NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS

Muddy Run Pumped Storage Project
Conowingo Eel Collection Facility

FERC Project No. 2355

Prepared for:

Exelon.

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Prepared By:
Normandeau Associates, Inc.
1921 River Road
Drumore, Pennsylvania 17518

www.normandeau.com

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Executive Summary

Exelon Generation Company, LLC (Exelon) received a license from the Federal Energy Regulatory Commission (FERC) on December 22, 2015 for the Muddy Run Pumped Storage Project (Muddy Run Project). An American Eel, *Anguilla rostrata*, Passage Plan (Eel Plan) was developed by Exelon and was included as a condition of the Pennsylvania (PADEP) 401 Water Quality Certification (PADEP File No. EA 36-033; dated December 10, 2014) for the Muddy Run Project. This plan is also a condition of the FERC license for the Muddy Run Project. Specifically, the Eel Plan states that Exelon will trap, hold, and transport American Eels from the Conowingo Dam and transport them to designated points in the Susquehanna River watershed.

Exelon designed, installed, and operated the permanent eel collection and holding facility (Conowingo Eel Collection Facility, CECF) at Conowingo Dam in 2017 and continued operating this facility in the same manner in 2018. Eels collected at Conowingo and those transported from the Octoraro Creek Eel facility were held and later transported and released at designated stocking areas in the Susquehanna River watershed as approved by PADEP and the Eel Passage Advisory Group (EPAG).

Specifically, the objectives of the 2018 field investigation were to:

- Operate, maintain, and monitor the eel collection and holding facility (daily) from May 1 through September 15, 2018;
- Collect catch and length data, water quality, stream flow, and moon phase data during the entire sampling period;
- Examine a subsample of juvenile eels for presence of swim bladder parasite and determine age from a portion of subsample;
- Transport eels from the CECF at Conowingo Dam to designated points in the Susquehanna River watershed;
- Conduct weekly quality control (QC) checks and cleaning of the eel collection facility to maintain proper attraction water flow;
- Document any modifications made to the facility during the course of the season to improve functionality.

The facility was placed in service on May 1, 2018. The facility operated a total of 138 days from May 1 to September 15.

A total of 67,949 juvenile eels were collected at the CECF. Juvenile eel numbers > 1,000 individuals were recorded on 15.9% of the collection days. The greatest number of juvenile eels were collected on July 30, 2018 with 5,572 or 8.2% of the total season catch. Slightly over 50.0% (34,213 of 67,949, 50.4%) of the eels were collected between 22 July and 11 August. Volumetric estimates were utilized on 25 days this year.

Length, weight, and condition factor were recorded from biweekly subsamples on 857 juvenile eels. Length of juvenile eels ranged from 84-173 mm and an average length of 121.6 mm. The average

weight of juvenile eels was 2.0 grams (g) and ranged from 0.5-4.8 g. Only 19 of the 857 (2.2%) showed any form of external injury (condition factor) such as bruising, scrape, or hemorrhage.

Approximately 11% (93 of 857) eels collected were examined internally for presence of the eel swim bladder parasite (*Anguillicoloides crassus*). Parasites were found in 45 (48.4%) of the 93 sacrificed eels. The number of parasites per eel ranged from one to four. Eighty-seven of the 93 sacrificed eels were examined for age and it was determined that the average age was 2.3 years old (range 1-4 years old).

Lunar fraction and eel catch appeared to be related in 2018 at the CECF. During low light periods (near new moon), the number of juvenile eels collected within a few days also increased. Although, during the season's highest daily average river flow of 329,000 cfs on July 29, 2018, which was during a period of greatest lunar fraction, the facility captured most of the eels within a few days following this event.

The CECF collected a total of 67,949 juvenile eels in 2018 with a total of eight eel mortalities found in the collection tank. A total of 2,176 (3.02% mortality) juvenile eels were recovered dead from the holding tanks over the entire season. Eels were held no longer than one week prior to transport from the CECF. A combined total of 69,815 eels from CECF and the Octoraro Creek eel facility were transported to designated locations in the Susquehanna River watershed. An additional 60 juvenile eels were removed by the Susquehanna River Basin Commission (SRBC) June 18, 2018, for an "Eels in a classroom program". West Fairview Access (Site 5) was stocked with 22,586 juvenile eels. Fort Hunter Access (Site 6) received a stocking of 22,348 juvenile eels. The remainder of the juvenile eels (24,869) were stocked in the Susquehanna River at City Island Boat Ramp (Site 12). A total of 12 juvenile eels died during the 31 transport trips from the CECF in 2018.

Cleaning and calibration of the trapping facility was performed weekly. Scrubbing of the collection tank and the screened drain occurred daily after eels were removed. The holding tank and overflow drain were scrubbed every time the eels were removed for transport. Volumetric estimates were compared against actual counts twice during the season, and due to the small differences in numbers, the method provided accurate estimates and no changes are warranted.

List of Abbreviations

Agencies/Groups

CECF	Conowingo Eel Collection Facility
EPAG	Eel Passage Advisory Group
EXELON	Exelon Generation Company, LLC
FERC	Federal Energy Regulatory Commission
PADEP	Pennsylvania Department of Environmental Protection
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
SRBC	Susquehanna River Basin Commission

Units of Measure

C	Celsius
cfs	cubic feet per second
DO	dissolved oxygen
g	gram
gpm	gallons per minute
L	liter
mg/L	milligrams per liter
mL	milliliter
mm	millimeter
QC	quality control
WFL	West Fish Lift

1 Introduction

Exelon Generation Company, LLC (Exelon) received a license from the Federal Energy Regulatory Commission (FERC) on December 22, 2015 for the Muddy Run Pumped Storage Project (Muddy Run Project). An American Eel Passage Plan (Eel Plan) was developed by Exelon and included as a condition of the Pennsylvania 401 Water Quality Certification (PADEP File No. EA 36-033; dated December 10, 2014) for the Muddy Run Project, and is a condition of the FERC license for the Muddy Run Project.

The Eel Plan required Exelon to install and operate a juvenile eel trapping and holding facility (the Conowingo Eel Collection Facility (CECF)) at Conowingo Dam. The location identified for the CECF was on the Susquehanna River immediately downstream of the West Fish Lift (WFL) where a previous USFWS temporary eel facility was located from 2008 to 2016. This site was approved by the Pennsylvania Department of Environmental Protection (PADEP) and other members of the Eel Passage Advisory Group (EPAG)[1].

In 2017, Exelon designed, installed, and operated the permanent eel collection and holding facility at Conowingo Dam and continued operation in 2018. Eels collected at Conowingo and those transported from Exelon's Octoraro Creek eel facility were held and later transported and released at designated points in the Susquehanna River watershed.

Specifically, the objectives of the 2018 field investigation were to:

- Operate, maintain, and monitor the eel collection and holding facility (daily) from May 1 through September 15, 2018;
- Collect catch and length data, water quality, stream flow, and moon phase data during the entire sampling period;
- Examine a subsample of juvenile eels for presence of swim bladder parasite and determine age from a portion of subsample;
- Transport eels from the CECF at Conowingo Dam to designated points in the Susquehanna River watershed;
- Conduct weekly quality control (QC) checks and cleaning of the eel collection facility to maintain proper attraction water flow;
- Document any modifications made to the facility during the course of the season to improve functionality.

[1] EPAG members include the Pennsylvania Department of Environmental Protection, United States Fish and Wildlife Service (USFWS), Pennsylvania Fish and Boat Commission, Maryland Department of Natural Resources, Susquehanna River Basin Commission, and Exelon.

2 Background

The American Eel (*Anguilla rostrata*) is the only species of freshwater eel in North America. They are catadromous, meaning they are hatched in the ocean, mature in freshwater, and then return to the sea to spawn. Throughout their life cycle, the American Eel occupies a variety of habitats and goes through multiple physical changes, known as metamorphoses. The American Eel begins its life in the Sargasso Sea. The larval eels, known as leptocephalus larvae, are transported to the eastern seaboard of North America via ocean currents, which takes about a year. Their coastal range extends as far north as Greenland and as far south as Brazil. By the time the larvae reach the coast, they have developed fins and have taken on the shape of an adult eel (Hedgepeth 1983). The glass eel is clear and is usually less than 25 millimeters (mm) and when these eels start to become pigmented they are considered juvenile eel.

The CECF is located on the west shore of the Susquehanna River just downstream of the WFL (Figure 2.0-1 and Figure 2.0-2). This report describes the work completed by Exelon/Normandeau Associates, Inc. with oversight from EPAG in 2018 to collect and transport juvenile American Eels past Conowingo Dam.

From 2005-2016 the trapping efforts were performed by the USFWS (Minkkinen and Park 2014 and personal communication with USFWS, Christopher Reily, October 27, 2016) on the west shore of the Susquehanna River below Conowingo Dam have shown that the bulk of the juvenile eel migration occurs from May into September with most eels collected in June and July (Figure 2.0-3).

The PADEP 401 WQC for Muddy Run Project required Exelon to design and install an eel collection facility at Conowingo and start operation by May 1, 2017.

3 Methods

3.1 Design, Construction, and Installation of Facility

The 2018 trapping facility was identical to the 2017 trapping facility (Appendix A, Normandeau Associates and Gomez and Sullivan 2018). Complete designs descriptions can be found in Section 3: Methods in the Normandeau Associates and Gomez and Sullivan 2018 report.

3.2 Data Collection

Sample data, including eel counts and lengths were recorded, verified, tabulated, and entered into an electronic format for each day. Flow readings, water quality, and environmental conditions were also recorded, verified, tabulated, and entered into an electronic format during each days sampling event.

Eel count data included actual counts or volumetric estimates (when performed). Volumetric estimates were performed as in 2017 (Normandeau Associates and Gomez and Sullivan 2018).

Length and weight measurements, along with condition factor were recorded biweekly from a maximum of 25 individuals (when available). Eels were measured and weighed after being anesthetized (Figure 3.2-1 and Figure 3.2-2). Once a week during this biweekly subsample, a portion of these eels were examined for the presence of a swim bladder parasite (*Anguillicoloides crassus)* and for age analysis. Age analysis methodology is described in Appendix B.

Flow readings and water quality data (temperature and dissolved oxygen) were recorded daily upon arrival from the control panel readouts for the collection tank and any holding tank in service. The main flow was also recorded daily.

Environmental data including river flow, moon phase, and weather condition was also recorded daily.

3.3 Juvenile Eel Transport

A wild health screening was required prior to the transport of eels upstream into the Susquehanna River watershed. Juvenile eels were collected by a back pack electroshocker in March, 2018 from Stone Run, a tributary of the Octoraro Creek, and sent to the USFWS Fish Health Center (Lamar, PA) for examination (Figures 3.3-1 through 3.3-3). After the results of the wild health screening were received and reviewed by the EPAG, eels were stocked in the approved locations.

All juvenile eels captured from the CECF, plus eels collected at the Octoraro Creek eel facility, were held for no longer than one week prior to transport. All eels were transported and released at designated locations in the Susquehanna River watershed.

When less than 150 eels were collected during a sampling event, transport occurred using aerated 19-liter (L) buckets with lids, containing the maximum amount of water to prevent sloshing, with ≤ 50 eels in each bucket. When counts of juvenile eels were greater than 150 but less than 1,000 individuals, a small enclosed transport tank (250 L) with supplemental oxygen capability was used to transport eels to designated locations (Figure 3.3-4). When large loads (> 1,000) of American Eels were transported, the custom made transport truck and tank unit was used to efficiently and safely deliver eels to designated stocking locations (Figure 3.3-5).

4 Results

The CECF facility was installed and began operation May 1, with continued operation through September 15, 2018. Eels were collected daily during the 138 days that the facility was operated. A total of 67,949 juvenile eels were collected during the 2018 season (Table 4.0-1).

4.1 Juvenile Eel Collection

A total of 67,949 juvenile American Eels were captured at the CECF during the 2018 season. Counts or volumetric estimates were recorded daily. Volumetric estimates were taken from the CECF on 25 of the 138 days of operation (approximately 18% of the season, Table 4.0-1).

The highest one-day total of 5,572 juvenile eels occurred on July 30, when 8.2% of the total number of eels collected were captured (Table 4.0-1 and Figure 4.1-1). For the 2018 season, 15.9% (22 days) of the monitoring checks recorded juvenile eel numbers greater than 1,000 individuals (Table 4.0-1). Only two (1.4%) of the sample days recorded eel collection greater than 5,000 individuals.

4.2 Juvenile Eel Biological Data

Biological data (length, weight and condition factor) was recorded from biweekly subsamples. A total of 857 juvenile eels was collected from these biweekly subsamples (1.3% of total eels collected), during 38 of the 138 sample days (Table 4.2-1).

The average length of juvenile eels was 121.6 mm, with a median size of 120.0 mm (Table 4.2-1). The length of juvenile eels ranged from 84 – 173 mm. Twenty-seven juvenile eels measured less than 100 mm and no eels measured greater than 175 mm (Table 4.2-2). The average weight of juvenile eels was 2.0 grams (g), with a median weight of 2.0 g (Table 4.2-1). The weight of juvenile eels ranged from 0.5 – 4.8 g (Table 4.2-2). Over 85% of the 857 juvenile eels weighed between 1 – 3 g (Table 4.2-3).

Eels from each biweekly subsample were examined for external injuries. Individual condition factors, date, and detailed biological data for these are shown on Table 4.2-4. External injuries were noted on 2.2% (19 of 857 individuals) of the examined eels. Nearly all injuries were coded as a bruise, scrape, hemorrhage, or fungus. Six eels showed evidence of fungus, five of which were taken as sacrifices from a single subsample.

4.3 Eel Sacrifice and Internal Analysis

From each biweekly subsample, a portion of juvenile eels were retained and inspected for the presence of the swim bladder parasite (*Anguillicoloides crassus*) and examined for age determination. Roughly 11% (93 of the 857 individuals) were dissected for the parasite (Table 4.3-1 and Figure 4.3-1) and later examined for age (Table 4.3-2).

Of the 93 juvenile eels that were inspected for the parasite, 48 (51.6%) eels did not contain the swim bladder parasite (Table 4.3-1 and Figure 4.3-2). The other 45 (48.4%) eels contained the swim bladder parasite. The infected eels contained one, two, three, or four parasites per individual; 27, 10, 6, and 2 eels, respectively. Table 4.3-2 provides detailed information by length frequency (five mm interval groups) of the 93 sacrificed eels with information including weight, age, and number that were infected by the parasite. The average length of the sacrificed eels was 121.7 (range 84-156) mm, average weight of 2.0 (range 0.5-4.8) g, and average number of parasites 0.8 (range 0-4, Table 4.3-1).

Age of the juvenile eels was determined from 87 eels, 6 additional eel otoliths could not be read for aging. The 87 juvenile eels analyzed for age were determined to be 1 to 4 years old (Average age = 2.3, Table 4.3-1). Detailed information of the 87 sacrificed and aged eels is shown on Table 4.3-1. Of the 87 aged eels, 11 eels (12.6%) were 1 year old, 38 eels (56.3%) were aged 2 years old, 29 eels (33.3%) were aged 3 years old, and 9 eels (10.3%) were aged 4 years old. Age agreement between Normandeau biologists occurred 79.6% (74 of the 93 eels) of the time (Appendix B). The average length of the aged eels was 121.7 (range 84-156) mm, average weight of 2.0 (range 0.5-4.8) g, and average number of parasites 0.8 (range 0-4). Length frequency of aged eels with weights, parasites, and age data are found on Table 4.3-2.

4.4 Peak Periods of Eel Collections

The greatest percentage of juvenile eels was collected during Week 14 (July 29-August 4) when the facility collected 30.85% of the season total (20,965 individuals, Table 4.4-1 and Figure 4.4-1). Week 13 (July 22-28) and Week 3 (May 13-19), were the only other weeks when ≥ 10% of the season total was collected in a single week, 11.75% (7,986 individuals) and 10.12% (6,879 individuals), respectively. The majority (50.4%, 34,213 individuals) of the juvenile eels were caught during Weeks 13-15 (July 22 through August 11, Table 4.4-1 and Figure 4.4-1). The eel ramp also collected nearly 20% (13,322 individuals) during Weeks 2-3 (May 6-19).

Weeks 1, 4-5, 7-8, and 18-20 of sampling collected no greater than 1.0% of the season total, accounting for 1,979 individuals (2.91%) combined. Only 258 individuals (0.38%) were collected during the last three weeks of the season (Table 4.4-1 and Figure 4.4-1).

During the season, there was one larger peak period and one smaller peak period. The larger peak (July 26 – August 3, 9 days) yielded 26,304 of the 67,949 (38.7%) juvenile eels (Table 4.0-1). The smaller peak occurred between May 9 - 17 (9 days), accounting for 12,304 of the 67,949 (18.1%) juvenile eels collected at the facility. Nearly 57% (38,608 of the 67,949) of the juvenile eels collected at this facility occurred during these 18 days or approximately 13% of the sampling days.

4.5 Juvenile Eel Catch in Relation to Environmental Factors

See Appendix C for weekly averages of juvenile eel capture, river flow, lunar fraction, water temperature, and DO.

River Flow

River flow and juvenile eel catch appeared to be related during the 2018 season. Daily average river flow was taken from The United States Geological Survey (USGS) 01578310 Susquehanna River at Conowingo, MD gage located at Conowingo Dam (Table 4.5-1). The highest daily average river flow value per the USGS gage station occurred on July 26, 2018 (329,000 cubic feet per second, cfs,). Figure 4.5-1 depicts the high-water level of the Conowingo tailrace relative to the CECF during the peak of this high flow event. This single highest daily average river flow value occurred at the end of Week 13 of eel facility operation, just prior to some of the highest days of eel collection (Table 4.0-1). During periods of high flows (greater than station maximum unit discharge, 80,000 cfs), the juvenile American Eel capture at the CECF usually increases over the next few days. Figure 4.5-2 shows a general trend; as the river flow started to fall, an increase in the number of eels captured was observed, especially during Week 14 when the average daily river flow drastically decreased and the largest peak of eel collection occurred. However, comparing the individual catch data to the individual daily average river flow shows that the

majority of eels captured in Week 13 occurred during the peak of flow, then slightly decreased as the flow started to decrease and then drastically increased for the next five days (Tables 4.0-1 and 4.5-1 and Figure 4.5-2). The last two weeks of the sampling season (Weeks 19-20) had an increase in average weekly flows but represented the lowest weekly capture totals, aside from Week 1 which was the lowest week of eel capture. A slight decrease in river flow generally corresponded to increased juvenile eel collection except for Weeks 5 and 17 (Figure 4.5-2). The higher catch numbers during Week 3 of the study than the previous week may be a function of other variables (e.g., migration timing).

Lunar Fraction

Juvenile eel catch appeared to be correlated to lunar fraction (cycle) during the 2018 season. Full moon is equal to 1.0. During periods of lower lunar fraction (lunar fraction near 0.0), the juvenile eel catch at CECF tended to increase (Table 4.5-2 and Figure 4.5-3, U.S Naval Observatory website 2018). This increase in juvenile eel catch was most notable during Weeks 3, 11, and 15. However, the largest peak in abundance did not occur near the new moon (Table 4.5-2 and Figure 4.5-3). The lower illuminance during lower lunar fraction periods, (new moon) has been associated with increases in eel catch at eel traps (Welsh *et al*. 2015, and Schmidt *et al*. 2009).

Water Temperature

Water temperature and eel catch did not appear to be related this season. The first week and the last few days when average weekly temperatures were below or near 20.0° Celsius (C) corresponded with some of the lowest eel catches of the season (Table 4.5-3). Over the course of the study, the water temperature ranged from a high of 30.1°C during July to a low of 14.1°C during early May. (Table 4.5-3 and Figure 4.5-4).

Dissolved Oxygen

Dissolved oxygen (DO) and eel collection numbers did not appear to be related this season. With the additional aeration and diffused compressed oxygen supplied to each of the tanks for most of the season, no relationship between eel catch and dissolved oxygen values could be derived. Daily DO values in milligrams per Liter (mg/L) are presented in Table 4.5-4 and displayed in Figure 4.5-5.

4.6 Juvenile Eel Holding and Mortality

Of the 67,949 juvenile eels that were captured at this facility, 8 eels died in the collection tank (99.9% survival, Table 4.6-1). All mortalities from the collection tank were recorded over the course of the season, and were not attributed to a single event such as low DO or loss of water flow to holding tanks.

A total of 2,176 (3.02% mortality) juvenile eels died in holding (Table 4.6-1). On July 9, an estimated total of 1,700 juvenile eels were recovered dead from holding while transferring them to the transport vehicle. Some of these eels showed signs of fungus and individuals from a subsample of eels were examined. The eels had no obvious signs of injury, and roughly half contained the swim bladder parasite. During this occasion, none of the 986 eels in the collection tank that day were found dead, and there were 5,039 eels that remained in holding that were alive and free from fungus, which were ultimately transported upriver. Because of the unknown cause of mortality, this holding tank was drained, scrubbed clean, and left dewatered for a period of two weeks to kill any bacteria that may have been in this tank. On two other transport occasions (July 13 and August 12), 86 or more dead eels were observed upon removal from the holding tanks. The dates listed above coincided with some of the highest water temperatures recorded during the 2018 season. Eels collected at the CECF and the

Octoraro Creek eel facility were held together in the same holding tanks prior to transport, providing no opportunity to determine the source of these dead eels.

4.7 Juvenile Eel Transport and Mortality

See Table 4.7-1 for detailed information of transport and mortality data.

On March 26, 2018, Normandeau field crew collected 60 juvenile American Eels (< 200 mm) by back pack electroshocker from Stone Run, a tributary of Octoraro Creek near Rising Sun, Maryland. The following day, these 60 live juvenile American Eels were delivered to John Coll, a USFWS biologist at the Fish Health Center located at Lamar Fish Hatchery, Lamar, Pennsylvania for examination. No bacterial or viral pathogens of concern were detected in the 60 eels and the Fish Health Inspection Report is presented in Appendix D. An additional 60 eels were supplied to the SRBC on June 18, 2018 from the CECF for an "Eels in a classroom program".

All juvenile eels that were captured in the CECF at Conowingo Dam, plus any eels collected at the Octoraro Creek eel facility, were held for no longer than one week prior to transport. All eels were transported and released at designated locations in the Susquehanna River watershed (Figure 4.7-1). A total of 69,815 juvenile eels were transported upstream (Table 4.6-1 and 4.7-1).

Eels were transported to West Fairview Access, Fort Hunter Access, and City Island Boat Ramp. Total elapsed time of transport from the holding facility at Conowingo Dam to each stocking location varied between trips. Eel transports from the CECF to West Fairview Access (Site 5), Fort Hunter Access (Site 6), and City Island Boat Ramp (Site 12) were completed in approximately two and a half hours (± 30 minutes).

Of the 22,592 eels that were transported to West Fairview Access (Site 5), 22,586 eels were stocked (Table 4.6-1 and Figure 4.7-2). This location was stocked eleven times from May 10 to August 12. Detailed data from each of the transports is found on Table 4.7-1.

Of the 22,352 eels that were transported to Fort Hunter Access (Site 6), 22,348 eels were stocked (Table 4.6-1 and Figure 4.7-3). This location was stocked thirteen times from May 24 to September 15. Detailed data from each of the transports is found on Table 4.7-1.

Of the 24,871 eels that were transported to City Island Boat Ramp (Site 12), 24,869 eels were stocked (Table 4.6-1 and Figure 4.7-4). This location was stocked eight times from May 17 to September 10. Detailed data from each of the transports is found on Table 4.7-1.

Mortality

Mortality during transport trips from the CECF at Conowingo Dam totaled 12 eels (0.02%, 12 of 69,815, Table 4.6-1). Six eels died (0.03%, 6 of 22,592 eels) during transports from the CECF to West Fairview Access (Site 5). Four eels (0.02%, 4 of 22,352) died during transports to Fort Hunter Access (Site 6). Only two eels (0.01%, 2 of 24,871) died during transports to City Island Boat Ramp (Site 12).

5 Quality Assurance/Quality Control Activities

Since the CECF is a relatively new facility, it still requires oversight to ensure its reliability and effectiveness. The shade cloth over the rip-rap on the shoreline below the entrance of the ramp was a major help in deterring birds and animals from preying on juvenile eels as they ascended the wetted substrate, but did not hinder the collection of eels during periods of extreme high flows in 2018. The alarm systems were useful, but required debugging and troubleshooting throughout the season to prevent excessive notifications and/or false alarms. Supplemental aeration from the bubblers and the compressed oxygen diffusers was a great asset during times of low DO levels in the water supply line from the forebay. The total attraction flow of the facility varied throughout the season dependent upon which tanks were in-service, but an attraction flow was always being discharged down the ramp and shoreline. Attraction flows were set between 50 and 80 gallons per minutes (gpm), slightly higher than last year. The hardiness of this species and its ability to adjust to parameters outside of those developed for this facility was evidenced by the numbers captured here. Future testing and adjustments to this facility will continue to be investigated in future years.

The area below the ramp entrance was covered with a shade cloth to about the normal high water tailrace elevation to protect the juvenile eels when ascending the attraction flow over/through the rip-rap shoreline. Small areas had to be filled in or secured to keep small birds from climbing under the cloth during the first month of the season. The transition from the ramp to the rip-rap was inspected periodically to insure a smooth transition for eels climbing the substrate. The entire ramp was covered with a sheet of aluminum to protect the juvenile eels while climbing.

The area over the collection tank, holding tanks, and hoses is partially shaded by a scaffold frame and shade cloth. The tanks were covered with a sheet of Lexan with weather stripping attached to prevent large-scale insect hatches from clogging the screened drains. No indications were observed of animals attempting to enter any of the tanks during the season.

The control panel to the CECF provided an instantaneous readout of DO and water temperature and connected to the flow meters for all of the tanks and fill lines. When a one minute average was outside the range of specification, an alarm would be sent to the control room, followed ten minutes later by an alarm sent to Normandeau via a text or e-mail message. The alarm to the control room would be a general alarm but the alarm to Normandeau was a detailed message about the alarm. Conowingo operations handled most of the alarms with guidance from Normandeau. Periodically throughout the season, low flow alarms were frequent. Slight adjustments made to the gravity feed line to adjust the pressure within the pipe to obtain a constant water flow into the tanks resolved this issue.

Continuous water temperature and DO readings were taken from each tank in use. A linear piston blower and blower box controlled the air supplied to the collection and holding tank #1 through a manifold, while the other blower and blower box controlled air to holding tanks #2 and #3. An air pump was in service constantly throughout the season for all tanks that were in-service. Compressed bottled oxygen (125 cubic feet) was also supplied to each of the tanks. As with the air blower, an oxygen manifold was used for the collection and holding tank #1, while another oxygen manifold controlled holding tanks #2 and #3. After Mid-May, the compressed oxygen was used for every tank in-service. Both the air blower manifold and the oxygen manifold were attached to a diffuser by a 6 mm hose. Each tank had one air blower fine pore diffuser and an oxygen micro pore diffuser. These diffusers laid flat on the tank bottom to insure that the full length of the diffuser was expelling bubbles. The micro pore diffusers reduced the amount of oxygen required to supply the tanks with sufficient oxygen levels. A 125

cubic foot bottle of oxygen connected to a micro pore diffuser lasted nearly five days, when adjusted properly for two tanks.

Cleaning and calibration activities were conducted at least weekly during the season. Operating ranges of flow, dissolved oxygen, and water temperature specifications for the CECF is located on Table 5.0-1. The collection tank and screened drain were scrubbed after eels were removed daily, whereas the holding tanks and overflow drain were scrubbed every time the eels were removed for transport. Holding tanks remained empty after dewatering and removing eels for transport until the following day. Dissolved oxygen probes were cleaned regularly. The overflow tank was cleaned periodically. With the gravity feed line from the forebay, the amount of algae was minimal but cleaning was still performed. Quality control checks were also performed on the volumetric eel count estimates.

Calibration of the ramp flow was executed each week after cleaning, using a 19-L graduated bucket. Multiple locations of the facility were checked for calibration purposes - the spray bar, the collection tank fill and drain, scent line, and the drains of each of the holding tanks that were in service. Some of the water from the spray bar that was not used for attracting eels up the ramp but used to help slide eels into the collection tank was identified as the backside of ramp flow. The backside of ramp flow was calculated by adding the scent line to the collection tank drain and subtracting the collection tank fill. The attraction flow at the top of the ramp (top attraction) was calculated by subtracting the backside of ramp flow from the spray bar amount. Bottom of ramp attraction is a sum of the collection tank drain and the drains of the in-service holding tanks. Total attraction flow is equal to the collection tank fill, the spray bar and the drains of the holding tanks. Details and calibration records are listed in Table 5.0-2.

Actual eel counts were compared to volumetric eel estimates to determine accuracy of the volumetric estimates. A quality control comparison on estimates occurred twice during the 2018 season: May 13 and July 29. The detailed estimates for juvenile eels per 200 milliliter (mL), displacement, total estimated, and actual counts are in Table 5.0-3. With only a small difference observed between estimates and actual counts (1.6%), no further changes to this method are required.

6 Conclusions and Discussion

The CECF at Conowingo Dam has one Enkamat substrate ramp compared to the Octoraro Creek eel facility which contains one Enkamat substrate and one Milieu substrate ramp. Both ramps operated simultaneously (May 1 – September 15). Conowingo's facility captured 67,949 eels compared to the Octoraro Creek eel facility that captured 4,203 juvenile eels during the 2018 season. With both ramps operating simultaneously, the CECF at Conowingo Dam captured approximately sixteen times the number of eels collected by the Octoraro Creek facility. During the season, the size range of the juvenile eels caught at the CECF at Conowingo Dam facility was 84-173 mm with an average length of 121.6 mm, compared to the size range of 78-192 mm with an average size of 122.3 mm observed in 2017 (Normandeau Associates and Gomez and Sullivan 2018). The size of the juvenile eels caught in the ramp with the Enkamat substrate at the Octoraro Creek eel facility was similar with a size range of 100-178 mm and an average length of 135 mm (Normandeau Associates 2018). Juvenile eels that were captured using the Milieu substrate were larger (average size 149 mm), but this substrate did not capture any eels under 114 mm and captured eels as large as 259 mm. Overall, the ramps at the Octoraro Creek eel facility collected a wider size range of eels, but the CECF at Conowingo Dam collected much smaller eels.

Most environmental factors aside from lunar fraction and river flow did not appear to have a measurable effect on the number of eels collected in 2018. The highest daily average river flow value per the USGS gage station occurred on July 26, 2018 (329,000 cfs) and the lowest daily average river flow occurred on July 20, 2018 (11,100 cfs). The highest and lowest daily river flow occurred within 6 days of each other, with the largest peak of eel collection occurring just after the high flow event. The discharge at Conowingo Dam can change hourly, sometimes quicker, depending on energy demand, and may not be a good metric to use to compare eel collection numbers in a given season. The dissolved oxygen is augmented by air pumps and compressed oxygen injected into the tanks. The lower lunar fraction is one environmental factor typically showing the greatest relationship to the number of eels collected, but in 2018, the largest peak of eels collected at Conowingo Dam was during a period of greater lunar fraction. However, periods of low light (near new moon) typically have a significantly higher collection of juvenile eels than those periods of higher illumination. Weekly comparison between number of eels captured and environmental factors for 2017 and 2018 are in Appendix C.

The daily operation of the CECF and the set-up of the facility including the shade cloth over the holding and collection tanks, and the shade cloth over the rip-rap near the entrance of the ramp will remain the same in 2019 as it was in 2018.

Mortality from collection, holding, and transport was below the 5% maximum value mandated for the facility. A way to minimize mortality at the CECF is to perform the following actions:

- Transport eels between June 15 and September 1 at least twice a week;
- When excessive air temperature are forecasted to be above 32 °C for three straight days and water temperature approximately 29 °C daily transports will be instituted;
- Ensure proper water flow and dissolved oxygen levels are maintained.

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8 Tables and Figures

Table 4.0-1: Number of Juvenile Eel Caught Daily, Conowingo Eel Collection Facility, 2018

Date	Number of Eels
5/1/2018	0
5/2/2018	0
5/3/2018	0
5/4/2018	1
5/5/2018	6
5/6/2018	14
5/7/2018	117
5/8/2018	509
5/9/2018	980
5/10/2018	1303
5/11/2018	*1904*
5/12/2018	*1616*
5/13/2018 *	*1742*
5/14/2018	*1406*
5/15/2018	*1518*
5/16/2018	*891*
5/17/2018	*944*
5/18/2018	241
5/19/2018	137
5/20/2018	46
5/21/2018	40
5/22/2018	5
5/23/2018	6
5/24/2018	57
5/25/2018	29
5/26/2018	14
5/27/2018	41
5/28/2018	56
5/29/2018	36
5/30/2018	47
5/31/2018	38
6/1/2018	102
6/2/2018	78
6/3/2018	90
6/4/2018	120
6/5/2018	103
6/6/2018	152
6/7/2018	437
6/8/2018	82
6/9/2018	332
6/10/2018	83
6/11/2018	22
6/12/2018	66
6/13/2018	97
6/14/2018	94
6/15/2018	45
6/16/2018	55
6/17/2018	121
6/18/2018	55
6/19/2018	54
6/20/2018	119
6/21/2018	111
6/22/2018	146
6/23/2018	51
6/24/2018	65
6/25/2018	111
6/26/2018	163
6/27/2018	267
6/28/2018	182
6/29/2018	51
6/30/2018	238
7/1/2018	737
7/2/2018	515
7/3/2018	262
7/4/2018	276
7/5/2018	608
7/6/2018	1656
7/7/2018	*1966*
7/8/2018	*1255*
7/9/2018	*986*
7/10/2018	*576*
7/11/2018	109
7/12/2018	141
7/13/2018	69
7/14/2018	39
7/15/2018	55
7/16/2018	69
7/17/2018	16
7/18/2018	39
7/19/2018	27
7/20/2018	606
7/21/2018	217
7/22/2018	238
7/23/2018	229
7/24/2018	269
7/25/2018	*1027*
7/26/2018	*2921*
7/27/2018	*2872*
7/28/2018	*430*
7/29/2018 *	*748*
7/30/2018	***5572***
7/31/2018	*4305*
8/1/2018	***5204***
8/2/2018	*2181*
8/3/2018	*2071*
8/4/2018	*884*
8/5/2018	799
8/6/2018	318
8/7/2018	335
8/8/2018	666
8/9/2018	352
8/10/2018	1056
8/11/2018	*1736*
8/12/2018	1194
8/13/2018	970
8/14/2018	150
8/15/2018	114
8/16/2018	177
8/17/2018	335
8/18/2018	*1008*
8/19/2018	*1204*
8/20/2018	373
8/21/2018	77
8/22/2018	30
8/23/2018	19
8/24/2018	24
8/25/2018	143
8/26/2018	39
8/27/2018	11
8/28/2018	18
8/29/2018	19
8/30/2018	39
8/31/2018	28
9/1/2018	11
9/2/2018	13
9/3/2018	9
9/4/2018	12
9/5/2018	1
9/6/2018	5
9/7/2018	15
9/8/2018	18
9/9/2018	9
9/10/2018	3
9/11/2018	3
9/12/2018	0
9/13/2018	2
9/14/2018	0
9/15/2018	3
TOTAL	67949

Volumetric estimates are in Italics
Bolded numbers are peak days

The peak periods are shown in boxes
* QC checks

Table 4.2-1: Number of Juvenile Eel Captured and Length and Weight Measurements, Conowingo Eel Collection Facility, 2018

	Total
Number eels collected	67,949
Number measured	857
Data Collection Days	38
Range of lengths (mm)	84-173
Average length (mm)	121.6
Median length (mm)	120.0
Range of weights (g)	0.5-4.8
Average weight (g)	2.0
Median weight (g)	2.0

Table 4.2-2: Juvenile Eel Length Frequency, Conowingo Eel Collection Facility, 2018

TL (mm)	Number
80-84	1
85-89	1
90-94	9
95-99	16
100-104	43
105-109	97
110-114	115
115-119	135
120-124	106
125-129	90
130-134	75
135-139	71
140-144	48
145-149	30
150-154	12
155-159	4
160-164	2
165-169	-
170-174	2
Total	**857**

Table 4.2-3: Juvenile Eel Weight Frequency, Conowingo Eel Collection Facility, 2018

Weight (g)	Number
0.5-0.9	11
1.0-1.4	153
1.5-1.9	247
2.0-2.4	184
2.5-2.9	147
3.0-3.4	79
3.5-3.9	28
4.0-4.4	6
4.5-5.0	2
Total	**857**

Table 4.2-4: Observed Injuries of Juvenile American Eels, Conowingo Eel Collection Facility, 2018

Date	Length	Weight	Condition Factor
5/17/2018	138	3.0	Scratch on tail
5/25/2018	127	2.0	Lesion on ventral side
5/28/2018	123	2.0	Scratch on mid-body *
6/15/2018	117	2.0	Scratch on back
6/15/2018	119	2.0	Scratch on side
6/22/2018	123	1.5	Scratch on right side
6/29/2018	130	2.5	Bruise behind head
7/2/2018	116	2.0	Scratch on side
7/9/2018	97	1.0	Fungus on tail
	126	2.0	Bruise on back
	125	1.5	Scratch on mid-body
7/23/2018	123	2.0	Bruise on back *
8/14/2018	129	2.6	Fungus *
	119	2.6	Fungus *
	143	3.2	Fungus *
	146	3.5	Fungus *
	156	4.2	Fungus *
8/26/2018	117	1.5	Off color near gills (reddish) *
9/15/2018	112	1.6	Off color near gills (reddish)

* Taken as a sacrifice

19 of 857 eels (2.2%) that were processed had injury

8 of the 19 were sacrificed (42.1%)

3 of the 8 that were sacrificed contained 1 or 2 parasites,

These occurred on: 5/28/2018
8/14/2018
8/14/2018

Table 4.3-1: Sacrificed Eel Data, Conowingo Eel Collection Facility, 2018

Date	Length (mm)	Weight (g)	Parasite	Age	Date	Length (mm)	Weight (g)	Parasite	Age
5/7/2018	106	1.5	0	2	7/23/2018	94	0.5	2	1
	133	2.5	1	3		113	1	1	2
	119	1.5	0	2		136	3	0	3
	124	2.5	2	NR		143	4	0	3
	130	2.0	0	3		123	2	0	2
5/14/2018	134	2.5	0	4	7/30/2018	128	2.5	0	2
	126	2.5	1	3		111	1.5	0	2
	110	2.0	0	2		107	1.5	1	2
	146	3.0	2	3		109	1	2	2
	96	1.5	0	1		115	1.5	1	2
5/21/2018	141	3.0	0	3	8/6/2018	135	2.6	1	3
	150	3.5	0	4		146	3.6	3	3
	134	3.0	1	3		122	1.6	0	3
	126	2.0	0	NR		151	3.2	1	4
	111	2.0	0	2		130	1.9	0	4
5/28/2018	109	2.5	0	2	8/14/2018	127	2.6	1	2
	123	1.0	1	3		119	2.2	2	3
	134	2.0	0	3		143	3.2	0	3
	147	3.0	0	4		146	3.5	0	4
	114	3.5	2	2		156	4.2	0	4
6/4/2018	122	1.5	0	2	8/21/2018	108	1.1	3	2
	139	2.5	0	3		137	3.1	0	3
	144	3.5	0	2		151	4.8	1	4
	117	2.0	1	2		140	2.6	1	NR
	105	1.5	0	2		124	2	1	2
6/11/2018	105	1	0	2	8/27/2018	123	2.7	1	3
	121	1.5	1	2		117	1.5	0	2
	135	2.5	0	3		107	1.1	1	NR
	99	1	2	1		120	1.1	1	2
	94	1	0	NR		145	2.7	0	4

Table 4.3-1. (Continued

Date	Length (mm)	Weight (g)	Parasite	Age	Date	Length (mm)	Weight (g)	Parasite	Age
6/18/2018	133	2.5	0	2	9/3/2018	94	0.6	1	NR
	148	3.5	1	3		127	2.4	1	3
	109	1.5	0	3		101	1.1	2	2
	99	1	0	2		115	1.5	0	2
	113	1.5	1	2		120	1.3	2	2
6/25/2018	145	2.5	1	3	9/11/2018	84	0.8	4	1
	120	1.5	1	2		92	0.5	4	1
	147	2.5	0	3		122	1.8	3	2
	115	1.5	3	2	**Avg.**	**121.7**	**2.0**	**0.8**	**2.3**
	120	1.5	0	3	**Range**	**84-156**	**0.5-4.8**	**0-4**	**1-4**
7/2/2018	126	2	0	2					
	98	1	1	1	Total Sacrificed		93		
	118	2.5	0	2	Total Aged		87		
	107	1.5	1	2					
	130	2.5	3	3	0 Parasites		48 (51.6%)		
7/5/2018	111	1	0	2	1 Parasite		27 (29.0%)		
	131	2.5	0	3	2 Parasites		10 (10.8%)		
	104	1	0	1	3 Parasites		6 (6.5%)		
	95	1	2	1	4 Parasites		2 (2.2%)		
	130	2.5	0	2					
7/16/2018	122	1.5	0	3	Eels without parasites		48 (51.6%)		
	105	1	1	1	Eels with parasites		45 (48.4%)		
	133	2.5	3	3					
	88	0.5	0	1	NR – age could not be determined				
	94	0.5	0	1					

Table 4.3-2: Sacrificed Eels Length Frequency with Detailed Info, Conowingo Eel Collection Facility, 2018

TL (mm)	Weight (g)	Number	Contained Parasite	Age
80-84	0.8	1	1	1
85-89	0.5	1	0	1
90-94	0.5-1.0	5	3	NR,NR,1,1,1
95-99	0.5-1.0	5	3	1,1,1,1,2
100-104	1-1.1	2	1	1,2
105-109	1-2.5	11	6	NR,1,2,2,2,2,2,2,2,2,3
110-114	1-3.5	7	3	2,2,2,2,2,2,2
115-119	1.5-2.5	8	4	2,2,2,2,2,2,2,3
120-124	1.0-2.7	14	9	NR,2,2,2,2,2,2,2,2,3,3,3,3,3
125-129	2.0-2.6	6	3	NR,2,2,2,3,3
130-134	1.9-3.0	11	4	2,2,3,3,3,3,3,3,3,4,4
135-139	2.5-3.1	5	1	3,3,3,3,3
140-144	2.6-4.0	5	1	NR,2,3,3,3
145-149	2.5-3.6	8	4	3,3,3,3,3,4,4,4
150-154	3.2-4.8	3	2	4,4,4
155-159	4.2	1	0	4
160-164		-		
165-169		-		
170-174		-		
Total		**93**	**45**	

Table 4.4-1: Juvenile Eel Collection by Week and Ranks, Conowingo Eel Collection Facility, 2018

	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10
Total	7	6443	6879	197	398	1316	462	657	1077	6020
Rank	20	4	3	16	15	10	14	13	11	5
Percent Catch (%)	0.01	9.48	10.12	0.29	0.59	1.94	0.68	0.97	1.59	8.86

	Wk 11	Wk 12	Wk 13	Wk 14	Wk 15	Wk 16	Wk 17	Wk 18	Wk 19	Wk 20
Total	3175	1029	7986	20965	5262	3948	1870	165	73	20
Rank	8	12	2	1	6	7	9	17	18	19
Percent Catch (%)	4.67	1.51	11.75	30.85	7.74	5.81	2.75	0.24	0.11	0.03

Top 3 ranked weeks are shown in boxes.

Wk 1: May 1 - May 5
Wk 2: May 6 - May 12
Wk 3: May 13 - May 19
Wk 4: May 20 - May 26
Wk 5: May 27 - June 2
Wk 6: June 3 - June 9
Wk 7: June 10 - June 16
Wk 8: June 17 - June 23
Wk 9: June 24 - June 30
Wk 10: July 1 - July 7
Wk 11: July 8 - July 14
Wk 12: July 15 - July 21
Wk 13: July 22 - July 28
Wk 14: July 29 - August 4
Wk 15: August 5 - August 11
Wk 16: August 12 - August 18
Wk 17: August 19 - August 25
Wk 18: August 26 - September 1
Wk 19: September 2 - September 8
Wk 20: September 9 - September 15

Table 4.5-1: USGS 01578310 - Conowingo Dam USGS Gage Station, 2018

Day	May	June	July	August	September
1	58,600	48,700	26,400	75,400	41,500
2	52,700	49,800	36,500	66,400	29,800
3	47,500	43,500	22,600	75,200	30,600
4	46,700	45,700	20,100	99,900	29,900
5	40,600	39,100	21,000	135,000	25,900
6	29,700	34,900	25,000	104,000	24,800
7	41,400	30,800	19,700	75,700	24,900
8	43,100	30,700	21,500	69,900	25,100
9	43,700	27,900	32,700	52,600	35,800
10	46,200	29,500	25,700	53,500	71,800
11	38,100	30,600	15,300	37,600	118,000
12	30,800	58,500	14,000	52,200	238,000
13	39,600	55,200	13,500	70,700	222,000
14	58,600	52,300	12,500	104,000	166,000
15	90,900	24,800	13,300	176,000	128,000
16	93,400	28,300	13,700	212,000	
17	95,000	25,600	14,600	175,000	
18	111,000	43,500	20,300	101,000	
19	99,200	24,600	12,100	78,900	
20	101,000	26,000	11,100	76,600	
21	100,000	11,700	12,000	68,600	
22	80,600	24,700	21,600	77,500	
23	78,000	22,400	*	68,000	
24	127,000	21,000	*	53,200	
25	123,000	27,900	234,000	35,600	
26	89,700	26,700	**329,000**	45,200	
27	68,300	19,000	286,000	47,400	
28	60,100	20,900	171,000	32,300	
29	55,100	32,300	114,000	37,100	
30	53,200	29,400	93,900	22,700	
31	48,400		65,300	28,500	

Bolded value represents the highest average river flow
* equipment failure
Daily average river flows are represented in cubic feet per second (cfs)

Table 4.5-2: Fraction of Moon Illumination, 2018 EST (*1.0 equals full moon*)

Day	May	June	July	August	September
1	0.98	0.94	0.92	0.83	0.70
2	0.95	0.88	0.86	0.75	0.60
3	0.90	0.82	0.79	0.66	0.49
4	0.84	0.74	0.71	0.56	0.38
5	0.76	0.65	0.61	0.45	0.27
6	0.68	0.56	0.51	0.34	0.17
7	0.58	0.46	0.41	0.24	0.09
8	0.49	0.36	0.31	0.15	0.03
9	0.39	0.26	0.21	0.07	0.00
10	0.30	0.17	0.12	0.02	0.00
11	0.21	0.10	0.06	0.00	0.03
12	0.13	0.04	0.01	0.01	0.08
13	0.07	0.01	0.00	0.05	0.15
14	0.02	0.00	0.02	0.11	0.24
15	0.00	0.03	0.07	0.19	0.33
16	0.01	0.08	0.14	0.29	
17	0.04	0.16	0.23	0.39	
18	0.10	0.26	0.33	0.49	
19	0.19	0.36	0.44	0.59	
20	0.28	0.47	0.54	0.68	
21	0.39	0.58	0.64	0.77	
22	0.51	0.68	0.73	0.84	
23	0.62	0.78	0.82	0.91	
24	0.72	0.85	0.88	0.95	
25	0.81	0.92	0.94	0.98	
26	0.88	0.96	0.98	1.00	
27	0.94	0.99	1.00	0.99	
28	0.98	1.00	1.00	0.97	
29	1.00	0.99	0.98	0.93	
30	1.00	0.96	0.95	0.87	
31	0.97		0.90	0.79	

Table 4.5-3: Water Temperature (°C) Taken in Collection Tank, Conowingo Eel Collection Facility, 2018

Day	May	June	July	August	September
1	14.1	21.8	25.9	23.7	26.9
2	14.4	22.9	26.4	23.9	26.4
3	14.6	23.5	27.0	24.4	26.9
4	15.6	23.1	27.4	24.5	26.7
5	17.4	23.1	28.3	24.2	27.4
6	17.5	23.2	29.0	24.4	26.6
7	19.0	23.2	30.1	24.4	27.1
8	18.8	23.2	29.4	25.7	27.2
9	20.8	22.9	29.5	26.0	26.6
10	19.8	22.7	29.5	26.5	25.3
11	19.9	23.5	29.7	26.5	23.7
12	20.4	22.8	29.7	27.3	19.2
13	20.8	23.2	29.3	28.0	18.2
14	20.3	23.8	29.1	26.5	18.4
15	20.3	22.7	29.0	26.1	19.0
16	19.1	22.8	29.4	23.0	
17	18.9	23.8	29.3	22.7	
18	17.9	23.9	29.3	22.9	
19	17.0	23.7	30.0	23.2	
20	17.1	24.8	29.7	23.5	
21	17.4	24.8	29.2	23.5	
22	17.9	25.6	28.6	23.3	
23	19.3	25.8	28.3	23.5	
24	19.4	25.9	26.6	23.5	
25	19.4	25.9	24.0	23.7	
26	19.2	26.6	22.6	24.3	
27	20.2	26.1	21.7	24.8	
28	20.7	26.0	21.7	24.5	
29	21.6	25.6	22.0	25.0	
30	21.8	26.2	22.7	25.5	
31	21.7		23.1	25.9	

Table 4.5-4: Dissolved Oxygen (mg/L) Reading Taken in Collection Tank, Conowingo Eel Collection Facility, 2018

Day	May	June	July	August	September
1	11.80	8.14	6.51	9.96	11.35
2	12.22	7.68	9.56	8.95	9.80
3	12.30	7.65	8.69	12.04	9.00
4	12.14	8.06	7.76	12.60	8.60
5	11.00	7.30	5.40	9.70	6.90
6	10.60	7.56	11.05	10.11	8.60
7	10.00	8.56	13.80	9.90	6.42
8	9.64	8.60	11.70	8.89	6.74
9	9.36	8.10	6.07	14.96	7.19
10	9.86	8.66	8.40	8.35	7.55
11	9.70	8.97	7.15	8.01	8.30
12	9.26	8.29	10.50	8.31	11.12
13	8.92	8.00	9.23	9.55	11.44
14	9.01	8.84	8.31	9.98	11.50
15	8.72	9.13	6.48	9.90	11.30
16	9.50	9.94	6.89	13.90	
17	9.38	10.10	8.25	13.30	
18	9.90	10.07	8.39	11.70	
19	10.11	11.54	8.60	11.46	
20	10.20	11.94	9.12	11.00	
21	10.19	8.20	7.60	10.70	
22	9.69	7.93	9.79	9.30	
23	9.44	9.15	9.40	9.52	
24	9.26	8.71	10.30	12.50	
25	8.24	8.65	11.51	9.72	
26	9.12	9.37	10.80	10.05	
27	8.80	7.23	12.90	12.03	
28	8.47	8.92	11.80	10.44	
29	8.70	7.42	12.10	10.50	
30	8.35	6.99	12.38	13.08	
31	8.18		8.82	10.55	

Table 4.6-1: Eel Transport/Stocking Data, 2018

Location of stocking	Number of eels	Died (Mortality)			Removed for Analysis	Removed for SRBC	Number Stocked
		Collection Tank	Holding Tank	Transported			
Octoraro Creek Collection tanks	4,203	0 (0.00%)					
Transported to Conowingo Eel Collection Facility	4,203			0 (0.00%)			4,203
Conowingo Collection tank	67,949	8 (0.01%)	**2,176 *(3.02%)***		93	60	65,612
Total Transported from Conowingo Eel Collection Facility	69,815			12 (0.02%)			69,803
Stocked at West Fairview (Site 5)	22,592			6 (0.03%)			22,586
Stocked at Fort Hunter (Site 6)**	22,352			4 (0.02%)			22,348
Stocked at City Island (Site 12)***	24,871			2 (0.061%)			24,869
TOTAL Transported #	69,815			12 (0.02%)			69,803

Bolded value is assumed as worst case, could be eels from Octoraro or Conowingo

* Transported to West Fairview (Site 5) (May 10 and 30, July 3, 13, 16, 20, 23, and 27, August 3, 7, and 12)

** Transported to Fort Hunter (Site 6) (May 24, June 7, 13, 21, and 27, July 9 ad 30, August 3, 14, 28, and 31, September 7 and 15)

*** Transported to City Island (Site 12) (May 17, July 31, August 10, 17, 20, and 24, September 4 and 10)

Some eels were counted twice if they were transported to and from the Conowingo Eel Collection Facility

Table 4.7-1: Detailed Individual Eel Transport Data, 2018

Transport to West Fairview (Site 5)

Date	Number of eels stocked	Holding Facility			Loaded for Transport			Prior to Unloading			Stocking site	
		Time	Temp	DO	Time	Temp	DO	Time	Temp	DO	Temp	DO
5/10	2,949	1120	19.7	9.4	1220	20.0	8.5	1535	21.0	9.3	20.3	9.6
5/30	311	741	21.9	7.8	830	22.2	9.8	1100	22.4	14.1	22.3	7.5
7/3	1,978	820	26.8	8.5	855	27.6	7.0	1110	28.2	22.4	28.3	7.3
7/13	803	801	29.3	8.8	925	29.0	12.4	1201	29.6	18.2	26.8	9.7
7/16	158	1015	29.4	8.0	1045	29.5	23.5	1340	29.8	8.6	30.0	12.3
7/20	699	807	29.6	10.1	910	29.2	12.1	1140	29.6	6.5	26.0	9.5
7/23	701	1020	28.3	10.0	1045	28.6	14.0	1245	28.0	15.0	21.0	9.0
7/27	7,504	945	2.6	11.4	1124	22.0	5.5	1324	22.5	9.0	21.8	7.4
8/3	2,092	1020	24.4	12.0	1115	24.7	15.2	1430	25.0	11.8	22.0	8.1
8/7	2,637	815	24.4	8.9	910	25.2	9.7	1123	26.2	13.7	23.9	7.6
8/12	2,754	950	27.2	11.5	1025	27.2	9.1	1210	27.5	13.1	25.0	6.6
Total	**22,586**											

Transport to Fort Hunter (Site 6)

Date	Number of eels stocked	Holding Facility			Loaded for Transport			Prior to Unloading			Stocking site	
		Time	Temp	DO	Time	Temp	DO	Time	Temp	DO	Temp	DO
5/24	705	948	19.6	9.2	955	19.7	7.7	1147	20.7	15.6	18.4	6.3
6/7	1,482	950	23.3	7.7	1015	23.5	7.8	1220	23.8	15.8	24.2	5.9
6/13	799	900	23.2	6.4	945	23.6	9.6	1140	23.2	15.9	19.3	9.0
6/21	605	920	25.0	7.9	933	25.0	6.7	1217	25.0	8.7	25.5	7.0
6/27	790	940	25.9	8.4	955	26.1	9.5	1245	25.7	15.4	23.6	8.0
7/9	5,039	850	29.2	14.0	1015	29.5	12.6	1206	29.5	18.7	25.5	9.0
7/30	4,089	951	22.7	12.4	1040	22.9	14.4	1250	23.7	16.4	21.2	7.9
8/3	7,381	1020	24.5	9.5	1115	24.5	16.6	1355	24.8	6.8	22.6	8.9
8/14	1,102	1040	26.3	8.8	1100	26.3	8.7	1230	26.7	9.0	24.8	7.3
8/28	210	855	24.4	9.4	935	25.1	5.6	1136	25.4	16.5	25.2	5.7
8/31	86	900	25.7	10.7	940	25.7	7.7	1137	25.8	8.7	26.0	6.2
9/7	47	1000	27.0	6.3	1048	25.3	8.1	1238	26.8	7.6	27.3	8.0
9/15	13	939	18.8	12.2	1025	20.8	9.7	1225	20.8	10.0	19.8	6.6
Total	**22,348**											

Table 4.7-1 (Continued)

Transport to City Island (Site 12)

Date	Number of eels stocked	Holding Facility			Loaded for Transport			Prior to Unloading			Stocking site	
		Time	Temp	DO	Time	Temp	DO	Time	Temp	DO	Temp	DO
5/17	11,998	1100	19.0	8.6	1200	17.9	10.2	1415	18.5	9.1	16.5	9.1
7/31	6,977	1015	23.1	8.8	1102	23.1	10.3	1400	21.9	7.5	21.8	7.5
8/10	2,113	900	26.5	10.1	950	26.6	7.7	1143	27.2	10.5	25.2	7.6
8/17	623	950	22.5	13.4	956	24.5	12.7	1155	24.8	18.0	21.5	9.3
8/20	2,825	1000	23.4	10.9	1015	23.5	10.0	1225	23.5	21.1	21.7	8.3
8/24	203	801	23.4	11.0	930	23.5	8.9	1120	23.2	10.7	23.3	6.1
9/4	86	853	26.5	8.3	1001	26.2	15.6	1135	26.3	13.6	29.1	5.4
9/10	44	819	24.0	9.6	846	23.4	6.5	1030	19.3	7.4	18.9	6.3
Total	**24,869**											

Table 5.0-1: Specified operating range of Conowingo Eel Collection Facility, 2018

	Main flow	Collection Tank	Holding tank
Flow (GPM)	5 - 150	5 - 25	5 - 40
Dissolved Oxygen (mg/L)	5 - 20	5 - 20	5 - 20
Temperature (°C)	10 - 32	10 - 32	10 - 32

Table 5.0-2: Calibration of Flows (Gallons per Minute), Conowingo Eel Collection Facility, 2018

	Date									
	5/4	**5/11**	**5/18**	**5/23**	**5/29**	**6/6**	**6/14**	**6/20**	**6/28**	**7/6**
Collection Tank Fill	16.2	17.2	10.5	16.5	15.0	15.0	13.2	15.6	12.6	11.4
Collection Tank Drain	15.6	16.8	13.2	16.2	15.0	15.0	13.5	15.0	14.4	12.6
Holding Tank #1 Drain			24.6	29.0	21.0	27.0	27.0	25.5	22.2	22.2
Holding Tank #2 Drain	27.0	30.0	17.1	32.5					10.8	16.2
Holding Tank #3 Drain										
Spray Bar	4.8	7.2	7.8	8.7	8.1	8.4	8.7	7.8	7.8	8.4
Scent line	1.5	2.0	1.2	2.0	1.8	1.9	1.8	2.0	1.6	1.9
Backside of Ramp	0.9	1.6	3.9	1.7	1.8	1.9	2.1	1.4	3.4	3.1
Top Attraction	3.9	5.6	3.9	7.1	6.4	6.5	6.7	6.4	4.5	5.3
Bottom of Ramp Attraction	42.6	46.8	54.9	77.7	36.0	42.0	40.5	40.5	47.4	51.0
Total Attraction	**48.0**	**54.4**	**60.0**	**86.7**	**44.1**	**50.4**	**48.9**	**48.9**	**53.4**	**58.2**

	Date									
	7/12	**7/18**	**7/24**	**8/1**	**8/9**	**8/16**	**8/22**	**8/29**	**9/5**	**9/11**
Collection Tank Fill	15.0	13.5	13.8	13.5	16.5	12.0	13.5	10.8	10.8	18.0
Collection Tank Drain	14.4	13.8	14.7	14.4	15.3	12.0	12.6	14.4	10.8	18.0
Holding Tank #1 Drain	12.0	13.8	13.5	13.5	14.7		14.4			
Holding Tank #2 Drain						13.8			13.1	15.6
Holding Tank #3 Drain	30.0	20.1	36.0	36.0	25.0	32.0	18.6	33.0	33.0	40.0
Spray Bar	10.5	7.5	7.2	6.9	7.5	7.8	8.4	8.0	7.2	7.1
Scent line	3.0	2.6	2.5	3.0	2.7	1.5	1.5	1.8	1.3	1.9
Backside of Ramp	2.4	2.9	3.4	3.9	1.5	1.5	0.6	5.4	1.3	1.9
Top Attraction	8.1	4.6	3.8	3.0	6.0	6.3	7.8	2.6	5.9	5.2
Bottom of Ramp Attraction	56.4	47.7	64.2	63.9	55.0	57.8	45.6	47.4	56.9	73.6
Total Attraction	**67.5**	**54.9**	**70.5**	**69.9**	**63.7**	**65.6**	**54.9**	**51.8**	**64.1**	**80.7**

Table 5.0-3: Quality Control Checks on Counts, Conowingo Eel Collection Facility, 2018

Date	Number of eels in:		Displacement	Volumetric	Actual	Difference
	200 mL	1 L	of Water	Estimate	Counts	
5/13/2018	103	515	3.1	1742	1797	55
7/29/2018	114	570	1.05	748	733	-15
				2490	2530	40
						1.6%

All estimated eel counts contain extra eels that were anesthetized and counted.

Figure 2.0-1: Location of the Conowingo Eel Collection Facility at Conowingo Dam, 2018

Figure 2.0-2: Location of the Conowingo Eel Collection Facility Just Downstream of the West Fish Lift, Conowingo, MD, 2018

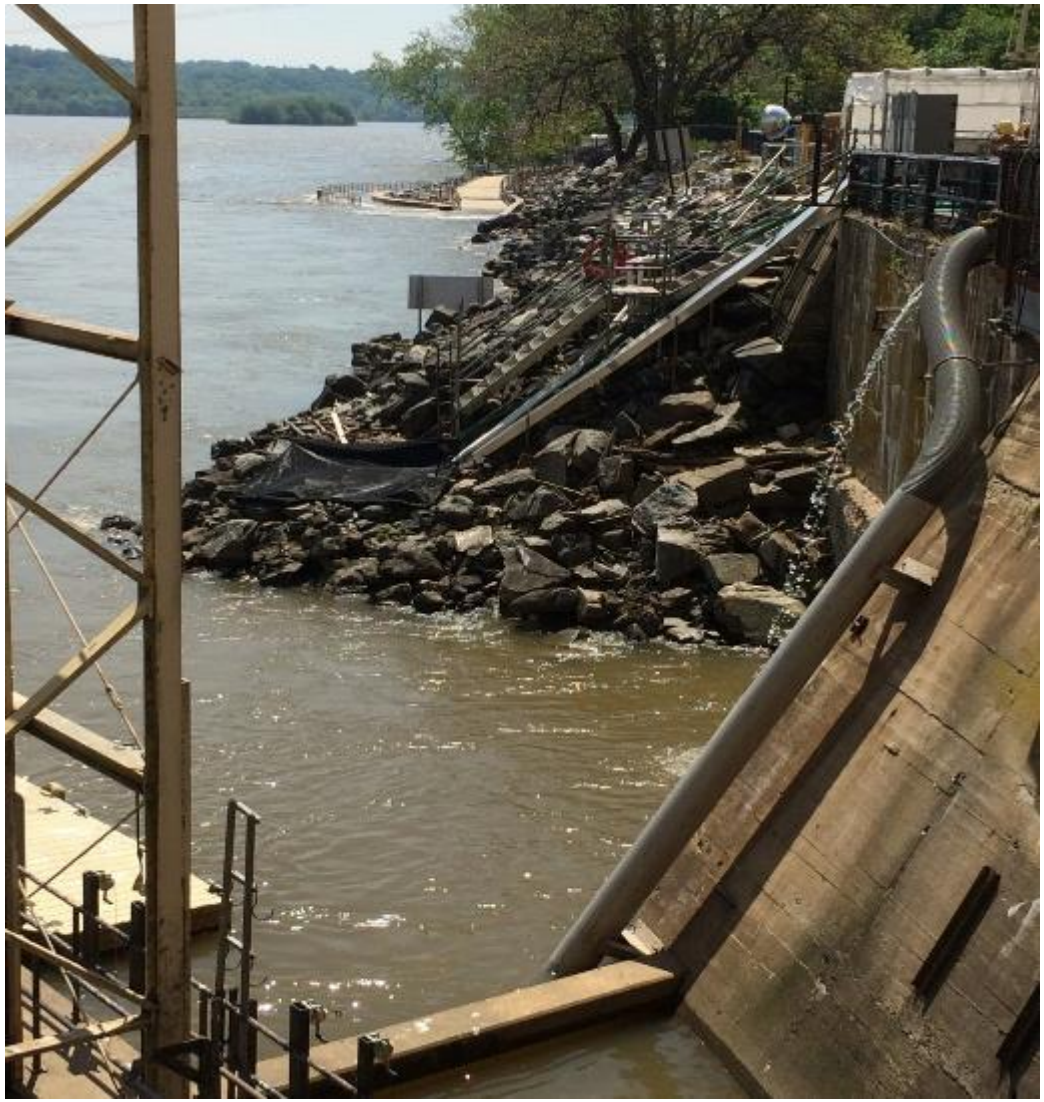


Figure 2.0-3: USFWS Weekly Catch of Juvenile American Eel at Conowingo, 2008-2016

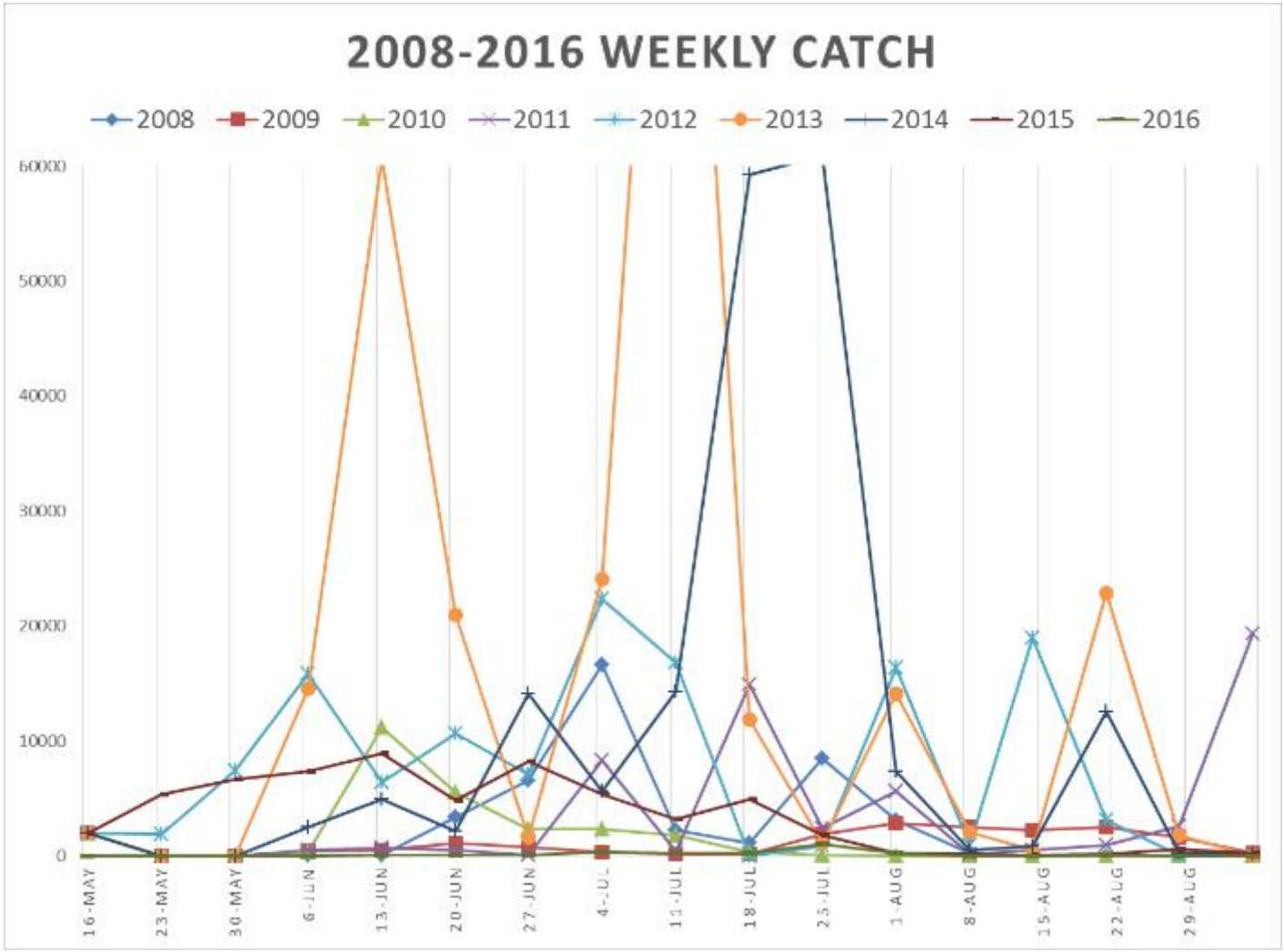


Figure 3.2-1: Measuring Juvenile Eel to Nearest Millimeter While Sedated, Conowingo Eel Collection Facility, 2018

Figure 3.2-2: Weighing Juvenile Eel in Grams While Sedated, Conowingo Eel Collection Facility, 2018

Figure 3.3-1: Sample Location (Stone Run) of American Eel Collected for Wild Health Screening, Conowingo Eel Collection Facility, 2018

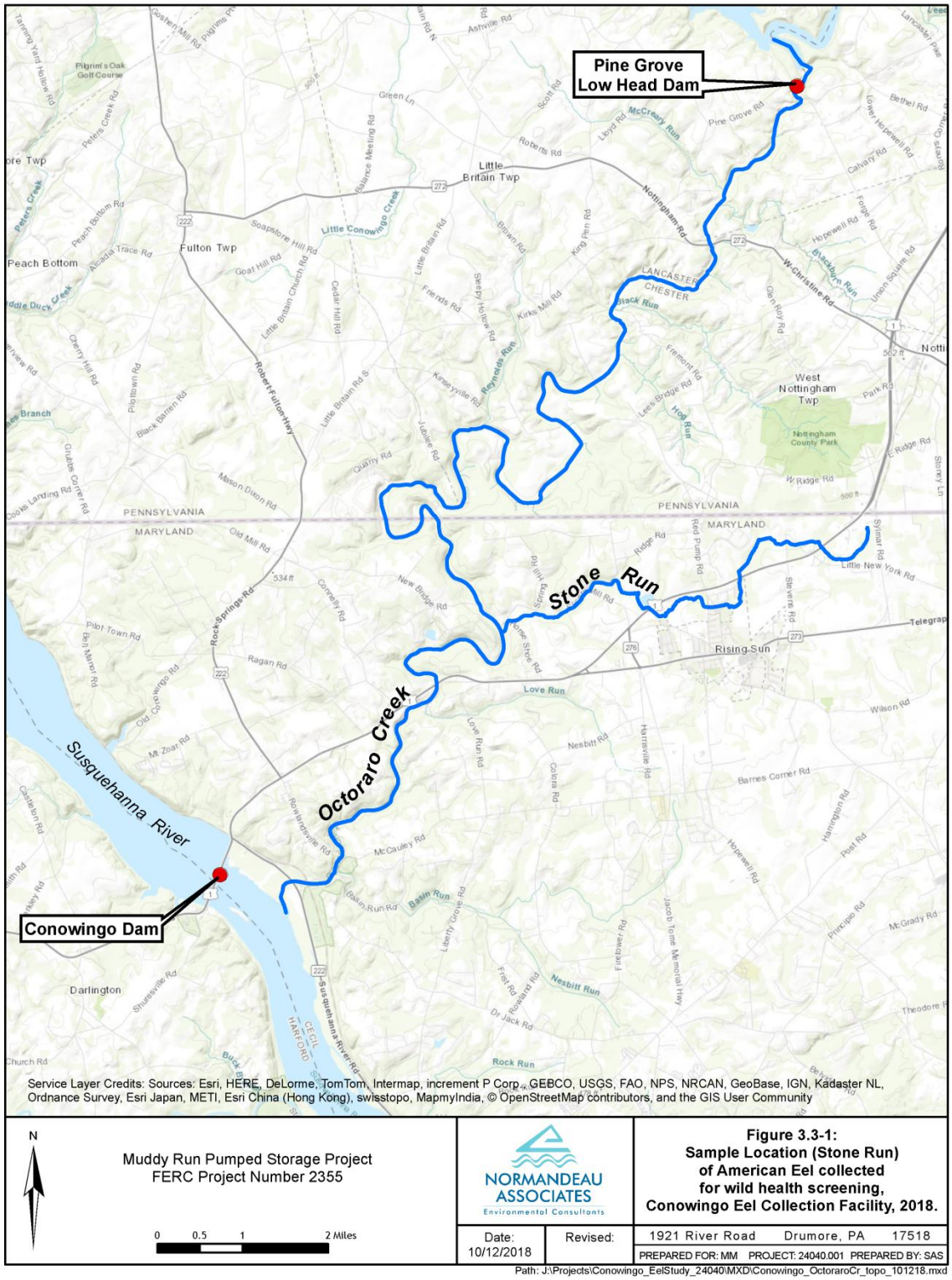


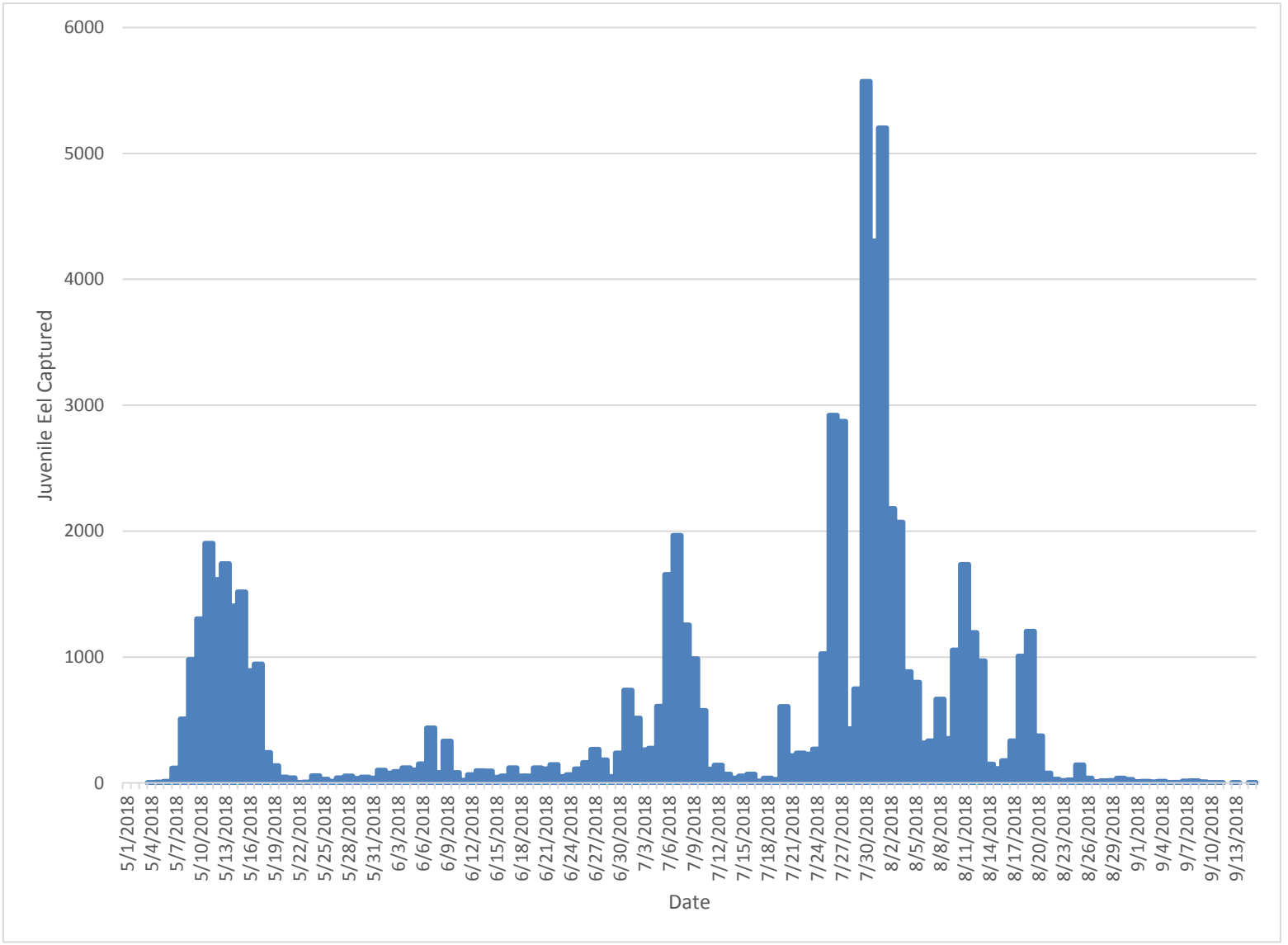
Figure 3.3-2: Stone Run, a Tributary of Octoraro Creek (Looking Downstream from Horseshoe Road to confluence of Octoraro Creek) for the Wild Health Screening, Conowingo Dam, 2018

Figure 3.3-3: Stone Run, a Tributary of Octoraro Creek (Looking Upstream from Horseshoe Road) for the Wild Health Screening, Conowingo Dam, 2018

Figure 3.3-4: Small Eel Transport Tank, Conowingo Eel Collection Facility, 2018

Figure 3.3-5: Large Eel Transport Tank, Conowingo Eel Collection Facility, 2018

Figure 4.1-1: Daily Eel Catch, Conowingo Eel Collection Facility, 2018



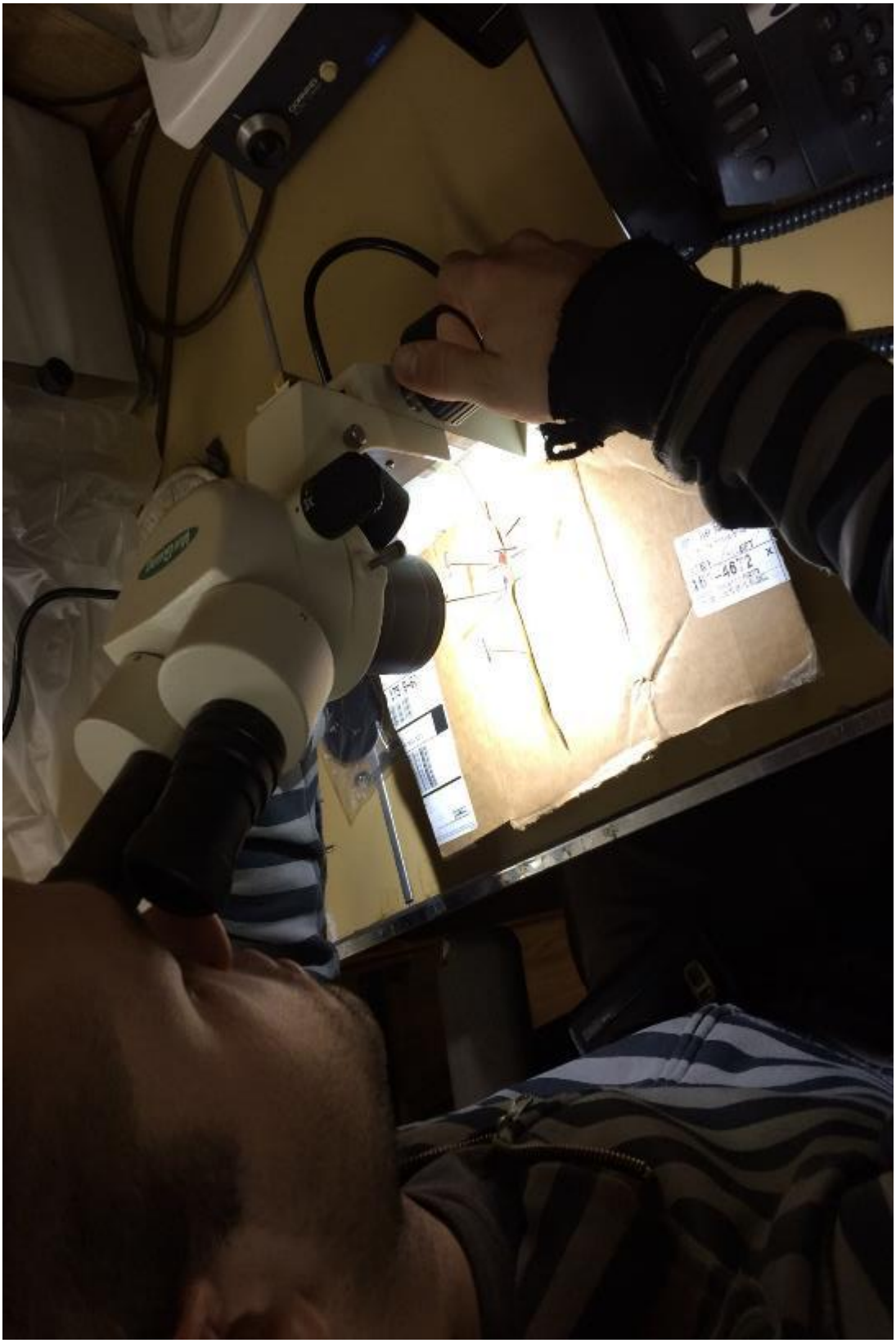


Figure 4.3-1: Examining Sacrificed Juvenile Eels for Swim Bladder Parasite, 2018

Figure 4.3-2: Swim Bladder Parasite Dissection, Conowingo Eel Collection Facility, 2018

Figure 4.4-1: Percentage of Eels Collected per Week, Conowingo Eel Collection Facility, 2018

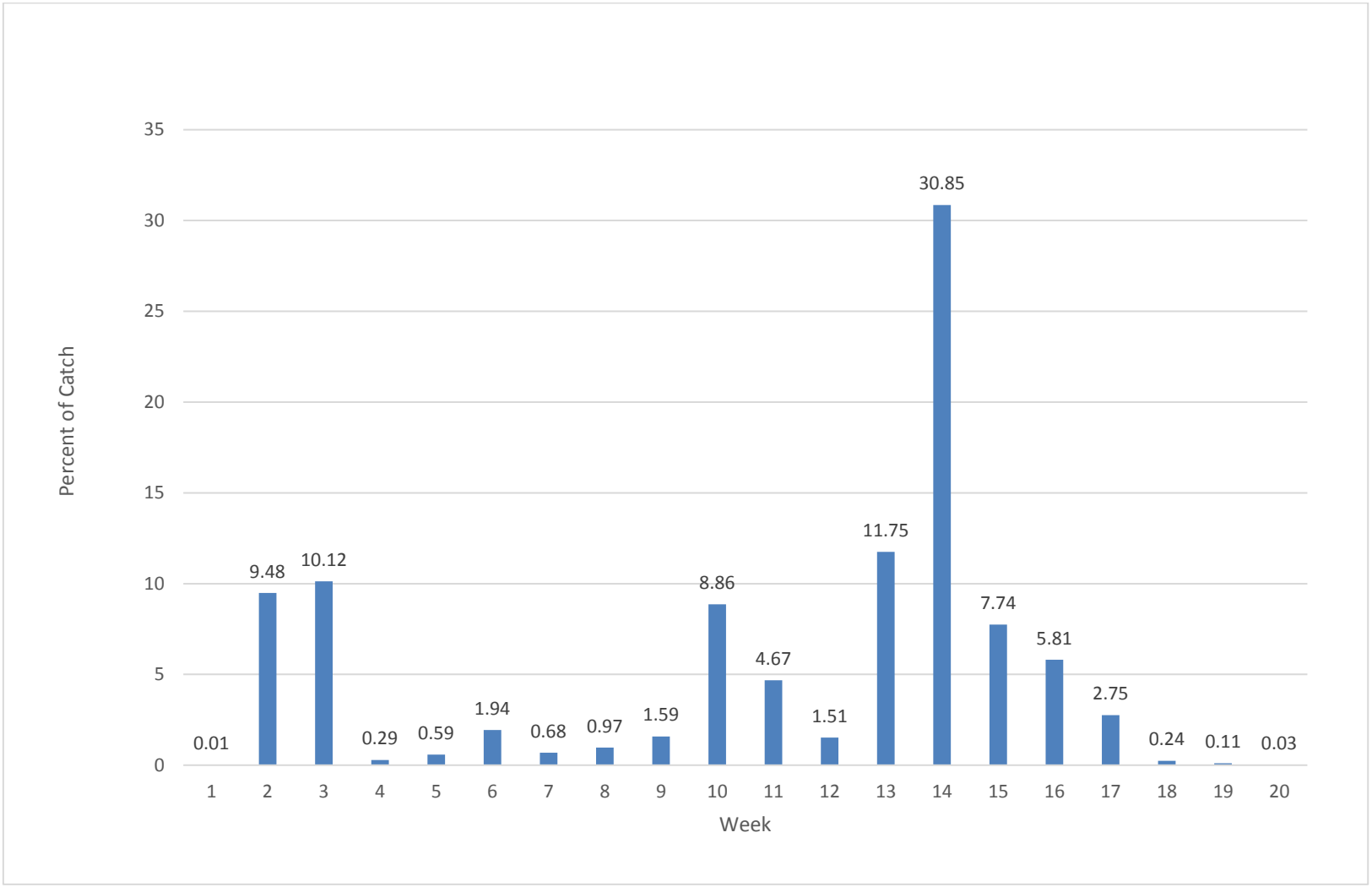


Figure 4.5-1: Conowingo Eel Ramp during High Flow Event, Conowingo Eel Collection Facility, July 26, 2018

Figure 4.5-2: Eel Catch to River Flow (Daily above, Weekly Average below), Conowingo Eel Collection Facility, 2018

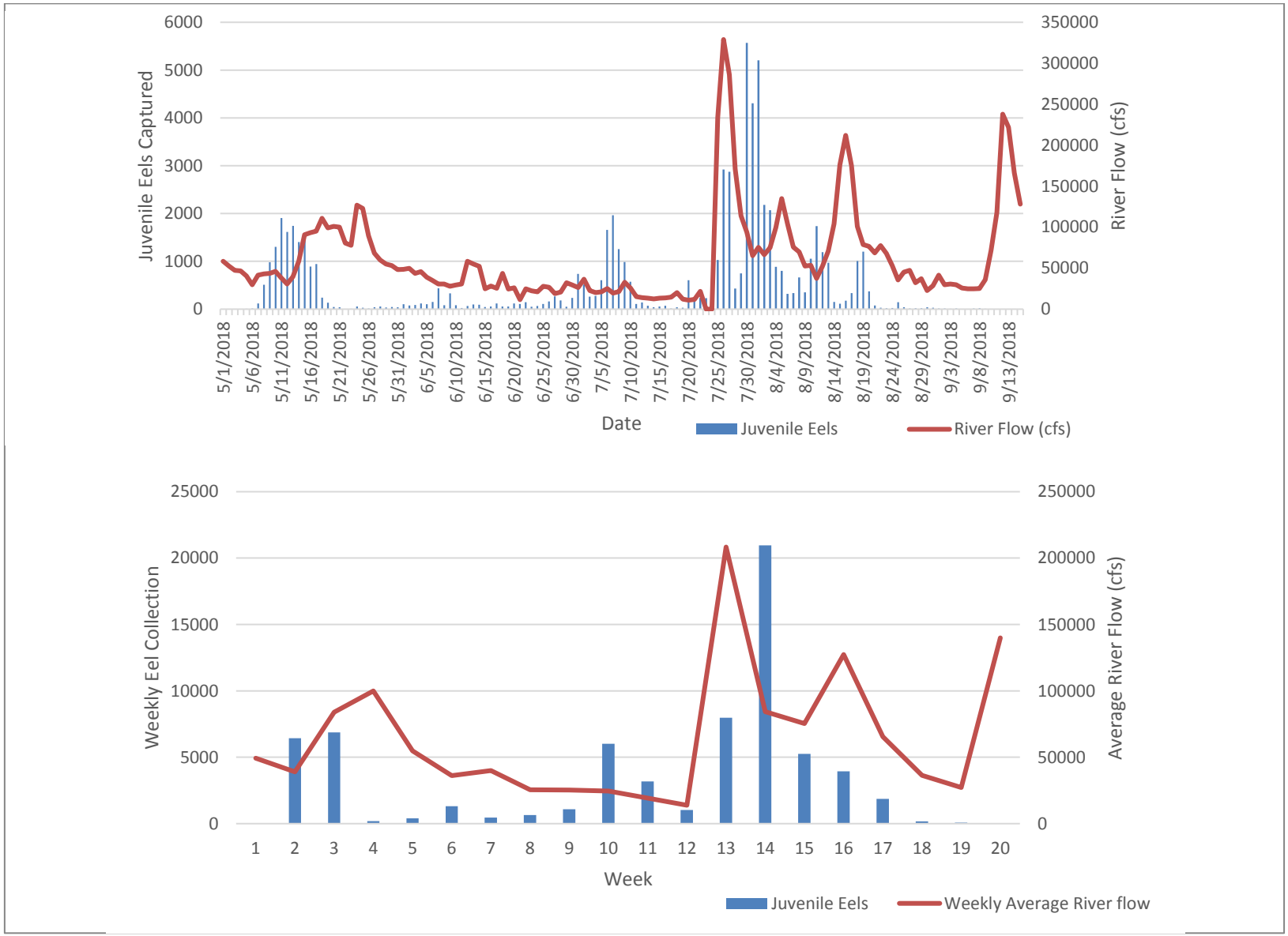


Figure 4.5-3: Eel Catch to Lunar Fraction (Daily above, Weekly Average below), Conowingo Eel Collection Facility, 2018 (*1.0 Equals Full Moon*)

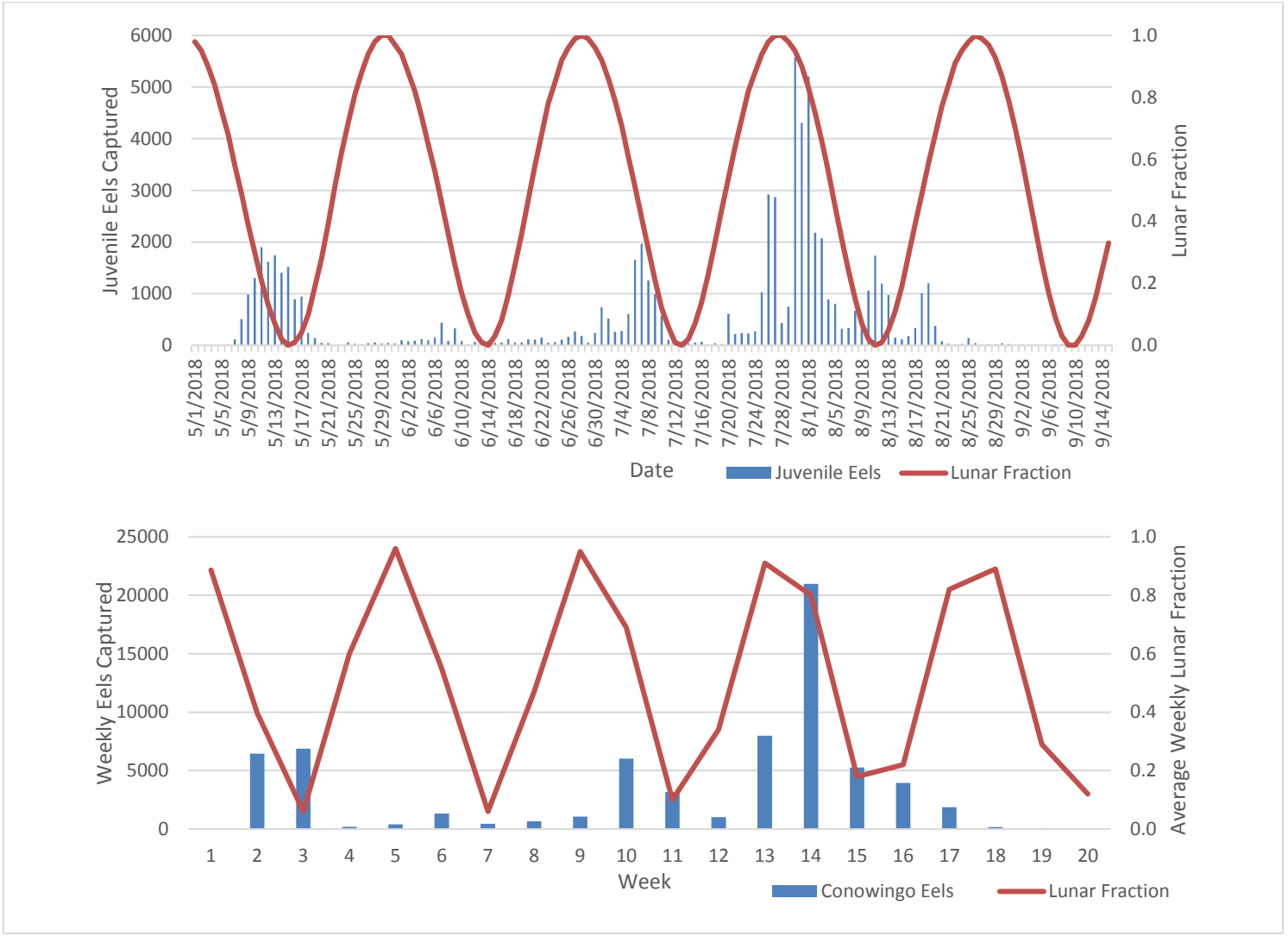


Figure 4.5-4: Eel Catch to Water Temperature, Conowingo Eel Collection Facility, 2018

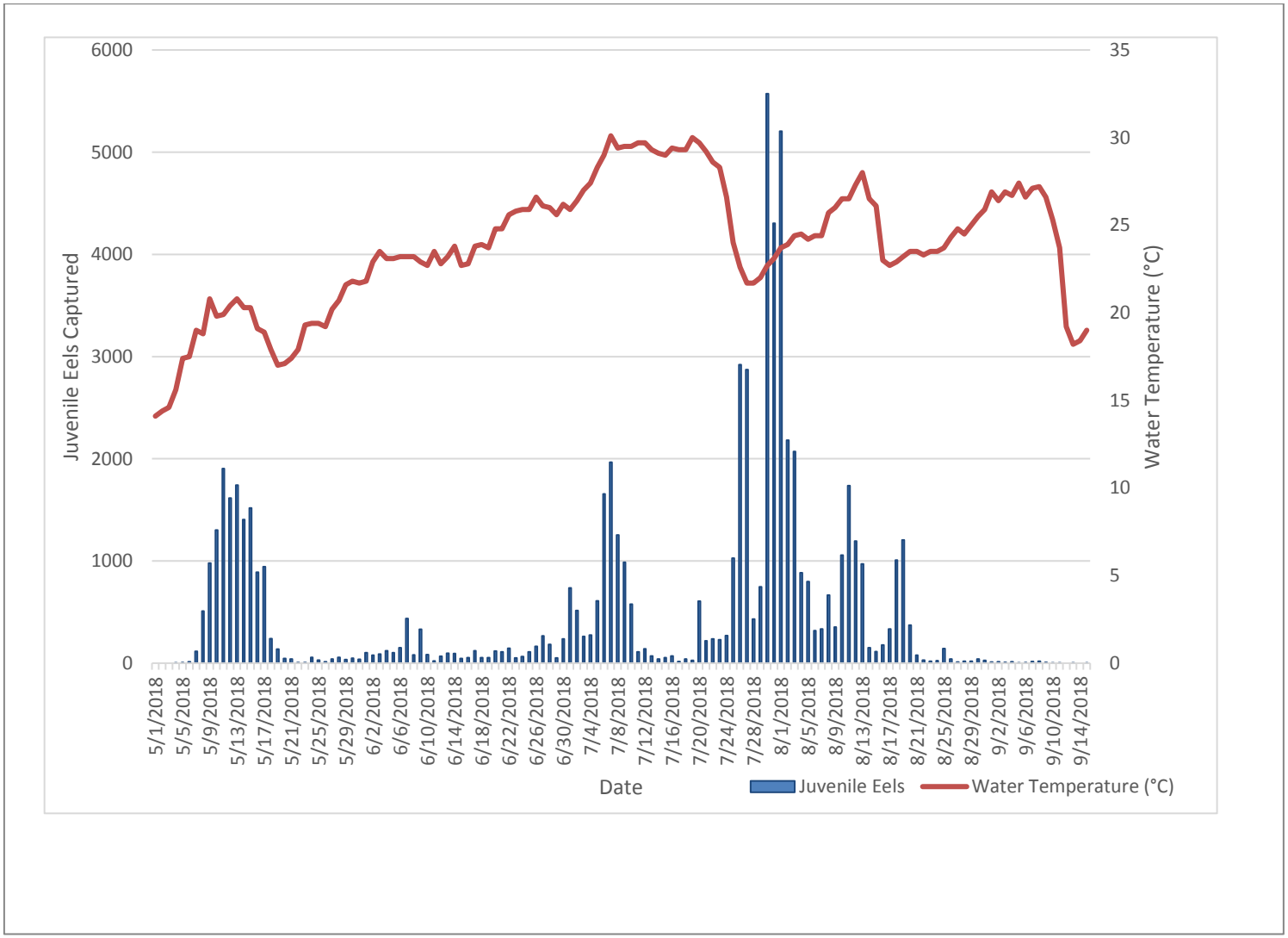


Figure 4.5-5: Eel Catch to Dissolved Oxygen, Conowingo Eel Collection Facility, 2018

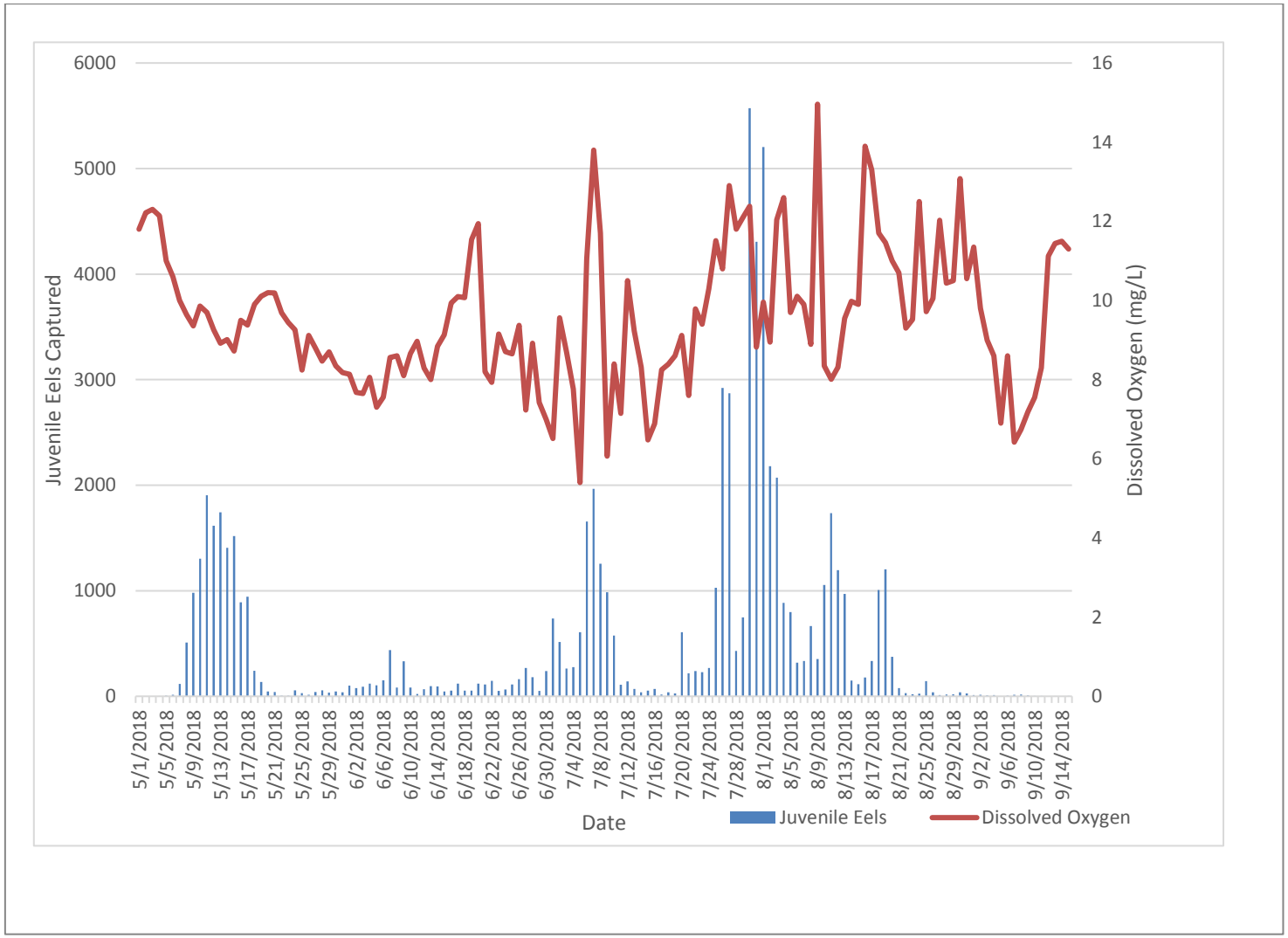


Figure 4.7-1: Stocking Locations in the Susquehanna River Watershed, 2016-2018

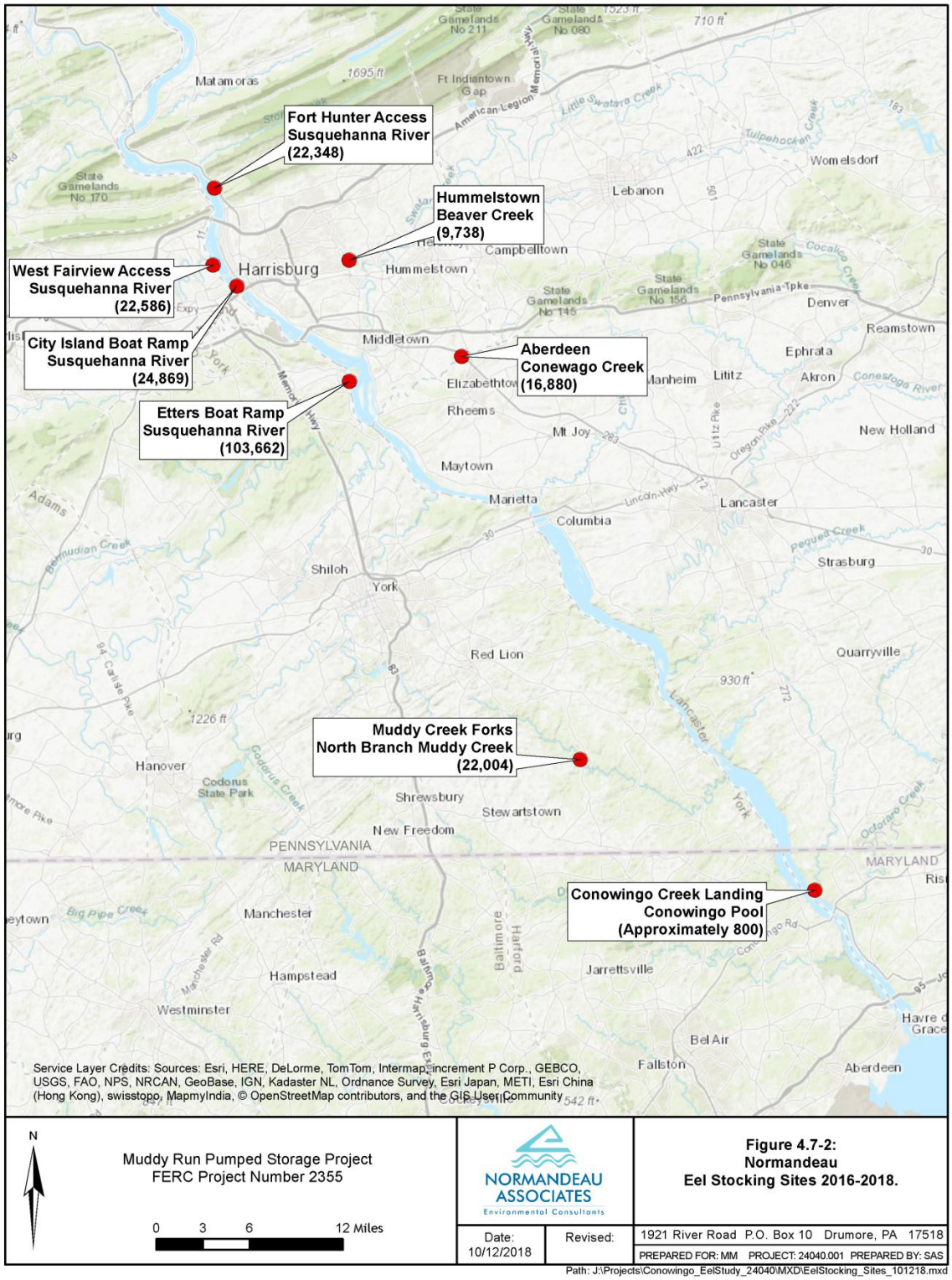
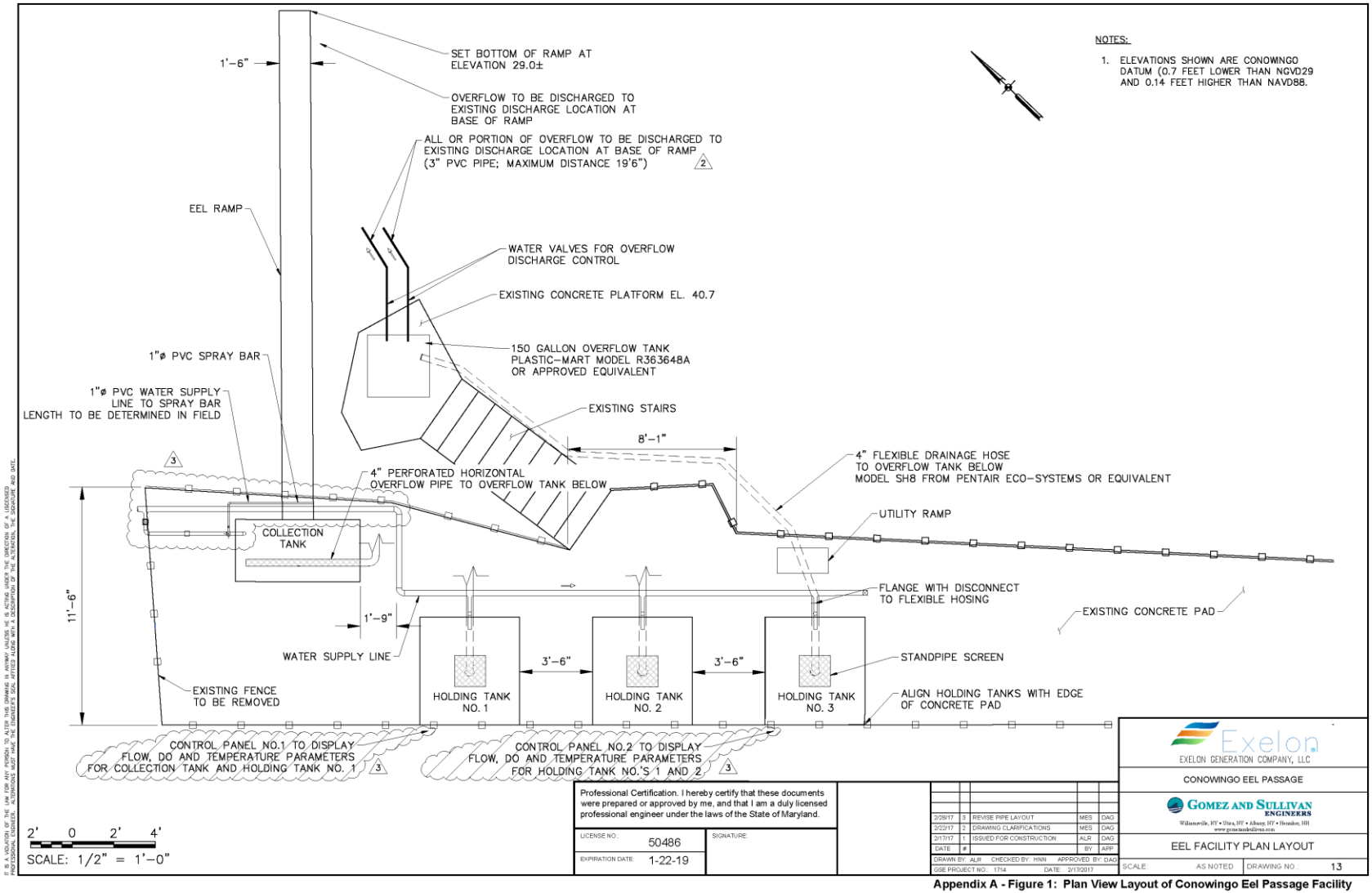


Figure 4.7-2: West Fairview Access (Site 5) Stocking Site, 2018

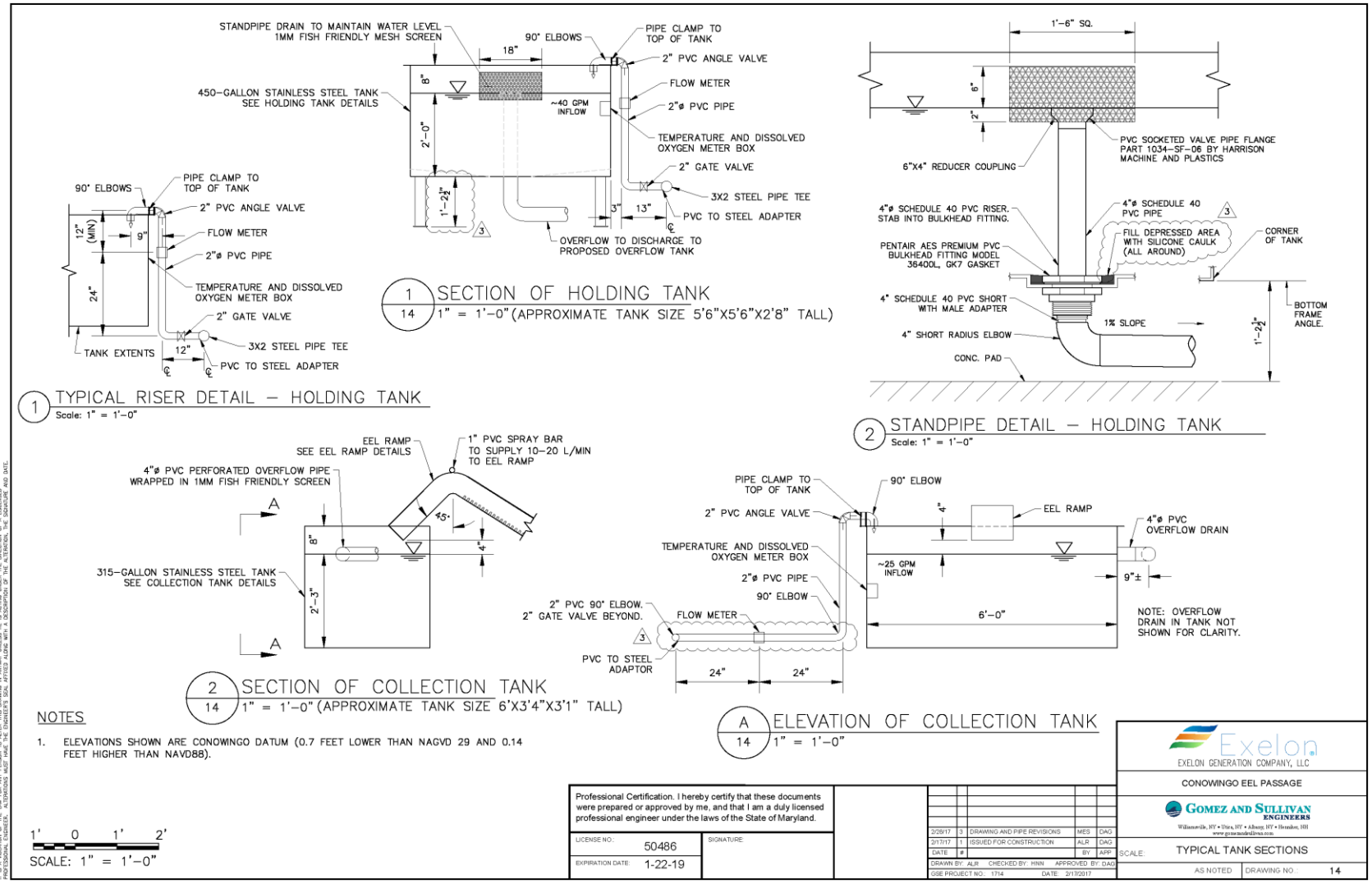
Figure 4.7-3: Fort Hunter Access (Site 6) Stocking Site, 2018

Figure 4.7-4: City Island Boat Ramp (Site 12) Stocking Site, 2018

Appendix A:
Conceptual Design of Conowingo Eel Collection Facility, 2018



Appendix A - Figure 1: Plan View Layout of Conowingo Eel Passage Facility



NOTES

1. ELEVATIONS SHOWN ARE CONOWINGO DATUM (0.7 FEET LOWER THAN NAGVD 29 AND 0.14 FEET HIGHER THAN NAVD88).

1' 0 1' 2'
SCALE: 1" = 1'–0"

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.
LICENSE NO.: 50486
EXPIRATION DATE: 1-22-19
SIGNATURE:

DATE	#		BY	APP.
3/28/17	3	DRAWING AND PIPE REVISIONS	MES	DAG
2/17/17	1	ISSUED FOR CONSTRUCTION	ALR	DAG

DRAWN BY: ALR CHECKED BY: HNN APPROVED BY: DAG
GSE PROJECT NO.: 1714 DATE: 2/17/2017

Exelon
EXELON GENERATION COMPANY, LLC
CONOWINGO EEL PASSAGE
GOMEZ AND SULLIVAN ENGINEERS
Willamsville, NY • Utica, NY • Albany, NY • Herndon, DH
www.gomezandsullivan.com
SCALE: TYPICAL TANK SECTIONS
AS NOTED DRAWING NO. 14

Appendix A - Figure 2 :Side View of Conowingo Eel Passage Facility

Appendix B:
Method of Aging Eel Otolith, Conowingo Eel Collection Facility, 2018

Method of Aging

A representative sample of juvenile eels were frozen for future age determination. Aging of the preserved individuals was conducted using otolith microstructure analysis and followed established techniques for the species presented in the Proceedings of the Workshop on Aging and Sexing American Eel (ASMFC 2001). To remove the sagittal otoliths from an individual eel, a transverse cut was made through the cranium. When positioned correctly, the cut exposed the posterior part of the brain and the two cavities of the inner ear were visible on either side of the rachidian bulb. The otolith bones were then carefully removed from the inner ear cavities with a pair of tweezers, cleaned, and placed in a clean, dry, labeled glass vial. Each otolith sample was allowed to dry for a minimum of 12 hours prior to proceeding to the next step.

At the conclusion of the drying time, each otolith was embedded in a clear epoxy (e.g., 2-part West System epoxy resin) poured into a small mold and allowed adequate time to fully cure. Utilizing a double-bladed, slow speed saw, a 0.2-mm thick transverse section was cut through the nucleus perpendicular to the sulcus. The otolith section was then bonded to a glass slide using CrystalBond. Each mounted otolith sample was polished using a series of fine grade lapping films (12, 9 and 3 micron) and the sample was periodically inspected to insure no damage to the otolith section. Following polishing, the mounted sections were etched in a 5% solution of EDTA for 3-5 minutes, rinsed and then stained in a bath of toluidine blue for approximately 5 minutes to enhance visibility of each annulus.

After removal of the slide and otolith section from the staining bath, the sample was rinsed with distilled water and ready for age determination. Sectioned otoliths were inspected under a dissecting microscope using both reflected and transmitted light and an external fiberoptic light source. Each otolith sample was examined by two readers and the number of distinct annuli was determined. Following independent age determinations for each sample by both readers, the list of age estimates were compared. If the two readers agreed on the analysis, the age estimate was accepted. If readers of the slides weren't in agreement on an age, that slide was re-analyzed. If no consensus was met, the otolith was rejected. The age reported herein is the freshwater age (i.e., the numbers of annuli outside the transition mark - the end of larval growth in salt water).

ASMFC (Atlantic States Marine Fisheries Commission). 2001. Proceedings of the Workshop on Aging and Sexing American Eel. ASMFC Special Report No. 72. Washington, D.C. 25 p.

Individual Sacrificed Eel Data, 2018

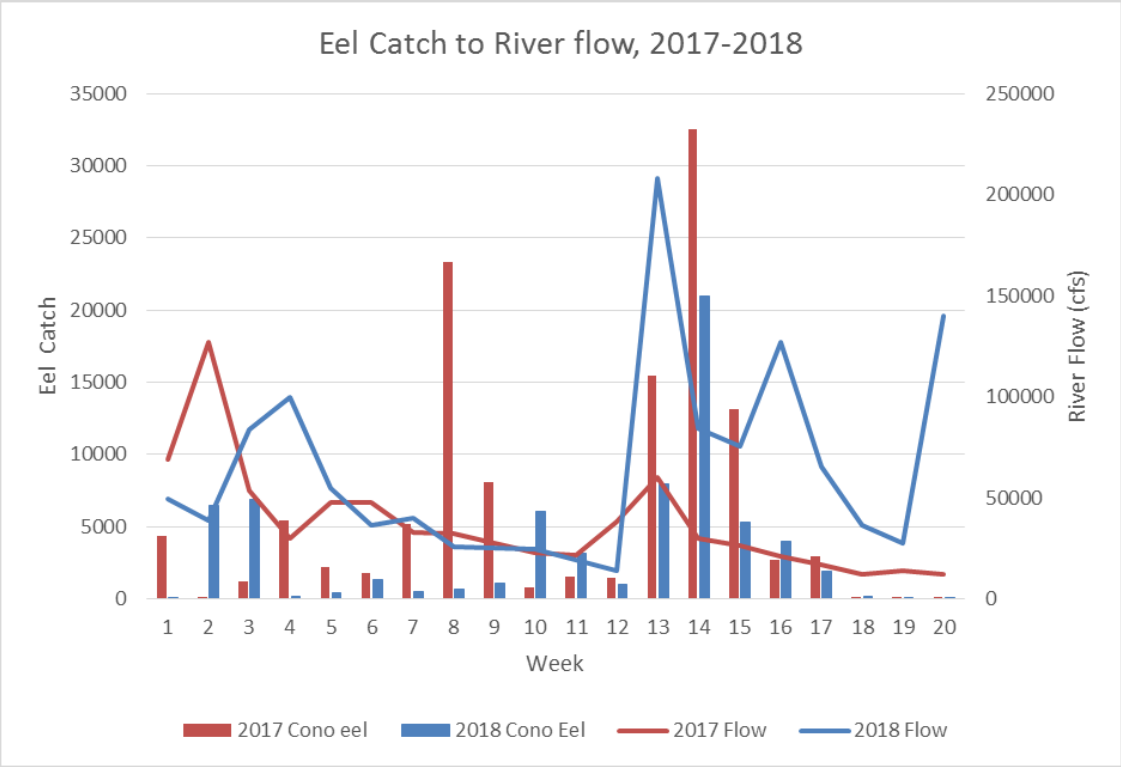
Date 2018	Batch Number	Collection Number	Number of Eels	Within Batch ID	Total Length (mm)	Age 1 - CAF*	Age 2- ERS*	Age Consensus
	1	1			106	2	2	2
	1	2			133	3	3	3
	1	3			119	2	2	2
	1	5			124	NR	NR	NR
	1	17			130	3	2	3
	3	1			134	4	3	4
	3	2			126	3	2	3
	3	5			110	2	1	2
	3	8			146	3	3	3
	3	9			96	1	0	1
	5	1			141	3	3	3
	5	5			150	4	3	4
	5	11			134	3	3	3
	5	20			126	NR	NR	NR
	5	24			111	2	2	2
	7	1			109	2	2	2
	7	2			123	3	3	3
	7	3			134	3	3	3
	7	5			147	4	3	4
	7	6			114	2	2	2
	9	1			122	2	2	2
	9	2			139	3	3	3
	9	3			144	2	2	2
	9	13			117	2	2	2
	9	18			105	2	1	2
	11	1			105	2	2	2
	11	3			121	2	2	2
	11	5			135	3	3	3
	11	8			99	1	1	1
	11	12			94	NR	NR	NR
	13	1			133	2	2	2
	13	2			148	3	3	3
	13	3			109	3	3	3
	13	5			99	2	2	2
	13	6			113	2	2	2
	15	1			145	3	3	3
	15	2			120	2	2	2
	15	3			147	3	3	3
	15	4			115	2	2	2
	15	5			120	3	2	3
	17	1			126	2	1	2
	17	2			98	1	1	1
	17	3			118	2	2	2
	17	11			107	2	2	2

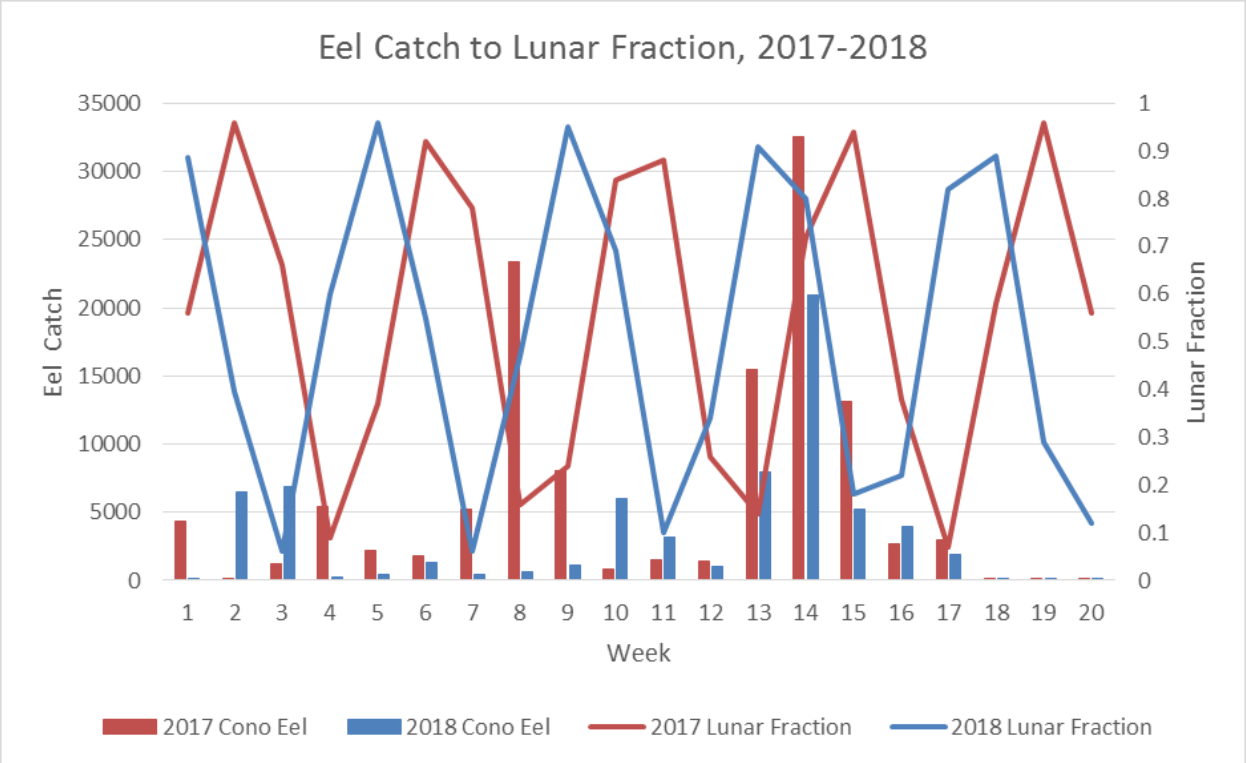
Date 2018	Batch Number	Collection Number	Number of Eels	Within Batch ID	Total Length (mm)	Age 1 - CAF*	Age 2- ERS*	Age Consensus
	17	25			130	3	2	3
	18	1			111	2	2	2
	18	3			131	3	3	3
	18	8			104	2	1	1
	18	11			95	1	1	1
	18	25			130	2	2	2
	21	2			122	3	3	3
	21	3			105	1	1	1
	21	5			133	3	3	3
	21	7			88	1	0	1
	21	9			94	1	1	1
	23	1			94	1	1	1
	23	2			113	2	2	2
	23	3			136	3	3	3
	23	4			143	3	3	3
	23	5			123	2	2	2
	25	1			128	2	2	2
	25	3			11	2	2	2
	25	6			107	2	2	2
	25	20			109	2	2	2
	25	23			115	2	2	2
	27	2			135	3	3	3
	27	4			146	3	3	3
	27	10			122	3	2	3
	27	11			151	4	4	4
	27	12			130	4	2	4
	29	1			127	2	2	2
	29	2			119	3	3	3
	29	3			143	3	3	3
	29	4			146	4	4	4
	29	5			156	4	4	4
	31	4			108	2	2	2
	31	14			137	3	3	3
	31	15			151	4	4	4
	31	18			140	NR	NR	NR
	31	24			124	2	2	2
	33	1			123	3	3	3
	33	4			117	2	2	2
	33	5			107	NR	NR	NR
	33	8			120	2	2	2
	33	10			145	4	3	4
	35	1			94	NR	NR	NR
	35	2			127	3	3	3

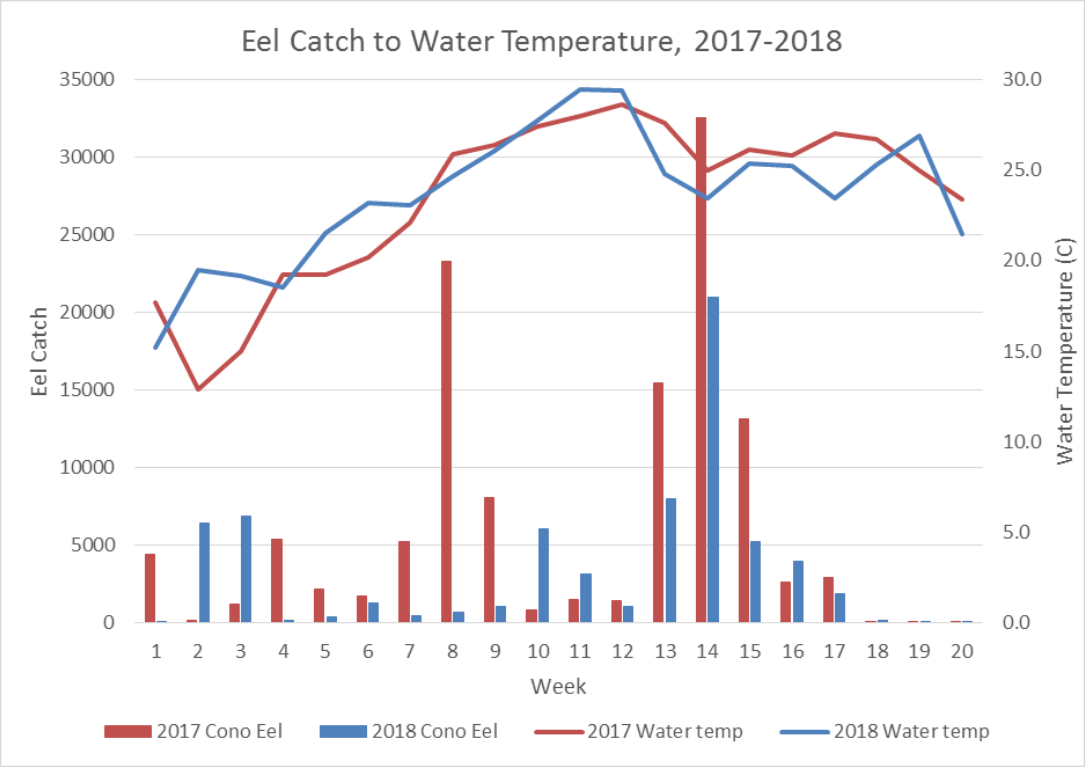
Date 2018	Batch Number	Collection Number	Number of Eels	Within Batch ID	Total Length (mm)	Age 1 - CAF*	Age 2- ERS*	Age Consensus
	35	3			101	2	2	2
	35	4			115	2	1	2
	35	5			120	2	2	2
	37	1			84	1	0	1
	37	2			92	1	0	1
	37	3			122	2	2	2

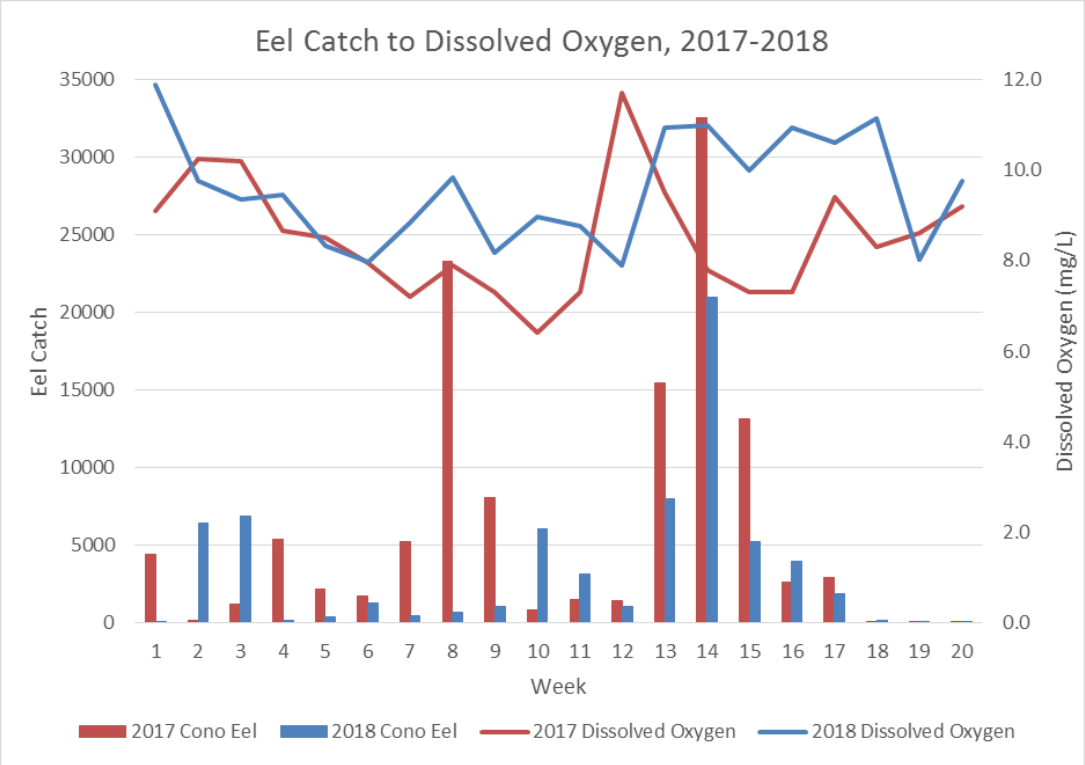
Appendix C:
Weekly Biological Data and Environmental Conditions for Conowingo Eel Collection Facility, 2017-2018

2017 Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Octoraro Eels	17	9	9	39	21	7	2	61	1565	19	13	7067	419	48	16	68	1793	12	149	12
Conowingo Eels	4387	151	1224	5384	2196	1761	5199	23318	8090	799	1503	1432	15435	32524	13130	2654	2931	88	51	43
Creek flow (cfs) (wk avg)	691.00	1272.29	535.43	298.00	478.86	477.29	331.00	322.57	274.43	227.00	214.14	381.57	601.43	300.57	264.71	208.86	166.14	118.19	137.79	119.22
Lunar Fraction (wk avg)	0.56	0.96	0.66	0.09	0.37	0.92	0.78	0.16	0.24	0.84	0.88	0.26	0.14	0.72	0.94	0.38	0.07	0.58	0.96	0.56
Water temp (°C) (wk avg)	17.7	12.9	15.0	19.2	19.2	20.2	22.1	25.9	26.4	27.4	28.0	28.6	27.6	25.0	26.1	25.8	27.0	26.7	25.0	23.4
Dissolved Oxygen (mg/L) (wk avg)	9.1	10.3	10.2	8.7	8.5	7.9	7.2	7.9	7.3	6.4	7.3	11.7	9.5	7.8	7.3	7.3	9.4	8.3	8.6	9.2
2018 Week	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Octoraro Eels	5	31	2072	101	115	407	55	3	4	0	1	11	464	29	393	343	73	5	69	22
Conowingo Eels	7	6443	6879	197	398	1316	462	657	1077	6020	3175	1029	7986	20965	5262	3948	1870	165	73	20
Creek flow (cfs) (wk avg)	492.20	390.00	839.57	999.00	548.00	360.86	398.86	255.00	253.14	244.71	193.14	138.71	2083.20	843.00	754.71	1272.71	654.86	363.86	272.86	1399.43
Lunar Fraction (wk avg)	0.89	0.40	0.06	0.60	0.96	0.55	0.06	0.47	0.95	0.69	0.10	0.34	0.91	0.80	0.18	0.22	0.82	0.89	0.29	0.12
Water temp (°C) (wk avg)	15.2	19.5	19.2	18.5	21.5	23.2	23.1	24.6	26.0	27.7	29.5	29.4	24.8	23.5	25.4	25.2	23.5	25.3	26.9	21.5
Dissolved Oxygen (mg/L) (wk avg)	11.9	9.8	9.4	9.5	8.3	8.0	8.8	9.9	8.2	9.0	8.8	7.9	10.9	11.0	10.0	11.0	10.6	11.1	8.0	9.8


Eel Catch to River flow, 2017-2018
Eel Catch
River Flow (cfs)
Week
2017 Cono eel
2018 Cono Eel
2017 Flow
2018 Flow


Eel Catch to Lunar Fraction, 2017-2018
Eel Catch
Lunar Fraction
Week
2017 Cono Eel
2018 Cono Eel
2017 Lunar Fraction
2018 Lunar Fraction


Eel Catch to Water Temperature, 2017-2018
Eel Catch
Water Temperature (C)
Week
2017 Cono Eel
2018 Cono Eel
2017 Water temp
2018 Water temp


Eel Catch to Dissolved Oxygen, 2017-2018
Eel Catch
Dissolved Oxygen (mg/L)
Week
2017 Cono Eel
2018 Cono Eel
2017 Dissolved Oxygen
2018 Dissolved Oxygen

Appendix D:
Fish Health Inspection Report, Conowingo Eel Collection Facility 2018

DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service
FISH HEALTH INSPECTION REPORT[1]

This report is NOT evidence of future disease status. To determine status, contact the inspecting biologist below.

Fish Source & Facility Contact	Fish Examined	Water Supply[2]	5 year facility classification
Octoro Creek (trib of Susquehanna, below Connowingo Dam) Michael Martinek, collector Ray Bleistine, Project Mgr, Normandeau	☐ Hatchery ☑ Wild	☑ Unsecured: Open Spring, Stream ☐ Secured: Well, sterilized	Last sample date / Classification 1 03/26/2018 2 03/21/2017 3 4 04/20/2016 5 04/07/2015

Species[3]	Lot Identity	Age[4]	# in lot	Eggs (E) or fish (F) Obtained From	Pathogens inspected[3] & results'[5]													
					EI	AS	YR	RS	MC	IH	IP	IS	LM	OM	SV	VH	A	B
AME	2018 collection	y		(F) Octoro Creek, MD	60	60	60			60	60			60		60	60	
					--	--	--	NT	NT	--	--	NT	NT	--	NT	--	+	

Remarks[6]: Lab Case 18-97; AME = American eel; A = swimbladder nematode (Anguillicola crassus)

Inspecting Biologist Signature	Concurred (signature & title)	
Print: Patricia Barbash Date: 04/25/2018	Print: John Coll Date: 04/25/2018	Lamar Fish Health Center 400 Washington Ave; PO Box 155 Lamar, PA 16848 (570_ 726-6611

[1] Done in accordance with the AFS Fish Health Section Bluebook *Suggested Procedures for the Detection and Identification of Certain Finfish and Shellfish Pathogens* and the U.S. Fish and Wildlife Service Fish Health Policy 713 FW 1-5. [2] Secure = free of all aquatic pathogens or sterilized, Unsecured = aquatic pathogens may be present. [3] FWS abbreviations (see back of this page), [4] For hatchery fish give age in months; for feral fish, use symbols: e=eggs or fry; f=fingerling; y=yearlings; b=older fish. [5] Findings reported as number examined over results; (-) = undetected, (+) = positive, and NT= not tested, A,B = other pathogens as listed in remarks[6] Additional remarks can be made on back page.

DEPARTMENT OF THE INTERIOR
U.S. Fish and Wildlife Service
FISH HEALTH INSPECTION REPORT[1]
This report is NOT evidence of future disease status. To determine status, contact the inspecting biologist below.

Additional Inspection Information
Laboratory Case Number:
18-97, received March 27, 2018. Collection of 60 American eels occurred on 3/26/18 by Michael Martinek.

Bacterial cultures - primary inoculum from kidney onto BHIA, negative for AS, YR, EI

Virology exam of kidney/spleen homogenates on CHSE-214, EPC, BF-2, and FHM cells on microtiter, negative for IH, IP, OM, VH, and any other replicating agent.

General gross observation for the swimbladder nematode was conducted with an incidence of 38% (23/60), typical level as reported in previous years.Also typical this year was histological/parsitological observation of Myxosporidian parasite Myxobolus (NOT cerebralis sp.), Myxidium sp., and trematode cysts. Freedom of Myxobolus cerebralis (salmonid whirling disease) was confirmed by PCR.These observations are for the record only, none of the organisms observed are of regulatory concern, and are probably quite common. Full parasitology reported provided in separate electronic attachment of this email.

PATHOGEN ABBREVIATIONS	SPECIES ABBREVIATIONS			
AS Aeromonas salmonicida	Amur Pike AMP	Colorado Pikeminnow CPM	Kokanee KUE	Rainbox Trout X Steelhead
EI Edwardsiella ictaluri	Apache Trout APT	Comanche Springs pupfish CSP	Landlocked ATS LAS	RBTSTT
RS Renibacterium salmoninarum	Arctic Grayling ARG	Cutthroat Trout CUT	Leon Springs pupfish LSP	Razorback Sucker RBS
YR Yersinia ruckeri	Atlantic Salmon ATS	Darters DAR	Lake Trout LAT	Redear Sunfish RSF
MC Myxobolus cerebralis	Beautiful Shiner GBS	Desert Pupfish DEP	Lampreys LAY	Rio Grande Silvery Minnow RGSM
IH Infectious Hematopoietic Necrosis Virus	Big Bend Gambusia BBG	Desert Sucker DES	Largemouth Bass LMB	Sanora Sucker SOS
IP Infectious Pancreatic Necrosis Virus	Bigmouth Buffalo BIB	Devils Hole Pupfish DHP	Livebearers LIR	Sauger SAR
IS Infectious Salmon Anemia Virus	Black Bullhead BLB	Dolly Varden DOV	Miscellaneous Warm Water MSC	Smallmouth Buffalo SAB
LM Largemouth Bass Virus	Black Crappie BLC	Dolly Varden X BKT DOVBKT	Mooneyes MOE	Silver Carp SVC
OM Oncorhynchus masou Virus	Blue Catfish BCF	Fall Chinook Salmon FCS	Mudminnows MUW	Smallmouth Bass SMB
SV Spring Viremia of Carp Virus	Blue X Channel BCFCCF	Fathead Minnow FHM	Muskellunge MUE	Sockeye Salmon SOS
VH Viral Hemorrhagic Septicemia Virus	Bluegill BLG	Flathead Catfish FCF	Northern Pike NOP	Spotted Bass SPB
	Blue Pike BLP	Freshwater Drums FRD	Ohrid Trout OHT	Spring Chinook Salmon SCS
	Bluntnose Shiner PBS	Gars GAR	Other Catfishes OCF	Steelhead Trout STT
	Bonytail Chub BTC	Gila Topminnow GTM	Other Minnows OTM	Sticklebacks STK
	Bowfin BON	Gila Trout GIT	Other Pikes OTP	Striped Bass STB
	Brook Trout BKT	Golden Shiner GOS	Other Salmonids OSA	Sturgeons STN
	Brown Bullhead BRB	Golden Trout GOT	Other Suckers OTS	Virgin Chub VRC
	Brown Trout BNT	Goldfish GOF	Other Sunfishes OSF	Walleye WAE
	Carp CAP	Grass Carp GRC	Paddlefish PAH	Walleye X Sauger WAESAR
	Channel Catfish CCF	Green Sunfish GSF	Pahranagat Roundtail Chub PRC	Warmouth WAM
	Chihuahua Chub CCH	Guadalupe Bass GUB	Pecos Gambusia PEG	White Catfish WCF
	Chum Salmon CHS	Herrings HEG	Pink Salmon PKS	Winter Chinook Salmon WCS
	Coho Salmon COS	Killifishes KIH	Rainbow Trout RBT	Woundfin WDF

Appendix E:
Agency Comments on Draft 2018 Conowingo Eel Ramp Collection Report

Mike Martinek

Subject: FW: 2018 Exelon Conowingo Eel Ramp Collection Report and Appendices
Attachments: SRBC comments on Muddy Run Pumped Storage Project Periodic Evaluation of Upstream Stream Segments 2018.docx; SRBC comments on Muddy Run Pumped Storage Project American Eel Collection Facility in Octoraro Creek.docx; SRBC comments on Muddy Run Pumped Storage project Conowingo Eel Collection Facility 2018.docx

From: Henning, Aaron [mailto:ahenning@srbc.net]
Sent: Thursday, December 13, 2018 3:13 PM
To: Danucalov, Andrea H:(GenCo-Pwr) <Andrea.Danucalov@exeloncorp.com>
Cc: Bjorn Lake - NOAA Federal <bjorn.lake@noaa.gov>; Bob A. Sadzinski <bob.sadzinski@maryland.gov>; David Lemon <david.lemon@dec.ny.gov>; Don Pugh <don.pugh@outlook.com>; Jesus Morales <Jesus_Morales@fws.gov>; Mccollum, Allyson <amccollum@pa.gov>; Mike.Cox@ERM.com; Miller, Jeremy <jeremmille@pa.gov>; Richard McCorkle <richard_mccorkle@fws.gov>; Rob Bourdon <robert.bourdon@maryland.gov>; Shawn Seaman -DNR- <shawn.seaman@maryland.gov>; Steve Schreiner <sschreiner@versar.com>; Tryninewski, Joshua <jtryninews@pa.gov>; Williamson, Scott <scwilliams@pa.gov>; Shank, Matthew <mshank@srbc.net>; Sheila Eyler (sheila_eyler@fws.gov) <sheila_eyler@fws.gov>
Subject: RE: 2018 Exelon Conowingo Eel Ramp Collection Report and Appendices

Andrea,

Thank you for the opportunity to comment on these reports. The Susquehanna River Basin Commission's comments on these two reports as well as the Periodic Evaluation of Upstream Stream Segments are attached. If you have any questions or feedback on these comments feel free to contact me directly.

Aaron

Aaron Henning
Aquatic Biologist
Susquehanna River Basin Commission
4423 North Front St.
Harrisburg, PA 17110
Office: (717) 238-0423 ext.1184
Mobile: (717) 884-5937
ahenning@srbc.net

From: Danucalov, Andrea H:(GenCo-Pwr) [mailto:Andrea.Danucalov@exeloncorp.com]
Sent: Thursday, November 15, 2018 1:04 PM
To: Erin Redding; 'Avalos, Chris'; Elisabeth Bleistine; Bleistine, Ray; Mike.Cox@ERM.com; David Frazier; 'Eyler, Sheila'; Henning, Aaron; Hicks, Colleen E:(GenCo-Pwr); Ian Kiraly; jesus_morales@fws.gov; Martinek, Michael; 'McCollum, Allyson'; 'McCorkle, Richard'; 'Miller, Jeremy'; 'Minkkinen, Steve'; Peifer, Cheri A:(GenCo-Pwr); Royer, Doug; 'Sadzinski, Robert'; 'Seaman, Shawn'; Shank, Matthew; 'Slowik, Adam'; Smith, Fred P:(GenCo-Pwr); Kirk Smith; 'Tryninewski, Joshua'; White, Eric; 'Williamson, Scott'
Subject: 2018 Exelon Conowingo Eel Ramp Collection Report and Appendices

All,

Please see attached 2018 Conowingo Eel Ramp Collection Report and appendices. We are still waiting for the age analysis and will update as soon as we have that information.

1

Please provide comments by Friday, December 14, 2018 so that we can finalize the report for submittal to FERC.

Please let me know if you have any questions.

Thanks

Andrea

Andrea Danucalov
FERC License Compliance Manager

Exelon.

Exelon Generation
300 Exelon Way
Kennett Square, PA 19348
New Phone Number - Skype: 267.533.1125
Fax: 610.765.5805
Cell: 610.301.1664
andrea.danucalov@exeloncorp.com

SRBC comments on Muddy Run Pumped Storage project Conowingo Eel Collection Facility (2018)

- Section 4.7 Juvenile Eel Transport and Mortality. Last sentence of second paragraph is incomplete
- Recommend increasing frequency of transports to at least twice per week to minimize large mortality events
- In future reports please include photographs of the ramp/bank/rip-rap interface at the beginning and end of the season from a fixed vantage point.

Mike Martinek

Subject: FW: [EXTERNAL] FWS Comments on Exelon Reports

From: Eyler, Sheila [mailto:sheila_eyler@fws.gov]
Sent: Friday, December 14, 2018 1:46 PM
To: Danucalov, Andrea H:(GenCo-Pwr) <Andrea.Danucalov@exeloncorp.com>
Subject: [EXTERNAL] FWS Comments on Exelon Reports

Good afternoon Andrea,

Thank you for the opportunity to review several study reports related to the license requirements for Muddy Run Pumped Storage Facility and Conowingo Dam. The U.S. Fish and Wildlife Service offers the following specific comments and edits to the reports:

2018 Octoraro Creek Eel Ramp Collection Report
Attraction flow should be reported in gallons per minute in the report. Also, per discussion at the meeting held on December 11, 2018 between Exelon and the Resource Agencies, Exelon will need to increase attraction flow that will be provided to the permanent eel passage facility on the Octoraro. Current attraction flow at the temporary facility averages 81.8 L/min, where the design specifications for attraction flow at the project is 210-230 L/min (see report Pg 8, Section 5, Paragraph 2). The upper end of the target attraction flow range, 230 L/min, converts to <61 gal/min and would be more acceptable than what is currently being implemented at Octoraro. We recommend that Exelon/Normandeau address this issue to at least achieve the target attraction flow of 210-230 L/min. The plan to replace the 1.5" water supply line with a 2" line to match pump capacity, as a part of conversion to a permanent facility, may help to address this issue, but additional modifications (i.e. larger pump, increased supply line size, etc.) may be required to achieve the design specifications.

2018 Conowingo Eel Ramp Collection Report
No specific changes are recommended for the report, however, we support the plan to increase transport frequency to at least twice per week between June 15 and September 1. We also support daily transports when air temperatures are forecasted to be above 32 degrees C for three straight days and/or when water temperature is above 29 degrees C. With respect to the thresholds for daily transports, we recommend future consideration for lower thresholds if mortality events continue to occur during high air and water temperature periods.

2018 Periodic Evaluation of Upstream Stream Segments
FWS recommends that more information be included in Section 3.3 (Sampling Data and Collection) of the report. If the information is available from field collections, include more details on electrofishing methods, including the size of the sites that were blocked off and a spatial estimate of coverage for the site (length and average width of the site). Also include a spatial estimate of coverage (i.e. the percentage of blocked off area was covered during sampling). It appears that no portions of the site were subject to electrofishing more than once during the 30 minute time period (i.e. only 1 upstream pass was conducted), so the methods should be more explicit to indicate that effort. The methods for determining Habitat Suitability Scores should also be described in this section or reference a document where those methods can be accessed.

Muddy Run FPOP Annual Report – 2018
Please modify Pg 1-1, paragraph 4, line 2 to "United States Fish and Wildlife Service." Please submit the operational data (Appendix A) to the FWS in an Excel spreadsheet format as the link to the data in the report was inaccessible. FWS would also like to discuss the feasibility of adding peak hourly discharge and withdrawal along with the currently reported hourly averaged discharge and withdrawals in cfs in the spreadsheet.

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Upstream and Downstream Adult Shad Telemetry
Comments on those reports will be submitted to Exelon no later than January 25, 2019.

Please let me know if you have any questions or require further clarification on the items described above.

Sheila Eyler
U.S. Fish & Wildlife Service
Mid-Atlantic Fish and Wildlife Conservation Office
177 Admiral Cochrane Dr., Annapolis, MD 21401
410-573-4554 (O)
717-387-2117 (C)
Sheila_Eyler@fws.gov

Mike Martinek

Subject: FW: Exelon - Muddy Run - EPAG and American Shad Studies Report Due Dates

From: Miller, Jeremy [mailto:jeremmille@pa.gov]
Sent: Friday, December 14, 2018 12:23 PM
To: Danucalov, Andrea H:(GenCo-Pwr) <Andrea.Danucalov@exeloncorp.com>; Ray Bleistine <rbleistine@normandeau.com>; Kirk Smith <ksmith@gomezandsullivan.com>
Cc: Williamson, Scott <scwilliams@pa.gov>; Mccollum, Allyson <amccollum@pa.gov>; Sheila Eyler <Sheila_Eyler@fws.gov>; Tryninewski, Joshua <jtryninews@pa.gov>; Shawn Seaman -DNR- <shawn.seaman@maryland.gov>; Aaron Henning <ahenning@srbc.net>; Richard McCorkle <richard_mccorkle@fws.gov>
Subject: RE: Exelon - Muddy Run - EPAG and American Shad Studies Report Due Dates

Andrea,

DEP offers the following comments for your review in regards to the Muddy Run Pumped Storage Project (FERC Project 2355 & PADEP 401 WQC EA 36-033) 2018 reports:

2018 Octoraro Creek Eel Ramp Collection Report-

1. Please convert liters per minute (L/min) to gallons per minute (gpm) in Table 4.6-1: Calibration of Flows and second paragraph under Discussion. This change will allow both the Conowingo and Octoraro reports to be consistent.
2. In Figure 4.4-4 Dissolved Oxygen was lower then head pond during 5/8-5/15 and again 9/4. Please explain why this occurred.

2018 Conowingo Eel Ramp Collection Report- No Comments

2018 Periodic Evaluation of Upstream Stream Segments Report-

1. The report did not mention what fish sampling protocol was used in the study. In an email dated November 20, 2017 from DEP to Exelon sampling guidance from either PADEP's semi-quantitative wadeable fish sampling protocol or SRBC's single-unit multiple-pass width based protocol was to be used with only one protocol being implemented across all sample sites. Please revise 2018 report to reflect chosen protocol and include any completed field data sheets.

2018 FPOP Annual Report- No comments

Comments in regards to the Muddy Run American Shad Radio Telemetry Study will submitted at a later date.

Thanks,
Jeremy

Jeremy Miller | Aquatic Biologist II
Department of Environmental Protection | Clean Water Program
Southcentral Regional Office
909 Elmerton Ave. | Hbg PA 17110

1

Phone: 717.705.4777 | Fax: 717.705.4760
www.dep.pa.gov

From: Danucalov, Andrea H:(GenCo-Pwr) <Andrea.Danucalov@exeloncorp.com>
Sent: Friday, November 16, 2018 4:27 PM
To: Erin Redding <eredding@gomezandsullivan.com>; 'Avalos, Chris' <cavalos@normandeau.com>; Elisabeth Bleistine <ebleistine@gomezandsullivan.com>; Bleistine, Ray <rbleistine@normandeau.com>; Mike.Cox@ERM.com; David Frazier <dfrazier@gomezandsullivan.com>; Sheila Eyler <Sheila_Eyler@fws.gov>; Aaron Henning <ahenning@srbc.net>; Hicks, Colleen E:(GenCo-Pwr) <Colleen.Hicks@exeloncorp.com>; Ian Kiraly <ikiraly@gomezandsullivan.com>; jesus_morales@fws.gov; Martinek, Michael <mmartinek@normandeau.com>; Mccollum, Allyson <amccollum@pa.gov>; 'McCorkle, Richard' <richard_mccorkle@fws.gov>; Miller, Jeremy <jeremmille@pa.gov>; 'Minkkinen, Steve' <steve_minkkinen@fws.gov>; Peifer, Cheri A:(GenCo-Pwr) <Cheri.Peifer@exeloncorp.com>; Royer, Doug <droyer@normandeau.com>; 'Sadzinski, Robert' <bob.sadzinski@maryland.gov>; 'Seaman, Shawn' <shawn.seaman@maryland.gov>; 'Shank, Matt' <mshank@srbc.net>; 'Slowik, Adam' <aslowik@normandeau.com>; Smith, Fred P:(GenCo-Pwr) <fredp.smith@exeloncorp.com>; Kirk Smith <ksmith@gomezandsullivan.com>; Tryninewski, Joshua <jtryninews@pa.gov>; White, Eric <ewhite@normandeau.com>; Williamson, Scott <scwilliams@pa.gov>
Subject: Exelon - Muddy Run - EPAG and American Shad Studies Report Due Dates

All,

As we discussed on the EPAG call yesterday, please find attached a table with the reports that have been emailed and corresponding Resource Agency and FERC filing dates.

Report/Study Plan Title	Date Exelon Emailed	Comments from Resource Agencies/Submit to Exelon	Resource Agency Filing Date	FERC Filing Date
2018 Periodic Evaluation of Upstream Stream Segments	11/14/2018	12/14/2018	1/15/2019	1/15/2019
2018 Octoraro Creek Eel Ramp Collection Report	11/14/2018	12/14/2018	1/15/2019	1/15/2019
2018 Conowingo Eel Ramp Collection Report	11/15/2018	12/14/2018	1/15/2019	1/15/2019
2018 Upstream Migrating Adult American Shad within the Muddy Run Pumped Storage Project	11/16/2018	12/14/2018	12/31/2018	3/1/2019*
2018 Emigrating Adult American Shad in the Vicinity of the Muddy Run Pumped Storage Project	11/16/2018	12/14/2018	12/31/2018	7/3/2019* (Exelon plans to file with upstream adult American Shad report on 3/1/2019)
FPOP Annual Report - 2018	11/16/2018	12/14/2018	12/31/2018	12/31/2018

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2018 Emigration and Behavior of Telemetered Juvenile American Shad in the Vicinity of the Muddy Run Pumped Storage Project	4/5/2019 (est)	4/26/2019	5/3/2019	7/3/2019*

*Per the FERC Order issued April 5, 2018.

Please let me know if you have any questions.

Thanks

Andrea

Andrea Danucalov
FERC License Compliance Manager

Exelon.

Exelon Generation
300 Exelon Way
Kennett Square, PA 19348
New Phone Number - Skype: 267.533.1125
Fax: 610.765.5805
Cell: 610.301.1664
andrea.danucalov@exeloncorp.com

Mike Martinek

Subject: FW: [EXTERNAL] PFBC Comments: Exelon - Muddy Run - 2018 EPAG and American Shad Study Reports

From: Tryninewski, Joshua [mailto:jtryninews@pa.gov]
Sent: Friday, December 14, 2018 3:51 PM
To: Danucalov, Andrea H:(GenCo-Pwr) <Andrea.Danucalov@exeloncorp.com>
Subject: [EXTERNAL] PFBC Comments: Exelon - Muddy Run - 2018 EPAG and American Shad Study Reports

Andrea,

Thank you for the opportunity to review and provide comments on the following reports. Below you will find PFBCs comments on each report.

- Muddy Run Pumped Storage Project, Periodic Evaluation of Upstream Stream Segments, 2018:
  - The Sample and Data Collection sections should include more detail on methods employed and include references / citations. Specifically, the electrofishing technique, PIT tag insertion method, and water quality measurement protocol(s) and specifics on relevant equipment used should be identified (make, model, settings). Please include more detail on how mussel presence / absence was determined and include relevant methods reference. Similarly, please expand on the habitat assessment technique used, including methods reference. Collectively, this information will be important to maintain continuity in subsequent years of surveys.

- Muddy Run Pumped Storage Project, American Eel Collection Facility in Octoraro Creek, 2018:
  - Please report attraction flows in gallons per minute, similar to the Conowingo Eel Collection Facility Report.
  - Per our conversations on 12/11/18 at the Annual Fish Passage Technical Advisory Committee and Eel Passage Advisory Committee meetings regarding attraction flows at the Octoraro Creek eel collection facility, the PFBC recommends Exelon take the appropriate measures to increase attractions flow to the original design specifications of 210-230 L/min (over the current 65.7 to 94.6 L/min).

- Muddy Run Pumped Storage Project, Conowingo Eel Collection Facility, 2018:
  - Minor edit: Table 5.0-1: Specified operating range of Conowingo Eel Collection Facility, 2018 – Row heading "Flow (GMP)" should be "Flow (GPM)"

- Muddy Run Pump Storage Project, Fish Passage Operating Report, 2018:
  - No comments on the report.

- Assessment of Passage Success of Upstream Migrating Adult American Shad & Assessment of Passage Success of Emigrating Adult American Shad, at Muddy Run Pumped Storage Project Spring 2018
  - Comments to be submitted to Exelon by January 25, 2019.

Regards,
-Josh

Joshua D. Tryninewski
Anadromous Fish Restoration Unit

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Pennsylvania Fish & Boat Commission
1735 Shiloh Rd.
State College, PA 16801
Office: 814-353-2239
Fax: 814-355-8264
Email: jtryninews@pa.gov

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ENVIRONMENTAL CONSULTANTS

Responses to the Resource Agency Comments Relating to the 2018 Conowingo Eel Collection Facility Report

SRBC

- Section 4.7 Juvenile Eel Transport and Mortality. Last sentence of second paragraph is incomplete.
  Exelon Response: Corrected in Report - An additional 60 eels were supplied to the SRBC on June 18, 2018 from the CECF for an "Eels in a classroom program".
- Recommend increasing frequency of transports to at least twice per week to minimize large mortality events.
  Exelon Response: Addressed in Section 6 of the Report:
  - Transport eels between June 15 and September 1 at least twice per week;
  - When excessive air temperature is forecasted to be above 32 °C for three straight days and water temperature is approximately 29 °C, daily transports will be instituted;
- In future reports please include photographs of the ramp/bank/rip-rap interface at the beginning and end of the season from a fixed vantage point.
  Exelon Response: We will include photographs of the ramp/rip-rap interface at the start and end of each season. This is difficult to do from a fixed vantage point, but we will do our best to take photos from the same general location. This ramp stays in-place all year; it does not get removed during the off-season.

USFWS

- No specific changes are recommended for the report, however, we support the plan to increase transport frequency to at least twice per week between June 15 and September 1. We also support daily transports when air temperatures are forecasted to be above 32 degrees C for three straight days and/or when water temperature is above 29 degrees C. With respect to the thresholds for daily transports, we recommend future consideration for lower thresholds if mortality events continue to occur during high air and water temperature periods.
  Exelon Response: See our response to SRBC comment (Bullet #2) above.

PADEP

- No Comments

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PFBC

- Minor edit: Table 5.0-1: Specified operating range of Conowingo Eel Collection Facility, 2018 – Row heading "Flow (GMP)" should be "Flow (GPM)"
  Exelon Response: This correction has been made in the report.