OCCUM PROJECT

LIHI APPLICATION

ATTACHMENT C

FISH PASSAGE

Norwich Public Utilities

January 10, 2012

Kimberly D. Bose, Secretary
Nathaniel J. Davis, Sr., Deputy Secretary
Federal Energy Regulatory Commission
Mail code P J 12.3
888 1st street NE room 1A
Washington, DC 20426

Re: FERC No. P-11574-CT (NATDAM#CT00576)

Dear Ms. Bose

Enclosed is the 2011 Effectiveness Test Report for the Occum Dam Fishway per "8/3/04 Order Modifying and Approving Fish Passage Plan under Articles 405 & 406". We have enclosed a complete 2011 Test Report package.

The license conditions require us to perform a three-year study of the effectiveness of the Occum Dam Fish way. The (2010) was the sixth year of the study. Norwich Public Utilities (NPU), the U.S. Fish & Wildlife Service (USFWS), and the Connecticut Department of Environmental Protection/Inland Fisheries Division (CT DEP) all agree that the three-year study has not fully addressed the effectiveness of the fish way. Much of this is due to unresolved passage issues at the Taftville dam immediately downstream (a FERC non-jurisdictional project). That fish way has failed to pass appreciable numbers of anadromous fishes, requiring us to truck fish around that dam, which affects the performance of the fish. All three parties have agreed to continue the study. . The study will continue similar to 2011. Annual Reports will continue to be sent to the FERC. All three parties are confident that the extended study will be successful in developing and documenting a successful fish way.

If you have any questions or require additional information regarding this letter please contact me at (860) 823-4507.

Sincerely,

Wayne McLaughlin
Project manager

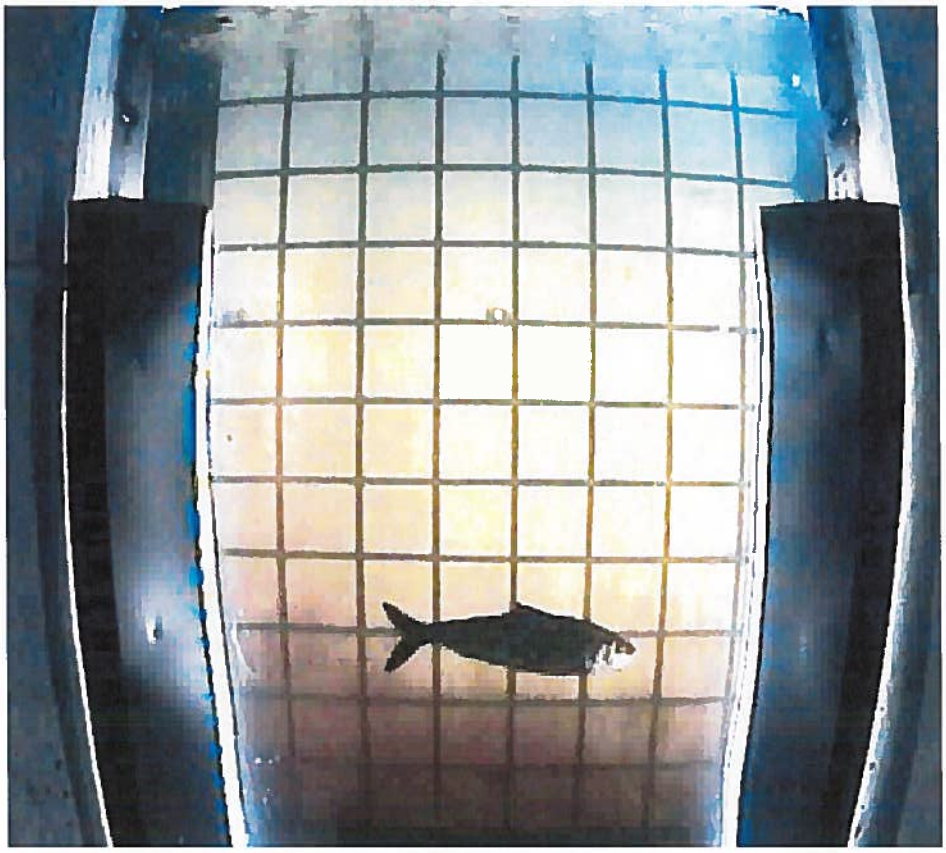
Enclosures

cc: Melissa Grader, USFWS
Stephen Gephard, CT DEP
Gerald L. Cross P.E., Regional Engineer FERC

Norwich Public Utilities

Occum Dam Fishway, Evaluation Study

Year 7 Report: 2011



By

Lee Cutler

1. Introduction

The City of Norwich, Department of Public Utilities (NPU) owns and operates the Occum Hydroelectric Project, Federal Energy Regulatory Commission (FERC) license # 11574. A condition of their FERC license is to support anadromous fish restoration on the Shetucket River. NPU constructed a Denil fishway at the Occum Dam in 2004, as well as an eel pass to support the restoration of American eel to the river. The addition of a fish bypass to help downstream migrating fish navigate around the hydroelectric project was installed in 2006. NPU has agreed to conduct evaluation studies of the fish passage facilities and present a report to the State of Connecticut, Department of Energy and Environmental Protection- Inland Fisheries Division (CT DEEP) annually. This is the seventh year of the study, 2011 performance report.

2. Methods

2.1 Operation

The Occum Dam fishway opened for the 2011 spring migration on April 11th and officially closed for the season on July 1st. Opening day 80% of the flashboards were in place on the dam. High river levels from consistent heavy rains that blanketed the New England region throughout April and into May resulted in water flowing over the dam. The first opportunity to repair the damaged flashboards was on May 11th. Potentially, false attraction was spilling over the dam up to that point.

Digital recorders were installed along the fishway and readings were taken daily, measuring the entrance, resting pools and exiting water levels. This compiled data was used to determine if there was a correlation between water level and the numbers and species of fish seen using the fishway.

The fishway was opened again in the fall for the downstream migration, from September 26th to October 31st. One tour was given this year at the hydro on November 1st. (Table 8)

2.2 Maintenance

Staff was present five days a week, Monday-Friday, to monitor the site for potential problems that could damage the fishway or inhibit upstream passage of migrating fish. Debris was removed and the trash sluice cleared as needed. The viewing window was cleaned on a regular basis during the week to prevent buildup of algae.

2.3 Upstream Fish Passage

A digital video system was used to record fish activity in the viewing window twenty-four hours a day, seven days a week. A 500 GB hard drive was dedicated to the fishway recordings for the period of time it was in operation. On Mondays, the recordings of the previous weekend were reviewed by staff and then a daily review of the previous day's recordings was performed through the week.

Staff also logged other environmental data on a daily basis: water temperature, water visibility, the water levels around the dam; headpond, forebay, tailrace, and the set points inside the fishway mentioned above, the river's flow (measured in cubic feet per second (CFS)) and also the weather conditions. Along with the quantitative data, general observations around the fishway were documented as well; milling activity at the entrance to the fishway and any other fish activity seen in the general area of the fishway, the forebay, and the headpond.

Other miscellaneous data also tracked at the site: kilowatt generation, the number of forebay spill boards in place and the number of fishway baffles removed on a given day.

2.4 PIT Tagging

In consideration of low passage rates of targeted anadromous fish at the downstream Taftville Dam Fishway and the need for NPU to expend considerable funds on other aspects of the Occum Dam Fishway, the CT DEEP agreed to allow NPU to suspend PIT tagging of shad for the purposes of detecting them in the fishway. PIT tag studies may resume in the future when both parties agree such studies could be useful.

2.5 Eel Passage

The eel pass was opened on May 24th and closed on October 7th. It was checked daily during the week, Monday-Friday. Eels were enumerated and assigned into total length categories before being released into the head pond. Categories were: <6", 6-10", 11-15", and >15". The passage was maintained through the season, entrance monitored for anything that impeded upstream passage, spray bars cleaned and piping reamed before being placed back into service after eel counts.

2.6 Downstream Fish Passage

The 2011downstream bypass was opened on September 26th and closed on October 31st.

In 2010 NPU installed three cameras in the forebay area to record the downstream passage of fish. They are located at the entrance of the bypass.

Camera 1 - anchored 3' deep: across the entrance to the downstream bypass.
Camera 2 - anchored 3' deep: faces the racks in front of the intake for the hydroelectric unit.
Camera 3 - anchored above Camera 1 for an expanded viewing field.

Each camera is mounted on a stainless steel unistrut, which is lifted out of the water for adjustments during the season. A metal plate protects the camera's positions from floating debris. Reflective paneling is secured to the concrete wall of the bypass for increased visibility and contrast to identify fish. An attraction light is anchored above the reflective paneling, connected to a photo cell. It will illuminate with the loss of light and turns off with the increase of it, typically at dusk and dawn, but will also respond in stormy weather.

The viewing angle for each camera is sixty degrees. Data from the cameras are recorded in clips of five minutes on to a 1 TB hard drive, which is able to store over twenty days of data at a time. Recordings can be viewed on a computer at Occum, or transferred onto DVDs for later viewing.

In addition to the bypass video, NPU staff checked for shad popping starting on September 19th. Normal surveillance methodology was one day a week, increased to two days a week, till no popping was observed. Staff track the number of pops in a ten minute period, the total then used as a relative indicator to estimate how many juvenile shad were in the river. This year when no popping was observed by the same time as last year, surveillance was increased to three days a week for the remainder of the season. The 2011 season ran from September 19th to October 23rd.

3. Results

3.1 Operation

Early spring was cool with frost seen as late as April 22nd. Consistent heavy rains blanketed the region, producing high water levels on the river. As a consequence, possible false attraction was spilling over the dam since its opening on April 11th. Responding to concerns regarding the dam's overflow, CT DEEP representatives inspected the fishway on April 27th and approved the fishway's water level and entrance 'tongue' to draw fish.

During the later stages of the spring operation the cool weather was supplanted by unseasonably hot conditions. A number of severe storm fronts, including one that produced a tornado which touched down in Springfield, MA on June 2nd, came through the Occum Dam hydro and fishway.

3.2 Maintenance

Headpond and tailrace levels were tracked through the spring and fall seasons at Occum this year, along with flashboard integrity and closures of the fishway. (Table 7)

The fishway was closed and the headpond drawn down May11th and 12th for annual flashboard repairs. Due to high water it was closed from May 18th - 22nd. It was again closed on June 8th to repair an entire flashboard section destroyed by heavy debris that washed down river.

No major maintenance had to be done to the fishway during the 2011 season. The only consistent fishway maintenance was the removal of trash and debris near the exit gate, which came downstream after any rain events.

After the fishway was closed for the season an entire flashboard section was destroyed in August from the high water and debris generated by Tropical Storm Irene. More flashboard sections were damaged in early September after the high water and debris generated by Tropical Storm Lee.

3.3 Upstream Fish Passage

This year NPU supported CT DEEP in shad trucking efforts. A shad transport tank was purchased and put into use for the spring season. Three transports were performed by NPU, moving shad upriver from the Greeneville Dam's lift before the shad's run closed. The transports were as follows:

May 25th - 30 American shad released above Taftville Dam
May 27th - 92 American shad released in Baltic above Occum Dam
June 3rd - 69 American shad released above Taftville Dam

But despite the influx of shad released above Taftville Dam and the two shad the Taftville fishway passed, none were seen utilizing the Occum fishway to migrate further upriver.

There was an increase in other target diadromous species (Tables 1-2) in 2011. A school of white perch utilized the fishway, as well as several lampreys. The consistent stream of American eel seen struggling against the current in the fishway, prompted the eel passage to be opened early this season.

Atlantic salmon migration also had an exceptional year. Atlantic salmon is normally considered a diadromous species, but on the Shetucket, due to a small salmon fishery that has been implemented in the river (consisting of broodstock taken from local hatcheries) they are categorized as a resident species. (Tables 3-4)

For other resident species the number utilizing the fishway trebled from last year. Fourteen species were recorded in 2011, as opposed to the eight recorded in 2010. Gathering the data from the same eight species for comparison purposes, in 2010, 355 fish passed. In 2011, 759 fish passed. The additional six species that utilized the fishway brings the total count to 962 fish passed at Occum (864 uprunners and 98 downrunners) in 2011. (Tables 3-4)

The number of fish passed compared to the amount of spill over the flashboards was examined to determine if false attraction played a significant role in diverting fish from the fishway (Figures 1-6). The results were, 41 fish passed while there was spill over the flashboards, and 379 passed when there was no spill. With nine times the number of fish using the fishway without false attraction occurring, it appears decreasing spill or lack of spill over the flashboards results in more successful migration upriver.

Fish passage was also compared to the tailwater level over the course of the season, with the height of the Taftville flashboards (52.3 ft above sea level) inserted as a reference point. (Figures 7-12) The results were 261 fish were passed when the tailwater level was within 0.3 ft (above or below) the height of the Taftville boards and 159 fish were passed when the tailwater level was greater than 0.3 ft above the height of the Taftville boards. This year, unlike 2010, the tailwater level was never 0.3 ft below the height of the Taftville boards or lower during spring migration.

Most fish passed when the water level was within 0.3 ft of the board height (97%), which supports the theory that normal flows yield the greatest fish passage. The statistic of last year's study, when no fish passed when the water was lower than 0.3 ft below the Taftville boards suggests there is a minimum flow (and thus attraction) required to reliably pass fish.

The last comparison made in regards to fish passage was the generation of the turbines at the time of passage (Figures 13-18). Cataloguing headpond level, river flow and temperature to gauge an approximation of the flow down the fishway, generation (in kilowatts) was noted to see if there was a correlation between the times fish made use of the fishway and the amount of laminar flow generated by the turbines.

Laminar flow is the discharge from the turbine impacting the river. It hits the river at a certain velocity and at a right angle; in essence creating a wall of water migrating fish must navigate around to reach the fishway. In low flow years laminar flow will have more of an effect, based on the currents in the area (i.e. it will extend further into the river). In high flow years its effect will be diminished.

The different fish species are another subjective factor, like laminar flow, to be considered in the study. A bluegill (weak swimmer) might take five hours to traverse the fishway and be recorded, while a salmon (strong swimmer) might only take an hour, entrance to exit. Or any fish, regardless of swimming strength, might utilize the resting pools for a period of time before continuing onward. So the fish count per hour does not necessarily correspond to the KW generation in that hour. It is difficult to determine what kind of impact generation has on fish passage without knowing how many hours prior to being recorded the fish entered the fishway.

That being said, a total of 421 fish utilized the fishway on the selected days of the study. The results are 366 fish (87%) passed when generation averaged ≤563KW. When generation averaged ≥631KW, 55 fish (13%) passed.

With a higher headpond and lower generation (less laminar flow), the attraction toward the fishway is greater, especially in low flow years. In high flow years, like 2011, the laminar flow's impact on the attraction to the fishway was reduced.

3.4 PIT Tagging

No PIT tagging was done in 2011

3.5 Eel Passage

This year 2,051 eels were captured and released into the head pond (Figure 19). Of these, 812 were <6", 1,224 were 6-10", 14 were 11-15", and 1 was >15". There was a drop off of <6"eels from last year's count of 1,360, but the 6-10" eel count took an exponential leap, increasing seventeen fold from the 68 recorded in 2010. The total count for 2011 represents an increase of approximately 38% more eel migration than last year.

3.6 Downstream Fish Passage

Due to the unusually high water levels on the Shetucket River from Tropical Storm's Irene and Lee, and with CT-DEEP personnel's concurrence, the fishway/upstream passage was not opened for the fall season in 2011.

Popping observation in past years was one day a week at the start of the season, increased to two days a week once popping occurred. This year when no popping was observed by the expected time, surveillance was increased to three days a week. When the lack of activity continued CT-DEEP personnel were consulted regarding whether popping had been seen elsewhere in the state. The last observation of popping was in August on the Connecticut River just prior to Tropical Storm Irene. CT-DEEP personnel theorized that the high waters generated by Tropical Storms Irene and Lee could have swept the majority of the juvenile shad out to sea.

Another factor considered was water temperature. In 2010 popping was not seen until the river's temperature fell to 13˚C. The Shetucket had an average temperature several degrees warmer than that through September and into October. When temperatures settled to 13˚C, a week later the first popping of the season was observed with three pops seen in a ten minute period on the 18th. A storm then inundated the area, generating high water for several days. No other popping was observed for the season. (Table 5)

Approximately 1,039 fish were observed using the downstream passage with our cameras. The recordings captured many fish fighting the current (maintaining their position in front of the lenses), instead of following the flow of water from the forebay into the tailrace. It's assumed they circled in the forebay to reappear at a later time. Largemouth and smallmouth bass exhibited this behavior, as well as Atlantic salmon.

A school of shad were also observed swimming against the current early in the season. Due to the water's turbidity it was difficult to get an accurate count, the shad 'surfacing' out of the murky bubbles only when close to the lens. The school was estimated at 20, but could have been larger. Later in the season, the day after popping was seen, 776 juvenile shad were recorded being swept through the downstream passage by turbulent waters. (Several largemouth bass were also seen exiting with the shad, tumbling laterally in the water's current.)

The successive day's recordings were too murky to distinguish many fish; the few observed being large, dark silhouettes and listed as 'other'. It is unknown whether the school of juvenile shad seen on the 19th reflects an average of the populace on the river, with more numbers unseen in the turbid waters that followed, or whether the majority had been swept out to sea earlier in the year by high waters.

On October 29th Snow Storm Alfred impacted New England, dumping a foot or more of snow across the region. CT-DEEP personnel determined the downstream season was abbreviated by the weather conditions and ended it on October 31st. (Table 6)

4. Discussion

4.1 Operation

Despite the cold start of the spring season and the erratic weather patterns experienced by the region, numbers indicate more species of resident fish utilized the fishway for their upstream passage this year than last. The fishway was closed for 192 hours during the entire upstream season. Headpond and tailrace levels were tracked, as well as flashboard integrity and fishway closures for 2011. (Table 7)

4.2 Maintenance

The viewing window, backdrop and grating were scrubbed daily with a 10' wooden handled brush to facilitate an unobstructed view of the area. The camera was also focused and repositioned to capture the smaller fish swimming closer to the window along the grating.

Later in the season it became increasingly difficult to remove the buildup of algae from the window and the backdrop, despite the daily scrubbing to impede its growth. The strong current also made this maintenance a struggle at times.

It was discussed previously to install a slotted track to slide the backdrop in and out of for easier cleaning, but the track has not yet been fabricated. A recommendation for next season is to also create a multi-purpose tool to maintain the viewing area, utilizing lengths of aluminum pole that lock together with interchangeable heads. The ability to add more length to the brush's handle during strong flow times of the season will help in exerting leverage and also aid in holding onto the tool if it's swept away by the current. Changing out the handle's head from a brush to a non-damaging plexiglass scrapper or squeegee will make keeping the window and backdrop clear of algae buildup easier as well. Putting a gaff head on the pole will make clearing away any tree debris swept down river into the exit area much easier too.

4.3 Upstream Fish Passage

Heavy rains inhibited upstream passage early in the season and a spate of violent storms inhibited it later in the season. When the fishway initially opened there was a spike of activity with over a hundred white suckers passing the first day. The weather had been seasonably pleasant prior to the opening. Heavy rains then inundated the region for several weeks, raising the river's level and flow and also decreasing the water's temperature. No activity was seen on the fishway till the river's level dissipated and the water gradually warmed to opening day temperatures.

Spring remained cool with frost still seen on some mornings, then the conditions changed overnight, becoming unseasonably hot with air temperatures in the 90's. The river was drawn down for flashboard repairs during this time and when the fishway was reopened on the 13th at 7AM, one hundred seventy-four resident species fish passed before midnight. The next day ninety-one resident species fish passed.

It was hoped that the spike of resident species activity was indicative of a corresponding diadromous species surge, and in regards to the American eel, it was. The smaller eel (<6" and 6-10") struggled against the current in the viewing window and were swept downstream again. This prompted the opening of the eel passage early this year.

For other target fish, there was no correlation to the resident fish usage of the fishway. All diadromous species that make it to Occum must first pass through the Taftville fishway, which regularly records very low numbers of migrating fish. With suitable spawning habitat between the fishways, it is no surprise the 101 shad that reached the river above Taftville Dam (2 passed at Taftville and 99 released by NPU) were not detected at the Occum fishway.

To help compensate for the poor passage of shad through the Taftville fishway, NPU has been given access by a Baltic resident to private land along the river above Occum Dam. Upon inspection it was determined by CT DEEP personnel that it was a more ideal release spot than the previously considered locale; below the dam behind the Occum firehouse. Hopefully the shad released further upriver will produce greater numbers making it past the Taftville Dam in future years.

One shad was spotted at Occum, on June 8th, expired on the bottom of the forebay when the river was drawn down for flashboard repairs. The assumption was it washed downriver from the Baltic release, since there was no evidence of its passage on the fishway recordings.

The unseasonably hot conditions broke with violent storms blanketing the region, causing the river to rise and become swift and cool again. The season continued along this vein until its close, the river's level surging and dissipating accordingly with the weather. Many resident species fish passed when temperature and flow were moderate, but later in the season during the strong, cool flow after storms, only the strongest swimmers (predominately salmon and brown trout) were seen utilizing the fishway.

No observations, other than the American eel, were made of fish having difficulty ascending the fishway. Any drop back observed was purposeful, exhibited by largemouth and smallmouth bass hunting in the fishway. The bass would reappear within minutes of being swept down the fishway, and then repeat the maneuver again and again.

During heavy flow later in the season drop back was infrequently observed with salmon, but the activity appeared more skittish, than actual difficulty traversing the fishway. After several 'false starts' the fish would then charge past the viewing window. When this behavior was observed on the recording the fishway exit would be probed with a gaff to feel for any obstructions unseen deep in the water. Storm debris was then removed to facilitate the fish's passage.

There were never fish milling around the fishway entrance for extended periods of time. Unlike 2010, the tail water level in 2011 changed frequently over the course of a sampled day and passage corresponded with its surge and ebb. It suggests that tail water level has an effect on when fish used the fishway. In future years when more fish use the fishway each day, it will be easier to identify passage trends in relation to water levels.

4.4 PIT Tagging

No PIT tagging was done in 2011

4.5 Eel Passage

Passage started in late May with a steep rise in numbers which then quickly dropped off with the influx of strong, cool water from storms. The rest of the season followed suit with the eel's numbers fluctuating with the river's temperature and flow.

In 2010 the supposition was extremely low water may have been a contributing factor to the drop in eel passage after July. As a consequence, in 2011 water temperature and flow have been tracked along with eel numbers to see if there is a correlation.

There was a steady increase of eels through July till a high spike in temperature (several days in the 90's and one reaching a 103°F) corresponded to a severe drop in the eel's numbers afterwards. The river's temperature resumed an average of 24°C but the flow remained low and the eel count remained in the single digits for weeks. But once the flow increased on the river, the eel's numbers increased as well.

Steady numbers were catalogued until Tropical Storm Irene. The eel pass was de-energized on the afternoon of August 26th and remained closed until conditions on the river were deemed safe for it to be re-energized again on September 6th. Tropical Storm Lee then migrated up the eastern region on September 8th and inundated New England with heavy rains for several days. The river's level rose and eel passage dropped to zero for a period of time.

Once the storm surge dissipated the eel's numbers remained low throughout September, with a total of seven counted over the remainder of the month. CT-DEEP personnel were consulted and it was determined the passage should be officially closed for the season on October 7th. (Figure 19)

Since the installation of the aluminum eel pass in 2006, the number of smaller eels (<6" and 6-10") utilizing the passage have increased each year. 2011 has had the highest count yet with 2,036 passing upriver.

4.6 Downstream Fish Passage

In 2011 the river levels were high during the fall season. Tropical Storm's Irene and Lee destroyed a number of flashboard sections and a steady flow poured over the dam in those areas. Herons, kingfishers, osprey and cormorants were seen working the river above and below these sections. It was theorized that fish were migrating along these routes, instead of funneling into the forebay to travel downriver. Unlike 2010, where low water constrained the fish to navigate through the downstream passage and be recorded, the 2011 season had multiple avenues available for fish to migrate down river.

The water's turbidity also rendered much of the recordings murky and indistinct. Large adult fish would 'surface' only when right in front of the camera and were identified predominately by silhouette. Juveniles were nearly impossible to discern and identify.

Another difficulty in establishing an accurate count of fall migration numbers is the 'fight the current' behavior of some ichthyoids. The fish exhibiting this mannerism and their subsequent circling activity in the forebay no doubt resulted in multiple counts of the same fish. As was suggested in 2010, perhaps a camera installation further in the channel, when a fish has no recourse but to go downstream, would enable a more accurate tally of migration activity.

5. Conclusions

The spring passage at Occum suggests, in regards to resident species, that an attractive avenue for fish to traverse the dam and continue migrating upriver has been provided. For anadromous species the fishway's effectiveness continues to be undetermined. Of the 992 American shad passed at Greeneville Dam's lift, only 2 were passed at Taftville Dam's lift and fishway. Until Taftville becomes more effective at enabling migrating shad access to the river beyond the dam, low numbers will be the norm at Occum's fishway in the future.

For the American eel, the 2011 migration count was the highest recorded since the eel pass was installed in 2006. Their attraction and passage at Occum can be considered successful and their figures are a good indicator of the relative number of eels in the river during any given year.

Finally, despite high water and damaged flashboard sections during fall migration, the downstream passage's numbers increased 147% from last year. The cameras also provided evidence of some juvenile shad populace, offsetting the lack of popping observed in 2011. In future years with lower, less turbulent waters and a restricted egress to reach down river, a more accurate count of migrating fish should be achieved.

6. Recommendations for 2012

Create a multi-section tool (handle composed of snap together aluminum poles) with an interchangeable head for maintenance of the fishway. The multiple head options will facilitate cleaning algae build up from the viewing window (brush and squeegee) as well as being able to adjust its length for probing the bottom and removing any accumulated storm debris (gaff and rake).

Fabricate a slotted track for the viewing window backdrop, for ease of cleaning without having to de-water the fishway. Also, acquire a second backdrop to exchange with the first for minimal impact on recorded data.

Add scale/ruler or 1" tick marks from lip of eel basket inward, to enable easier differentiation between <6"eels and >6" eels.

Install an additional camera further in the bypass channel, eliminating multiple counts of fish that fight the downstream current and circle in the forebay.

7. Comments by: (Comments in bold type are NPU's reply)

a. US FWS/New England Field Office -.

Thanks for the report Lee - I only have two minor grammatical suggestions, and one comment:
on Page 9, I think you want to say "With suitable spawning habitat between the fishways, it is no surprise that the 101 shad that reached the river above Taftville Dam (2 passed at Taftville and 99 released by NPU) were not detected at the Occum fishway." **CHANGED SENTENCE TO READ AS ABOVE.**

and on Page 11, I suggest using the word "until" instead of "till" in the second sentence, fourth paragraph under the Eel Passage section. **WAS PAGE "10" AND MADE CHANGES.**

My only comment is that the report does not provide details on what camera #2 picked up during the downstream passage season. As this camera is intended to document whether any fish are milling in front of, or pass through, the trash racks, it would be good to provide the results (were any fish picked up by the camera? if not, was it due to camera issues or because they were not attracted to the racks, etc.). **TABLE "6" SHOWS ONE SALMON BEING OBSERVED IN FRONT OF THE RACKS (SEPT 28, @ 1457) AND CONSEQUENTLY SWAM OFF. NO OTHER FISH WERE OBSERVED MILLING IN FRONT OF OR PASSING THROUGH THE TRASH RACKS DURING THE DOWNSTREAM PASSAGE.**

In general, I think the data collected, recorded and analyzed by NPU really provides extremely useful information. Particularly, I think the long-term data collected from all 3 sites (Greeneville, Taftville and Occum) on the timing, numbers and size distribution of eels moving upstream will really help us understand eel movements in mid-size watersheds.

Thank you for the opportunity to review the report.

Sincerely,
Melissa Graderf

b. State of Connecticut-DEEP/Inland Fisheries Division –

Shared a draft of the report and received feedback from Stephen Gephard.

Grammatical and punctuation errors were corrected.

Suggestion to reposition page 5, paragraph 1 to page 9, paragraph 2 and 3 **was applied.**

Content recommendations:

Page 3, paragraph 1 – abbreviation cu.ft/sec be changed to CFS due to its universal use in the industry. **Change made.**

Page 5, paragraph 5 – reference to grilse (one winter at sea Atlantic run salmon) deemed inaccurate. Atlantic salmon are stocked on the Shetucket River. **Reference removed.**

Page 6, paragraph 4 – white sucker used as an example of a weak swimmer deemed inaccurate. Recommended bluegill as a better example. **Change made.**

Table 1. Spring 2011 - Uprunning Diadromous Fish

Date	Alewife	American Shad	Gizzard Shad	White Perch	Sea-Run Trout	American Eel	Sea Lamprey	Temp C
4/11								10
4/12								10
4/13								10
4/14								9.4
4/15								11.1
4/16								
4/17								
4/18								10
4/19								10
4/20								10
4/21								10.5
4/22								10
4/23								
4/24								
4/25								11.6
4/26								14.4
4/27								15.5
4/28								15.5
4/29								16.1
4/30				1				
5/1								
5/2								16.1
5/3								16.1
5/4								15
5/5								
5/6								15
5/7								
5/8						3		
5/9				1		1		15
5/10								14.4
5/11	Closed	Flash	Board	Repairs				14.4
5/12								16.1
5/13						10	1	15
5/14						2		
5/15						1		
5/16								14.4
5/17								12.7
5/18	Closed	High	Water					
5/19								13.3
5/20								12.7
5/21								
5/22								
5/23								14.4
5/24				2				15
5/25								17.2
5/26								16.6
5/27								18.8
5/28								
5/29								
5/30								
5/31						12	1	21.1
6/1				23		6		21.1

Date	Alewife	American Shad	Gizzard Shad	White Perch	Sea-Run Trout	American Eel	Sea Lamprey	Temp C
6/2								22.2
6/3								20.5
6/4								
6/5								
6/6								18.8
6/7				1				21.1
6/8	Closed	Flash	Board	Repairs				21.1
6/9				1				22.2
6/10								21.6
6/11								
6/12								
6/13								15.5
6/14								17.7
6/15								17.7
6/16								18.8
6/17				1				18.3
6/18								
6/19				1				
6/20								22.2
6/21				1				21.1
6/22								20
6/23								20
6/24								18.3
6/25				1				
6/26								
6/27								20
6/28								21.1
6/29								22.7
6/30								22.2
7/1								21.6
Totals				33		35	2	

Total Uprunners 70

Table 2. Spring 2011 - Downrunning Diadromous Fish

Date	Alewife	American Shad	Gizzard Shad	White Perch	Sea-Run Trout	American Eel	Sea Lamprey	Temp C
4/11				20				10
4/12								10
4/13								10
4/14								9.4
4/15								11.1
4/16								
4/17								
4/18								10
4/19								10
4/20								10
4/21								10.5
4/22								10
4/23								
4/24								
4/25								11.6
4/26								14.4
4/27								15.5
4/28								15.5
4/29								16.1
4/30								
5/1								
5/2								16.1
5/3								16.1
5/4								15
5/5								
5/6								15
5/7								
5/8								
5/9								15
5/10								14.4
5/11	Closed	Flash	Board	Repairs				14.4
5/12								16.1
5/13								15
5/14								
5/15								
5/16								14.4
5/17								12.7
5/18	Closed	High	Water					
5/19								13.3
5/20								12.7
5/21								
5/22								
5/23								14.4
5/24								15
5/25								17.2
5/26								16.6
5/27								18.8
5/28								
5/29								
5/30								
5/31								21.1
6/1								21.1
6/2								22.2

Date	Alewife	American Shad	Gizzard Shad	White Perch	Sea-Run Trout	American Eel	Sea Lamprey	Temp C
6/3								20.5
6/4								
6/5								
6/6								18.8
6/7								21.1
6/8	Closed	Flash	Board	Repairs				21.1
6/9								22.2
6/10								21.6
6/11								
6/12								
6/13								15.5
6/14								17.7
6/15								17.7
6/16								18.8
6/17								18.3
6/18								
6/19								
6/20								22.2
6/21								21.1
6/22								20
6/23								20
6/24								18.3
6/25				1				
6/26								
6/27								20
6/28								21.1
6/29								22.7
6/30								22.2
7/1								21.6
Totals				21				

Total Downrunners	21

Table 3. Spring 2011 - Uprunning Resident Fish

Date	LM Bass	SM Bass	Brown Bullhead	Burbot	Common Carp	Fallfish	Lepomis Spp.	Atlantic Salmon	Shiner	White Sucker	Brook Trout	Brown Trout	Rainbow Trout	Tiger Trout	Temp C
4/11					7		2			104			1		10
4/12										27			1		10
4/13										3					10
4/14															9.4
4/15										5					11.1
4/16												1			
4/17															
4/18															10
4/19							1								10
4/20															10
4/21															10.5
4/22					1										10
4/23							1								
4/24															
4/25										5					11.6
4/26					1					4					14.4
4/27							2			4					15.5
4/28					1					4					15.5
4/29							5			5	1				16.1
4/30		2			10		6			5					
5/1	1	1			1					3					
5/2							1								16.1
5/3							7			2			1		16.1
5/4					2		2								15
5/5					1			1		1					
5/6										4					15
5/7	1	1			1		2			2					
5/8	2	1				6	2			1			2		
5/9		1			1				3	5					15
5/10										1					14.4
5/11			Closed	Flash	Board	Repairs									14.4
5/12															16.1
5/13		7			4		5		97	20		1	4		15
5/14		1			5				63	5		4	1		
5/15	1	2			2		1	1	4	1			2		
5/16		1						2			2	3	1		14.4
5/17								3				6			12.7
5/18			Closed	High	Water										
5/19															13.3
5/20															12.7
5/21															
5/22															
5/23		1			3										14.4
5/24							1				3	1	5	1	15
5/25	1	3					2		1		1	3	2		17.2
5/26		1			1			1	1			5			16.6
5/27	1	7			2		4	7			1	1			18.8
5/28		13			10		3	3		1		2			
5/29	1	10			1		2	1			3	4	2		
5/30	1	9			4			5			1	10	2		
5/31		12			4			12				5			21.1
Date	**LM Bass**	**SM Bass**	**Brown Bullhead**	**Burbot**	**Common Carp**	**Fallfish**	**Lepomis Spp.**	**Atlantic Salmon**	**Shiner**	**White Sucker**	**Brook Trout**	**Brown Trout**	**Rainbow Trout**	**Tiger Trout**	**Temp C**
6/1	3	7			2			4				1			21.1

Date	LM Bass	SM Bass	Brown Bullhead	Burbot	Common Carp	Fallfish	Lepomis Spp.	Atlantic Salmon	Shiner	White Sucker	Brook Trout	Brown Trout	Rainbow Trout	Tiger Trout	Temp C
6/2		2						3				1			22.2
6/3	3	4			1							3	2		20.5
6/4	1	4				1	1					3			
6/8			Closed	Flash	Board	Repairs									21.1
6/9	1	1					4								22.2
6/10	4	1										6			21.6
6/11	1	1					2								
6/12								2							
6/13															15.5
6/14		1					1								17.7
6/15															17.7
6/16															18.8
6/17		2					3	1				1	1		18.3
6/18		3						1							
6/19															
6/20										2					22.2
6/21															21.1
6/22							1	1					1		20
6/23		3											2		20
6/24	1	3													18.3
6/25		1													
6/26		3													
6/27		1													20
6/28		1						1							21.1
6/29		2					2								22.7
6/30							1								22.2
7/1	2	1													21.6
Total	31	121	2	1	71	9	79	56	169	214	13	67	30	1	

Total Uprunners 864

Table 4. Spring 2011 - Downrunning Resident Fish

4/11					7		10			2			1		10
4/12					1		1						1		10
4/13															10
4/14															9.4
4/15										2					11.1
4/16															
4/17															
4/18															10
4/19															10
4/20															10
4/21															10.5
4/22												1			10
4/23															
4/24															
4/25															11.6
4/26															14.4
4/27							1								15.5
4/28	2														15.5
4/29							1								16.1
4/30		2					1								
5/1		1					1								
5/2	1														16.1
5/3							3			3					16.1
5/4							2								15
5/5															
5/6							4								15
5/7															
5/8															
5/9									1						15
5/10															14.4
5/11			Closed	Flash	Board	Repairs									14.4
5/12															16.1
5/13		1			4		11		1						15
5/14					5		4		6						
5/15					2		1					1			
5/16															14.4
5/17												1			12.7
5/18			Closed	High	Water										
5/19															13.3
5/20															12.7
5/21															
5/22															
5/23															14.4
5/24															15
5/25		1					2								17.2
5/26		1													16.6
5/27		2													18.8
5/28		4			1							1			
5/29		1						2							
5/30		1						1							
5/31								2				2			21.1
Date	**LM Bass**	**SM Bass**	**Brown Bullhead**	**Burbot**	**Common Carp**	**Fallfish**	**Lepomis Spp.**	**Atlantic Salmon**	**Shiner**	**White Sucker**	**Brook Trout**	**Brown Trout**	**Rainbow Trout**	**Tiger Trout**	**Temp C**
6/1															21.1
6/2		1													22.2
6/3		1													20.5

6/4								1							
6/5															
6/6															18.8
6/7		1													21.1
6/8			Closed	Flash	Board	Repairs									21.1
6/9												1			22.2
6/10															21.6
6/11															
6/12															
6/13															15.5
6/14															17.7
6/15															17.7
6/16															18.8
6/17															18.3
6/18															
6/19															
6/20															22.2
6/21															21.1
6/22															20
6/23															20
6/24															18.3
6/25		1													
6/26															
6/27															20
6/28							4								21.1
6/29															22.7
6/30		1													22.2
7/1															21.6
Total	3	18			9		39	6	8	7		6	2		

Total Downrunners 98

Table 5. Fall 2011 - Popping Observations

Date	Temp C	Popping	# per 10 min
9/19/2011	17	N	0
9/28/2011	20	N	0
10/3/2011	16	N	0
10/5/2011	15	N	0
10/8/2011	12	N	0
10/10/2011	15	N	0
10/12/2011	14	N	0
10/15/2011	15	N	0
10/18/2011	13	Y	3
10/20/2011	13	N	0
10/23/2011	12	N	0

Table 6. Fall 2011 - Downstream Fish, Popping and Generation

date	time	Cam	shad	trout	salmon	smb	lmb	perch	Leopomis	other	popping observed	pond level	generator running
09/26/2011	1507	1		1								66.1	Y
	1532	1							1			66.1	Y
	1607	1		1								66	Y
	1642	1				1						66	Y
	1651	1			1							66	Y
	1716	1			1							65.9	Y
09/28/2011	1404	1				1						66.5	Y
	1457	2			1							66.5	Y
	1557	1				1			1			66.5	Y
	1612	1							1			66.5	Y
	1600										0	66.5	Y
	↓										0	66.5	Y
	↓										0	66.4	Y
	1900										0	66.4	Y
09/29/2011	0715	3								1	←WhSkr	66.6	Y
	1023	3				1						66.8	Y
	1203	1								2	←WhSkr	67	Y
	1217	1								3	←WhSkr	67	Y
	1233	1								2	←WhSkr	67	Y
	1241	1								3	←WhSkr	67	Y
	1315	1								6	←WhSkr	67	Y
	1407	1								1	←WhSkr	67.2	Y
09/30/2011	0024	3			1							67.1	Y
	0239	3			1							67.1	Y
	0304	3			2							67.1	Y
	0312	3			1							67.1	Y
	0321	3			3							67.1	Y
	0325	3			3							67.1	Y
	0340	3			3							67.1	Y
	0344	3			1							67.1	Y
	1814	3				1						66.9	Y
	1815	3				1						66.9	Y
	1816	3				1						66.9	Y
10/01/2011	0234	3			1							66.9	Y
	0435	3			1							66.9	Y
	0439	3			1							66.9	Y
	0504	3			1							66.8	Y
	0514	3			1							66.8	Y
	0519	3			1							66.8	Y
	0529	3			1							66.8	Y
date	time	Cam	shad	trout	salmon	smb	lmb	perch	Leopomis	other	popping observed	pond level	generator running
	0544	3			1							66.8	Y

	0604	3			2							66.8	Y
10/03/2011	1114	3			1							66.2	Y
	1405	3				1						66.2	Y
	1434	3		1		1						66.2	Y
date	time	Cam	shad	trout	salmon	smb	lmb	perch	Leopomis	other	popping observed	pond level	generator running
	1459	3		4								66.2	Y
	1504	3		3								66.1	Y
	1509	3		1								66.1	Y
	1519	3		2	1							66.1	Y
	1524	3		2								66.1	Y
	1600										0	66.2	Y
	↓										0	66.3	Y
	↓										0	66.3	Y
	1900										0	66.3	Y
	2149	3			1							66.3	Y
	2229	3				1						66.3	Y
10/04/2011	1005	1								1		66.5	Y
	1220	1								1		66.5	Y
	1550	1								1		66.5	Y
	1720	3			1							66.6	Y
	1810	3				1						66.6	Y
	1850	3			1							66.6	Y
	1940	3								1		66.6	Y
10/05/2011	0905	3			1							66.6	Y
	1600										0	66.6	Y
	↓										0	66.6	Y
	↓										0	66.6	Y
	1900										0	66.6	Y
	1936	3								1		66.6	Y
10/06/2011	0601	3		1								66.3	Y
10/07/2011	0517	1	20									66.1	Y
	0927	1								1		66.3	Y
10/08/2011	1600										0	66.2	Y
	↓										0	66	Y
	↓										0	65.8	Y
	1900										0	65.7	Y
10/10/2011	1600										0	65.7	Y
	↓										0	65.7	Y
	↓										0	65.7	Y
	1900										0	65.7	Y
10/11/2011	0604			1								66.1	Y

date	time	Cam	shad	trout	salmon	smb	lmb	perch	Leopomis	other	popping observed	pond level	generator running
10/18/2011	1700										0	66.8	Y
	1204									1	3	65.8	Y
	1304									1		66.7	Y
	1739			1								65.8	Y
10/12/2011	0104	3							2			66	Y
	0439	3								1		65.8	Y
	0444	3								2		65.9	Y
	0709	1							1			65.9	Y
	0719	3								1		66	Y
	0814	1								1		66	Y
	0829	1							1			66	Y
	1445	3								1		66	Y
	1600											66.9	N
	↓										0	66.9	N
	↓										0	66.7	Y
	1900										0	66.3	Y
10/13/2011	0310	3								1	0	66	Y
	0425	3								1		66.1	Y
	0445	3								1		66.1	Y
	0605	3								1		66.1	Y
	0950	1								1		65.9	Y
	1626	1								1		65.8	Y
	1911	3								1		65.9	Y
10/14/2011	0026	3								1		66.3	Y
	0241	3								1		66.6	Y
	0251	3								1		66.5	Y
	0416	1								1		66.5	Y
	0826	1	16							3		66.5	Y
	1036	1			1							66.5	Y
10/15/2011	1600										0	67.3	Y
	↓										0	67.3	Y
	↓										0	67.3	Y
	1900										0	67.3	Y
10/17/2011	1311	3								1		67.4	N
	2001	1	9									66.8	Y
	2006	1	8									66.8	Y
10/18/2011	0012	1	25									66.8	Y
	0152	1	20									66.8	Y
	0157	1	20									66.8	Y
	1600										0	67	Y

	1900										0	66.7	Y
10/19/2011	1453	1	3									66.8	Y
	1458	1	14									66.8	Y
	1503	1	45				1					66.8	Y
	1503	3	17									66.8	Y
	1508	1	23									66.8	Y
	1508	3	33									66.8	Y
	1513	1	74									66.8	Y
	1513	3	23									66.8	Y
	1518	1	113				1					66.8	Y
	1518	3	14									66.8	Y
	1523	1	62				1					66.8	Y
	1523	3	17									66.8	Y
	1528	1	45									66.8	Y
	1528	3	8									66.8	Y
	1533	1	54									66.8	Y
	1533	3	3									66.8	Y
	1538	1	26		1							66.8	Y
	1538	3	15									66.8	Y
	1543	1	27									66.8	Y
	1543	3	10									66.8	Y
	1548	1	23									66.8	Y
	1548	3	7									66.8	Y
	1553	1	18									66.8	Y
	1553	3	6									66.8	Y
	1558	1	3									66.8	Y
	1558	3	8									66.8	Y
	1603	3	13									66.8	Y
	1608	3	11									66.8	Y
	1613	3	15									66.8	Y
	1618	3	12									66.8	Y
	1623	3	1									66.8	Y
	1638	3	4									66.8	Y
	1643	3	1									66.8	Y
	1648	3	1									66.8	Y
	1908	3	9									66.7	Y
	1913	3	7									66.7	Y
	1918	3	9									66.7	Y
	1923	3	1									66.7	Y
	1928	3	1									66.7	Y
	1838	3								1		66.7	Y
date	time	Cam	shad	trout	salmon	smb	lmb	perch	Leopomis	other	popping observed	pond level	generator running
10/19/2011	2148	3								1		66.6	Y
	2333	3				2						66.7	Y

10/20/2011	0838	3								1		67.1	Y
	0843	3								1		67.1	Y
	1209	3								2		67.8	N
	1229	3								1		67.8	N
	1419	3								1		67.7	N
	1600										0	67.7	N
	↓										0	67.7	N
	↓										0	67.8	N
	1900										0	67.8	N
10/23/2011	0210	3			1							66.8	Y
	1045	1								1		66.8	Y
	1600										0	66.7	Y
	↓										0	66.7	Y
	↓										0	66.7	Y
	1900										0	66.7	Y
10/25/2011	2056	1								1		66.1	Y
10/26/2011	0606	3								1		66.4	Y
	0631	3								1		66.4	Y
	0901	3								1		66.5	Y
	0956	3								1		66.5	Y
	1112	3								1		66.5	Y
	1116	1			1							66.5	Y
Total			894	21	40	13	3		7	61	3		
Total Passage 1,039													

Table 7. Headpond and Tailrace Levels, Flashboard Integrity and Fishway Closures

SPRING (Fishway)

Date	Headpond	Tailrace
4/1/2011	66.4	53
4/2/2011	66.4	53.3
4/3/2011	66.4	53.4
4/4/2011	66.8	52.8
4/5/2011	66.7	53
4/6/2011	66.5	53.8
4/7/2011	66.6	53
4/8/2011	66.1	52.9
4/9/2011	66.2	53.6
4/10/2011	66.1	53.6
4/11/2011	66.1	53.3
4/12/2011	65.7	52
4/13/2011	66.2	52.7
4/14/2011	66.5	53.9
4/15/2011	66.4	53.7
4/16/2011	66.5	52.6
4/17/2011	67.8	55.5
4/18/2011	68.2	56.2
4/19/2011	67.6	55.2
4/20/2011	67.3	54.8
4/21/2011	65.8	53.2
4/22/2011	66.1	53.5
4/23/2011	66.4	53.4
4/24/2011	66.6	53.9
4/25/2011	66.2	53.6
4/26/2011	66.8	53.6
4/27/2011	66.7	53.5
4/28/2011	66.3	53
4/29/2011	33.2	53.4
4/30/2011	65.9	53.1
5/1/2011	65.6	52.7
5/2/2011	65.5	53
5/3/2011	66.2	52.5
5/4/2011	65.6	52
5/5/2011	65.3	52.4

FALL (Downstream Passage)

Date	Headpond	Tailrace
9/1/2011	67.8	55
9/2/2011	67.6	54
9/3/2011	67	53.2
9/4/2011	67	53.1
9/5/2011	66.9	52.5
9/6/2011	65.9	52.5
9/7/2011	67	54.1
9/8/2011	68.6	55.7
9/9/2011	68.5	56.4
9/10/2011	68.5	54.4
9/11/2011	67.8	54.3
9/12/2011	67.6	54
9/13/2011	67.3	54.3
9/14/2011	66.2	53.3
9/15/2011	65.9	53.1
9/16/2011	65.9	52.7
9/17/2011	66.1	52.5
9/18/2011	66	52.4
9/19/2011	65.5	53
9/20/2011	65.8	52.5
9/21/2011	65.5	52.7
9/22/2011	66.1	53.2
9/23/2011	65.7	52.6
9/24/2011	67	53.8
9/25/2011	66.9	54.2
9/26/2011	66.5	53.5
9/27/2011	66.6	53.6
9/28/2011	66.3	53.3
9/29/2011	66.7	53.6
9/30/2011	67	56.1
10/1/2011	66.8	53.5
10/2/2011	66.7	53.4
10/3/2011	66.2	53.6
10/4/2011	66.4	53.4
10/5/2011	66.4	53.5

5/6/2011	66.4	52.6
5/7/2011	65.8	52.7
5/8/2011	65.7	52.8
5/9/2011	65.3	52.6
5/10/2011	66.1	53.2
5/11/2011	64.1	52.7
5/12/2011	63.6	52.3
5/13/2011	66.7	52.9
5/14/2011	66.3	52.9
5/15/2011	66.1	52
5/16/2011	66.7	53.1
5/17/2011	66.8	53.4
5/18/2011	68.8	56.2
5/19/2011	68.7	56.1
5/20/2011	69	56.3
5/21/2011	68	54.6
5/22/2011	67.1	53.3
5/23/2011	67.3	53.7
5/24/2011	67	53.7
5/25/2011	66.9	53.5
5/26/2011	66.8	53.4
5/27/2011	65.8	53
5/28/2011	66.2	53
5/29/2011	66.3	52.9
5/30/2011	65.9	52.8
5/31/2011	65.6	52.9
6/1/2011	66.3	53.1
6/2/2011	65.8	52.1
6/3/2011	66.1	52
6/4/2011	66.7	52.4
6/5/2011	65.9	51.9
6/6/2011	65.5	52.8
6/7/2011	66.3	52
6/8/2011	63.2	52.8
6/9/2011	66	52.3
6/10/2011	66.3	52.9
6/11/2011	66.9	52.4
6/12/2011	67.1	53.9
6/13/2011	67.4	53.5
6/14/2011	67.1	53.7
6/15/2011	67	53.6
6/16/2011	66.9	53.5

10/6/2011	66	53.6
10/7/2011	66.3	52.7
10/8/2011	66	52.9
10/9/2011	66.1	53.3
10/10/2011	65.6	52.8
10/11/2011	65.8	52.6
10/12/2011	65.9	52.2
10/13/2011	65.7	52.8
10/14/2011	66.4	53.7
10/15/2011	66.9	53.8
10/16/2011	66.9	53.9
10/17/2011	67.1	53.7
10/18/2011	67	54
10/19/2011	66.4	53.3
10/20/2011	67.3	54.5
10/21/2011	67.6	54.4
10/22/2011	66.8	53.6
10/23/2011	66.8	53.4
10/24/2011	67	53.2
10/25/2011	66.9	52.8
10/26/2011	66.2	52.9
10/27/2011	66.1	53.3
10/28/2011	67	53.4
10/29/2011	66.9	54.1
10/30/2011	67.2	53.7
10/31/2011	67.3	54.3

6/17/2011	66.4	52.6
6/18/2011	66.9	53.4
6/19/2011	66.5	53.4
6/20/2011	65.8	52.3
6/21/2011	66	52.9
6/22/2011	66	52.5
6/23/2011	65.7	53
6/24/2011	66.8	53.2
6/25/2011	66.8	53.2
6/26/2011	66.3	52.8
6/27/2011	68.3	53.7
6/28/2011	68.4	53.6
6/29/2011	66.9	52.5
6/30/2011	66.7	52.6
7/1/2011	66.5	51.8

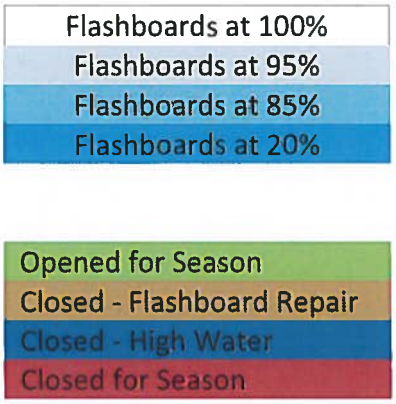
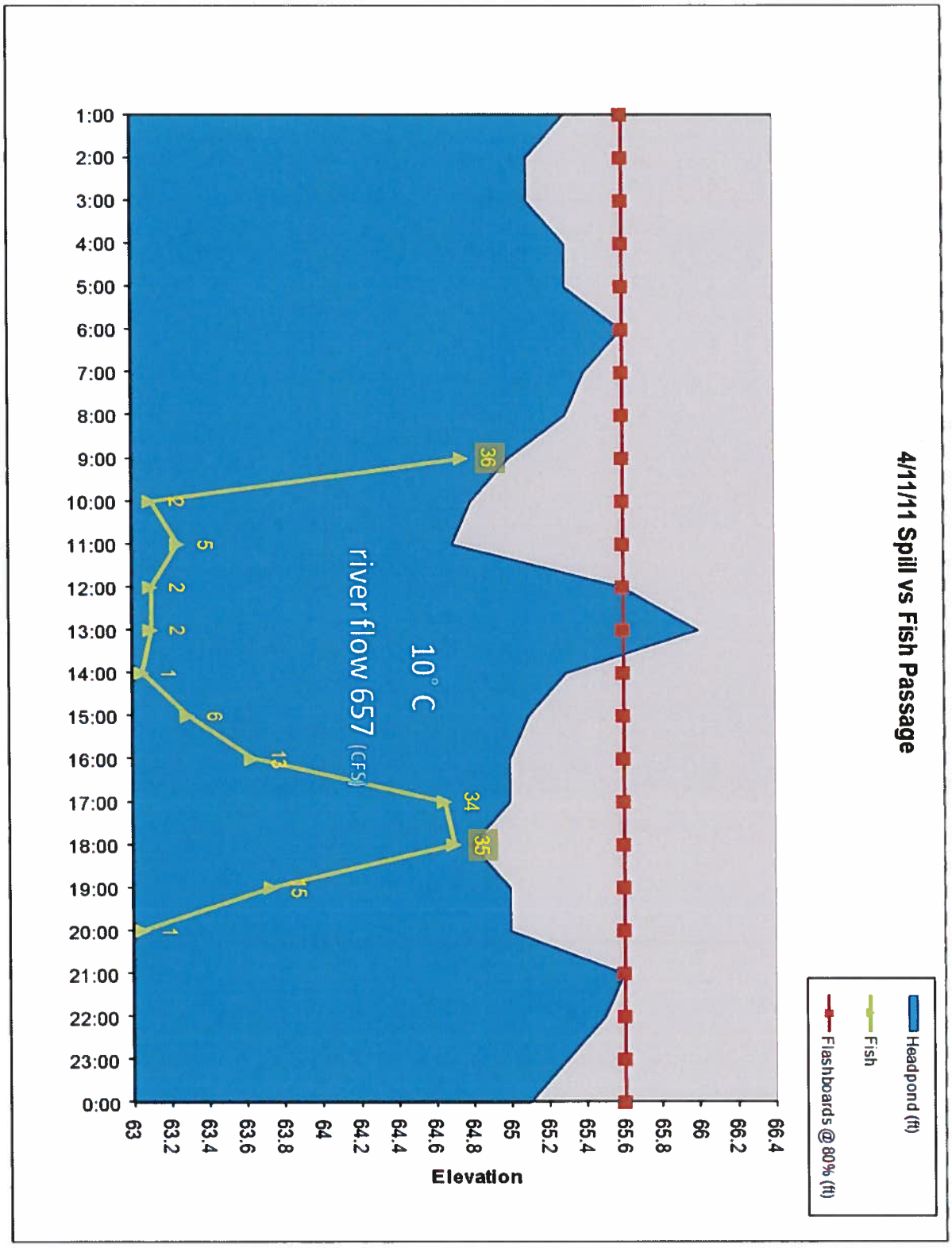


Table 8. Occum Hydro Tours

Date	Organization	Size of Group	Reason for Tour
11/1/2011	Lisbon Middle School	70-80	Field trip as part of class curriculum

Figure 1. Spill vs Fish Passage, 4/11/11

Figure 2. Spill vs Fish Passage, 4/30/11



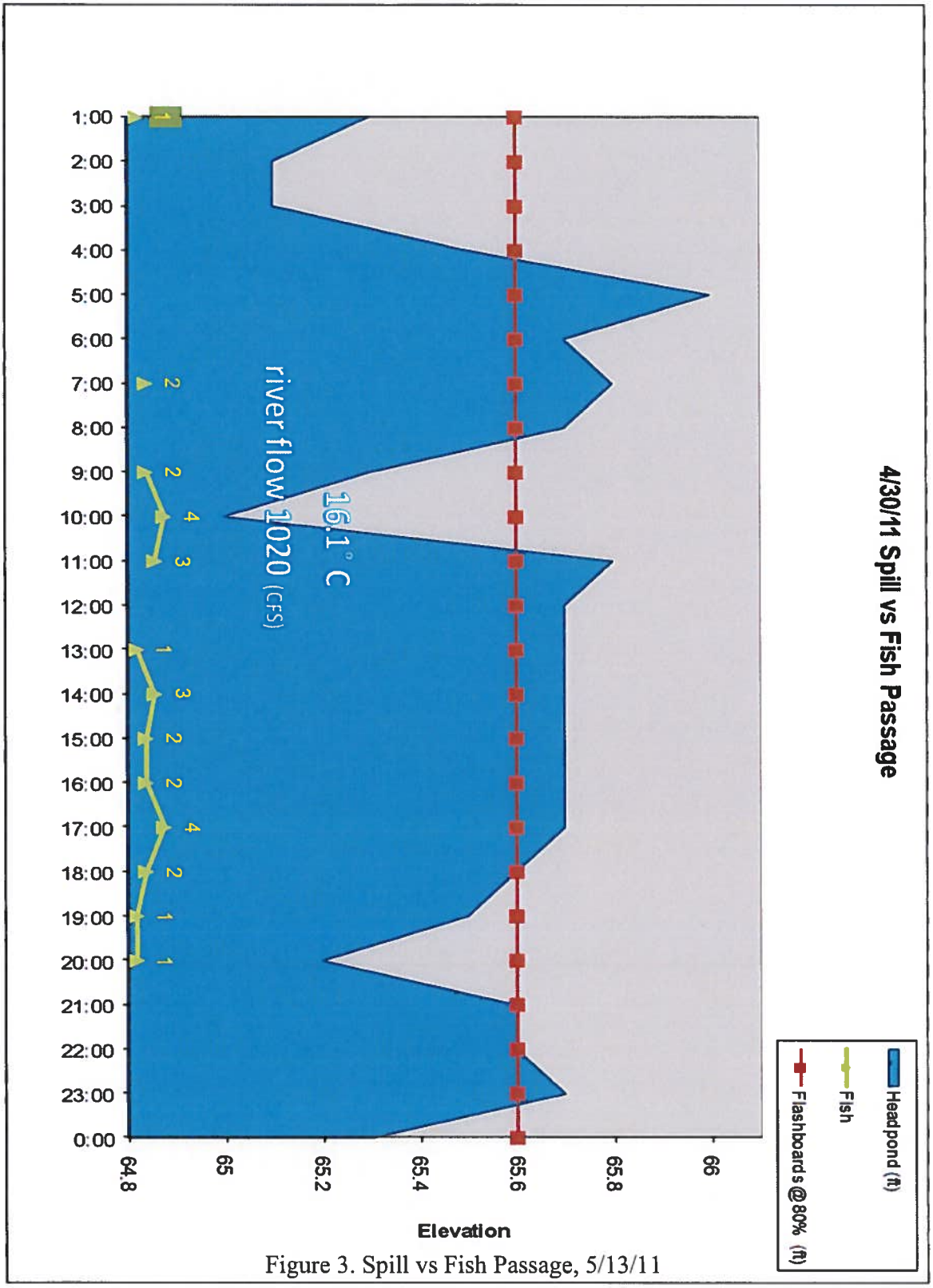


Figure 3. Spill vs Fish Passage, 5/13/11

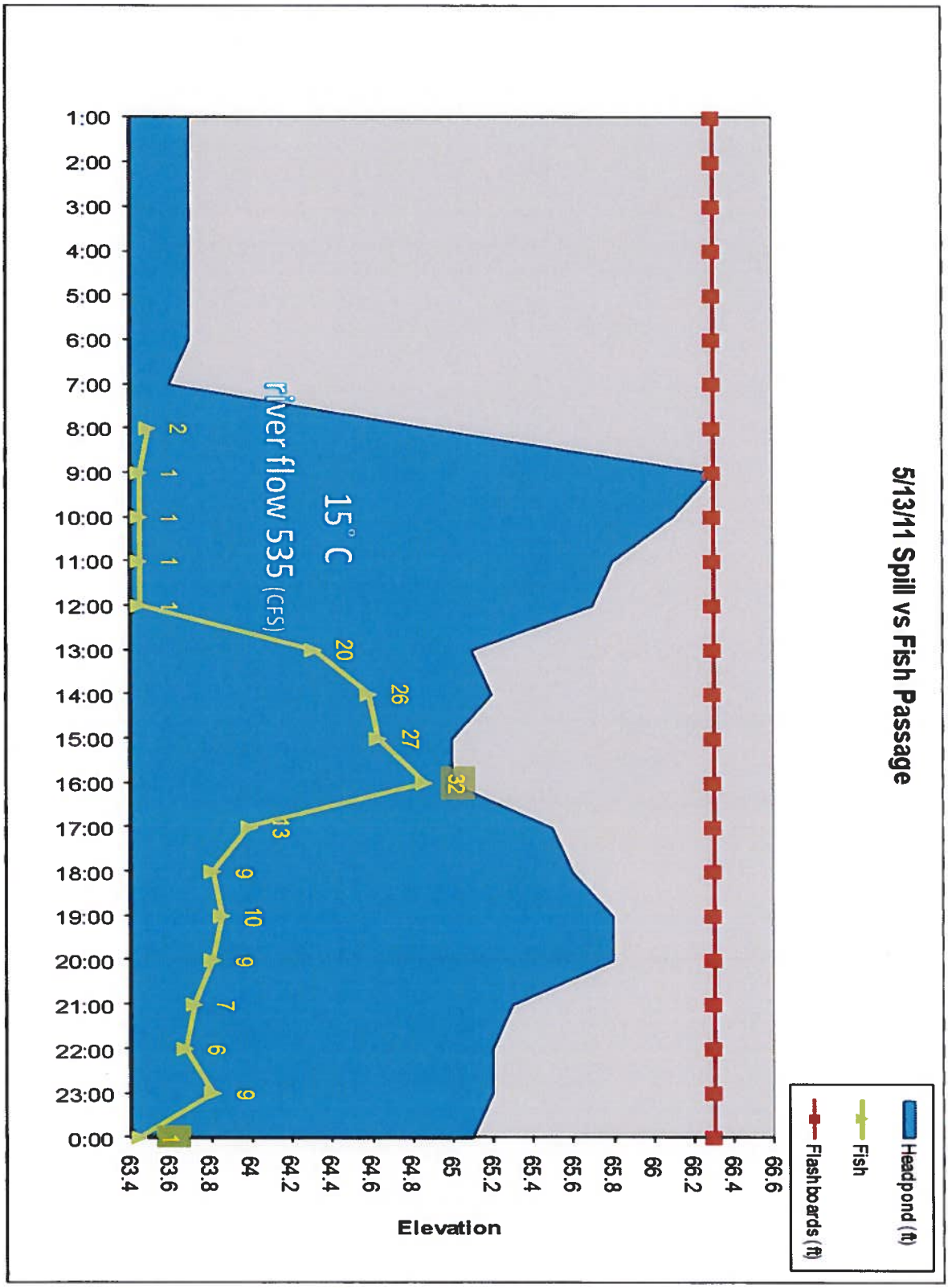

5/13/11 Spill vs Fish Passage
Headpond (ft)
Fish
Flashboards (ft)
Elevation
63.4
63.6
63.8
64
64.2
64.4
64.6
64.8
65
65.2
65.4
65.6
65.8
66
66.2
66.4
66.6
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
River flow 535 (CFS)
15° C
2
1
1
1
1
20
26
27
32
13
9
10
9
7
6
9
1

Figure 4. Spill vs Fish Passage, 5/31/11

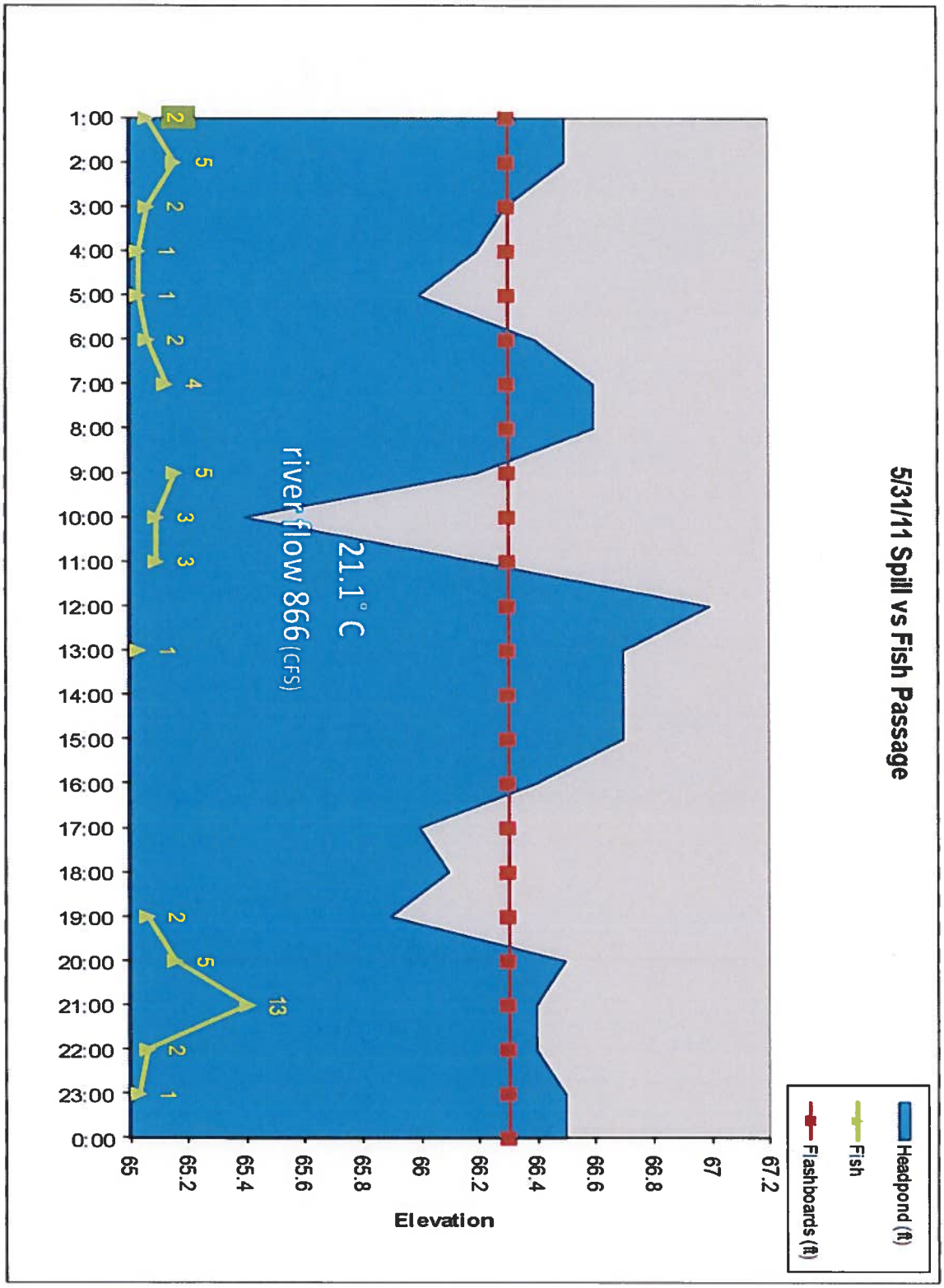
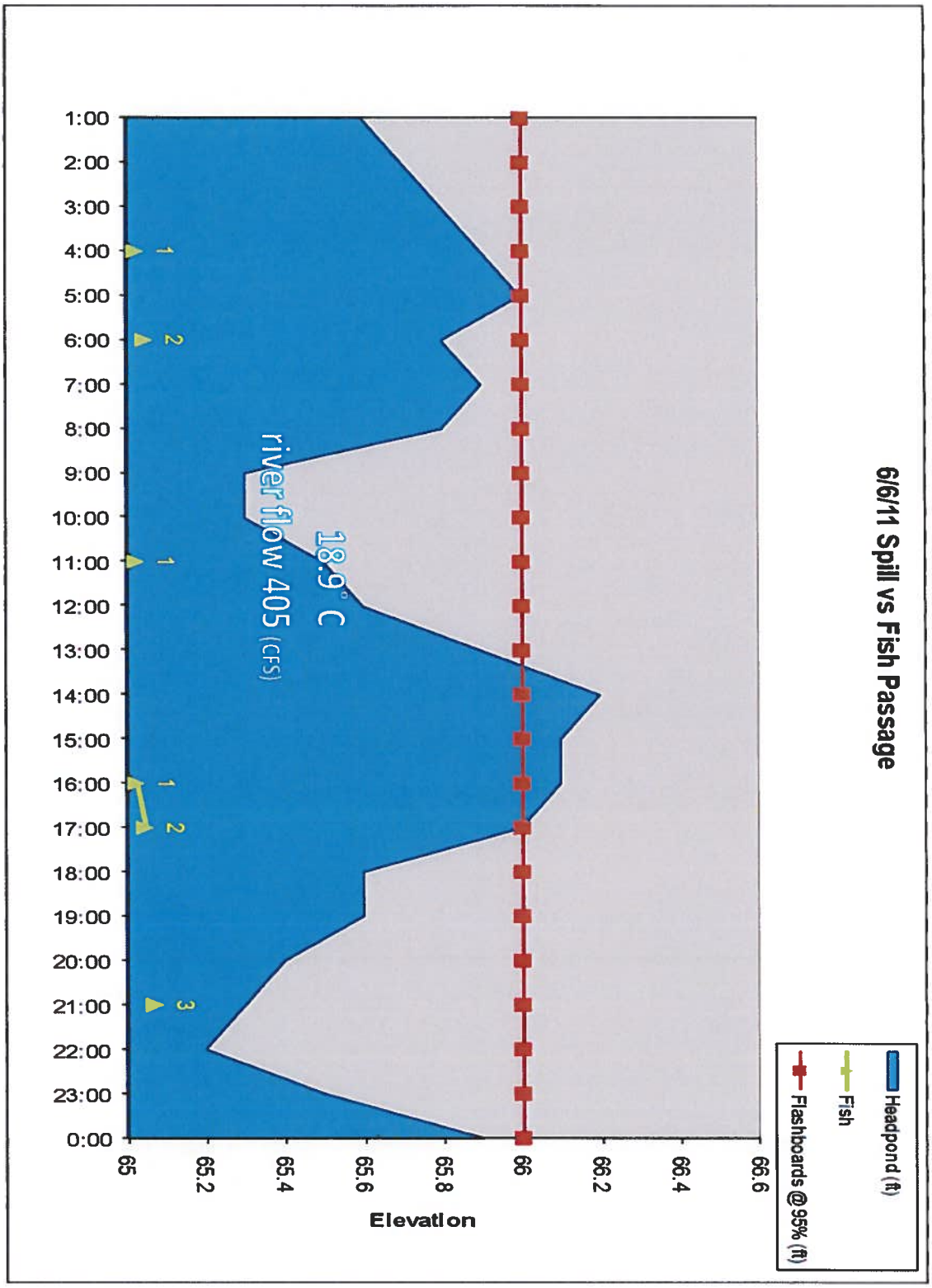


Figure 5. Spill vs Fish Passage, 6/6/11

Figure 6. Spill vs Fish Passage, 6/13/11



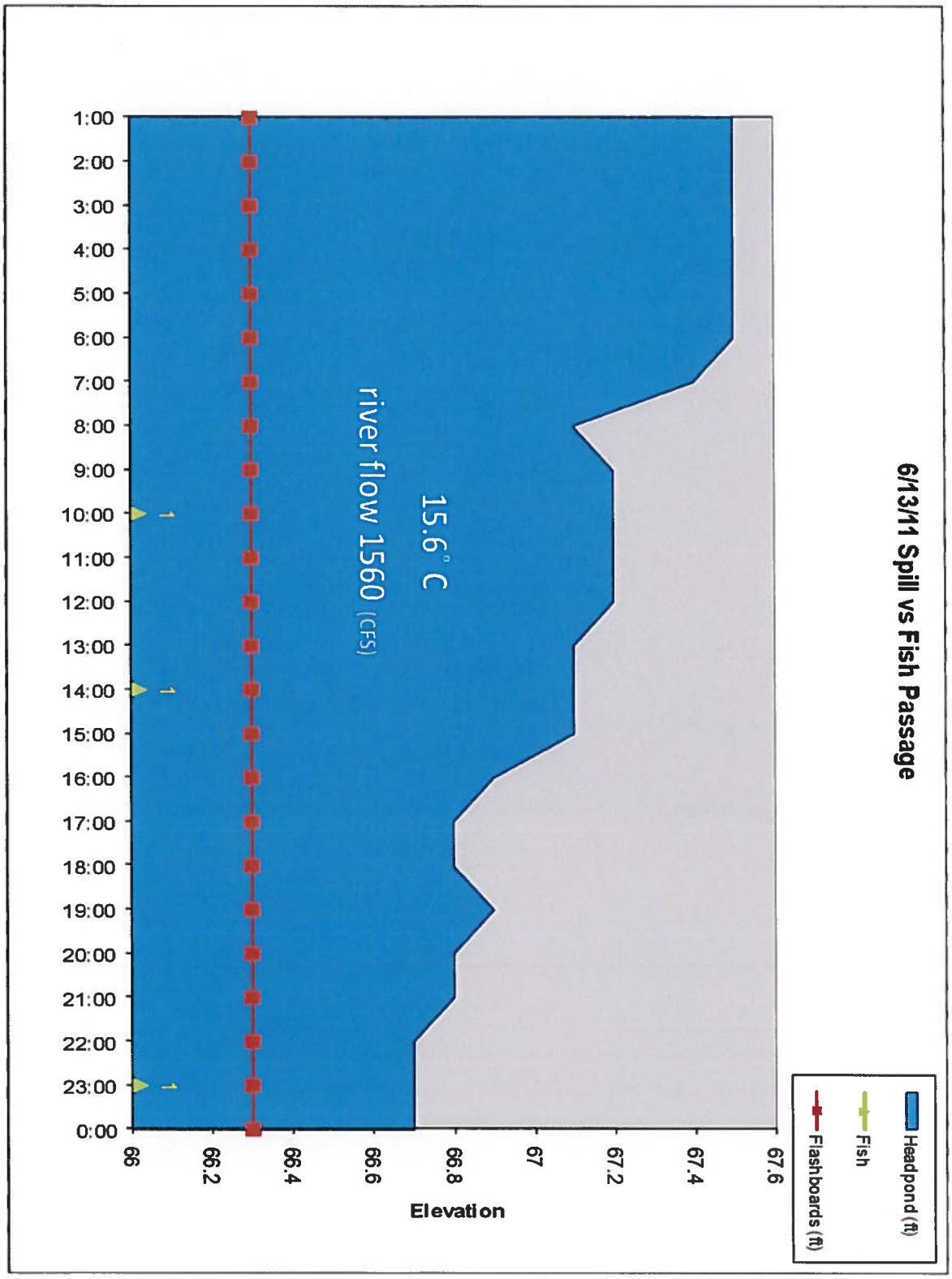


Figure 7. Tailwater vs Fish Passage, 4/11/11

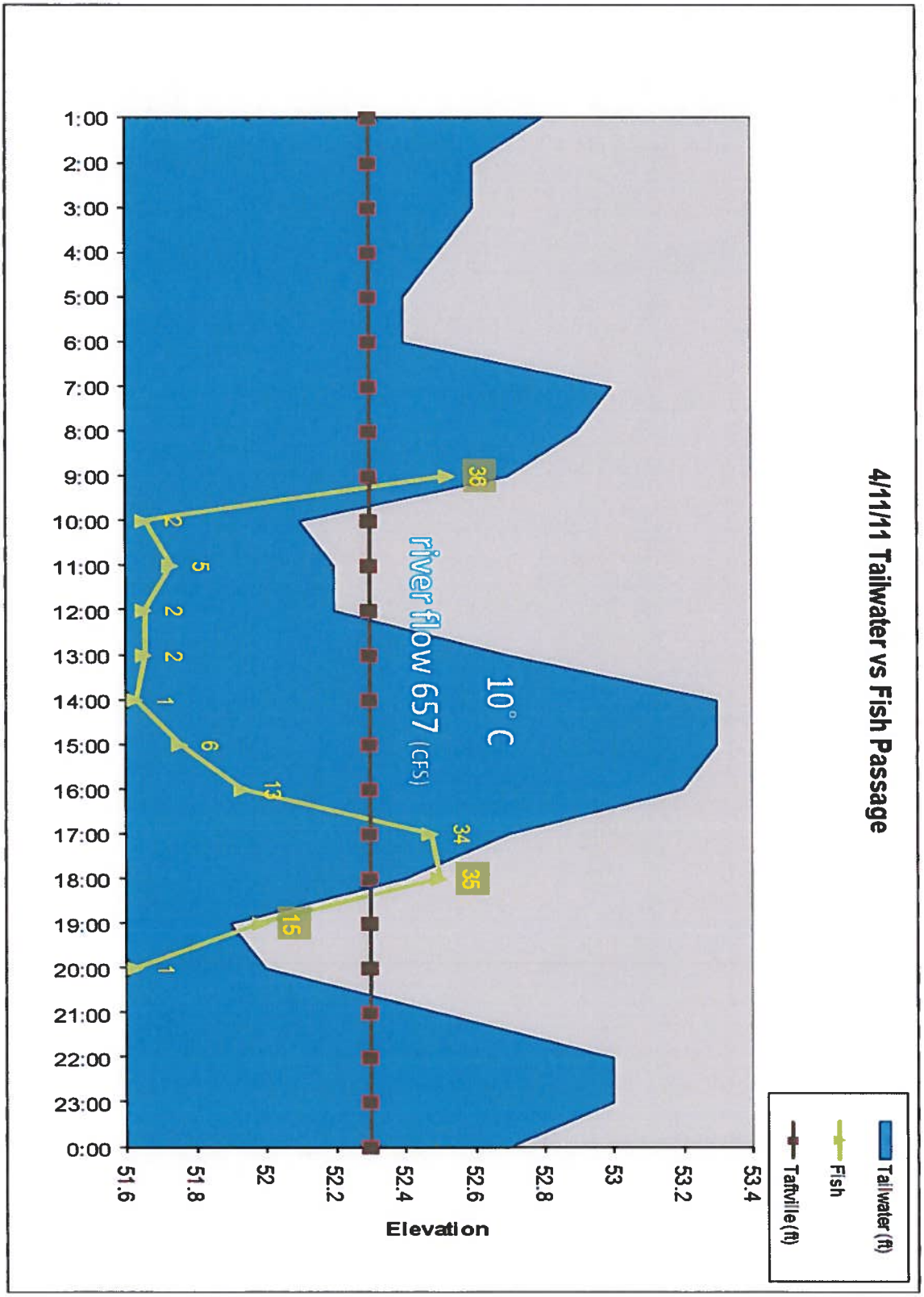


Figure 8. Tailwater vs Fish Passage, 4/30/11

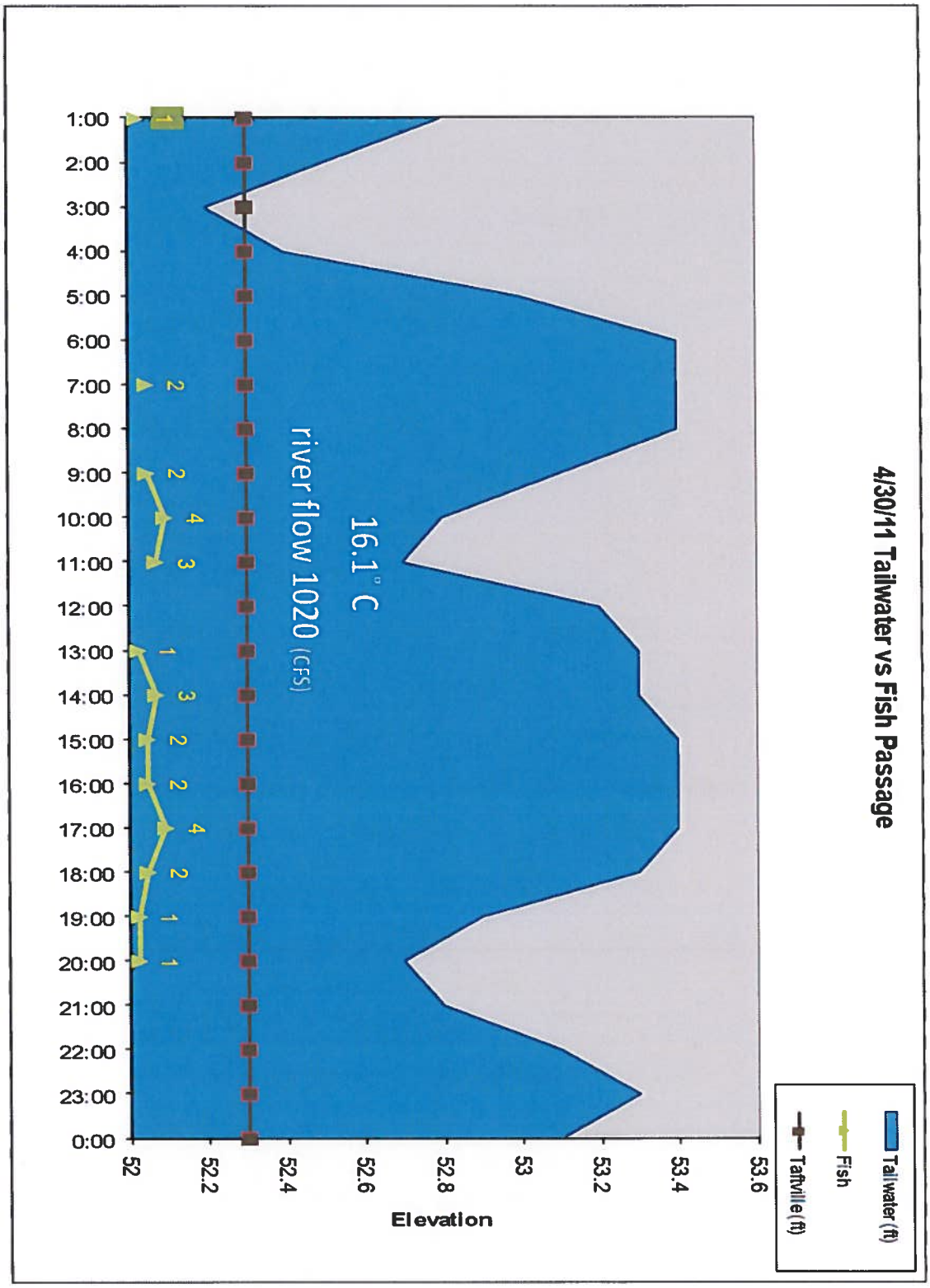
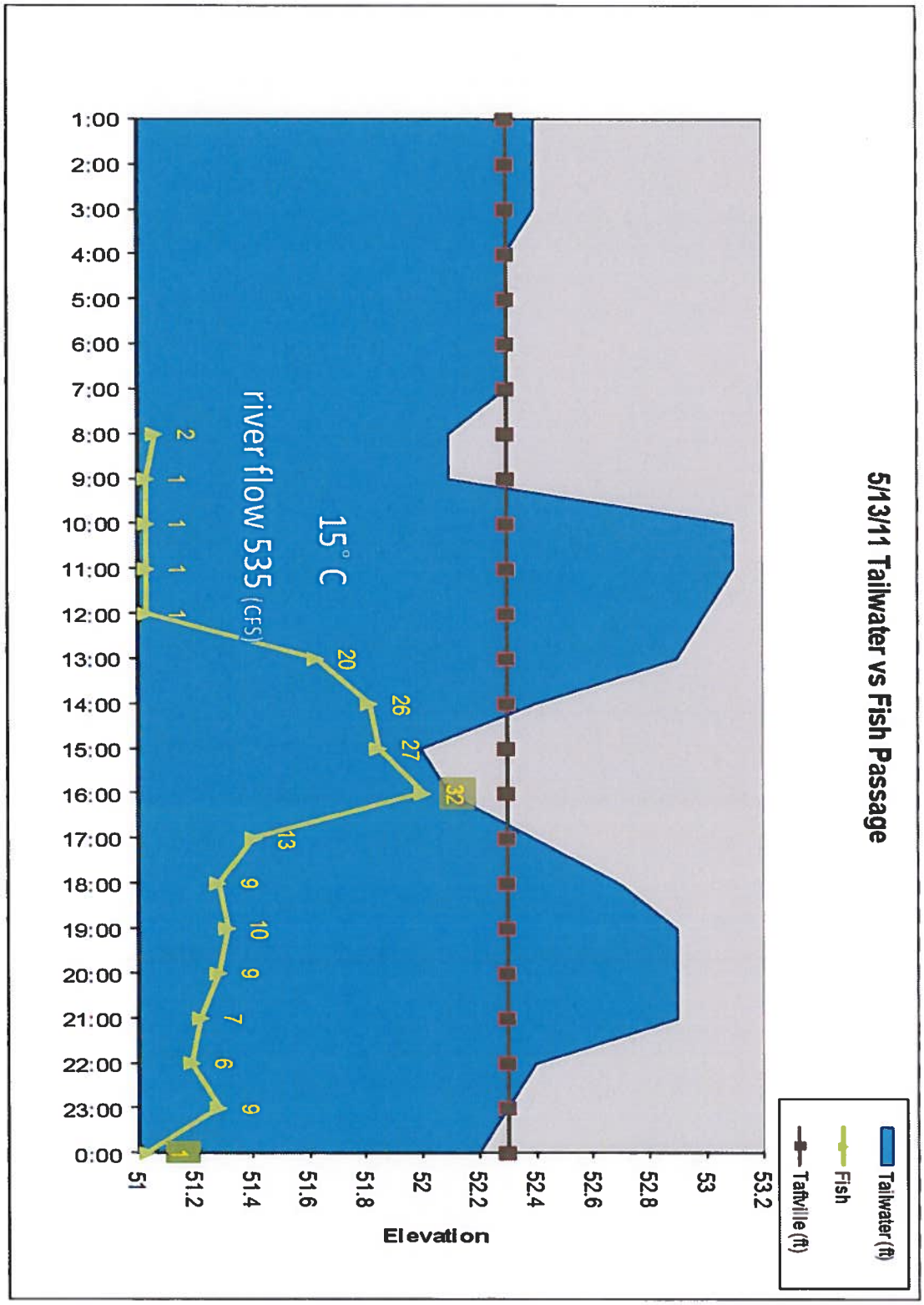


Figure 9. Tailwater vs Fish Passage, 5/13/11

Figure 10. Tailwater vs Fish Passage, 5/31/11



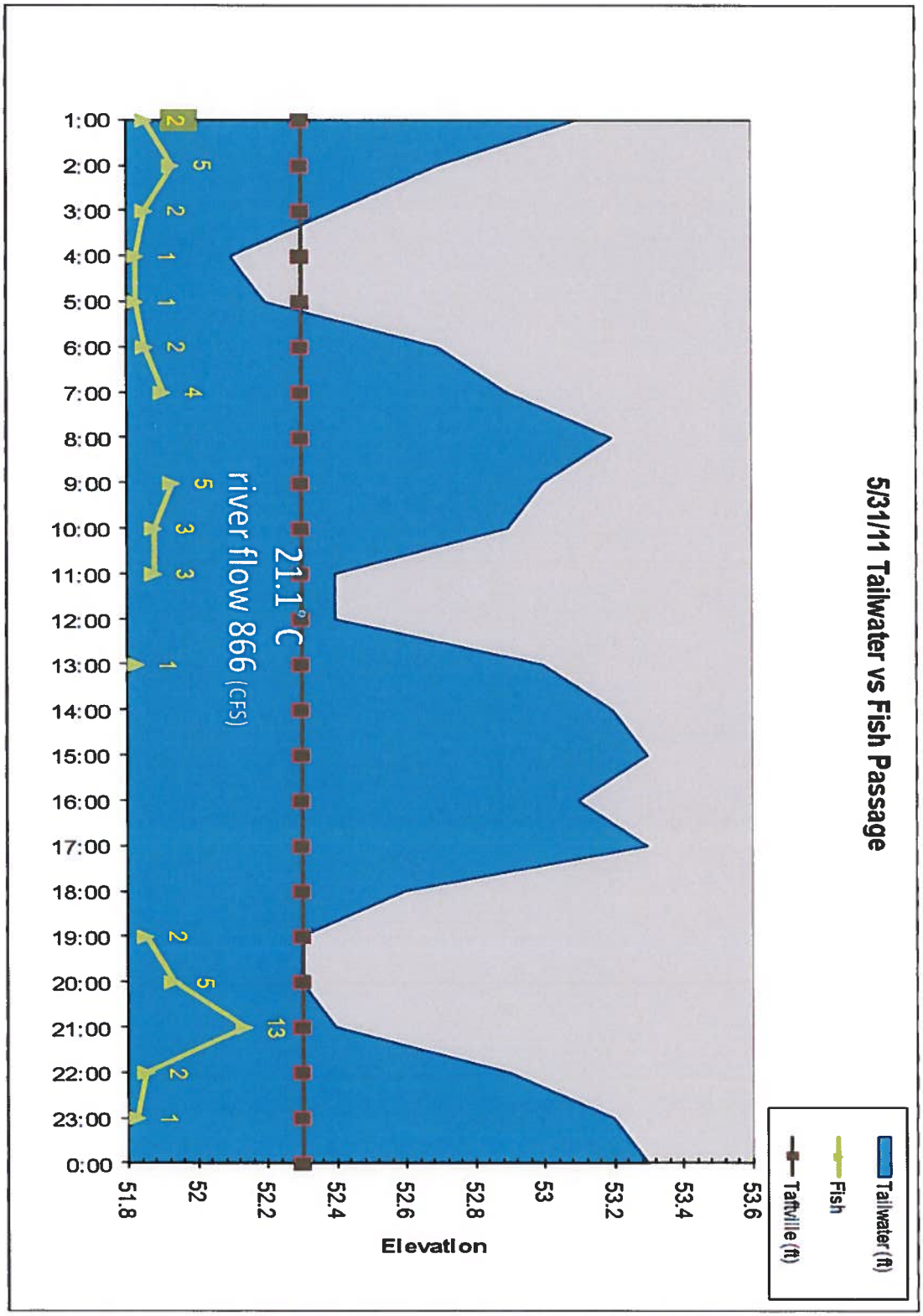

5/31/11 Tailwater vs Fish Passage
Tailwater (ft)
Fish
Taftville (ft)
Elevation
51.8
52
52.2
52.4
52.6
52.8
53
53.2
53.4
53.6
0:00
23:00
22:00
21:00
20:00
19:00
18:00
17:00
16:00
15:00
14:00
13:00
12:00
11:00
10:00
9:00
8:00
7:00
6:00
5:00
4:00
3:00
2:00
1:00
21.1° C
river flow 866 (CFS)

Figure 11. Tailwater vs Fish Passage, 6/6/11

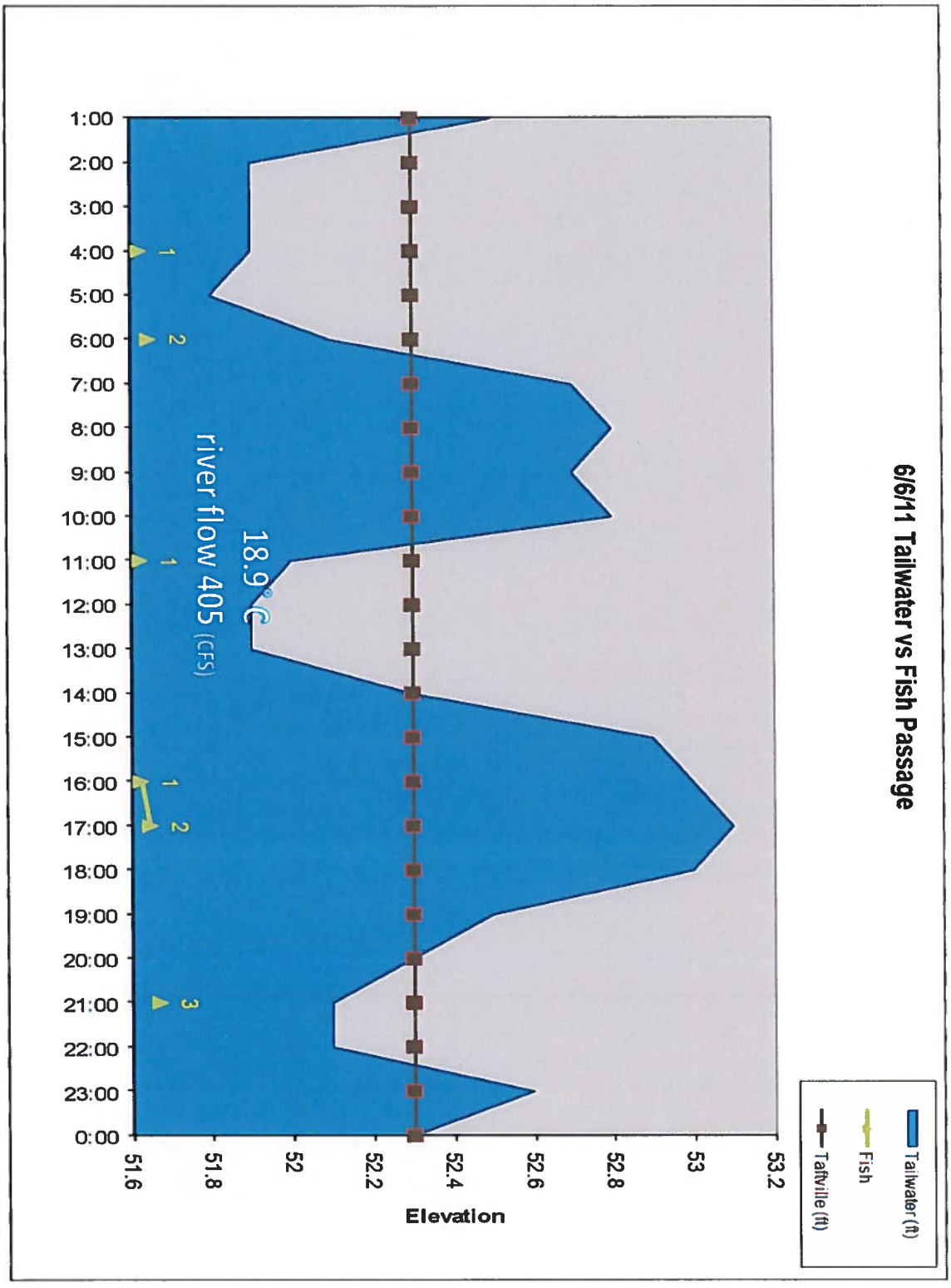


Figure 12. Tailwater vs Fish Passage, 6/13/11

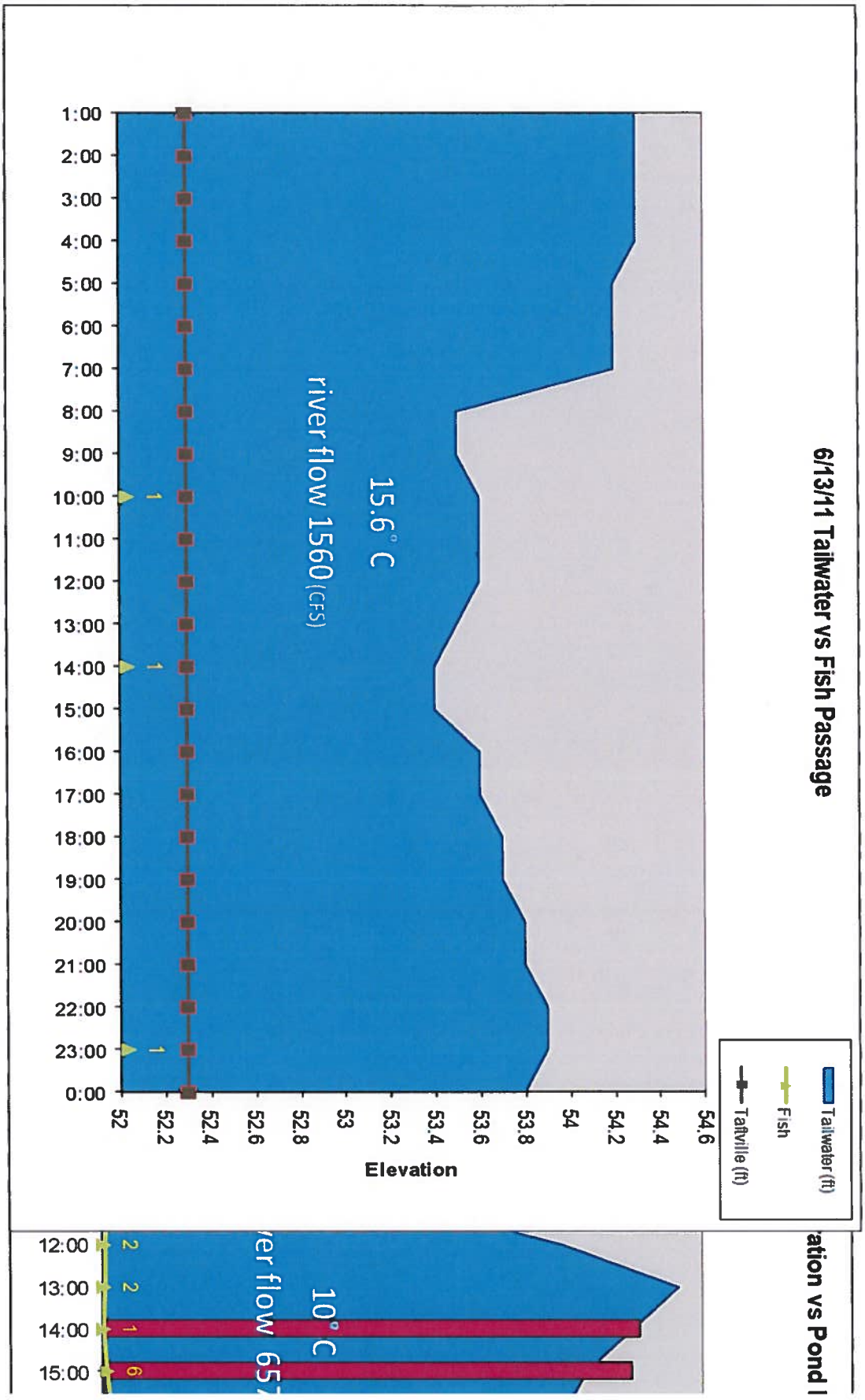


Figure 13. Generation vs Pond Level and Fish Passage, 4/11/11.

Figure 14. Generation vs Pond Level and Fish Passage, 4/30/10.

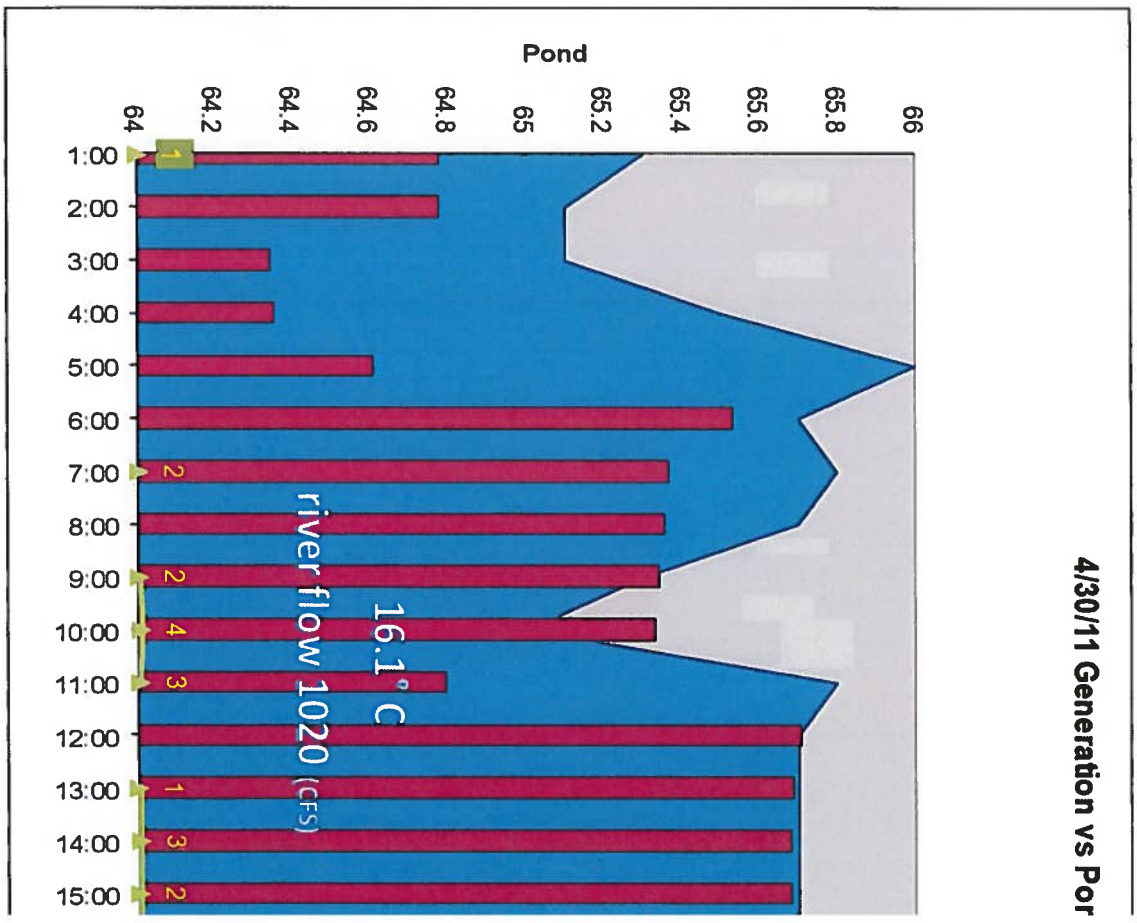


Figure 15. Generation vs Pond Level and Fish Passage, 5/13/11.

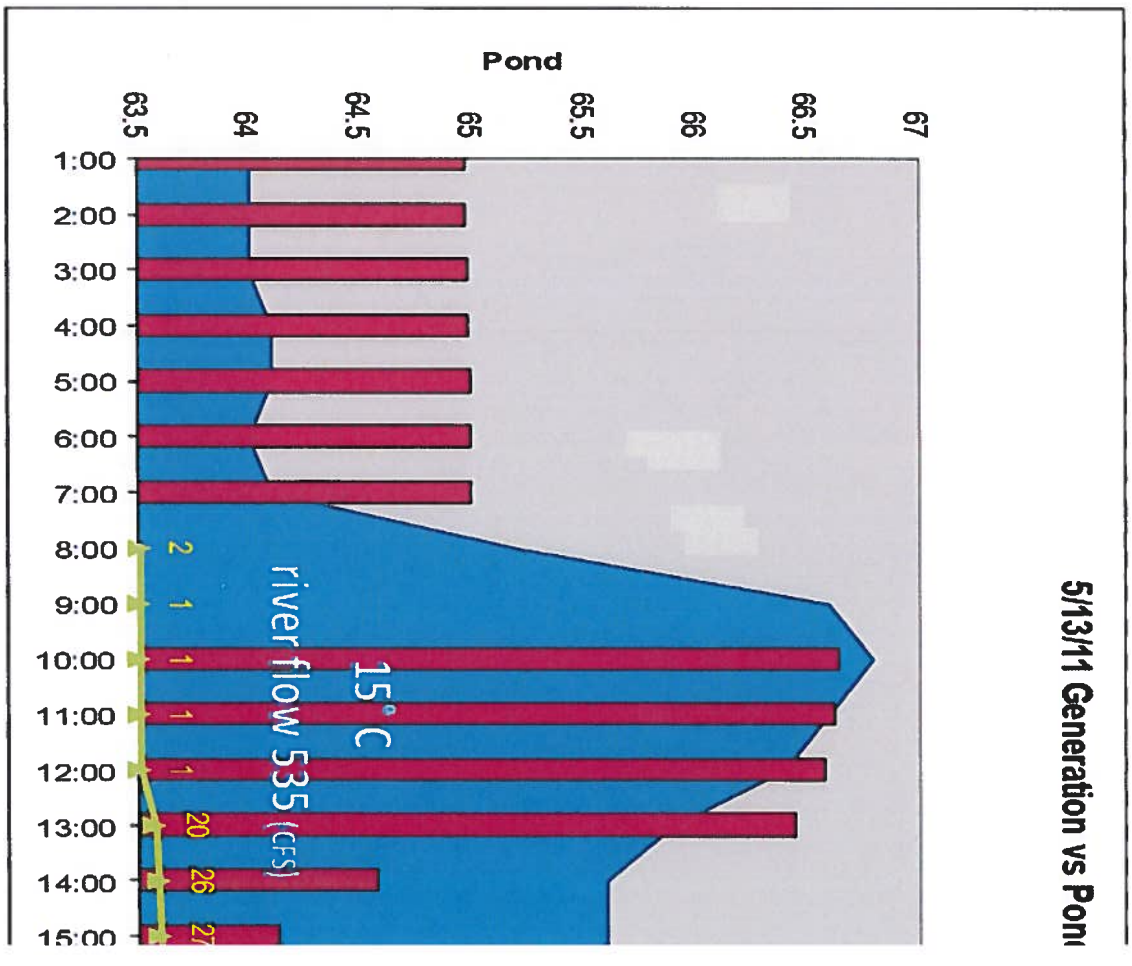


Figure 16. Generation vs Pond Level and Fish Passage, 5/31/11.

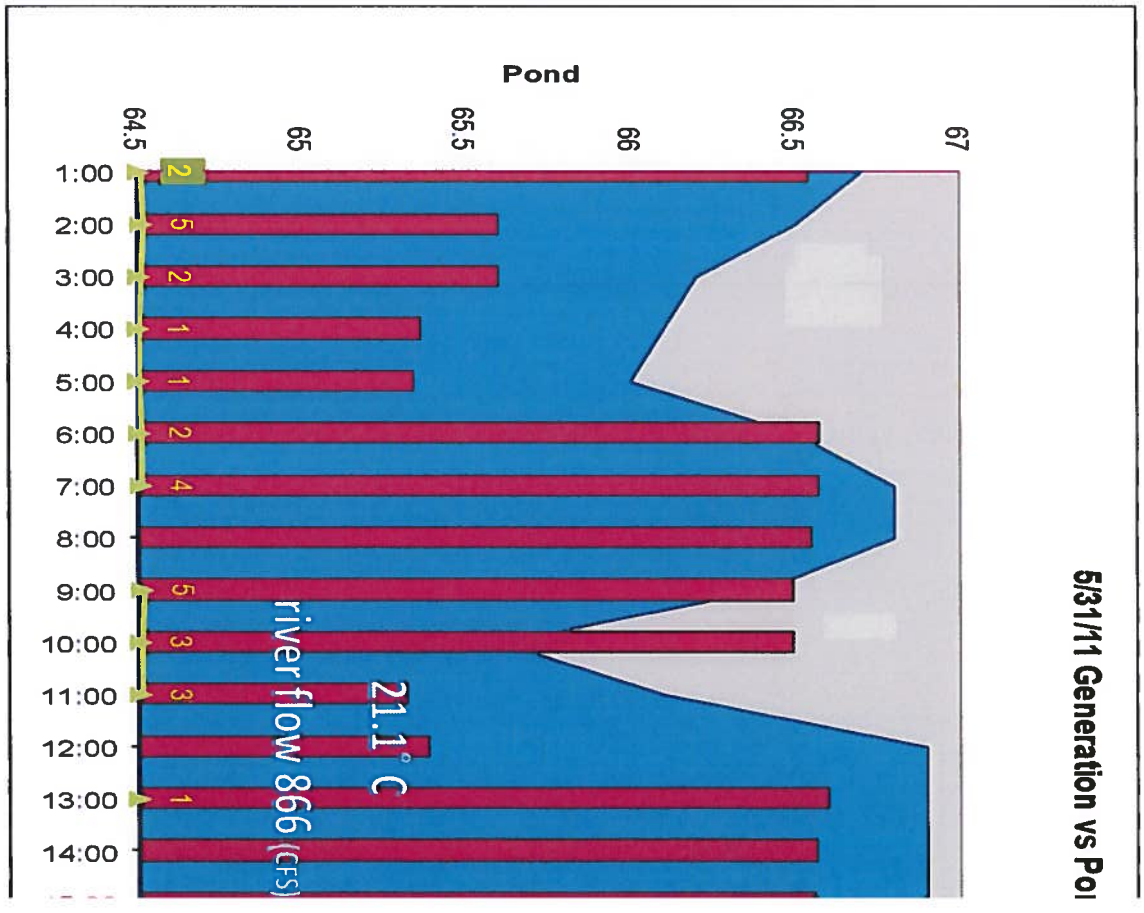


Figure 17. Generation vs Pond Level and Fish Passage, 6/6/11.

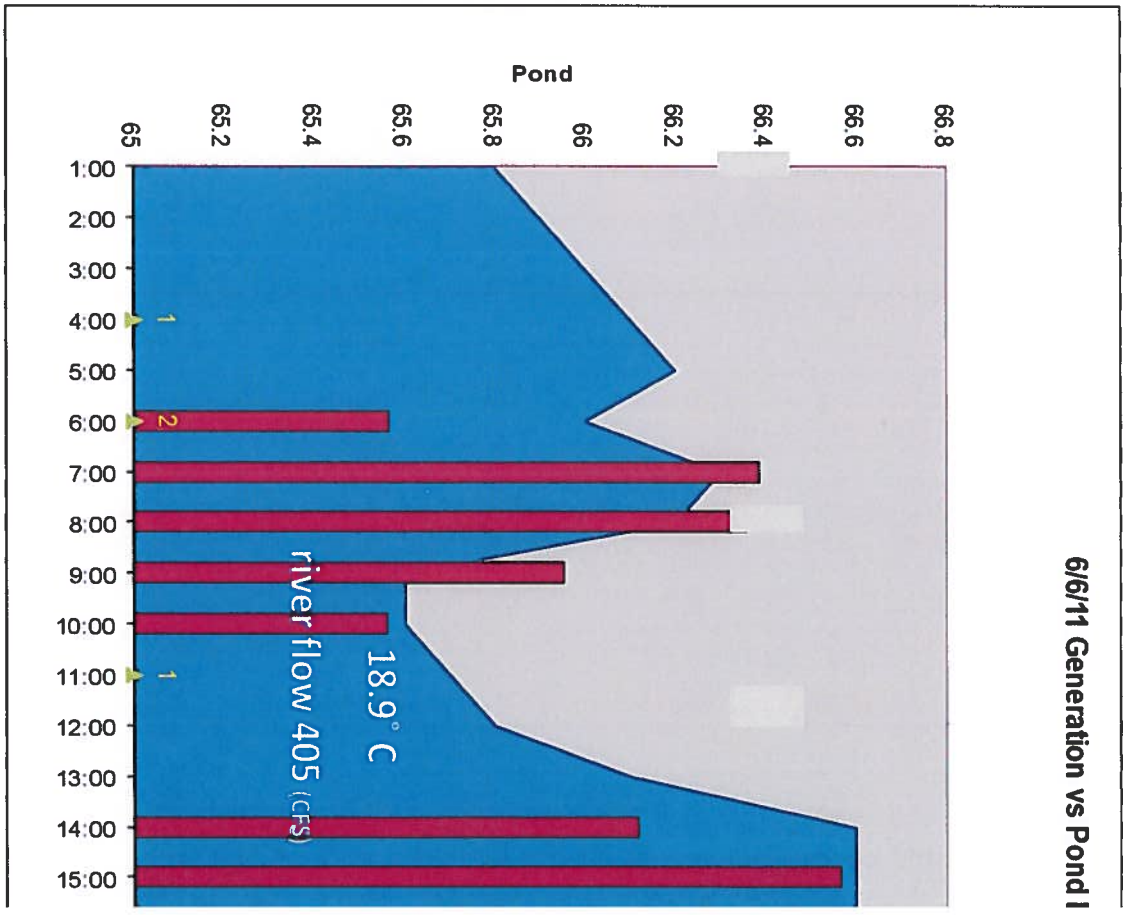


Figure 18. Generation vs Pond Level and Fish Passage, 6/13/11.

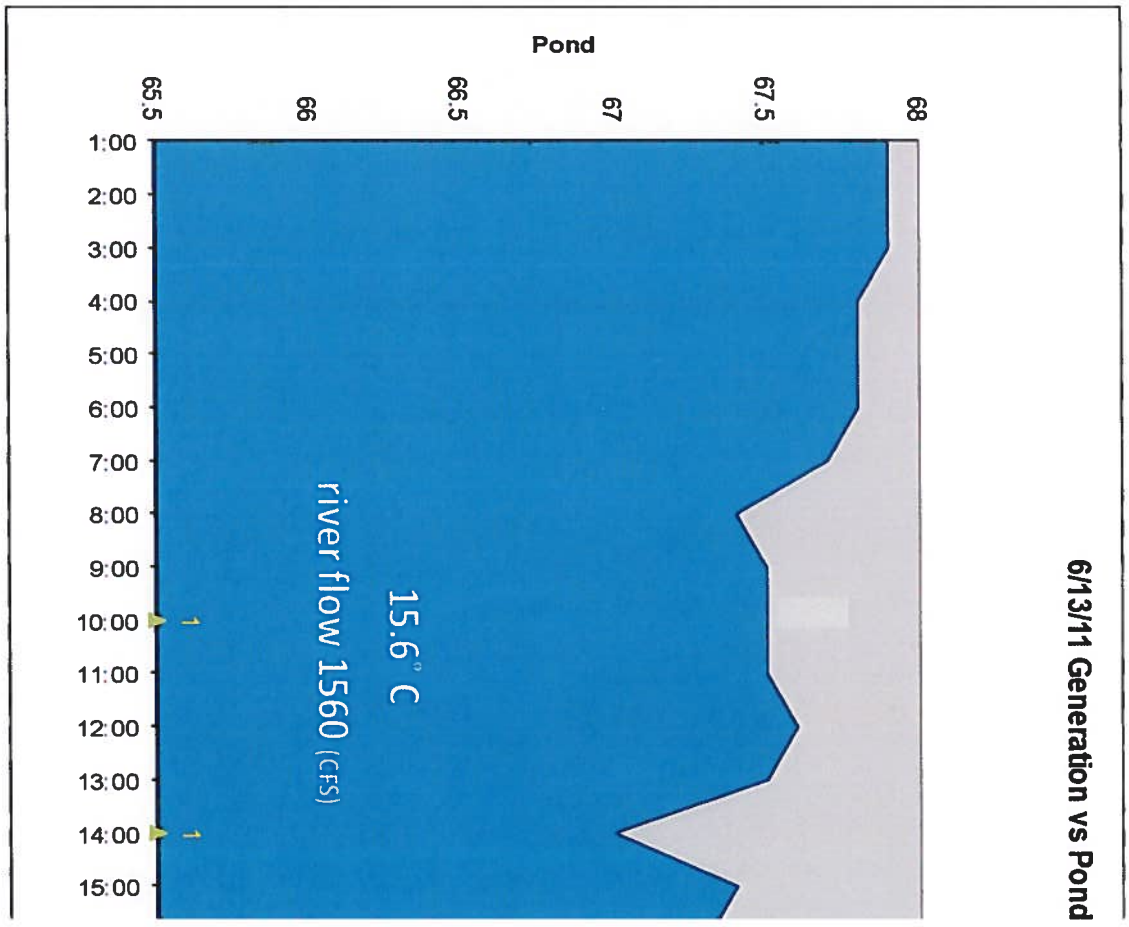
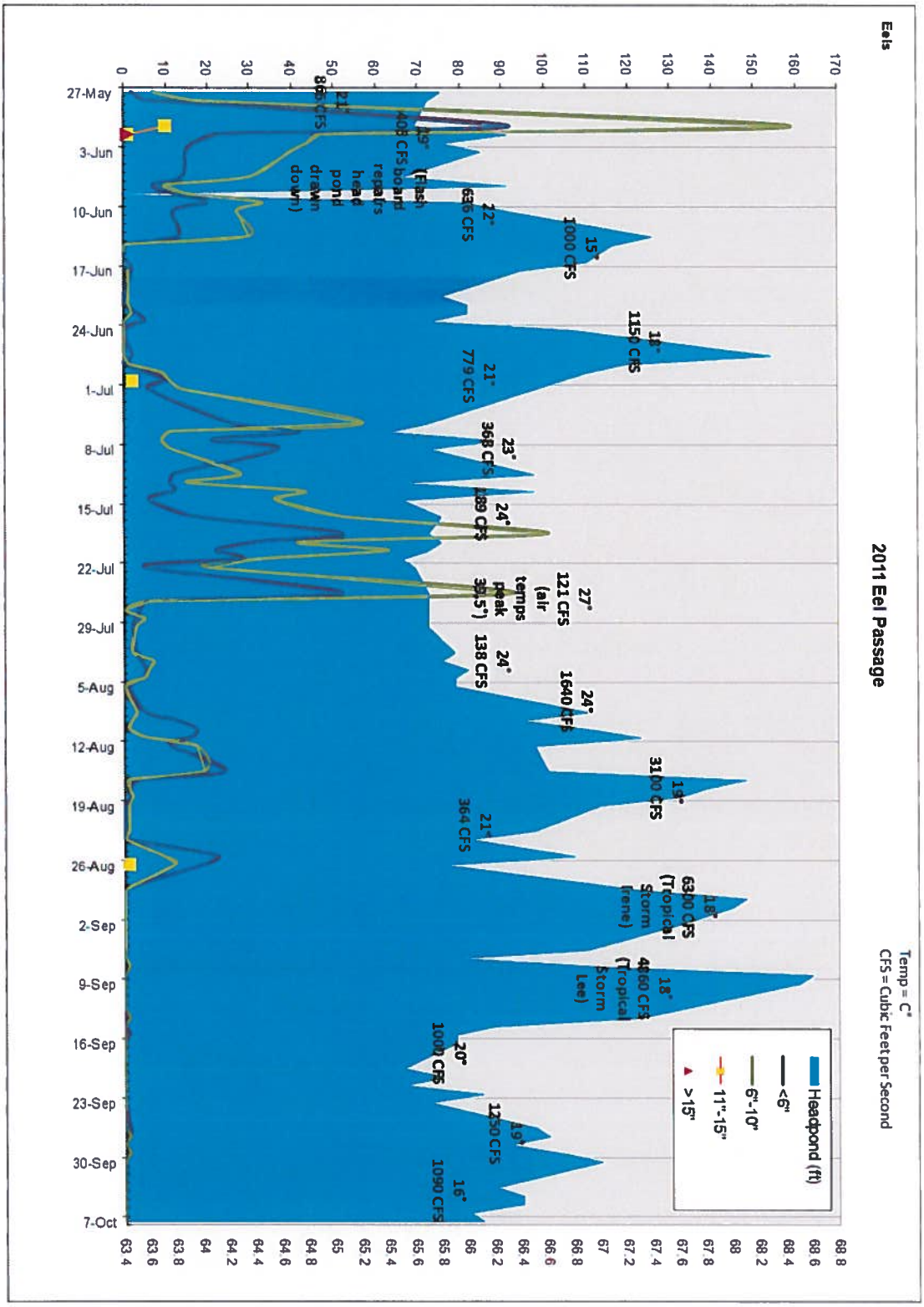


Figure 19. 2011 Eel Passage


Eels
2011 Eel Passage
Temp = C°
CFS = Cubic Feet per Second
Headpond (ft)
<6"
6"-10"
11"-15"
>15"
27-May
3-Jun
10-Jun
17-Jun
24-Jun
1-Jul
8-Jul
15-Jul
22-Jul
29-Jul
5-Aug
12-Aug
19-Aug
26-Aug
2-Sep
9-Sep
16-Sep
23-Sep
30-Sep
7-Oct
19° (Flash 408 CFS board repairs head pond drawn down)
21° 86 CFS
22° 636 CFS
15° 1000 CFS
18° 1150 CFS
21° 779 CFS
23° 368 CFS
24° 189 CFS
27° 121 CFS (air temps peak 39.5°)
24° 138 CFS
24° 1640 CFS
19° 3100 CFS
21° 364 CFS
18° 6300 CFS (Tropical Storm Irene)
18° 4960 CFS (Tropical Storm Lee)
20° 1000 CFS
19° 1250 CFS
16° 1090 CFS

Al Nash

From: Gephard, Steve [Steve.Gephard@ct.gov]
Sent: Friday, December 21, 2012 3:01 PM
To: 'Al Nash'
Cc: Mark Greene
Subject: RE: Counter information and LIHI letter

I'm sorry to tell you that I just can't get to this until January. Too many last minute things and I'm am off next week. I will try to get to it promptly after the new year.

I will reassure Mark that I have decided to write the letter of support for LIHI. In most cases, I send that directly to LIHI. Should I do that (and copy you) or should I send it to one of you?

Merry Christmas.

Steve

From: Al Nash [mailto:al.nash@renewablepowerconsulting.com]
Sent: Wednesday, December 19, 2012 11:42 AM
To: Gephard, Steve
Subject: Counter information and LIHI letter

Good morning Steve - when you get a chance would you please send me the Denil counter information we discussed and the LIHI letter for Norwich's Occum and Greenville stations?

Alfred Nash, P.E.
Renewable Power Consulting, PA
43 Spaulding Road
P.O. Box 195
Palmyra, ME 04965
(207) 992-3926
email: AL.Nash@renewablepowerconsulting.com

FEDERAL ENERGY REGULATORY COMMISSION
Washington, D. C. 20426

OFFICE OF ENERGY PROJECTS

Project No. 11574-024 -- Connecticut
Occum Project
City of Norwich, CT

May 4, 2011

Mr. Wayne McLaughlin
City of Norwich
16 South Golden Street
Norwich, CT 06360

Subject: 2010 Occum Dam fishway evaluation study report

Dear Mr. McLaughlin:

This acknowledges receipt of your April 25, 2011 filing of additional information concerning your 2010 Occum dam fishway evaluation study report required pursuant to Articles 405 and 406 of the Occum Project license[1] and ordering paragraph (B) of the Order Modifying and Approving Fish Passage Plan Under Articles 405 and 406.[2] In a letter dated March 25, 2011, we indicated that, after review of your February 22, 2011 filing, additional information was needed for us to complete our review of your 2010 fishway report. We requested that you provide (in regard to your report): agency comments and your responses to those comments; daily water level averages for specified dates in the spring and fall; and dates that the flashboards were damaged or missing and their effect, if any, on the fish passage facility.

Your April 25, 2011 filing provides sufficient information for us to complete our review of your report. Your February 22, 2011 filing, and your April 25, 2011 supplemental information, adequately fulfill the reporting requirements of Article 405 and 406, and the August 2004 order. Please remember to include this type information in your next report which is due by March 31, 2012.

---

[1] 88 FERC ¶ 62,249 (issued September 19, 1999).

[2] 108 FERC ¶ 62,115 (issued August 3, 2004).

Please be advised that, while Commission staff will continue to review these filings, staff will no longer issue acknowledgement letters for future filings under this license requirement, unless further Commission action is needed. When your future filings for this requirement are posted on the Commission's e-library system, you may consider that as acknowledgement of the Commission's receipt of your submittal.

Thank you for your cooperation and if you have any questions regarding this matter, please contact me at (202) 502-6289.

Sincerely,

Robert Ballantine
Aquatic Resources Branch
Division of hydropower Administration
And Compliance

Project No. 11574-024—Connecticut
Occum Project
City of Norwich, Ct

April 08, 2011

The Secretary
Federal Energy Regulatory Commission
Mail Code PJ12.7
888 First Street, NE
Washington, D.C. 20426

Subject: Response to letter dated March 25, 2011 concerning article 405 and 406 fish passage evaluation at Occum Dam fishway

Dear Mr. LoVullo

The following addresses the comments of the March 25th letter;

ITEM #1, PROVIDE AGENCY COMMENTS, OUR RESPONSE AND HOW THEY WERE ADDRESSED

DEP comments: "I have finally completed my review of this report. It is a good report and I agree with all of the conclusions and recommendations. I have attached it with some comments. All comments are in red. Text that I am suggesting that you add is in regular font whereas text that is merely a message from me to you and is not intended for inclusion is in italics. Also check Tables 1 and 7 for comments. I like table 6-- good job! If you have questions, get back to me. Steve"

1. ~~entirety~~ balance >> CHANGED REPORT TO SAY BALANCE
2. The ~~closing of the~~ Occum fishway was closed on June 16 ~~resulted in a much better view of the window area after it was cleaned of~~ to remove built up algae and debris from the viewing window. Fish that would have previously been able to swim by undetected due to the decreased visibility ~~could now~~ were subsequently easily ~~be~~ seen and identified. >> CHANGED REPORT TO READ EXACTLY AS STATED
3. The appearance of a target species suggests when the Taftville fishway pass fish, those fish are able to find the entrance and climb the Occum fishway as well. Without many target fish to observe in recent years, that has been an area of concern. ~~Now it's known anadromous fish are able to use the ladder without difficulty.~~ *I have a gut feeling that this statement is true but it is premature to state this. This year, one alewife came up. We have not received the final report from Taftville to learn whether any alewives ascended Taftville. If they did not, the Occum alewife could have been a downrunner from our upstream stocking. The window was dirty and it is possible that the alewife could have slipped down past the window undetected. >> REMOVED ENTIRE PARAGRAPH*
4. There were no observations made to support the conclusion that once fish found the fishway they had trouble ascending it. There was not a lot of drop back on the video once fish passed the viewing window and there were never fish milling around the entrance for extended periods of time. Had either of these situations been seen, it would be clear that fish were having difficulty climbing the fishway. (*This is a good statement that the data support.)>> NO CHANGES WERE MADE*
5. fishway ~~per~~ each day. >>CHANGED TO EACH DAY
6. Table 7 had addition error and it was corrected.

7. Per phone conversation with DEP, recommended that the salmon count should be kept as a diadromous species due to them not being migratory in the Shetucket. >>>>MADE THIS CHANGE

USFWS

Hi Wayne,

I've reviewed the 2010 Occum Fishway Report and have no comments. I know that Steve is out this week, but I'm sure he'll provide comments to you when he returns.

By the way, do you happen to have the 2010 passage numbers for Greeneville (particularly eels)?

Regards,
Melissa
~~~~~~~~~~~~~~~~~~~~~~~~~~
Melissa Grader
Fish and Wildlife Biologist
US FWS/New England Field Office
c/o CT River Coordinator's Office
103 East Plumtree Road
Sunderland, MA 01375
413-548-8002, x124
413-548-9622 (FAX)
melissa_grader@fws.gov
www.fws.gov/newengland

ITEM #2 DAILY WATER LEVEL AVERAGED FROM APRIL 1, 2010 TO JUNE 22, 2010 AND FROM SEPTEMBER 1, 2010 TO NOVEMBER 15, 2010 FOR THE HEAD, POND AND TAILRACE

SPRING

Date	Headpond	Tailrace	Date	Headpond	Tailrace
4/12/2010	66.7	53.4	5/27/2010	66.2	52.3
4/13/2010	66.5	53.3	5/28/2010	65.9	52.8
4/14/2010	no staff	no staff	5/29/2010	WE	WE
4/15/2010	no staff	no staff	5/30/2010	WE	WE
4/16/2010	no staff	no staff	5/31/2010	WE	WE
4/17/2010	WE	WE	6/1/2010	66.1	52.1
4/18/2010	WE	WE	6/2/2010	66.7	53
4/19/2010	66.6	53.2	6/3/2010	66.3	52.1
4/20/2010	66.5	53.2	6/4/2010	66.2	52
4/21/2010	66.5	53.1	6/5/2010	WE	WE
4/22/2010	66.4	53.1	6/6/2010	WE	WE
~~~~~~~~~~~~~~~~~~~~~~~~~~

4/23/2010	66.6	53	6/7/2010	65.9	52
4/24/2010	WE	WE	6/8/2010	66	52
4/25/2010	WE	WE	6/9/2010	66.2	52
4/26/2010	66.1	52.2	6/10/2010	65.9	52
4/27/2010	66.5	53.1	6/11/2010	66.2	51.9
4/28/2010	66.4	53	6/12/2010	WE	WE
4/29/2010	64.7	52.6	6/13/2010	WE	WE
4/30/2010	66.4	53	6/14/2010	66.7	52.9
5/1/2010	WE	WE	6/15/2010	66.7	53
5/2/2010	WE	WE	6/16/2010	66.9	52.1
5/3/2010	65.9	52.9	6/17/2010	66	52.1
5/4/2010	66	52.6	6/18/2010	66.8	53
5/5/2010	66	52.2	6/19/2010	WE	WE
5/6/2010	63.6	52.2	6/20/2010	WE	WE
5/7/2010	66.5	52.9	6/21/2010	66.5	52.4
5/8/2010	WE	WE	6/22/2010	66	51.7
5/9/2010	WE	WE			
5/10/2010	66.8	52.3			
5/11/2010	65.5	52.2			
5/12/2010	66.3	52			
5/13/2010	66.3	52.1			
5/14/2010	66	52.2			
5/15/2010	WE	WE			
5/16/2010	WE	WE			
5/17/2010	65.8	52			
5/18/2010	65.8	52.2			
5/19/2010	66.8	53.2			
5/20/2010	66.8	53.1			
5/21/2010	66	52.2			
5/22/2010	WE	WE			
5/23/2010	WE	WE			
5/24/2010	66.7	52.3			
5/25/2010	66.6	52.2			
5/26/2010	66.3	52.2			

FALL

Date	Headpond	Tailrace	Date	Headpond	Tailrace
9/1/2010	66.2	52.1	10/16/2010	WE	WE
9/2/2010	no staff	no staff	10/17/2010	WE	WE
9/3/2010	66	52	10/18/2010	65.7	53
9/4/2010	WE	WE	10/19/2010	65.7	52
9/5/2010	WE	WE	10/20/2010	65.8	52
9/6/2010	65.2	52.9	10/21/2010	66.3	52.2
9/7/2010	65	53	10/22/2010	66.3	52.3
9/8/2010	65.8	52.4	10/23/2010	WE	WE
9/9/2010	66.1	51.9	10/24/2010	WE	WE
9/10/2010	65.8	52.5	10/25/2010	65.9	51.9
9/11/2010	WE	WE	10/26/2010	65.9	52.1
9/12/2010	WE	WE	10/27/2010	65.8	52
9/13/2010	65.7	52.2	10/28/2010	65.8	50.1
9/14/2010	66.1	51.8	10/29/2010	66.4	50.5
9/15/2010	65.7	52.3	10/30/2010	WE	WE
9/16/2010	66.1	51.1	10/31/2010	WE	WE
9/17/2010	66.2	52.2	11/1/2010	66.4	50.1
9/18/2010	WE	WE	11/2/2010	66.4	50.5
9/19/2010	WE	WE	11/3/2010	66.5	50.3
9/20/2010	65.8	51.6	11/4/2010	no staff	no staff
9/21/2010	65.9	51.4	11/5/2010	65.8	52.2
9/22/2010	65	51.8	11/6/2010	WE	WE
9/23/2010	66	51	11/7/2010	WE	WE
9/24/2010	66.4	51.6	11/8/2010	66.1	52
9/25/2010	WE	WE	11/9/2010	65.6	52
9/26/2010	WE	WE	11/10/2010	66.3	52.3
9/27/2010	66.5	52.3	11/11/2010	no staff	no staff
9/28/2010	66.2	52.2	11/12/2010	66.1	52.5
9/29/2010	66.5	52.1			
9/30/2010	65.7	51.7			
10/1/2010	66.3	51.1			
10/2/2010	WE	WE			
10/3/2010	WE	WE			
10/4/2010	66.4	51.9			
10/5/2010	66.5	52.4			
10/6/2010	66.4	52			
10/7/2010	66.7	52.8			

10/8/2010	66.2	52.8
10/9/2010	WE	WE
10/10/2010	WE	WE
10/11/2010	66.6	52.6
10/12/2010	66.6	52.6
10/13/2010	66.6	52.9
10/14/2010	66.6	52.7
10/15/2010	65.8	52.6

ITEM #3 STATUS OF FLASHBOARDS

The flashboards were damaged during the spring flood (30 March, 2010). The flashboards were not replaced until May 6th, 2010 due to no access to the dam until the river level receded.

As for the effectiveness of the fish passage whether the flashboards were installed or not, Table #4 of our report shows that we had a significant amount of resident fish use the passage while the flashboards were not in place.

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