# JOB 1, PART 2. SUMMARY OF CONOWINGO DAM WEST FISH LIFT OPERATIONS – 2011

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## INTRODUCTION

The shore-based trapping device at Conowingo Dam known as the West Fish Lift has operated every spring since 1972 for the purpose of collecting and counting American shad, river herring, other migratory species and resident fishes in the tailrace. Since 1985, most shad collected here have been sorted from the daily catch, placed into circular transport tanks, and stocked into suitable spawning waters upstream of the mainstem hydroelectric dams. During the spring runs of 1991 through 1996 the newer East Fish Lift at Conowingo Dam also served this purpose. With fish passage available at Holtwood and Safe Harbor dams since 1997, the Conowingo East Fish Lift was operated to pass all fish into the project head pond in spring 2011 (see Part 1). Upstream licensees are no longer obligated to pay for trap and transport activities from Conowingo Dam but Susquehanna Electric Company (SECO) has agreed to keep the West Fish Lift operational, and to administer an annual contract for West Fish Lift trapping operations. Project details are coordinated with the resource agencies through the Susquehanna River Technical Committee (SRTC). Funding to reimburse SECO for contractor expenses for these operations, as well as shad tank spawning trials in 2011 was derived from several sources including upstream utility carryover monies from the 1984 settlement agreement, and annual contributions by the PA Fish and Boat Commission and Maryland DNR. These contributed funds have been administered by the USFWS Susquehanna Coordinator.

The objectives of Conowingo West Fish Lift operations in 2011 included: collection and enumeration of shad, river herring, and other migratory and resident fishes; and obtaining shad for an on-site tank spawning and shad egg collection program conducted at Conowingo Dam. Shad taken here are also monitored for DNR tags and sex ratios, and scale and head samples are taken for age and otolith analysis. No fish were trucked upstream in 2011.

**METHODS**

West Fish Lift operational procedures adopted by the SRTC included limiting the period of operation to the peak six weeks of the run (late April through the first week in June) and limiting daily lift operations to 8 hours (1100-1900 hrs.). Within these parameters the West Fish Lift was operated as in past years, maintaining appropriate entrance velocities and curbing use of adjacent units 1 and 2 whenever river flow dropped below 60,000 cfs. Normandeau Associates, Inc. (NAI) was contracted by SECO to operate both Conowingo fish lifts and to conduct American shad tank spawning trials with egg deliveries to Van Dyke hatchery.

Average daily river flow at Conowingo suffered 4 peaks between April 1 and May 6 which delayed operation of the west lift until May 13. Average daily flow encountered two additional peaks during West Fish Lift operation, varying between 52,000 cfs on May 13 to 158,000 cfs on May 21, back to 81,000 cfs on May 27, to 123,000 on May 30, and back down to 43,000 cfs on June 5, the last day of operation (Figure 1). Water temperature during the same period increased more or less gradually from 63 to 74° F. Lift operations began on May 13 and occurred on 15 days through June 5. Total fishing effort over this period amounted to 144 lifts and a fishing time of 85.4 hours.

American shad collected in the lift were counted and either placed into holding or spawning tanks. Shad in excess of those needed for on-site spawning, or for biological data were returned alive to the tailrace. Other species were identified, enumerated and returned to the tailrace. No live shad brood fish were provided to Maryland DNR for tank spawning in 2011. Every 50th shad in the West Fish Lift collection was sacrificed for otoliths and a scale sample was taken. Lengths and weights were measured, and sex ratios of shad in daily catches were recorded.

**RESULTS**

The West Fish Lift caught 100,070 fish of 32 taxa (Table 1). Gizzard shad comprised 79% of the total catch and the next two most numerous species, channel catfish and American shad comprised 19% of the total. Some 3,074 American shad were caught, representing 3.1% of the total catch (Table 2). No other Alosines were caught. Catch of American shad averaged 205 per operating day with a peak day catch of 1,185 shad on May 16.

Normandeau Associates used 378 American shad at the lift site for tank spawning (Job II, Part 3). Of the 134 shad sacrificed for hatchery vs. wild analysis by PFBC, 37% were shown to be of hatchery origin. Males averaged 465 mm in total length and 1,060 g while females averaged 512 mm and 1,269 g. Four shad tagged by Maryland DNR in 2011 and two tagged in 2010 were recaptured at the West Fish Lift. Overall male to female sex ratio of shad in the West Fish Lift in 2011 was 1.0 to 1.4 (Table 3).

**DISCUSSION**

River flows were high in 2011 causing a late start for the West Fish Lift operation. Peak catch occurred on May 16 with a catch of 1,185 American shad. West Fish Lift catch per effort of 35.9 shad per fishing hour, 21 shad per lift, and 205 shad per day were above the long term averages of 30 shad per fishing hour, 14 shad per lift, and 202 shad per day (Table 4). Operations and fish catch at the West Fish Lift during 1985-2011 are summarized in Table 5.

**Table 1. Catch of fishes at the Conowingo Dam West Fish Lift, 2011.**

| | |
|---|---|
| **Number of Days** | **15** |
| **Number of Lifts** | **144** |
| **Fishing Time (hours : minutes)** | **83:47** |
| **Number of Taxa** | **32** |
| AMERICAN SHAD | 3,074 |
| HICKORY SHAD | 0 |
| BLUEBACK HERRING | 0 |
| ALEWIFE | 0 |
| GIZZARD SHAD | 79,044 |
| STRIPED BASS | 28 |
| HYBRID STRIPED BASS | 0 |
| CARP | 424 |
| White Perch | 47 |
| American Eel | 21 |
| Brook Trout | 3 |
| Brown Trout | 4 |
| Rainbow Trout | 1 |
| Muskellunge | 1 |
| Goldfish | 1 |
| Comely Shiner | 15 |
| Spotfin Shiner | 10 |
| Quillback | 30 |
| White Sucker | 2 |
| Shorthead Redhorse | 30 |
| Brown Bullhead | 21 |
| Channel Catfish | 15,953 |
| Flathead Catfish | 738 |
| White Catfish | 3 |
| Rock Bass | 34 |
| Redbreast Sunfish | 3 |
| Green Sunfish | 1 |
| Pumpkinseed | 27 |
| Bluegill | 22 |
| Smallmouth Bass | 68 |
| Largemouth Bass | 28 |
| White Crappie | 2 |
| Yellow Perch | 16 |
| Walleye | 298 |
| Atlantic Needlefish | 117 |
| Sea Lamprey | 4 |
| **Total** | **100,070** |

**Table 2. Daily summary of fishes collected at the Conowingo Dam West Fish Lift, 13 May- 5 June, 2011.**

| **Date:** | 13-May | 14-May | 15-May | 16-May | 17-May | 18-May | 19-May | 26-May |
|---|---|---|---|---|---|---|---|---|
| **Day:** | FRIDAY | SATURDAY | SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | THURSDAY |
| **Number of Lifts:** | 12 | 10 | 7 | 10 | 2 | 9 | 3 | 22 |
| **Time of First Lift:** | 11:00 | 11:15 | 11:50 | 9:35 | 13:05 | 9:20 | 12:15 | 9:23 |
| **Time of Last lift:** | 16:45 | 15:30 | 16:00 | 16:00 | 15:25 | 15:20 | 13:00 | 17:13 |
| **Operating time (hours):** | 5:45 | 4:15 | 4:10 | 6:25 | 2:20 | 6:00 | 0:45 | 7:50 |
| **Average Water Temperature (°F):** | 63.4 | 63.9 | 65.9 | 67.0 | 66.5 | 66.1 | 67.5 | 66.7 |
| American shad | 172 | 253 | 186 | 1185 | 29 | 311 | 114 | 28 |
| Blueback herring | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Alewife | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gizzard shad | 13550 | 10150 | 3850 | 4900 | 1500 | 3100 | 330 | 16050 |
| Hickory shad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Striped bass | 0 | 0 | 0 | 1 | 0 | 5 | 4 | 1 |
| Carp | 3 | 8 | 4 | 5 | 3 | 18 | 38 | 115 |
| Other species | 305 | 1264 | 611 | 715 | 433 | 786 | 121 | 4647 |
| **Total** | 14,030 | 11,675 | 4,651 | 6,806 | 1,965 | 4,220 | 607 | 20,841 |

| **Date:** | 27-May | 28-May | 1-Jun | 2-Jun | 3-Jun | 4-Jun | 5-Jun | **Total** |
|---|---|---|---|---|---|---|---|---|
| **Day:** | FRIDAY | SATURDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY | SUNDAY | **for the Year** |
| **Number of Lifts:** | 15 | 12 | 10 | 8 | 8 | 8 | 8 | **144** |
| **Time of First Lift:** | 8:30 | 8:27 | 8:50 | 8:50 | 9:00 | 8:45 | 8:05 | |
| **Time of Last lift:** | 16:14 | 15:05 | 15:30 | 15:00 | 15:30 | 15:45 | 13:40 | |
| **Operating time (hours):** | 7:44 | 6:38 | 6:40 | 6:10 | 6:30 | 7:00 | 5:35 | **85:35** |
| **Average Water Temperature (°F):** | 68.8 | 70.6 | 74.0 | 75.1 | 74.8 | 74.0 | 73.8 | |
| American shad | 108 | 156 | 11 | 33 | 49 | 40 | 399 | **3,074** |
| Blueback herring | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| Alewife | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| Gizzard shad | 6350 | 5640 | 9600 | 2250 | 1330 | 84 | 360 | **79,044** |
| Hickory shad | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **0** |
| Striped bass | 5 | 1 | 3 | 2 | 2 | 4 | 0 | **28** |
| Carp | 127 | 25 | 20 | 40 | 16 | 2 | 0 | **424** |
| Other species | 2468 | 1585 | 1250 | 1346 | 1078 | 609 | 282 | **17,500** |
| **Total** | 9,058 | 7,407 | 10,884 | 3,671 | 2,475 | 739 | 1,041 | **100,070** |

**Table 3. American shad sex ratio information, Conowingo West Fish Lift, 2011. No operation on 20-25 and 29-31 May.**

| Date | Sample size | Males | Females | Male:Female Ratio |
|---|---|---|---|---|
| 13-May | 103 | 51 | 52 | 1: 1.0 |
| 14-May | 103 | 50 | 53 | 1: 1.1 |
| 15-May | 62 | 31 | 31 | 1: 1.0 |
| 16-May | 108 | 37 | 71 | 1: 1.9 |
| 17-May | 29 | 12 | 17 | 1: 1.4 |
| 18-May | 124 | 65 | 59 | 1: 0.9 |
| 19-May | 114 | 54 | 60 | 1: 1.1 |
| 26-May | 17 | 9 | 8 | 1: 0.9 |
| 27-May | 103 | 43 | 60 | 1: 1.4 |
| 28-May | 155 | 58 | 97 | 1: 1.7 |
| 1-Jun | 11 | 5 | 6 | 1: 1.2 |
| 2-Jun | 33 | 14 | 19 | 1: 1.4 |
| 3-Jun | 49 | 16 | 33 | 1: 2.1 |
| 4-Jun | 40 | 12 | 28 | 1: 2.3 |
| 5-Jun | 201 | 78 | 123 | 1: 1.6 |
| **Totals** | **1,252** | **535** | **717** | **1: 1.4** |

Table 4. Catch and effort of American shad taken at the Conowingo Dam West Fish Lift during primary collection periods,* 1985-2011.

| Year | Number Days | Number Lifts | Fishing Hours | Total Catch | Catch Per Day | Catch Per Lift | Catch Per Hour |
|---|---|---|---|---|---|---|---|
| 1985 | 37 | 839 | 328.6 | 1,518 | 41 | 2 | 4.6 |
| 1986 | 53 | 737 | 431.5 | 5,136 | 97 | 7 | 11.9 |
| 1987 | 49 | 1,295 | 506.5 | 7,659 | 156 | 6 | 15.1 |
| 1988 | 54 | 1,166 | 471.7 | 5,137 | 95 | 4 | 10.9 |
| 1989 | 46 | 1,034 | 447.2 | 8,216 | 179 | 8 | 18.4 |
| 1990 | 62 | 1,247 | 541.0 | 15,958 | 257 | 13 | 29.5 |
| 1991 | 59 | 1,123 | 478.5 | 13,273 | 225 | 12 | 27.7 |
| 1992 | 61 | 1,517 | 566.0 | 10,323 | 169 | 7 | 18.2 |
| 1993 | 41 | 971 | 398.0 | 5,328 | 130 | 5 | 13.4 |
| 1994 | 44 | 918 | 414.0 | 5,595 | 127 | 6 | 13.5 |
| 1995 | 64 | 1,216 | 632.2 | 15,588 | 244 | 13 | 24.7 |
| 1996 | 27 | 441 | 245.2 | 11,458 | 424 | 26 | 46.7 |
| 1997 | 44 | 611 | 295.1 | 12,974 | 295 | 21 | 44.0 |
| 1998 | 26 | 476 | 238.6 | 6,577 | 253 | 14 | 27.6 |
| 1999 | 43 | 709 | 312.6 | 9,658 | 225 | 14 | 30.9 |
| 2000 | 34 | 424 | 206.5 | 9,785 | 288 | 23 | 47.4 |
| 2001 | 41 | 425 | 195.1 | 10,940 | 267 | 26 | 56.1 |
| 2002 | 31 | 417 | 147.1 | 9,347 | 302 | 22 | 63.5 |
| 2003 | 31 | 637 | 171.8 | 9,802 | 316 | 27 | 57.0 |
| 2004 | 14 | 151 | 74.3 | 3,426 | 245 | 23 | 46.1 |
| 2005 | 30 | 295 | 165.9 | 3,896 | 130 | 13 | 23.5 |
| 2006 | 37 | 394 | 214.9 | 3,970 | 107 | 10 | 18.5 |
| 2007 | 29 | 288 | 135.3 | 4,272 | 147 | 15 | 31.6 |
| 2008 | 34 | 481 | 174.4 | 2,627 | 77 | 5 | 15.1 |
| 2009 | 28 | 282 | 144.1 | 6,534 | 233 | 23 | 45.3 |
| 2010 | 27 | 238 | 138.2 | 5,605 | 208 | 24 | 40.6 |
| **2011** | **15** | **144** | **85.6** | **3,074** | **205** | **21** | **35.9** |

*Only applies to 1985-1995 data. Excludes early and late season catch and effort when less than 10 shad/day were taken.

**Table 5. Operations and fish catch at Conowingo West Fish Lift, 1985 - 2011.**

| Year | Number of Days | Total Fish (Millions) | Number of Taxa | American Shad | Hickory Shad | Alewife | Blueback Herring |
|---|---|---|---|---|---|---|---|
| 1985 | 55 | 2.318 | 41 | 1,546 | 9 | 377 | 6,763 |
| 1986 | 59 | 1.831 | 43 | 5,195 | 45 | 2,822 | 6,327 |
| 1987 | 60 | 2.593 | 43 | 7,667 | 35 | 357 | 5,861 |
| 1988 | 60 | 1.602 | 49 | 5,169 | 64 | 712 | 14,570 |
| 1989 | 53 | 1.066 | 45 | 8,311 | 28 | 1,902 | 3,611 |
| 1990 | 72 | 1.188 | 44 | 15,964 | 77 | 425 | 9,658 |
| 1991 | 63 | 0.533 | 45 | 13,330 | 120 | 2,649 | 15,616 |
| 1992 | 64 | 1.560 | 46 | 10,335 | 376 | 3,344 | 27,533 |
| 1993 | 45 | 0.713 | 37 | 5,343 | 0 | 572 | 4,052 |
| 1994 | 47 | 0.564 | 46 | 5,615 | 1 | 70 | 2,603 |
| 1995 | 68 | 0.995 | 44 | 15,588 | 36 | 5,405 | 93,859 |
| 1996 | 28 | 1.233 | 39 | 11,473 | 0 | 1 | 871 |
| 1997 | 44 | 0.346 | 39 | 12,974 | 118 | 11 | 133,257 |
| 1998 | 41 | 0.575 | 38 | 6,577 | 6 | 31 | 5,511 |
| 1999 | 43 | 0.722 | 34 | 9,658 | 32 | 1,795 | 8,546 |
| 2000 | 34 | 0.458 | 37 | 9,785 | 1 | 9,189 | 14,326 |
| 2001 | 41 | 0.310 | 38 | 10,940 | 36 | 7,824 | 16,320 |
| 2002 | 31 | 0.419 | 35 | 9,347 | 0 | 141 | 428 |
| 2003 | 31 | 0.147 | 30 | 9,802 | 1 | 16 | 183 |
| 2004 | 14 | 0.039 | 30 | 3,426 | 0 | 0 | 1 |
| 2005 | 30 | 0.094 | 36 | 3,896 | 0 | 0 | 0 |
| 2006 | 37 | 0.163 | 38 | 3,970 | 0 | 2 | 6 |
| 2007 | 29 | 0.159 | 36 | 4,272 | 0 | 7 | 153 |
| 2008 | 34 | 0.733 | 37 | 2,627 | 0 | 2 | 7 |
| 2009 | 28 | 0.226 | 39 | 6,534 | 4 | 20 | 165 |
| 2010 | 27 | 0.158 | 36 | 5,605 | 1 | 1 | 81 |
| **2011** | **15** | **0.100** | **32** | **3,074** | **0** | **0** | **0** |

**Figure 1. A plot of river flow (x 1000 cfs) and water temperature (°F) in relation to the daily American shad catch at the Conowingo West Fish Lift, spring 2011. The West Lift was not operated from 20 to 25 and 29 to 31 May.**