015.

#### Task 2: Trap Collection (2015)

- Stakeholder site visit held on 5/7 to locate eel ramp locations.
- Temporary eel ramps installed in early July at Cabot Emergency Spill Gate, Cabot Ladder and Spillway Ladder after consultation with Alex Haro and other stakeholders. Medusa traps placed below Station No. 1.
- Being monitored ~ 3x/week - captured fish moved above TF Dam. Traps in place until October 2015.

#### Task 3: Data Analysis

- Not complete.

#### Task 4: Report

- Not complete.

### **Findings (if any)**

- Year 2: All eel ramps operating properly. Similar to the systematic surveys, most eels are detected in the Spillway ladder.

### **Variances (if any)**

- 2014: On 6/26/2014, certain areas not surveyed for safety reasons. After 7/17/2014, due to the lack of eels detected some sites were eliminated from further survey.
- 2015: RSP indicated eel ramp inclines should be 35°. As installed, the incline of the ramps was 38°, 40°, and 43° at the Spillway fishway, Cabot fishway and Cabot spill gate eel ramps, respectively.

### **Work Remaining**

- Data analysis and report complete by 3/1/2016.

### 3.3.4- Evaluate Upstream Passage of American Eel (Year 2 of 2 Year Study)



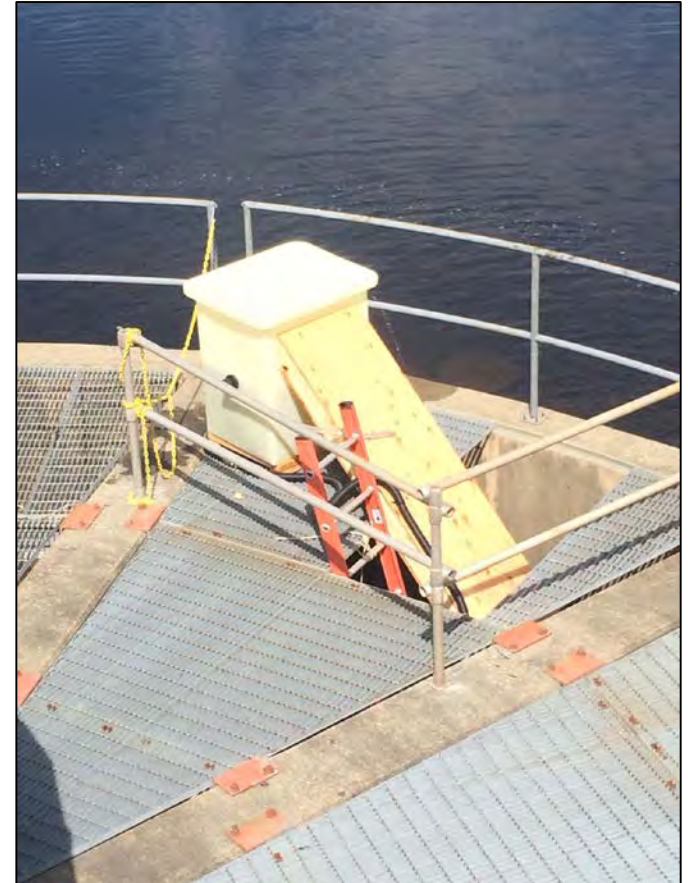
Cabot Emergency Spillway Eel Ramp



### 3.3.4- Evaluate Upstream Passage of American Eel (Year 2 of 2 Year Study)



Spillway Ladder Trap



Cabot Ladder Trap



### 3.3.3-Evaluate Downstream Passage of Juvenile American Shad

#### Study Progress

##### Task 1: Evaluation of Timing, Duration and Magnitude of Migration

- The juvenile shad emigration timing, duration and magnitude are being evaluated using split beam sonar which was installed on July 9, 2015.
- Data collection began on August 15, 2015 and will continue to end of October, 2015.
- 4 split beam systems were installed at: Cabot Station (2); Turners Falls Power Canal; and Northfield tailrace.
- The downstream fish bypass at Cabot Station will be sampled during 12 to 18 evenings to ground truth the hydroacoustic data and compare the percent of juvenile shad passing via the Cabot sampler and Cabot Station. Sampling began in September 2015 and continue through October.

##### Task 2: Evaluate Route of Passage

- Installation of the radio telemetry equipment occurred in late August, 2015 with the study initiated in mid-to-late September.
- A total of 224 larger juvenile shad will be tagged externally using the Lotek NanoTag Series model NTQ – 1. This is the smallest radio tag currently available.
- Tagged shad will be released about 2 mi upstream of the Northfield Mountain Project intake/tailrace and at least 1 mi upstream of the Turners Falls Dam.
- The releases will occur on six days and tagged fish will be monitored at 13 antenna locations within the study area.

##### Task 3: Turbine and Dam Passage Survival

- The turbine and dam passage survival study will determine rates of survival for juvenile shad entrained at No. 1 and Cabot Stations, and spilled over the dam using HI-Z Turb'N tags.
- 150 tagged juvenile shad will be released into the turbines for testing and an additional 150 will be released into the tailrace as controls. An additional 125 tagged juvenile shad will be released above the dam.

##### Task 4: Reporting

- Not complete.

### 3.3.3-Evaluate Downstream Passage of Juvenile American Shad

#### **Findings (if any)**

- Study ongoing.

#### **Variations (if any)**

- The specification for the radio tags have been changed.
- A Gatehouse monitoring station was added.
- A Cabot Station tailrace monitoring station was added.
- FL proposes to conduct the first turbine survival tests running both Station No. 1 Units 2 and 3 together, rather than running Unit 2 alone.
- FL proposes to inject a total of 120 juvenile shad above bascule gate 1 (60 juvenile shad), bascule gate 4 (60 juvenile shad).

#### **Work Remaining**

- Field Studies.
- Data Analysis.
- Report to be completed by 9/1/2016.

### 3.3.5- Evaluate Downstream Passage of American Eel (2015 & 2016 Study)

#### **Study Progress**

##### Task 1: Evaluation of Timing, Duration and Magnitude of Migratory Movement

- In order to optimize the split beam transducers spatial coverage of the targeted areas, field testing was performed in August 2014.

##### Task 2: Assessment of Downstream Passage of American Eel

- Data collection began on August 1, 2015 and will continue through the end of October, 2015. Silver eels will be tagged and released at strategic points of interest to assess general passage routes.

##### Task 2a: Northfield Mountain Route Selection Study

- One split beam sonar unit (with four transducers) was installed at the Northfield Mountain Project intake. Telemetry receivers were installed at the intake and in the upper reservoir.

##### Task 2b: Turners Falls Dam Route Selection Study

- Two split beam sonar units (each with four transducers) were installed at the Cabot Station intake and one unit was installed within the Turners Falls power canal in the vicinity of the 6th Street Bridge. A dual frequency identification sonar (DIDSON) unit was installed in the power canal adjacent to the split beam system. A total of 19 radio telemetry monitoring stations were installed throughout the Turners Falls Project area, covering approximately eight river miles.

##### Task 2c: Mobile Tracking

- Mobile tracking (i.e., via boat, vehicle, or by foot) in river reaches between release sites and 5 km downstream of Cabot Station will be performed on a weekly basis during and after releases to confirm routes and fates of passed fish. Tracking will occur until the tagged eels leave the study area or water temperatures at 5°C.

##### Task 3: Data Management, Analysis and Reporting

- Not complete.

### 3.3.5- Evaluate Downstream Passage of American Eel (2015 & 2016 Study)

#### **Findings (if any)**

- Study ongoing.

#### **Variances (if any)**

- The RSP envisioned conducting the testing at two turbines at Station No. 1 (one to represent the four larger turbines and one at the smaller turbine, Unit 2). It was determined that the velocity at the smaller unit is not high enough to ensure entrainment. Typical operations include tandem operation of Unit 2 and Unit 3.
- FL proposes to conduct the first turbine survival test running both Units 2 and 3 together (50 adult eels) and then perform a second test at one of the larger units with an additional 50 adult eels. By setting up the tests in this manner, survival at both the smaller and larger units can be estimated.

#### **Work Remaining**

- Field Studies
- Data analysis
- Report to be completed by 3/1/2017.



### 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 Progress**

##### Task 1: Development of Detailed Study Design

- After consultation in early 2015, a final study design plan was sent out on 4/27/2015.

##### Task 2: Examination of Known Spawning Areas between Cabot and Rte 116 Bridge

##### Task 3: Identification of Spawning Areas in TF Impoundment

##### Task 4: Identification of Spawning Areas in TF Canal, Rock Dam and Station No. 1

##### Task 5: Examination of Identified Spawning Areas in TF Canal

- Field work completed between 5/19 to 6/24/2015.

##### Task 6: Data Analysis and Reporting

- Not Complete.

#### **Findings (if any)**

- Because minimal shad spawning activity was observed in the Turners Falls Canal, no spawning areas in the canal were identified for further examination.
- The largest concentration of spawning areas occurred between Cabot Station and the Rte 116 bridge.
- Spawning in the impoundment took place in the vicinity of Stebbins Island.

#### **Variances (if any)**

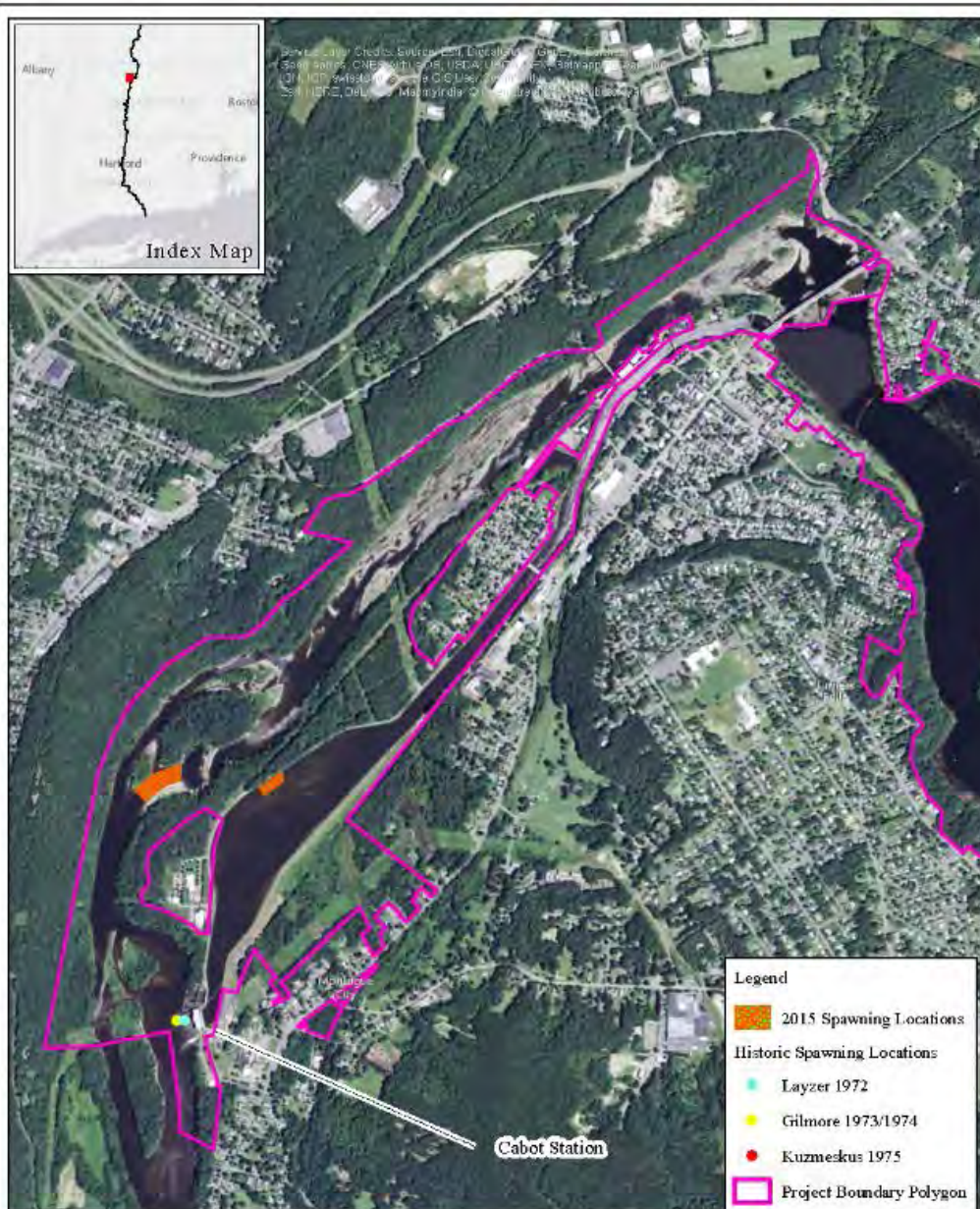
- Survey terminated on 6/24 (6/30 was the proposed end date) because spawning activity was not observed during the 6/24 survey.

#### **Work Remaining**

- Report to be completed by 3/1/2016.







## Shad Spawning in the Turners Falls Bypass Reach and Canal

Northfield Mountain Pumped Storage Project (No. 2485)  
 and Turners Falls Hydroelectric Project (No. 1889)  
 RELICENSING STUDY 3.3.6

Figure 3  
 Shad spawning location identified in Turners Falls and Bypass Reach

Copyright © 2015 FirstLight Power Resources. All rights reserved.



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

### **Study Progress**

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

- An amended study plan was developed based on the consultation.
- Field work completed September 29 – October 2, 2014.

#### **Task 2: Identify and Assess Potential Measures**

- See Findings, below.

#### **Task 3: Design Selected Measure**

- See Findings, below.

#### **Task 4: Report**

- Report for Task 1 posted to relicensing website on 3/31/2015 and filed with FERC on 9/14/2015.

### **Findings (if any)**

- Results of this study demonstrated little impact to organisms in the canal during the drawdown. To further enhance aquatic organism survival, FL has identified the following potential measures: draw the canal down at a rate similar to what occurred in 2014 to allow time for fish to exit the canal, and for mussels and sea lamprey ammocoetes to burrow into sediment; and establish travel zones for heavy machinery within the canal to minimize the area disturbed.

### **Variances (if any)**

- None.

### **Work Remaining**

- None.

## 3.3.19- Evaluate the Use of an Ultrasound Array to Facilitate Upstream Movement to Turners Falls Dam by Avoiding Cabot Station Tailrace (2016 Study)

### **Study Progress (2016 Study)**

#### **Task 1: Ultrasound Deployment**

- Plans are in progress 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 shad moving by Cabot Station by monitoring shad behavior.
- 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**

- Study not started until 2016.

#### **Findings (if any)**

- None.

#### **Variances (if any)**

- None

#### **Work Remaining**

- Conduct Study spring 2016
- Data Analysis
- Report to be completed by 3/1/2017.

## 3.3.7-Fish Entrainment and Turbine Passage Mortality Study

### **Study Progress**

#### Task 1: Qualitative Assessment of Entrainment and Impingement

- A preliminary assessment of entrainment risk was performed for resident species documented in previous studies. Results from the Fish Assemblage Assessment (Study No. 3.3.11, conducted September 2015) is needed to complete the desktop analyses for resident species.

#### Task 2: Quantification of Shad and Eel Entrainment

- Not complete – need to complete juvenile shad (3.3.3) and adult eel (3.3.5) turbine mortality studies.

#### Task 3: Estimation of Turbine Mortality Rates

- Plan to test turbine mortality for juvenile shad and adult eels week of October 12 to 16, 2015.

#### Task 4: Report

- Not Complete.

### **Findings (if any)**

- Data analysis has not yet begun and will commence upon completion of field data collection in the fall of 2015.

### **Variances (if any)**

- None to date.

### **Work Remaining**

- Results from the Fish Assemblage Assessment (Study No. 3.3.11, to be conducted in 2015) will be necessary to complete the desktop analyses for resident species.
- Entrainment and turbine mortality of juvenile and adult American shad and adult American eel will be estimated using hydroacoustic and radio telemetry data (Study Nos. 3.3.2, 3.3.3, and 3.3.5).
- Report to be completed by 10/1/2016.

### 3.3.20- Ichthyoplankton Entrainment Assessment at the NFM

#### Study Progress

##### Task 1: Entrainment Sampling

- Entrainment sampling to collect American shad eggs and larvae (ichthyoplankton) was accomplished by tapping off of existing piping that supplies cooling water from the Connecticut River to the station.
- PVC and rubber piping, a digital flow meter, a 1,000-liter plastic tank, and a 0.333 mm mesh plankton net were utilized to construct the sampling system.
- 100-200 cubic meters of intake water at a rate of 3 and 3 ½ gallons per second was filtered for each sample.
- At least once per week samples were collected every 2 hours during a pumping cycle.
- Sample collection was initiated at least 30 minutes after the pumping cycle began to ensure the water was well mixed.
- Weekly samples were designated as **random** because the number of pumps operated was not controlled.
- Pumpback operations were manipulated to specifically sample operations with 1 2, 3, and 4 pumps running (**Scenario** samples). Scenario samples were intended to coincide with peak shad spawning:

Scenario 1: 1 pump operational (Unit 2)

Scenario 2: 2 pumps operational (Unit 2 and one other)

Scenario 3: 3 pumps operational (Unit 2 and two others)

Scenario 4: All 4 pumps operational



### 3.3.20- Ichthyoplankton Entrainment Assessment at the NFM

Sample Number	Rep	Date	Regime Number of Pumps
1	1	5/28/2015	Random 3
2	2	5/28/2015	Random 3
3	1	6/5/2015	Random 3
4	2	6/5/2015	Random 3
5	1	6/9/2015	Scenario 4
6	2	6/9/2015	Scenario 4
7	1	6/10/2015	Scenario 3
8	2	6/10/2015	Scenario 3
9	1	6/11/2015	Random 1-3
10	2	6/11/2015	Random 3
11	1	6/15/2015	Random 1-3
12	2	6/15/2015	Random 1-4
13	1	6/18/2015	Scenario 2
14	2	6/18/2015	Scenario 2
15	1	6/19/2015	Scenario 1
16	2	6/19/2015	Scenario 1
17	1	6/26/2015	Random 1-3
18	2	6/26/2015	Random 3
19	1	7/1/2015	Random 1-2
20	2	7/1/2015	Random 3
21	1	7/8/2015	Random 4
22	2	7/8/2015	Random 4
23	1	7/17/2015	Random 1

## 3.3.20- Ichthyoplankton Entrainment Assessment at the NFM

### Task 2: Sample Processing

- Samples are currently being sorted by staff biologists with the aid of a dissecting microscope.
- American shad larvae and eggs will be removed from the samples, identified to the lowest practical taxonomic category, and enumerated.
- A quality control program designed to ensure that the Average Outgoing Quality Limit for sorting and identification is greater than 90% will be followed.

### Task 3: Ichthyoplankton Data Analysis Methods

#### ***Entrainment Estimates***

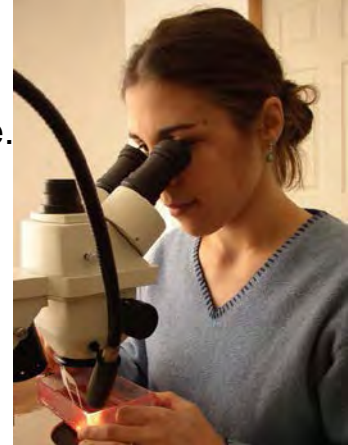
Entrainment estimates for American shad eggs and larvae will be derived based on the extrapolation of raw counts using a volumetric ratio and summing of weekly estimates derived from samples. The daily water volume pumped will be calculated based on daily average flow rates obtained from Northfield Mountain Project personnel. An estimate for each day not sampled will be calculated by multiplying the average entrainment density for a weekly time period by the total number of days sampled in that week by the volume of water used on each day not sampled.

#### ***Equivalent Adult Estimates***

The numbers of entrained fish larvae and eggs will be converted into adult equivalents to determine population impact.

Adult equivalent losses (AELs) are estimates of the number of entrained organisms removed from the population that

otherwise would have survived to some future age, or age of equivalence.



### Task 4: Report

- Not complete.

### Findings (if any)

- Not complete.

### Variances (if any)

- None to date.

### Work Remaining

- Finish sample sorting.
- Data entry and analysis.
- Final Report.
- Report to be completed by 3/1/2016.

## Study Progress

### Task 1 – Analysis of Existing Data

- Analysis provided in ISR. Questions raised at ISR meeting were addressed in the ISR meeting summary-- data presented as cfs (vs no. of gates opened) and whether the gates were opened for emergency or non-emergency reasons.
- On 3/18/2015, FL provided stakeholders with a memo containing additional analysis. On 3/24/2015, FL held a meeting to discuss the additional data analysis.

### Task 2: Scenario Development

- Contingent on whether additional field study is required.

### Task 3: Field Verification of Conditions

- FL proposes to use the two-dimensional hydraulic model that is being developed as part of Study No. 3.3.1 (Instream Flow Study) for Reach 3 to assess the potential for sediment impacts (scour and deposition) to sturgeon spawning areas in the river reach just downstream of Cabot Station.

### Task 4: Data Analysis and Reporting

- FL will conduct the remaining data analysis once the River 2D model is completed for the instream flow study as described in Study No. 3.3.1.



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



### 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



### **Findings**

- Spill gate operation was documented in the Initial Study Report.

### **Variances**

- FL is proposing to utilize 2D modeling to assess potential impacts, in lieu of field data collection.

### **Work Remaining**

- Apply River2D model.
- Assess results.
- Complete report by 3/1/2016.

### **Study Progress**

#### Task 1: Develop Sampling Plan

- Field Sampling Plan filed with ISR.

#### Task 2: Dissolved Oxygen (DO) and Temperature Monitoring

- 18 Monitoring Sites
- Temperature: April through mid-November
- Dissolved Oxygen: June through September
- Biweekly site visits to download data and calibrate meters.

#### Task 3: DO and Temperature Profiles

- Three profile sites in the Turners Falls Impoundment
- Biweekly vertical profiles
- April through mid-November

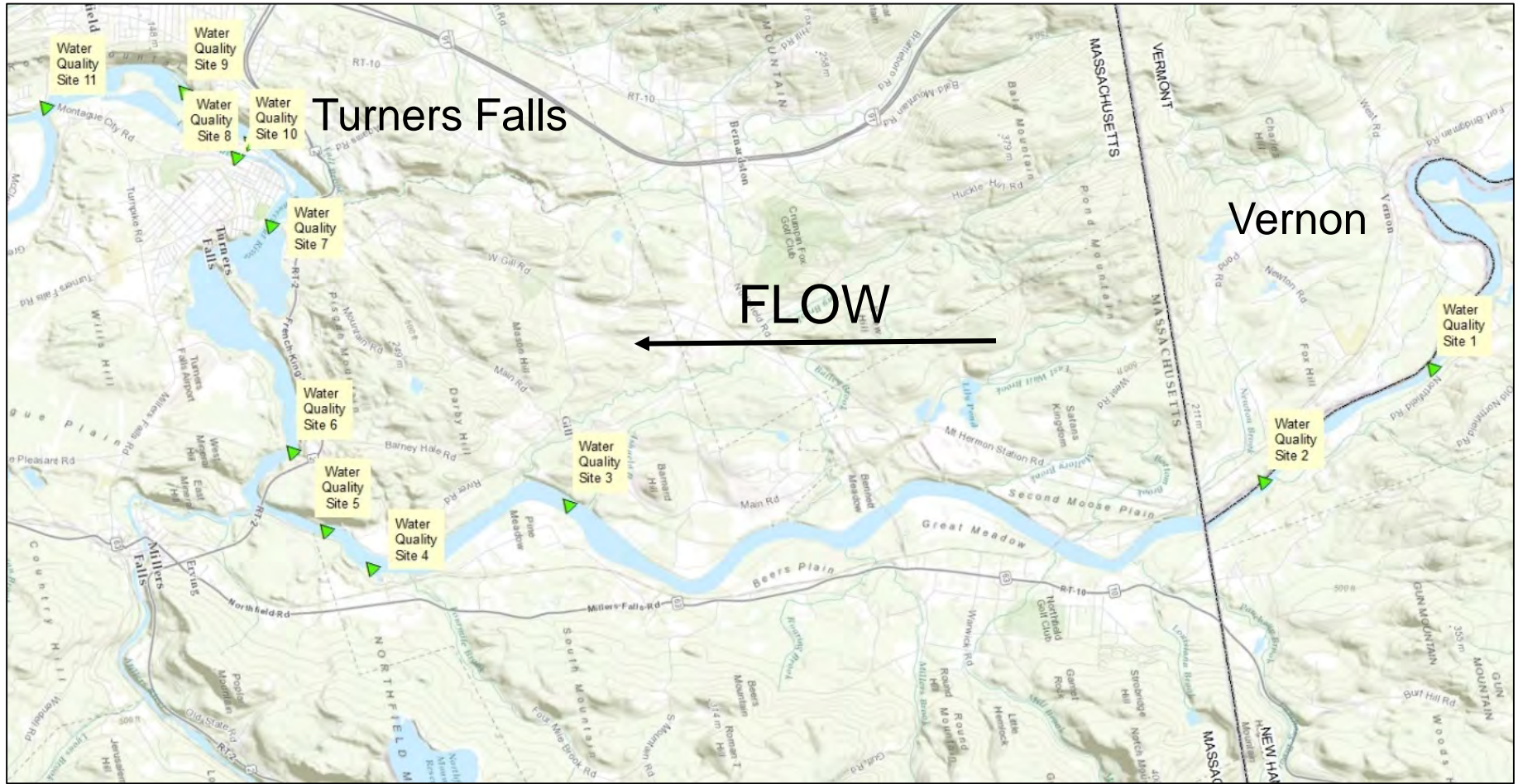
#### Task 4: Report

- Not complete.

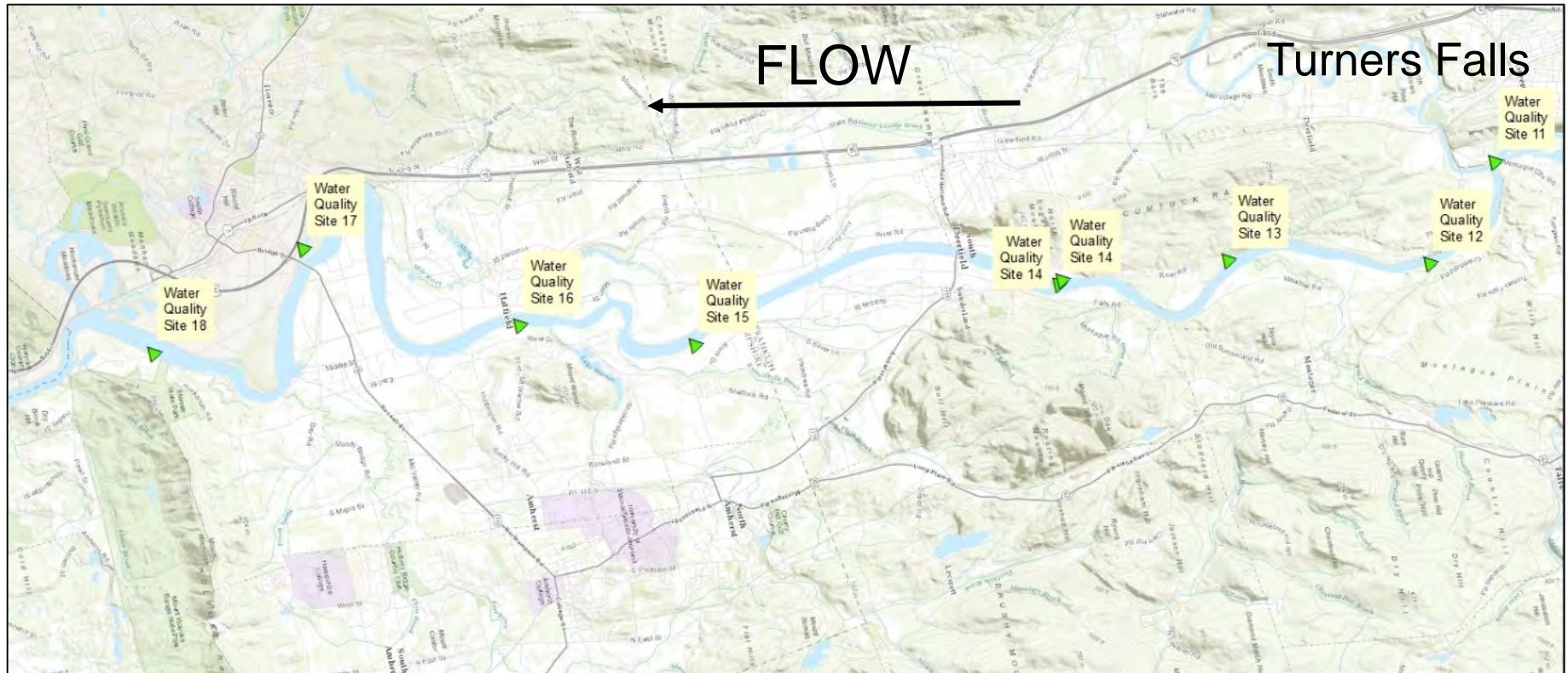
### **Variations**

- Temperature loggers installed April 3-10, due to ice cover.
- Station 7 at boat barrier installed in May 14 due to ice cover and high flows.
- Station 10 and Station 12 location.

### 3.2.1-Water Quality Monitoring Study



### 3.2.1-Water Quality Monitoring Study



## 3.2.1-Water Quality Monitoring Study

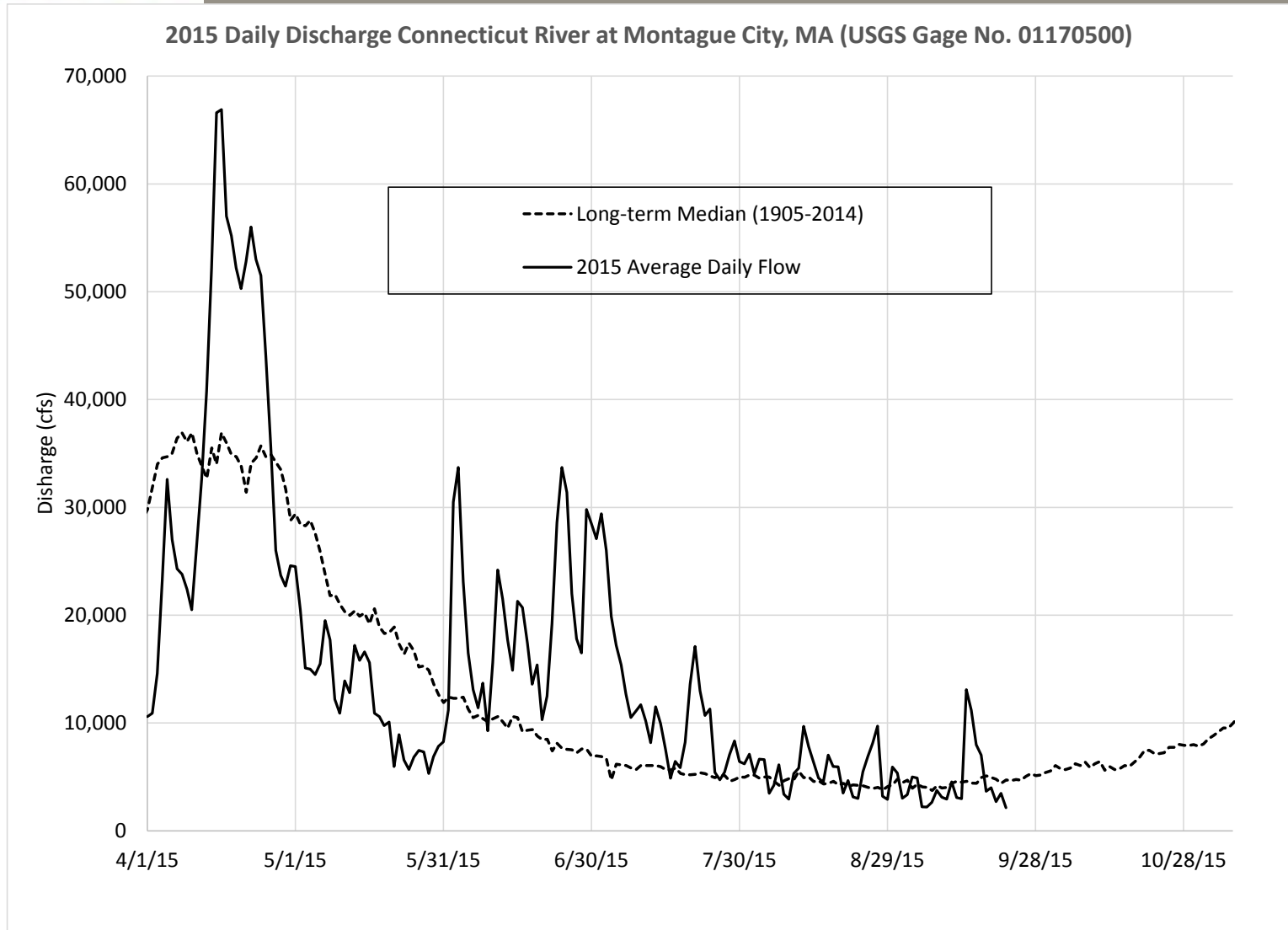
### **Findings**

- Turners Falls Impoundment does not stratify.
- DO levels high.
- Water temperature results similar from site to site.
- Operational effects not evaluated at this time.

### **Work Remaining**

- DO data collected through 9/30/2015.
- Water temperature data collected through mid-November.
- Data analysis and report to be completed by 3/1/2016.

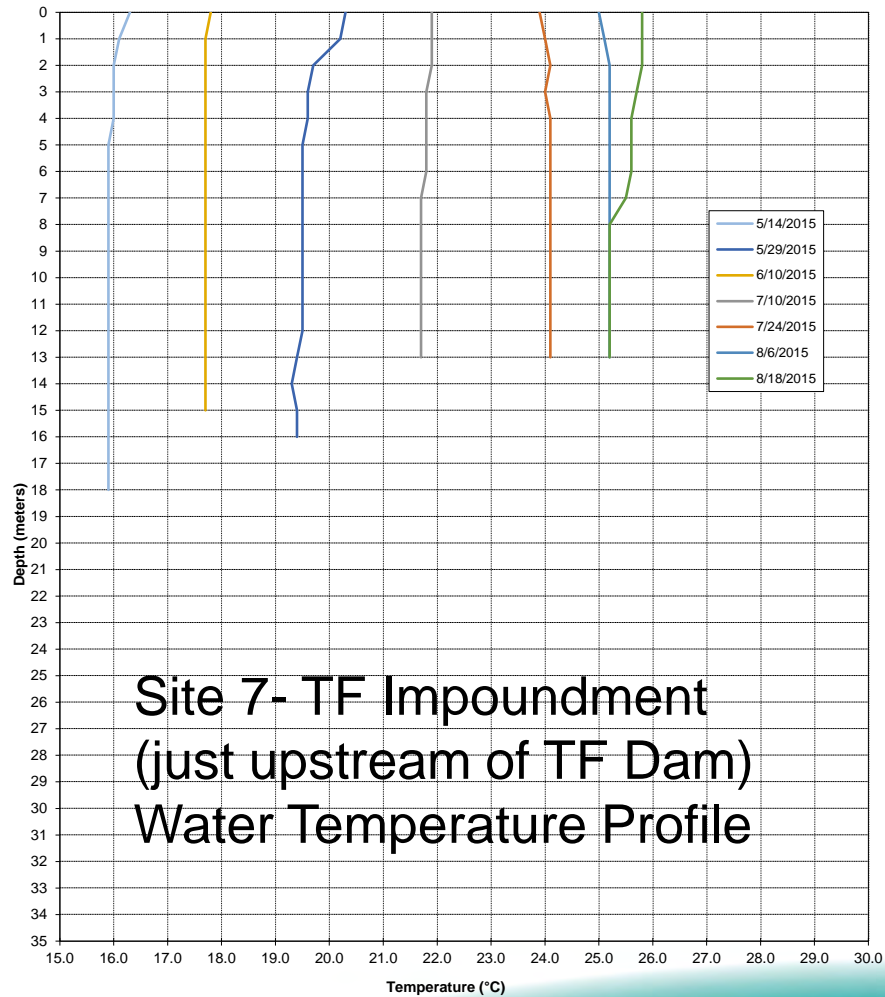
### 3.2.1-Water Quality Monitoring Study



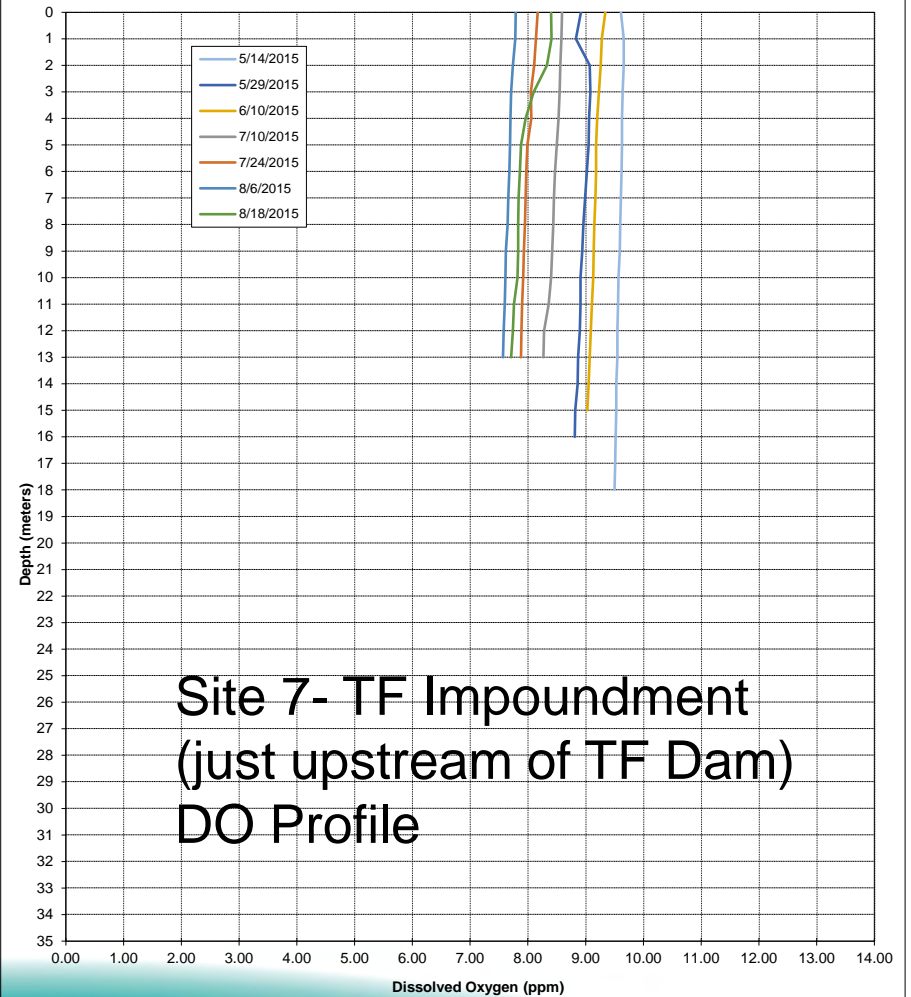


# 3.2.1-Water Quality Monitoring Study

Turners Falls Impoundment (Site 7)  
Water Temperature Profiles  
2015



Turners Falls Impoundment (Site 7)  
Dissolved Oxygen Profiles  
2015



### 3.3.10-Assess Operational Impacts on Emergence of State-Listed Odonates in the Connecticut River

#### **Study Progress**

##### Task 1: Review of Existing Information

- Some existing information reviewed to provide context for Phase 1 results and to help plan for Phase 2 fieldwork
- A more comprehensive review and synthesis will be provided in the final report.

##### Task 2: Finalize Study Plan and Attain Collection Permit

- Meeting held with NHESP and USFWS on April 28, 2015 after Task 3 was completed.
- Concurrence on methods and site selection was reached at the meeting.
- Field sampling plan provided with USR.

##### Task 3: Qualitative Surveys for Larvae and Exuviae to Determine Species Preference

- Field work was completed at 8 sites in May and June 2014.
- Phase 1 report summarizing Task 3 was included on FL's website in April 2015 and filed with USR.

##### Task 4: Quantitative Surveys of Emergence/Eclosion Behavior

- FL conducted quantitative surveys at five sites in the Connecticut River.
  1. Barton Cove (Gill)
  2. Rock Dam in the bypass reach (Montague)
  3. Area from bike path bridge to Montague City Road, opposite the Deerfield River confluence (Montague)
  4. DFW conservation lands on the eastern shore upstream from the Sawmill River confluence (Montague)
  5. Eastern shore near the Route 116 Bridge (Sunderland)
- Six transects at each site.
- Late May – Early September, biweekly

### 3.3.10-Assess Operational Impacts on Emergence of State-Listed Odonates in the Connecticut River

#### **Study Progress**

##### Task 5: Water Fluctuations and Assessment

- Temporary loggers installed at most locations. Permanent gages (TF Dam and USGS gage) will also be used.
- Assessment not complete

##### Task 6: Report

- Not complete

#### **Findings**

- Qualitative surveys documented species assemblage, habitat and emergence and eclosure patterns.
- Quantitative surveys: For each exuvia and teneral, the vertical height above the water's surface, the horizontal distance from the water's edge, and its eclosure structure/substrate was recorded. Each exuvia and some tenerals were collected, labeled with site information and date, and preserved for later species identification.

#### **Variances**

- Included one additional qualitative survey site near the Route 116 Bridge to compare species composition here to areas farther upstream.
- Addition of approximately 7 days of fieldwork to collect additional information on emergence behavior in an attempt to increase sample sizes (especially for rare species).

#### **Work Remaining**

- Synthesis of existing information, identification of samples, data entry and analysis, the water fluctuation impact assessment, and preparation of the quantitative survey report (to be completed by 3/1/2016)

### **Study Progress**

#### Task 1: Finalize Study Plan

#### Task 2: Mussel Survey and Habitat Assessment

- Task 1 and 2 are complete. In June 2014, a habitat assessment was completed throughout the 13-mile reach of the Connecticut River between Cabot Station and the Sunderland Bridge. A summary report of these findings was posted to the relicensing website in January 2015.

#### Task 3: Develop Binary HSI Curves for State-Listed Mussel Species documented in the Project Area

- Delphi panel established
- The three target species include Yellow Lampmussel (*Lampsilis cariosa*), Tidewater Mucket (*Leptodea ochracea*), and Eastern Pondmussel (*Ligumia nasuta*). All found in “Reach 5.”

#### Task 4: Effects of Flow Regime on State-Listed Mussels

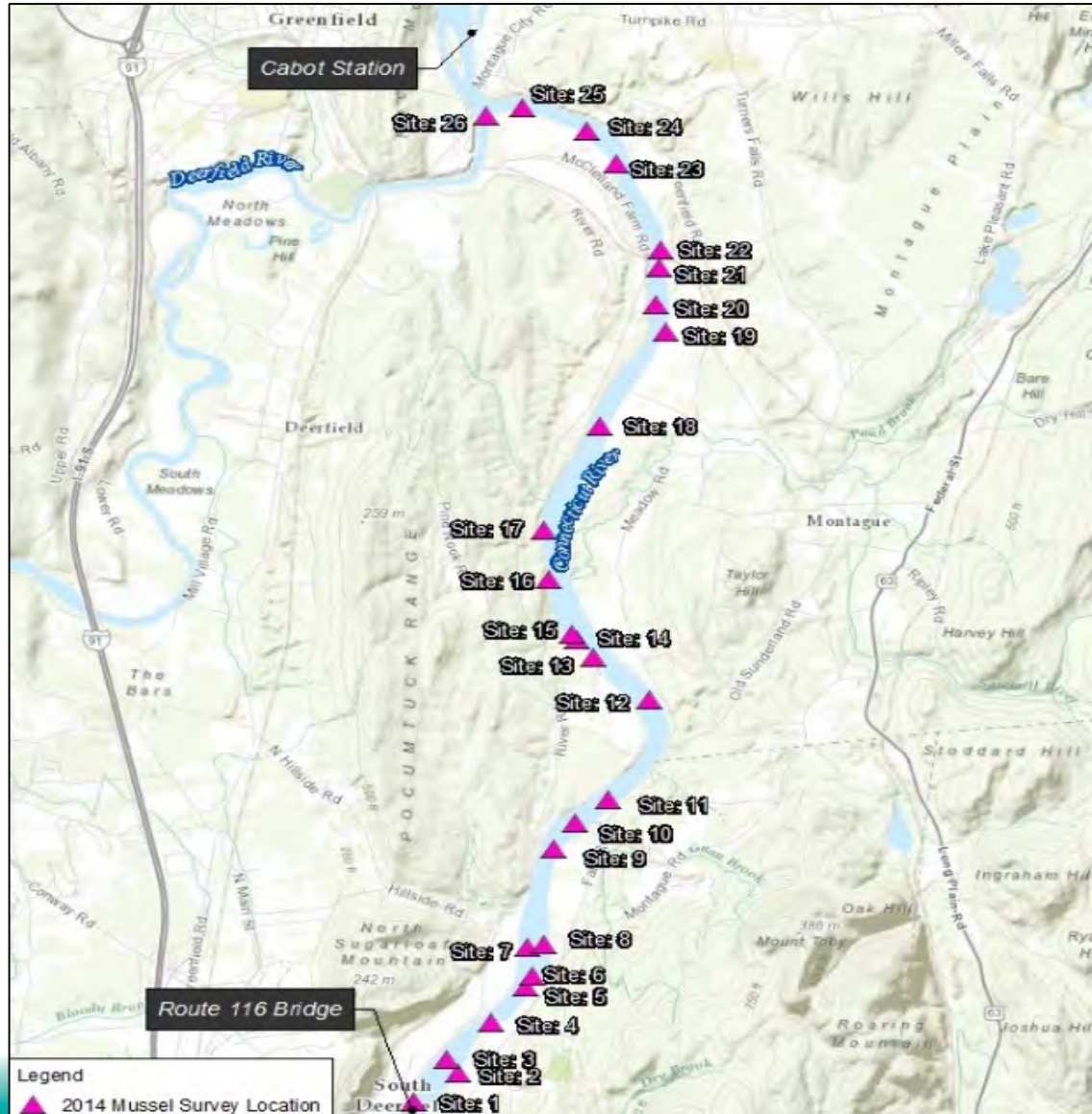
- This task will occur once the HSI criteria are complete.

#### Task 5: Report

- To be completed by 3/1/2016.

### 3.3.16-Habitat Assessment, Surveys, and Modeling of Suitable Habitat for State-listed Mussel Species in CT River below Cabot Station

## 2014 Mussel Survey Sites



### **Findings**

- Summary of mussel community and habitat provided.
- The mussel community in the reach from Cabot Station to the Route 116 Bridge is dominated by Eastern Elliptio.
- No live state-listed mussels were found in the survey areas. One relic *Lampsilis cariosa* shell was found.

### **Variances (if any)**

- Schedule.

### **Work Remaining**

- Development of HSI criteria.
- HSI criteria will be used in the habitat modeling in the IFIM study (Study No. 3.3.1) to model the potential effects of flow regime on state-listed mussels.
- Completion of final report by 3/1/2016.

# Terrestrial and Wildlife Resources

## 3.4.1-Baseline Study of Terrestrial Wildlife and Botanical Resources

### **Study Progress**

#### **Task 1. Literature Review**

- Prior to field work in 2014, the literature review was completed.

#### **Task 2: Field Surveys**

- Surveys were completed from May-Sep 2014
  - Wildlife & Habitat Type Mapping
  - Botanical Surveys
  - Invasive Plant Surveys
  - NHESP vegetation plots/transects will be completed in early fall 2015

#### **Task 3: Data Analysis and Reporting**

- Plant and wildlife lists have been completed
- Mapping of invasive species has been completed

### **Findings (if any)**

- Invasive species not widespread, but do occur along the Turners Falls Impoundment. Common species that occur are Purple loosestrife, Oriental bittersweet, Japanese knotweed, and yellow iris.

### **Variances (if any)**

- NHESP forms will be completed in early fall 2015.

### **Work Remaining**

- Update vegetation type mapping with results from NHESP sample transects.
- Report to be completed following completion of NHESP sample transects (by 12/31/2015).



### 3.4.2-Effects of Northfield Mountain Project-related Land Management Practices and Recreation Use on Terrestrial Habitats

#### Study Progress

Task 1. Literature Review

Task 2: Wildlife and Habitat Type Mapping

Task 3: Vegetation Cover Type Mapping

Task 4: Invasive Plant Survey

Task 5: Land Management Practices and Recreation Use

- Completed in 2014

Task 6: Data Analysis and Reporting

- Completed and filed 9/14/2015.

#### Findings (if any)

- 35 mammal species, 23 amphibian or reptile species, and 59 species of birds.
- 13 woodland vernal pools identified.
- 179 plant species occurring in 6 NHESP Communities (as well as a ROW community and areas of development).

#### Variances (if any)

- None.

#### Work Remaining

- None.

Pool ID	Egg Masses		Pool Dimensions (Feet)	Water Depth (Feet)	Comments
	Spotted Salamander	Wood Frog			
VP-2	0	0	200x50	3.0	Spotted salamander ( <i>Ambystoma maculatum</i> ) spermatophores man-made rock-quarry
VP-3	>66	40	45x72	1.5	
VP-4	25	0	120x30	2.0	
VP-5	50	25	100x40	1.0	
VP-6	32	0	100x45	1.0	
VP-7	25	0	125x75	2.0	
VP-8	18	6	75x40	2.0	
VP-9	12	2	20x20	2.0	
VP-10	12	0	-	3.0	
VP-11	52	18	45x25	2.0	
VP-12	15	>30	-	-	red spotted newts ( <i>Notophthalmus viridescens</i> ) feeding on egg masses
VP-13	25	>500	250x50	4.0	red spotted newts ( <i>Notophthalmus viridescens</i> ) feeding on egg masses
VP-14	5	6	120x45	2	

## 3.5.1-Baseline Inventory of Wetland, Riparian and Littoral Habitat in the Turners Falls Impoundment, and Assessment of Operational Impacts on Special-Status Species

### **Study Progress**

#### Task 1. Literature Review

- Completed in 2014.

#### Task 2: Riparian and Littoral Zone Botanical Survey

- Littoral zone and SAV mapping completed in 2014.

#### Task 3: Sensitive Plant Survey

- 10 Target Species as identified by NHESP, Surveys completed in the Impoundment and from the Turners Falls Dam downstream to the Route 116 Bridge in Sunderland, MA.
- Field survey efforts assisted by Steven Johnson PhD. – NHESP approved botanist.
- Initial Recon completed in June 2014.
- A survey to gather presence/ absence data on state-listed plants at identified potential habitat and historic EO was conducted over the weeks of August 18 – October 10 2014.
- During the presence / absence survey, botanists will selected preliminary transects which will later be used to collect additional fine scale data and complete biological evaluations on representative populations.
- Fine scale data collections was completed in August of 2015.

#### Task 4: Invasive Plant Survey

- Completed in 2014, with supplemental data collection occurring in 2015.



## 3.5.1-Baseline Inventory of Wetland, Riparian and Littoral Habitat in the Turners Falls Impoundment, and Assessment of Operational Impacts on Special-Status Species

### **Study Progress**

#### Task 5: Mapping Wetlands and Waters of the United States

- Completed in 2014.

#### Task 6: Project Water Level Fluctuation Assessment

- Data collected during this study, along with the results of hydraulic modeling (Study 3.2.2), are being used to evaluate the effect of Project-related water level fluctuations on known populations of Puritan and cobblestone tiger beetles habitat. Fine scale data collected at each of 15 sensitive plant transects as well as transects surveyed in 2014 within tiger beetle habitat (Rainbow beach and North Bank) are being used along with the results of Study 3.2.2 to analyze the potential impacts.

#### Task 7: Data Analysis

- Currently underway.

#### Task 8: Reporting

- Currently underway.

### **Findings (if any)**

- Data analysis and reporting is in development.

### **Variances (if any)**

- Fine scale data collection at each of 15 survey transects was completed in August of 2015. Surveys could not be completed in 2014, as the growing season ended prior to the planned survey.

### **Work Remaining**

- Report to be completed by 12/31/2015.

# Hydraulic Modeling

## 3.2.2-Hydraulic Study of Turners Falls Impoundment, Bypass Reach and below Cabot Station

### **Study Progress**

Task 1: Update Turners Falls Impoundment HEC-RAS Model

Task 2: Installation of Water Level Recorders in Turners Falls Impoundment for Model Verification

Task 3: Model Verification and Calibration

Task 4: Unsteady Flow Model

Task 5: Contact FEMA and Obtain FIS Hydraulic Model

Task 6: Development of HEC-RAS Model and Model Calibration

Task 7: Unsteady Flow Model

Task 8: Report

- All of the above tasks are complete. Report posted to relicensing website on 6/30/2015 and filed with FERC on 9/14/2015.

### **Findings (if any)**

- See next pages.

### **Variances (if any)**

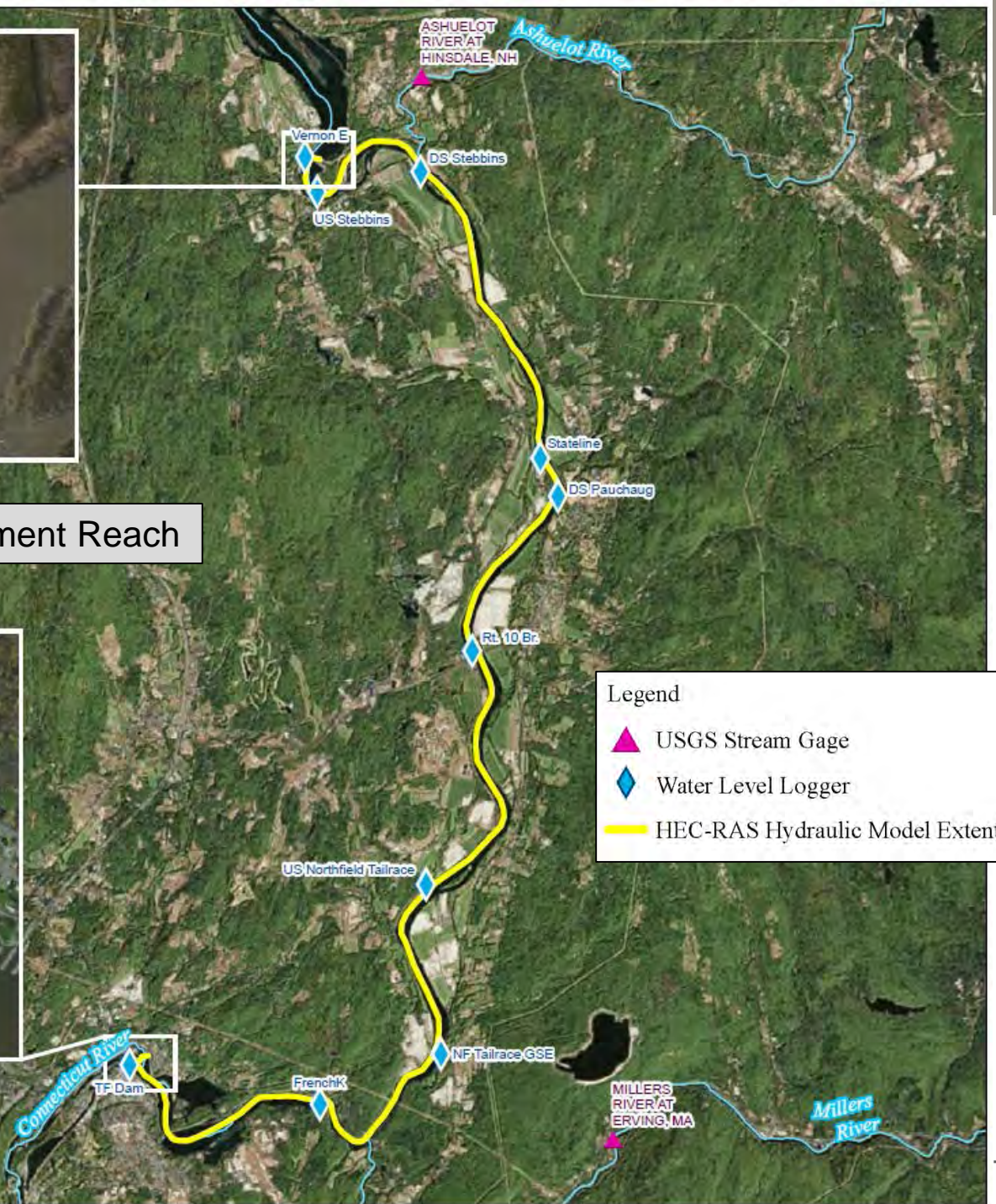
- Water level loggers were to be installed in April 2014, the logger at the French King gorge was not installed until the end of April due safety concerns. FERC's SPDL requested FL install an additional water level logger at Transect 70000. Due to vandalism concerns in this area the logger was relocated downstream to transect 69500.
- Hydraulic model – TF Dam to Holyoke Dam; modified to be Montague USGS Gage to Holyoke Dam.

### **Work Remaining**

- None.



Turners Falls Impoundment Reach

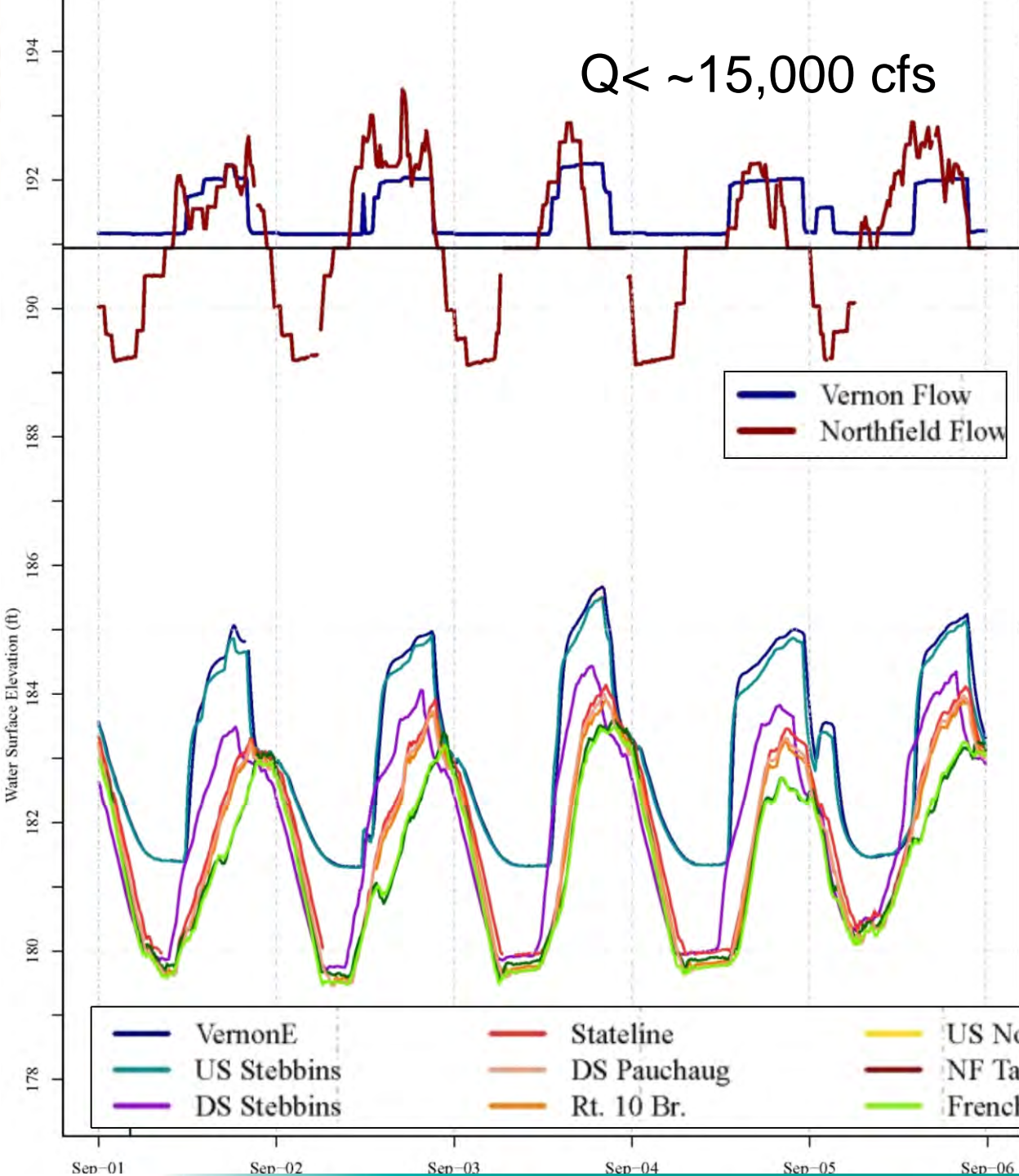


Legend

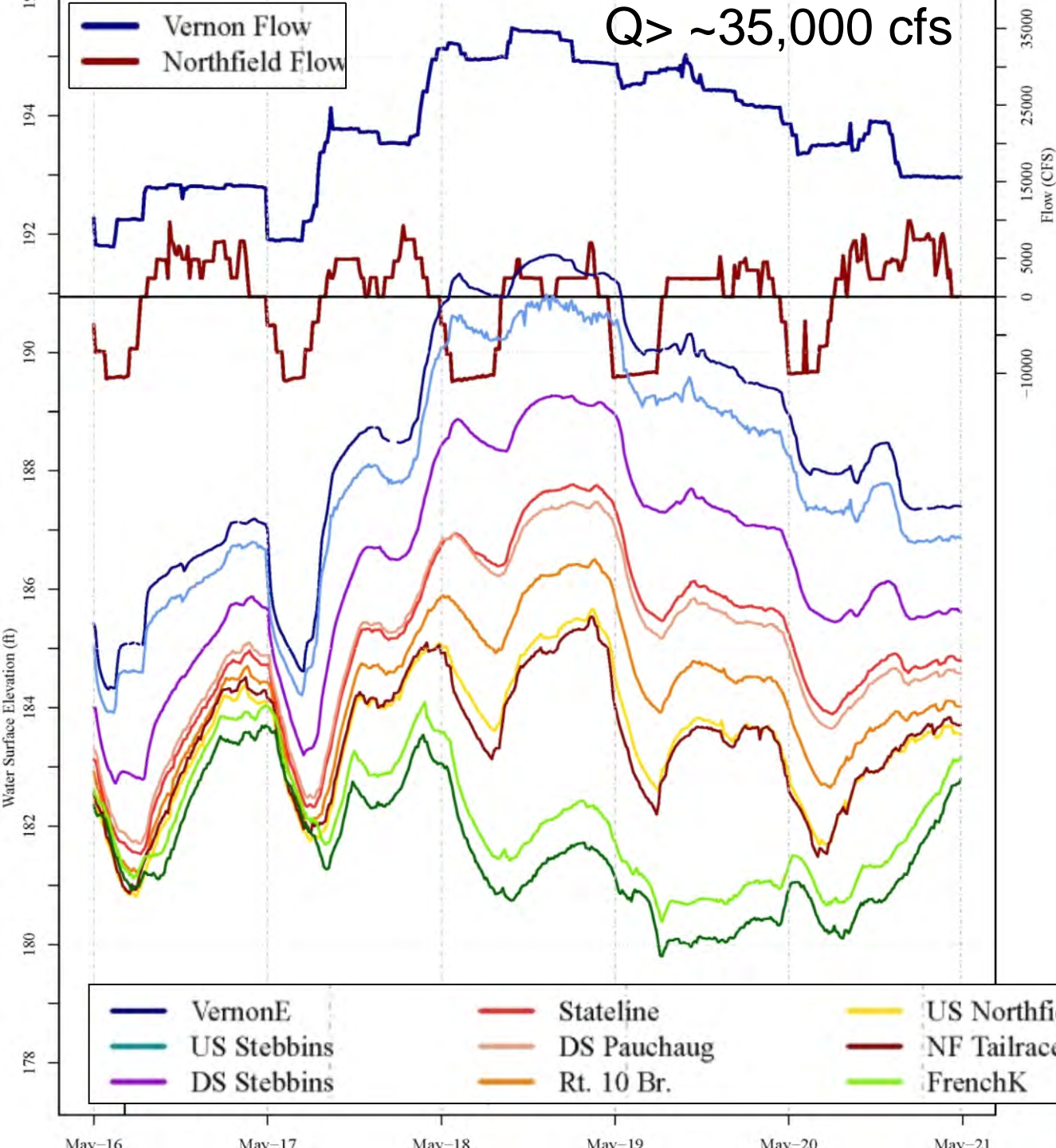
- ▲ USGS Stream Gage
- ◆ Water Level Logger
- HEC-RAS Hydraulic Model Extent

# Project Operations Data, Flow Data, and WSEL plots

$Q < \sim 15,000$  cfs



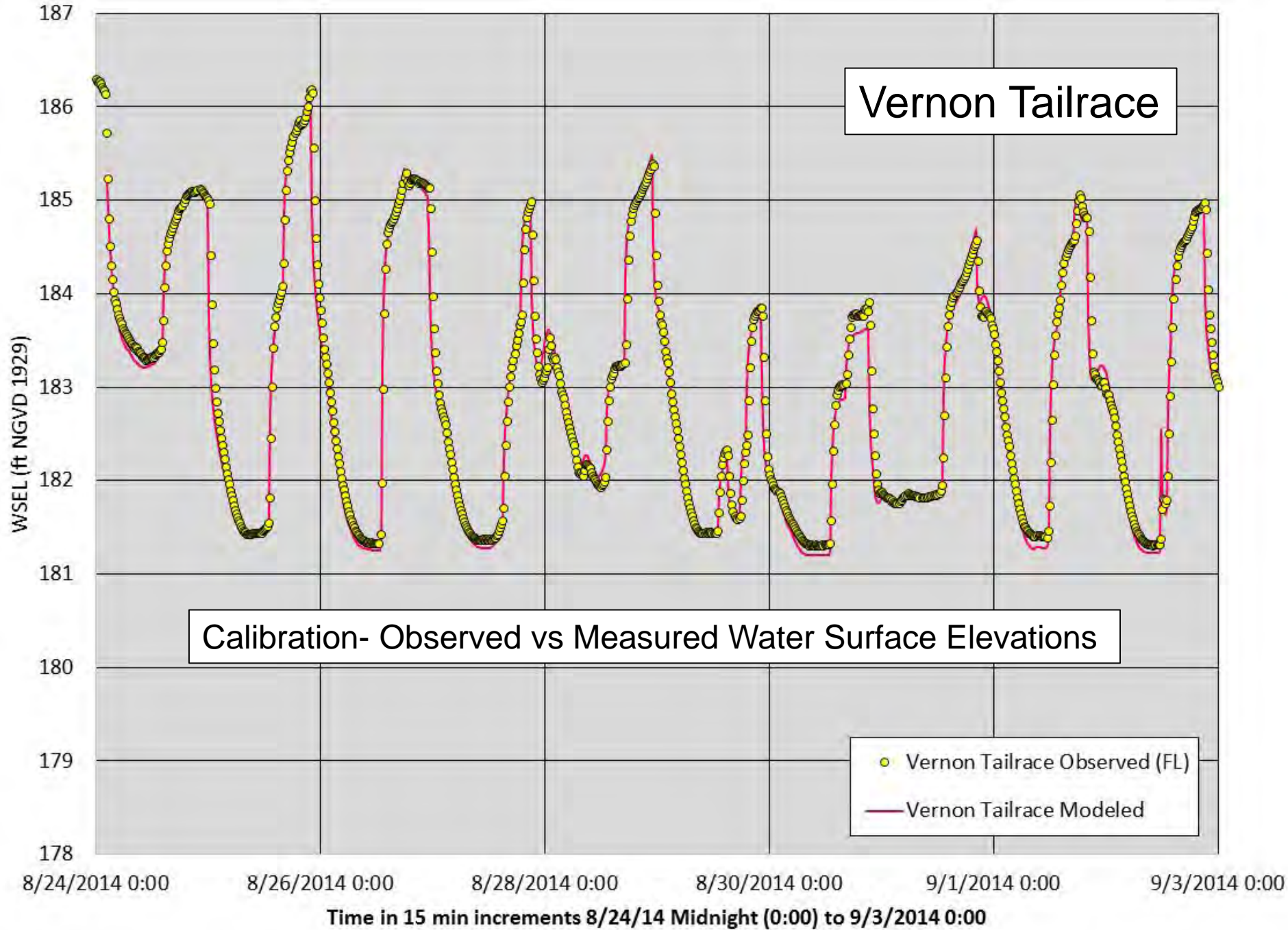
Example Low Flow  
Event- Plots developed  
For Entire Period  
Water Level Loggers  
Operated



**Project Operations  
Data, Flow Data,  
and WSEL plots**

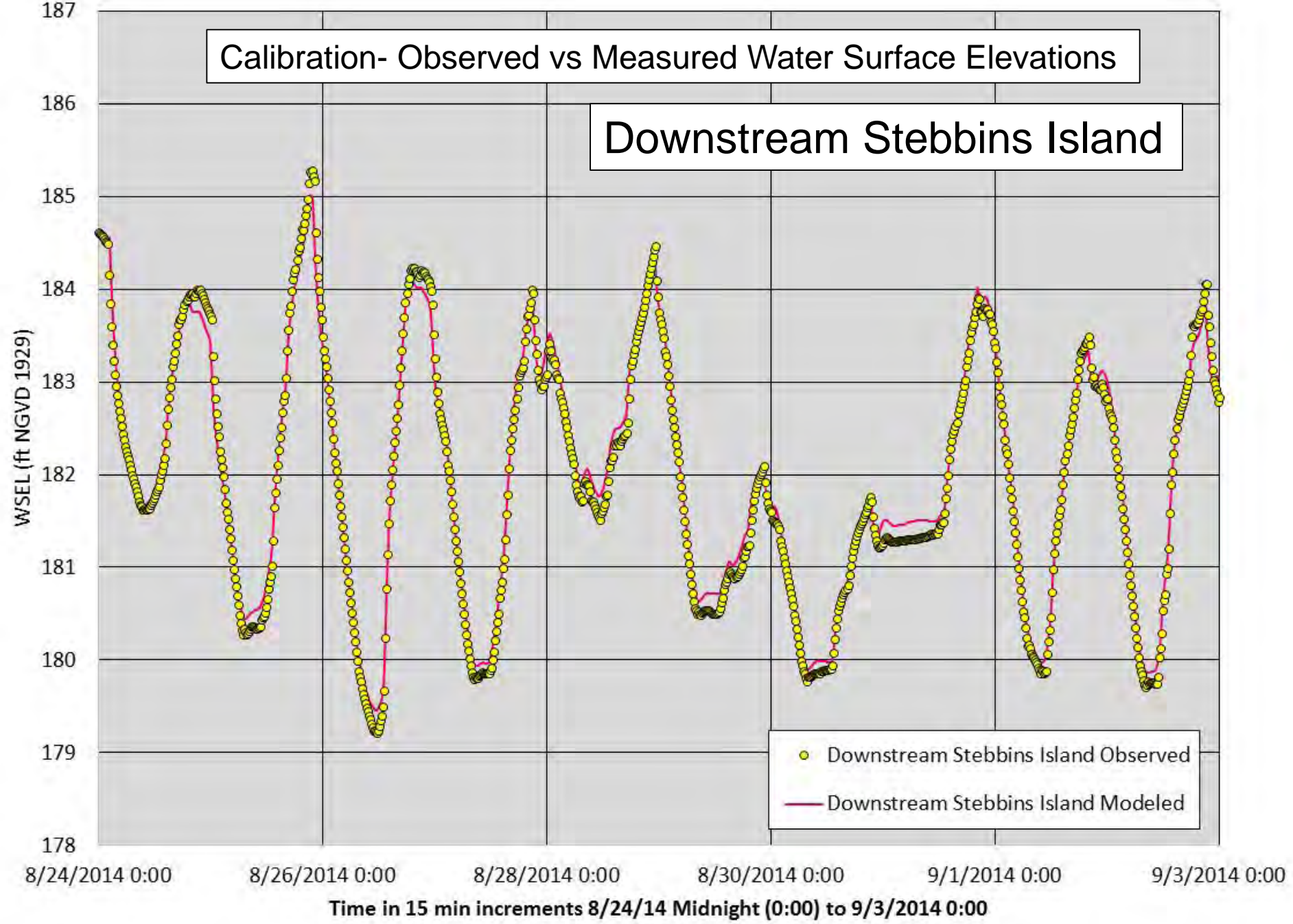
Example High Flow  
Event- see influence of  
French King Gorge



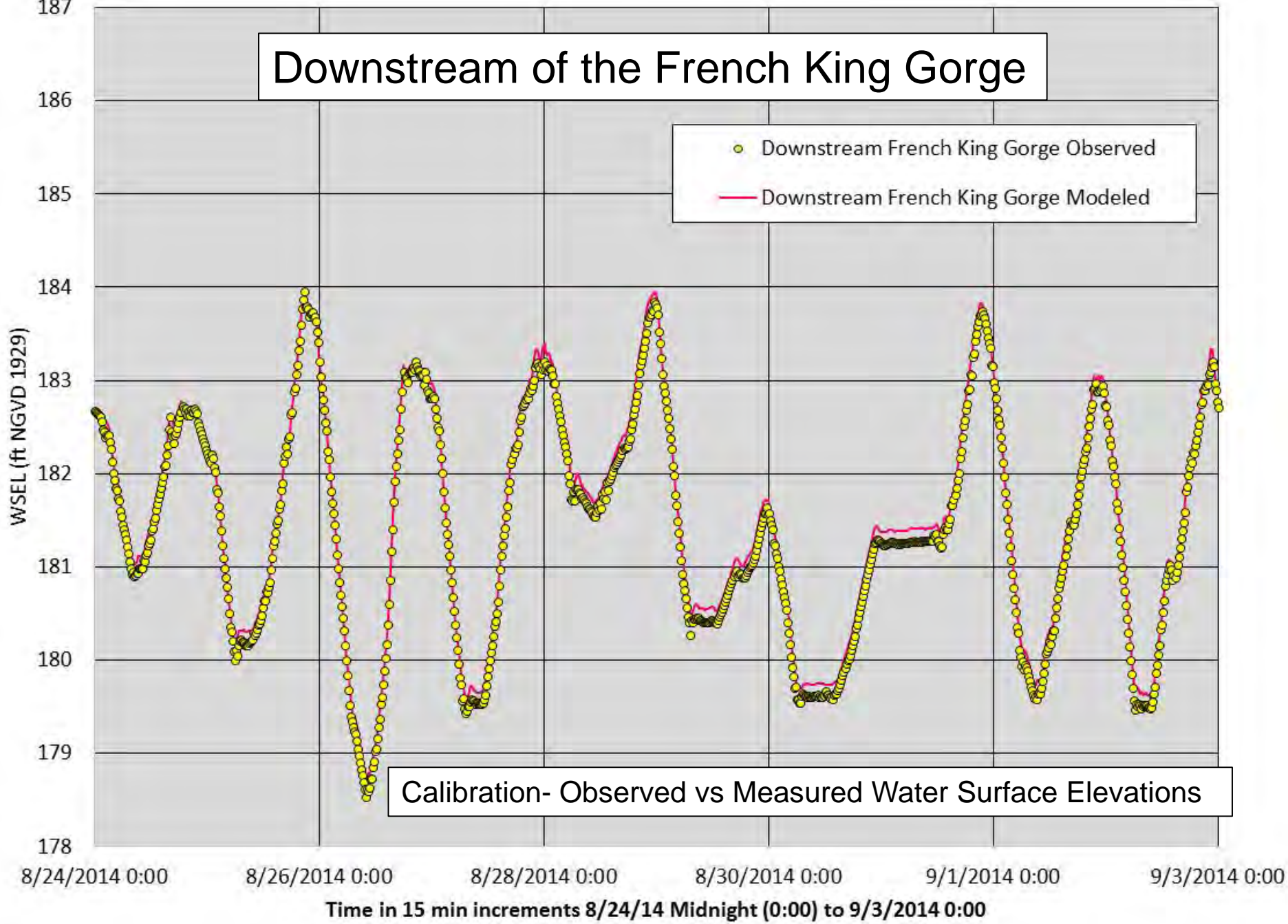


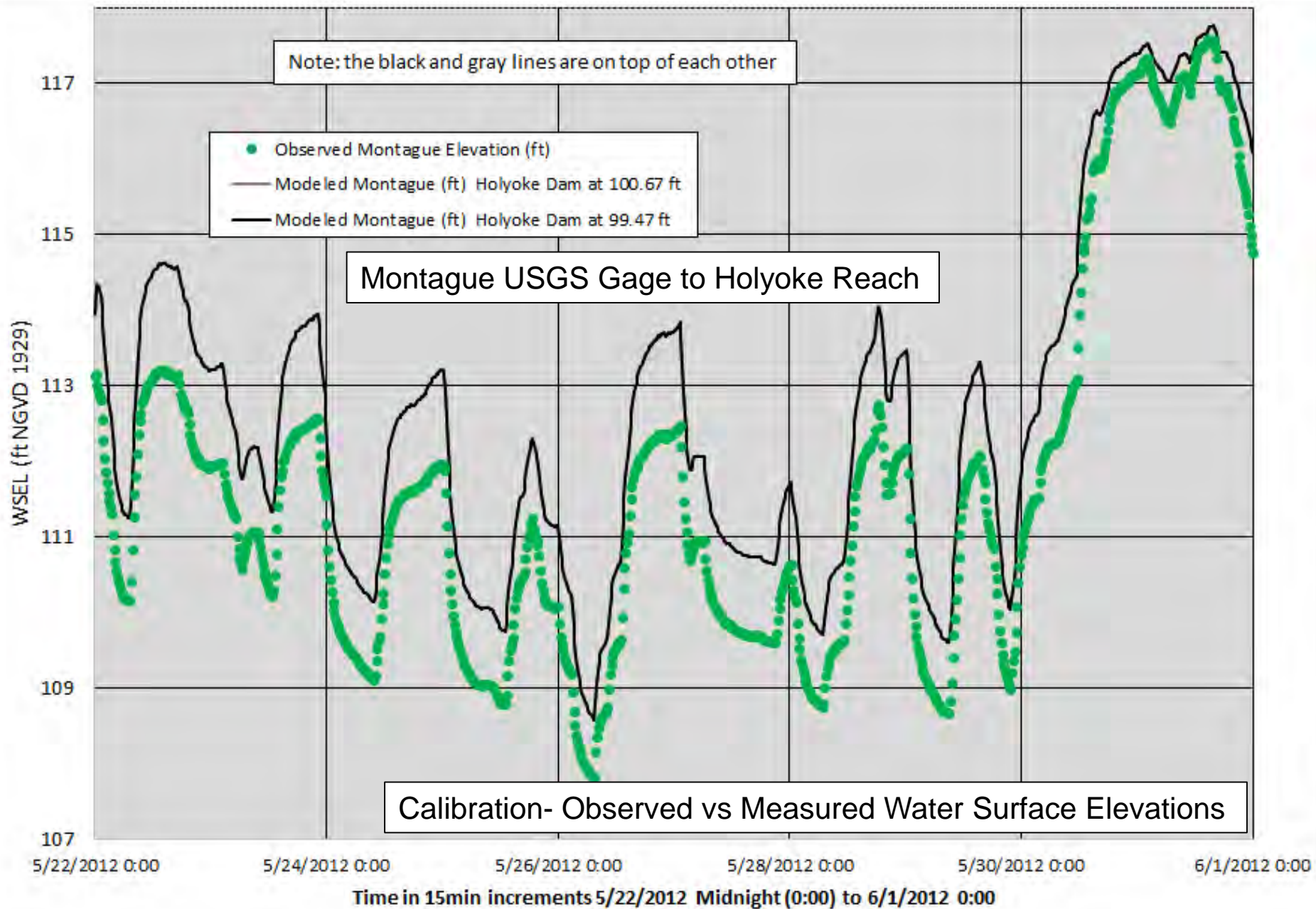
# Calibration- Observed vs Measured Water Surface Elevations

## Downstream Stebbins Island

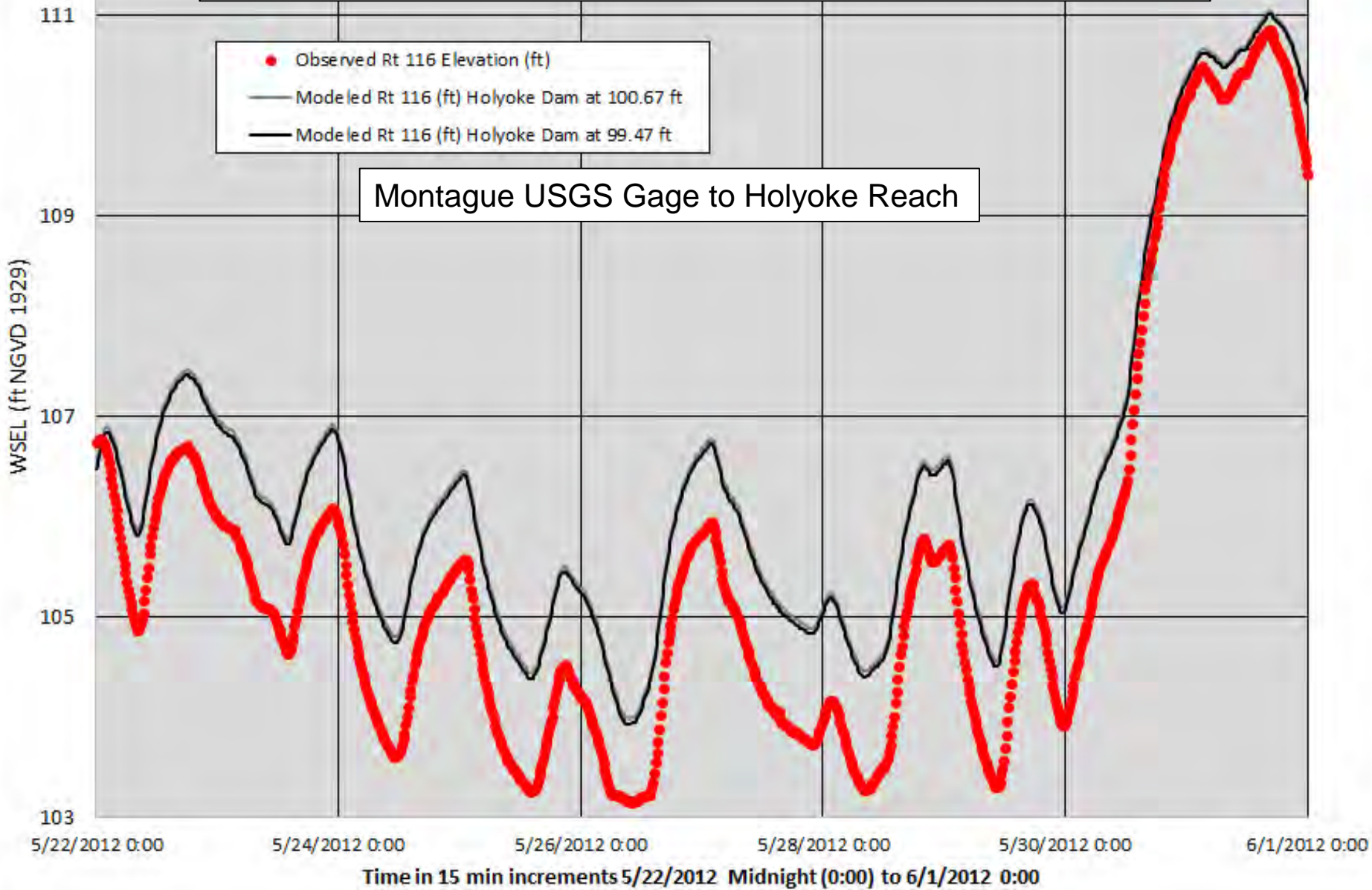


# Downstream of the French King Gorge





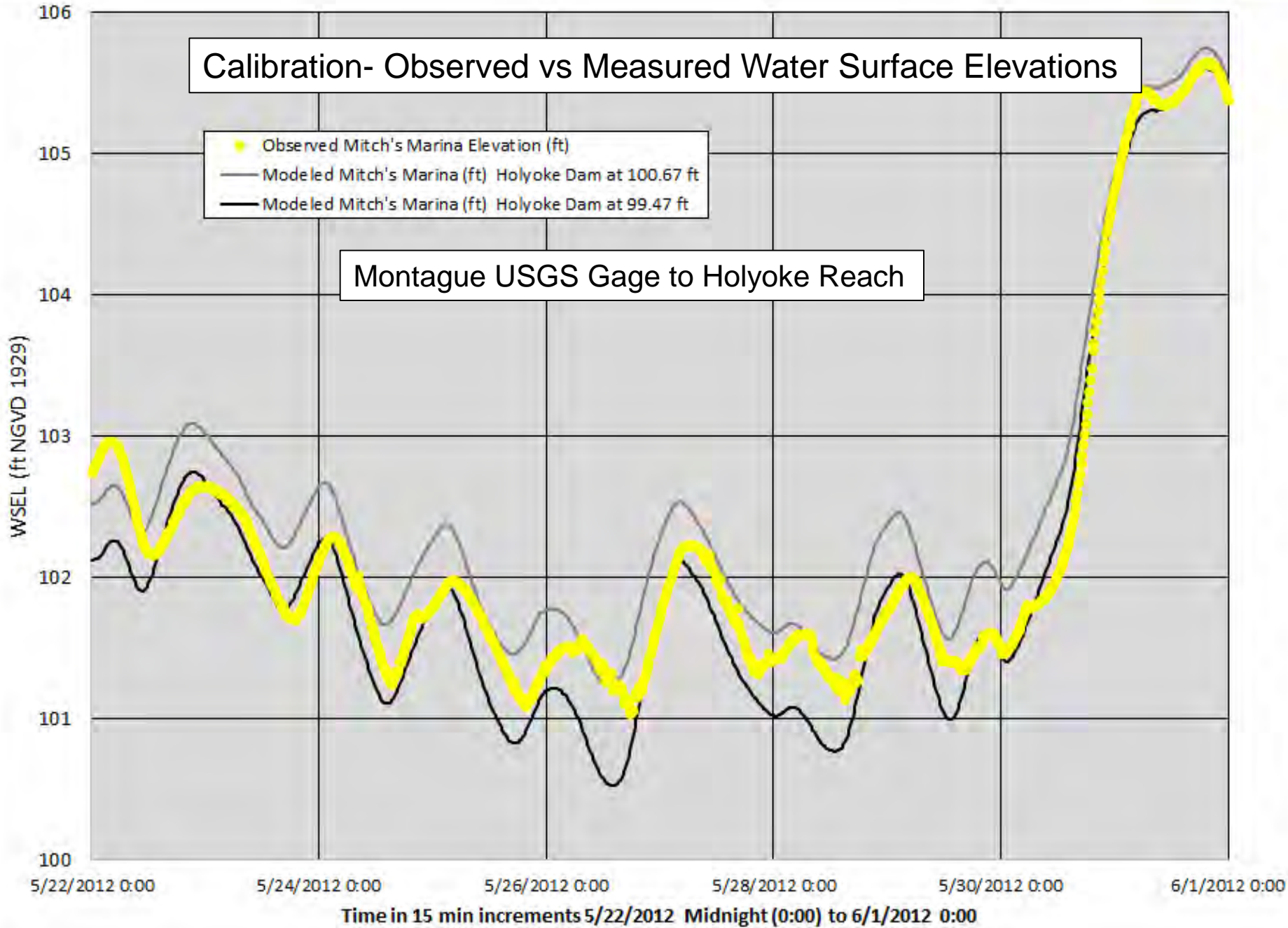
# Calibration- Observed vs Measured Water Surface Elevations



# Calibration- Observed vs Measured Water Surface Elevations

- Observed Mitch's Marina Elevation (ft)
- Modeled Mitch's Marina (ft) Holyoke Dam at 100.67 ft
- Modeled Mitch's Marina (ft) Holyoke Dam at 99.47 ft

Montague USGS Gage to Holyoke Reach



### **Study Progress**

#### **Task 1: Bathymetric Survey of Study Areas**

- Survey work completed in 2014.

#### **Task 2: Compile Model Input Datasets in CAD**

- Total of 4 models: Station No. 1 intake, Cabot intake, Cabot Ladder, Spillway Ladder. All CAD work is complete.

#### **Task 3: Construct 3D Model**

- CFD models of the four locations are complete.

#### **Task 4: Conduct Model Production Runs**

- Production runs for the Station No. 1 forebay and Cabot forebay are complete.
- Cabot fishway and spillway fishway are still underway.

#### **Task 5: Report**

- Underway, but not complete. Waiting for completion of the Cabot and spillway fishway production runs.

### **Findings (if any)**

- Not complete. Some preliminary results are shown in the following slides.

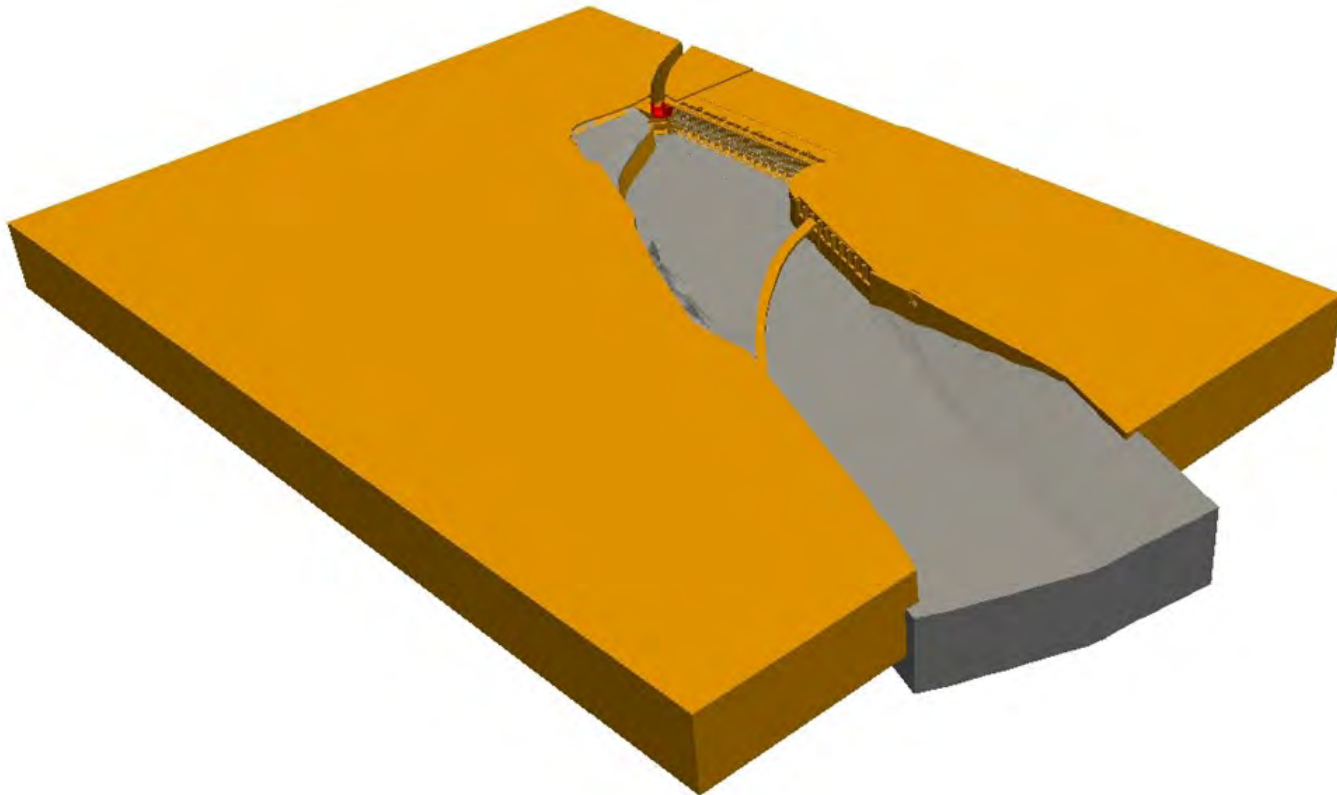
### **Variations (if any)**

- The RSP called for developing high-resolution sub-models at the face of the Cabot and Station No. 1 intake racks.
- Due to computational limitations, not practical to create/build these models.
- In lieu of separate model, added 1-foot mesh in front of intake racks to calculate approach and sweeping velocities.

### **Work Remaining**

- Report to be completed by 12/1/2015.

Geometry input for the Cabot forebay CFD model



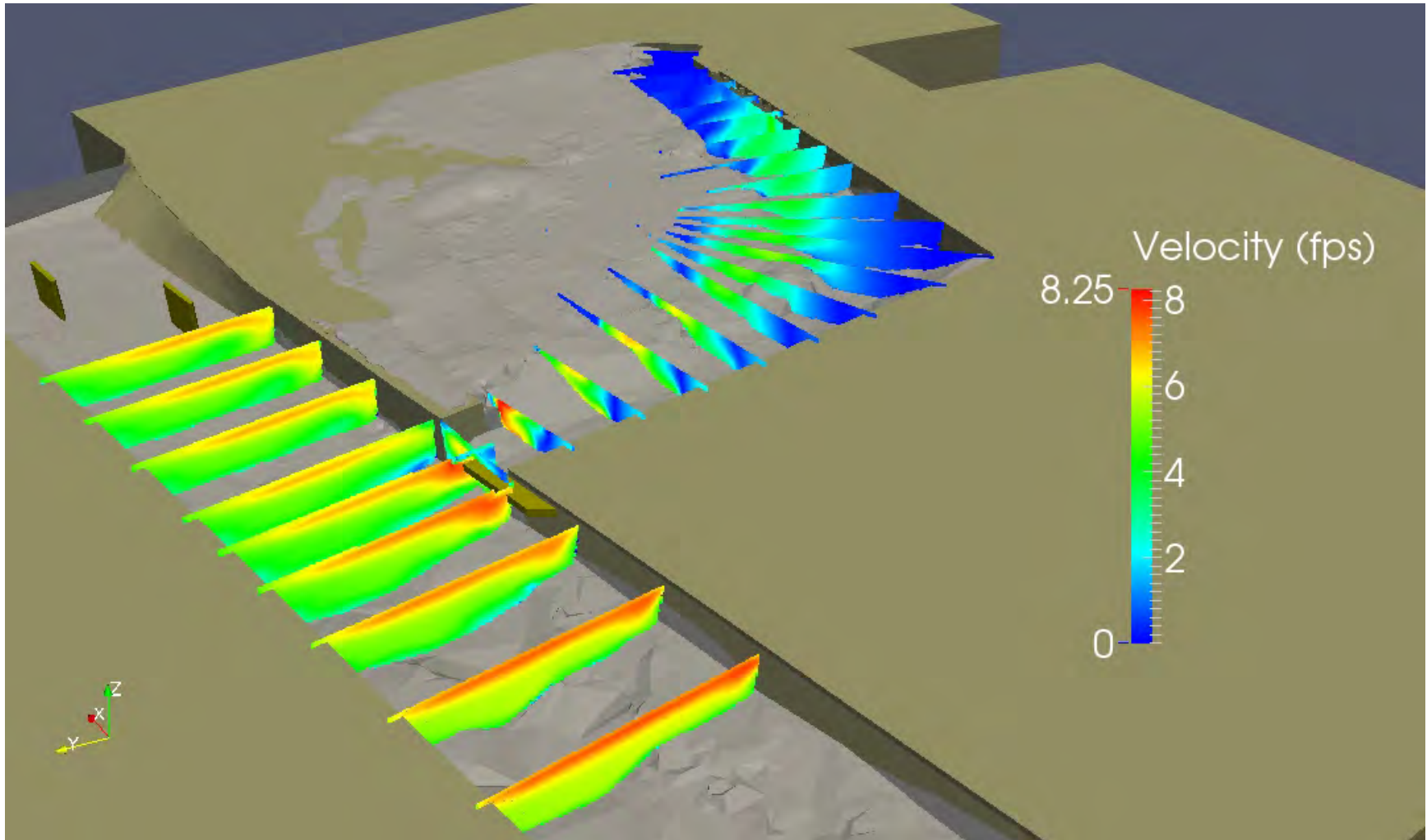
Legend

- CAD Model Geometry
- Bathymetric Surface
- Fish Weir



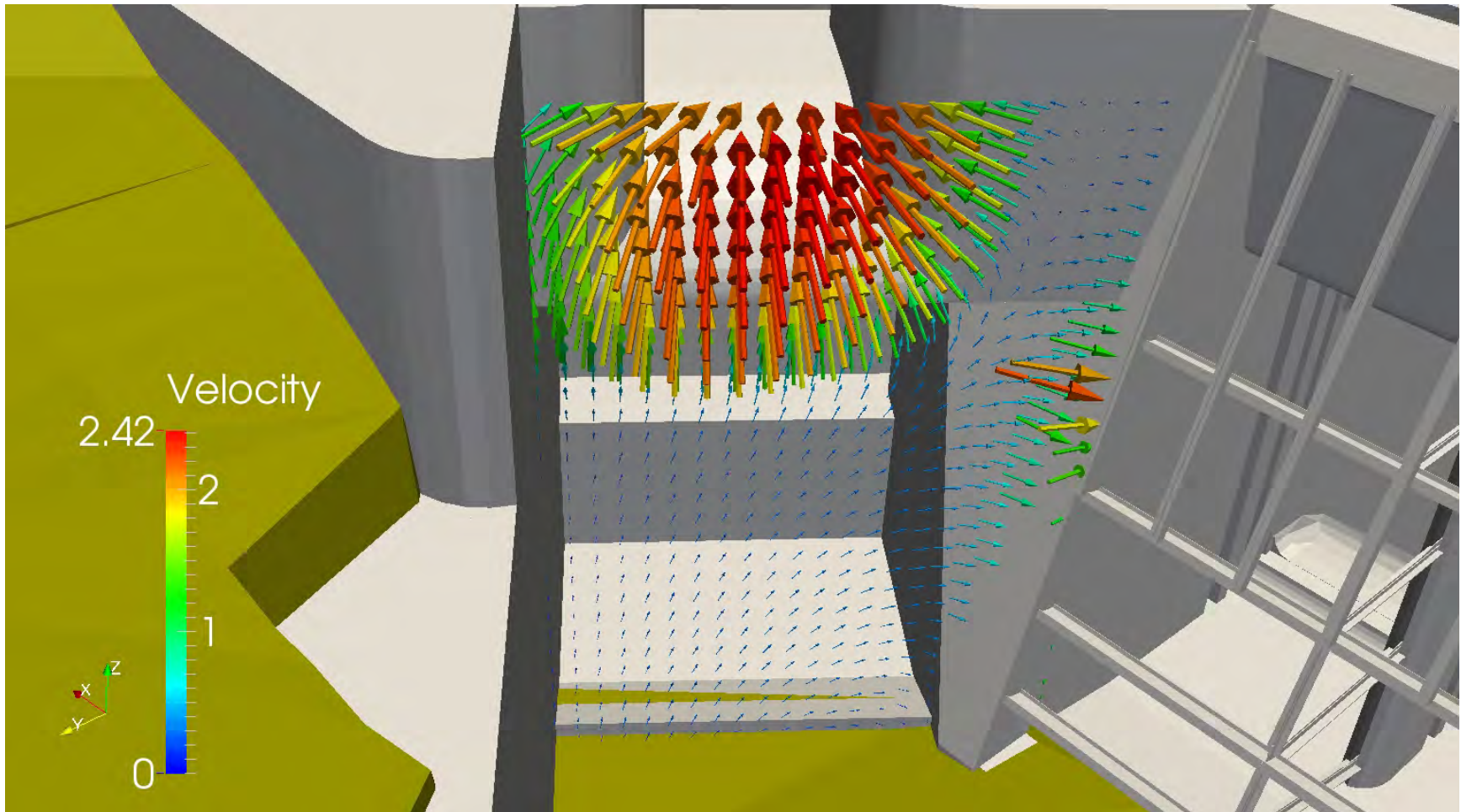
### 3.3.8-Computational Fluid Dynamics Modeling in the Vicinity of the Fishway Entrances and Powerhouse Forebays

Preliminary results for Station No. 1 forebay CFD model, production run number 1-3.



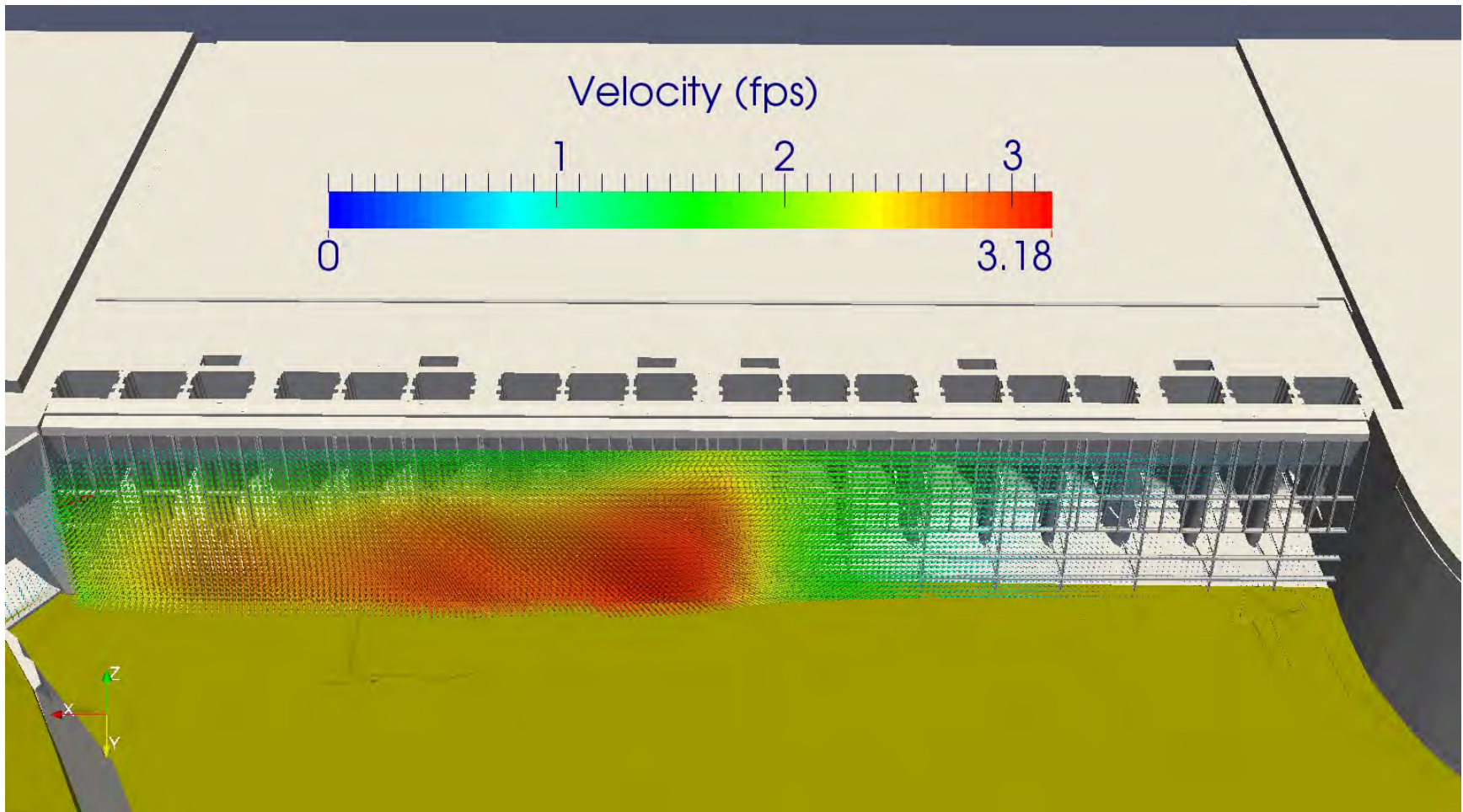
### 3.3.8-Computational Fluid Dynamics Modeling in the Vicinity of the Fishway Entrances and Powerhouse Forebays

Preliminary results for Cabot forebay, production run number 3-1 at the log sluice entrance.



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

Preliminary results for Cabot forebay, production run number 3-2 near the Cabot Station intake racks.



#### **Study Progress**

Task 1: Review Existing Data and Identify Data Gaps

Task 2: Bathymetric Survey Update and Post Processing

Task 3: Develop and Graph Water Column Velocity Profiles

Task 4: Build and Calibrate 2D Model

Task 5: Conduct and Analyze Transient Production Runs

- Complete

Task 6: Reporting

- Approximately 80% complete.

#### **Findings (if any)**

- See next page.

#### **Variations (if any)**

- Water column velocity data only collected at three transects as the fourth transect was located on top of the intake structure.

#### **Work Remaining**

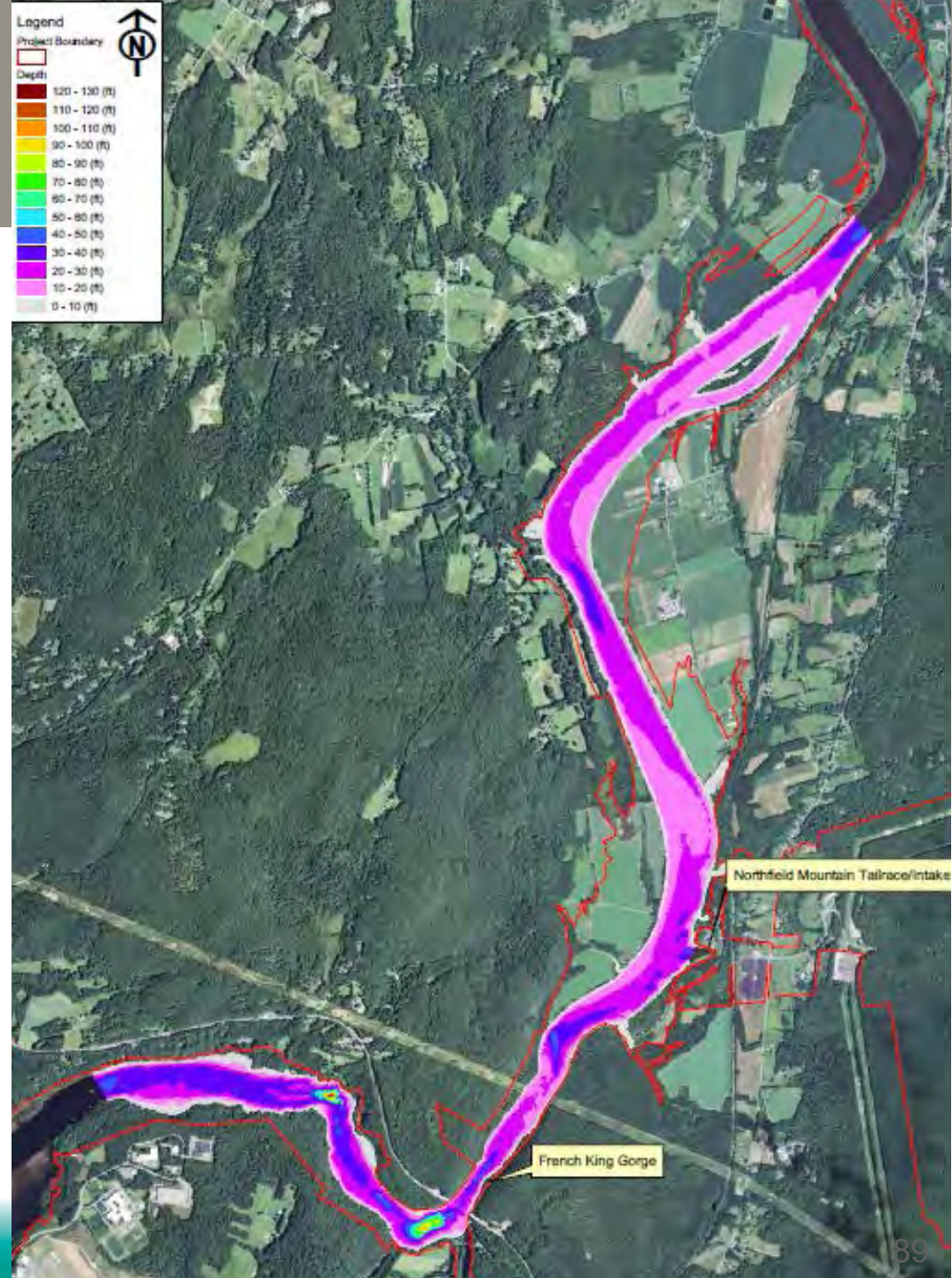
- Report to be completed by the 12/1/2015.

Table 1: List of River2D Hydraulic Modeling Scenarios

Scenario No.	Northfield Mountain Generation Flow (cfs)	Northfield Mountain Pumping Flow (cfs)	Turners Falls Impoundment Elevation at Turners Falls Dam (ft)	Turners Falls Dam Flow (cfs)
1	10,000	0	176.0	1,760 (95% exceedance flow)
2	10,000	0	185.0	1,760
3	20,000	0	176.0	1,760
4	20,000	0	185.0	1,760
5	0	7,600	176.0	1,760
6	0	7,600	185.0	1,760
7	0	15,200	176.0	1,760
8	0	15,200	185.0	1,760
9	10,000	0	176.0	4,900 (75% exceedance flow)
10	10,000	0	185.0	4,900
11	20,000	0	176.0	4,900
12	20,000	0	185.0	4,900
13	0	7,600	176.0	4,900
14	0	7,600	185.0	4,900
15	0	15,200	176.0	4,900
16	0	15,200	185.0	4,900
17	10,000	0	176.0	8,440 (50% exceedance flow)
18	10,000	0	185.0	8,440
19	20,000	0	176.0	8,440
20	20,000	0	185.0	8,440
21	0	7,600	176.0	8,440
22	0	7,600	185.0	8,440
23	0	15,200	176.0	8,440
24	0	15,200	185.0	8,440
25	10,000	0	176.0	15,700 cfs (25% exceedance flow)
26	10,000	0	185.0	15,700
27	20,000	0	176.0	15,700
28	20,000	0	185.0	15,700
29	0	7,600	176.0	15,700
30	0	7,600	185.0	15,700
31	0	15,200	176.0	15,700
32	0	15,200	185.0	15,700
33	10,000	0	176.0	40,100 (5% exceedance flow)
34	10,000	0	185.0	40,100
35	20,000	0	176.0	40,100
36	20,000	0	185.0	40,100
37	0	7,600	176.0	40,100
38	0	7,600	185.0	40,100
39	0	15,200	176.0	40,100
40	0	15,200	185.0	40,100

### Depth Map for Scenario 18

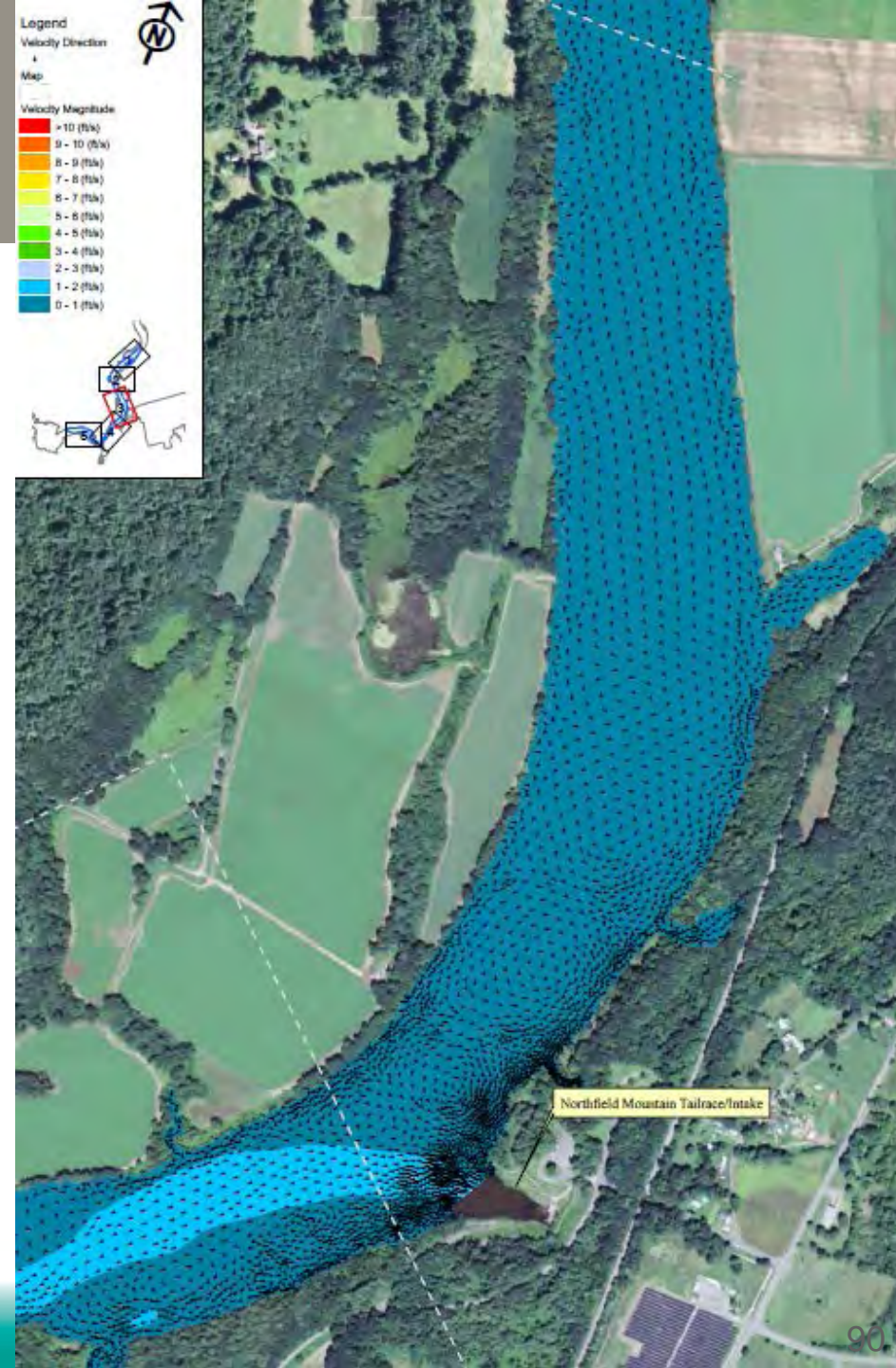
- 50% Exceedence Flow (8,440 cfs)
- 2 Units Generating (10,000 cfs)
- WSEL at Dam= 185 ft





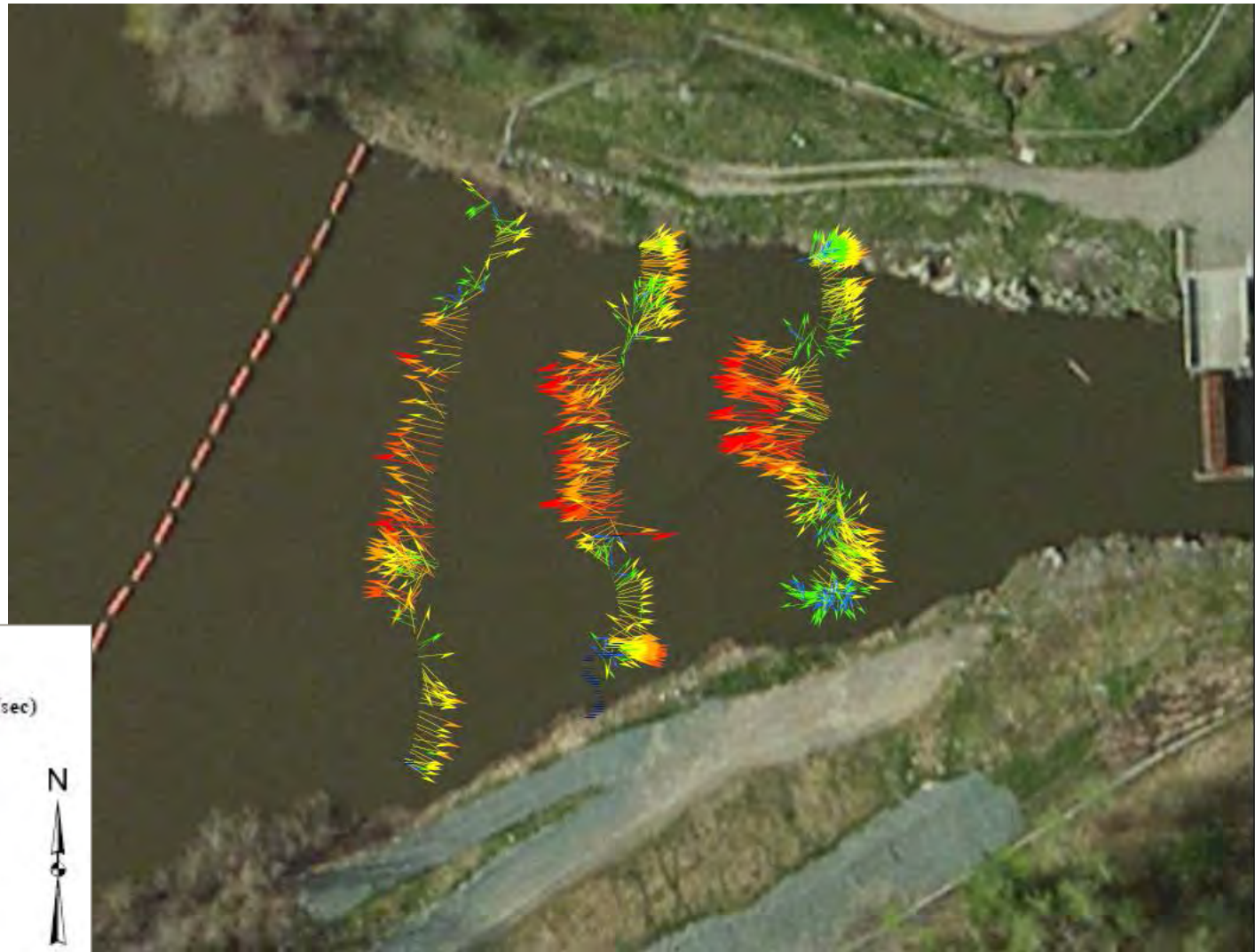
## Velocity Vector Map for Scenario 18

- 50% Exceedence Flow (8,440 cfs)
- 2 Units Generating (10,000 cfs)
- WSEL at Dam= 185 ft



**Velocity Vector Map**

- 4 Units Generating (20,000 cfs)



**Legend**

**Depth-Averaged Velocity (ft/sec)**

—	0.0 - 0.1
—	0.1 - 0.5
—	0.5 - 1.5
—	1.5 - 3.0
—	3.0 - 4.5
—	4.5 - 6.0
—	6.0 - 8.5





# Developmental Resources

### Study Progress

#### Task 1: Modify Model

- Using HEC-ResSim simulation model provided by the USACOE via The Nature Conservancy.
- Model was updated to reflect hourly time step, pumping/generating cycles at Northfield and fishway/attraction flows.

#### Task 2: Calibration

- Model calibrated to generation (for the year 2000) and flow at the Montague USGS Gage.
- Added updated hydrology (2004-2012), but have not validated model with these data.

#### Task 3: Establish Baseline Model

- Established a baseline model reflecting current operations and operating equipment .

#### Task 4: Production Runs

- Some internal productions runs are being evaluated.

#### Task 5: Use of Model Output for other Uses

- To date, the model output has not been used for other studies such as habitat time series analysis.

#### Task 6: Report

- Not complete.

### **Findings (if any)**

- None to date.

### **Variations (if any)**

- None

### **Work Remaining**

- Validate model calibration for period of record 2004-2012.
- Once studies are complete, evaluate alternative modes of operation.
- Report to be completed by 3/1/2017.

# Geology & Soils

### **Study Progress**

- All tasks have been completed

### **Variations (if any)**

- None to report.

### **Work Remaining**

- None - final report filed on 9/15/2014, addendum to final report filed in 4/22/2015.

### **Summary of 2015 Activities**

- FL distributed a draft addendum to the final report to the Stakeholders on February 24, 2015. The draft addendum included:
  - Attachment A: Riverbank Segment QA Comparison, and
  - Attachment B: 2007 to 2014 Photo Comparison.
- FL held a meeting for interested Stakeholders on March 4, 2015 to discuss the draft addendum.
  - FL received comments on the draft addendum from FRCOG on April 2, 2015, no other comments were received.
  - On April 22, 2015 FL filed the final FRR Addendum as well as a responsiveness summary addressing FRCOG's comments.

### **Summary of 2015 Activities**

- In March 2015, FRCOG requested FERC make a determination regarding FL's compliance with the 1999 Erosion Control Plan, specifically if the proposed stabilization sites found in the 2013 FRR (i.e. Phase IV sites) were appropriate.
  - FL met with the CRSEC on April 15, 2015 to discuss the proposed Phase IV stabilization sites.
- In July 2015, FERC requested that FL provide the Commission with information regarding how the Phase IV sites were selected and why they are appropriate.
- FL provided the requested information to FERC on August 4, 2015.
  - In addition to providing rationale for why the sites proposed for Phase IV stabilization were appropriate, FL agreed to add Segments 140-142 to the Phase IV scope of work based on feedback received from the CRSEC.
  - FL requested that FERC approve the updated Phase IV stabilization sites.

## 3.1.2-Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability

### **Study Progress**

#### **Task 1: Data gathering and literature review**

- Supplemental resources and data were provided to Stakeholders in December 2014, May 2015, and August 2015.
- Task Complete.

#### **Task 2: Geomorphic understanding of the Connecticut River**

- Substantially complete. Outstanding sub-task: historic imagery analysis (ongoing).

#### **Task 3: Identification of potential causes of erosion.**

- In progress. Identification of potential and potential primary causes of erosion has been completed, the process of assessing the relative importance of each of those causes will not be conducted until completion of Tasks 4, 5, and 6.
- Potential primary causes: hydraulic shear due to flowing water, boat waves, water level fluctuations due to hydropower operations, and land management & anthropogenic influences in riparian zone.

#### **Task 4: Field studies and data collection**

- Ongoing- Field work continues until March 2016 (ice).

#### **Task 5: Data Analyses**

- Ongoing.

### **Findings (if any)**

- None at this time. Data review is still underway as is model development and calibration (BSTEM).

### **Variances (if any)**

- Supplemental boat wave data collection and analysis (ongoing).



## 3.1.2-Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability

### Work Remaining

- Task 2: Historic imagery analysis.
- Task 3: Evaluation of causes upon completion of Tasks 4,5, & 6
- Task 4: Complete field work for BSTEM and boat wave analyses. Also, ice monitoring through March 2016.
- Task 5: Review, post process, and QA/QC all field collected data.
- Task 6: Evaluation of the Causes of Erosion.
- Task 7: Report and Deliverables.
  - *Final report to be completed by second quarter 2016*

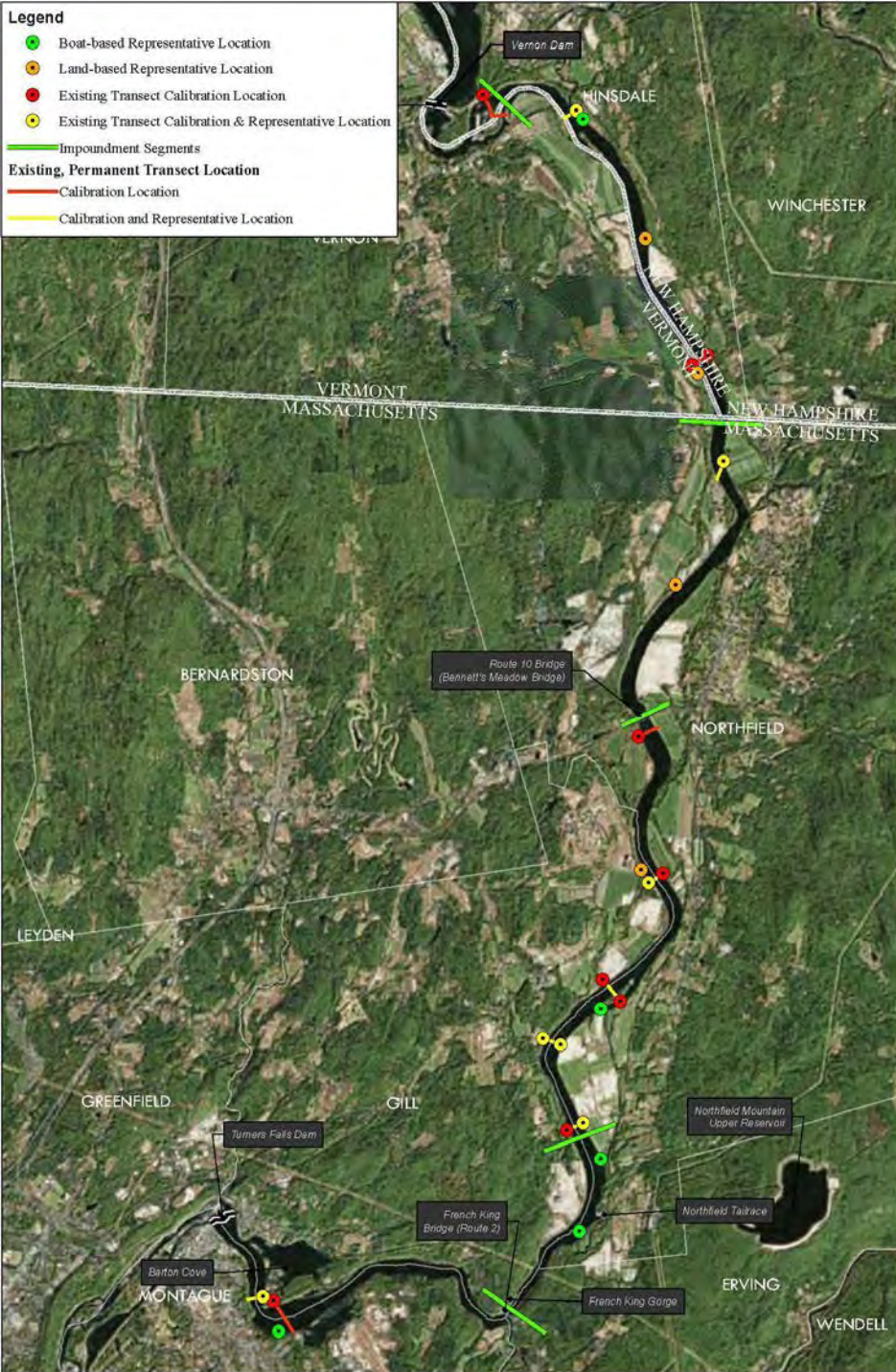
### Task 4: Field Studies and Data Collection – Summary of 2014/2015 Activities

- 2014 – BSTEM data collection
  - Soils analyses
  - Collection of sediment samples
  - Direct, in-situ bore hole shear tests (*see photos*)
  - Submerged jet tests (*see photos*)
  - Information on vegetation, root structure, and density (*see photos*)
  - Annual cross-section surveys
- 2015
  - Supplemental BSTEM data collection
  - Annual cross-section surveys
  - Boat wave data collection
  - HEC-RAS model output
  - RIVER2D model output
  - Project Operations data (flow, water level, operating conditions)
  - Ice monitoring (*to occur winter 2015/2016*)

#### **Task 5: Data Analyses**

- Data collected during the 2014 field season have been reviewed, post processed (if required), and undergone QA/QC. Following completion of the QA/QC process, the data were analyzed for incorporation into BSTEM.
- Preliminary review of data collected in 2015 has begun
- Data analysis and BSTEM setup and calibration are ongoing

### 3.1.2-Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability



### Location of Detailed Study Sites

### 3.1.2-Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability



### 3.1.2-Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability



### 3.1.2-Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability



## 3.1.2-Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability

### Supplemental Boat Wave Data Collection

- In early 2015 historic boat wave data was found to be insufficient for inclusion in BSTEM.
- Supplemental boat wave data were collected from May – September to address this.
- Data collected included:
  - Boat statistics: *boat length, boat speed, and distance of its sailing line from the shoreline.*
  - Wave properties: *wave period, wave height, and direction of wave propagation.*
- Digital cameras were installed at three locations (French King Bridge, Rt. 10 Bridge, and Schell Bridge) to capture boat statistics (*see photos*).
- Wave loggers were installed at three locations in the vicinity of the cameras to capture the wave properties (*see photos*).
  - Upstream of the French King Bridge.
  - Downstream of the Rt. 10 Bridge.
  - Upstream of Schell Bridge/Pauchaug boat launch.
- Data were downloaded on a bi-weekly schedule at which time a preliminary QA check occurred.
- The data are then analyzed using a custom developed image processing tool to measure the speed, location, and passage time of the boat as well as to estimate the type, shape, and size of boats as they pass.
- The corresponding wave data for each wave passage is then extracted from the wave staff measurements.
- The results of the imaging analysis together with the wave measurements will provide data for the calibration and use of the empirical wave height model in BSTEM.

### 3.1.2-Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability





## 3.1.2-Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability

### Schedule

- Final study will be completed in second quarter of 2016, as specified in the USR. Cover letter incorrectly indicated 3/1/2016 completion date.

## 3.1.3-Northfield Mountain Project Sediment Management Plan

### **Study Progress**

- Continuous suspended sediment monitoring – adjacent to Rt. 10 Bridge and at Northfield Mountain tailrace.
- Collection of grab samples at continuous monitoring locations and across Rt. 10 Bridge (*ongoing*).
- Annual bathymetry surveys - 2011-2014 (*2015 survey to be completed in October*).
- Computational Hydrodynamic Sedimentation model of the Upper Reservoir (*ongoing*).
- Computational Fluid Dynamics Model of the Northfield Mountain tailrace (*ongoing*).
- Physical model of the Northfield Mountain tailrace (*ongoing*).
- Pilot dredge of the Upper Reservoir (*ongoing*).

### **Variances (if any)**

- Discontinuation of continuous monitoring in June 2015, expanded grab sample program in 2015.
- Expansion of study to include pilot dredge and mathematical and physical modeling efforts.
- Final report proposed to be completed by September 1, 2016 to allow evaluation of expanded study elements that are continuing into 2016.

### **Work Remaining**

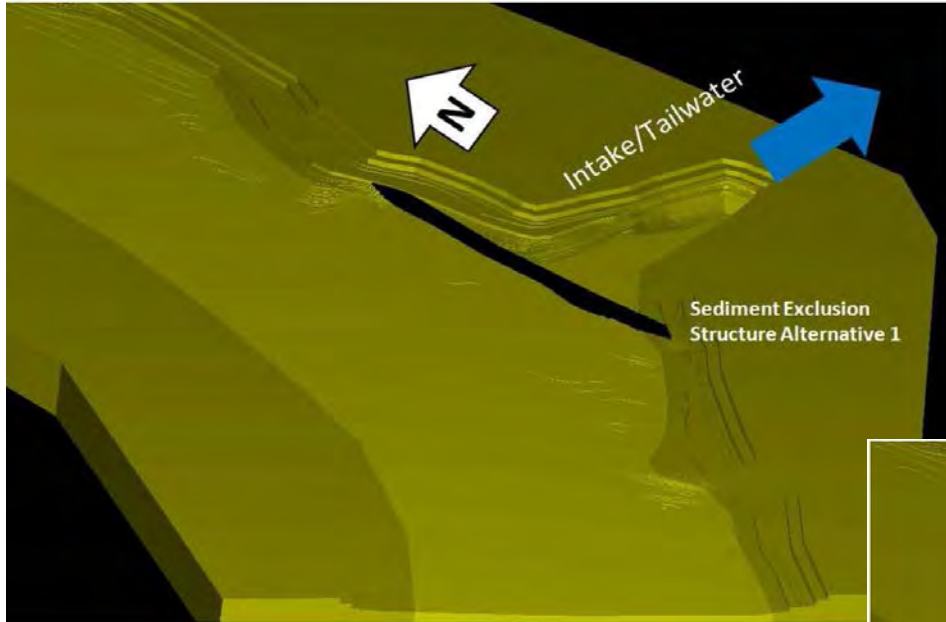
- Grab sample collection through mid-November, 2015 Upper Reservoir bathymetry survey.
- Physical model and review of all modeling results.
- Completion of pilot dredge and assessment of results.
- Review the results of all components of this study to inform sediment management measures that will avoid or minimize the entrainment of sediment in the Project works and Connecticut River.
- Final report– September 1, 2016.



### Computational Modeling

- Computational Hydrodynamic Sedimentation Modeling of the Upper Reservoir
  - *Alden developed a 2-D model to understand the process of sedimentation in the Upper Reservoir and to evaluate long-term sediment management alternatives.*
  - *Objective: determine if a modification in the Upper Reservoir intake channel geometry or lowering the Upper Reservoir below its current lower limit could reduce sediment accumulation.*
  - *Four model runs were executed: 1) the current operational drawdown limit (938 ft. msl); 2) lowering the drawdown limit to 928 ft.; 3) lowering the drawdown limit to 920 ft.; and 4) physically reducing the intake channel width, with the goal of increasing intake channel velocities during generation.*
  - *Results are still under review in conjunction with the other modeling components.*
  - *Alden report was filed as an appendix to the 2014 Annual Summary of Sediment Monitoring Activities report*
- Computational Fluid Dynamics Sediment Modeling of the Northfield Mountain tailrace
  - *Alden developed a 3-D model to understand the sediment dynamics of the entrained sand and fine material from the Connecticut River which is transported to the Upper Reservoir during operational pumping phases as well as potential solutions in the tailrace to reduce sediment transport to the Upper Reservoir.*
  - *Objective: determine if physical modifications to the tailrace intake area could reduce sediment entrained to the Upper Reservoir during pumping operations.*
  - *Model extended 500 ft. upstream and downstream of the tailrace, including the tailrace intake area.*
  - *Three CFD simulations were run: 1) existing conditions; 2) installing a convex sediment exclusion structure; and 3) installing a concave sediment exclusion structure.*
  - *Results are still under review in conjunction with the other modeling components.*

### 3.1.3-Northfield Mountain Project Sediment Management Plan



**Convex Sediment Structure (Alternative 1)**

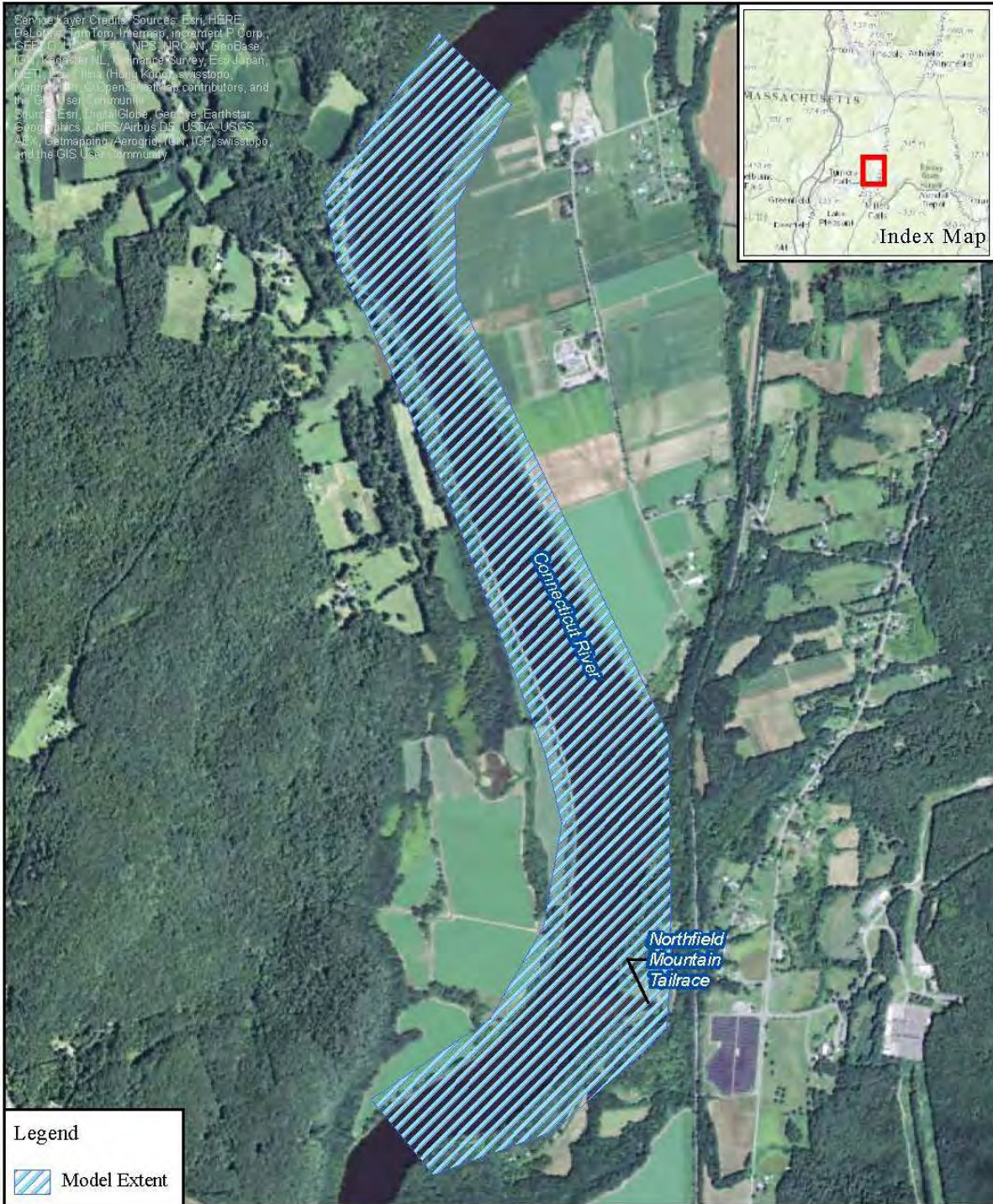


**Concave Sediment Structure (Alternative 2)**

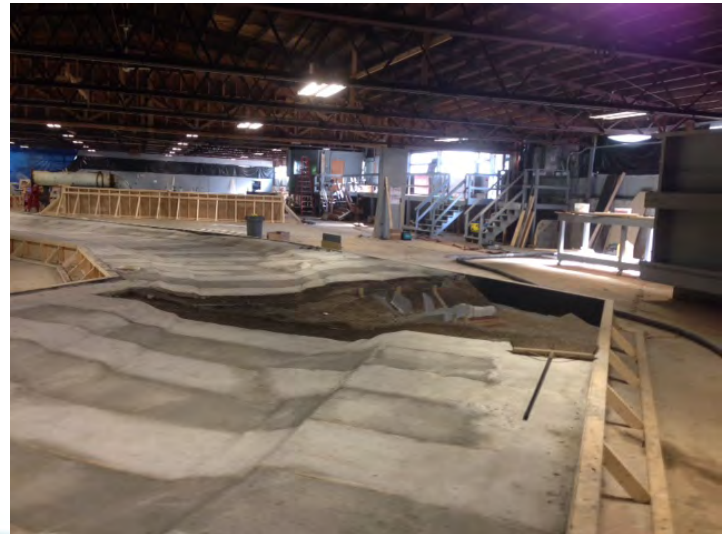
### **Physical Model**

- Northfield Mountain Tailrace and Surrounding Area – Physical Model
  - *Alden developed a physical model of the Northfield Mountain tailrace and surrounding area (3.2 km upstream and 0.8 km downstream) to reproduce river conditions and to investigate new civil works that could be constructed at the tailrace to reduce the entrainment of sediment.*
  - *Supplemental field data (suspended sediment, bed sediment, bathymetry, and water level) were collected in 2015.*
  - *The model will be used to compare sediment intake associated with any modeled structural modifications to the existing intake structure.*
  - *The modeled change to the intake structure will consist of a deviation/deflection structure upstream of the existing intake structure to mobilize the river secondary currents and divert the sediment away from the intake structure.*
  - *Model is currently being constructed. Model results will be reviewed in conjunction with other modeling efforts to help inform sediment management measures.*

Service Layer Credits: Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, Esri, Japan (METI), Swisstopo (Helioplane), Swisstopo, Mapbox, OpenStreetMap contributors, and the GIS User Community  
 Source: Esri, DigitalGlobe, GeoEye, Earthstar, GeoEye, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, Esri, Japan (METI), Swisstopo (Helioplane), Swisstopo, Mapbox, OpenStreetMap contributors, and the GIS User Community



# 3.1.3-Northfield Mountain Project Sediment Management Plan



### Upper Reservoir Pilot Dredge

- Started in April 2015, targeted completion fall 2015.
- Conducted to assess whether deep water hydraulic dredging is a viable option for removing excess sediment in the Upper Reservoir.
- Dredging activities are occurring within and immediately upstream of the intake channel.
- Affects about 4.5 acres (1.6%) of the 274 acre Upper Reservoir.
- As of September 21, ~36,000 cubic yards have been dredged.
- Dredged slurry mixture is incorporated with a polymer additive while being pumped into the Geotube dewatering system, which is located adjacent to the Upper Reservoir.
- Sediments from the sediment-water mixture will be substantially captured in the Geotubes, with the filtered effluent flowing back into the Upper Reservoir at a controlled flow rate.





### 3.1.3-Northfield Mountain Project Sediment Management Plan



### **Upper Reservoir Bathymetry Surveys**

- Surveys conducted annually starting in 2011.
- Using the results from the 2012 and 2014 multi-beam survey and gravity core analysis, net deposition in the Upper Reservoir was found to be between ~4,000 - 8,000 cubic yards per year.

### **Suspended Sediment Monitoring - Analyses**

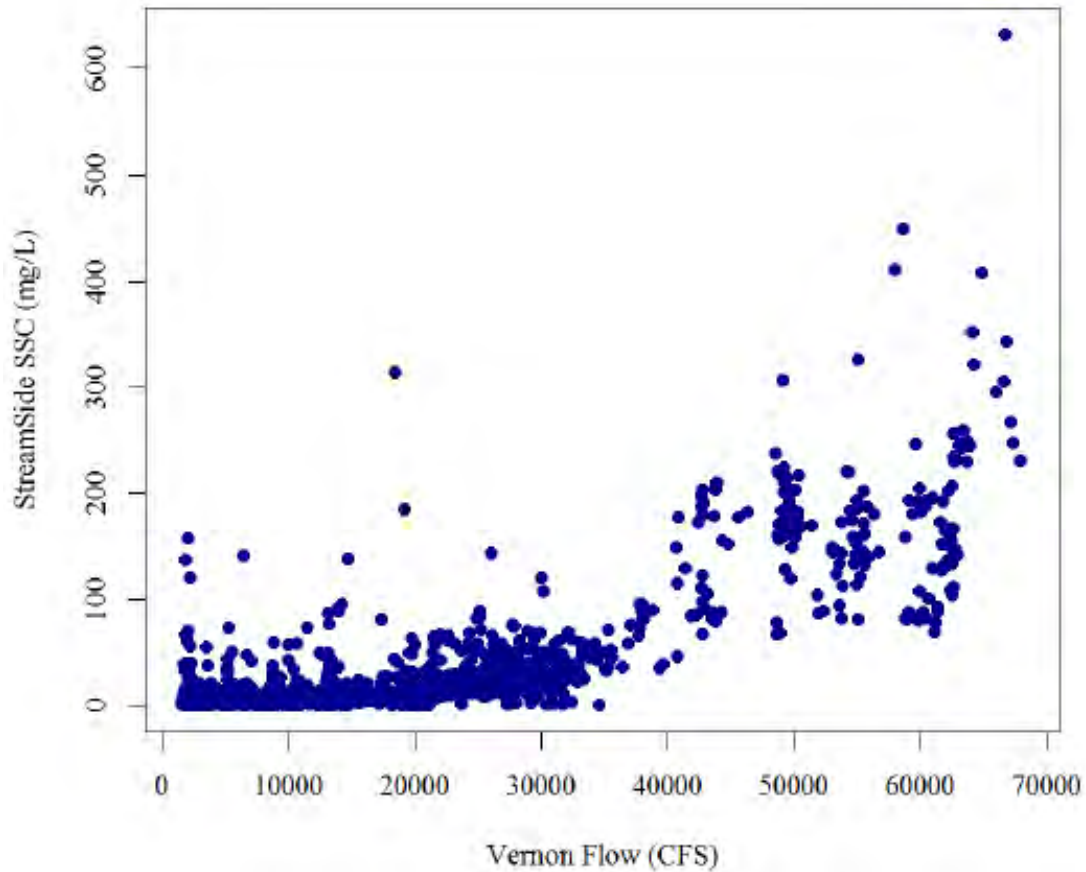
- Continuous LISST data (StreamSide, HYDRO North, and HYDRO South) were converted from  $\mu\text{L/L}$  to  $\text{mg/L}$  using available grab sample data.
- Data collected via the LISST-100X were used to determine if general patterns observed in the data were consistent with the patterns observed at the continuous LISST instruments and if the location of the continuous instrument pumps were representative of the cross-section.
- The converted continuous LISST data (StreamSide) were compared against the cross-sectional Rt. 10 Bridge grab sample data to determine if the StreamSide location was representative of the cross-section.
- Suspended sediment data were analyzed to identify:
  - *Seasonal SSC patterns and trends observed in relation to flow;*
  - *SSC patterns and trends observed in relation to flow and Project operating conditions at Vernon; and*
  - *SSC patterns and trends observed in relation to flow and Project operating conditions at Northfield Mountain*
    - Three representative time periods were examined in detail: 1) a spring freshet when flows increased to a level greater than 35,000 cfs; 2) a moderate flow period when flows were between 12,000-35,000 cfs; and 3) a low flow period when flows were less than 12,000 cfs.
- Timeseries plots of all converted data were developed for 2013, 2014, and 2015.

### **Suspended Sediment Monitoring - Results**

- Mainstem SSC values are directly proportional to flow (i.e., the higher the flow, the higher the SSC values).
- Three flow thresholds were observed in regard to SSC values - <12,000 cfs, 12,000-35,000 cfs, and >35,000 cfs. Median values for each threshold were 2.9 mg/L (<12,000 cfs), 12.45 mg/L (12,000-35,000 cfs), and 144.61 mg/L (>35,000 cfs).
  - *Flows <12,000 cfs were equaled or exceeded 53% of the time over the course of the study, 12,000-35,000 cfs 42% of the time, and >35,000 cfs 5%.*
- Mainstem hydrology is typically defined by the season
- Apparent increases in SSC were typically not observed during Vernon peaking events.
- During high and moderate flow periods SSC measurements as recorded at the HYDROs were comparable to those measured in the mainstem (StreamSide) when Northfield Mountain was pumping. Alternatively, SSC values lower than those observed in the mainstem were observed when the Project was generating. This suggests that the Project was pumping more suspended sediment into the Upper Reservoir than it was transporting back to the river and that the Project had no discernable impact on mainstem SSC values.
- During low flow periods SSC values observed in the river were very low and differences in SSC between generation and pumping cycles were negligible.
- Data collected from the North and South banks of the Northfield Mountain tailrace, the Northfield Mountain tailrace cross-section, and the Rt. 10 Bridge cross-section all indicated that the continuous LISST pumps were installed at locations representative of the cross-section.

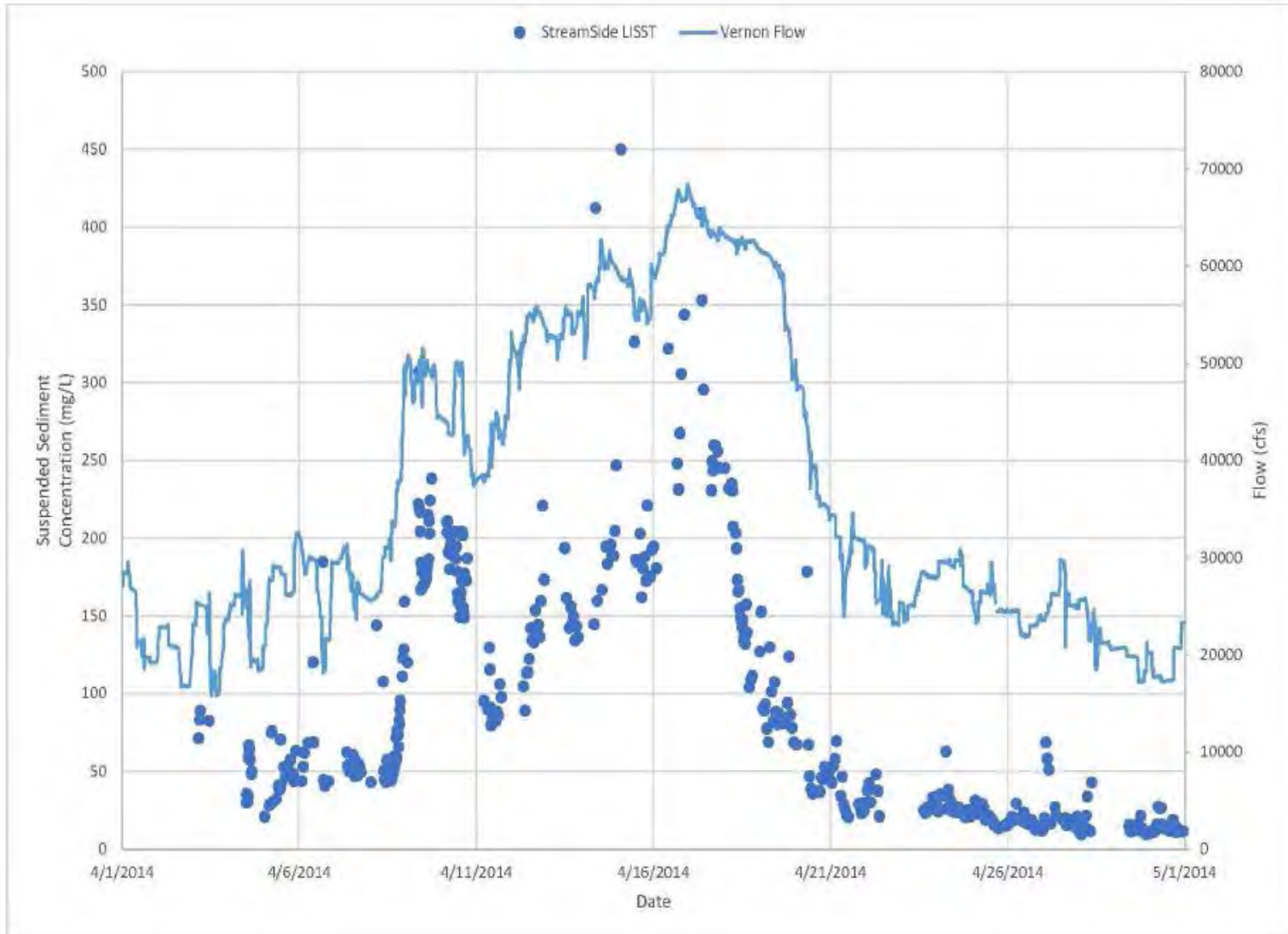
### 3.1.3-Northfield Mountain Project Sediment Management Plan

**Connecticut River SSC vs. Vernon Discharge (2013-2015)**



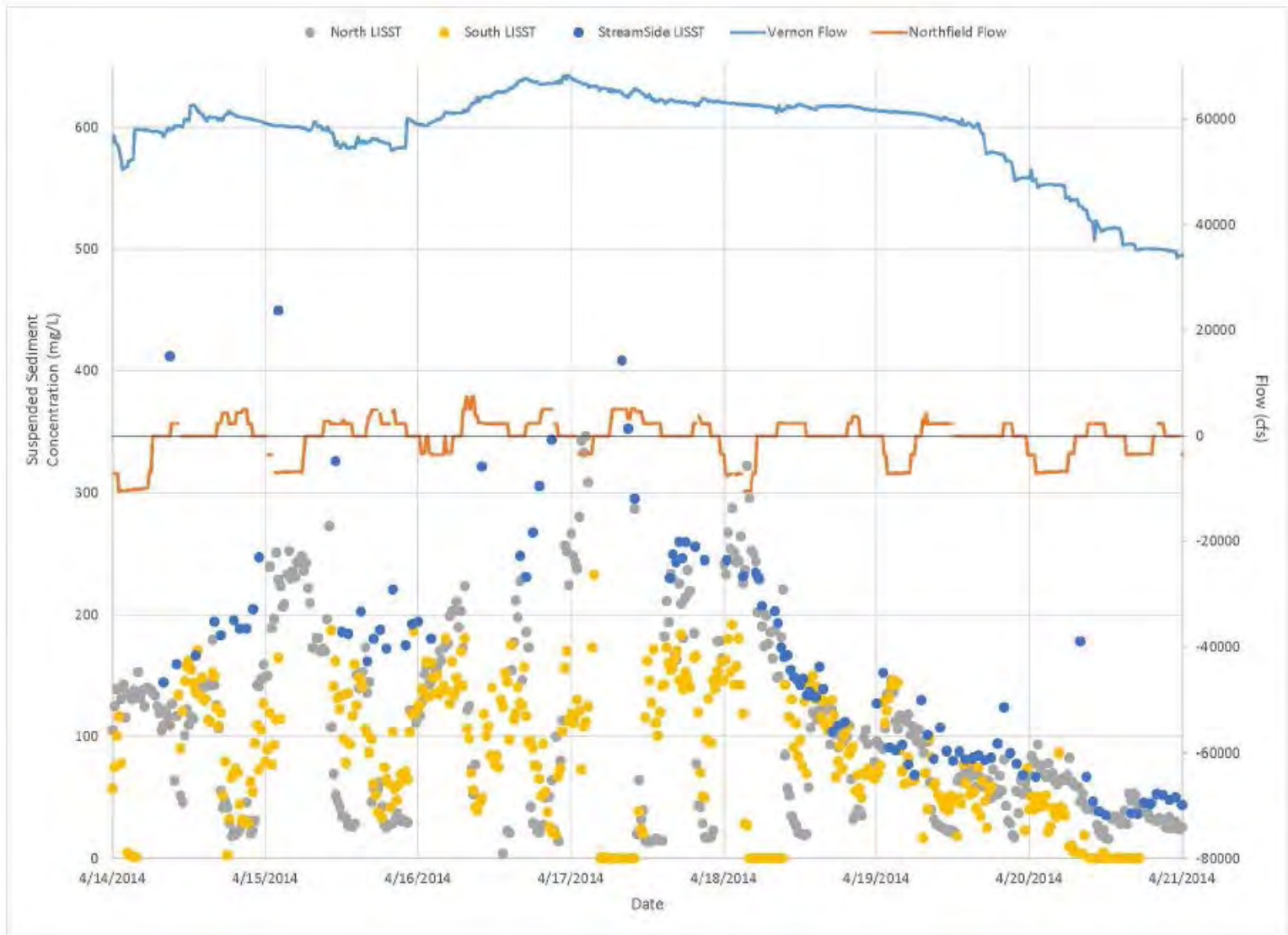
## 3.1.3-Northfield Mountain Project Sediment Management Plan

### 2014 Spring Freshet – SSC vs. Flow (StreamSide)



# 3.1.3-Northfield Mountain Project Sediment Management Plan

## Northfield Mountain Tailrace High Flow Scenario



# Recreation and Land Use Resources





## 3.6.1-Recreation Use/User Contact Survey

### **Study Progress**

#### **Task 1: Study Preparation**

- Study preparation was primarily conducted in 2014 and reported in the ISR.
- Conducted consultation with the MA Environmental Police and local police departments.
- Confirmed with recreation departments in local towns and recreation/open space committees that FL has obtained the most current recreation and open space plans.

#### **Task 2: Field Work**

- Traffic counters removed when each site closed in the fall of 2014 or prior to the first snowfall.
- Field work completed in December of 2014.
- Information regarding recreation use at the Franklin County Boat Club, Turners Falls Rod and Gun Club, the Northfield Mount Hermon School and the Massachusetts Division of Fish and Wildlife was requested.

#### **Task 3: Data Entry and Statistical Analysis**

- Data entry into electronic spreadsheets was completed and QA/QC'ed.
- Data analysis for the Northfield Mountain trail user survey was conducted and results presented in the report for Study No. 3.6.7 – Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use.

#### **Findings (if any)**

- Findings will be presented in the study report.
- Findings regarding Northfield Mountain Trail survey were reported in the report for Study No. 3.6.7, which was posted on the relicensing website in June 2015 and filed with FERC on September 14, 2015.

#### **Variances (if any)**

- There were no variances from the study plan or schedule during the second year of the study.

#### **Work Remaining**

- Statistical/data analysis is ongoing.
- Report is under development and anticipated to be filed by 12/31/2015.

## 3.6.2-Recreation Facilities Inventory and Assessment Addendum

### Addendum

- Original Recreation Facilities Inventory and Assessment was filed with ISR on September 15, 2014.
- FERC issued the Determination on Requests for Study Modifications and New Studies on January 22, 2015.
  - Requirements included:
    - A full inventory and assessment of all climbing areas within the Project boundaries, including Rose Ledge;
    - A full inventory and assessment of the put-in site downstream of Turners Falls Dam;
    - Separate descriptions of the Poplar Street Access Site and the Portage Route including take-out and put-in locations, the process to call for portage assistance, and the route(s) used for the portage (including distance);
    - A description of how visitors access the bypassed reach from Cabot Woods and the condition of the route;
    - Address discrepancies between the text of the assessment report and the inventory sheet for Cabot Woods and provide a legible site drawing or map that show and label all pertinent features, such as parking lots, gates, and river access routes;
    - A condition assessment of Poplar Street Access Site and the Gatehouse Fishway Viewing Area with legible site drawings or maps that show and label all pertinent features such as parking lots, gates, and river access routes;
    - Inclusion of all information from FL's response to comments;
    - Legible site maps that show and label all pertinent features (e.g. river access routes, parking lots, and structures); and
    - Recreation Facilities and Recreation Amenities tables that list all sites and include basic facility information.

## 3.6.2-Recreation Facilities Inventory and Assessment Addendum

### **Addendum**

- Full inventory and assessment of the put-in site downstream of Turners Falls Dam.
- Separate descriptions of Poplar Street Access Site and the Canoe Portage Route.
- Description of how visitors access the bypassed reach from Cabot Woods including condition of route.
- Addressed discrepancies between the text of the assessment report and the inventory sheet for Cabot Woods.
- Provided legible site drawing or map that shows and labels all pertinent features of all sites including Cabot Woods.
- Condition assessment of Poplar Street Access Site and the Gatehouse Fishway Viewing Area with legible site drawings or maps that show and label all pertinent features such as parking lots, gates, and river access routes.
- Included information from FL response to comments filed December 15, 2014.
- Provided Recreation Facilities and Recreation Amenities tables for the 10 Commission approved recreation facilities.
- FERC-required addendum posted on the relicensing website and filed with FERC on 6/15/2015.

### **Findings**

- See next pages.

### **Variances (if any)**

- None.

### **Work Remaining**

- None.

## 3.6.2-Recreation Facilities Inventory and Assessment Addendum

### Results and Analysis

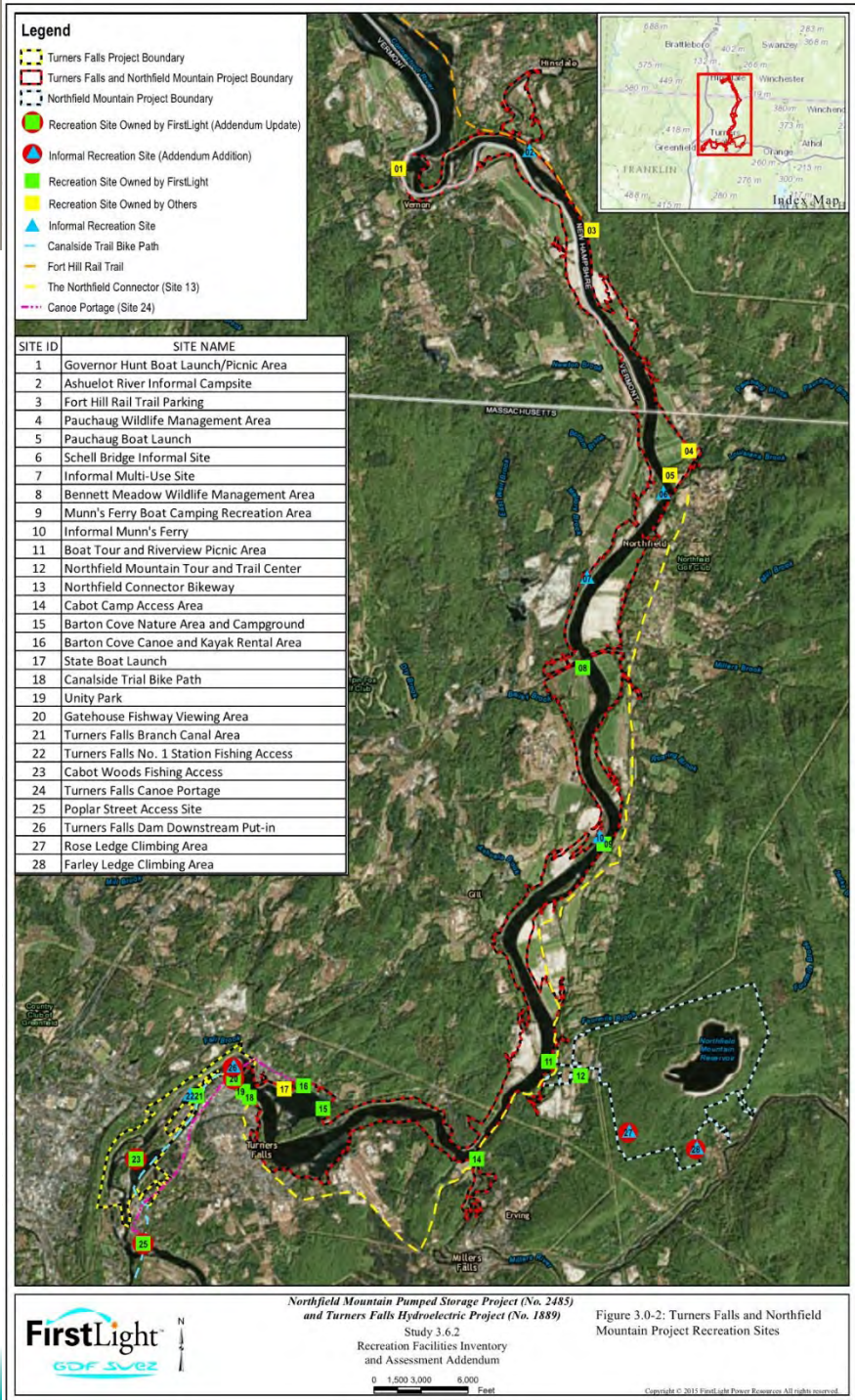
- Report contains the following information

#### Recreation Site Data Collected as part of the Inventory Addendum

Site ID	Recreation Site Name	Data Collected as Part of the Recreation Inventory Assessment Addendum
1	Governor Hunt Boat Launch/Picnic Area	New field site map of the portion of the site located within the Project boundaries.
3	Fort Hill Rail Trail	New field site map.
4	Pauchaug Wildlife Management Area	New field site map.
5	Pauchaug Boat Launch	New field site map.
6	Schell Bridge Informal Site	New field site map
8	Bennett Meadow Wildlife Management Area	New field site map.
9	Munn's Ferry Boat Camping Recreation Area	New field site map.
10	Informal Munn's Ferry Access Site	New field site map
11	Boat Tour and Riverview Picnic Area	New field site map.
12	Northfield Mountain Tour and Trail Center (Northfield Mountain Visitors Center)	New field site map.
14	Cabot Camp Access Area	New field site map.
15	Barton Cove Nature Area and Campground	New field site map.
16	Barton Cove Canoe and Kayak Rental Area	New field site map.
17	State Boat Launch	New field site map.
19	Unity Park	New field site map
20	<b>Gatehouse Fishway Viewing Area</b>	<b>New field site map, updated inventory, and condition assessment.</b>
21	Turners Falls Branch Canal Area	New field site map.
22	Turners Falls No. 1 Station Fishing Access	New field site map
23	<b>Cabot Woods Fishing Access</b>	<b>New field site map, updated inventory and, description of how the bypass can be accessed from this site.</b>
24	<b>Turners Falls Canoe Portage</b>	<b>Review of portage operations and updated portage description.</b>
25	<b>Poplar Street Access Site</b>	<b>New field site map, updated inventory, and condition assessment.</b>
26	<b>Turners Falls Dam Downstream Put-in</b>	<b>Completed inventory data form, and assessed to prepare field site map.</b>
27	<b>Rose Ledge Climbing Area</b>	<b>Completed inventory data form, and assessed to prepare field site map.</b>
28	<b>Farley Ledge Climbing Area</b>	<b>Completed inventory data form, and assessed to prepare field site map.</b>

Sites in bold are those sites for which FERC's ISR Determination Letter specifically requested new or updated information.

- 28 Recreation Sites Inventoried.
- 10 Project Recreation Sites (Commission Approved).
- Remaining 18 Sites include both formal (improved) and informal (unimproved) recreation sites and access areas.
- Of the 10 Project Recreation Sites (Commission approved):
  - 5 were approved as part of the Northfield Mountain Exhibit R in 1977.
  - 1 was approved as part of the Northfield Mountain Revised Exhibit R in 2003.
  - 4 were approved as part of the Turners Falls Exhibit R in 1982.



### **Work Completed**

Task 1: Develop Boating Evaluation Protocol, Logistics and Schedule

Task 2: On-Water Boating Evaluation

Task 3: Identify and Evaluate Access to the Turner Falls Bypass Reach

Task 4: Data Review and Analysis

Task 5: Report Development

- All of the above tasks are complete. Report posted to website on 3/31/15 and filed with FERC on 9/14/15.

### **Findings**

- See next pages.

### **Variations**

- “Photograph/Videotape Coverage Locations” component of Task 1 of the Modified RSP:
  - FirstLight originally proposed a site near the Turners Falls Road Bridge. Based on discussions with the boater stakeholders at the July 1, 2014 consultation meeting, this site was eliminated and replaced with a site at the Gill-Montague Bridge near Turners Falls Dam.

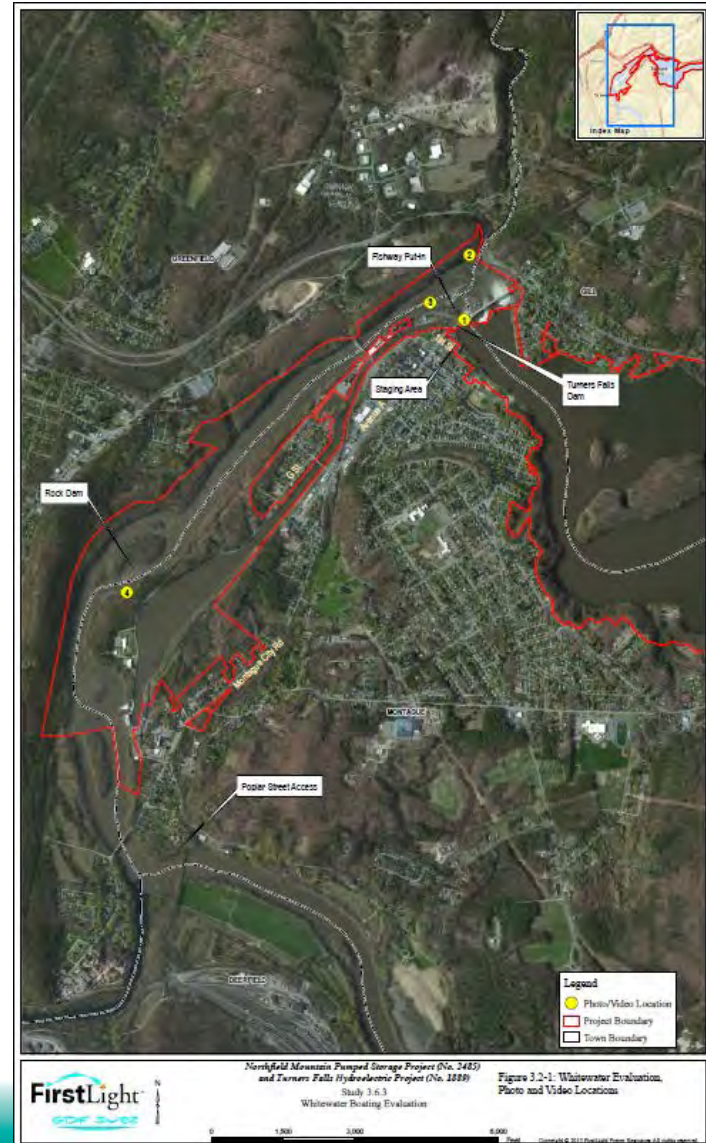
### **Work Remaining**

- None.

## 3.6.3-Whitewater Boating Evaluation

### Methodology

- Five specific tasks:
  - Boating evaluation protocol, logistics and schedule development
  - On-Water Boating Evaluation
  - Identification and Evaluation of Access to the Turners Falls
  - Data Analysis
  - Report Preparation
- Whitewater experience evaluated for 6 flows: 2,500, 3,500, 5,000, 8,000, 10,000, and 13,000 cfs.
- Variety of watercraft included: hard shell kayaks, solo open canoes (OC1), solo closed canoes (C1), tandem closed canoes (C2), rafts, cataraft/shredders, and a stand up paddle board (SUP).
- 42 participants, of various levels of boating experience, rated the flows and boating experience.
- After each test flow, participants completed a “Single Flow Evaluation Form”.
- After the final run, participants completed the “Comparative Flow Evaluation Form”.
- Post-Evaluation Discussion was collected to identify additional input from the boaters regarding the bypass reach whitewater opportunities.



### 3.6.3-Whitewater Boating Evaluation

#### Findings:

#### Assessment of Whitewater Boating Opportunities in the Bypass Reach

- The reach was found to provide an acceptable boating experience for most watercraft types at all six of the study flows; participant evaluations showed varied acceptable and optimal flows:
  - Minimum flow varied by watercraft, from 2,500 to 5,000 cfs.
  - Optimal flow also varied by watercraft, from 3,500 to 10,000 cfs.
  - Overall, flows in the range of 5,000 to 8,000 cfs provided optimal boating conditions for most watercraft types.
- Both lower and higher flows rated well with the participants, although the ratings were dependent on type of watercraft and skill level.

#### Bypass Reach Flow Suitability by Watercraft

Watercraft	Flow 1 2,500 cfs	Flow 2 3,500 cfs	Flow 3 5,000 cfs	Flow 4 8,000 cfs	Flow 5 10,000 cfs	Flow 6 13,000 cfs
Kayaks	Acceptable (0.60)	Acceptable (0.63)	Acceptable (1.27)	Totally Acceptable (1.67)	Acceptable (1.09)	Acceptable (1.18)
OC1	Acceptable (0.75)	Acceptable (1.00)	Acceptable (1.20)	Acceptable (1.25)	Acceptable (0.66)	Neutral (0.50)
Rafts	Unacceptable (-0.75)	Neutral (0.00)	No response	Acceptable (1.00)	Acceptable (1.10)	Acceptable (1.00)
C1/C2	Acceptable (1.50)	Acceptable (1.50)	Acceptable (1.00)	Totally Acceptable (2.00)	Acceptable (1.00)	Acceptable (1.00)
Cataract/Shredder	No response	Acceptable (1.20)	Totally Acceptable (2.00)	Totally Acceptable (2.00)	Did not run	Did not run
SUP	Totally Acceptable (2.00)	Totally Acceptable (2.00)	Totally Acceptable (2.00)	Totally Acceptable (2.00)	Did not run	Did not run

#### Minimum Acceptable and Optimal Flow Compilation/Comparison

Watercraft	2,500 cfs		3,500 cfs		5,000 cfs		8,000 cfs		10,000 cfs		13,000 cfs	
	Min	Opt	Min	Opt	Min	Opt	Min	Opt	Min	Opt	Min	Opt
Kayak					✓					✓		✓
OC1	✓					✓						
Raft					✓		✓	✓				
C1/C2	✓			✓		✓						
Cataract/Shredder			✓		✓	✓		✓				
SUP	✓							✓				



### 3.6.3-Whitewater Boating Evaluation

#### Findings:

#### Assessment of Whitewater Boating Opportunities in the Bypass Reach

- The Turner Falls Dam bypass reach was rated as a Class I-IV whitewater run, although at most flows, the overall rating is Class II-IV.
- For most evaluation flows, the Class IV rating was attributed to a single natural feature, the Rock Dam.
- Overall, the results of the whitewater boating evaluation of the reach demonstrate that the bypass reach provides whitewater opportunities for a variety of watercraft and skill levels, over a range of flow conditions.
- Post-study discussion input suggests that other factors impact satisfaction with the bypass reach, including aesthetics. Several boaters indicated that the urban/industrial setting would deter recreational boaters.

#### Bypass Reach Flow Difficulty based on the International Scale of River Difficulty by Watercraft and Flow

Watercraft	Flow 1 2,500 cfs	Flow 2 3,500 cfs	Flow 3 5,000 cfs	Flow 4 8,000 cfs	Flow 5 10,000 cfs	Flow 6 13,000 cfs
Hard shell kayak	I to III	II to III	II to IV	II+ to IV	II to IV	I <sup>5</sup> to IV
Solo Open Canoe (OC1)	I to II	II to III+	II to IV	II to IV	III	III to IV
Raft	II to III	I to III	I to IV	II to III	I to III+	II to III
Closed canoe (C1 and C2)	II	II to II+	II to II+	II to III	II+ to III	III
Cataract/Shredder	II	II to III+	II to III	II to III	Did not run	Did not run
Stand Up Paddle Board (SUP)	II to III	II to III	III	III	Did not run	Did not run
OVERALL RATING	I to III	II to III	II-IV	II to IV	II-IV	II-IV

#### Skill Level needed to Safely Paddle Bypass Reach

Level	2,500 cfs	3,500 cfs	5,000 cfs	8,000 cfs	10,000 cfs	13,000 cfs
Beginner	6 (22%)	3 (11%)	1 (4%)	1 (4%)	2 (6%)	2 (7%)
Novice	15 (56%)	14 (54%)	14 (56%)	7 (29%)	5 (16%)	6 (20%)
Intermediate	6 (22%)	9 (35%)	10 (40%)	14 (58%)	21 (68%)	18 (60%)
Advanced	0	0	0	2 (8%)	3 (10%)	4 (13%)
Expert	0	0	0	0	0	0

#### **Findings: Demand for Whitewater Boating in the Bypass Reach**

- At optimal flows of 5,000 – 8,000 cfs, boaters were fairly evenly divided among those who would “possibly”, “probably”, and “definitely” return.
- At minimum acceptable flows of 2,500 cfs, boaters were equally split between those that would “definitely not return” and those that would “possibly” or “probably” return.
- Some boaters indicated a lack of interest to return to the bypass due to factors including short run, lack of features, and availability of better regional opportunities.

#### **Likelihood of Boaters to Return to Boat the Test Flows**

<b>All Boaters</b>				
<b>Likely to Return</b>	<b>Definitely No</b>	<b>Possibly</b>	<b>Probably</b>	<b>Definitely Yes</b>
2,500, cfs	11 (42%)	7 (27%)	3 (12%)	5 (19%)
3,500 cfs	6 (23%)	10 (38%)	5 (19%)	5 (19%)
5,000 cfs	0	7 (33%)	7 (33%)	7 (33%)
8,000 cfs	1 (5%)	5 (24%)	8 (38%)	7 (33%)
10,000 cfs	1 (3%)	9 (31%)	7 (24%)	12 (41%)
13,000 cfs	2 (9%)	7 (30%)	4 (17%)	10 (43%)

### **Findings: Demand for Whitewater Boating in the Bypass Reach**

- More than 60 regional whitewater boating opportunities that provide the same range of whitewater classifications (Class I to IV) were identified within a 50 mile radius of the Turners Falls Project.
- Many regional rivers provide longer whitewater stretches (4 to 30 miles) than the bypass reach (2.7 miles).
- Regional rivers provide a variety of natural flow and regulated spill release rivers.

#### **Unregulated/Natural Flows**

- Some regional boating rivers are dependent on natural flows, including the Turners Falls bypass reach.
- Natural flows provide seasonal whitewater boating opportunities, typically in the spring or fall, or after a heavy rain.

#### **Scheduled Flow Release**

- Several regional boating reaches provide scheduled flow releases.
- These scheduled releases provide regulated flow throughout the recreation season, including on weekends and during summer.
- Locations that provide scheduled whitewater boating releases include the Deerfield, West, and Millers Rivers.
- The Deerfield River provides approximately 106 scheduled boating flows, annually.

### 3.6.3-Whitewater Boating Evaluation

#### **Findings: Demand for Whitewater Boating in the Bypass Reach**

- 11 regional rivers within a 40 mile radius of the Turners Falls bypass reach were identified for comparison.
- The bypass reach provides an average to slightly better than average whitewater opportunity in comparison to other local and regional opportunities of similar difficulties.
- Survey results suggest that the overall appeal of the bypass reach is impacted based on the short length of the boating run (2.7 miles), the urban setting, and the lack of information of spills.
- When evaluating the overall boating experience including suitability and characteristics of boating features, ratings indicate that almost all of the regional rivers are slightly more desirable than the bypass reach. Numerous regional whitewater boating opportunities, that are available as a result of scheduled releases, or seasonally, provide as good or better whitewater opportunities for boaters of all skill levels.

*Overall, regional opportunities appear to be sufficient to meet current demand, based on the boaters' ratings of the comparability of these other rivers to the Turners Falls bypass reach.*

#### **Bypass Comparison to Rivers/Boating Opportunities of Similar Difficulty**

	<b>Other rivers w/in a 1 hour drive</b>	<b>Other rivers in Massachusetts</b>	<b>Other rivers in the northeast</b>	<b>Other rivers in the country</b>
Kayak	Better than average (0.64)	Average (0.46)	Average (0.00)	Average (-0.21)
Open canoe	Average (0.00)	Average (0.00)	Average (-0.13)	Average (-0.25)
Raft	Better than average (0.67)	Average (0.47)	Average (0.00)	Worse than average (-0.54)
Closed canoe	Average (0.00)	Average (0.00)	Average (0.00)	Average (0.00)
Cataract/Shredder	Average (0.40)	Better than average (1.00)	Average (0.00)	Average (-0.25)
SUP	Average (0.00)	Average (0.00)	Average (0.00)	Average (0.00)

### Findings:

#### Whitewater Boating Flow Analysis

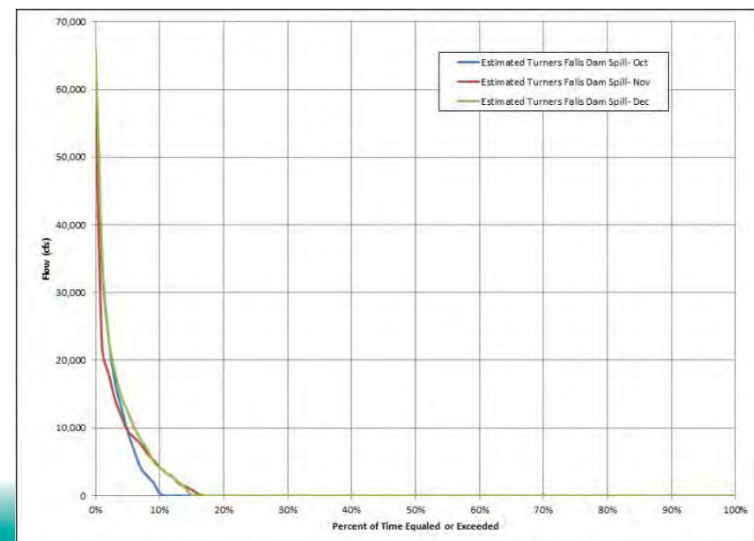
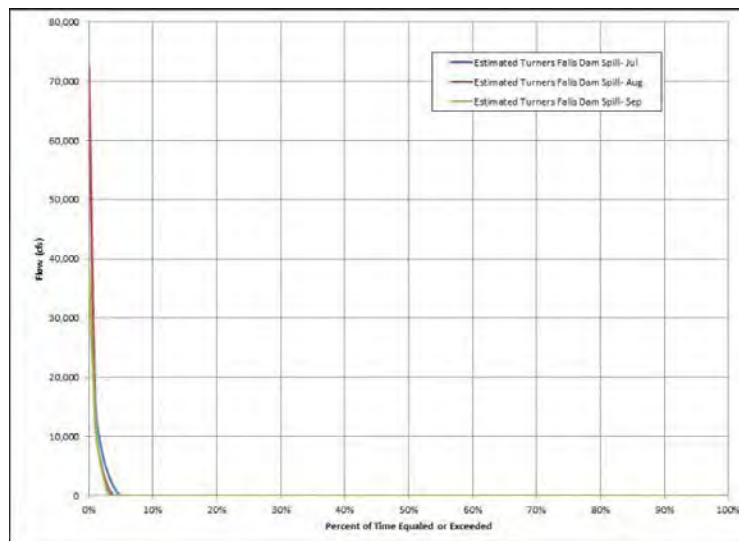
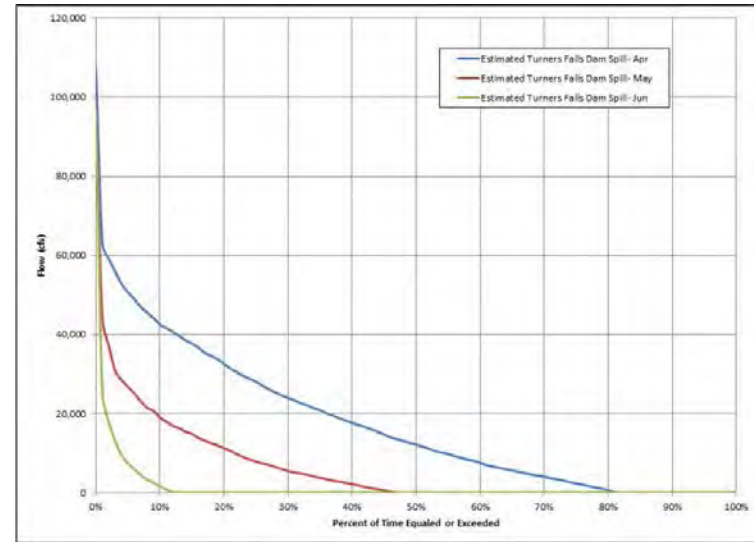
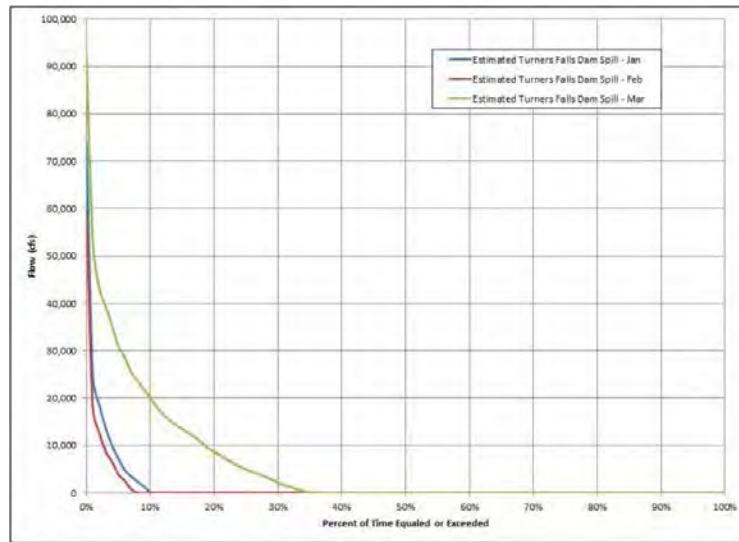
- Based on the river hydrology assessment, acceptable boating flows typically occur an estimated 40-45 days between April and November.
  - Approx. 45 days exceeding acceptable boating flows (2,500-3,500 cfs)
  - Approx. 40 days exceeding optimal boating flows (5,000-8,000 cfs)
- Analysis was conducted to estimate flows at the Turner Falls Dam using long term records (1940-2013) from USGS gauges along the Connecticut River.
  - USGS gauges include Gauge No. 01170500 at Montague City, MA, and 01170000 near West Deerfield, MA.
- Spill duration curves demonstrate that boatable flows >2,500 cfs can and do occur in the bypass reach year round, with the highest incidence of boating opportunities occurring in the spring (March through May).
- Boatable flows occur in the spring
  - Approx. 74% of the time in April
  - Approx. 38% of the time in May

#### Percentage by Month and Estimated Number of Days Spill Flows Equal or Exceed Boating Evaluation Flows

Month	Flows Evaluated during the July 2014 Bypass Reach Whitewater Boating Study					
	2,500 cfs		5,000 cfs		10,000 cfs	
	Percent of Time	Estimated Days	Percent Exceeded	Estimated Days	Percent Exceeded	Estimated Days
January	7%	2	5%	2	4%	1
February	6%	2	4%	1	2%	<1
March	29%	9	24%	7	18%	6
April	74%	22	66%	20	54%	16
May	38%	12	31%	10	21%	7
June	8%	2	6%	2	3%	1
July	3%	1	2%	1	1%	<1
August	2%	1	2%	1	1%	<1
September	2%	1	2%	1	1%	<1
October	8%	2	6%	2	4%	1
November	12%	4	9%	3	4%	1
December	17%	5	14%	4	10%	3

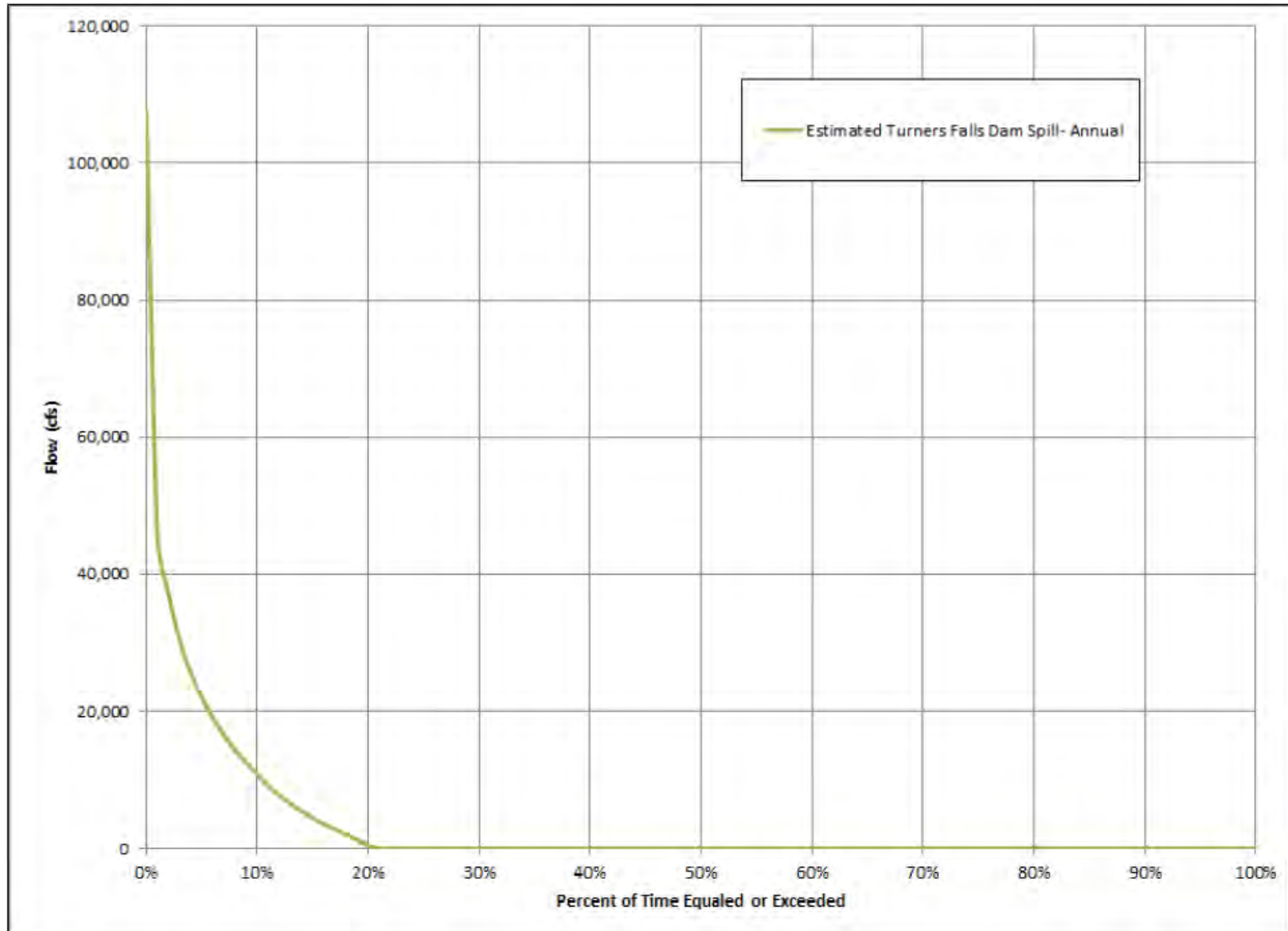
### 3.6.3-Whitewater Boating Evaluation

#### Turners Falls Dam Spill into Bypass Reach – Seasonal Spill Duration Curves (1940-2013)



### 3.6.3-Whitewater Boating Evaluation

**Turners Falls Dam Spill into Bypass Reach – Annual Spill Duration Curve (1940-2013)**



## Findings: Bypass Reach Access

- Three existing access points into the bypass reach include the fishway put-in (RM 20.2), Turners Falls Station No. 1 Fishing Access (RM 20.9), and Cabot Woods Fishing Access (RM 22.0).
- Both the fishway put-in and Turners Falls Station No. 1 Fishing Access are suitable for whitewater boating use and reach access.
- Cabot Woods Fishing Access is not suitable as a boating access due to steep slopes and in-water safety concerns.
- The Poplar Street Access, downstream of the bypass was the take-out location during the July 2014 evaluation. 91% of participants rated access as moderate/difficult.

## Turners Falls Bypass Reach Put-in and Take-out Ratings

Fishway Put-in Rating							
	Kayakers	OC1	Raft	C1/C2	Cataraft/Shredder	SUP	Totals
Easy	56	26	27	6	7	4	126 (85%)
Moderate	1	5	7	5			18 (12%)
Difficult	2				2		4 (3%)
Poplar Street Access (Take-out) Rating							
	Kayakers	OC1	Raft	C1/C2	Cataraft/Shredder	SUP	Totals
Easy	4	3	5		2		14 (9%)
Moderate	37	11	15	1	1	3	68 (44%)
Difficult	17	20	15	11	7	1	71 (46%)





### **Conclusions:**

*The final results of the whitewater boating evaluation demonstrate that the current bypass reach provides adequate whitewater boating opportunities for a variety of watercraft and skill levels, and in conjunction with the abundance of regional whitewater boating opportunities, there is no significant demand for increased whitewater boating opportunities in the bypass reach.*



## 3.6.4-Assessment of Day Use and Overnight Facilities Associated with Non-motorized Boats

### **Work Completed**

Task 1: Literature Review

Task 2: Field Work

Task 3: Report Preparation

- All of the above tasks are complete. Report posted to website on 3/31/15 and filed with FERC on 9/14/15.

### **Findings (if any)**

- See next pages.

### **Variances (if any)**

- None.

### **Work Remaining**

- None.

### Methodology

- Literature review:
  - Internet and literature search providing information regarding the Connecticut River Trail, facilities, access and use of the Connecticut River through the Projects' areas.
- Field work:
  - Collection of existing data, such as municipal property records reviewed to determine general land ownership adjacent to study area.
  - Field work occurred and was completed on August 28-29, 2014.
  - Representatives from AMC, CWRC, and Northfield Open Space Committee participated in field work on one or both days.
  - Field work included:
    - Boating shorelines of study area.
    - Ground-verifying location of existing and potential use and access sites, including those identified in the "MA-CT Expansion Feasibility Study".
    - Investigating areas where potential canoe portage trails may be beneficial to paddlers.

## 3.6.4-Assessment of Day Use and Overnight Facilities Associated with Non-motorized Boats

### Existing Campsites and Access Sites within the Study Area

Site Name/ Designation	Facilities/ Amenities	Location <sup>9</sup>	Access and/or Camping	Ownership <sup>10</sup>	Located w/in Project <sup>11</sup>
Governor Hunt Boat Launch/ Picnic Area <sup>13</sup>	Hard surface boat launch	RM 0.1 River right	access	TransCanada	Partially
Stebbins Island	Water access camping	RM 1.1 island	camping	TransCanada	Yes
Pauchaug Boat Launch	Hard surface boat launch	RM 6.5 River left	access	Commonwealth of MA.	Yes
Munn's Ferry Boat Camping Recreation Area	5 water access campsites, dock	RM 11.5 River left	camping	FirstLight	Yes
Boat Tour and Riverview Picnic Area	Picnic area, pavilion, tour boat dock,	RM 14.7 River left	access	FirstLight	Yes
Cabot Camp Access Area	Parking	RM 16.2 River left	access	FirstLight	Yes
Barton Cove Nature Area & Campground	Carry-in access, campsites	RM 18.3 River right	access & camping	FirstLight	Yes
Barton Cove Canoe & Kayak Rental	Carry-in access	RM 19.6 River right	access	FirstLight	Yes
State Boat Launch	Hard surface boat ramp	RM 19.6 River right	access	Commonwealth of MA.	Partially
Poplar Street Access	Parking, steep unimproved path to shoreline	RM 23.5 River left	access	FirstLight	No
Sunderland Bridge Boat Launch	Unimproved boat launch	RM 32.5 River left	access	Maintained by Town of Sunderland	No
Sunderland Bridge access	Parking and foot path to river	RM 32.5 River right	access	Within State right-of-way	No

### Findings: Existing Campsites and Access Sites

- Sites within the study area:
  - 2 formal campsites and 6 access sites owned and operated by FirstLight within the Project boundary.
  - 1 formal campsite and 1 access site either partially or wholly within the Project boundary owned and operated by TransCanada.
  - 3 access sites and no campsites in the 9.5 mile reach below the Project.

## Findings: Determining Necessity of Future Campsites and Access Facilities

- FirstLight’s campground records show the maximum occupancy that has occurred in the past five years:
  - 56.4% at Munn’s Ferry
  - 67.4% at Barton Cove
- Significant surplus capacity throughout the camping season at both campgrounds.

## Occupancy Rates for FirstLight Managed Project Campgrounds

Year	Munn’s Ferry (Memorial Day weekend – Columbus Day weekend)		Barton Cove (Group sites – Memorial Day weekend – 3 <sup>rd</sup> weekend in November; Individual sites – Memorial Day weekend – Labor Day weekend)	
	Weekday	Weekend	Weekday	Weekend
2014	5.1%	30.2%	8.4%	37.6%
2013	4.2%	28.4%	9.1%	39.2%
2012	9.6%	31.1%	13.6%	50.7%
2011	12.7%	56.4%	13.6%	55.8%
2010	14.3%	38.6%	15.0%	67.4%

### Findings: Determining Necessity of Future Campsites and Access Facilities

#### Water Trail Guidelines for Campsite and Access Site Spacing

- Water trail spacing guidelines vary considerably, and range from 3-15 miles for campsites, and 4-10 miles for access sites.
- FCRPT Connecticut River Paddlers' Trail Management Protocol and Stewardship Guidelines recommendations:
  - Access spacing: 5-10 miles for ideal spacing of access points.
  - Campsite spacing: No recommendation noted in guidelines. Short-term goal is 15 mile spacing.

#### Current Spacing

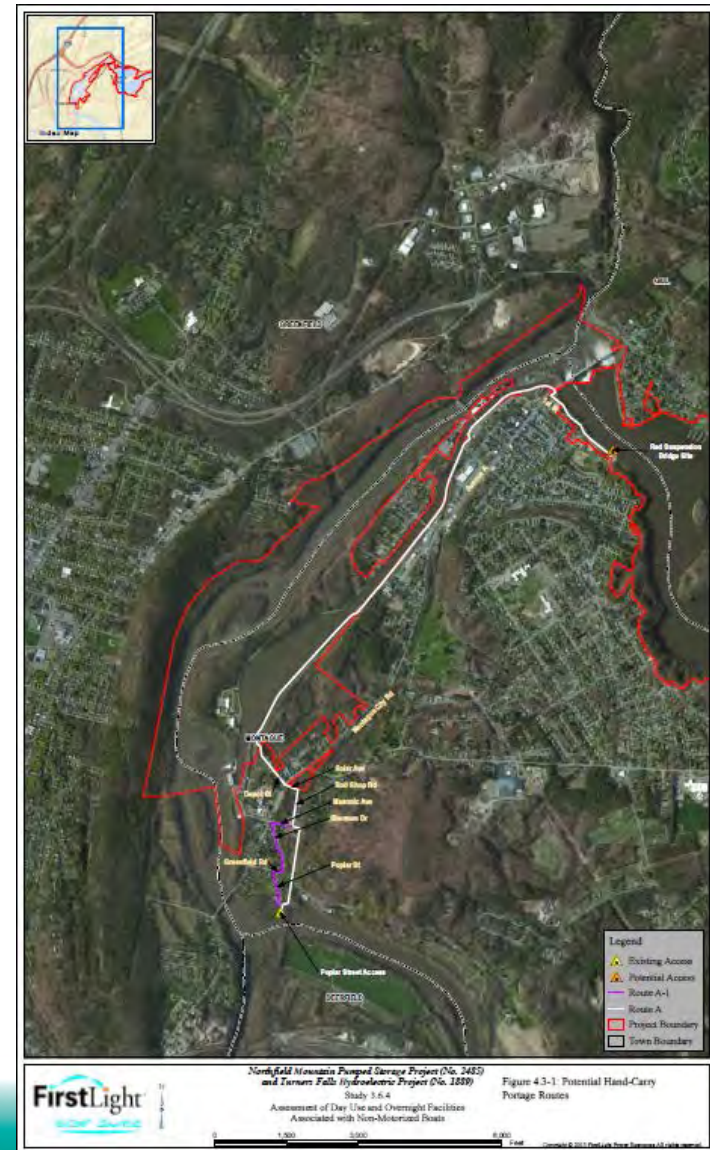
- Spacing between access points:
  - Between 1.3 and 9 miles apart.
  - Consistent with other water trails spacing.
  - Consistent with FCRPT's "ideal" spacing of access every 5-10 miles.
- Spacing between campsite facilities:
  - Between 6.8 and 10.4 miles apart.
  - Consistent with campsite spacing on other water trails.
  - Consistent with FCRPT's short term goal of 15 mile spacing between campsites.

- The field assessment identified 8 additional possible locations for campsites and 7 additional possible locations for access sites within the study area, should it be determined that additional camping or access sites are needed in the future due to an increase in demand or a change in spacing requirements for the river trail system.

## Findings:

### Canoe Portage Trail Assessment

- Existing vehicle portage shuttle provided by FirstLight provides adequate portage around Turners Falls Dam.
  - Telephone number provided for pick up.
  - Portage provided within 15-90 minutes.
  - Take-out is at Barton Cove Rental Area.
  - Put-in is approx. 3.5 miles downstream of Turners Falls Dam at Poplar Street Access site.
  - Free, as-needed service.
- Feasibility of hand-carry canoe portage analyzed.
  - Identified Canalside Trail Bike Path (Route A) as the best alternative route, to minimize use of dangerous public streets.
    - Length of route: 3.08 miles total, with 0.37 miles on public side streets.
  - Alternative route on southerly end (Route A-1) would utilize side streets from Depot Street to the Poplar Street Access.
    - Length of route: 3.17 miles total, with 0.80 miles on public side streets.
  - Improvements would be needed to allow use of either hand-carry portage trail option.



#### **Conclusions:**

- *Existing campsites and access sites provide adequate overnight and day use facilities based on both spacing considerations and existing use and demand.*
- *If demand for campsites or access increases in the future or there are changes regarding river trail system spacing goals, the study has identified a number of possible locations for development of additional access or campsites.*
- *Currently, the collected data confirms that there is no necessity for additional facilities to be developed.*
- *The study identified a feasible hand-carry portage route utilizing the Canalside Trail Bike Path that could serve as walkable canoe portage trail, although the existing vehicle portage shuttle provides adequate portage around the Turners Falls Dam.*



### **Study Progress**

#### Task 1: Literature and Aerial Photography Review

- Reviewed and consolidated data from the National Land Cover Database and MassGIS into eight potential land use classifications.
- Aerial photography review is complete.
- Areas unclear in aerial photography were ground-truthed to verify appropriate land use classification.
- Reviewed available open space plans, master plans and applicable development plans.
- Contacted the towns of Erving, Gill, Greenfield, Montague, Northfield, Hinsdale and Vernon to confirm proper plans were obtained and reviewed.
- Existing conservation easements within 200 feet of the Project boundaries have been identified.

#### Task 2: Development and Application of Land Use Designations

- Land use classifications have been developed.

#### Task 3: Map and Summary Development

- Preliminary land use maps have been developed.

### **Findings (if any)**

- None to report at this time.

### **Variances (if any)**

- None.

### **Work Remaining**

- Continue to refine the land use maps based on information from other relicensing resource studies such as delineated wetlands and plans that were reviewed as part of task 1.
- Report is under development and anticipated to be completed by 12/31/2015.

## 3.6.6-Assessment of Effects of Project Operation on Recreation and Land Use

### **Study Progress**

#### **Task 1: Data Compilation**

- Completed applicable studies include: Recreation Facilities Inventory and Assessment (Study No. 3.6.2), Recreation Facilities Inventory and Assessment Addendum (Study No. 3.6.2), Whitewater Boating Evaluation (Study No. 3.6.3), Assessment of Day Use and Overnight Facilities Associated with Non-Motorized Boats (Study No. 3.6.4), Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use (Study No. 3.6.7), and Hydraulic Study of Turners Falls Impoundment, Bypass Reach and below Cabot Station (Study No. 3.2.2).
- Analysis will also be based on data from other pertinent relicensing studies, including Recreation Use/User Contact Survey (Study No. 3.6.1), Two-Dimensional Modeling of the Northfield Mountain Pumped Storage Project Intake/Tailrace Channel and Connecticut River Upstream and Downstream of the Intake/Tailrace (Study 3.3.9), and Northfield Mountain/Turners Falls Operations Impact on Existing Erosion and Potential Bank Instability (Study No. 3.1.2).

#### **Task 2: Data Analysis**

- Data and information applicable to the assessment of Project operational effects on recreation facilities and land use are being reviewed as various studies progress and are completed.

#### **Task 3: Report Development**

- Report is anticipated to be completed by 6/30/2016.

### **Findings (if any)**

- None to report at this time.

### **Variances (if any)**

- None to date.

### **Work Remaining**

- Completion of data compilation, data analysis and report development will occur as results from supporting studies become available.

### **Study Progress**

Task 1: Review of Existing Information

Task 2: Field Work

Task 3: Desktop Analysis

Task 4: Report Development

- All of the above tasks are complete. Report posted to website on 6/30/2015 and filed with FERC on 9/14/2015

### **Findings (if any)**

- See next pages.

### **Variances (if any)**

- None to report.

### **Work Remaining**

- None.

#### **Findings: Northfield Mountain Tour and Trail Center (NMTTC)**

The NMTTC is a four-season facility that provides a wide variety of opportunities, programs and amenities.

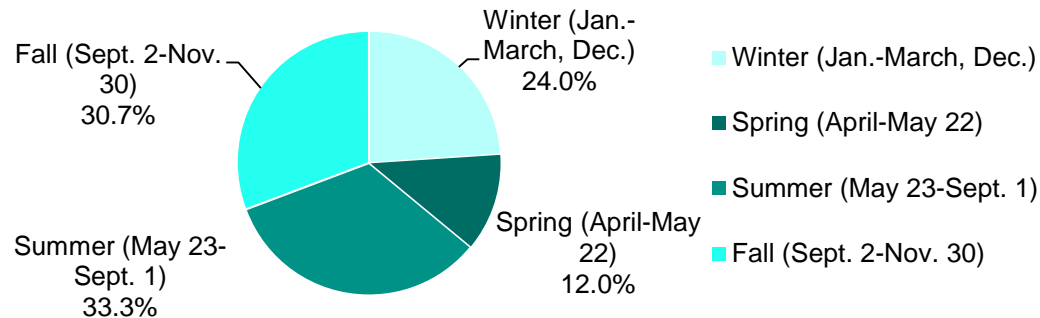
- Physical features and amenities include:
  - Visitor Center: interpretive displays, meeting rooms, cross-country ski rentals, a lounge, public restrooms.
  - Trail System: approximately 25 miles of trail used for hiking, mountain biking, equestrian use, snowshoeing and cross-country skiing.
  - Parking: paved area for approximately 53 vehicles. Overflow is provided on nearby mowed area. Horse trailers and buses utilize the cul-de-sac on the west side of the Visitor Center for parking.
  - Mountain Top Observation Area: wooden platform which provides views of the Upper Reservoir from the southern shore.
  - Additional amenities: picnic tables, grills, informational kiosks , and a yurt.
- Visitor Center offers a variety of public and school programs
- Recreation facilities and programs managed from the NMTTC include:
  - Munn's Ferry Boat Camping Recreation Area and camping at Barton Cove Nature Area and Campground;
  - the Quinnetuckut II ticket sales; and
  - the Gatehouse Fishway Viewing Area.

## Findings: Northfield Mountain Tour and Trail Center (NMTTC)

### Recreation Use of the NMTTC

- The NMTTC supported an estimated 20,024 recreation days in 2014.

#### Recreation Usage by Season

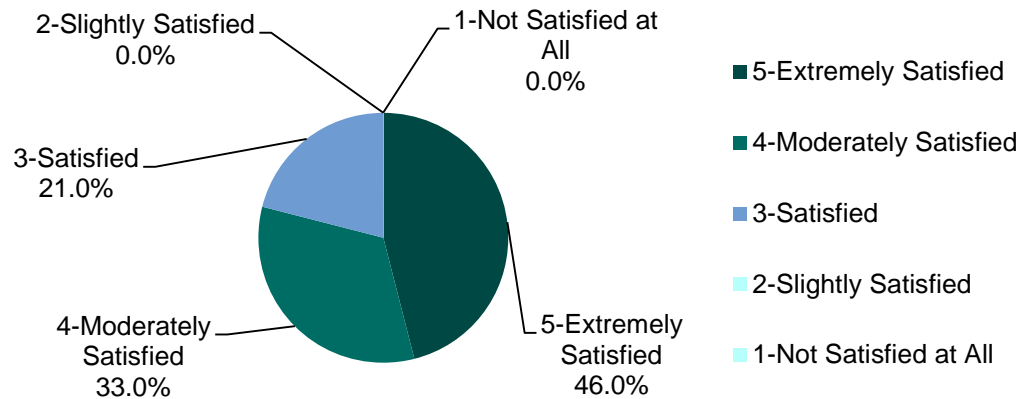


- Use of the NMTTC fell into three broad categories:
  - registered program use (includes registrants for environmental programs, recreation programs and ticketed cross-country skiers and snowshoers): data derived from records maintained by staff.
  - trail use during the Visitor Center’s open times (non-ticketed trail users): data derived from records maintained by staff.
  - trail use during the Visitor Center’s closed times: data derived from parking lot spot counts and calibrations.

## Findings: Northfield Mountain Tour and Trail Center (NMTTC)

- Visitors were asked beginning in late August to rate their overall satisfaction on a scale of 1 (“not satisfied at all”) to 5 (“extremely satisfied”) with the available recreation facilities at the NMTTC.

### Visitor Overall Satisfaction with Available NMTTC Recreation Facilities



- Visitors were requested to rate certain amenities and aspects of the NMTTC on a scale of 1 (“poor”) to 5 (“excellent”). 94% of respondents rated “parking” as a 4 or 5. 93% of respondents rated the “facility condition” and “toilets/restrooms” as a 4 or 5.
- Visitors were asked if the NMTTC amenities serve their interest. Of the visitors who responded 96% responded “yes” while only 4% responded “no”.

*Overall, visitors were satisfied with available programs and amenities.*



### 3.6.7-Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use

#### Findings: NMTTC Recent Historic Use

- Registration data for NMTTC program use and trail use was compiled for the period 2010-2014 and 2005.
- Average number of registrants over the five-year period from 2010 to 2014 was 20,430, which is 6% lower than 2014 use.
- Total registrations for NMTTC programs and trail use was highest in 2012; much of the increase was associated with a large cross-country meet.
- 2010 experienced the lowest use in terms of registrations. This is attributable to the fact that recreation areas adjacent to the Upper Reservoir were temporarily closed while the Project was out of service from early May to mid-November.

NMTTC Program/Activity Registration Data

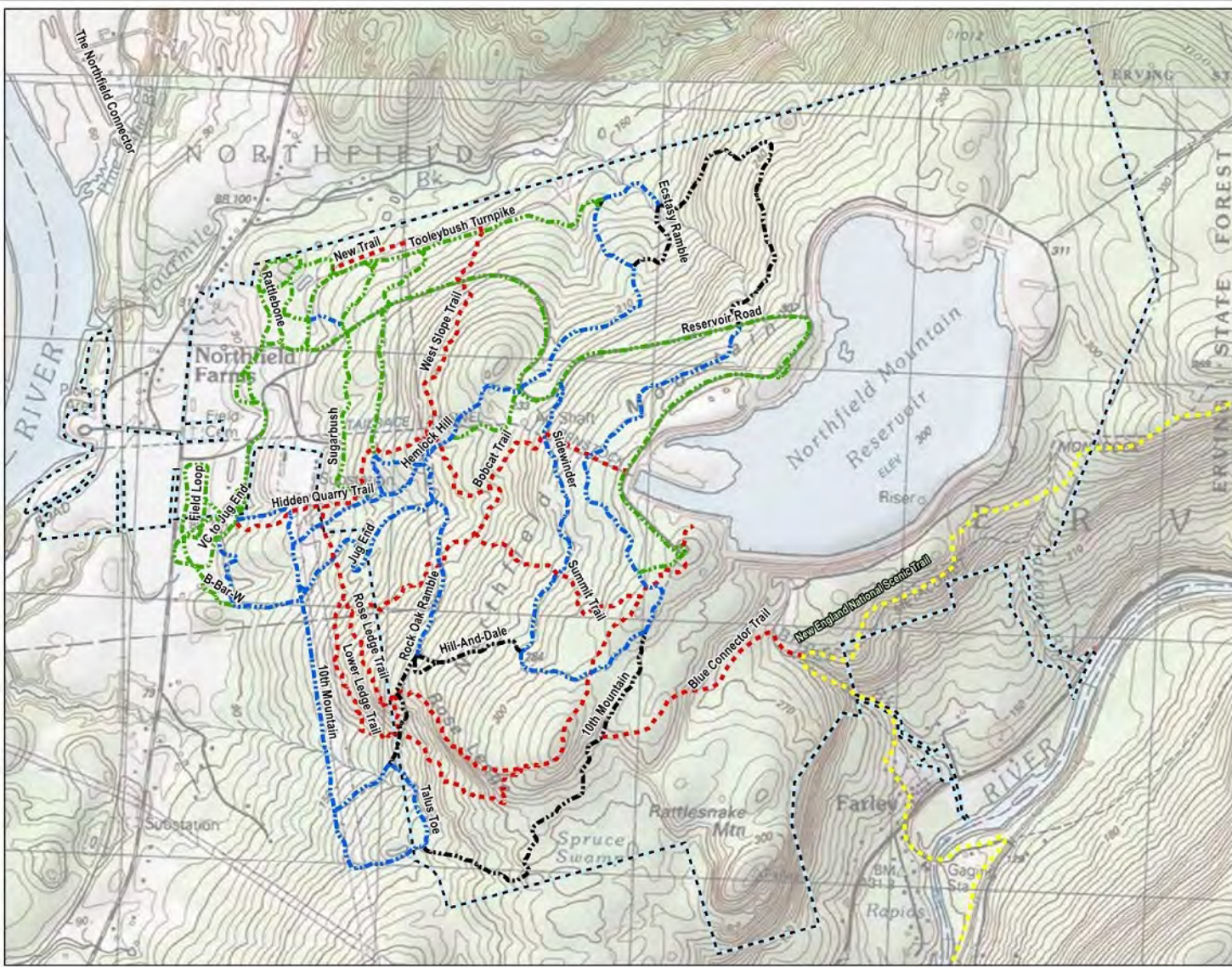
Event	2005	2010	2011	2012	2013	2014	2010-2014 Average
Participants in Environmental Programs	3,064	2,828	2,534	2,998	2,167	3,623	2,830
Riverboat Passengers	5,718	3,530	1,239	2,722	2,748	2,733	2,594
Skiers/Snowshoers	3,578	1,910	4,775	484	2,434	2,922	2,505
Trail Use	9,433	548	6,322	16,060	7,484	7,398	7,563
Fishway Tours	4,845	5,183	4,464	5,221	4,760	5,061	4,938
<b>Total</b>	<b>26,638</b>	<b>13,999</b>	<b>19,334</b>	<b>27,485</b>	<b>19,593</b>	<b>21,737</b>	<b>20,430</b>

Note: The figures here do not include use occurring when the NMTTC was closed.

*Use of the NMTTC has remained relatively consistent in the near term.*

*Use of environmental programs, the Quinnetuckut II and tours of the Turners Falls Fishway has seen a downward trend when viewing long-term use data.*

# 3.6.7-Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use



**Northfield Mountain Pumped Storage Project (No. 2485) and Turners Falls Hydroelectric Project (No. 1889)**  
 Recreation Study at Northfield Mountain, Including Assessment of Sufficiency of Trails for Shared Use  
 Figure 4.2-1  
 Northfield Mountain Trail System

**Legend**

**Trail Rating**

- Most Difficult
- More Difficult
- Easier
- ■ Snowshoeing/Hiking Only
- ■ New England National Scenic Trail
- Northfield Mountain Project Boundary

**Note:**  
 Blue Connector Trail digitized based on best available imagery.

Service Layer Credits: Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GEBCO, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), Swisstopo, Mapbox India, © OpenStreetMap

0 625 1,250 2,500 Feet

1 inch = 1,250 feet

### **Findings: NMTTC Trail System**

- The trail system supports a variety of uses such as for hiking, mountain biking, equestrian use, snowshoeing and cross-country skiing.
- Trails are a mix of organic materials and gravel.
- Maintenance is on-going and are conducted on an as-needed basis.
- General assessments of the trail system are completed in spring, July and in fall. Winter maintenance includes grooming of cross-country ski trails for both classical and free-style skiing when snow conditions permit.
- An active tree program targets potential hazard trees and removes them as necessary.

### **Results of Trail Survey**

- Rapid assessment of entire trail system (including Blue Connector and portion of the New England National Scenic Trail.)
- Trails and trail segments were selected for more detailed observation based on steep slopes, observed drainage concerns/erosion, alignment issues, and trails requiring more frequent maintenance.
- Ski trails can support mountain biking and horseback riding.
- Long-term sustainability could be improved by implementing measures to address a few areas of drainage and erosion issues.

Overall, the trail system is well designed, well maintained and in good condition.

## 3.6.7-Recreation Study at Northfield Mountain, including Assessment of Sufficiency of Trails for Shared Use

### Findings: NMTTC Trail System

#### Trail Use

- The trail system saw an estimated 16,123 recreation days in 2014.
- Visitors were asked their opinions of the NMTTC Trail system

#### User Opinions on the NMTTC Trail System

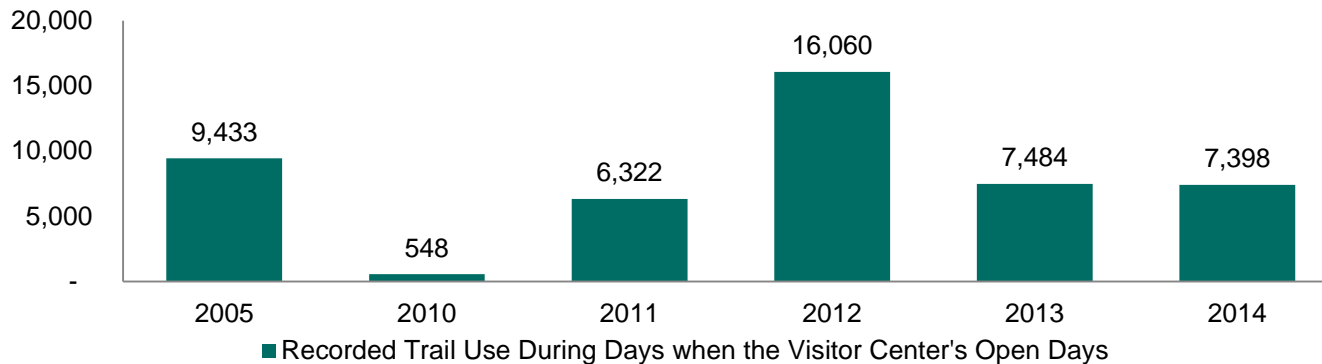
Variable (Total Responses)	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Trails are in good condition (90)	50%	44%	3%	2%	0%
Trails are well maintained (89)	52%	43%	4%	1%	0%
Trails are too steep (88)	1%	3%	14%	49%	33%
Trails are too flat (88)	0%	1%	10%	51%	38%
More trails are needed (88)	1%	11%	26%	44%	17%
There is an appropriate mix of easy, moderate, difficult trails (87)	42%	51%	6%	1%	0%
Winter trail grooming is sufficient (68)	54%	31%	10%	4%	0%
Trail signage/markings are adequate (86)	35%	47%	6%	9%	3%
Trailhead parking is sufficient (87)	39%	53%	2%	5%	1%
Trail surface material is adequate (86)	36%	48%	16%	0%	0%
Hours of operation are adequate (26)	42%	54%	4%	0%	0%

Note: Figures may not total to 100% because of rounding.

## Findings: NMTTC Trail System

### Historic Trail Use

- Trail use has remained relatively consistent over the 2010 to 2014 period when considering for special events and closures.



### Existing Hiking and Mountain Bike Trails in the Northfield Mountain Area

- 133 properties with hiking and/or mountain biking opportunities within 25 miles of the NMTTC.
- 64 provide both hiking and mountain bike trails.
- 62 provide only hiking trails.
- 7 provide only mountain bike trails.
- Owned and managed by various federal and state agencies, municipalities, land trusts and other non-profit organizations, colleges, universities, land management companies, and private landowners.

### Conclusion

#### **NMTTC**

- The NMTTC is a well-utilized regional recreation resource with a wide variety of opportunities, programs and amenities.
- Surveyed visitors were overwhelmingly satisfied with the amenities provided at the NMTTC.
- With exception of special circumstances, total recreation use associated with the NMTTC has remained relatively consistent over the past five years (2010-2014).
- Over the longer term, environmental program use, QII use, and fishway viewing tour use have declined since the 1980s.
  - Declines are not a result of reduced program offerings, which have remained constant or increased slightly since 2001.
- The results of the recreation user survey and analysis demonstrate that the NMTTC and related program offerings are meeting or exceeding area recreation needs.

#### **Northfield Mountain Trail System**

- Trail System supports cross-country skiing, snowshoeing, hiking, biking, and horseback riding.
- Vast majority of visitors to the Trail System are very satisfied with the number of trails and difficulty of the trails.
- Overall the Trail System is well designed, well maintained and in good condition.
- A few areas were identified where measures could be implemented to improve long-term sustainability of trails.
- Though designed for hiking and cross-country skiing, the cross-country ski trail system is well adapted to handle mountain biking and can accommodate horseback riding use while remaining in good condition.
- There are ample hiking and mountain biking opportunities in the area, which are supplemented by the NMTTC Trail System.

# Cultural Resources

## 3.7.1-Phase 1A, 1B, and II Archaeological Surveys

### Study Progress

- Completion of Phase IA (Reconnaissance) Archaeological Survey Reports.
  - Two study reports were generated from the study: one combined both the Vermont and New Hampshire portions of the Project; a separate report focused on the Massachusetts portion of the Project.
  - The reports included a summary of background research, precontact and historic contexts for the Project environs, a description of the sensitivity model, methods and results of Phase IA reconnaissance survey, maps of the APE, and recommendations for future Phase IB (Intensive) archaeological surveys, in the event that it is determined that any observed erosion is Project-induced, or that there are other Project-related effects.
  - Background research (completed in 2014) identified 73 previously recorded archaeological sites in the APE: 71 in Massachusetts, 2 in Vermont, none in New Hampshire.
  - Field reconnaissance (conducted in July 2014) recorded three previously recorded precontact period sites and six previously unrecorded archaeological sites in the Project APE.
  - The Phase IA (Reconnaissance) reports were issued to MA, VT, and NH SHPOs and filed with FERC in December 2014.
  - In February 2015, FL received report review letters from NH and MA SHPOs concurring with recommendations for Phase IB (Intensive) archaeological surveys in segments identified as sensitive for archaeological resources. No review report letter was received from the VT SHPO. In April 2015, the Stockbridge-Munsee Tribal Historic Preservation Office commented it wished to continue consultation and receive future survey reports.



## 3.7.1-Phase 1A, 1B, and II Archaeological Surveys

### **Variations (if any)**

- No variations from the study plan or schedule have been identified since the publication of the ISR in September 2014.

### **Work Remaining**

- Conduct possible Phase IB (Intensive) archaeological surveys, followed by possible Phase II (Site Examination) NRHP evaluation studies, as determined appropriate based on FERC and SHPO consultation and their comments on the Phase IA Reconnaissance reports.

## 3.7.2-Survey and Evaluation of Historic Architectural Resources

### **Study Progress**

- FERC has defined the Area of Potential Effects (APE) for the Project in consultation with SHPOS from MA, VT and NH, Narragansett Indian Tribe, and The Nolumbeka project. (November 27, 2013)
- TRC, on behalf of FL, conducted field surveys to document all resources 50 years or older within the APE. (March 2014 and July 2015).
- Reports were completed and filed with the SHPOs from MA, VT, and NH and FERC on December 31, 2014.

### **Findings (if any)**

- The historic architectural survey report with NRHP recommendations, historic context, maps, and state survey forms was submitted to Massachusetts SHPO (MHC) and Vermont SHPO (VDHP) on December 31, 2014.
- VDHP has concurred with findings that no historic properties are located in Vermont portion of APE (March 2015).
- MHC responded (January 2015) with request for additional information. FL conducted additional research and fieldwork in May-July 2015 and will submit revised report/survey forms to MCH and FERC in 4<sup>th</sup> Quarter of 2015.
- The NH required-Project Area Form was submitted to New Hampshire SHPO (NHDHR) on December 31, 2014. NHDHR has concurred with findings of Project Area Form and that no further evaluation or study is necessary (July 2015).

### **Variances (if any)**

There were no variations from the FERC-approved study plan.

### **Work Remaining**

Submit revised architectural survey report and survey forms to MHC and FERC by 12/31/2015.

### 3.7.3-Traditional Cultural Properties Study

#### **Study Progress**

- FL completed a Traditional Cultural Properties Study Report in March 2015.
- The report included background research that was undertaken to identify Traditional Cultural Properties.
- Background research identified one NRHP listed TCP with the Project vicinity – the Turners Falls Sacred Ceremonial Hill Site, located at the Turners Falls Municipal Airport.
- No NRHP listed TCPs were identified in the Project APE.
- The report noted that field work and interviews to document and evaluate potential TCPs had not taken place, because FL has been unable to schedule meetings with the NIT and the Nolumbeka Project despite a number of requests to them.
- A letter to FERC from Mr. Joe Graveline of the Nolumbeka Project dated April 29, 2015 offered comments on the report, and offered to conduct a field visit of TCPs located on the Wissatinnewag property that was claimed to be located within the Project APE.
- FL responded to FERC and the Nolumbeka Project in a letter dated June 9, 2015 accepting the offer to walk the Wissatinnewag property but noted that the property is located outside of the Project APE. There has been no further communication from the Nolumbeka Project.

#### **Variances (if any)**

- The schedule for the FERC-approved Study Plan has not been met because it has not been possible to document TCPs with the NIT.

#### **Work Remaining**

- Tasks 2 (Tribal Consultation and Documentation of TCPs) and 4 (Field Visit) will be conducted if the NIT participates in the FERC-approved TCP study.