# SUMMARY OF OPERATIONS AT THE CONOWINGO DAM EAST FISH PASSAGE FACILITY SPRING 2010

**August 2010**

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## TABLE OF CONTENTS



## LIST OF TABLES AND FIGURES

# 1.0 INTRODUCTION

Exelon Generation Company, LLC, formerly the Susquehanna Electric Company (SECO), has operated a fish passage facility (West lift) at its Conowingo Hydroelectric Station since 1972. Lift operations are part of a cooperative private, state, and federal effort to restore American shad (*Alosa sapidissima*) and other migratory fishes to the Susquehanna River. In accordance with the restoration plan, the operational goal had been to monitor fish populations below Conowingo Dam and transport pre-spawned migratory fishes upriver.

In 1988, the former PECO Energy Company negotiated an agreement with state and federal resource agencies and private organizations to enhance restoration of American shad and other anadromous species to the Susquehanna River. A major element of this agreement was for PECO Energy Company to construct an East Fish Passage Facility (East lift) at Conowingo Dam. Construction of the East lift commenced in April 1990 and it was operational by spring 1991.

With the completion of fishways at Holtwood, Safe Harbor, and York Haven dams, the East lift has been operated to pass fish directly into Conowingo Pond since spring 1997.

Objectives of 2010 operation were: (1) monitor passage of migratory and resident fishes through the fishway; (2) assess fishway and trough effectiveness and make modifications as feasible; and (3) assist in the conduction of studies relating to Conowingo Relicensing issues.

# 2.0 CONOWINGO OPERATION

## 2.1 Project Operation

The Conowingo Hydroelectric Station, built in 1928, is located at river mile 10 on the Susquehanna River (RMC 1992). The powerhouse has a peaking generating capacity of 549.5 MW and a hydraulic capacity of approximately 85,000 cfs. Flows in excess of station draft are spilled through two regulating and 50 crest gates. The powerhouse contains seven vertical Francis (numbered 1 through 7) and four Kaplan (numbered 8 through 11) turbines. The seven Francis units have been equipped with aeration systems that permit a unit to draw air into the unit (vented mode) or operate conventionally (unvented mode). The four original Kaplan turbines installed in 1964 were replaced over a period of four years (1992 to 1996), with more efficient mixed-flow Kaplan type turbines.

Minimum flow releases from the station during the spring spawning and fishway operating season follow the schedule outlined in the settlement agreement. Minimum flows of 10,000 cubic feet per second (cfs) or natural river flow, whichever is less, as measured at the United States Geological Survey (USGS) gage at Marietta, PA were maintained for the period 1 to 30 April. A minimum flow of 7,500 cfs or natural river (as previously noted) was maintained for the period 1 to 31 May. A minimum flow of 5,000 cfs or natural river (as previously noted) is maintained when fish lift operations occur in June.

## 2.2 Fishway Operation

The start of operation for the East Fish Lift in 2010 began on 5 April. The first four American shad were passed on 7 April. Everyday operation began on 13 April, and continued to the end of the season on 6 June. The season ended, when a combination of warmer water temperatures, dwindling shad numbers, and the late season condition of the shad ultimately required operations to cease. The lift operated a total of 59 days during the 2010 season.

Daily operation times were planned during optimal fish passage parameters. This year, operational methodologies were influenced by natural river flows, water temperatures, generation schedules, and

daily/hourly fish passage numbers. Fishway operation was conducted by a staff of three people: a lift operator, a supervising biologist, and a biological technician.

The mechanical aspects of East lift operation in 2010 were similar to those described in RMC (1992) and Normandeau Associates, Inc. (1999). Fishing time and/or lift frequency was determined by fish abundance, but the hopper was cycled at least hourly throughout the day. The method of lift operation was also influenced by fish abundance. When a great number of fish were in the fishing channel, the crowder was not operated; instead the crowder screen was raised and then lowered trapping fish over the hopper. This mode of operation, called "fast fish", involved leaving the crowder in the normal fishing position and raising the hopper frequently to remove fish that accumulated in the holding channel.

The specific entrance(s) used to attract fishes was dictated by the station discharge and which turbine units were operating. For example, when turbine units 8, 9, 10, and 11 or any combination of large turbines were operating, entrance C was the primary entrance used to attract fishes. Under these conditions the attraction flow through the other entrances is negated or disrupted. Depending on flow, and or generation, entrance C or A was utilized throughout the 2010 season to attract fishes.

### 2.3 Fish Counts

Fish that were lifted and sluiced into the trough were guided by a series of fixed screens. The fixed screens directed the fish to swim up and through a 3 ft wide channel and past a 4 ft by 10 ft counting window located on the west wall of the trough. Fish passing the counting window were identified to species and enumerated by a biologist and/or technician. Passage of fish by the window and out of the trough system was controlled by a set of gates located downstream of the counting window. During periods of peak passage, two people were used to identify and count fish.

At the end of each hour, fish passage data were recorded on data sheets and entered into a Microsoft Excel worksheet on a Personal Computer. Data processing and reporting were PC based and accomplished by program scripts, or macros, created within Microsoft Excel software. After the technician verified the correctness of the raw data, a daily summary of fish passage was produced and distributed in hard copy to plant personnel. Each day's data were backed up to a diskette and stored off site. Daily reports and weekly summaries of fish passage were electronically distributed to plant personnel and other cooperators.

## 3.0 RESULTS

### 3.1 Relative Abundance

The number of fishes collected and passed by the Conowingo Dam East fish lift is presented in Table 1. A total of 857,263 fish of 36 species and two hybrids passed upstream into Conowingo Pond. Gizzard shad (813,429), American shad (37,757), channel catfish (4,626), quillback (489), and walleye (378), were the dominant species passed. Gizzard shad and American shad comprised 95% and 4% respectively of the season total; the two species together accounted for 99% of the total fish passed. Other common fishes included spotfin shiner (98), comely shiner (92), carp (47), and shorthead redhorse (43). Alosids, (American shad and river herring) comprised 4.4% of the total catch. Peak passage occurred on 11 April when 56,198 fish, (99.9% gizzard shad), were passed.

### 3.2 American Shad Passage

The East lift collected and passed 37,757 American shad (Table 1). The first four American shad passed on 7 April. Collection and passage of shad varied daily with 2.7% (1,036) of the shad passed from 5 to 18 April, 41% (15,576) passed from 19 to 30 April, 43% (16,361) passed from 1 to 15 May, and 12.7% (4784) passed from 16 May to 6 June (Figures 1 and 2). On 12 of the 59 days of

operation, American shad passage exceeded 1,000 fish. Peak passage occurred on 20 April when 3,272 American shad were passed.

American shad were collected at water temperatures of 56.8 to 80.9°F and at natural river flows of 16,000 to 55,800 cfs (Table 2 and Figure 1). The natural river flow and water temperature during the three highest days of shad passage, (20, 21, and 22 April), ranged from 25,300 cfs to 26,100 cfs and 58.1°F to 58.4°F, respectively. The average daily river flow on those days when American shad passage exceeded 1,000 fish was approximately 29,000 cfs. The average daily river flow during the operational season was 28,570 cfs.

The hourly passage of American shad for the East lift is given in Table 3. Nearly 52% (19,602), of all American shad passed between 1400 and 1759 hours. After 1200 hours, shad passage was consistent with the highest hourly passage rate occurring from 1500 to 1559 hours.

### 3.3 Alosids

A small number of river herring, (1alewife and 4 blueback herring) were passed during the 2010 season. No hickory shad were collected and passed in spring 2010.

### 3.4 Maryland tag-recapture

During the 2010 season, the East fish lift passed a total of 115 American shad that were captured, floy-tagged and released downstream of Conowingo dam by the MDDNR. Of these floy-tagged fish, 106 tags were pink (2010 hook and line) and 9 were orange (2009 hook and line).

## SUMMARY

East fish lift operation was initiated on 5April with the first four American shad passed on 7 April. The East fish lift passed 37,757 American shad from 7 April through 6 June. The total number of American shad passed during the 2010 season was higher than passage values recorded in 2008 and 2009, (Tables 4 and 5). It is also the fourth consecutive year in which the East lift did not surpass the 50,000 mark.

Modifications made to the fish trough, particularly the valve grating and hopper trough chute since 1999 have diminished the potential for the valve grating to clog with various types of debris and have decreased the number of American shad lift mortalities observed throughout the last several fish passage seasons. Since the valve grating was modified prior to the start of the 2000 season, loss of water flow in the trough has not occurred, particularly during high river flow periods when large amounts of debris may enter the trough through the fish exit area. An aeration system was also installed prior to the 2000 passage season to diminish low dissolved oxygen levels when the American shad population is heavy in the trough. Prior to fishway operations in 2002, a 30 inch diameter fiberglass elbow was attached to the hopper extension chute, which had been installed in 2001. The modification allows fish to enter the trough center stream, instead of being directed toward the east trough wall. A decrease in lift mortalities has also been observed since the fiberglass elbow was installed. A total of 427 American shad lift mortalities, (1.1% of the total shad passed), was observed in 2010, similar to lift mortalities observed in recent years (0.2% to 1.0%) and less than values observed during trap and transport operations (1.5% to 10.5%).

## 4.0 RECOMMENDATIONS

1) Continue to operate the East lift at Conowingo Dam per annual guidelines developed and approved by the Susquehanna River Technical Committee. Lift operation should adhere to the guidelines; however, flexibility must remain with operating personnel to maximize fishway performance and fish passage.

2) Continue the use of two fish counters during periods of increased fish passage to accurately reflect the number of fish that pass through the East lift.

3) Continue to inspect cables, limit switches, and lift components to enhance season operability, and continue to evaluate effectiveness of fish trough modifications.

## 5.0 LITERATURE CITED

RMC. 1992. Summary of the operations of the Conowingo Dam fish passage facilities in spring 1991. Prepared for Susquehanna Electric Company, Darlington, MD.

Normandeau Associates, Inc. 1999. Summary of the operations at the Conowingo Dam East fish passage facility in spring, 1998. Prepared for Susquehanna Electric Company, Darlington, MD.

# TABLES AND FIGURES

**Table 1**

**Summary of the daily number of fish passed by the Conowingo Dam East Fish Passage Facility in 2010.**

| *Date:* | *4/5* | *4/7* | *4/9* | *4/11* | *4/13* | *4/14* | *4/15* | *4/16* |
|---|---|---|---|---|---|---|---|---|
| *Start Fishing Time:* | *11:00* | *9:45* | *7:00* | *7:30* | *8:30* | *8:00* | *8:00* | *8:15* |
| *End Fishing Time:* | *16:00* | *16:35* | *16:15* | *16:55* | *16:50* | *16:30* | *16:30* | *16:40* |
| *Hours of Operation:* | *5.0* | *6.8* | *9.3* | *9.4* | *8.3* | *8.5* | *8.0* | *8.4* |
| *Number of Lifts:* | *6* | *10* | *13* | *20* | *15* | *15* | *14* | *17* |
| *Water Temperature (°F):* | *58.2* | *59.4* | *61.7* | *64.4* | *62.6* | *61.5* | *62.7* | *63* |
| American Shad | 0 | 4 | 1 | 18 | 626 | 29 | 1 | 5 |
| Blueback herring | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Alewife | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Gizzard shad | 6,672 | 10,863 | 39,817 | 56,157 | 37,948 | 28,945 | 54,498 | 34,363 |
| Striped bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hybrid striped bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| White perch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sea lamprey | 0 | 0 | 0 | 4 | 1 | 1 | 1 | 0 |
| Rainbow trout | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brown trout | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 |
| Muskellunge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Northern pike | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carp | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Quillback | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| White sucker | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Shorthead redhorse | 0 | 0 | 1 | 2 | 1 | 0 | 2 | 0 |
| White catfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow bullhead | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brown bullhead | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Channel catfish | 253 | 2 | 8 | 15 | 48 | 17 | 2 | 6 |
| Rock bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Redbreast sunfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Green sunfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumpkinseed | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bluegill | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Smallmouth bass | 0 | 0 | 3 | 0 | 3 | 1 | 2 | 4 |
| Largemouth bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Black Crappie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow perch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Walleye | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 0 |
| Tiger Muskie | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| American Eel | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Atlantic Needlefish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Comely Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spottail Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Stopfin Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Golden Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Flathead Catfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *TOTAL* | 6,927 | 10,872 | 39,831 | 56,198 | 38,628 | 28,994 | 54,508 | 34,378 |

**Table 1**

**Continued.**

| *Date:* | *4/17* | *4/18* | *4/19* | *4/20* | *4/21* | *4/22* | *4/23* | *4/24* |
|---|---|---|---|---|---|---|---|---|
| *Start Fishing Time:* | *8:00* | *13:00* | *8:00* | *8:00* | *8:30* | *8:00* | *8:00* | *8:00* |
| *End Fishing Time:* | *16:30* | *17:00* | *18:25* | *18:15* | *18:45* | *18:40* | *17:45* | *18:45* |
| *Hours of Operation:* | *8.5* | *4.0* | *10.4* | *10.3* | *10.3* | *10.7* | *9.8* | *10.8* |
| *Number of Lifts:* | *12* | *8* | *15* | *17* | *17* | *17* | *16* | *15* |
| *Water Temperature (°F):* | *64.4* | *60.8* | *60.4* | *61.7* | *61* | *62.6* | *62.1* | *61.7* |
| American Shad | 282 | 70 | 1,364 | 3,272 | 3,097 | 2,440 | 1,706 | 2,171 |
| Blueback herring | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Alewife | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gizzard shad | 11,356 | 10,290 | 19,413 | 32,755 | 19,936 | 15,790 | 28,517 | 12,856 |
| Striped bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hybrid striped bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| White perch | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sea lamprey | 0 | 2 | 4 | 1 | 0 | 1 | 1 | 0 |
| Rainbow trout | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brown trout | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Muskellunge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Northern pike | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Carp | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Quillback | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| White sucker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Shorthead redhorse | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| White catfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow bullhead | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brown bullhead | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Channel catfish | 14 | 31 | 14 | 24 | 21 | 18 | 16 | 8 |
| Rock bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Redbreast sunfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Green sunfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumpkinseed | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| Bluegill | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Smallmouth bass | 2 | 4 | 1 | 4 | 3 | 2 | 0 | 0 |
| Largemouth bass | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |
| Black Crappie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow perch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Walleye | 0 | 0 | 0 | 1 | 4 | 0 | 0 | 0 |
| Tiger Muskie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| American Eel | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Atlantic Needlefish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Comely Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spottail Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Stopfin Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Golden Shiner | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| Flathead Catfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *TOTAL* | 11,656 | 10,398 | 20,796 | 36,060 | 23,064 | 18,253 | 30,241 | 15,037 |

**Table 1**

**Continued.**

| *Date:* | *4/25* | *4/26* | *4/27* | *4/28* | *4/29* | *4/30* | *5/1* | *5/2* |
|---|---|---|---|---|---|---|---|---|
| *Start Fishing Time:* | *8:15* | *8:00* | *8:00* | *8:00* | *8:00* | *8:00* | *8:00* | *7:30* |
| *End Fishing Time:* | *18:35* | *16:30* | *18:20* | *16:30* | *16:30* | *16:40* | *18:00* | *18:45* |
| *Hours of Operation:* | *10.3* | *8.5* | *10.3* | *8.5* | *8.5* | *8.7* | *10.0* | *11.3* |
| *Number of Lifts:* | *15* | *11* | *14* | *11* | *11* | *13* | *14* | *14* |
| *Water Temperature (°F):* | *61.7* | *60.5* | *62.3* | *61.7* | *61.7* | *61.8* | *61.7* | *61.9* |
| American Shad | 954 | 77 | 128 | 40 | 201 | 126 | 368 | 1,192 |
| Blueback herring | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Alewife | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gizzard shad | 10,502 | 16,146 | 15,780 | 17,787 | 11,499 | 14,490 | 21,373 | 13,125 |
| Striped bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hybrid striped bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| White perch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Sea lamprey | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 0 |
| Rainbow trout | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brown trout | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Muskellunge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Northern pike | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carp | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Quillback | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| White sucker | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 1 |
| Shorthead redhorse | 1 | 1 | 0 | 0 | 0 | 0 | 2 | 0 |
| White catfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow bullhead | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brown bullhead | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Channel catfish | 13 | 44 | 17 | 1 | 7 | 26 | 12 | 7 |
| Rock bass | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Redbreast sunfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Green sunfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumpkinseed | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bluegill | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Smallmouth bass | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Largemouth bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Black Crappie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow perch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Walleye | 1 | 3 | 1 | 3 | 1 | 0 | 0 | 1 |
| Tiger Muskie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| American Eel | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Atlantic Needlefish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Comely Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spottail Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Stopfin Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Golden Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Flathead Catfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *TOTAL* | 11,471 | 16,276 | 15,927 | 17,833 | 11,709 | 14,646 | 21,755 | 14,327 |

**Table 1**

**Continued.**

| *Date:* | *5/3* | *5/4* | *5/5* | *5/6* | *5/7* | *5/8* | *5/9* | *5/10* |
|---|---|---|---|---|---|---|---|---|
| *Start Fishing Time:* | *8:00* | *8:00* | *8:00* | *8:00* | *8:00* | *7;45* | *7:10* | *8:30* |
| *End Fishing Time:* | *18:30* | *17:00* | *16:30* | *16:30* | *18:50* | *16:30* | *16:40* | *18:30* |
| *Hours of Operation:* | *10.5* | *9.0* | *8.5* | *8.5* | *10.8* | *8.8* | *9.5* | *10.0* |
| *Number of Lifts:* | *17* | *15* | *10* | *10* | *16* | *10* | *12* | *10* |
| *Water Temperature (°F):* | *63.5* | *65.7* | *66.3* | *68.9* | *70* | *70.7* | *68.2* | *67.1* |
| American Shad | 1,000 | 668 | 730 | 695 | 2,343 | 2,141 | 973 | 744 |
| Blueback herring | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Alewife | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gizzard shad | 27,026 | 25,821 | 22,544 | 8,963 | 26,503 | 15,121 | 13,291 | 1,251 |
| Striped bass | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Hybrid striped bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| White perch | 0 | 0 | 0 | 3 | 0 | 1 | 0 | 0 |
| Sea lamprey | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2 |
| Rainbow trout | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Brown trout | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Muskellunge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Northern pike | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carp | 6 | 1 | 1 | 2 | 4 | 0 | 0 | 0 |
| Quillback | 0 | 0 | 1 | 1 | 5 | 4 | 69 | 2 |
| White sucker | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Shorthead redhorse | 3 | 3 | 0 | 0 | 8 | 0 | 1 | 0 |
| White catfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow bullhead | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| Brown bullhead | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Channel catfish | 11 | 11 | 8 | 17 | 66 | 25 | 39 | 50 |
| Rock bass | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 2 |
| Redbreast sunfish | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| Green sunfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumpkinseed | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Bluegill | 1 | 0 | 1 | 0 | 5 | 2 | 2 | 12 |
| Smallmouth bass | 2 | 0 | 0 | 2 | 6 | 0 | 2 | 0 |
| Largemouth bass | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 |
| Black Crappie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow perch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Walleye | 2 | 0 | 0 | 0 | 16 | 5 | 11 | 0 |
| Tiger Muskie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| American Eel | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Atlantic Needlefish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Comely Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spottail Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Stopfin Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Golden Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Flathead Catfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *TOTAL* | 28,052 | 26,505 | 23,286 | 9,688 | 28,958 | 17,302 | 14,394 | 2,065 |

**Table 1**

**Continued.**

| *Date:* | *5/11* | *5/12* | *5/13* | *5/14* | *5/15* | *5/16* | *5/17* | *5/18* |
|---|---|---|---|---|---|---|---|---|
| *Start Fishing Time:* | *7:45* | *7:50* | *8:00* | *8:00* | *8:00* | *7:45* | *8:00* | *8:00* |
| *End Fishing Time:* | *18:00* | *18:00* | *17:00* | *16:20* | *16:20* | *16:30* | *18:00* | *16:30* |
| *Hours of Operation:* | *10.3* | *10.2* | *9.0* | *8.3* | *8.3* | *8.8* | *10.0* | *8.5* |
| *Number of Lifts:* | *15* | *12* | *12* | *12* | *13* | *10* | *11* | *8* |
| *Water Temperature (°F):* | *67.1* | *65.7* | *65.3* | *67.1* | *64.4* | *62.6* | *63.5* | *63.3* |
| American Shad | 1,818 | 1,968 | 1,390 | 77 | 254 | 77 | 527 | 163 |
| Blueback herring | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Alewife | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gizzard shad | 6,127 | 8,729 | 1,034 | 14,681 | 8,093 | 8,100 | 10,251 | 1,894 |
| Striped bass | 1 | 0 | 0 | 2 | 1 | 0 | 2 | 0 |
| Hybrid striped bass | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| White perch | 0 | 3 | 0 | 0 | 5 | 4 | 0 | 1 |
| Sea lamprey | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Rainbow trout | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brown trout | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Muskellunge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Northern pike | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carp | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 1 |
| Quillback | 21 | 21 | 1 | 5 | 3 | 13 | 3 | 4 |
| White sucker | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| Shorthead redhorse | 2 | 0 | 2 | 1 | 0 | 8 | 1 | 0 |
| White catfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow bullhead | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brown bullhead | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Channel catfish | 53 | 61 | 3 | 92 | 29 | 43 | 134 | 89 |
| Rock bass | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Redbreast sunfish | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| Green sunfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumpkinseed | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| Bluegill | 1 | 0 | 0 | 0 | 1 | 2 | 2 | 0 |
| Smallmouth bass | 0 | 0 | 0 | 1 | 0 | 3 | 2 | 0 |
| Largemouth bass | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Black Crappie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow perch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Walleye | 5 | 11 | 0 | 4 | 2 | 7 | 31 | 5 |
| Tiger Muskie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| American Eel | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Atlantic Needlefish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Comely Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spottail Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Stopfin Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Golden Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Flathead Catfish | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| *TOTAL* | 8,033 | 10,804 | 2,432 | 14,863 | 8,389 | 8,260 | 10,957 | 2,158 |

**Table 1**

**Continued.**

| *Date:* | *5/19* | *5/20* | *5/21* | *5/22* | *5/23* | *5/24* | *5/25* | *5/26* |
|---|---|---|---|---|---|---|---|---|
| *Start Fishing Time:* | *8:00* | *8:00* | *7:45* | *8:00* | *7:00* | *7;45* | *8:00* | *8:00* |
| *End Fishing Time:* | *16:40* | *18:00* | *17:20* | *16:30* | *17:00* | *16:30* | *16:20* | *16:20* |
| *Hours of Operation:* | *8.7* | *10.0* | *9.6* | *8.5* | *10.0* | *8.8* | *8.3* | *8.3* |
| *Number of Lifts:* | *10* | *11* | *12* | *8* | *10* | *9* | *8* | *8* |
| *Water Temperature (°F):* | *64.3* | *65.7* | *66.8* | *67.1* | *67.5* | *68* | *70.3* | *73.4* |
| American Shad | 127 | 229 | 774 | 315 | 532 | 352 | 291 | 157 |
| Blueback herring | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Alewife | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gizzard shad | 9,830 | 12,391 | 15,358 | 6,650 | 5,510 | 4,050 | 6,729 | 6,696 |
| Striped bass | 1 | 1 | 2 | 0 | 1 | 0 | 1 | 1 |
| Hybrid striped bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| White perch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sea lamprey | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rainbow trout | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brown trout | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Muskellunge | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Northern pike | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carp | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| Quillback | 9 | 2 | 14 | 57 | 12 | 32 | 3 | 13 |
| White sucker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Shorthead redhorse | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 |
| White catfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow bullhead | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brown bullhead | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Channel catfish | 14 | 15 | 65 | 179 | 8 | 59 | 44 | 36 |
| Rock bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Redbreast sunfish | 0 | 0 | 0 | 1 | 0 | 1 | 3 | 0 |
| Green sunfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumpkinseed | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bluegill | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 1 |
| Smallmouth bass | 0 | 0 | 2 | 0 | 0 | 1 | 3 | 0 |
| Largemouth bass | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Black Crappie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow perch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Walleye | 1 | 5 | 23 | 122 | 19 | 5 | 9 | 3 |
| Tiger Muskie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| American Eel | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Atlantic Needlefish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Comely Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spottail Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Stopfin Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Golden Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Flathead Catfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *TOTAL* | 9,986 | 12,644 | 16,241 | 7,324 | 6,084 | 4,501 | 7,084 | 6,909 |

**Table 1**

**Continued.**

| *Date:* | *5/27* | *5/28* | *5/29* | *5/30* | *5/31* | *6/1* | *6/2* | *6/3* |
|---|---|---|---|---|---|---|---|---|
| *Start Fishing Time:* | *8:00* | *7:45* | *8:00* | *7:30* | *8:00* | *8:00* | *8:00* | *8:00* |
| *End Fishing Time:* | *17:00* | *16:30* | *16:20* | *16:30* | *16:00* | *16:00* | *16:15* | *16:00* |
| *Hours of Operation:* | *9.0* | *8.8* | *8.3* | *9.0* | *8.0* | *8.0* | *8.3* | *8.0* |
| *Number of Lifts:* | *9* | *8* | *7* | *8* | *8* | *8* | *8* | *8* |
| *Water Temperature (°F):* | *73.4* | *73.1* | *75.2* | *75.5* | *78.8* | *79.3* | *80.6* | *80.6* |
| American Shad | 254 | 147 | 13 | 170 | 235 | 47 | 141 | 59 |
| Blueback herring | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| Alewife | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gizzard shad | 2,350 | 670 | 789 | 262 | 321 | 380 | 220 | 423 |
| Striped bass | 5 | 1 | 2 | 2 | 1 | 3 | 0 | 1 |
| Hybrid striped bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| White perch | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sea lamprey | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rainbow trout | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brown trout | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Muskellunge | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Northern pike | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carp | 0 | 4 | 6 | 0 | 2 | 3 | 0 | 0 |
| Quillback | 15 | 5 | 4 | 4 | 1 | 1 | 6 | 60 |
| White sucker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Shorthead redhorse | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| White catfish | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow bullhead | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Brown bullhead | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Channel catfish | 328 | 561 | 386 | 56 | 133 | 495 | 235 | 341 |
| Rock bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Redbreast sunfish | 1 | 0 | 0 | 4 | 3 | 0 | 2 | 0 |
| Green sunfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Pumpkinseed | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Bluegill | 0 | 0 | 0 | 4 | 1 | 0 | 0 | 0 |
| Smallmouth bass | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Largemouth bass | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Black Crappie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Yellow perch | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Walleye | 1 | 24 | 6 | 7 | 4 | 8 | 5 | 6 |
| Tiger Muskie | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| American Eel | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| Atlantic Needlefish | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| Comely Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 |
| Spottail Shineer | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Stopfin Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 28 |
| Golden Shiner | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Flathead Catfish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *TOTAL* | 2,957 | 1,415 | 1,206 | 510 | 703 | 938 | 628 | 940 |

**Table 1**

**Continued.**

| *Date:* | *6/4* | *6/5* | *6/6* | ***Season*** |
|---|---|---|---|---|
| *Start Fishing Time:* | *8:00* | *8:00* | *8:00* | ***Total*** |
| *End Fishing Time:* | *16:00* | *16:00* | *15:00* | |
| *Hours of Operation:* | *8.0* | *8.0* | *7.0* | ***526.2*** |
| *Number of Lifts:* | *8* | *8* | *6.0* | ***685*** |
| *Water Temperature (°F):* | *81.5* | *83.3* | *83.3* | |
| American Shad | 123 | 31 | 20 | **37,757** |
| Blueback herring | 0 | 0 | 0 | **4** |
| Alewife | 0 | 0 | 0 | **1** |
| Gizzard shad | 165 | 268 | 60 | **813,429** |
| Striped bass | 0 | 2 | 2 | **34** |
| Hybrid striped bass | 0 | 0 | 0 | **2** |
| White perch | 0 | 0 | 0 | **21** |
| Sea lamprey | 0 | 0 | 0 | **31** |
| Rainbow trout | 0 | 0 | 0 | **3** |
| Brown trout | 0 | 0 | 0 | **5** |
| Muskellunge | 0 | 0 | 0 | **1** |
| Northern pike | 0 | 0 | 0 | **1** |
| Carp | 0 | 3 | 2 | **47** |
| Quillback | 34 | 56 | 6 | **489** |
| White sucker | 0 | 0 | 0 | **9** |
| Shorthead redhorse | 0 | 0 | 0 | **43** |
| White catfish | 0 | 0 | 0 | **1** |
| Yellow bullhead | 0 | 0 | 0 | **1** |
| Brown bullhead | 0 | 0 | 0 | **1** |
| Channel catfish | 74 | 133 | 109 | **4,626** |
| Rock bass | 0 | 0 | 0 | **8** |
| Redbreast sunfish | 0 | 0 | 1 | **20** |
| Green sunfish | 0 | 0 | 0 | **0** |
| Pumpkinseed | 0 | 0 | 1 | **6** |
| Bluegill | 0 | 12 | 2 | **54** |
| Smallmouth bass | 0 | 1 | 1 | **57** |
| Largemouth bass | 0 | 4 | 1 | **18** |
| Black Crappie | 0 | 0 | 0 | **0** |
| Yellow perch | 0 | 0 | 2 | **2** |
| Walleye | 2 | 2 | 7 | **378** |
| Tiger Muskie | 0 | 0 | 0 | **1** |
| American Eel | 0 | 1 | 1 | **4** |
| Atlantic Needlefish | 0 | 2 | 0 | **4** |
| Comely Shiner | 20 | 0 | 50 | **92** |
| Spottail Shiner | 11 | 0 | 0 | **12** |
| Stopfin Shiner | 0 | 0 | 53 | **98** |
| Golden Shiner | 0 | 0 | 0 | **2** |
| Flathead Catfish | 0 | 0 | 0 | **1** |
| *TOTAL* | 429 | 515 | 318 | **857,263** |

**Table 2.**

**Summary of American shad catch, Maryland DNR recaptures, daily average river flow, water temperature, turbidity (secchi), unit operation, entrance gates utilized, attraction flow, and project water elevations during operation of the Conowingo Dam East fish passage facility in 2010.**

| Date | American Shad Catch | MD DNR Recaptures* | Holtwood River Flow (cfs) | Water Temp. (°F) | Secchi (in) | Maximum Units in Operation | Entrance Gates Utilized | Attraction Flow (cfs) | Tailrace Elevation (ft) | Forebay Elevation (ft) | Crest Gates |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5-Apr | 0 | *0* | 72,100 | 55.4 | 8 | 11 | C | 310 | 23.0-24.0 | 106.9 | 0 |
| 7-Apr | 4 | *0* | 55,800 | 59.9 | 16 | 11 | C | 310 | 22.5-23.5 | 107.2 | 0 |
| 9-Apr | 1 | *0* | 45,000 | 63.7 | 20 | 10 | A/C | 310 | 18.5-23.0 | 106.9 | 0 |
| 11-Apr | 18 | *0* | 40,900 | 60.1 | 22 | 5 | A/C | 310 | 18.0-21.0 | 96.8 | 0 |
| 13-Apr | 626 | *0* | 37,700 | 59.7 | 20 | 9 | C | 310 | 20.5-23.0 | 107.4 | 0 |
| 14-Apr | 29 | *0* | 34,600 | 59.2 | 22 | 6 | C | 310 | 22.00 | 107.3 | 0 |
| 15-Apr | 1 | *0* | 30,900 | 58.5 | 28 | 6 | C | 310 | 21.50 | 106.9 | 0 |
| 16-Apr | 5 | *0* | 30,300 | 59.2 | 27 | 6 | C | 310 | 18.0-21.0 | 107.2 | 0 |
| 17-Apr | 282 | *0* | 28,100 | 60.2 | 30 | 5 | A/C | 310 | 17.0-18.5 | 107.7 | 0 |
| 18-Apr | 70 | *0* | 27,600 | 60.3 | 28 | 4 | C | 310 | 19.50 | 108.3 | 0 |
| 19-Apr | 1364 | *0* | 26,000 | 59.5 | 28 | 9 | A/C | 310 | 19.8-22.8 | 98.2 | 0 |
| 20-Apr | 3272 | *4O* | 25,300 | 58.4 | 27 | 5 | C/A/C | 310 | 19.0-22.0 | 107.2 | 0 |
| 21-Apr | 3097 | *0* | 26,100 | 58.1 | 30 | 10 | C/A | 310 | 18.5-23.0 | 107.4 | 0 |
| 22-Apr | 2440 | *2O* | 26,100 | 58.1 | 30 | 9 | A/C | 310 | 19.0-22.9 | 107.4 | 0 |
| 23-Apr | 1706 | *2P* | 23,500 | 59.7 | 28 | 6 | C/A/C | 310 | 19.0-21.0 | 106.8 | 0 |
| 24-Apr | 2171 | *1P,1O* | 23,200 | 60.6 | 25 | 2 | A | 310 | 18.5-19.0 | 106.4 | 0 |
| 25-Apr | 954 | *1P,1O* | 21,100 | 61.0 | 24 | 4 | A | 310 | 18.0-19.5 | 106.2 | 0 |
| 26-Apr | 77 | *0* | 24,400 | 60.9 | 28 | 6 | C | 310 | 21.5-22.0 | 106.9 | 0 |
| 27-Apr | 128 | *0* | 26,800 | 60.6 | 28 | 9 | A | 310 | 19.0-22.5 | 106.7 | 0 |
| 28-Apr | 40 | *0* | 30,000 | 58.7 | 28 | 6 | A/C | 310 | 18.5-21.5 | 106.6 | 0 |
| 29-Apr | 201 | *1P* | 38,900 | 56.8 | 28 | 10 | A/C | 310 | 18.5-23.0 | 107.5 | 0 |
| 30-Apr | 126 | *2P* | 45,500 | 57.1 | 28-20 | 10 | C | 310 | 22.5-23.0 | 92.9 | 0 |
| 1-May | 368 | *0* | 43,400 | 59.1 | 25 | 10 | C | 310 | 21.0-23.5 | 106.7 | 0 |
| 2-May | 1,192 | *1P* | 37,600 | 62.5 | 24 | 10 | A/C | 310 | 18.0-23.0 | 107.4 | 0 |
| 3-May | 1,000 | *1P* | 45,700 | 65.5 | 26 | 10 | A/C | 310 | 18.5-23.0 | 107.8 | 0 |
| 4-May | 668 | *1P* | 45,400 | 68.1 | 26 | 10 | A/C | 310 | 20.0-23.5 | 107.8 | 0 |
| 5-May | 730 | *8P* | 38,500 | 69.2 | 36+ | 10 | A/C | 310 | 19.0-23.0 | 107.7 | 0 |
| 6-May | 695 | *2P* | 33,100 | 69.5 | 36+ | 11 | A/C | 310 | 18.0-23.0 | 107.6 | 0 |
| 7-May | 2,343 | *6P* | 30,400 | 69.4 | 36+ | 9 | C | 310 | 21.0-23.0 | 97.6 | 0 |
| 8-May | 2,141 | *9P* | 27,200 | 69.2 | 30+ | 6 | A/C | 310 | 19.0-22.5 | 107.4 | 0 |

**Table 2.**

**Continued.**

| Date | American Shad Catch | MD DNR Recaptures* | Holtwood River Flow (cfs) | Water Temp. (°F) | Secchi (in) | Maximum Units in Operation | Entrance Gates Utilized | Attraction Flow (cfs) | Tailrace Elevation (ft) | Forebay Elevation (ft) | Crest Gates |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9-May | 973 | *6P* | 27,400 | 67.2 | 36+ | 7 | A/C | 310 | 18.0-21.5 | 107.2 | 0 |
| 10-May | 744 | *7P* | 25,400 | 64.5 | 36+ | 6 | C/A/C | 310 | 19.0-20.5 | 106.7 | 0 |
| 11-May | 1,818 | *8P* | 26,300 | 63.2 | 34 | 6 | C/A | 310 | 19.0-22.0 | 107.4 | 0 |
| 12-May | 1,968 | *8P* | 28,600 | 60.2 | 34 | 7 | C/A | 310 | 19.3-21.5 | 107.2 | 0 |
| 13-May | 1,390 | *13P,1O* | 30,200 | 58.8 | 32 | 2 | A/C | 310 | 18.5-19.0 | 96.2 | 0 |
| 14-May | 77 | *1P* | 39,600 | 58.4 | 25 | 11 | C | 310 | 20.6-23.5 | 105.7 | 0 |
| 15-May | 254 | *3P* | 46,000 | 60.4 | 36 | 11 | C | 310 | 21.5-24.0 | 107.4 | 0 |
| 16-May | 77 | *1P* | 47,600 | 63.6 | 25 | 7 | C | 310 | 21.50 | 106.7 | 0 |
| 17-May | 527 | *0* | 43,500 | 64.7 | 24 | 10 | C | 310 | 21.5-23.5 | 106.8 | 0 |
| 18-May | 163 | *0* | 40,200 | 64.5 | 20 | 11 | A/C | 310 | 18.5-23.5 | 107.0 | 0 |
| 19-May | 127 | *0* | 35,400 | 63.4 | 22 | 9 | A/C | 310 | 18.5-22.8 | 106.4 | 0 |
| 20-May | 229 | *2P* | 34,800 | 62.5 | 25 | 10 | C/A | 310 | 19.0-23.0 | 107.0 | 0 |
| 21-May | 774 | *11P* | 32,300 | 63.5 | 23 | 11 | A/C | 310 | 19.0-23.5 | 108.2 | 0 |
| 22-May | 315 | *0* | 29,900 | 65.4 | 36 | 8 | A/C | 310 | 19.0-22.5 | 118.9 | 0 |
| 23-May | 532 | *3P* | 28,400 | 67.9 | 24 | 6 | A/C | 310 | 18.25-22.0 | 107.4 | 0 |
| 24-May | 352 | *2P* | 30,300 | 69.6 | 24 | 9 | A/C | 310 | 18.5-23.3 | 108.4 | 0 |
| 25-May | 291 | *3P* | 37,100 | 70.2 | 15 | 9 | A/C | 310 | 19.5-23.0 | 108.6 | 0 |
| 26-May | 157 | *0* | 31,100 | 71.0 | 27 | 8 | A/C | 310 | 19.0-23.5 | 107.3 | 0 |
| 27-May | 254 | *1P* | 27,200 | 73.1 | 28 | 11 | A/C | 310 | 18.5-23.5 | 107.6 | 0 |
| 28-May | 147 | *1P* | 24,500 | 74.3 | 24 | 8 | A/C | 310 | 18.5-22.5 | 107.9 | 0 |
| 29-May | 13 | *0* | 22,500 | 74.7 | 30 | 6 | A/C | 310 | 18.5-21.5 | 108.3 | 0 |
| 30-May | 170 | *0* | 19,000 | 76.2 | 30 | 9 | A/C | 310 | 18.3-22.5 | 108.1 | 0 |
| 31-May | 235 | *1P* | 20,200 | 77.4 | 30 | 5 | A/C | 310 | 17.8-20.6 | 107.9 | 0 |
| 1-Jun | 47 | *0* | 20,000 | 77.3 | 30 | 10 | A/C | 310 | 17.8-23.0 | 107.7 | 0 |
| 2-Jun | 141 | *0* | 17,600 | 78.0 | 30 | 10 | A/C | 310 | 18.0-23.0 | 93.9 | 0 |
| 3-Jun | 59 | *0* | 16,000 | 79.0 | 30 | 7 | A/C | 310 | 18.0-22.5 | 71.2 | 0 |
| 4-Jun | 123 | *0* | 16,500 | 80.2 | 30 | 2 | A/C | 310 | 17.5-22.0 | 107.2 | 0 |
| 5-Jun | 31 | *0* | 18,700 | 80.7 | 36+ | 8 | A/C | 310 | 18.0-23.5 | 107.9 | 0 |
| 6-Jun | 20 | *0* | 19,600 | 80.9 | 36+ | 5 | A/C | 310 | 17.2-20.9 | 107.4 | 0 |

* Tag color: O = orange, P =pink,

**Table 3**

**Hourly summary of American shad passage at the Conowingo Dam East Fish Passage Facility in 2010.**

| ***Date:*** | *4/5* | *4/7* | *4/9* | *4/11* | *4/13* | *4/14* | *4/15* | *4/16* | *4/17* | *4/18* | *4/19* | *4/20* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Observation Time-Start:*** | *11:30* | *9:45* | *9:30* | *7:45* | *9:00* | *8:15* | *9:00* | *8:00* | *8:30* | *13:00* | *8:00* | *8:00* |
| ***Observation Time-End:*** | *16:30* | *16:35* | *16:15* | *17:20* | *17:18* | *17:00* | *17:00* | *17:00* | *17:00* | *17:15* | *18:45* | *18:40* |
| **Military Time (hrs)** | | | | | | | | | | | | |
| 0700 to 0759 | -- | -- | -- | 0 | -- | -- | -- | -- | -- | -- | -- | -- |
| 0800 to 0859 | -- | -- | -- | 0 | -- | 6 | -- | 0 | 1 | -- | 2 | 53 |
| 0900 to 0959 | -- | 0 | 0 | 4 | 0 | 12 | 1 | 1 | 18 | -- | 2 | 16 |
| 1000 to 1059 | -- | 0 | 0 | 4 | 0 | 7 | 0 | 0 | 12 | -- | 3 | 12 |
| 1100 to 1159 | 0 | 3 | 0 | 4 | 1 | 3 | 0 | 0 | 2 | -- | 5 | 3 |
| 1200 to 1259 | 0 | 0 | 0 | 0 | 18 | 0 | 0 | 0 | 8 | -- | 9 | 9 |
| 1300 to 1359 | 0 | 0 | 1 | 0 | 98 | 0 | 0 | 0 | 46 | 51 | 16 | 309 |
| 1400 to 1459 | 0 | 0 | 0 | 1 | 233 | 0 | 0 | 3 | 47 | 8 | 53 | 841 |
| 1500 to 1559 | 0 | 1 | 0 | 3 | 220 | 1 | 0 | 0 | 78 | 7 | 288 | 861 |
| 1600 to 1659 | 0 | 0 | 0 | 1 | 46 | 0 | 0 | 1 | 70 | 2 | 423 | 652 |
| 1700 to 1759 | -- | -- | -- | 1 | 10 | -- | -- | -- | -- | 2 | 448 | 390 |
| 1800 to 1859 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 115 | 126 |
| 1900 to 1959 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ***Total*** | 0 | 4 | 1 | 18 | 626 | 29 | 1 | 5 | 282 | 70 | 1364 | 3272 |

| ***Date:*** | *4/21* | *4/22* | *4/23* | *4/24* | *4/25* | *4/26* | *4/27* | *4/28* | *4/29* | *4/30* | *5/1* | *5/2* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Observation Time-Start:*** | *8:30* | *8:30* | *8:30* | *8:20* | *8:30* | *8:15* | *8:00* | *8:30* | *8:00* | *8:30* | *8:00* | *8:10* |
| ***Observation Time-End:*** | *19:00* | *19:00* | *18:10* | *19:00* | *19:00* | *17:00* | *18:50* | *17:00* | *16:50* | *16:45* | *18:25* | *19:00* |
| **Military Time (hrs)** | | | | | | | | | | | | |
| 0700 to 0759 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 0800 to 0859 | 37 | 71 | 5 | 13 | 10 | 50 | 0 | 3 | 3 | 1 | 1 | 110 |
| 0900 to 0959 | 66 | 51 | 18 | 61 | 76 | 18 | 5 | 2 | 4 | 19 | 3 | 76 |
| 1000 to 1059 | 39 | 19 | 8 | 19 | 36 | 0 | 6 | 13 | 3 | 38 | 0 | 70 |
| 1100 to 1159 | 136 | 8 | 1 | 12 | 39 | 2 | 4 | 5 | 26 | 23 | 1 | 16 |
| 1200 to 1259 | 231 | 1 | 3 | 22 | 48 | 0 | 4 | 8 | 45 | 21 | 2 | 6 |
| 1300 to 1359 | 623 | 185 | 0 | 101 | 56 | 1 | 3 | 2 | 25 | 8 | 2 | 2 |
| 1400 to 1459 | 497 | 456 | 154 | 267 | 61 | 4 | 52 | 6 | 74 | 10 | 10 | 13 |
| 1500 to 1559 | 274 | 673 | 669 | 478 | 86 | 2 | 34 | 1 | 14 | 4 | 32 | 104 |
| 1600 to 1659 | 251 | 435 | 462 | 372 | 176 | 0 | 6 | 0 | 7 | 2 | 42 | 110 |
| 1700 to 1759 | 676 | 421 | 309 | 477 | 195 | -- | 7 | -- | -- | -- | 175 | 246 |
| 1800 to 1859 | 267 | 120 | 77 | 349 | 171 | -- | 7 | -- | -- | -- | 100 | 439 |
| 1900 to 1959 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| *Total* | 3097 | 2440 | 1706 | 2171 | 954 | 77 | 128 | 40 | 201 | 126 | 368 | 1192 |

| ***Date:*** | *5/3* | *5/4* | *5/5* | *5/6* | *5/7* | *5/8* | *5/9* | *5/10* | *5/11* | *5/12* | *5/13* | *5/14* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Observation Time-Start:*** | *8:30* | *8:00* | *8:00* | *8:15* | *8:00* | *8:00* | *8:15* | *9:00* | *8:00* | *8:15* | *8:30* | *8:10* |
| ***Observation Time-End:*** | *18:45* | *17:12* | *16:45* | *17:00* | *19:20* | *16:45* | *17:00* | *18:45* | *18:20* | *18:25* | *17:25* | *16:40* |
| **Military Time (hrs)** | | | | | | | | | | | | |
| 0700 to 0759 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 0800 to 0859 | 21 | 44 | 14 | 17 | 1 | 233 | 87 | -- | 3 | 7 | 45 | 46 |
| 0900 to 0959 | 140 | 103 | 19 | 28 | 10 | 376 | 156 | 2 | 19 | 29 | 40 | 7 |
| 1000 to 1059 | 148 | 230 | 203 | 216 | 31 | 677 | 231 | 23 | 23 | 60 | 31 | 2 |
| 1100 to 1159 | 92 | 96 | 239 | 131 | 44 | 586 | 249 | 15 | 300 | 34 | 56 | 7 |
| 1200 to 1259 | 81 | 45 | 58 | 86 | 79 | 134 | 73 | 3 | 495 | 400 | 84 | 2 |
| 1300 to 1359 | 56 | 46 | 75 | 129 | 218 | 75 | 42 | 79 | 343 | 268 | 367 | 1 |
| 1400 to 1459 | 78 | 34 | 49 | 61 | 144 | 27 | 67 | 302 | 210 | 203 | 411 | 5 |
| 1500 to 1559 | 132 | 35 | 39 | 5 | 301 | 20 | 40 | 131 | 97 | 256 | 161 | 4 |
| 1600 to 1659 | 69 | 26 | 34 | 22 | 368 | 13 | 28 | 95 | 122 | 217 | 138 | 3 |
| 1700 to 1759 | 111 | 9 | -- | -- | 500 | -- | -- | 84 | 145 | 312 | 57 | -- |
| 1800 to 1859 | 72 | -- | -- | -- | 459 | -- | -- | 10 | 61 | 182 | -- | -- |
| 1900 to 1959 | -- | -- | -- | -- | 188 | -- | -- | -- | -- | -- | -- | -- |
| ***Total*** | 1000 | 668 | 730 | 695 | 2343 | 2141 | 973 | 744 | 1818 | 1968 | 1390 | 77 |

**Table 3**

**Continued.**

| ***Date:*** | *5/15* | *5/16* | *5/17* | *5/18* | *5/19* | *5/20* | *5/21* | *5/22* | *5/23* | *5/24* | *5/25* | *5/26* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Observation Time-Start:*** | *8:05* | *8:10* | *8:15* | *8:00* | *9:00* | *8:00* | *8;00* | *8:00* | *8:20* | *8:00* | *8:10* | *8:10* |
| ***Observation Time-End:*** | *16:30* | *16:45* | *18:25* | *16:55* | *17:00* | *18;25* | *17:35* | *16:45* | *17:15* | *16:50* | *16:45* | *16:40* |
| **Military Time (hrs)** | | | | | | | | | | | | |
| 0700 to 0759 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 0800 to 0859 | 5 | 14 | 6 | 13 | -- | 14 | 16 | 22 | 83 | 17 | 8 | 4 |
| 0900 to 0959 | 14 | 16 | 33 | 6 | 2 | 15 | 56 | 32 | 79 | 91 | 54 | 0 |
| 1000 to 1059 | 2 | 10 | 36 | 0 | 8 | 6 | 161 | 67 | 77 | 76 | 27 | 19 |
| 1100 to 1159 | 15 | 6 | 79 | 20 | 2 | 9 | 108 | 46 | 54 | 49 | 111 | 50 |
| 1200 to 1259 | 64 | 4 | 39 | 47 | 23 | 3 | 142 | 57 | 50 | 41 | 8 | 36 |
| 1300 to 1359 | 48 | 6 | 121 | 44 | 9 | 6 | 93 | 20 | 37 | 10 | 10 | 16 |
| 1400 to 1459 | 44 | 6 | 62 | 19 | 8 | 7 | 62 | 25 | 21 | 3 | 19 | 18 |
| 1500 to 1559 | 31 | 4 | 31 | 8 | 14 | 4 | 48 | 34 | 37 | 29 | 26 | 9 |
| 1600 to 1659 | 31 | 11 | 75 | 6 | 61 | 21 | 68 | 12 | 57 | 36 | 28 | 5 |
| 1700 to 1759 | -- | -- | 25 | -- | -- | 74 | 20 | -- | 37 | -- | -- | -- |
| 1800 to 1859 | -- | -- | 20 | -- | -- | 70 | -- | -- | -- | -- | -- | -- |
| 1900 to 1959 | -- | | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ***Total*** | 254 | 77 | 527 | 163 | 127 | 229 | 774 | 315 | 532 | 352 | 291 | 157 |

| ***Date:*** | *5/27* | *5/28* | *5/29* | *5/30* | *5/31* | *6/1* | *6/2* | *6/3* | *6/4* | 6/5 | 6/6 | *Season* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Observation Time-Start:*** | *8:15* | *8:00* | *8:10* | *8:10* | *8:15* | *8:00* | *8:00* | *8:15* | *8:15* | 8:10 | 8:00 | *Total* |
| ***Observation Time-End:*** | *17:25* | *17:00* | *16:40* | *16:40* | *16:20* | *16:00* | *16:35* | *16:20* | *16:15* | 16:10 | 15:30 | |
| **Military Time (hrs)** | | | | | | | | | | | | |
| 0700 to 0759 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **0** |
| 0800 to 0859 | 0 | 0 | 1 | 13 | 19 | 1 | 23 | 1 | 0 | 0 | 0 | **1,144** |
| 0900 to 0959 | 31 | 3 | 1 | 25 | 8 | 4 | 24 | 13 | 14 | 0 | 0 | **1,903** |
| 1000 to 1059 | 59 | 28 | 0 | 40 | 41 | 1 | 52 | 19 | 17 | 5 | 6 | **2,921** |
| 1100 to 1159 | 35 | 39 | 0 | 12 | 25 | 0 | 21 | 6 | 25 | 10 | 5 | **2,870** |
| 1200 to 1259 | 44 | 15 | 0 | 22 | 46 | 11 | 6 | 6 | 23 | 4 | 4 | **2,670** |
| 1300 to 1359 | 29 | 31 | 2 | 20 | 40 | 0 | 10 | 6 | 20 | 4 | 4 | **3,814** |
| 1400 to 1459 | 32 | 6 | 0 | 14 | 36 | 5 | 3 | 3 | 20 | 7 | 1 | **4,802** |
| 1500 to 1559 | 14 | 17 | 7 | 8 | 16 | 22 | 0 | 4 | 4 | 1 | 0 | **5,419** |
| 1600 to 1659 | 6 | 8 | 2 | 16 | 4 | 3 | 2 | 1 | -- | 0 | -- | **4,646** |
| 1700 to 1759 | 4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **4,735** |
| 1800 to 1859 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **2,645** |
| 1900 to 1959 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | **188** |
| ***Total*** | 254 | 147 | 13 | 170 | 235 | 47 | 141 | 59 | 123 | 31 | 20 | **37,757** |

**Table 4**

**Summary of selected operation and fish catch statistics at the Conowingo Dam East Fish Passage Facility, 1991 to 2010.**

| Year | Number of Days Operated | Number of Lifts | Operating Time (hrs) | Catch (millions) | Number of Species | American shad | Blueback herring | Alewife | Hickory shad |
|---|---|---|---|---|---|---|---|---|---|
| 1991 | 60 | 1168 | 647.2 | 0.651 | 42 | 13,897 | 13,149 | 323 | 0 |
| 1992 | 49 | 599 | 454.1 | 0.492 | 35 | 26,040 | 261 | 3 | 0 |
| 1993 | 42 | 848 | 463.5 | 0.53 | 29 | 8,203 | 4,574 | 0 | 0 |
| 1994 | 55 | 955 | 574.8 | 1.062 | 36 | 26,715 | 248 | 5 | 1 |
| 1995 | 68 | 986 | 706.2 | 1.796 | 36 | 46,062 | 4,004 | 170 | 1 |
| 1996 | 49 | 599 | 454.1 | 0.492 | 35 | 26,040 | 261 | 3 | 0 |
| 1997 | 64 | 652 | 640.0 | 0.719 | 36 | 90,971 | 242,815 | 63 | 0 |
| 1998 | 50 | 652 | 640.0 | 0.713 | 33 | 39,904 | 700 | 6 | 0 |
| 1999 | 52 | 610 | 467.0 | 1.184 | 31 | 69,712 | 130,625 | 14 | 0 |
| 2000 | 45 | 570 | 367.8 | 0.494 | 30 | 153,546 | 14,963 | 2 | 0 |
| 2001 | 43 | 559 | 359.8 | 0.922 | 30 | 193,574 | 284,921 | 7,458 | 0 |
| 2002 | 49 | 560 | 440.7 | 0.657 | 31 | 108,001 | 2,037 | 74 | 6 |
| 2003 | 44 | 645 | 416.6 | 0.589 | 25 | 125,135 | 530 | 21 | 0 |
| 2004 | 44 | 590 | 390.3 | 0.716 | 30 | 109,360 | 101 | 89 | 0 |
| 2005 | 52 | 541 | 434.3 | 0.378 | 30 | 68,926 | 4 | 0 | 0 |
| 2006 | 61 | 619 | 429.8 | 0.715 | 32 | 56,899 | 0 | 0 | 4 |
| 2007 | 39 | 479 | 335.3 | 0.539 | 31 | 25,464 | 460 | 429 | 0 |
| 2008 | 51 | 483 | 407.0 | 0.944 | 29 | 19,914 | 1 | 4 | 0 |
| 2009 | 57 | 618 | 496 | 0.915 | 30 | 29,272 | 71 | 160 | 0 |
| **2010** | **59** | **685** | **526** | **0.857** | **38** | **37,757** | **4** | **1** | **0** |

**Table 5**

**Summary of American shad passage counts and percent passage values at Susquehanna River dams, 1997-2010.**

| | Conowingo | Holtwood | | Safe Harbor | | York Haven | |
|---|---|---|---|---|---|---|---|
| | East | Number | % of C.E.L. | Number | % of Holt. | Number | % of S.H. |
| 1997 | 90,971 | 28,063 | 30.8% | 20,828 | 74.2% | - | - |
| 1998 | 39,904 | 8,235 | 20.6% | 6,054 | 73.5% | - | - |
| 1999 | 69,712 | 34,702 | 49.8% | 34,150 | 98.4% | - | - |
| 2000 | 153,546 | 29,421 | 19.2% | 21,079 | 71.6% | 4,687 | 22.2% |
| 2001 | 193,574 | 109,976 | 56.8% | 89,816 | 81.7% | 16,200 | 18.0% |
| 2002 | 108,001 | 17,522 | 16.2% | 11,705 | 66.8% | 1,555 | 13.3% |
| 2003 | 125,135 | 25,254 | 20.2% | 16,646 | 65.9% | 2,536 | 15.2% |
| 2004 | 109,360 | 3,428 | 3.1% | 2,109 | 61.5% | 219 | 10.4% |
| 2005 | 68,926 | 34,189 | 49.6% | 25,425 | 74.4% | 1,772 | 7.0% |
| 2006 | 56,899 | 35,968 | 63.2% | 24,929 | 69.3% | 1,913 | 7.7% |
| 2007 | 25,464 | 10,338 | 40.6% | 7,215 | 69.8% | 192 | 2.7% |
| 2008 | 19,914 | 2,795 | 14.0% | 1,252 | 44.8% | 21 | 1.7% |
| 2009 | 29,272 | 10,896 | 37.2% | 7,994 | 73.4% | 402 | 5.0% |
| **2010** | **37,757** | **16,472** | **43.6%** | **12,706** | **77.1%** | **907** | **7.1%** |

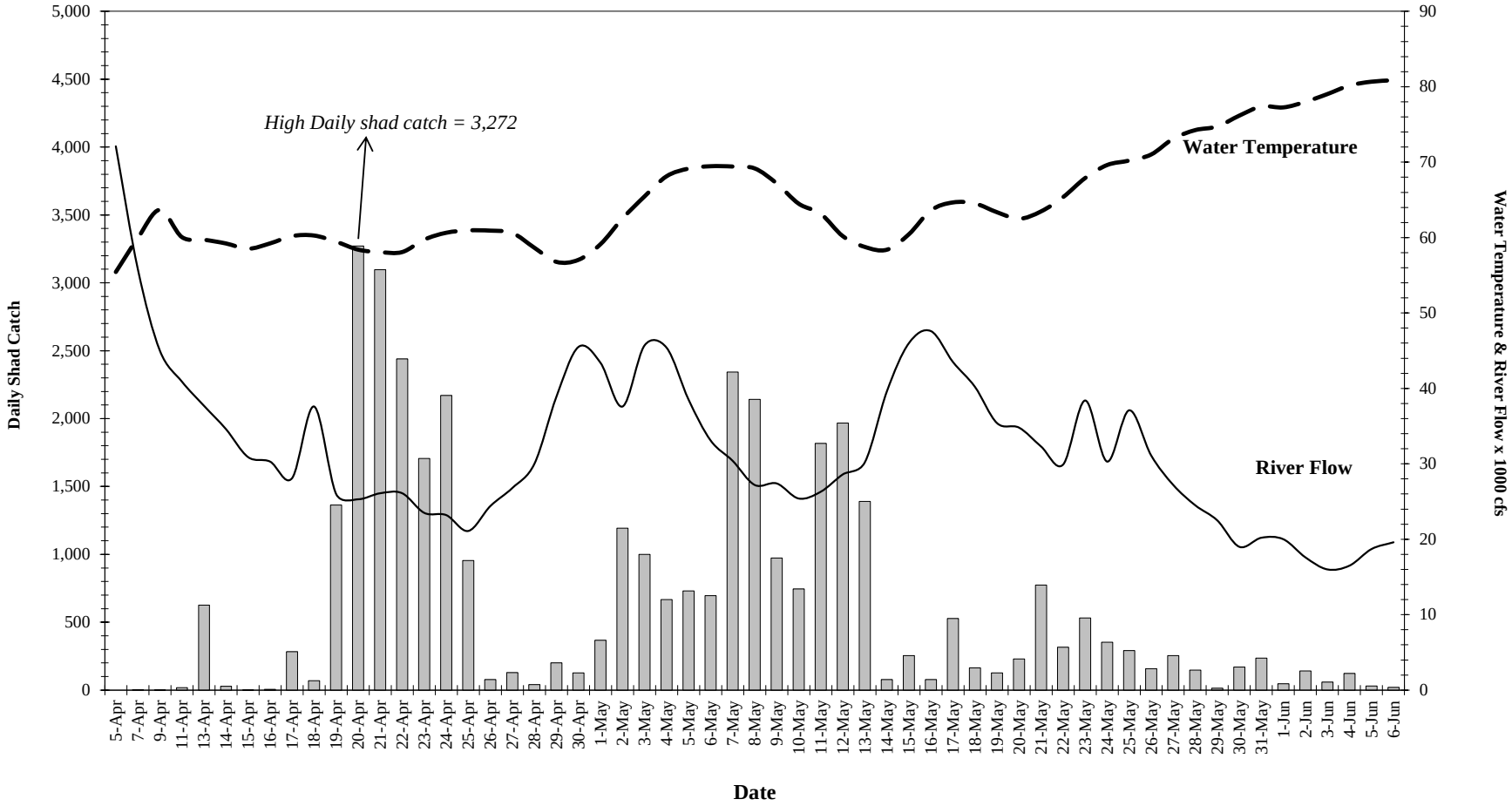


**Figure 1**

**A plot of river flow (x 1000 cfs) and water temperature (°F) as measured at Holtwood Dam, in relationship to the daily American shad catch at the Conowingo East Fish Lift, spring 2010.**

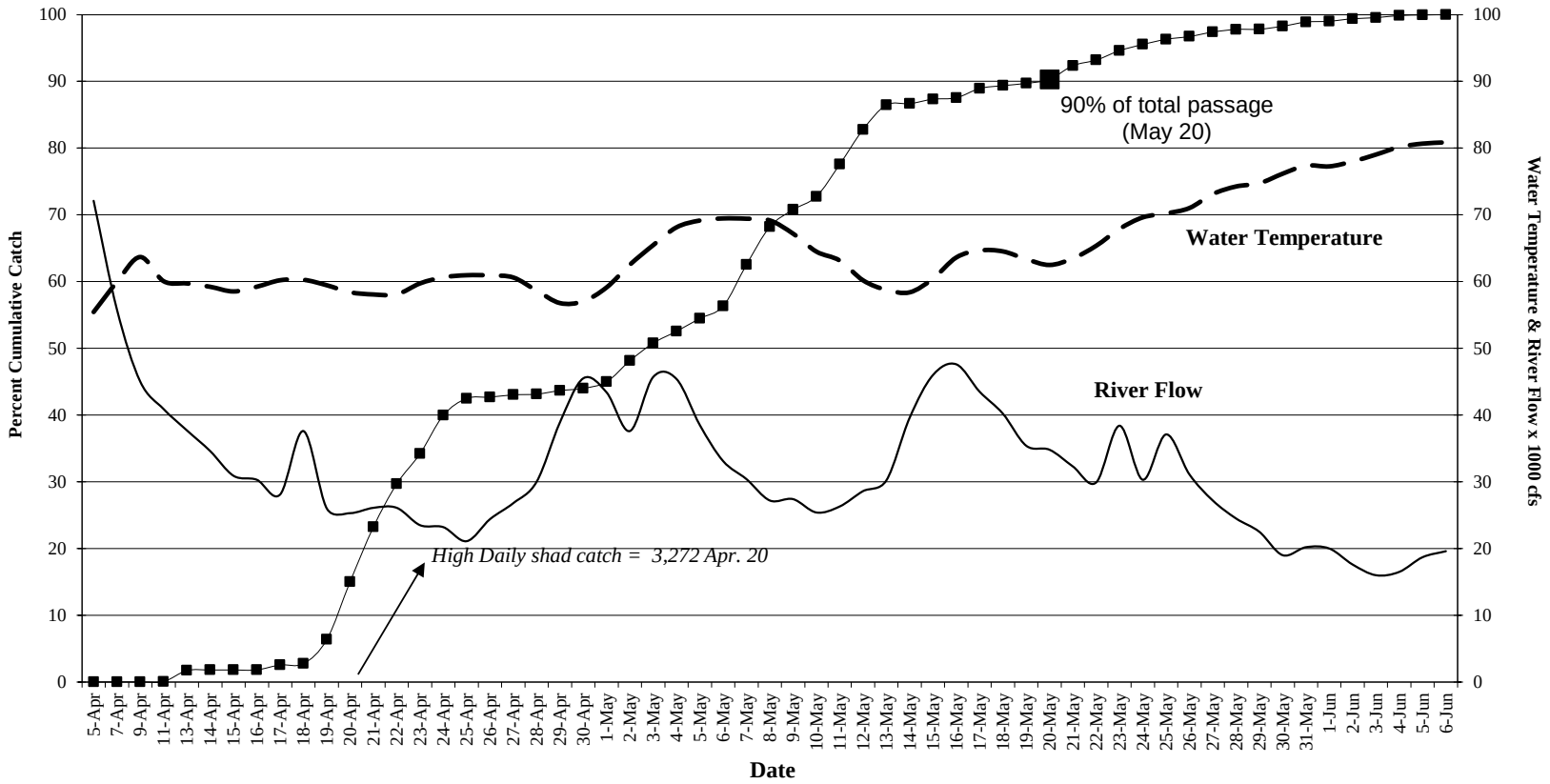


**Figure 2**

**A plot of river flow (x 1000 cfs) and water temperature (°F) as measured at Holtwood Dam,in relationship to the percent cumulative American shad catch at the Conowingo East Fish Lift, spring 2010.**