2.0 JOB 1, PART 2: SUMMARY OF CONOWINGO DAM WEST FISH LIFT OPERATIONS, 2009

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2.1 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 capturing and counting American shad, river herring, other migratory species and resident fishes in the tailrace. From 1985 through 1996, most shad collected at the West Fish Lift have been sorted from the daily catch, placed into circular transport tanks, and stocked into suitable spawning waters above 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 functional fish passage available at Holtwood and Safe Harbor dams in 1997, the Conowingo East Fish Lift has been operated to pass all lifted fish directly into the Conowingo Hydroelectric Project head pond (see Job 1, Part 1). Upstream hydroelectric project operators are no longer obligated under the settlement agreement to pay for trap and transport activities from the Conowingo fish lifts; however Exelon Power (Exelon) has agreed to maintain and operate the West Fish Lift, and to enter into an annual contract with a consultant for West Fish Lift trapping, egg taking, and data collection operations. Annual West Fish Lift operational details are coordinated with state and federal resource agencies through the Susquehanna River Technical Committee (SRTC) which oversees fish passage operations efforts at the Conowingo Hydroelectric Project. Funding to reimburse Exelon for contractor expenses for West Fish Lift operations, as well as shad tank spawning trials in 2009 was derived from annual contributions by the Pennsylvania Fish and Boat Commission (PFBC) and the Maryland Department of Natural Resources (MD DNR) to the Susquehanna River Anadromous Fish Restoration Cooperative's (SRAFRC) contributed funds account. These contributed funds have been administered by the U.S. Fish and Wildlife Service (USFWS), Susquehanna River Coordinator (Coordinator).

The objectives of Conowingo West Fish Lift operations in 2009 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. Shad taken here are also monitored for MD DNR tags and sex ratios, and scale and head samples are taken for age and otolith analysis. No fish were trucked for release upstream of the hydroelectric dams during 2009.

2.2 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 hours). Within these parameters the West Fish Lift was operated as in past years, maintaining appropriate entrance velocities and curbing use of adjacent hydroelectric generation Units 1 and 2, whenever river flow dropped below 60,000 cfs. Normandeau Associates (NA) was contracted by Exelon to conduct fish lift and/or passage operations at both the Conowingo Hydroelectric Project East and West fish lifts, and to conduct American shad tank spawning trials for delivery of eggs to PFBC Van Dyke shad hatchery.

American shad collected in the trap 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 MD DNR for tank spawning in 2009. 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.

2.3 RESULTS

Figure 1 shows daily West Fish Lift shad catch, river flow and water temperatures for the 2009 season. Average daily river flow at Conowingo during the West Fish Lift operating period was relatively low (32,500 cfs) and declining in late April and the first days of May until a rapid increase starting May 4 and continuing until May 7(62,600 cfs),after which it dropped off until may 16 when another flow increased started. It then decreased from a peak on May 19 (54,800 cfs) then gradually decreased until May 28 dropping off to the period low flow of 24,800 cfs then increasing to 41,800 cfs the next day when West Fish Lift operations ended for the season. Water temperature during the same period showed a gradual increase from 62.2o F on April 28 to 73.0 o F on May 29 when the West Fish Lift was shut down for the season.

Lift operations began on April 28 and occurred on 28 of the next 32 days through May 29 (Table 2). Total fishing effort over this period amounted to 282 lifts and a fishing time of 142.0 hours.

Total catch at the West Fish Lift amounted to 225,794 fish of 39 taxa, including hybrids (Table 1). Gizzard shad comprised 93.3% of the total catch and, white perch, channel catfish, and walleye comprised 2.9% of the total. Alosine catch included 6,534 American shad (2.9% of the total catch), 185 river herring, and 4 hickory shad. Catch of American shad averaged 233 per operating day with peak day catches of 1,069, 807 and 793 shad on May 17, May 3 and May 25, respectively. Daily operating parameters and catch by major species is shown in Table 2. Overall male to female sex ratio of shad in the West Fish Lift in 2009 was 1.0 to 1.6 (Table 3).

West Fish Lift catch per effort of 45.3 shad per fishing hour, 23 shad per lift, and 233 shad per day (Table 4). Operations and fish catch at the West Fish Lift during 1985-2009 are summarized in Table 5.

2.4 DISCUSSION

Spring 2009 water temperatures rose steadily over the period operation at a moderate rate. The first of three observed peaks in American shad capture was on May 3 when average daily river

flow was 27,400 cfs and average water temperature was 65.2° F. The season peak occurred on May 17 (average daily river flow 37,900 cfs, water temperature 66.8° F) with another peak on May 25 (average daily river flow 28,800 cfs, water temperature 73.2° F). The first two peak American shad capture days occurred during Sunday operations and the third was on a Monday. Overall, American shad catch statistics for 2009 were greatly improved from 2008 and were the highest since 2004.

2.5 TABLES AND FIGURES

Table 1: Catch of fishes at the Conowingo Dam West Fish Lift, 2009.

Number of Days	**28**
Number of Lifts	**282**
Fishing Time (hours : minutes)	**174:22**
Number of Taxa	**39**
American Shad	6,534
Hickory Shad	4
Blueback Herring	165
Alewife	20
Gizzard Shad	210,633
Striped Bass	179
Carp	399
White Perch	3,095
American Eel	37
Brook Trout	2
Brown Trout	8
Rainbow Trout	5
Muskellunge	2
Nortern Pike	1
Golden Shiner	2
Comely Shiner	1
Spotfin Shiner	6
Spottail Shiner	2
Quillback	2
White Sucker	7
Northern Hog Sucker	1
Shorthead Redhorse	92
Brown Bullhead	198
Channel Catfish	2,393
White Catfish	5
Flathead Catfish	196
Rock Bass	116
Redbreast Sunfish	71
Green Sunfish	9
Pumpkinseed	33
Bluegill	313
Smallmouth Bass	109
Largemouth Bass	6
Black Crappie	19
White Crappie	8
Yellow Perch	55
Walleye	977
Atlantic Needlefish	17
Sea Lamprey	72
Total	**225,794**

Table 2: Daily summary of fishes collected at the Conowingo Dam West Fish Lift, 28 April - 29 May, 2009.

Date:	28-Apr	29-Apr	30-Apr	1-May	3-May	4-May	5-May	6-May
Day:	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SUNDAY	MONDAY	TUESDAY	WEDNESDAY
Number of Lifts:	19	17	9	10	12	11	13	14
Time of First Lift:	10:20	9:55	11:05	9:40	9:50	12:25	9:45	9:55
Time of Last lift:	16:15	16:25	16:00	15:20	15:35	15:45	15:45	15:45
Operating time (hours):	5:55	6:30	4:55	5:40	5:45	3:20	6:00	5:50
Average Water Temperature (°F):	62.2	63.0	63.7	64.7	66.8	67.1	66.7	64.2
American shad	26	64	101	208	807	6	160	10
Blueback herring	0	0	0	0	0	8	1	0
Alewife	8	1	2	4	1	1	0	1
Gizzard shad	14,050	7,900	3,850	4,950	3,475	8,600	16,700	15,800
Hickory shad	0	1	3	0	0	0	0	0
Striped bass	1	0	1	5	0	8	7	3
Carp	1	0	2	0	0	16	54	4
Other species	72	107	38	229	151	193	637	973
Total	**14,158**	**8,073**	**3,997**	**5,396**	**4,434**	**8,832**	**17,559**	**16,791**

Date:	7-May	8-May	10-May	11-May	12-May	13-May	14-May	15-May
Day:	THURSDAY	FRIDAY	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Number of Lifts:	13	17	10	9	11	9	12	5
Time of First Lift:	8:15	9:30	10:17	10:45	9:45	12:15	9:40	12:30
Time of Last lift:	14:30	15:40	15:05	15:35	15:40	15:50	15:45	14:35
Operating time (hours):	6:15	6:10	4:48	4:50	5:55	3:35	6:05	2:05
Average Water Temperature (°F):	64.2	63.3	64.6	64.5	64.6	64.1	64.4	65.3
American shad	22	0	206	301	387	125	467	45
Blueback herring	1	0	16	0	1	5	32	85
Alewife	0	0	0	0	2	0	0	0
Gizzard shad	13,350	43,300	3,050	6,000	4,900	4,250	4,300	1,900
Hickory shad	0	0	0	0	0	0	0	0
Striped bass	3	1	4	3	6	16	17	4
Carp	1	34	1	0	1	1	1	0
Other species	297	147	192	341	343	199	195	151
Total	**13,674**	**43,482**	**3,469**	**6,645**	**5,640**	**4,596**	**5,012**	**2,185**

Table 2: Daily summary of fishes collected at the Conowingo Dam West Fish Lift, 28 April - 29 May, 2009 (continued).

Date:	17-May	18-May	19-May	20-May	21-May	22-May	24-May	25-May
Day:	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SUNDAY	MONDAY
Number of Lifts:	8	10	9	8	13	5	6	7
Time of First Lift:	9:43	11:45	9:30	12:05	9:10	9:20	9:36	9:45
Time of Last lift:	15:30	15:45	12:45	15:50	15:35	14:30	14:25	14:30
Operating time (hours):	5:47	4:00	3:15	3:45	6:25	5:10	4:49	4:45
Average Water Temperature (°F):	66.7	66.2	66.6	66.9	66.3	68.3	69.0	70.9
American shad	1069	13	265	11	230	382	352	793
Blueback herring	3	0	0	0	11	1	1	0
Alewife	0	0	0	0	0	0	0	0
Gizzard shad	4,500	13,300	6,665	10,050	10,900	2,225	430	825
Hickory shad	0	0	0	0	0	0	0	0
Striped bass	2	11	3	4	2	2	5	5
Carp	0	149	7	94	4	3	0	0
Other species	177	478	85	301	263	147	129	67
Total	**5,751**	**13,951**	**7,025**	**10,460**	**11,410**	**2,760**	**917**	**1,690**

Date:	26-May	27-May	28-May	29-May	
Day:	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	**Total for the Year**
Number of Lifts:	6	6	7	6	**282**
Time of First Lift:	9:50	10:05	9:25	9:45	
Time of Last lift:	14:35	14:30	16:00	14:30	
Operating time (hours):	4:45	4:25	6:35	4:45	**142:04**
Average Water Temperature (°F):	71.5	72.4	72.4	73.0	
American shad	68	33	349	34	**6,534**
Blueback herring	0	0	0	0	**165**
Alewife	0	0	0	0	**20**
Gizzard shad	1,900	1,050	1,755	658	**210,633**
Hickory shad	0	0	0	0	**4**
Striped bass	14	11	10	31	**179**
Carp	3	3	16	4	**399**
Other species	221	326	427	974	**7,860**
Total	**2,206**	**1,423**	**2,557**	**1,701**	**225,794**

Table 3: American shad sex ratio information, Conowingo West Fish Lift, 2009. No operation on 2, 9 16, and 23 May.

Date	Sample size	Males	Females	Male:Female Ratio
28-Apr	26	23	3	1: 0.1
29-Apr	60	44	16	1: 0.4
30-Apr	101	82	19	1: 0.2
1-May	208	169	39	1: 0.2
3-May	136	90	46	1: 0.5
4-May	6	6	0	1: 0.0
5-May	160	123	37	1: 0.3
6-May	10	9	1	1: 0.1
7-May	22	15	7	1: 0.5
8-May	0	0	0	0.0
10-May	114	96	18	1: 0.2
11-May	114	94	20	1: 0.2
12-May	110	86	24	1: 0.3
13-May	125	104	21	1: 0.2
14-May	229	188	41	1: 0.2
15-May	45	30	15	1: 0.5
17-May	202	134	68	1: 0.5
18-May	12	10	2	1: 0.2
19-May	186	135	51	1: 0.4
20-May	11	8	3	1: 0.4
21-May	141	99	42	1: 0.4
22-May	100	67	33	1: 0.5
24-May	103	65	38	1: 0.6
25-May	146	90	56	1: 0.6
26-May	68	41	27	1: 0.7
27-May	33	19	14	1: 0.7
28-May	116	67	49	1: 0.7
29-May	34	13	21	1: 1.6
28-Apr	26	23	3	1: 0.1
29-Apr	60	44	16	1: 0.4
Total	**2,618**	**1,907**	**711**	**1: 0.4**

Table 4: Catch and effort of American shad taken at the Conowingo Dam west Fish Lift during primary collection periods,* 1985-2009.

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**

*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 - 2009.

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**

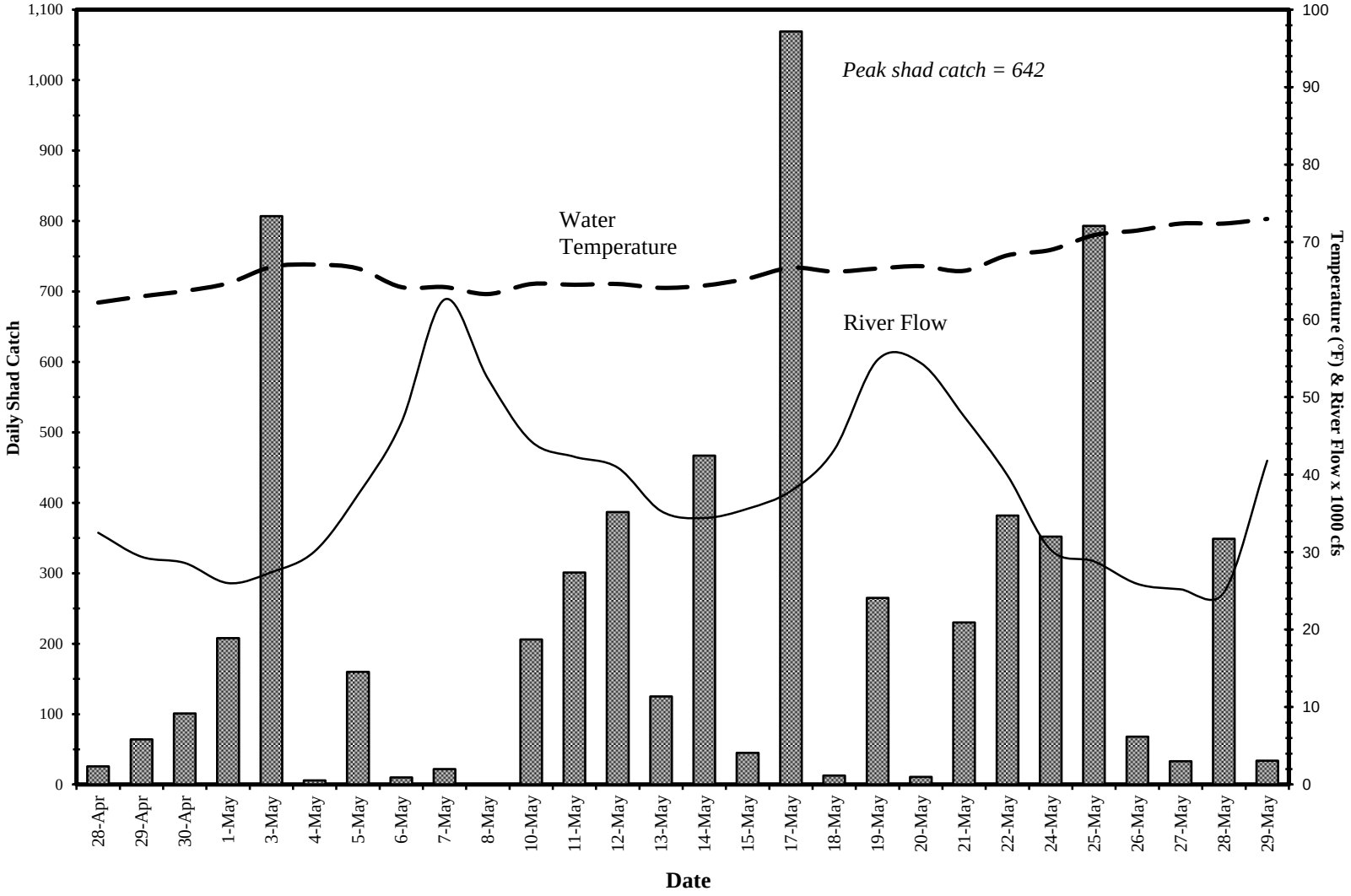

Figure 1: A plot of river flow (x 1000 cfs) and water temperature (°F) in relation to the daily American shad catch at the Conowingo West Fish Lift, spring 2009. The West Lift was not operated on 2, 9, 16, and 23 May.