

# Relicensing Study 3.3.18

## IMPACTS OF THE TURNERS FALLS CANAL DRAWDOWN ON FISH MIGRATION AND AQUATIC ORGANISMS ADDENDUM

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

*Prepared for:*



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## **LIST OF ABBREVIATIONS**

cfs	cubic feet per second
FERC	Federal Energy Regulatory Commission
FirstLight	FirstLight Hydro Generating Company
ILP	Integrated Licensing Process
Northfield Mountain Project	Northfield Mountain Pumped Storage Project
PAD	Pre-Application Document
PSP	Proposed Study Plan
RSP	Revised Study Plan
SD1	Scoping Document 1
SD2	Scoping Document 2
SPDL	Study Plan Determination Letter
Turners Falls Project or Project	Turners Falls Hydroelectric Project
USGS	United States Geological Survey
VY	Vermont Yankee Nuclear Power Plant

## **1 INTRODUCTION**

In 2014, Kleinschmidt Associates conducted a fish stranding survey within the lower Cabot Power Canal during the annual drawdown. The objective of the survey was to assess the impact of the drawdown on fish and aquatic organisms. The study focused primarily on the presence and condition of juvenile American shad, American eel, sea lamprey, and freshwater mussels. The survey team also recorded the presence and condition of resident fish species collected in pools sampled.

On March 31, 2015, FirstLight posted to its relicensing website Study Report No. 3.3.18 *Impacts of the Turners Falls Canal Drawdown on Fish Migration and Aquatic Resources*. On September 14, 2015, the same report was officially filed with FERC. On September 29-30, 2015, FirstLight held its Updated Study Report (USR) meetings in which Study No. 3.3.18 was discussed. FirstLight filed its USR meeting minutes on October 14, 2015 and stakeholders had until November 13, 2015 to file comments. Comments on Study No. 3.3.18 were received from the United States Fish and Wildlife Service (USFWS), Connecticut River Watershed Council (CRWC), and Karl Meyer. In FirstLight's response to comments, filed with FERC on December 14, 2015, it agreed to file an addendum to the report with FERC to address information requested in the comments.

### **1.1 Goals and Objectives**

The goal of this addendum is to provide additional information requested by stakeholders to more clearly document the location of stranded fishes; clarify the number of fish collected by species, zone, and pool; and identify, which pools were hydrologically connected within the study area.

## **2 METHODS**

Photos taken during the study were used to identify: the location of stranding; stranded species and their abundance, and hydrologically connected pools. Stranding locations were identified via landmarks and note observations. Species and abundance were estimated from photos taken at all observed stranding occurrences. Hydrologically connected pools were identified through the analysis of photos and notes observations recoded at each pool.

## **3 RESULTS**

### **3.1 Stranded Fishes**

An estimated 766 fish, representing nine (9) species, were identified as stranded during the 2014 drawdown ([Tables 3.1-1](#) and [3.1-2](#)). Of those fish, 266 were unidentifiable due to the quality of the imagery and/or the fish were partially covered or obscured by other fish, debris, and/or substrate. [Figures 3.1-1-3.1-16](#) document the stranding events. [Figure 3.1-17](#) depicts the approximate location of stranding events. The numbered locations correspond to [Figures 3.1-1-3.1-16](#). For example, the carp in [Figure 3.1-2](#) corresponds to location 2 on the map, [Figure 3.1-17](#).



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**Table 3.1-1. Number of Fish identified in each Stranding Event**

Figure	Species	Number
<a href="#">Figure 3.1-1</a>	sea lamprey	1
<a href="#">Figure 3.1-2</a>	carp	1
<a href="#">Figure 3.1-3</a>	sea lamprey	1
	American shad	34
<a href="#">Figure 3.1-4</a>	American shad	135
	sunfish spp.	10
	yellow perch	12
<a href="#">Figure 3.1-5-3.1-7</a>	American shad	77
	shiner spp.	12
	bass spp.	1
<a href="#">Figure 3.1-8</a>	shiner spp.	50
<a href="#">Figure 3.1-9</a>	unidentified	50
<a href="#">Figure 3.1-10</a>	sea lamprey	2
<a href="#">Figure 3.1-11</a>	shiner spp.	12
	banded killifish	1
<a href="#">Figure 3.1-12</a>	unidentified	22
	white sucker	7
	bass spp.	3
<a href="#">Figure 3.1-13</a>	sunfish spp.	40
	American shad	6
	yellow perch	1
	unidentified	17
<a href="#">Figure 3.1-14</a>	sunfish spp.	55
	yellow perch	5
	bass spp.	5
	white sucker	2
	unidentified	82
<a href="#">Figure 3.1-15</a>	sea lamprey	1
	yellow perch	6
	sunfish spp.	19
	unidentified	95
<a href="#">Figure 3.1-16</a>	sea lamprey	1
<b>TOTAL</b>		<b>766</b>

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**Table 3.1-1. Species identified in [Figures 3.1-1-3.1-16](#)**

<b>Species</b>	<b>Count</b>
American shad	252
banded killifish	1
bass spp.	9
carp	1
sea lamprey	6
shiner spp.	74
sunfish spp.	124
unidentified	266
white sucker	9
yellow perch	24
Grand Total	766



**Figure 3.1-1. Juvenile Sea Lamprey found Upstream of Cabot Station Emergency Spillway Gates**



**Figure 3.1-2. Mirror Carp found Upstream of Canal Access Ramp**



**Figure 3.1-3. Small Group of Stranded Fish beside the Thalweg, Upstream of Cabot Station, Downstream of Conte Lab**



**Figure 3.1-4. Stranded Fish along Bedrock Ledges, River left of the Main Thalweg, Upstream of Cabot Station, Downstream of Conte Lab**



**Figure 3.1-5. Stranded Fish in dried Pool across the Channel from Conte Lab, Picture from 9/29/2014**



**Figure 3.1-6. Stranded Fish in dried Pool across the Channel from Conte Lab, Picture from 10/3/2014**





**Figure 3.1-7. Dried Pool seen in Figures 5 and 6, Viewed from different Angles. Picture from 10/3/2014 (left); Picture from 9/29/2014 (right)**



**Figure 3.1-8. Stranded Fish among Bedrock, located Upstream of Cabot station, near Wall to river left**



**Figure 3.1-9. Stranded Fish in dried Pool located among Bedrock, Upstream of Cabot Station, near Wall to river left**



**Figure 3.1-10. Juvenile Sea Lamprey, found upstream of Cabot Station Emergency Spillway Gates**



**Figure 3.1-11. Stranded Fish in small Pools on Mudflats within wide section of Canal**



**Figure 3.1-12. Stranded Fish in small Pools on Mudflats within wide section of Canal**



**Figure 3.1-13. Stranded Fish in small Pool on Mudflats within widest reach of the Canal**



**Figure 3.1-14. Stranded Fish in dried Pool on Mudflats in wide section of Canal**

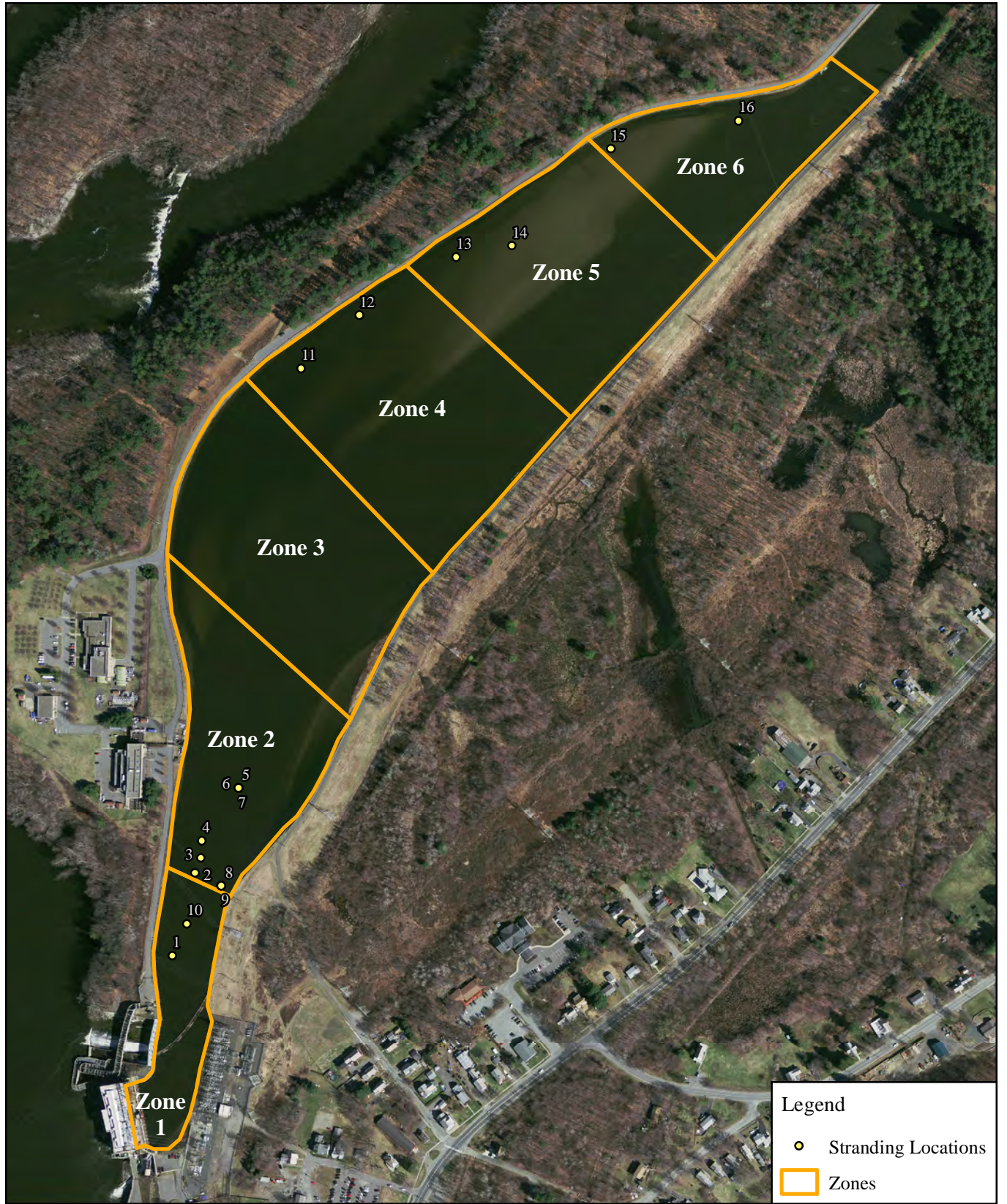




**Figure 3.1-15. Stranded Fish in dried Pool on top of Mudflat at wide section of Canal**

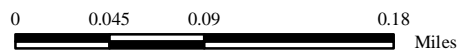


**Figure 3.1-16. Juvenile Sea Lamprey, found at the Upper End of the Study Site, where Canal Narrows**



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 Study No 3.3.18  
 Impacts of the Turners Falls Canal Drawdown

Figure 3.1-17: Locations of Fish Stranded During 2014 Drawdown



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### **3.2 Pool Connectivity and Species Abundance**

During the field survey conducted in 2014, the study team observed that some pools were hydrologically connected such that flow persisted throughout the week of the drawdown.

Pool connectivity and Zone location are depicted in [Figure 3.2-1](#). Pools 1, 2, 3, 6, 7, 8, 10, 11, 12, 13 and 14 were connected ([Figure 3.2-2-3.2-4](#), [3.2-7-3.2-9](#), and [3.2-11-3.2-15](#)). Pools 4, 5, and 9 were hydrologically isolated ([Figures 3.2-5](#), [3.2-6](#) and [3.2-10](#)).

Each pool was sampled twice during the study. The first sample occurred at the beginning of the drawdown on September 29 or 30, 2014 (Day 1), and again at the end of the week, October 3, 2014 (Day 2). Electrofishing and seining efforts resulted in collecting 6,101 fish, representing 28 species, over the two days of sampling. [Table 3.2-1](#) is the abundance of species documented in each pool, as well as the zone in which each pool was located.

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**Table 2.2-1. Number of Fish Collected by Species, Pool and Zone**

Zone	Pool No.	Species	Day 1 (9/29-30/2014)	Day 2 (10/3/2014)
1	1 (connected)	American eel	1	0
		American shad	20	0
		Black crappie	7	0
		bluegill	28	0
		brown bullhead	0	1
		channel catfish	4	0
		common carp	0	1
		common shiner	1	0
		fall fish	10	0
		golden shiner	2	0
		juvenile blue gill	0	3
		juvenile largemouth bass	0	1
		juvenile smallmouth bass	0	2
		largemouth bass	5	0
		rock bass	0	1
		sea lamprey	6	2
		smallmouth bass	4	0
		spottail shiner	79	5
		tessellated darter	3	22
		walleye	1	0
white sucker	28	0		
yellow perch	4	0		
1	2 (connected)	American eel	4	1
		American shad	392	545
		black crappie	0	2
		blue gill	10	0
		brown bullhead	0	69
		channel catfish	0	1
		common carp	1	0
		golden shiner	2	3
		juvenile bluegill	26	142
		juvenile largemouth bass	10	0
		juvenile smallmouth bass	75	16
		juvenile white sucker	3	14
		juvenile yellow perch	19	55
		largemouth bass	1	0
mudpuppy	0	1		

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<b>Zone</b>	<b>Pool No.</b>	<b>Species</b>	<b>Day 1 (9/29-30/2014)</b>	<b>Day 2 (10/3/2014)</b>
		rock bass	1	48
		smallmouth bass	13	0
		spottail shiner	130	95
		tessellated darter	1	263
		walleye	1	9
		white perch	0	6
		yellow perch	5	0
		American eel	1	2
		American shad	12	10
		black crappie	1	0
		fall fish	0	9
		golden shiner	0	6
		juvenile bluegill	4	8
		juvenile largemouth bass	0	9
		juvenile smallmouth bass	8	15
		juvenile white sucker	3	135
2	3 (connected)	juvenile yellow perch	9	21
		mudpuppy	0	1
		rock bass	1	2
		smallmouth bass	1	0
		spottail shiner	4	59
		tessellated darter	0	27
		walleye	0	1
		white perch	1	0
		white sucker	1	0
		yellow perch	7	0
		American eel	1	1
		American shad	3	2
		banded killifish	0	1
		brown bullhead	1	9
		channel catfish	0	2
		golden shiner	2	2
2	4 (isolated)	juvenile bluegill	6	8
		juvenile largemouth bass	0	1
		juvenile smallmouth bass	0	5
		juvenile white sucker	3	5
		rock bass	13	28
		sea lamprey	21	39
		smallmouth bass	1	0

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<b>Zone</b>	<b>Pool No.</b>	<b>Species</b>	<b>Day 1 (9/29-30/2014)</b>	<b>Day 2 (10/3/2014)</b>
		spottail shiner	7	19
		tessellated darter	36	97
		American shad	1	0
		banded killifish	11	7
		brown bullhead	8	2
		fall fish	2	0
		golden shiner	4	2
		juvenile bluegill	4	3
2	5 (isolated)	juvenile smallmouth bass	4	1
		juvenile white sucker	21	9
		rock bass	2	1
		sea lamprey	8	5
		spottail shiner	380	549
		tessellated darter	9	7
		white sucker	6	0
		American eel	4	0
		American shad	0	1
		brown bullhead	1	0
		juvenile bluegill	6	3
		juvenile largemouth bass	5	1
		juvenile smallmouth bass	3	0
2	6 (connected)	juvenile white sucker	3	0
		mudpuppy	0	1
		pumpkinseed	5	0
		rock bass	3	1
		sea lamprey	10	10
		spottail shiner	30	61
		tessellated darter	44	70
		American eel	1	0
		American shad	1	0
		golden shiner	1	0
		juvenile bluegill	16	1
2-3	7	juvenile largemouth bass	1	0
		juvenile smallmouth bass	1	1
		juvenile yellow perch	1	0
		rock bass	1	0
		sea lamprey	0	2
		tessellated darter	70	18
3	8	American eel	2	2

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<b>Zone</b>	<b>Pool No.</b>	<b>Species</b>	<b>Day 1 (9/29-30/2014)</b>	<b>Day 2 (10/3/2014)</b>
	(connected)	American shad	1	0
		brown bullhead	5	4
		fall fish	0	1
		golden shiner	1	5
		juvenile bluegill	5	17
		juvenile largemouth bass	2	4
		juvenile smallmouth bass	1	6
		juvenile white sucker	0	46
		juvenile yellow perch	0	9
		sea lamprey	9	10
		spottail shiner	83	13
		tessellated darter	57	57
		juvenile bluegill	1	0
3	9 (isolated)	juvenile largemouth bass	1	1
		juvenile white sucker	0	1
		sea lamprey	0	9
		tessellated darter	1	0
		American eel	1	0
		American shad	2	0
		banded killifish	1	0
		brown bullhead	2	0
		juvenile bluegill	9	0
		juvenile largemouth bass	3	1
4	10 (connected)	juvenile smallmouth bass	0	2
		juvenile white sucker	23	0
		juvenile yellow perch	4	0
		pumpkinseed	4	0
		rock bass	0	0
		sea lamprey	7	17
		spottail shiner	9	0
		tessellated darter	22	13
		American shad	6	25
		brown bullhead	21	7
		juvenile bluegill	14	12
4	11 (connected)	juvenile largemouth bass	0	2
		juvenile smallmouth bass	7	5
		juvenile white sucker	116	121
		juvenile yellow perch	26	29
		sea lamprey	8	3



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<b>Zone</b>	<b>Pool No.</b>	<b>Species</b>	<b>Day 1 (9/29-30/2014)</b>	<b>Day 2 (10/3/2014)</b>
		spottail shiner	202	1
		tessellated darter	16	36
		white perch	1	0
		American eel	0	1
		American shad	27	1
		brown bullhead	5	6
		juvenile bluegill	21	3
4	12 (connected)	juvenile smallmouth bass	1	1
		juvenile white sucker	14	4
		sea lamprey	1	3
		spottail shiner	8	0
		tessellated darter	10	66
		juvenile white sucker	1	1
4	13 (connected)	sea lamprey	1	2
		tessellated darter	0	2
		American eel	0	2
		American shad	6	24
		banded killifish	3	0
		brown bullhead	28	7
		common carp	1	1
		juvenile bluegill	16	79
		juvenile largemouth bass	7	8
		juvenile smallmouth bass	0	18
4-5	14 (connected)	juvenile white sucker	28	75
		juvenile yellow perch	9	22
		mudpuppy	1	0
		pumpkinseed	0	2
		rock bass	1	0
		sea lamprey	4	10
		smallmouth bass	1	0
		spottail shiner	108	0
		tessellated darter	11	19



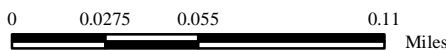
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Study No 3.3.18

Impacts of the Turners Falls Canal Drawdown

Figure : 3.2-1 Hydrologic  
Connectivity of Pools  
During 2014 Drawdown



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**Figure 3.2-2: Pool 1, Hydrologically connected to Pool 2**



**Figure 3.2-3. Pool 2, Hydrologically connected to Pools 1 and 3**



**Figure 3.2-4. Pool 3, Hydrologically connected to Pool 2 and 6**



Figure 3.2-5. Pool 4, Hydrologically isolated; Day 1 (Left); Pool 4, Day 2 (Right)



Figure 3.2-6. Pool 5, Hydrologically isolated



Figure 3.2-7. Pool 6, Hydrologically connected to Pools 3 and 7; Day 1 (Left), Day 2 (Right)



Figure 3.2-8. Pool 7, Hydrologically connected to Pool 6 and 8



Figure 3.2-9. Pool 8, Hydrologically connected to Pools 7 and 10; Day 1 (Left), Day 2 (Right)



Figure 3.2-10. Pool 9, Hydrologically isolated



Figure 3.2-11. Pool 10, Hydrologically connected to Pools 8 and 11



Figure 3.2-12. Pool 11, Hydrologically connected to Pools 10 and 12; Day 1, looking Upstream (Left); Day 2, looking Downstream (Right)



Figure 3.2-13. Pool 12, Hydrologically connected to Pools 11 and 13



Figure 3.2-14. Pool 13, Hydrologically connected to Pools 12 and 14



Figure 3.2-15. Pool 14, Hydrologically connected to Pool 13; Day 1 (Left); Day 2 (Right)