Relicensing Study 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

ADDENDUM 2

Northfield Mountain Pumped Storage Project (No. 2485)

and Turners Falls Hydroelectric Project (No. 1889)

Contains Sensitive Information - Do Not Distribute

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FirstLight™ Power Resources

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All attachments are separate files from this report. The attachment file names begin with '3_5_1_Attachment' and note that some attachments have multiple excel files.

LIST OF ABBREVIATIONS

cfs	cubic feet per second
CTB	Cobblestone tiger beetle
FERC	Federal Energy Regulatory Commission
FirstLight or FL	FirstLight Hydro Generating Company
GIS	Geographic Information Systems
GPS	Global Positioning System
IFIM	Instream Flow Incremental Methodology
NGVD29	National Geodetic Vertical Datum of 1929
NHESP	Natural Heritage and Endangered Species Program
MADFW	Massachusetts Division of Fisheries & Wildlife
MRSP	Modified Revised Study Plan
PTB	Puritan tiger beetles
RSP	Revised Study Plan
RTE	rare, threatened and endangered
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WSEL	water surface elevation

1 INTRODUCTION

On March 1, 2016, FirstLight filed with the Federal Energy Regulatory Commission (FERC) Study Report No. 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*. On March 16, 2015, FirstLight held its study report meeting in which Study No. 3.5.1 was discussed. After filing meeting minutes on March 31, 2016, comments on Study No. 3.5.1 were filed by the United States Fish and Wildlife Service (USFWS), Massachusetts Division of Fisheries & Wildlife (MADFW), and the Nature Conservancy (TNC). On May 30, 2016, FirstLight filed its responsiveness summary and agreed to file an addendum (Addendum 1) to the report to address the commenters' concerns. On June 26, 2016 FERC issued its Determination on Requests for Study Modifications and New Studies. FERC requested additional information be filed relative to Study No. 3.5.1.

On October 14, 2016, FirstLight filed Addendum 1 with FERC, along with several other studies, to address commenters concerns and provide the additional information requested by FERC. On December 15, 2016 the MADFW filed comments on Addendum 1. On January 17, 2017, FirstLight filed its responsiveness summary including responses to Addendum 1. In its responsiveness summary, FirstLight agreed to file an additional addendum (Addendum 2) to the report to address several comments raised by the MADFW. Section 2 of this Addendum 2 addresses these comments.

On February 17, 2017 FERC issued its Determination on Requests for Study Modifications and New Studies. FERC noted that MADFW requested FirstLight provide the following:

- In FERC's discussion relative to the Puritan Tiger Beetle it states "Because the information in the final report and addendum meet the study objectives (section 5.9(b)(1)) and should be adequate for staff's analysis and to develop any necessary license requirements (section 5.9(b)(5)), we do not recommend requiring FirstLight to provide the revised figures requested by Massachusetts DFW. However, because the maximum, mean, and median monthly water surface elevations, as well as standard deviations, are available and may provide additional information useful for evaluating project effects on shoreline areas, *we recommend that FirstLight prepare and file a table that includes this information with its proposed addendum to be filed by April 3, 2017*."
- In FERC's discussion relative to State-Listed Plants, it states "Inundation of the reproductive parts of a plant could disrupt or eliminate propagation of that plant by damaging or removing flowering parts or washing away pollen. While it may be possible to estimate the timing and duration of inundation of the reproductive components of state-listed plants, we are not aware of any detailed information that describes the relationship between the inundation of reproductive components and reproductive success for each of the ten plant species included in this study. Therefore, estimating the effects of the inundation of reproductive components on reproductive success would be highly speculative. Because the information in the final report and addendum meets the study objectives (section 5.9(b)(1)) and should be adequate for staff's analysis and to develop any necessary license requirements (section 5.9(b)(5)), *we do not recommend requiring FirstLight to provide the additional analysis describing inundation of reproductive components of state-listed plant species*."
- In FERC's discussion relative to Invasive Plant Species, it states "For the reasons described in staff's March 6, 2014, letter, FirstLight was required to survey for *Salix exigua* (not spp. *interior*), *Alnus glutinosa*, and *Salix purpurea*; therefore, *we recommend requiring FirstLight to conduct surveys for these species and file an addendum to the study report by July 31, 2017*."

FirstLight addresses bullets 1 and 3 above in Section 3.

2 RESPONSES TO STAKEHOLDER COMMENTS

As noted above, comments on Study No. 3.5.1 were received from MADFW. In its response to comments filed January 17, 2017, FirstLight cataloged the comments received such as MADFW-1 (refers to the first MADFW comment on Study No. 3.5.1), MADFW-2, etc. In its response to comments, FirstLight indicated which comments (MADFW-1, etc.) it would address in Addendum 2 to Study No. 3.5.1. Using the same cataloging system, the subsections below list the comment, and then FirstLight's response. FirstLight addresses comments where it indicated an addendum would be provided.

2.1 MADFW-1

Comment: Re: Puritan Tiger Beetles: As previously requested in our comments (dated April 30, 2016) on Study Report 3.5.1, the Division requests that Figures 2.1-5 through 2.1-8, inclusive, be revised to include monthly mean and median WSELs (including standard deviations) for May – August. Although the Division acknowledges that river flows exceed the operational capacity of the Project during portions of the year, we also request that this data be provided for January – April and September – December in order to help assess potential Project effects on larval life stages.

Response: A response to MADFW-1 was included in the January 17, 2017 response matrix submitted by FirstLight (FL).

2.2 MADFW- 2

Comment: Re: Cobblestone Tiger Beetle: FL surveyed six elevation transects at known Cobblestone Tiger Beetle (CTB) habitat in Montague and developed a digital terrain model of potential CTB habitat based on elevation/bathymetric data. FL used the calibrated hydraulic model to simulate WSELs at each location under actual conditions between January 1, 2008 and September 20, 2015. In the Addendum FL assessed the extent of available CTB habitat for corresponding WSELs, as well as the percent of time elevations are inundated (based on either 0.0 or 24.0 hours between May and August).

In the MRSP, FL committed to using data provided by the hydraulic model to estimate the change in water surface elevation over a range of flows, and that the hydraulic model will illustrate the relationship between water surface elevation and flow at transects where tiger beetles are found. Therefore, we request that FL provide a figure showing how predicted water surface elevations at the Montague site vary over the full range of flows within the operational capacity of the project; all associated raw numerical data should be provided in editable spreadsheet format. This figure should be similar.

Response: The Montague USGS Gage Rating Curve was supplied as a response to MADFW-2 in the response matrix submitted by FL on January 17, 2017.

2.3 MADFW- 3

Comment: Re: Cobblestone Tiger Beetle: Tables 2.2-1 and 2.2-2 of the Addendum show the percent of time that potential habitat is inundated for a period of 24 hours and the percent of time potential habitat is inundated for 0.0 hours. The tables also show how available habitat varies across WSELs. We request that FL provide corresponding figures showing the percent of time that potential habitat is inundated for less than 24 hours but more than 0.0 hours, per the following categories: 1-5, 6-9, 10-14, and 15+. All associated raw numerical data should be provided in editable spreadsheet format.

Response: In response to MADFW-3 FL developed figures showing the percent of time potential habitat is inundated for less than 24 hours and more than 0.0 hours based on categories of 1-5, 6-9, 10-14, and 15+

hours (Figure 2.3-1 through Figure 2.3-4). The data used to develop these figures is provided as Attachment MADFW-3 in an editable spreadsheet format.

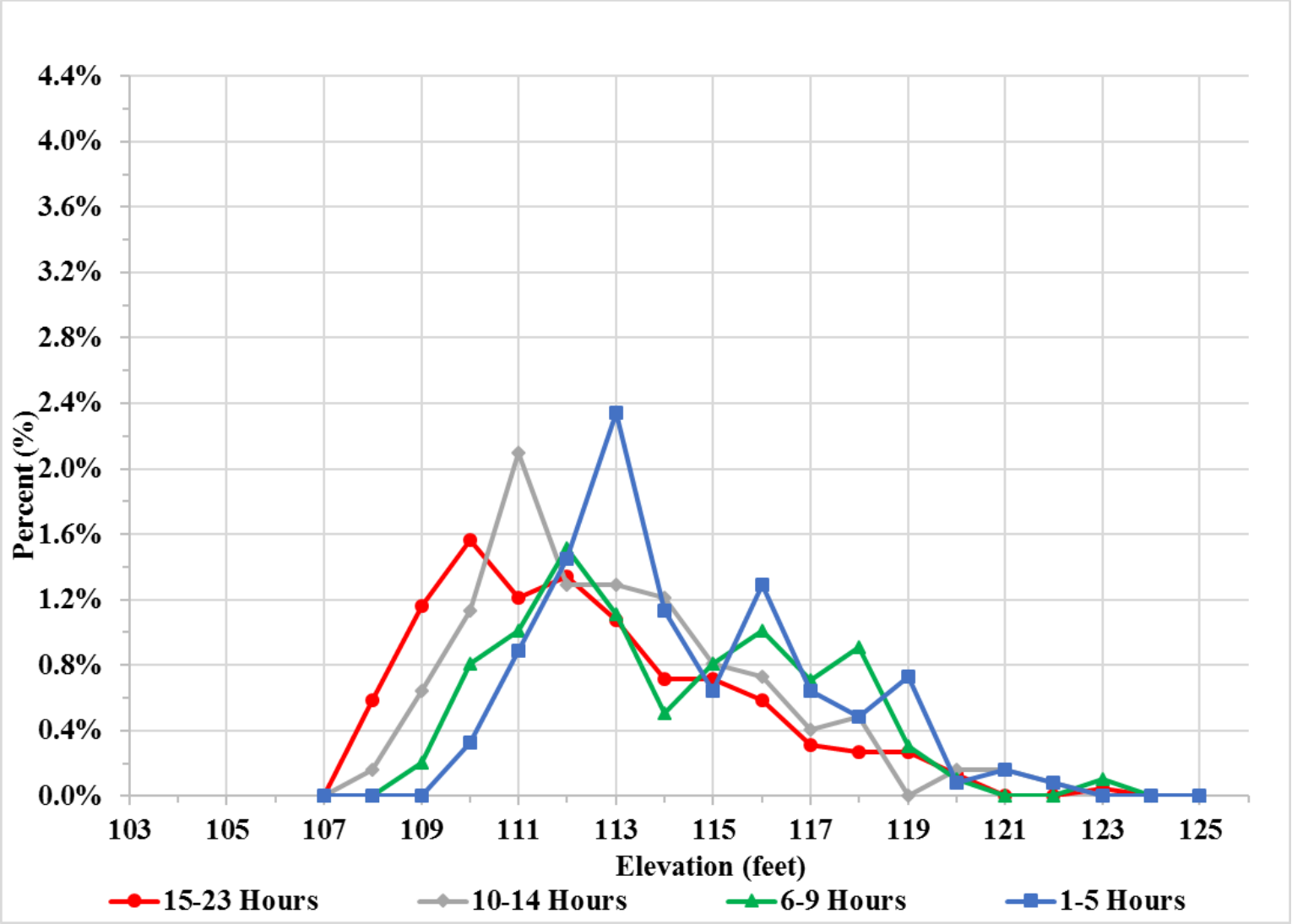


Figure 2.3-1 Average Percent of Days Potential Cobblestone Tiger Beetle Habitat was Inundated in May (2008-2015)

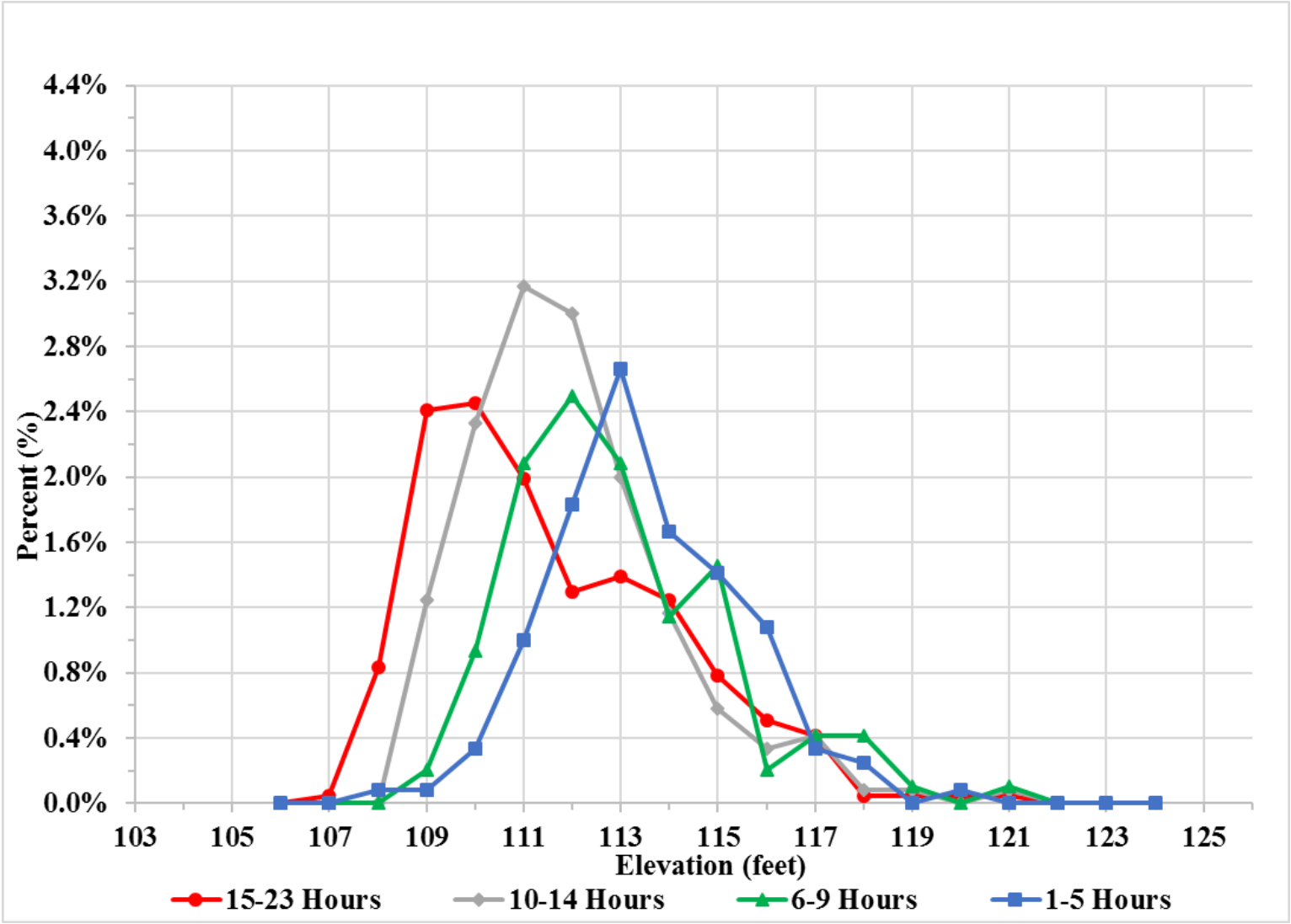


Figure 2.3-2 Average Percent of Days Potential Cobblestone Tiger Beetle Habitat was Inundated in June (2008-2015)

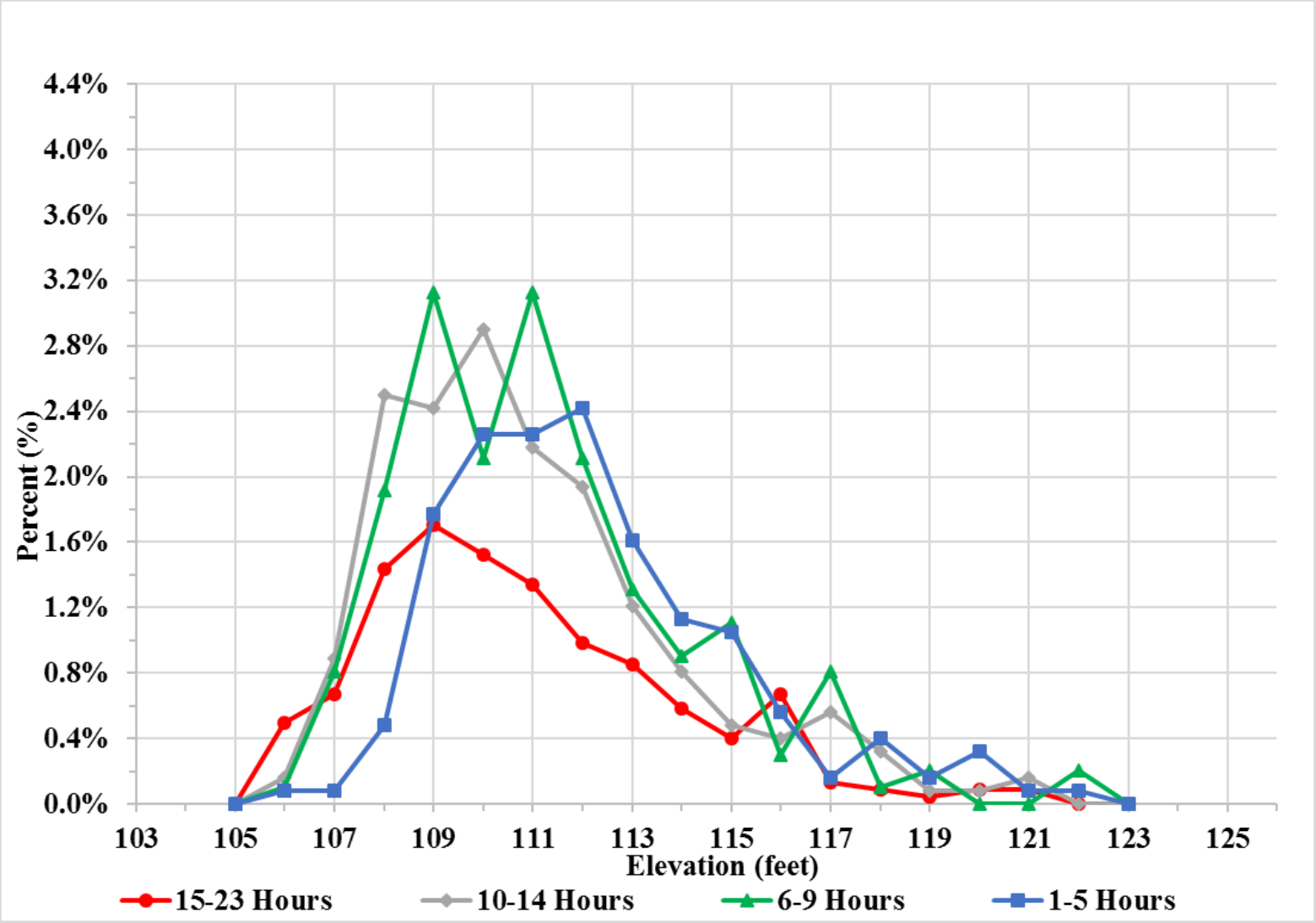


Figure 2.3-3 Average Percent of Days Potential Cobblestone Tiger Beetle Habitat was Inundated in July (2008-2015)

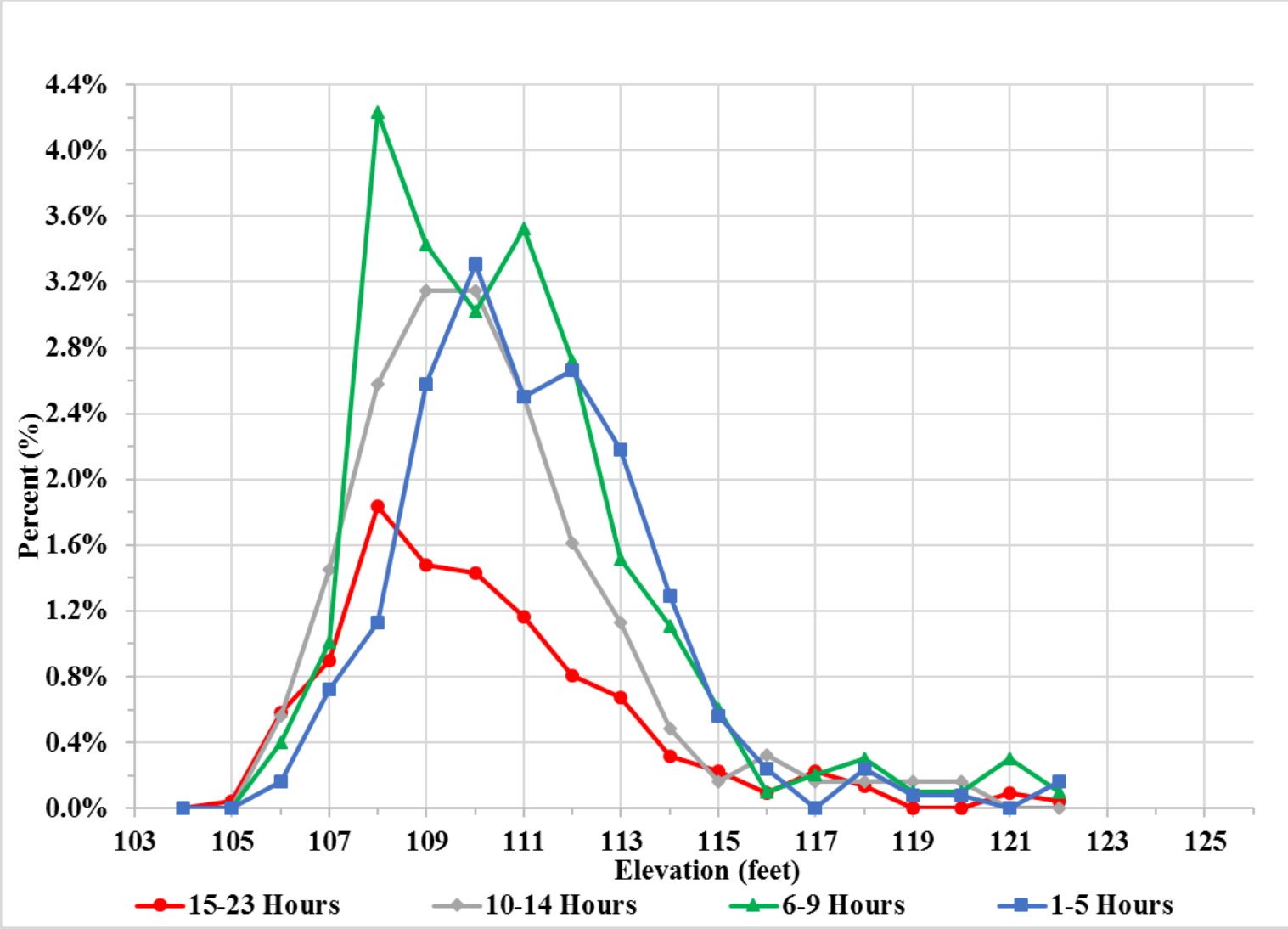


Figure 2.3-4 Average Percent of Days Potential Cobblestone Tiger Beetle Habitat was Inundated in August (2008-2015)

2.4 MADFW- 4

Comment: Re: Cobblestone Tiger Beetle: In the MRSP, FL committed to providing an analysis of both flood depth as well as duration across a range of potential project flows. Therefore, we request that FL provide the mean (±1 standard error), median number of hours per day, and number of times per day (±1 standard error) each elevation was inundated for each calendar day averaged across the eight-year period for each transect. All associated raw numerical data should be provided in editable spreadsheet format.

Response: In response to MADFW-4 FL has provide the mean (±1 standard error), median number of hours per day, and number of times per day (±1 standard error) each elevation was inundated for each calendar day averaged across the eight-year period for each transect with raw numerical data in an editable spreadsheet format as Attachment MADFW-4.

2.5 MADFW- 5

Comment: Re: Puritan Tiger Beetle: FL developed a digital terrain model of potential PTB habitat at Rainbow Beach and the North Bank based on elevation data from transects surveyed in 2015. FL used the calibrated hydraulic model to simulate WSELs at each location under actual conditions between January 1, 2008 and September 20, 2015.In the Addendum, FL assessed the extent of available PTB habitat for corresponding WSELs at each site, as well as the percent of time elevations are inundated (based on either 0.0 or 24.0 hours between May and August). Tables 2.3-1 and 2.3-4 of the Addendum show the percent of time that potential habitat at Rainbow Beach and the North Bank is inundated for a period of 24 hours and the percent of time potential habitat is inundated for 0.0 hours. The tables also show how available habitat varies across WSELs. We request that FL provide a corresponding figure showing the percent of time that potential habitat is inundated for less than 24 hours but more than 0.0 hours, per the following categories: 1-5, 6-9, 10-14, and 15+. All associated raw numerical data should be provided in editable spreadsheet format.

Response: In response to MADFW-3 FL developed figures showing the percent of time potential habitat is inundated for less than 24 hours and more than 0.0 hours based on categories of 1-5, 6-9, 10-14, and 15+ hours (Figure 2.5-1 and Figure 2.5-8). The data used to develop these figures is provided as Attachment MADFW-5A (Rainbow Beach) and MADFW-5B (North Bank) in an editable spreadsheet format.

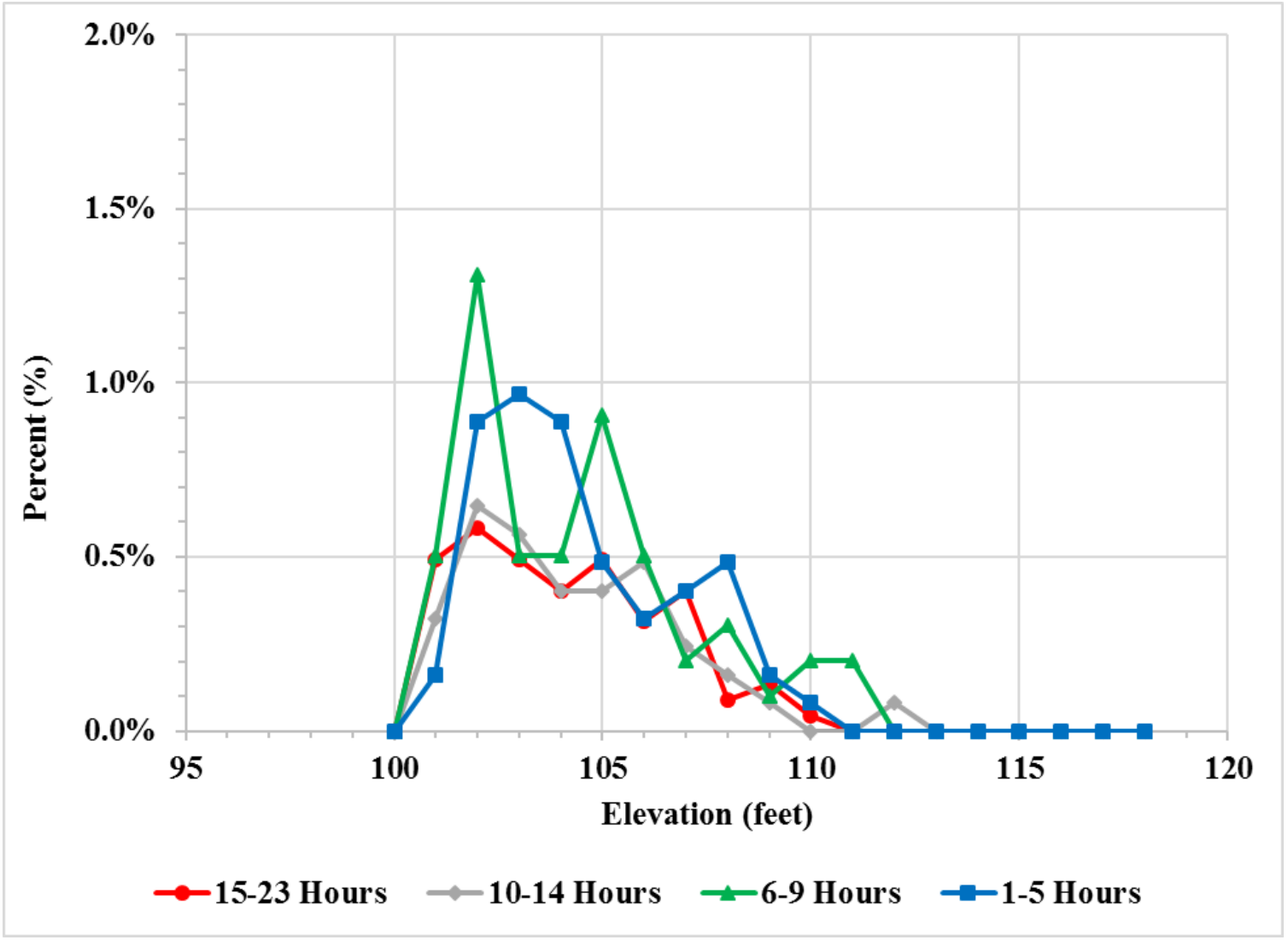


Figure 2.5-1 Average Percent of Days Potential Puritan Tiger Beetle Habitat at Rainbow Beach was Inundated in May (2008-2015)

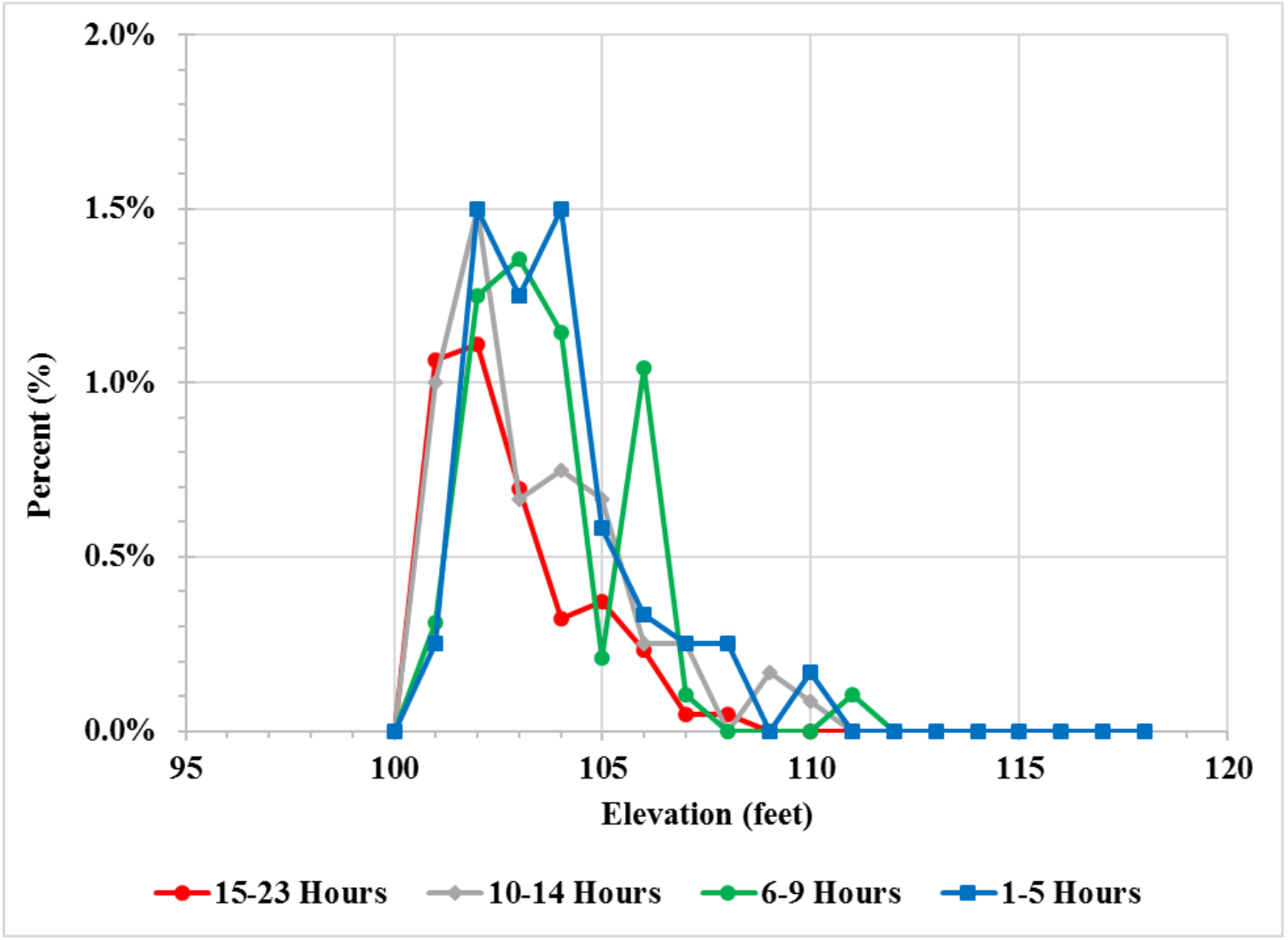


Figure 2.5-2 Average Percent of Days Potential Puritan Tiger Beetle Habitat at Rainbow Beach was Inundated in June (2008-2015)

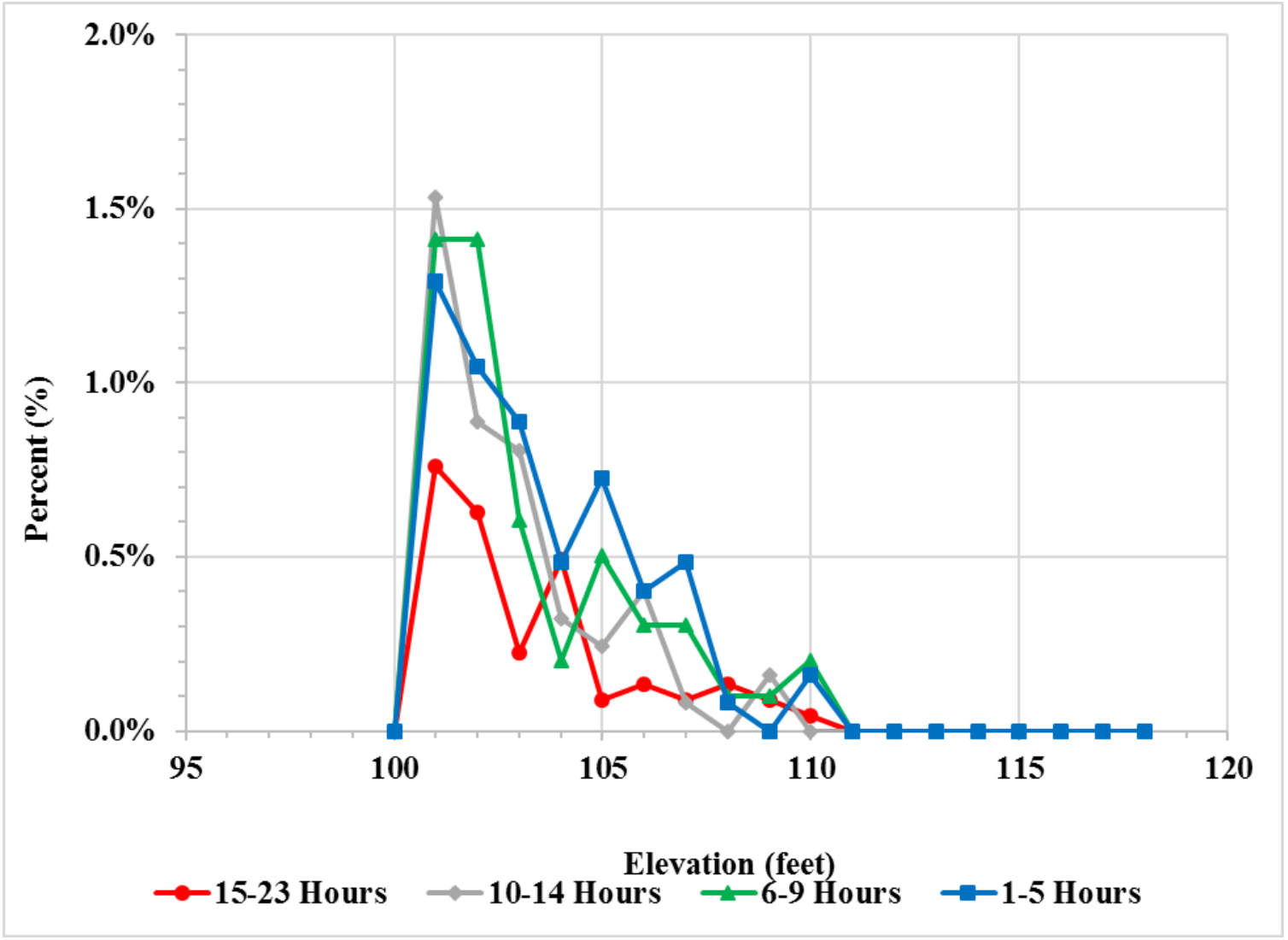


Figure 2.5-3 Average Percent of Days Potential Puritan Tiger Beetle Habitat at Rainbow Beach was Inundated in July (2008-2015)

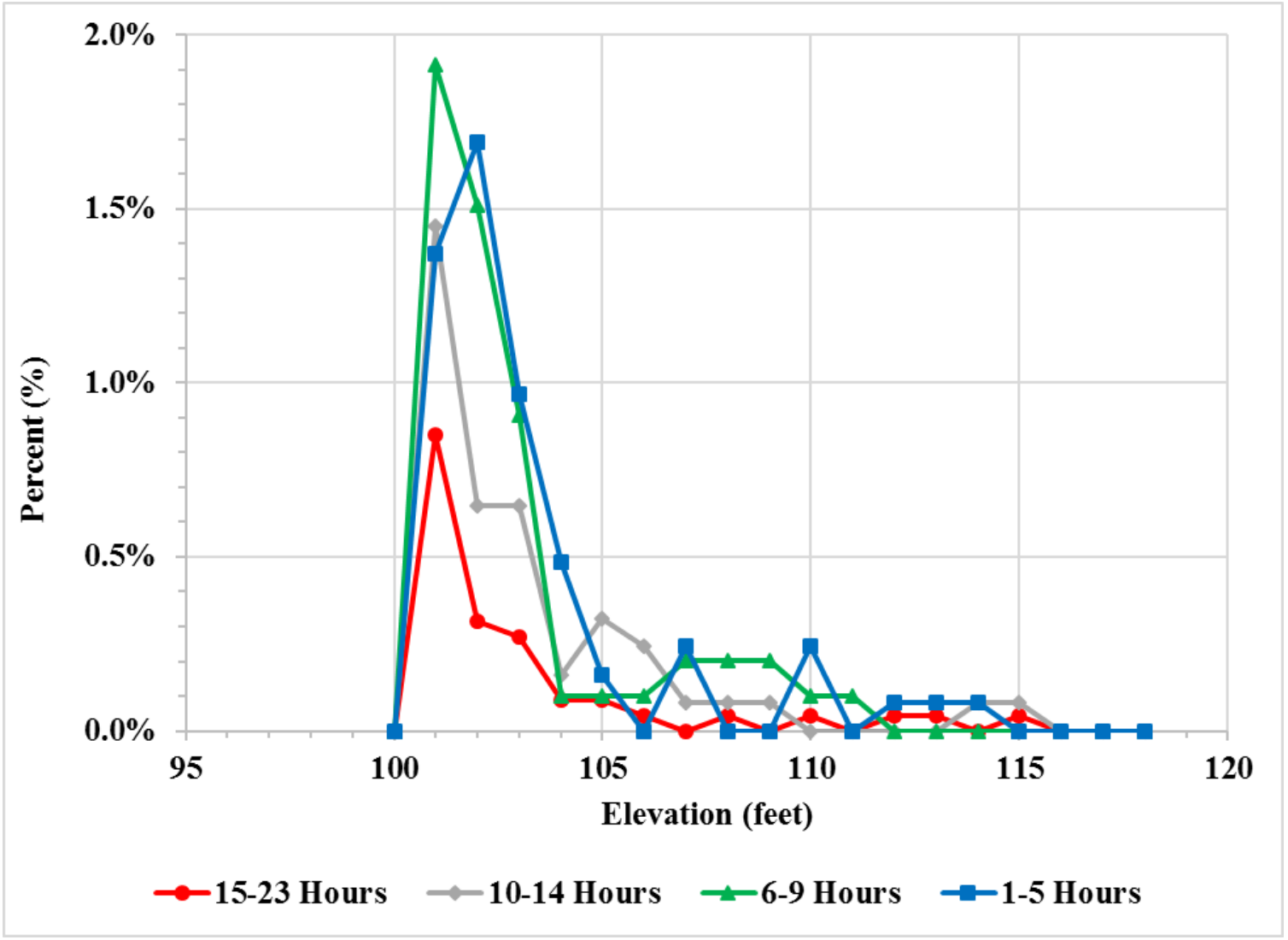


Figure 2.5-4 Average Percent of Days Potential Puritan Tiger Beetle Habitat at Rainbow Beach was Inundated in August (2008-2015)

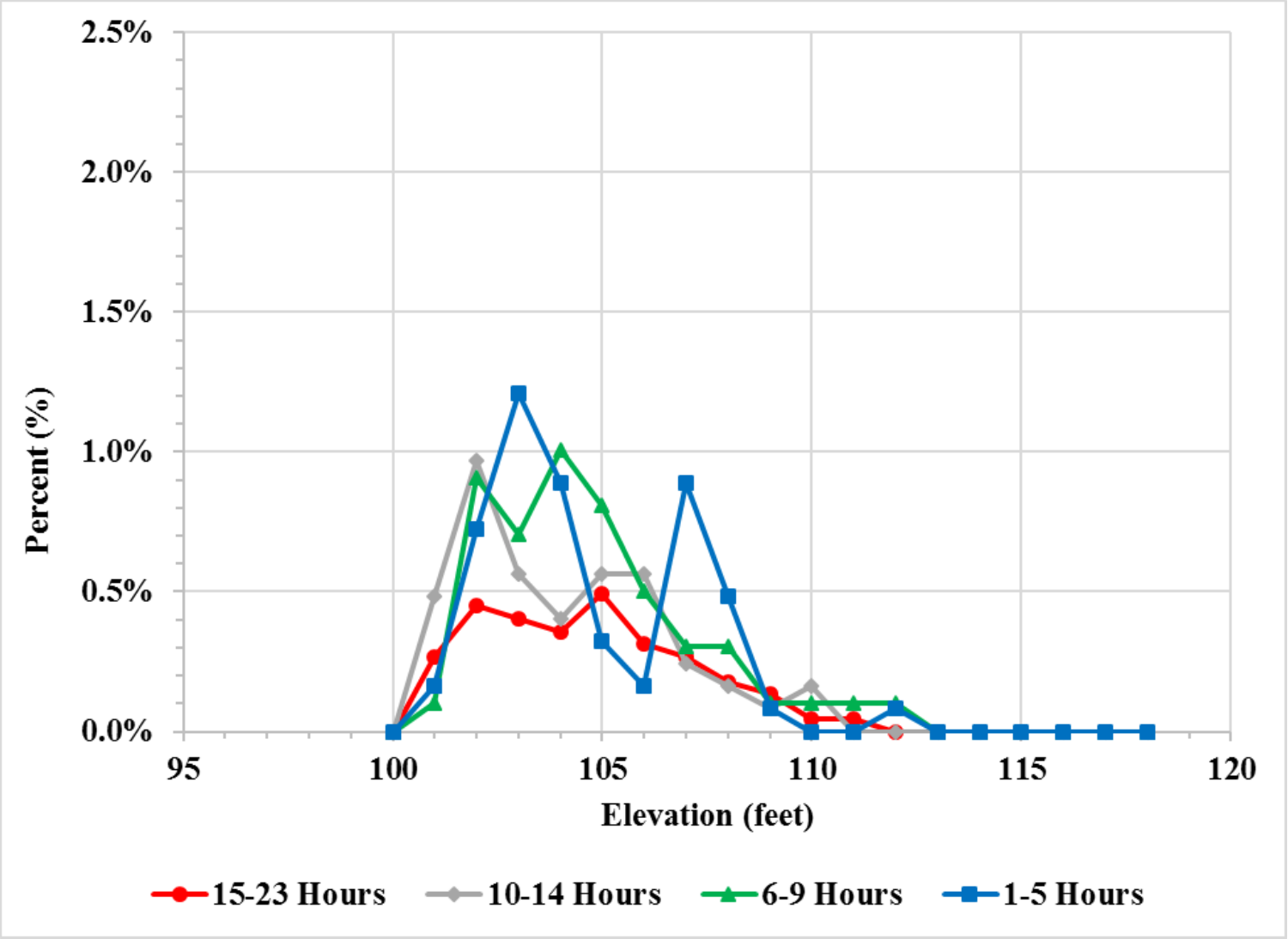


Figure 2.5-5 Average Percent of Days Potential Puritan Tiger Beetle Habitat at North Bank was Inundated in May (2008-2015)

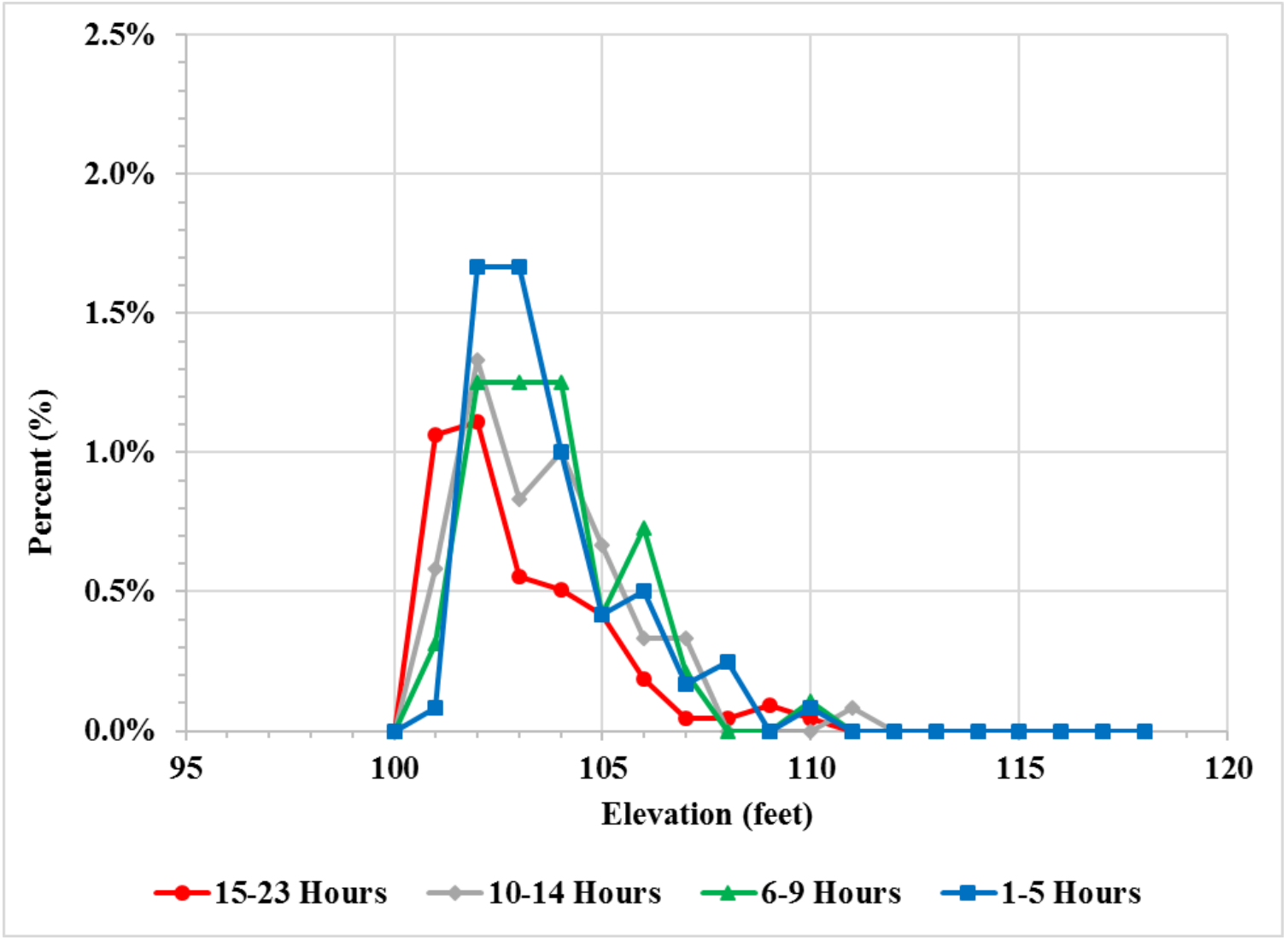


Figure 2.5-6 Average Percent of Days Potential Puritan Tiger Beetle Habitat at North Bank was Inundated in June (2008-2015)

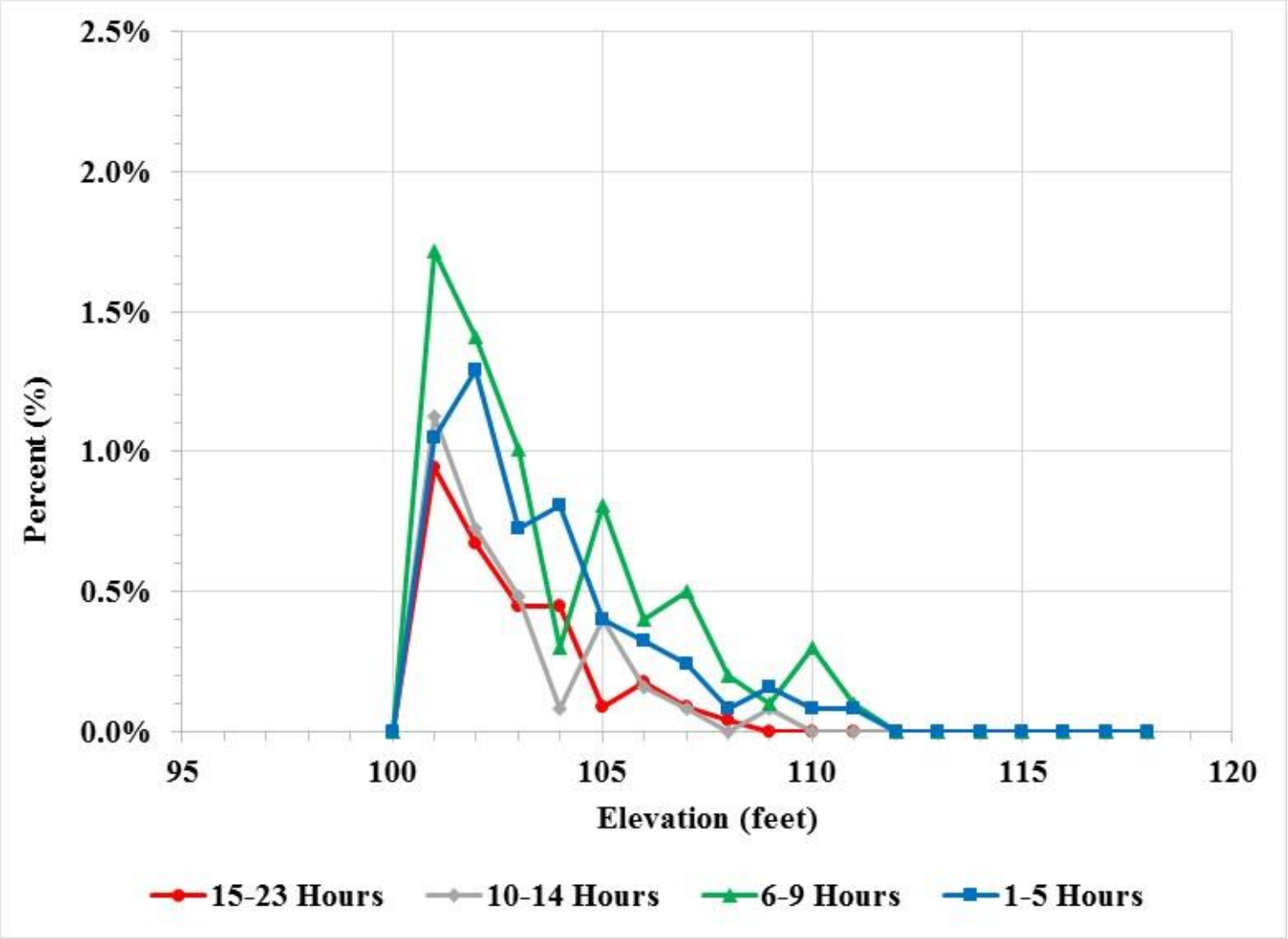


Figure 2.5-7 Average Percent of Days Potential Puritan Tiger Beetle Habitat at North Bank was Inundated in July (2008-2015)

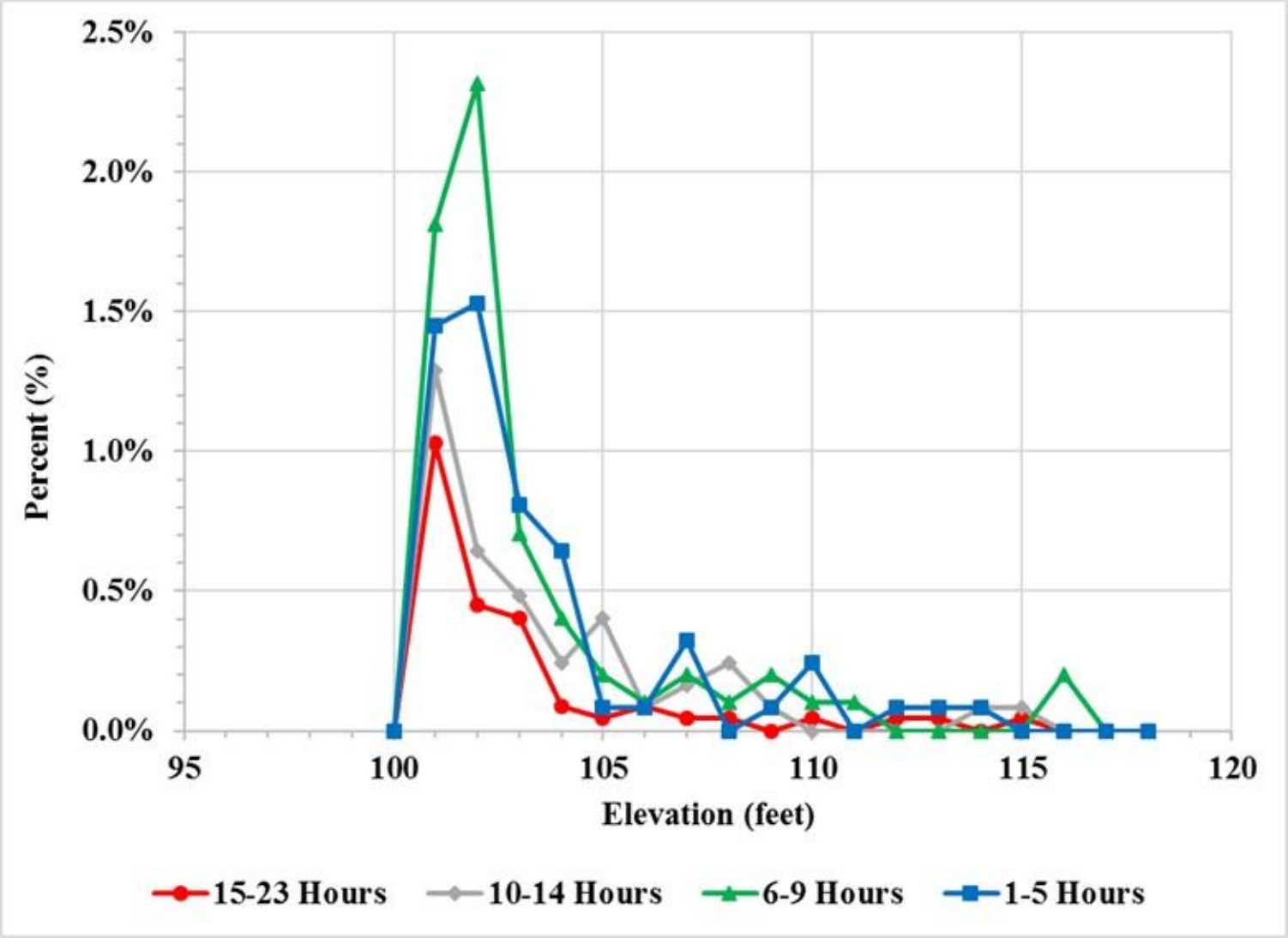


Figure 2.5-8 Average Percent of Days Potential Puritan Tiger Beetle Habitat at North Bank was Inundated in August (2008-2015)

2.6 MADFW- 6

Comment: As stated in the MRSP, FL committed to providing an analysis of both flood depth as well as duration across a range of potential project flows. Therefore, we request that FL provide the mean (±1 standard error), median number of hours per day, and number of times per day (±1 standard error) each elevation was inundated for each calendar day averaged across the eight-year period for each transect (separately for Rainbow Beach and the North Bank). Averages should be calculated for all months to facilitate assessment of potential effects on both adult (May – August) as well as larval (year around) life stages. All associated raw numerical data should be provided in editable spreadsheet format.

Response: In response to MADFW-6 FL has provided the mean (±1 standard error), median number of hours per day, and number of times per day (±1 standard error) each elevation was inundated for each calendar day averaged across the eight-year period for each transect with raw numerical data in an editable spreadsheet format as Attachment MADFW-6.

2.7 MADFW- 7

Comment: Re: State-Listed Species: Task 3, Objective 1 of the MRSP required FL to provide maps be generated to show all known, historic and potentially suitable habitats; potentially suitable habitat was defined as an area which appears to provide suitable habitat characteristics but which is currently unoccupied by state-listed plants.

In Study Report 3.5.1, FL provided maps of occupied habitat and confirmed (Page 3-3) that "*following the initial field reconnaissance, maps were generated to show all known, current, and potentially suitable habitat*." However, maps of potentially suitable habitat were not provided in Study Report 3.5.1. In the Addendum, the maps of potential habitat (Figures 3.0-1 through 3.0-3) appear to depict areas that were previously provided to FL by the Division to help identify areas warranting field assessment. These areas do not represent an on-the-ground delineation of potentially suitable habitat as required by (and defined within) the MRSP and the Division's Habitat Assessment and Survey Guidelines. Therefore, the Division reiterates its request that FL provide maps (and ArcGIS shapefiles) of potentially suitable habitat for state-listed plants based on its field assessments. If FL did not field-delineate the extent of potentially suitable habitat as required by the MRSP, then field assessments should be conducted in 2017.

Response: An ArcGIS polygon file of mapped unoccupied habitat was supplied as a response to MADFW-7 in the response matrix submitted by FL on January 17, 2017.

2.8 MADFW- 8

Comment: In response to comments on Study Report 3.5.1, FERC's June 29, 2016 determination recommended that "*the information requested by Massachusetts DFW be included in the addendum or FL should indicate why the information cannot be provided*" in reference to comments requesting FL to (a) articulate habitat suitability preferences for each species in terms of substrate and flow parameters; and (b) that Objective 3 (e.g., how quality, quantity and location of habitat changes over a range of elevations and flow parameters) be used to refine habitat suitability preferences, including assessment and spatial mapping of plant health and vigor (measured in terms of plant height and density) at occupied sites as they vary across spatial/elevation gradients (MRSP, p. 11).

In the Addendum (Page 3-66), FL briefly described habitat preferences used to identify plant survey locations. However, FL did not define habitat suitability preferences for each species based on an assessment of inundation frequencies, durations, timing or magnitude. Additionally, FL stated that, due to

field season time constraints, specific measurements (including height) of individual plants were not collected despite the fact that field work occurred during the 2015 field season for this study.

Additionally, and as detailed in Comment #3 below, it does not appear that FL incorporated information on rare plants observed in Reach 3 of the Bypass Reach, a critical source of information on habitat suitability preferences. Therefore, FL has not sufficiently addressed Objectives 2 and 3 of the MRSP and has not provided an explanation (either in Study Report 3.5.1 or the Addendum) for why they deviated from FERC's determination. Therefore, the Division requests that FERC direct FL to define habitat suitability preferences for each species based on an assessment of inundation duration, frequency and timing at the soil interface (e.g., root inundation) for public review and comment.

One aspect of a plant's tolerance to inundation is root inundation, best represented by the elevation recorded by FL for each plant (i.e., soil/plant interface). For example, some species may be unable to inhabit lower elevations due to longer and/or more frequent inundation of substrates (e.g., root structures) during the growing season (resulting from peaking operations). However, another critical aspect of a plant's tolerance is the timing and height of inundation relative to the plant's reproductive parts (measured as height above the soil/plant interface). Not only can inundation damage or remove flowering parts or wash away pollen, it can render the reproductive part unavailable when pollinators are present. The analysis by FL needs to factor in the physical height of reproductive parts and phenology of reproduction on each day of the reproductive window, per the table below.

Response:

In order to assess habitat suitability for each of the RTE species identified within the Survey Area, FL analyzed the range of species elevations, duration of inundation, timing of inundation, flowering and seeding period, and substrate for each of the protected species. Based upon a review of this data it appears that recruitment for each species requires exposure during the flowering and seeding portion of the growing season. While this study was not intended to identify the amount of exposure required to sustain plant growth and recruitment, it does provide information on suitable habitat conditions which might provide habitat for protected species. All species investigated prefer habitats prone to flood disturbance, and are adapted to survive in areas frequently inundated in the spring and early summer. The timing and duration of inundation must be such that the plants are not inundated during portions of the year which are important for growth and seed propagation.

As an example, Figure 2.8-1 shows the T-3 IFIM transect within the Bypass Reach and a selection of modeled flows and resulting WSELs. In the figure Tradescant's aster occupies much of the existing habitat along the transect. The minimum flow within the Bypass Reach from July 16 to November 15th is 120 cfs (WSEL 118.8 Feet), at this location the asters are normally exposed for most of the growing season, particularly during the flowering and seeding period from July to September (Table 2.8-1). In Figure 2.8-1 the red dotted line is the current minimum flow of 120 cfs. The green line in the figure shows the extent of mapped Tradescant's asters along the transect (IFIM T-3). The minimum elevation of the aster corresponds with the current minimum flow (120 cfs) elevation. Successful recruitment of riparian plants is closely tied to the magnitude, frequency, duration, and rate of decline of high-water events. Plants within the "recruitment window" often occur within elevations that allow for seed development and dispersal, but may be inundated during the spring and fall and exposed to high velocities. Based on the current location of Tradescant's aster at Transect T-3, it is likely that the 120 cfs flow (WSEL 118.8) is allowing for recruitment of the species by leaving suitable exposed during July through September, but providing high flows in the spring and early summer which reduces the potential for competing vegetation.

Figure 2.8-2 through Figure 2.8-11 show the range of elevations occupied by each species at each transect, the flowering/seeding/fruiting period, average WSEL (2008-2015) and the duration of inundation (2008-2015). Low flows have been identified based on the 120 cfs minimum flow within the Bypass Reach

transect, based on the NHESP comment, and as the minimum flow observed for August, over 2008-2015, in the remaining transect locations. Additionally, the average WSEL (based on data from 2004-2015) is shown for each transect location which is helpful, as life cycles of each species are not the same (i.e., the late summer flows may not be important to recruitment). Based on this information suitable habitat for each of the species can be described as a combination of appropriate substrate and duration/timing of inundation that allows for recruitment of the species. Generally speaking, if the substrate is appropriate, based on species preference, and the timing and duration of the inundation is such that the plant is able to complete its life cycle and produce viable seedlings the habitat is assumed to be suitable. There are other factors which may influence the potential success of plants within suitable habitat (e.g., ice scour or other site specific constraints), but those site specific impacts were not assessed as part of the MRSP. Table 2.8-1 provides a species summary and a description of suitable habitat for each species based on the substrate and elevation ranges identified based on the transect data, modeled WSEL data, and terrain modeling.

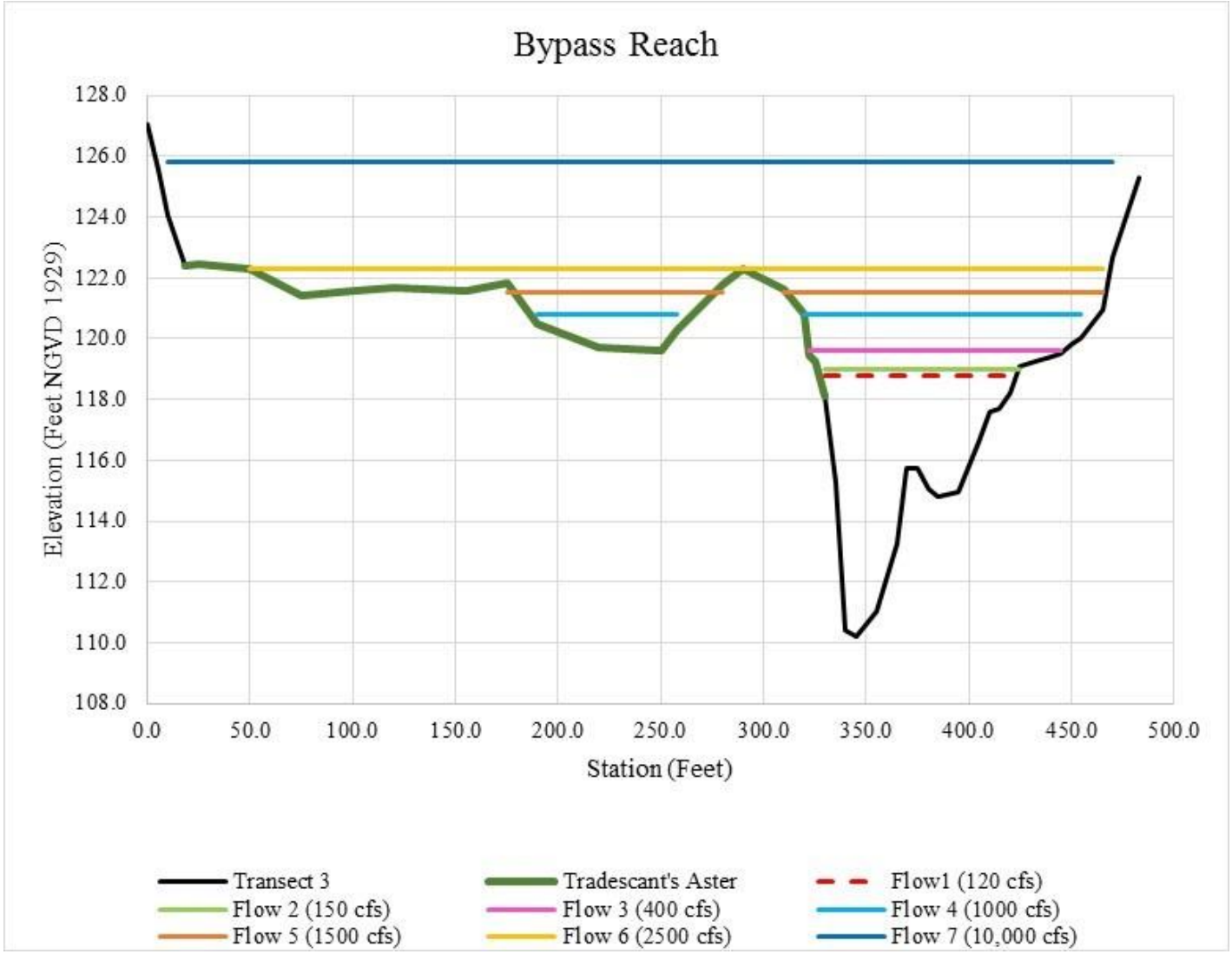


Figure 2.8-1 Modeled Water Surface Elevations at IFIM Transect T-3 and Mapped Tradescant's Aster

Table 2.8-1 Rare Plant Habitat Suitability Transect

	Species	Preferred Substrate	Flowering/Seeding/Fruiting Period[1]							Elevations Shown in Feet (NGVD 1929)					
			April	May	June	July	Aug	Sept	Oct	Min. Elev.	Max. Elev.	Mean Elev.	Low Flow (cfs)[2]	Mean Low Flow Elevation	Mean Plant Elevation Above Low Flow
1	*Salix exigya ssp. inerior*	Sandy, Gravelly, Rocky								105.7	105.9	105.8	2541	102.8	3.0
2	*Salix exigya ssp. inerior*	Sandy, Gravelly, Rocky								106.4	108.6	107.3	2518	102.8	4.5
3	*Prunus pumila*	Flood-scoured cobble and gravel								114.7	118.5	117.0	2124	105.3	11.7
4	*Symphyotrichum tradescantii*	Exposed Ledges								110.1	112.4	111.1	2037	106.5	4.6
4A	*Dechampsia cespitosa ssp. glauca*	Exposed Ledges, Cobble/Gravel Shores								109.0	-	109.0	2037	106.5	2.5
T-3 (IFIM)	*Symphyotrichum tradescantii*	Exposed Ledges								118.0	122.0	120.0	120	118.8	1.2
5	*Oligoneuron album*	Exposed Ledges/Outcrops								183.9	185.4	184.7	69	178.9	5.8
6	*Oligoneuron album*	Exposed Ledges/Outcrops								184.2	187.5	185.4	74	178.9	6.5
8	*Prunus pumila*	Flood-scoured cobble and gravel								188.2	190.4	189.2	524	180.7	8.5
9	*Prunus pumila*	Flood-scoured cobble and gravel								187.4	188.4	187.8	1031	180.9	6.9
10	*Alnus viridis ssp. crispa*	Exposed Ledges/Boulders								197.7	-	197.7	1031	180.9	16.8
10	*Salix exigya ssp. inerior*	Sandy, Gravelly, Rocky								186.6	190.96	188.52	1031	180.9	7.6
11D	*Eleocharis ovata*	Sandy River Banks								183.7	-	183.7	422	179.3	4.4
11D	*Egrostis frankii*	Sandy River Banks								187.2	-	187.2	422	179.3	7.9
11E	*Eleocharis intermedia*	Muddy Riverbanks								183.93	-	183.93	422	179.3	4.6

[1]MADFW Species Fact Sheets (http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/species-information-and-conservation)
[2]Based on the Average minimum flow observed in August (2000-2015 for impoundment and 2008-2015 downstream of Turners Falls)

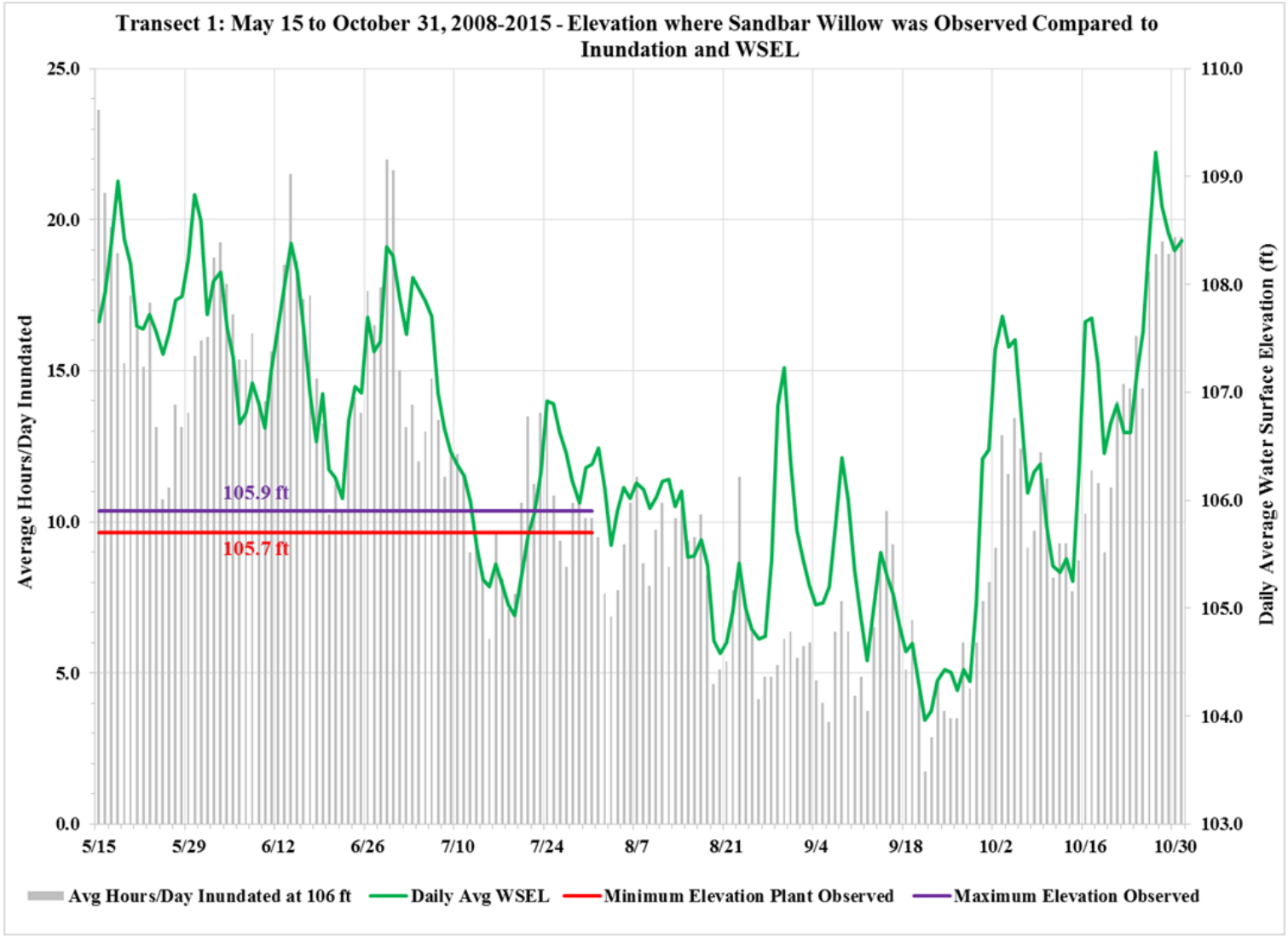


Figure 2.8-2 Transect 1: May 15 to October 31, 2008-2015 - Elevation where Sandbar Willow was Observed Compared to Inundation and WSEL

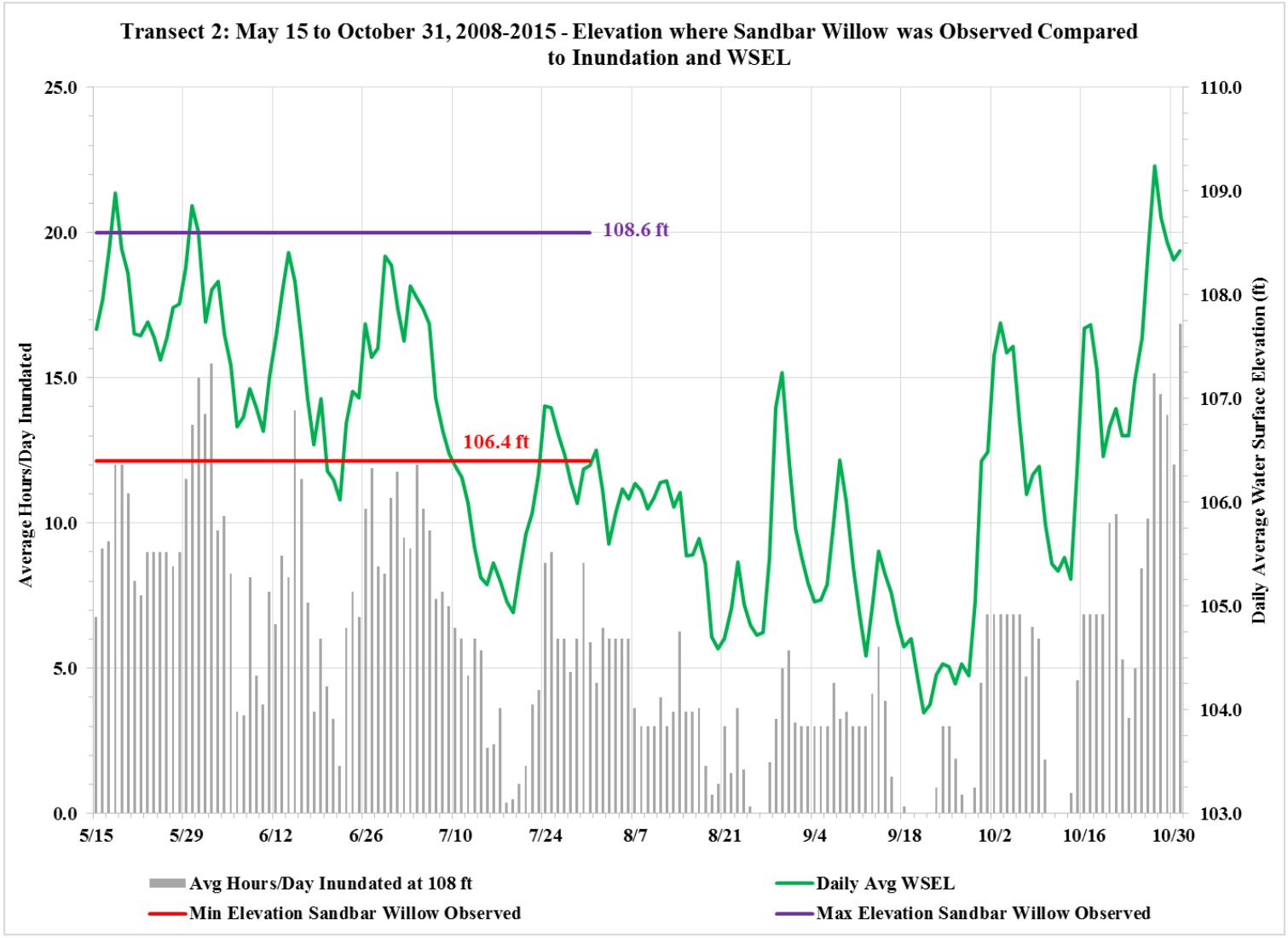


Figure 2.8-3 Transect 2: May 15 to October 31, 2008-2015 - Elevation where Sandbar Willow was Observed Compared to Inundation and WSEL

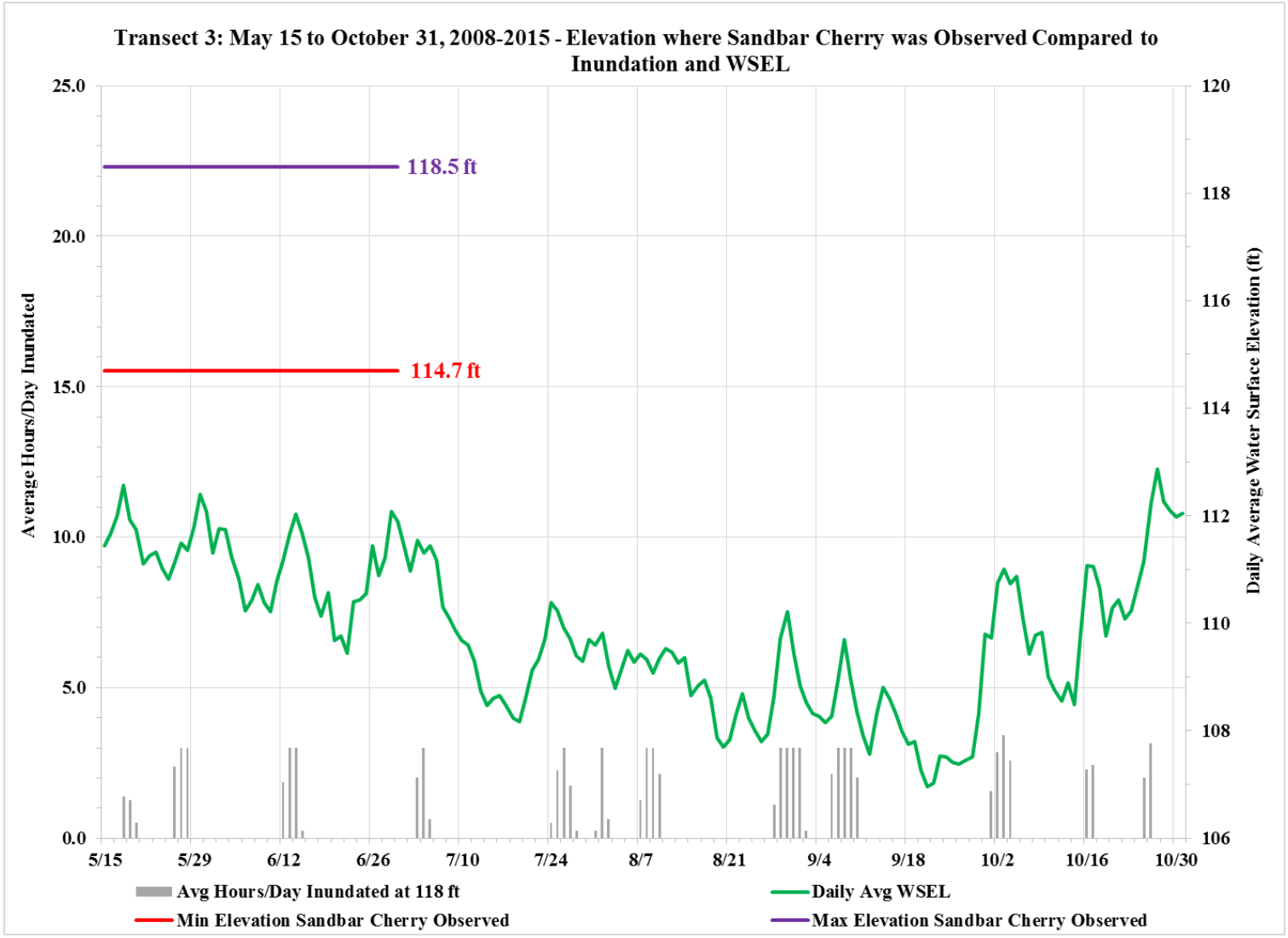


Figure 2.8-4 Transect 3: May 15 to October 31, 2008-2015 - Elevation where Sandbar Cherry was Observed Compared to Inundation and WSEL

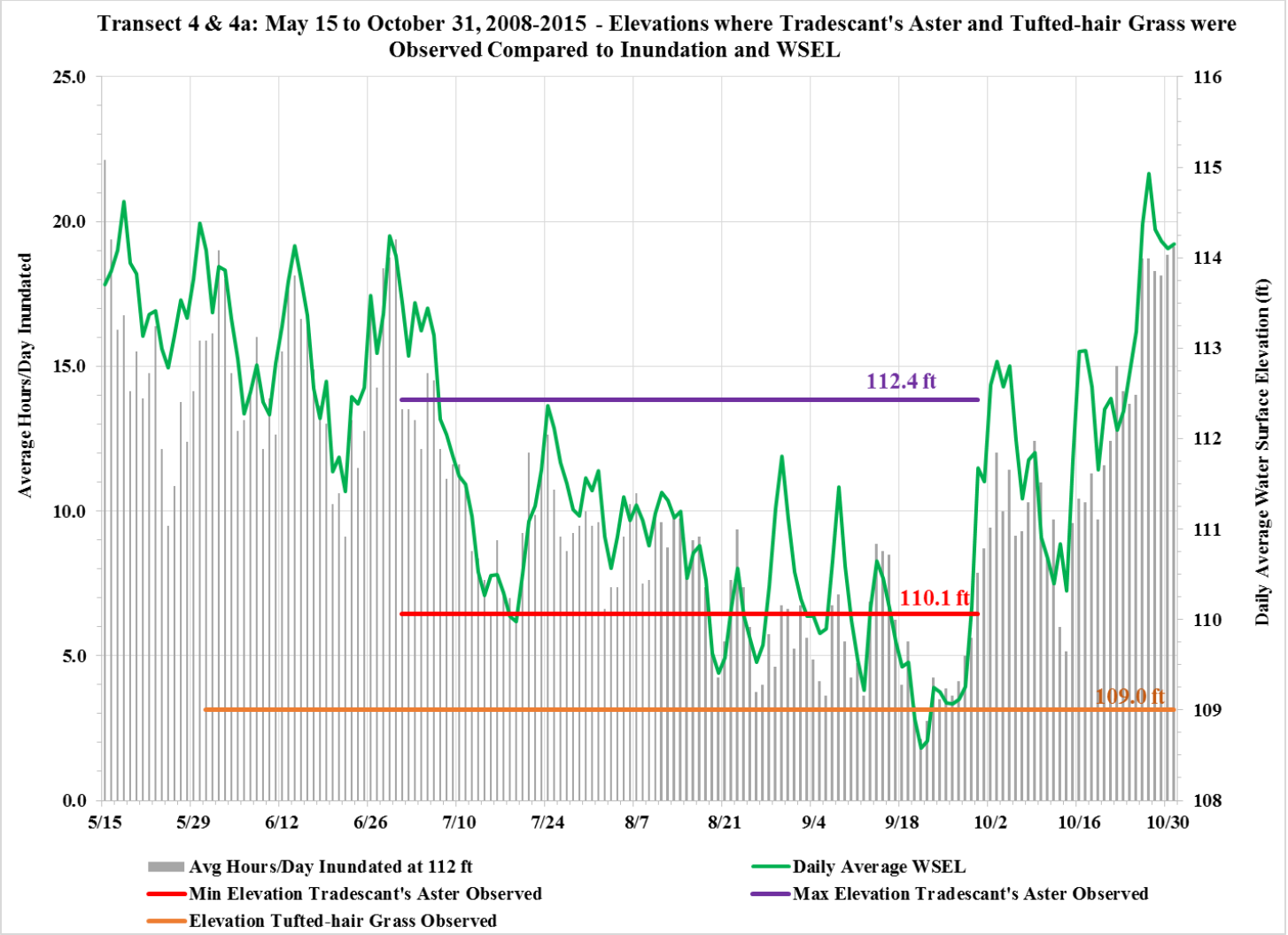


Figure 2.8-5 Transect 4 & 4a: May 15 to October 31, 2008-2015 - Elevations where Tradescant's Aster and Tufted-hair Grass were Observed Compared to Inundation and WSEL

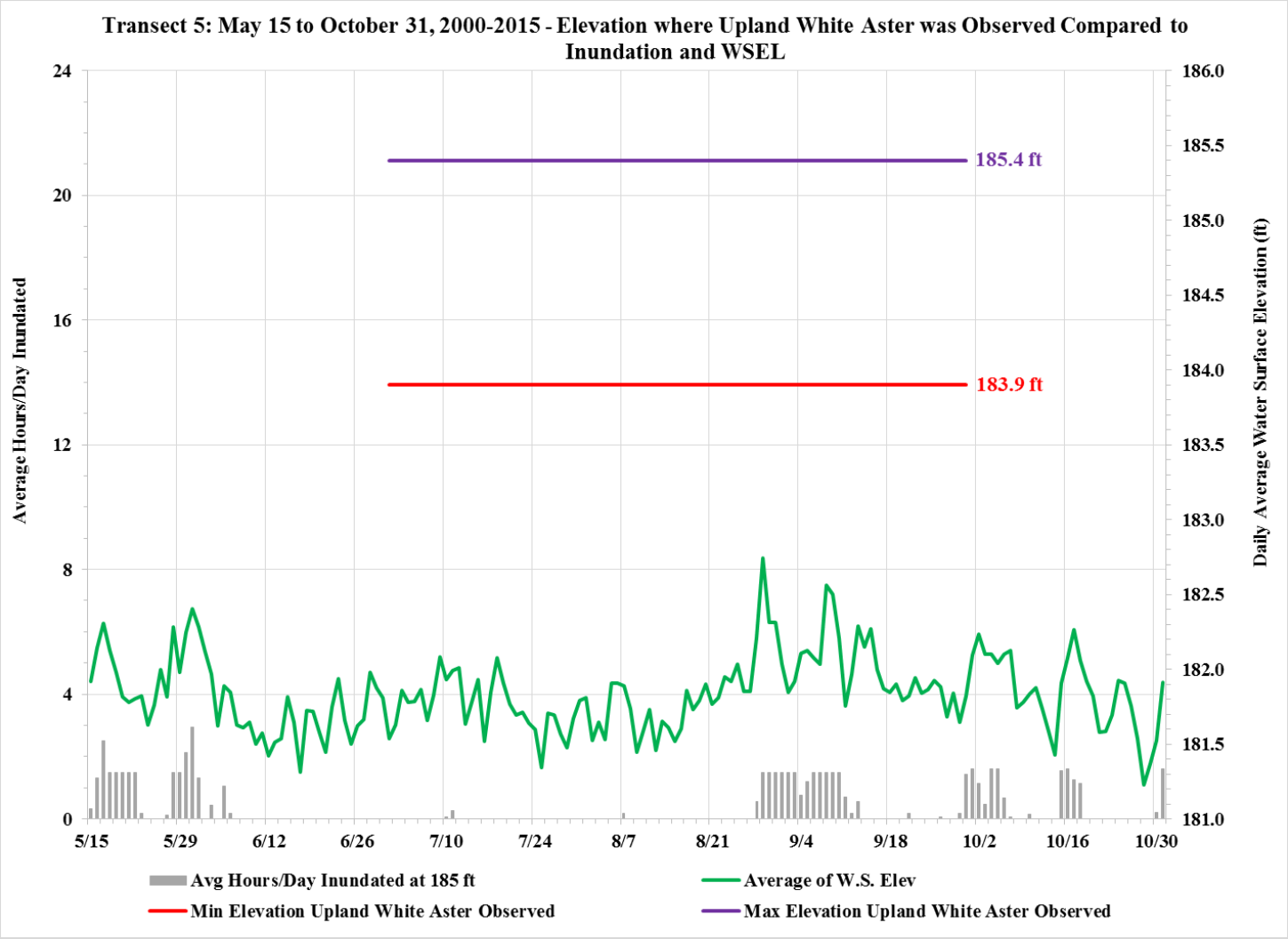


Figure 2.8-6 Transect 5: May 15 to October 31, 2000-2015 - Elevation where Upland White Aster was Observed Compared to Inundation and WSEL

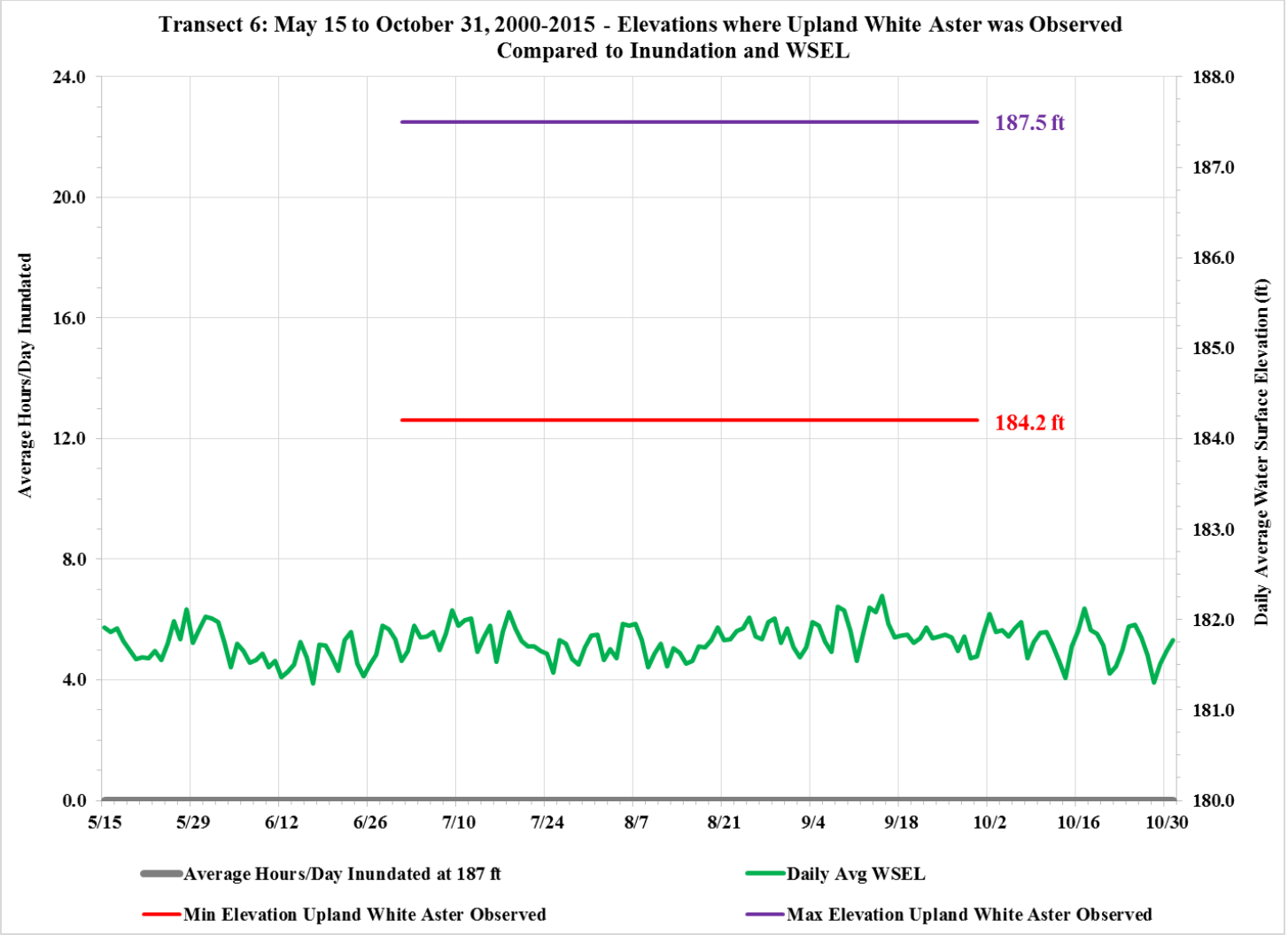


Figure 2.8-7 Transect 6: May 15 to October 31, 2000-2015 - Elevation where Upland White Aster was Observed Compared to Inundation and WSEL

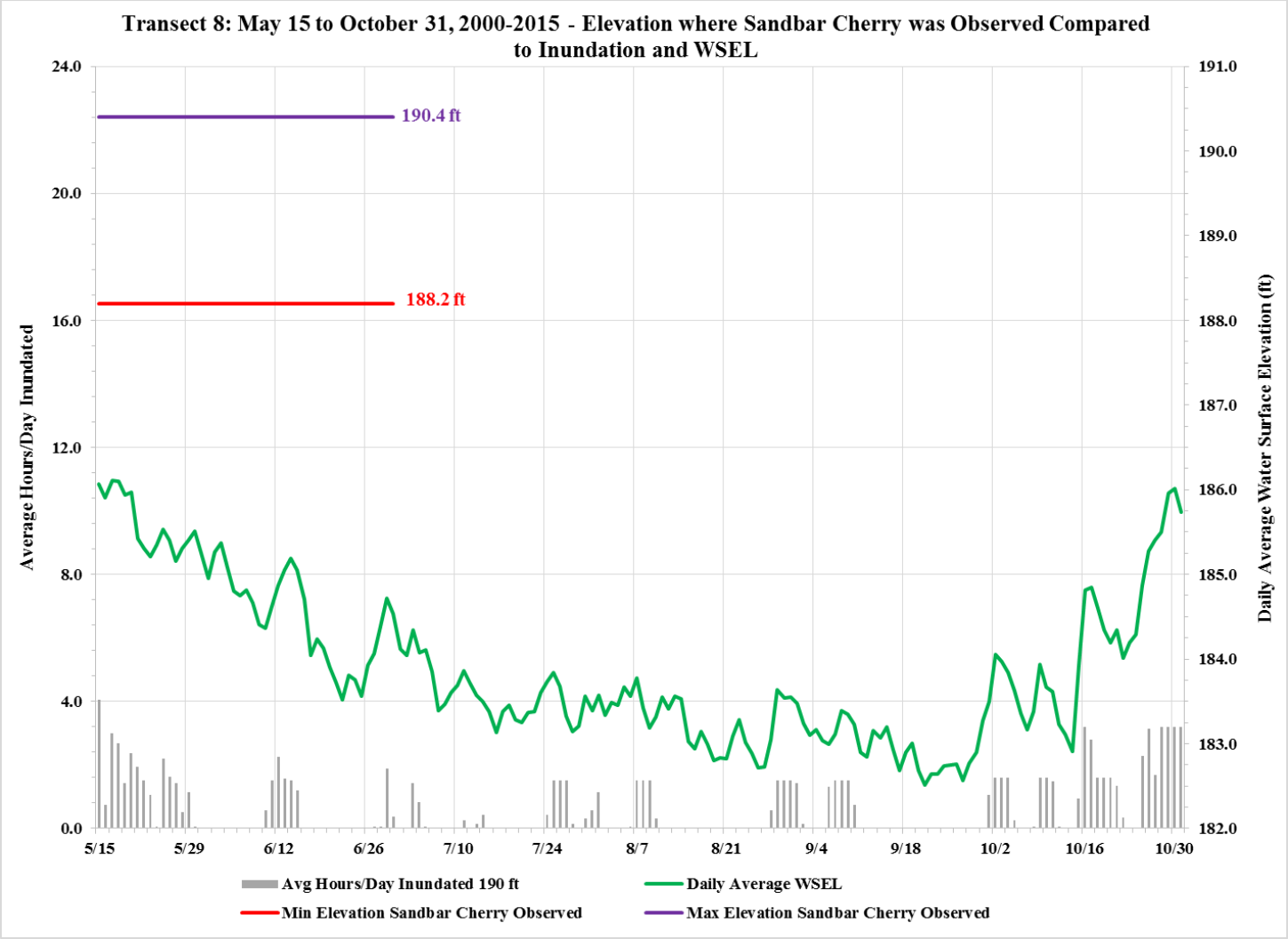


Figure 2.8-8 Transect 8: May 15 to October 31, 2000-2015 - Elevation where Sandbar Cherry was Observed Compared to Inundation and WSEL

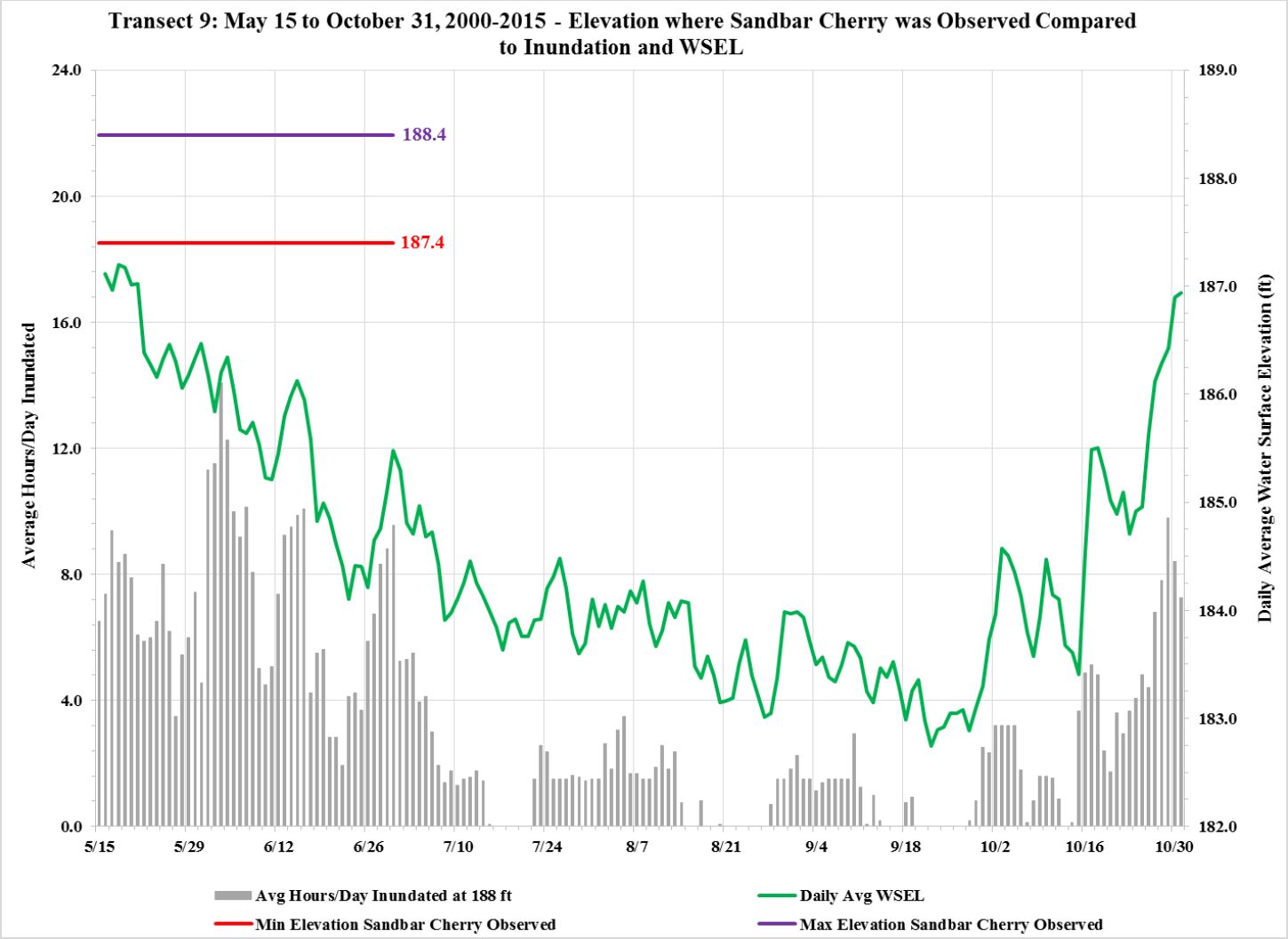


Figure 2.8-9 Transect 9: May 15 to October 31, 2000-2015 - Elevation where Sandbar Cherry was Observed Compared to Inundation and WSEL

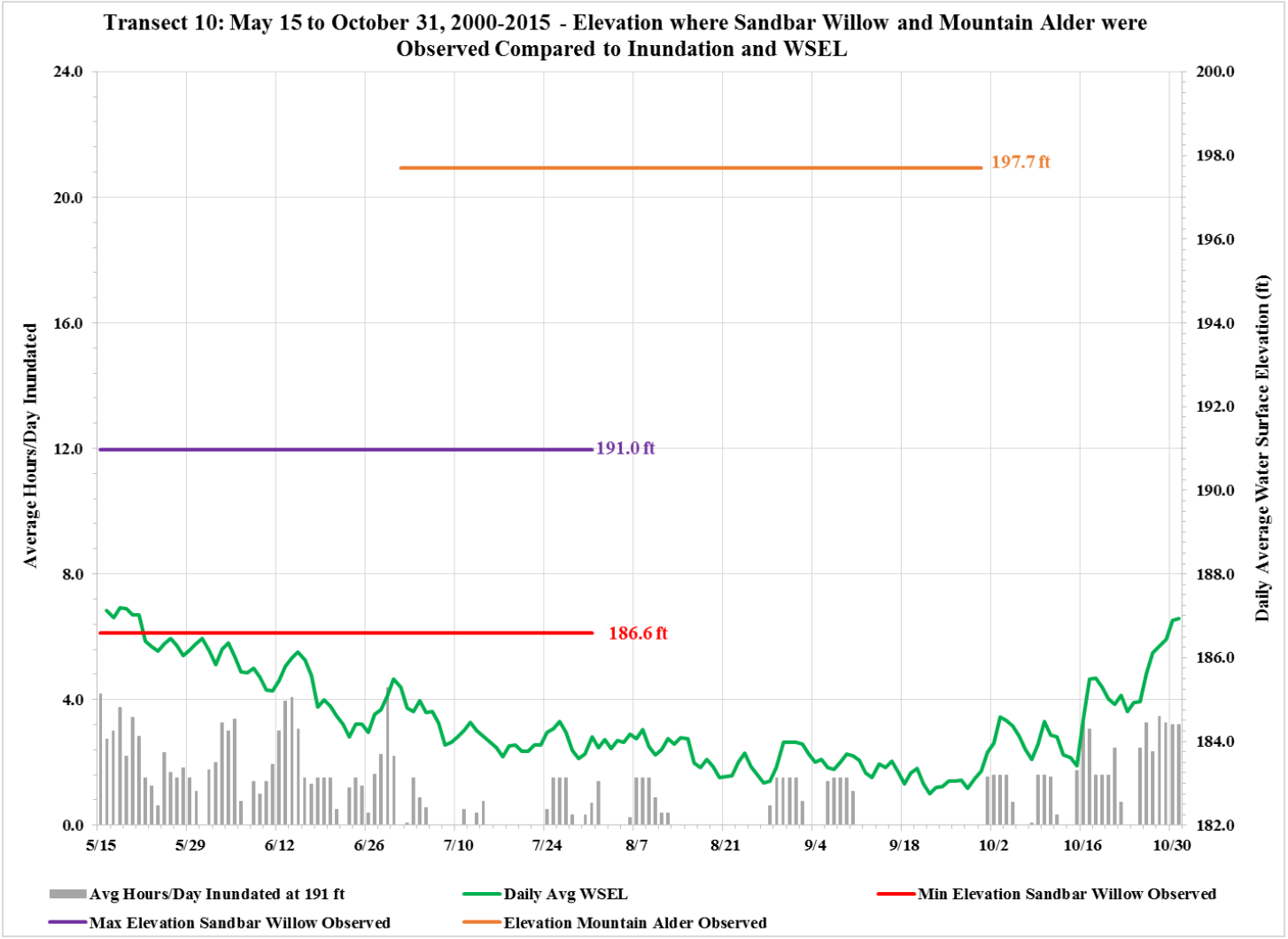


Figure 2.8-10 Transect 10: May 15 to October 31, 2000-2015 - Elevation where Mountain Alder and Sandbar Willow were Observed Compared to Inundation and WSEL

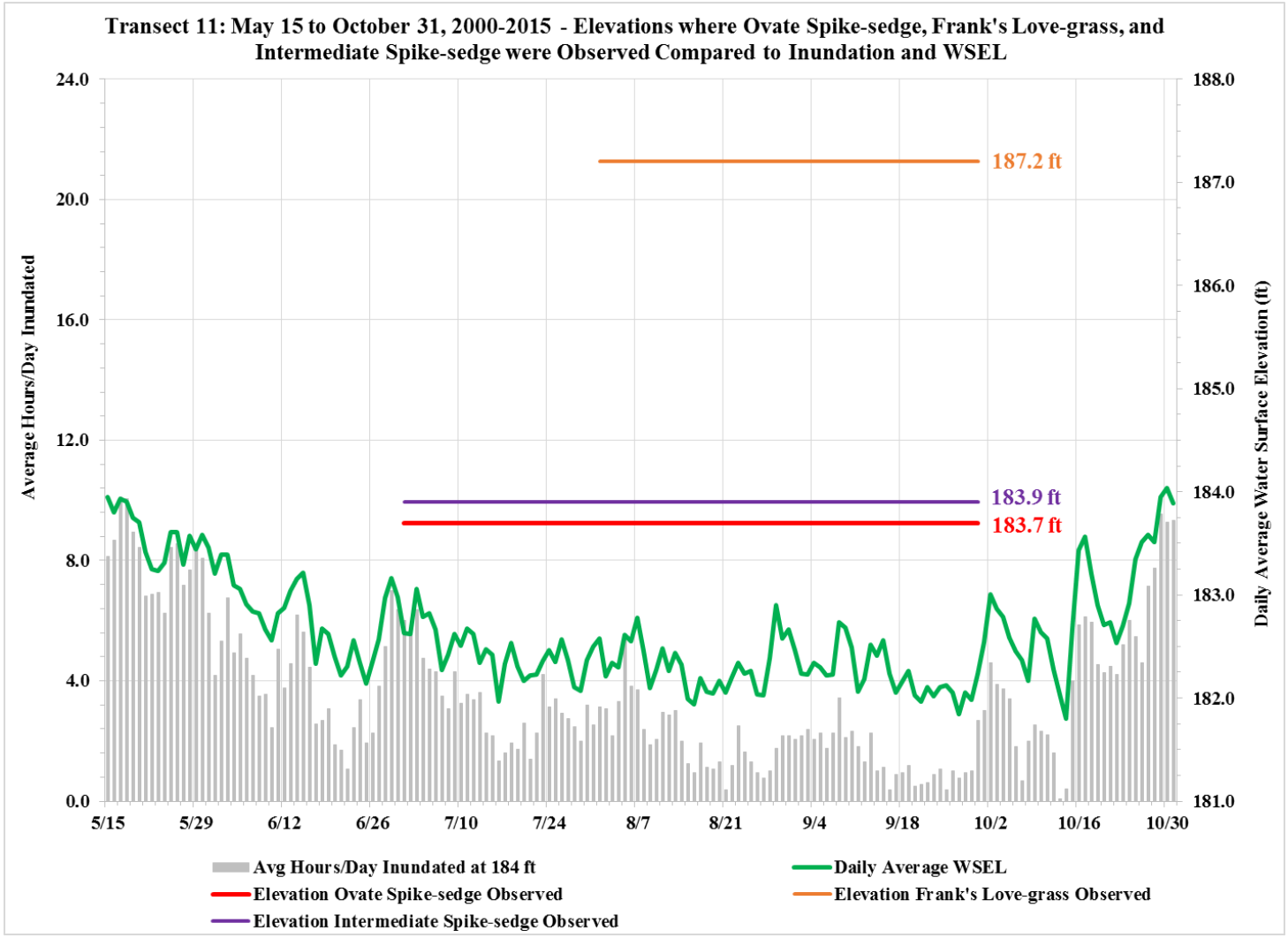


Figure 2.8-11 Transect 11: May 15 to October 31, 2000-2015 - Elevation where Ovate Spike-sedge, Frank's Love-grass, and Intermediate Spike-sedge were Observed Compared to Inundation and WSEL

2.9 MADFW- 9

Comment: Calculate and provide a table showing the number of hours per day each elevation was inundated, as well as the number of times each elevation is inundated, on each calendar day (May 15 and October 31) for each year of the eight-year period of record (2008-2015; 170 days*8 years*n elevations). Data should include the full range of elevations and flows provided in Figures 2.4-1 and 2.4-2 (for Transect 1), 2.4-3 and 2.4-4 (for Transect 2), etc.

Response: In response to MADFW-9 FL has developed tables showing the number of hours per day each elevation was inundated, as well as the number of times each elevation is inundated, on each calendar day (May 15 and October 31) for each year of the eight-year period of record. Data includes the full range of elevations and flows and the raw numerical data in an editable spreadsheet format as Attachment MADFW-9.

2.10 MADFW- 10

Comment: For the analysis conducted in 1), FL should calculate and provide a table showing the daily mean (±1 standard error), median number of hours per day, and number of times per day (±1 standard error) each elevation was inundated, for each calendar day (May 15 – October 31) averaged across the eight-year period for each transect.

Response: In response to MADFW-10 FL has calculated and provided a table showing the daily mean (±1 standard error), median number of hours per day, and number of times per day (±1 standard error) each elevation was inundated, for each calendar day (May 15 – October 31) averaged *across* the eight-year period for each transect including raw numerical data in an editable spreadsheet format as Attachment MADFW-10.

2.11 MADFW- 11

Comment: For Reach 3 of the Bypass Reach (the 2-D study area), the MRSP stated that "*FirstLight will use the 2-D hydraulic model information and transect information from the IFIM study to evaluate hydraulic conditions (water surface elevation) across any range of flows (this will eliminate the need for specific transect placement in the 2-D study area). This hydraulic information will be used with measured elevation data collected at occupied sensitive plant sites to evaluate how Project operations may impact habitat suitability for the plants within the bypass reach*." Additionally, in subsequent consultations with the Division, FL confirmed that fine-scale data collection associated with 2-D modeling of the Bypass Reach, combined with modeling of flow parameters in occupied habitat for each species, would provide extensive information regarding habitat suitability preferences for each species observed there. As we noted in our comments on Study Report 3.5.1, the Bypass Reach might also provide information on habitat suitability preferences for species not observed during FL surveys (but known to occur historically) through data collected in potentially suitable but unoccupied habitats.

However, to date FL has not provided any assessment associated with state-listed plants in the 2-D study area and has not provided an explanation (either in Study Report 3.5.1 or the Addendum) for why this information has not been provided. Strangely, the Addendum acknowledged that Transect T-3 (located within Reach 2 and representing the only source of data provided to date on rare plants within the Bypass Reach) was not actually visited in the field, so substrate and plant locations along this transect were not collected. Therefore, the Division requests that FERC direct FL to incorporate data from state-listed plant observations in the 2-D study area in its assessment of habitat suitability preferences (see Comment #2

above), including a description of how this information was used. Additionally, the Division requests that FL provide the following information:

Table(s) showing predicted water surface elevations over the full range of flows within the operational capacity of the project for the 2-D study area; all associated raw numerical data should be provided in editable spreadsheet format.

Response: Unlike the Turners Falls Impoundment and downstream of Cabot in Reach 4 and 5, modeled historical time series data of flow and elevation from the 1-D HEC-RAS model is not feasible to develop in the 2-D study area. A 2-D model (River2D) was used in the lower part of Reach 2 and Reach 3 due to the hydraulic complexity of the reach which includes side channels, islands, and inflow from the bypass reach, Cabot Station, and the Deerfield River. While over 100 steady state model runs were completed to analyze a wide range of flows, each steady state model took several days to stabilize even on a 12 Core Workstation with 128 GB of RAM. Therefore, a similar hourly time's series data for the 2-D study area is not feasible. However, to adequately cover the locations of the rare plans within the 2-D study area, FirstLight provides stage vs discharge curves at 10 locations for a combination of bypass flows and Cabot generation. While inflow from the Deerfield River can affect the lower part of this area, only the minimum flow of 200 cfs from the lowermost hydroelectric project on the Deerfield River was used in these analyses to emphasize effects from flows that are within the control of FirstLight. In addition, the inflow from the Deerfield River has normally a very a minor influence on these 10 locations.

Attachment MADFW-11A provides a map of the 10 locations in the 2-D study area. Attachment MADFW-11B provide figures of the stage vs discharge relationships at the 10 locations. The raw numerical data from the River2D output, tables and additional figures are provided the Excel file in Attachment MADFW-11C. In general, these figures indicate that above Rock Dam and Rawson Island, water level is only a function of bypass flows. Downstream of Rock Dam and Rawson Island, the influence of Cabot discharges become greater but is dependent on the location and the ratio between the bypass flows and Cabot discharges.

2.12 MADFW- 12

Comment: Elevation data for individual plants observed within the 2-D study area. In instances where minimum and maximum elevations were taken to describe a larger population (e.g., individual plant elevations were not taken), we request that FL provide the minimum and maximum elevations (measured at the soil interface to capture root inundation) for each spatially distinct population of each species. In these instances, please also provide any available data regarding how density and plant vigor varied across each population (see Comment #2, above).

Response: Utilizing elevation data developed as part of Study (Study 3.3.1) FL calculated the minimum, maximum, and mean elevations for each spatially distinct population of each species within the 2-D study area. Some locations were not included as elevation data was not available for portions of the Bypass Reach immediately downstream of the Turners Falls Dam. Table 2.12-1 includes the population size (sq. meters), population (counted number of plants in 2014), density (plants/sq. meter), minimum elevation, maximum elevation, and mean elevation.

Table 2.12-1. Plant Density and Elevation Data for Populations Mapped within the 2-D Study Area.

Population ID	Common Name	Species Name	Population Area (Sq M)	Estimated Population (Number of Plants)	Calculated Density (Plant/Sq M)	Elevations in Feet (NGVD 1929)		
						Minimum Elevation	Maximum Elevation	Mean Elevation
20	mountain alder	Alnus viridis ssp. crispa	4.0	1.0	0.25	137.4	139.0	138.3
27	Tradescant's aster	Symphyotrichum tradescantii	7.3	1.0	0.14	127.0	129.2	127.8
50	mountain alder	Alnus viridis ssp. crispa	189.0	1.0	0.01	114.4	126.3	117.2
65	Tradescant's aster	Symphyotrichum tradescantii	81.3	1.0	0.01	109.6	111.9	111.0
66	Tradescant's aster	Symphyotrichum tradescantii	71.3	1.0	0.01	109.6	112.1	111.3
44	mountain alder	Alnus viridis ssp. crispa	40.5	2.0	0.05	119.6	127.3	123.2
15	sandbar cherry	Prunus pumila var depressa	44.4	4.0	0.09	138.8	139.7	139.2
48	Tradescant's aster	Symphyotrichum tradescantii	385.6	5.0	0.01	113.5	130.0	117.5
41	mountain alder	Alnus viridis ssp. crispa	743.6	7.0	0.01	115.8	133.6	124.0
53	mountain alder	Alnus viridis ssp. crispa	140.5	7.0	0.05	110.9	123.3	115.7
63	Tradescant's aster	Symphyotrichum tradescantii	1564.7	7.0	0.00	110.4	121.4	113.9
67	Tradescant's aster	Symphyotrichum tradescantii	1369.1	10.0	0.01	105.1	116.8	110.5
14	Tradescant's aster	Symphyotrichum tradescantii	30.6	11.0	0.36	134.5	138.3	135.7
54	Tradescant's aster	Symphyotrichum tradescantii	379.9	11.0	0.03	98.5	120.8	112.5
59	Tradescant's aster	Symphyotrichum tradescantii	981.0	11.0	0.01	109.3	124.0	112.9
28	sandbar cherry	Prunus pumila var depressa	42.5	12.0	0.28	141.8	159.8	150.9
29	sandbar cherry	Prunus pumila var depressa	322.7	13.0	0.04	127.0	143.6	135.3
46	mountain alder	Alnus viridis ssp. crispa	153.2	15.0	0.10	114.7	127.9	119.9
43	sandbar cherry	Prunus pumila var depressa	481.6	16.0	0.03	117.0	128.9	121.6
47	sandbar cherry	Prunus pumila var depressa	111.1	16.0	0.14	122.4	126.8	124.0
39	mountain alder	Alnus viridis ssp. crispa	2237.4	17.0	0.01	118.4	130.0	123.4
25	sandbar cherry	Prunus pumila var depressa	3079.7	20.0	0.01	128.1	175.7	146.5
55	mountain alder	Alnus viridis ssp. crispa	378.4	20.0	0.05	112.6	130.4	122.2
64	Tradescant's aster	Symphyotrichum tradescantii	353.9	20.0	0.06	106.5	114.1	109.6
36	Tradescant's aster	Symphyotrichum tradescantii	6918.2	23.0	0.00	120.2	135.9	124.7

Population ID	Common Name	Species Name	Population Area (Sq M)	Estimated Population (Number of Plants)	Calculated Density (Plant/Sq M)	Elevations in Feet (NGVD 1929)		
						Minimum Elevation	Maximum Elevation	Mean Elevation
52	Tradescant's aster	Symphyotrichum tradescantii	312.4	29.0	0.09	98.7	136.0	113.2
62	sandbar cherry	Prunus pumila var depressa	4883.1	30.0	0.01	110.8	122.4	117.0
16	Tradescant's aster	Symphyotrichum tradescantii	107.6	36.0	0.33	133.7	137.3	135.2
57	sandbar cherry	Prunus pumila var depressa	510.2	40.0	0.08	113.4	119.2	115.7
56	sandbar willow	Salix exigua ssp. interior	181.0	48.0	0.27	113.0	116.1	114.1
51	Tradescant's aster	Symphyotrichum tradescantii	4929.8	50.0	0.01	97.8	128.1	115.1
58	Tradescant's aster	Symphyotrichum tradescantii	301.5	54.0	0.18	110.1	118.4	114.0
12	Tradescant's aster	Symphyotrichum tradescantii	671.5	70.0	0.10	130.1	145.3	137.5
40	sandbar cherry	Prunus pumila var depressa	373.6	81.0	0.22	118.6	126.8	123.4
61	sandbar cherry	Prunus pumila var depressa	4733.1	103.0	0.02	108.4	121.4	114.3
13	sandbar cherry	Prunus pumila var depressa	1147.3	110.0	0.10	130.1	149.9	142.9
38	Tradescant's aster	Symphyotrichum tradescantii	15260.4	114.0	0.01	118.3	146.3	123.5
21	sandbar cherry	Prunus pumila var depressa	390.9	182.0	0.47	134.1	139.9	137.2
18	upland white aster	Solidago ptarmicoides	1015.2	187.0	0.18	137.3	148.8	141.5
42	Tradescant's aster	Symphyotrichum tradescantii	3857.8	245.0	0.06	113.1	130.2	120.1
60	Tradescant's aster	Symphyotrichum tradescantii	24116.0	260.0	0.01	95.5	131.2	112.2
22	Tradescant's aster	Symphyotrichum tradescantii	541.7	300.0	0.55	128.4	137.8	133.8
19	sandbar cherry	Prunus pumila var depressa	1078.5	325.0	0.30	137.4	151.3	142.2
45	upland white aster	Solidago ptarmicoides	3281.8	451.0	0.14	114.5	130.2	121.3
49	Tradescant's aster	Symphyotrichum tradescantii	12482.9	950.0	0.08	105.7	130.4	114.7
11	Tradescant's aster	Symphyotrichum tradescantii	5576.4	1000.0	0.18	125.9	148.4	136.3
17	Tradescant's aster	Symphyotrichum tradescantii	6786.0	1000.0	0.15	131.7	140.5	136.1
34	Tradescant's aster	Symphyotrichum tradescantii	29889.3	1627.0	0.05	118.7	123.6	121.2
24	Tradescant's aster	Symphyotrichum tradescantii	39364.4	9328.0	0.24	126.2	166.7	137.3

2.13 MADFW- 13

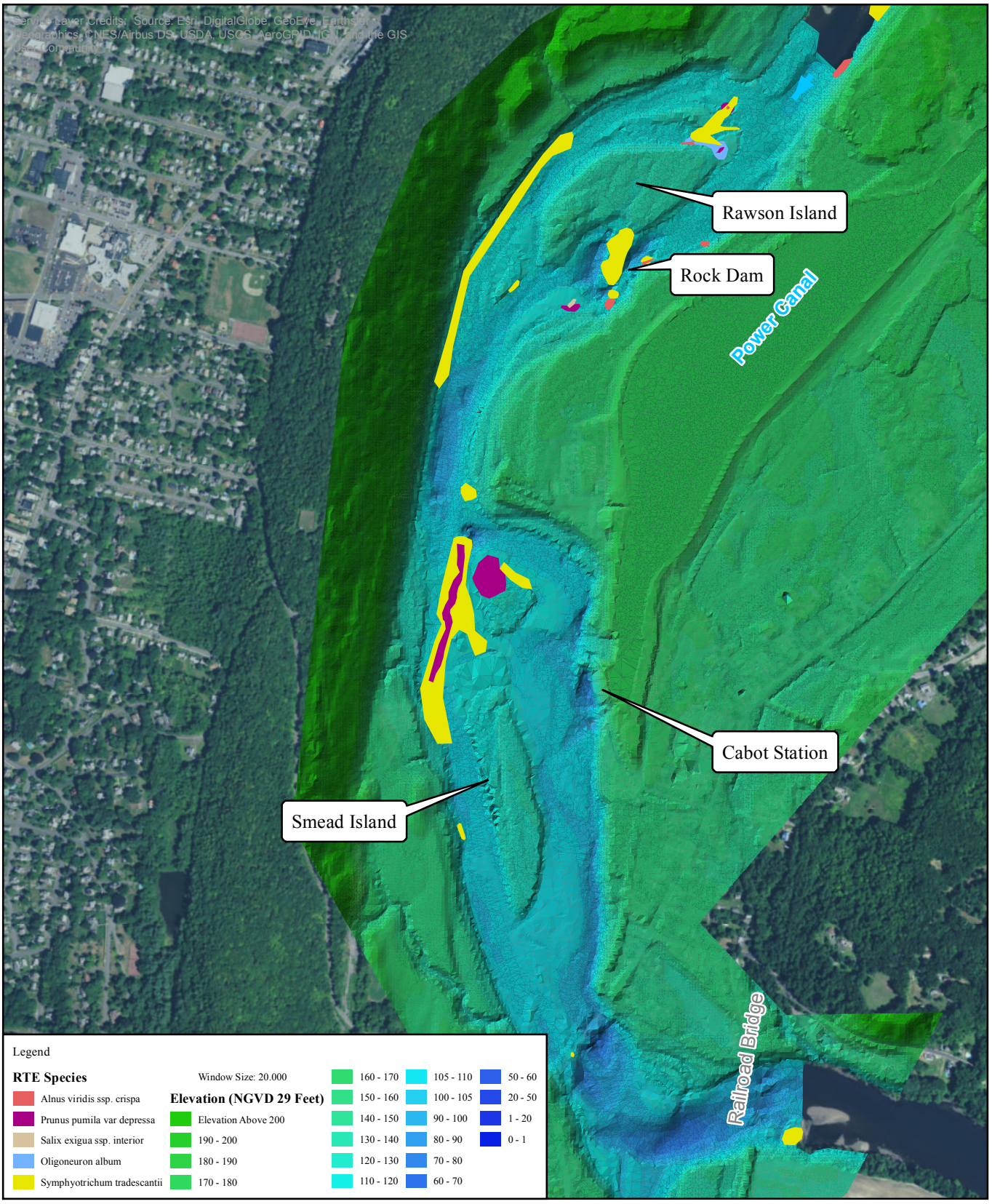
Comment: Based on the eight-year period of record (2008-2015) and the 2-D model, provide tables (similar to Tables 2.3-1 and 2.3-2 in the Addendum) showing each elevation, the flow (cfs) that corresponds to that elevation, and the percent of days that elevation is inundated for 24 hours, for 0 hours, or for some portion of the day (less than 24 hours but more than 0.0 hours) for May 15 through October 31. Please calculate the number of hours per day each elevation was inundated for each calendar day between May 15 and October 31 for the eight-year period of record. We also recommend that FL calculate the mean and median number of hours per day (with standard deviations) – as well as the number of times per day each elevation was inundated for each calendar day (May 15 – October 31) *across* the eight-year period of record. Data should include the full range of elevations and flows that state-listed species occur – or could occur, based on FL's delineation of suitable but unoccupied habitat - within the 2-D study area. All raw numerical data should be provided in editable spreadsheet format.

Response: See the response to comment MADFW-11.

2.14 MADFW- 14

Comment: Location and Digital Terrain Model Map(s), similar to Figure 2.5-23 provided for Transects 11A-11D), as appropriate to show the location and distribution of individual plants and/or populations for each species observed within the 2-D study area.

Response: This information has been provided in Figure 2.14-1.



FirstLight Power Resources

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

Study 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

N

0 500 1,000 2,000 Feet

Figure 2.14-1:
RTE Plant Populations and Terrain in the Bypass Reach

Path: W:\gis\studies\3_5_1\maps\2017 agency Responses\Bypass_RTE_Populations_and_Terrain.mxd

2.15 MADFW- 15

Comment: In our comments on Study Report 3.5.1, the Division requested that FL conduct additional field work using phonologically-targeted surveys in 2016 for Tufted Hairgrass (*Deschampsia cespitosa ssp. glauca*) (Hartman). FL did not acknowledge the Division's request for additional field work in its May 31, 2016 response to comments. In its June 29, 2016 determination, FERC recommended that "*the information requested by Massachusetts DFW be included in the addendum or FirstLight should indicate why the information cannot be provided*" Including the request for surveys. In an email to the Division dated June 27, 2016, Steve Knapp (Klein Schmidt Group) stated that "*throughout much of the by-pass and other rocky shorelines we observed perennial cespitose grasses that we suspected could be D. cespitosa; however, all individuals examined from June through September of 2014 had shattered seed heads, without sufficient features for identification. This was discussed with Karro Frost and Jesse Leddick during the October 22 site visit in 2014, but no conclusions were drawn at that time*." In a second email dated December 2, 2016, Knapp stated that FL "*conducted extensive field surveys for listed plant species, including Deschampsia, over the course of 21 days in the field in 2014. FirstLight believes this effort fulfilled the intent of the study plan relative to listed plant species*."

This Endangered, perennial grass species occurs only in the Connecticut River in Massachusetts, and its only extant population is located within the Bypass Reach. This species has high site fidelity; as a fairly long lived perennial species populations do not tend to move around significantly from year to year. This species has been observed in the Bypass Reach many times, extensively and in essentially the same locations, since as early as 1980. Most recently, at one location near the center of the Bypass Reach, approximately 100,000 mature genets were observed (90% in flower) over approximately 10 hectares by independent observers in late June of 2014.

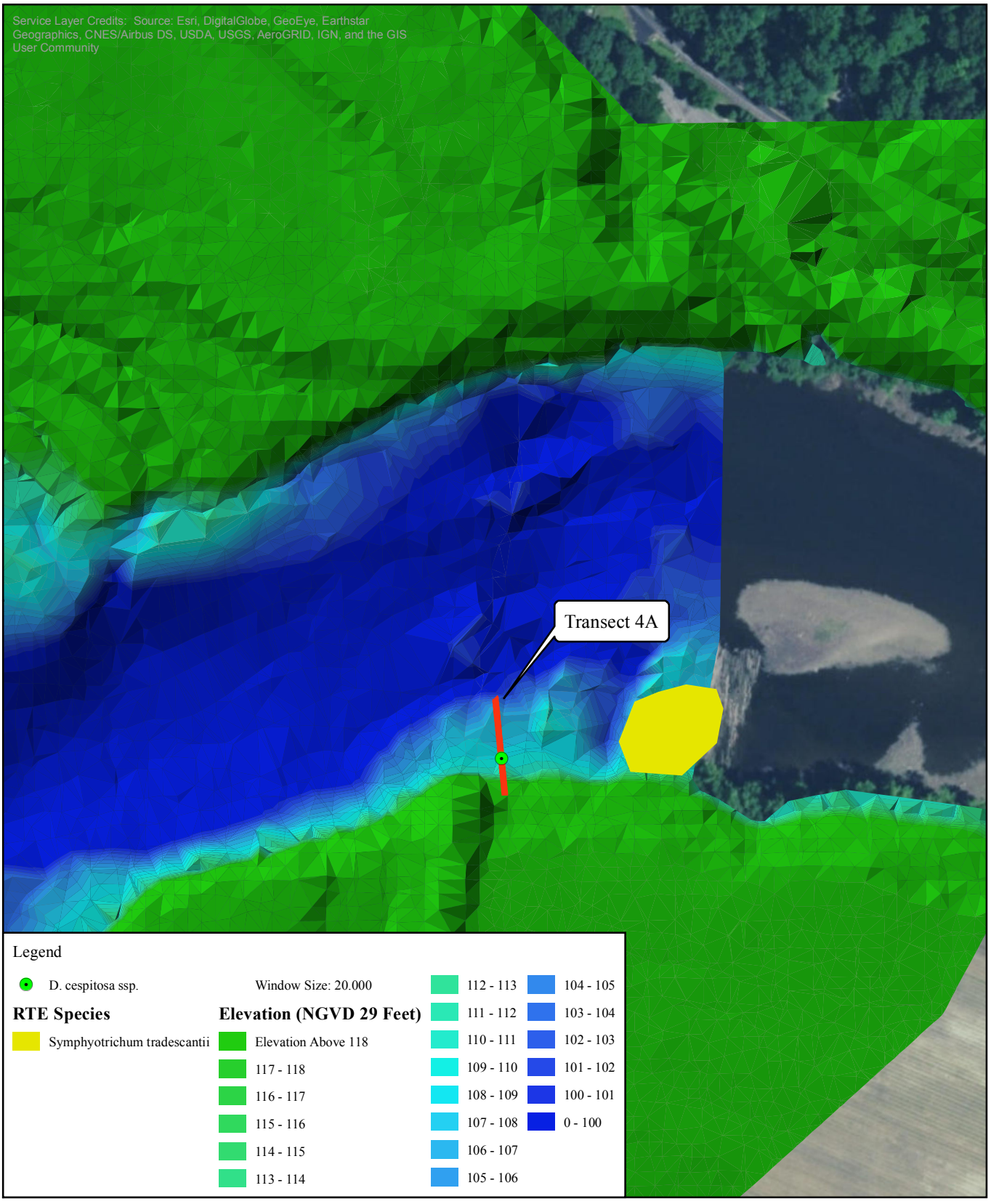
Although this grass can be difficult to identify, we note that FL conducted surveys in the Bypass Reach on June 3 and June 11, 2016 (lower & mid-bypass reach) and did not return to conducted additional surveys until August 18th and later (email from FL to Division, dated 12/1/2016). This means that there was an 8-9 week period between the beginning and end of the identification window where the Bypass Reach was unsurveyed by FL botanists. By the time FL visited the site on August 18th, they were only able to identify a single location where cespitose grasses were observed with shattered seed heads, insufficient to make a positive identification. Additionally, while this observation was within the general habitat for *D. cespitosa ssp. glauca*, it appears that FL did not observe cespitose grasses in any other locations where the species is known to occur in the Bypass Reach.

We believe that the observed, shattered seeds heads likely represent the target species. Indeed, the Division affirmed – both during the October 22, 2014 site visit and a phone call with FL representatives on March 30, 2016 – that this species had been previously observed within the Bypass Reach and that it was highly likely that the perennial cespitose grass observed by FL was *D. cespitosa spp. glauca*. However, the lack of field surveys in the Bypass Reach during the flowering/fruiting season and lack of positive identifications at known locations suggests that many plants went unobserved. We also note that additional field work related to this study occurred in 2015, and that field work related to other studies occurred in 2016; FL elected not to look for this plant in spite of the timing issues referenced in relation to the 2014 season and the Division's request for additional survey effort for this species in 2016 (Division comments on Study Report 3.5.1).

The intent of the MRSP was to assess potential project impacts under existing and potential future operational scenarios on this and other state-listed plant species. It is impossible to do so in the absence of requisite data collection for a species known to occur in the Bypass Reach. Therefore, FL's failure to assess Project impacts on this species, or adequately explain why it could not do so, is not consistent with the intent of the MRSP or FERC's June 29, 2016 determination. Therefore, the Division reaffirms its request

that FL conduct additional field surveys for *D. cespitosa spp. glauca* during the 2017 field season. FL botanists should conduct reconnaissance surveys every one to two weeks starting at the end of May until seed heads are observed. At this point, Division botanists are willing to accompany FL's botanists for several days to help confirm field identification and selection of survey areas. Alternatively, and consistent with our comments on Study Report 3.5.1, if FL collected data on all possible *D. cespitosa ssp. glauca* individuals observed during 2014 surveys (consistent with the MRSP and with the locations of known populations), FL may elect to assume that these individuals are *D. cespitosa ssp. glauca* and conduct all requisite analyses based on this assumption. For locations where *D. cespitose ssp. glauca* was observed in the 2-D study area, FL should use the 2-D hydraulic model, combined with measured elevation data for plant/population locations, to evaluate habitat suitability preferences and potential project impacts as outlined previously (see Comment #3 above).

Response: In response to MADFW-15, FL followed the MRSP for surveys completed in 2014 and identified a possible *D. cespitosa ssp. glauca* individual. FL did not receive and was unaware of specific location information which was obtained by the MADFW-NHESP in June of 2014. Additional information regarding the location of the information obtained by the MADFW-NHESP was requested in the January 17, 2017 response to comment, but the information was not provided. Therefore, FL has assumed that individual identified in 2014 is *D. cespitosa ssp. glauca*. As a result, using the digital elevation model a new transect (Transect 4A) (Figure 2.15-1) was established. Using this transect FL completed data analysis, as was completed for other Transects. Figure 2.15-2 and Figure 2.15-3 show the percent of time that the D. cespitosa is inundated. Supporting data in an editable spreadsheet format has been provided as an attachment (see Attachment MADFW- 8).



FirstLight Power Resources

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

Study 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

N

0 100 200 400 Feet

Figure 2.15-1:
Location of
D. cespitosa ssp. glauca
and Transect 4A

Path: W:\gis\studies\3_5_1\maps\2017 agency Responses\Transect_4A_and Terrain.mxd

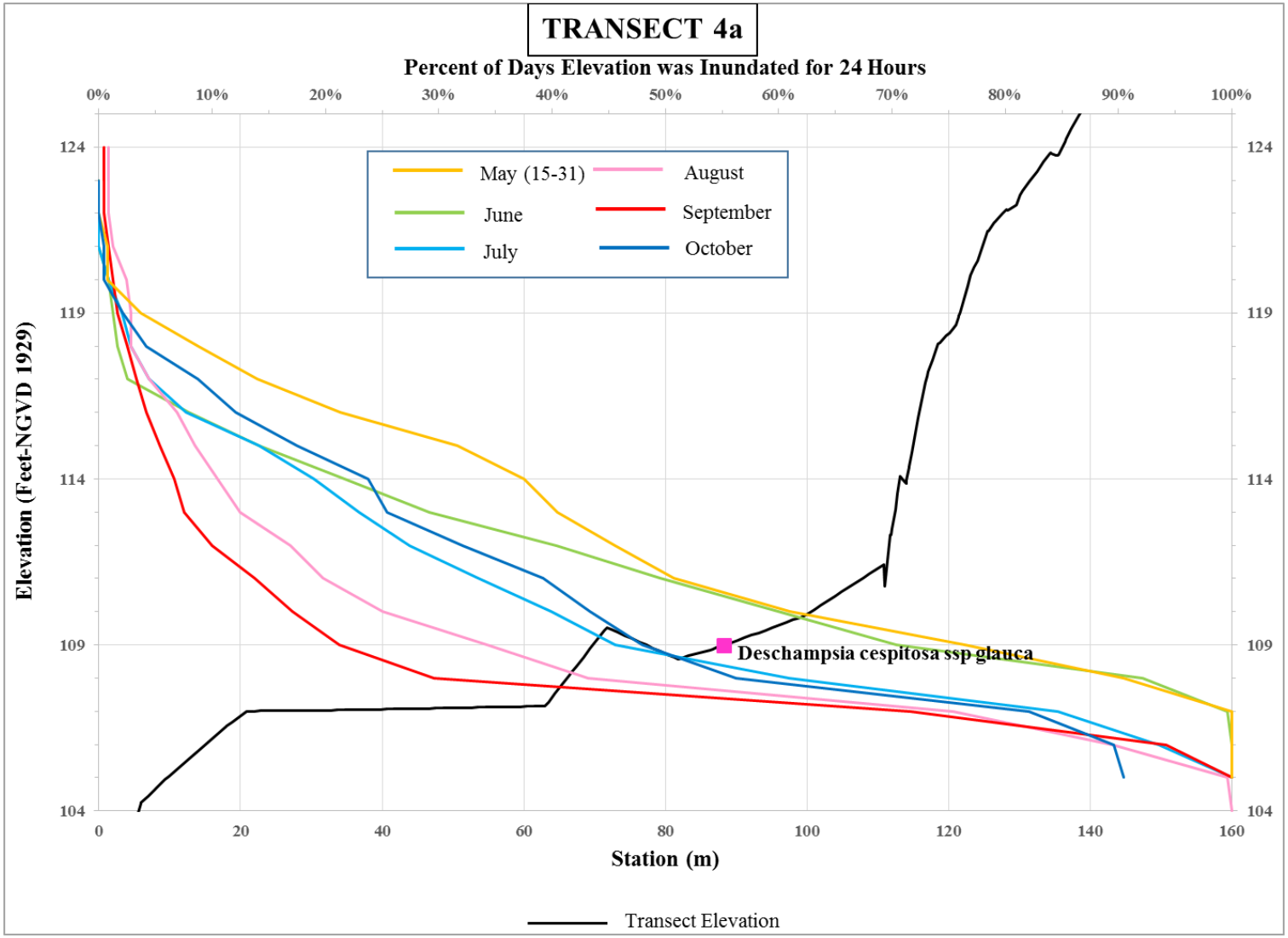


Figure 2.15-2 Transect 4A, *D. cespitosa*, Percent of Days Elevation was Inundated for 24 Hours

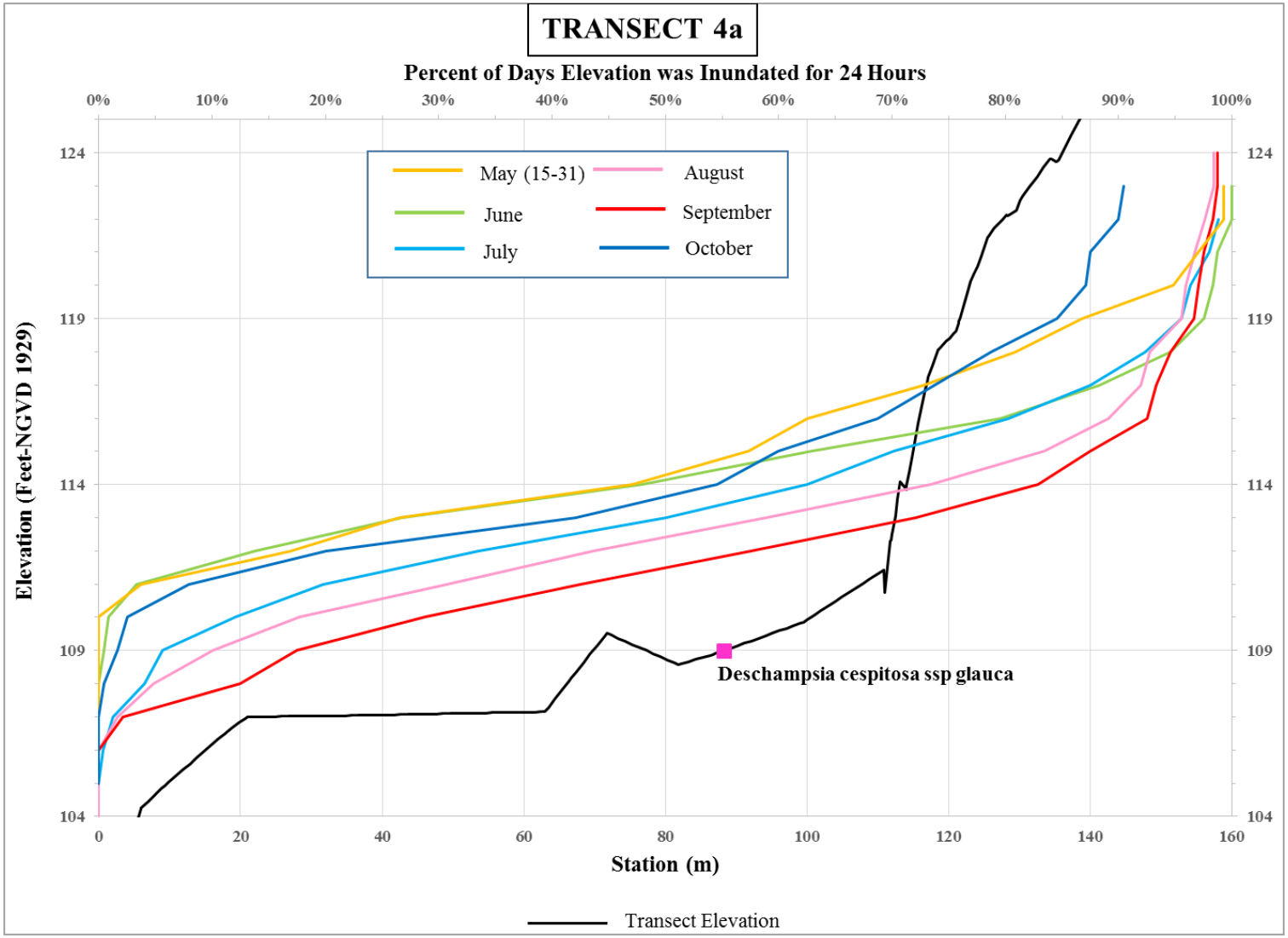


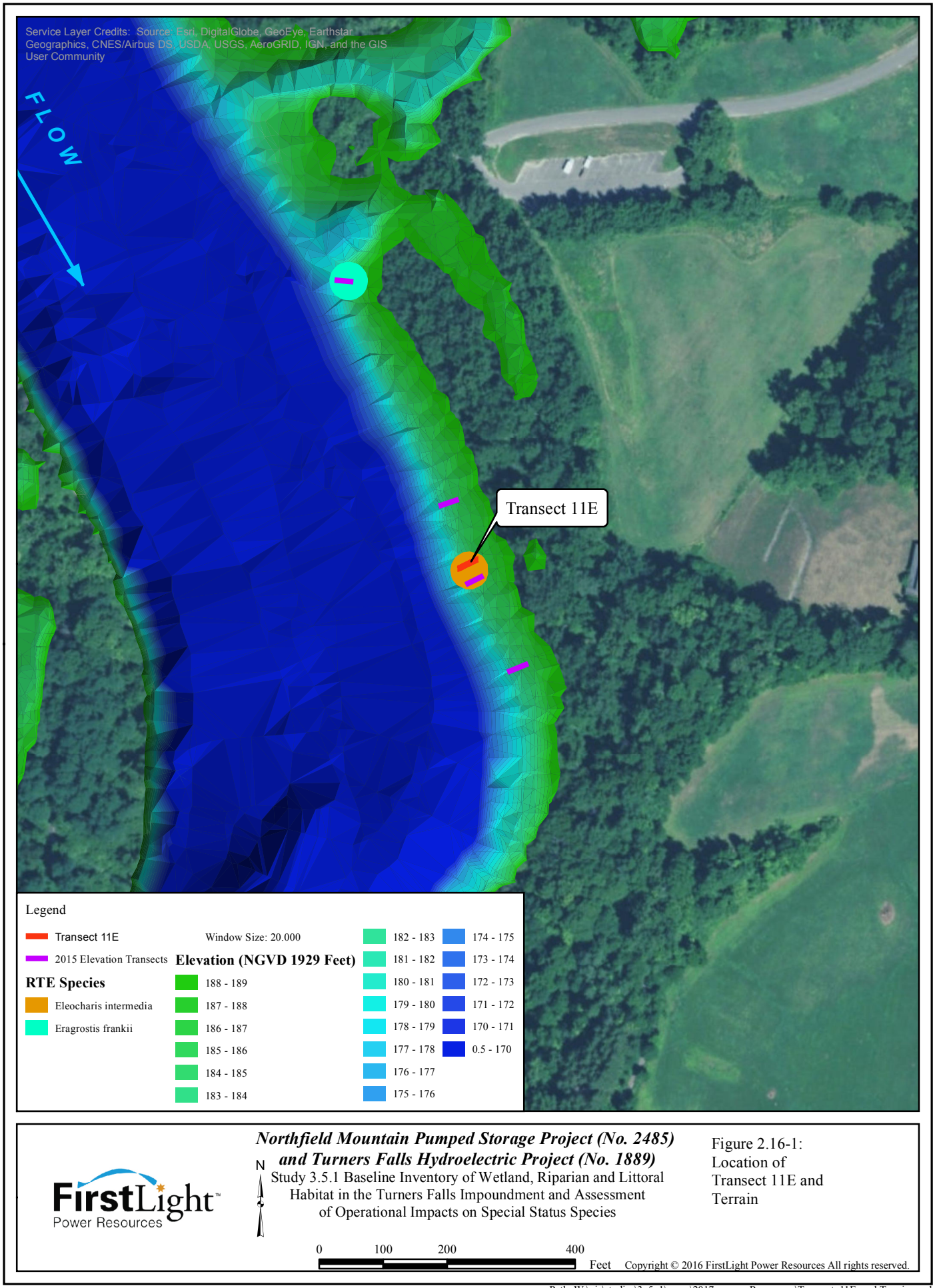
Figure 2.15-3 Transect 4A, D. cespitosa, Percent of Days Elevation was Inundated for 0 Hours

2.16 MADFW- 16

Comment: In our comments on Study Report 3.5.1, the Division requested that FL conduct additional field work (phonologically-targeted surveys) for Wright's Spike-rush, Intermediate Spike-Sedge and Ovate Spike-sedge in 2016. The Division's request was based on the fact that *Eleocharis* species were observed during FL surveys on Fourth Island and above Fourth Island (near Transects 3 and 4, respectively), on Third Island, and between First and Second Islands. However, FL did not provide any information regarding whether these *Eleocharis* species were state-listed.

In emails to the Division dated June 27 and December 2, 2016, Steve Knapp provided more detailed information regarding dates, locations, and target species of rare plant surveys undertaken in 2014. In 2014, FL conducted field work in and around Fourth Island on June 3, 2014 and the islands located in Sunderland on August 18 and 20, 2014 (email 12/1/2016, FL to Division). Mature achenes are required to definitively identify this species, which do not typically present until mid to late August. Therefore, the field work conducted by FL on and above Fourth Island would have been unable to definitively identify *Eleocharis* species level unless additional field surveys were conducted. If follow up surveys were not conducted to definitively identify *Eleocharis* species in and around Fourth Island where *Eleocharis* species were observed, the Division reaffirms its request that FL conduct additional field surveys for *Eleocharis* in these locations sufficient to allow definitive identification.

Response: In response to MADFW-16, FL followed methods as outlined in the MRSP in 2014 while searching for rare *Eleocharis* species. *Eleocharis* plants were found primarily in and around Pauchaug Brook and the associated boat ramp. Subsequent site visits to Pauchaug produced a single specimen of *E. intermedia* on August 20, 2014, and a single plant of *E. ovata* on August 26, 2015. In Response to MADFW-16, FL has used these observations (from 2014 and 2015) and included the species in the analysis of Transect 11 (A-D). Figure 2.16-1 shows the location of the newly established Transect 11E for analysis of *E. intermedia* based on the observed location from 2014 and the observation of E. ovata has been included in the analysis for Transect 11D. Figure 2.16-2 and Figure 2.16-3 shows the percent of time that the E. intermedia is inundated. Attachment MADFW-8 includes the data in raw format in an editable spreadsheet.



FirstLight Power Resources

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

Study 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

N

0 100 200 400 Feet

Figure 2.16-1: Location of Transect 11E and Terrain

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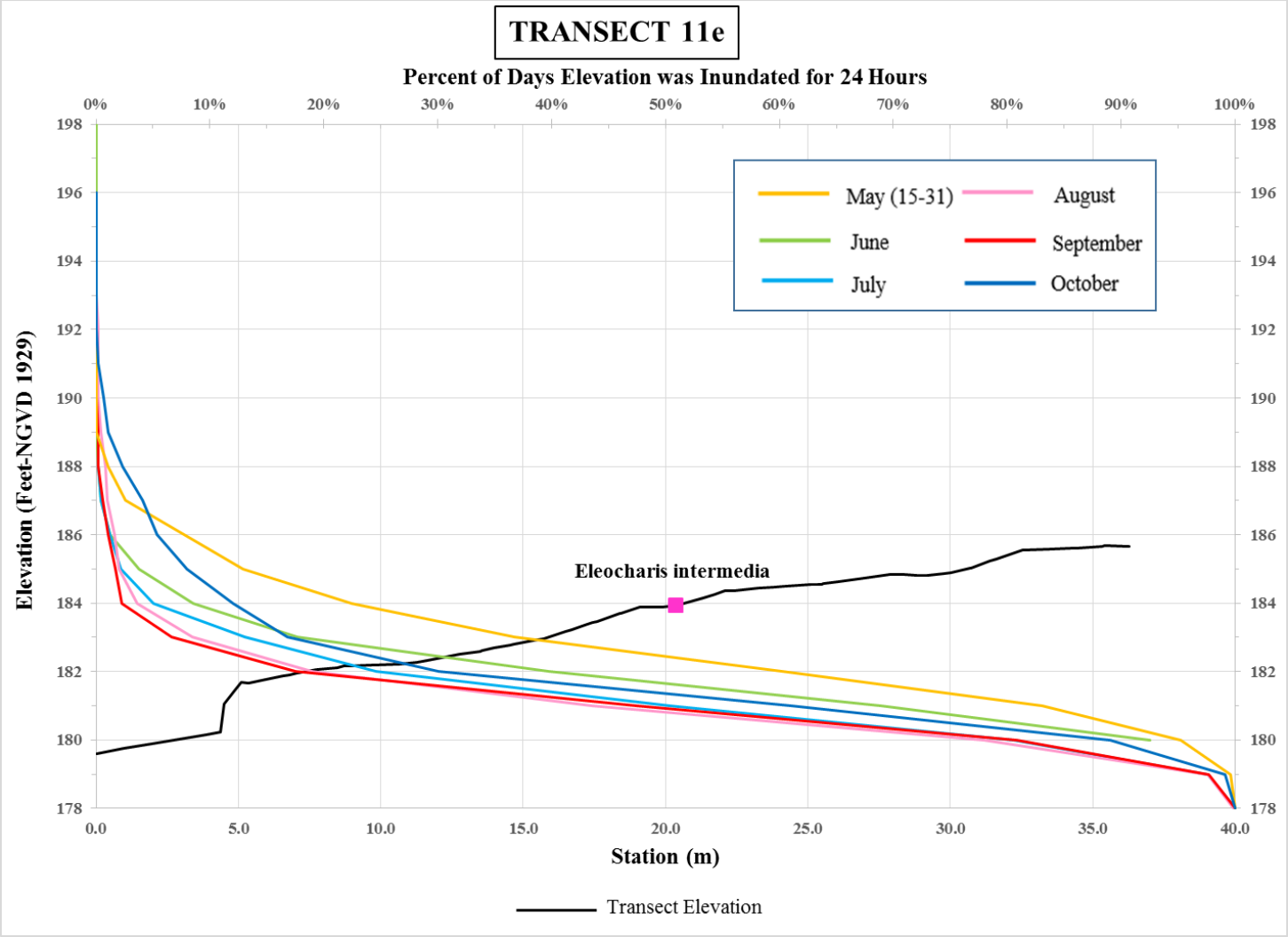


Figure 2.16-2 Transect 11E, *E. intermedia*, Percent of Days Elevation was Inundated for 24 Hours

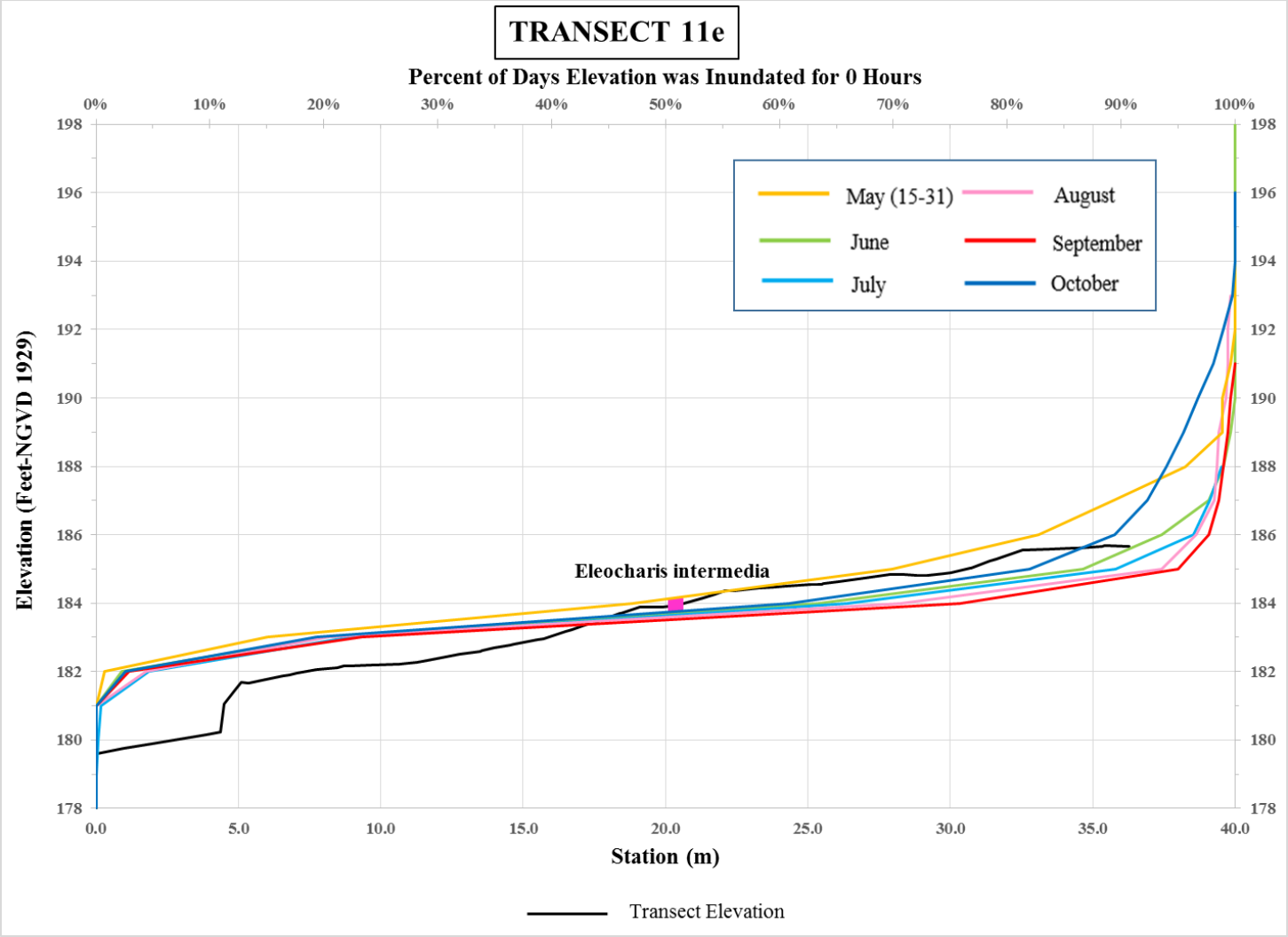


Figure 2.16-3 Transect 11E, *E. intermedia*, Percent of Days Elevation was Inundated for 0 Hours

2.17 MADFW- 17

Comment: In our comments on Study Report 3.5.1, the Division requested that FERC direct FL to orient transects at First, Second and Fourth Islands as previously agreed and that associated hydrological assessments be revised. However, the Division also noted that it would be willing to review supplemental elevation data collected by FL within occupied habitats at First, Second and Fourth Islands and, if deemed sufficient to enable all required hydrological assessments, the Division would support a subsequent request by FL to waive our request to recollect transect data at First, Second and Fourth Islands. FL has not provided any additional information regarding this request. Therefore, the Division requests that FERC require FL either re-collect data on the transects as previously agreed or provide the supplemental elevation data for review by the Division.

Response: In response to MADFW-18, FL submitted an ArcGIS shapefile of all elevation data collected during the 2015 elevation survey for review as part of the January 17, 2017 response to comments.

2.18 MADFW- 18

Comment: Please provide, in editable spreadsheet format, raw numerical associated with the following figures provided in the October 2016 Addendum. Please limit data to May 15 through October 31:

- Figure 2.4-1 and similar (percent of time that potential habitat is inundated for a period of 24 hours).
- Figure 2.4-2 and similar (percent of time potential habitat is inundated for a period of 0.0 hours).

Response: FL has provided the additional data to include October. However, the modeling period for this and most other studies that used the HEC-RAS hydraulic model ended on September 30, 2015 due to the extent of approved flow data available from the USGS and FL when the modeling was completed. So rather than change the modeled period, the data for 2015 will not include October 2015. This information has been provided in Attachment MADFW-8.

2.19 MADFW- 19

Comment: For each transect, we request that FL provide the following:

Exact elevation measurements (measured at the soil interface) for all plants observed; all raw numerical data should be provided in editable spreadsheet format. An ArcGIS shapefile with each transect (as a line) showing its location, orientation, and length.

Baseline flow conditions to help standardize flow-related habitat suitability preferences across transects. For example, for *Prunus pumila* var. *depressa*, FL established transects at Fourth Island (Transect 3) as well as just below Vernon Dam (Transects 8 and 9). But, the absolute elevation recorded by FL (Feet-NGDV 1929) does not represent the habitat space occupied by the plant, as the plant is responding to site-specific flow and inundation conditions rather than height of a fixed point. Therefore, to help understand habitat suitability preferences for this species, it is important to measure the relative elevation between where *Prunus* was observed along a transect and a minimum, baseline flow condition at that transect area during its growing season (likely occurring in August/September). Similarly, it is also important to be able to compare this relative elevation difference across transects (e.g., between Transect 3 downstream of Cabot Station and Transects 8/9 just below Vernon Dam) in order to compare typical flow conditions experienced by the same species indifferent locations.

Preliminary, we recommend using 120 cfs for the Bypass Reach (representing minimum flows between July 16th and November 15th) and 1,633 cfs for Reach 4 (representing minimum flows originating from the Deerfield Hydroelectric Project and Turners Falls Project). However, we request that FL work with the

Division and other stakeholders to establish sensible minimum, baseline flow conditions for each distinct portion of the river where rare plant transects were established (including Reach 4, the Bypass Reach, the Impoundment, and just downstream of Vernon Dam) to aid in evaluating plant habitat suitability.

Response: In the response to comment MADFW-6 in the May 2016 response to comments, FL provided, as Attachment C (Study 3.5.1), an excel table which provides all elevation and species information for each of the surveyed elevation transects collected in 2015. Attachment E (Study No. 3.5.1), of that response, contains an ArcGIS line shapefile showing the location, length, and orientation of the survey transects collected in 2015. FL proposes that the MADFW-NHESP use the data provided in the October 2015 Addendum to identify target elevations, based on the inundation duration data, for each species.

Stage versus discharge curves were completed at the transect locations downstream of Cabot and within the Turners Falls Impoundment. Within the Turners Falls Impoundment, the water level as controlled by FirstLight at the Turners Falls Dam and pumping and generation at Northfield Mountain, are key factors on water levels throughout the impoundment especially at flows below about 30,000 cfs. Therefore FirstLight has provided example stage versus flow scatter plots showing this relationship (and the raw Excel data) for transects located within the impoundment during 2011, a representative year. These stage versus discharge plots for transects 1, 2, 3, 4, 5, 6, 8, 9&10, and 11 are provided as Attachment MADFW-19A. The raw data and figures for the stage vs discharge curves are provided as Excel files in Attachments MADFW-19B through MADFW-19J.

2.20 MADFW- 20

Comment: Please provide, in editable spreadsheet format, raw numerical data associated with the following tables and figures from Study Report 3.5.1. Please limit data to May 15 through October 31:

- Figure 4.3-10 and similar (% exceedance curves for each transect based on the eight-year period of record).
- Figures 4.3-12 and similar (spring maximum daily changes in WSEL for each transect). Please expand data to include July, August, September and October.
- Tables 4.3-7 through Table 4.3-17.

Response: Exceedance curves for each transect were revised to limit the data to May 15-31, June, July, August, September, and October. The raw data and figures for these Exceedance Curves are provided as Excel files as Attachments MADFW-20A through MADFW-20I. Histograms providing the maximum daily changes at each transect are provided as Attachments MADFW-20J through MADFW-20R. Revised tables, similar to Tables 4.3-7 though Table 4.3-17 are also provided in the histogram excel files. Below is a table which provides the transects and the associated exceedance curve and histogram attachment names.

Transect #	Exceedance Curve Attachment Name	Histogram Attachment Name
1	MADFW-20A	MADFW-20J
2	MADFW-20B	MADFW-20K
3	MADFW-20C	MADFW-20L
4	MADFW-20D	MADFW-20M
5	MADFW-20E	MADFW-20N
6	MADFW-20F	MADFW-20O
8	MADFW-20G	MADFW-20P
9&10	MADFW-20H	MADFW-20Q
11	MADFW-20I	MADFW-20R

2.21 MADFW- 21

Comment: Table 4.3-11 of Study Report 3.5.1 provides predicted water surface elevations over a range of flows for Transect T-3 in the Bypass Reach. We request that FL provide tables (showing predicted water surface elevations over the full range of flows within the operational capacity of the project) for Transects 1 through 11.

Response: See response to MADFW-20.

2.22 MADFW- 22

Comment: Figure 4.3-1 of Study Report 3.5.1 shows areas occupied by various state-listed plants within Reach 2 and the northerly portion of Reach 3 of the Bypass Reach. We request that FL provide a similar figure showing areas occupied by rare plants within other portions of Reach 3 not shown in Figure 4.3-1.

Response: In response to MADFW-22, updated mapping, which shows areas occupied by state-listed plants within all portions of the by-pass reach was provided in the response to comments provided to FERC on January 17, 2017.

2.23 MADFW- 23

Comment: Section 4.4 (Invasive Plant Survey) confirmed that thirteen (13) terrestrial invasive plant species were identified and mapped within the study area. However, Study Report 3.5.1 did not provide maps showing locations where terrestrial invasive plant species were observed. We request that FL provide more detailed information on terrestrial invasive species observed within the Project area, including but not limited to maps as well as ArcGIS shapefiles.

Relatedly, in our comments on Study No. 3.4.1 the Division noted that *Salix exigua* (not spp. *interior*), *Alnus glutinosa*, and *Salix purpurea* are known to occur within the Project area. These species were not mentioned in Study Report 3.4.1 or included in Appendix D. Per the FERC SPD (dated March 6, 2014), FL was required to note the presence of these invasive species as part of the data collection efforts for this study. In our comments on Study Report 3.4.1 we requested that FL confirm whether these species were observed during invasive plant surveys, or whether they were not searched for. FL has not provided any additional information regarding this request.

Similarly, *Frangula alnus* (also known as *Rhamnus frangula*) and *Ligustrum obtusifolium* are considered invasive species and are known to occur within the Project area. These species are listed as observed species

in Appendix D of Study Report 3.4.1, but no information was provided in the body of the report regarding location and/or extent of species.

Response: The response to MADFW-23 is addressed in the response to the FERC determination, dated February 17, 2017, in Section 3.0.

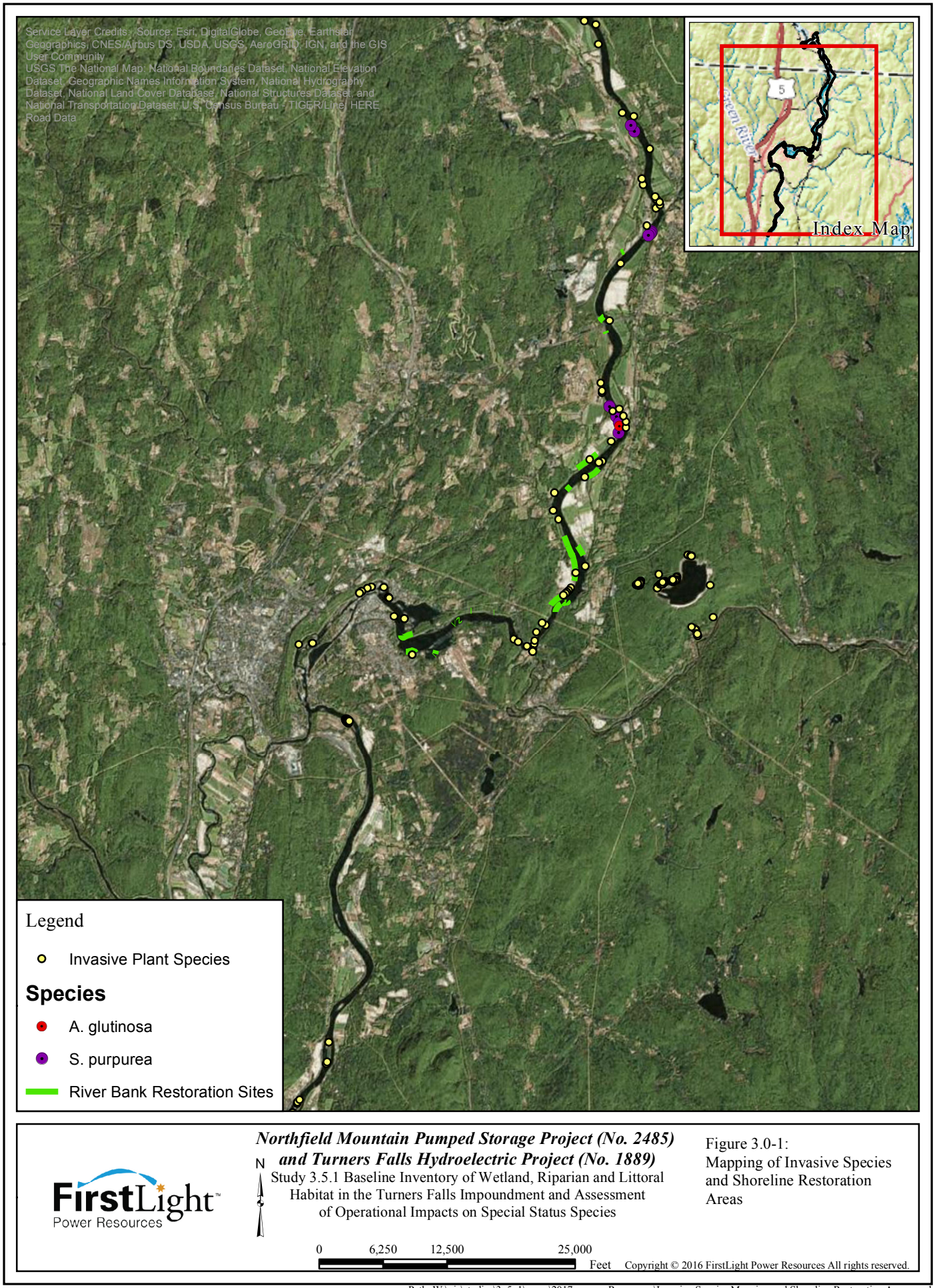
3 RESPONSE TO FERC DETERMINATION

Comment: In FERC's discussion relative to the Puritan Tiger Beetle in the February 17, 2017 determination, it states "Because the information in the final report and addendum meet the study objectives (section 5.9(b)(1)) and should be adequate for staff's analysis and to develop any necessary license requirements (section 5.9(b)(5)), we do not recommend requiring FirstLight to provide the revised figures requested by Massachusetts DFW. However, because the maximum, mean, and median monthly water surface elevations, as well as standard deviations, are available and may provide additional information useful for evaluating project effects on shoreline areas, *we recommend that FirstLight prepare and file a table that includes this information with its proposed addendum to be filed by April 3, 2017*."

Response: FL has provided this information as described in responses to comments MADFW-4 and MADFW-6 in Sections 2.4 and 2.6.

Comment: In FERC's discussion relative to Invasive Plant Species, it states "For the reasons described in staff's March 6, 2014, letter, FirstLight was required to survey for *Salix exigua* (not spp. *interior*), *Alnus glutinosa*, and *Salix purpurea*; therefore, *we recommend requiring FirstLight to conduct surveys for these species and file an addendum to the study report by July 31, 2017*."

Response: The ArcGIS shapefile provided as an attachment to the January 17, 2017 response includes data points for surveyed invasive species. The response provided in the January 17, 2017 submittal was inaccurate. After further review, the data set provided includes both observations of *Salix purpurea* as well as *Alnus glutinosa*. Figure 3.0-1 shows invasive species mapping completed during the 2014 field season as well as the location of the shoreline restoration areas. The mapped *Alnus glutinosa* and *Salix purpurea* occur within these restoration area. No *Salix exigua* was located during the survey, but was included in the survey effort. The data used to develop Figure 3.0-1 was provided as an attachment to the January 17, 2017 response to comments.



FirstLight Power Resources

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

N

Study 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

0 6,250 12,500 25,000 Feet

Figure 3.0-1:
Mapping of Invasive Species and Shoreline Restoration Areas

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