

**SUMMARY OF UPSTREAM AND DOWNSTREAM FISH PASSAGE AT
THE YORK HAVEN HYDROELECTRIC PROJECT, IN 2011**

PREPARED FOR:

York Haven Power Company
Middletown, Pennsylvania 17057

PREPARED BY:

Kleinschmidt
2 East Main Street
Strasburg, Pennsylvania 17579

March 2012

EXECUTIVE SUMMARY

INTRODUCTION

In 1993, York Haven Power Company (YHPC), the licensees of the Safe Harbor and Holtwood Projects, the U.S. Department of the Interior represented by the Fish and Wildlife Service (“USFWS”), the Susquehanna River Basin Commission (“SRBC”), the states of Maryland and Pennsylvania and their involved agencies – Maryland Department of Natural Resources (“MDNR”), Pennsylvania Fish and Boat Commission (“PFBC”) and Pennsylvania Department of Environmental Resources (“PADEP”), and two other parties signed the Susquehanna River Fish Passage Settlement Agreement.

This agreement established for each project a Fish Passage Technical Advisory Committee (“FPTAC”) comprised of representatives of the affected licensee, USFWS, PFBC and MDNR. Each FPTAC is responsible for reviewing and monitoring the design, construction, maintenance and operation of the fish passage facilities at the respective project, preparing an annual report, and recommending studies and/or modifications to improve upstream and downstream passage.

High River flows resulted in flooding at the Project in mid-March which resulted in cancelation of the York Haven FPTAC meeting that was scheduled prior to Fishway operation. Although the FPTAC was not able to reschedule the meeting to discuss Fishway operation, committee members had the opportunity to discuss Fishway operation with Station personnel during project relicensing meetings. As in previous years, objectives of 2011 operation were to monitor passage of migratory and resident fishes through the Fishway and continue to assess operation.

YORK HAVEN FISHWAY OPERATIONS

The installation and operation of the Fishway are part of a cooperative private, state and federal effort to restore American shad (*Alosa sapidissima*) and other migratory fish to the Susquehanna River. In 1997, YHPC and the resource agencies reached a new settlement agreement to revise the type and location of the York Haven fish passage facility. The Fishway is located in Dauphin County, PA at the Three Mile Island end of the East Channel Dam at the York Haven Hydroelectric Project (FERC No. 1888). The Fishway was placed in service by

YHPC in April 2000.

Fishway operation coincides with a springtime minimum flow release. As part of the 1997 agreement, YHP agreed to maintain a spill of up to 4,000 cfs over the Main Dam and a minimum release of approximately 2,000 cfs in the East Channel through the Fishway during spring operation. River flow in excess of spring minimum flow requirements and station capacity is spilled over the Main and East Channel Dams and through the Fishway. A nominal 2,100 cfs East Channel minimum flow is released through the fishway 24 hrs a day during the entire Fishway operating season. When River flow is less than 23,000 cfs, a nominal minimum spill of 4,000 cfs is maintained over the Main Dam during daily Fishway operation.

Project Operation

The hydroelectric station located in York Haven, PA built in 1904, is situated on the River (river mile 55) in Dauphin and York counties, Pennsylvania (Figure 1). It is the fourth upstream hydroelectric facility on the River. The Project is a 20 unit run-of-river facility capable of producing approximately 19 MW and has an estimated hydraulic capacity of 17,000 cfs. It includes two dams that impound approximately 5 miles of the River forming Lake Frederic. The Main Dam is approximately 5,000-ft long, with a maximum height of 17-ft. The East Channel Dam is approximately 925-ft long with a maximum height of 9-ft. When River flow exceeds station hydraulic capacity (55% of the year), water is spilled over the two dams.

Fishway Design and Operation

Fishway Design

Fishway design incorporated numerous criteria established by the USFWS and the other resource agencies. The Fishway has an operating limit of 150,000 cfs River flow (East Channel flow limit of approximately 22,000 cfs). The Fishway includes two sections; a “weir cut” and a vertical notch fish ladder. Figure 2 provides the general arrangement of the Fishway. A detailed description of the Fishway and its major components is located in 2000 and 2001 summary reports (Kleinschmidt 2000 & 2002).

Fishway Operation

Although Fishway preparations were delayed until late March by high River flows that flooded the power station and peaked at 385,000 cfs on 12 March the fish ladder was opened allowing volitional passage (unmanned) to begin on 1 April. Only the entrance and exit gate were open during a 66 day unmanned period of Fishway operation between 1 April and 5 June.

High spring River flows coupled with mechanical difficulties at the Holtwood Fish lift limited upstream American shad passage in the lower River during the spring of 2011. The first American shad passed the Conowingo East fish lift on 8 May; between 8 and 19 May some 20,571 shad were passed upstream. A total of 21 American shad passed upstream through the Holtwood fish Lift and only eight passed upstream through the Safe Harbor Lift. Due to the limited upstream passage of American shad at the Holtwood and Safe Harbor fish lifts, manned Fishway operation at York Haven was limited to 6 and 7 June. Since only 8 shad had passed upstream through the Safe Harbor lift and no shad were observed passing the ladder on 6 or 7 June members of the FPTAC mutually agreed to end manned Fishway operation. Manned operation ended at 1600 hrs on 7 June.

Generally during manned Fishway operation, fish were counted and allowed to pass upstream between 0800 hrs and 1600 hrs. Both fixed wheel gates and the diffuser gate were opened. The entrance gate was the only gate that was adjusted throughout the season. This gate was adjusted manually maintaining a 0.5-ft to 0.8-ft differential between the surface water elevation downstream of the entrance and the water elevation in the diffuser area of the fish ladder. This setting resulted in an average velocity of 4 ft/sec to 6 ft/sec at the entrance to the ladder. The 7-ft wide stop gate, located between the weir and the fish ladder entrance, remained closed during the entire period of operation.

The Fishway was staffed by two people in 2011. These individuals, a biologist and a technician, adjusted the position of the entrance gate, counted and recorded the number of fish that passed through the ladder hourly, removed debris from the exit of the ladder, made visual observations of fish activity and movement in and through the ladder, and made observations once each day below the Main Dam. These individuals also recorded water elevations several times each day on staff gauges located throughout the Fishway.

After manned Fishway operation ended on 7 June, the South fixed wheel gate was closed.

On 8 June, the fish ladder and North fixed wheel gate were set to deliver a minimum flow of 400 cfs into the East Channel. The Fishway remained open through 9/21/2011 and was set to deliver a minimum stream flow of at least 400 cfs to the East Channel.

Fish that passed through the ladder were identified to species and enumerated as they passed the counting window by a biologist and/or technician. A description of the procedures used to count fish is described in prior annual operating reports (Kleinschmidt 2000 and 2002). Fish passage by the viewing window was controlled by opening or closing an aluminum grating gate with an electric hoist that was controlled from inside the viewing room. The stop gate was opened each morning at 0800 hrs and closed nightly 1600 hrs when the Fishway was manned. Occasionally, it was closed for brief periods of time as needed each day to enable personnel manning the Fishway to remove debris from screens and the fishway exit other conduct other activities. In addition, in an effort to improve viewing, the adjustable crowder screen was adjusted as needed to allow all fish that passed to be observed. Gate settings on the two days the Fishway was manned varied from 8 in. to 12 in.

As in previous seasons, fish passage data was entered on a field data sheet and uploaded into a computer. Files were uploaded each evening, checked and corrected as necessary. Data reporting was PC-based and accomplished by program scripts, or macros, created within Microsoft Excel spreadsheets. Passage data and operational conditions were supplied electronically to YHPC's on-site coordinator/manager and other appropriate YHPC personnel on a daily basis. Passage information was subsequently provided electronically by YHPC personnel to members of the FPTAC.

RESULTS

Spring Fishway Operation

Relative Abundance

A total of 1,417 fish of 9 taxa were counted as they passed upstream through the York Haven Fishway on 6 and 7 June (Table 1). Total daily passage varied from 392 fish on 6 June to 1,025 fish on 7 June. Channel catfish (659) was the dominant fish species passed on both days and comprised over 46% of the fish passed. Other predominant fishes passed included gizzard

shad (317), quillback (217) and carp (125).

American Shad Passage

None of the 8 American shad that passed upstream through the Safe Harbor fish lift in 2011 were observed passing through the York Haven Fishway.

Other Alosids

No other alosids (alewife, blueback herring and hickory shad) were observed passing through the ladder (Table 1).

Observations

Observations were made at the “weir cut” several times each day in an attempt to see if American shad or other fishes passed upstream through this section of the Fishway. No fish were observed trying to swim over the 67 ft weir or through the fixed wheel gates. No fish were observed downstream of the Main Dam.

Downstream Fish Passage

As in previous years, YHPC anticipated making periodic observations for adult shad in the forebay and opening the trash gate if/when large numbers of adults were observed. They also planned to implement the juvenile Downstream Passage Protocol that was developed in concert with the FPTAC.

Adult Passage

Since only 8 American shad passed the Safe Harbor fish lift and no shad were observed passing the York haven Fishway in 2011, Station personnel did not make any observations for post-spawned adult shad in the forebay.

Juvenile Passage

While Station personnel had planned to implement the juvenile Downstream Passage Protocol, there was no need to implement the Protocol as record rainfall resulted in high River flows and continuous spill at the Project throughout the fall outmigration period. Spills at the Project began on 29 August during Hurricane Irene and continued through early September when tropical Storm Lee moved into the Susquehanna River Valley. On 9 September, flood flows associated with Tropical Storm Lee reached 590,000 cfs at Harrisburg (USGS Gage # 01570500). These flood flows were followed by above average river flows during the remainder of September and most of October and November (Figure 4). The high River flows during the fall outmigration period were a direct result of record rainfall that occurred in 2011. Rainfall at Harrisburg International Airport through November was the highest ever recorded.

LITERATURE CITED

- Kleinschmidt. 2000. Summary of operation at the York Haven Fishway in 2000. Prepared for York Haven Power Company, GPU Energy by Kleinschmidt, Strasburg, Pennsylvania. 21 pp.
- Kleinschmidt. 2002. Summary of operation at the York Haven Fishway in 2001. Prepared for York Haven Power Company, GPU Energy/FirstEnergy by Kleinschmidt, Strasburg, Pennsylvania. 21 pp.

TABLES AND FIGURES

Table 1. Summary of the daily number of fish that passed by the York Haven Hydroelectric Project through the serpentine vertical notch ladder at the East Channel Dam in 2011.

	Date	6-Jun	7-Jun	Total
Observation Time (hrs.)		8.0	8.0	16.0
Water Temperature (°F)		72.5	73.0	
American shad		0	0	0
Alewife		0	0	0
Blueback herring		0	0	0
Gizzard shad		113	204	317
Hickory shad		0	0	0
Striped bass		0	0	0
White perch		0	0	0
American eel		0	0	0
Carp		43	82	125
Quillback		72	145	217
Shorthead redhorse		1	2	3
Channel catfish		156	503	659
Green sunfish		1	1	2
Smallmouth bass		0	7	7
Walleye		5	77	82
Flathead catfish		1	4	5
Total		392	1,025	1,417

Table 2. Summary of daily average river flow (USGS, Harrisburg Gage), average flow in the East Channel, sum of average flow from power station and main dam, water temperature, secchi, stop log gate position, and East Channel and fishway water elevations during operation of the York Haven fishway complex in 2011.

Date	River Flow (cfs)	East Channel Flow	Main Channel Flow	Water Temp. (°F)	Secchi (in)			Stop Log Gate	Elevation (ft)					
					Avg.	Min.	Max.		Head Pond			Tailwater		
									Avg.	Min.	Max.	Avg.	Min.	Max.
6-Jun	32,800	3,900	28,900	72.5	8	8	8	closed	281.3	281.2	281.3	274.2	274.1	274.2
7-Jun	30,000	3,300	26,700	73.0	11	10	12	closed	279.2	279.2	279.2	274.0	274.0	274.0

Table 3. Summary of surface water elevations recorded during operation of the York Haven Fishway in 2011.

Date	River Flow (cfs)	Elevation (ft)																				
		Head Pond			Tailwater			Inside Fishway			Inside Weir			Above Counting Room			Below Fixed Wheel Gate			Counting Room		
		Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.
6-Jun	32,800	281.3	281.2	281.3	274.2	274.1	274.2	275.0	275.0	275.0	278.8	278.8	278.8	278.9	278.9	278.9	277.5	277.5	277.5	278.6	278.6	278.7
7-Jun	30,000	279.2	279.2	279.2	274.0	274.0	274.0	274.8	274.8	274.8	278.6	278.6	278.6	278.9	278.9	278.9	277.5	277.5	277.5	278.3	278.3	278.3

Figure 1. General layout of the York Haven Hydroelectric Project showing the location of the fishway.

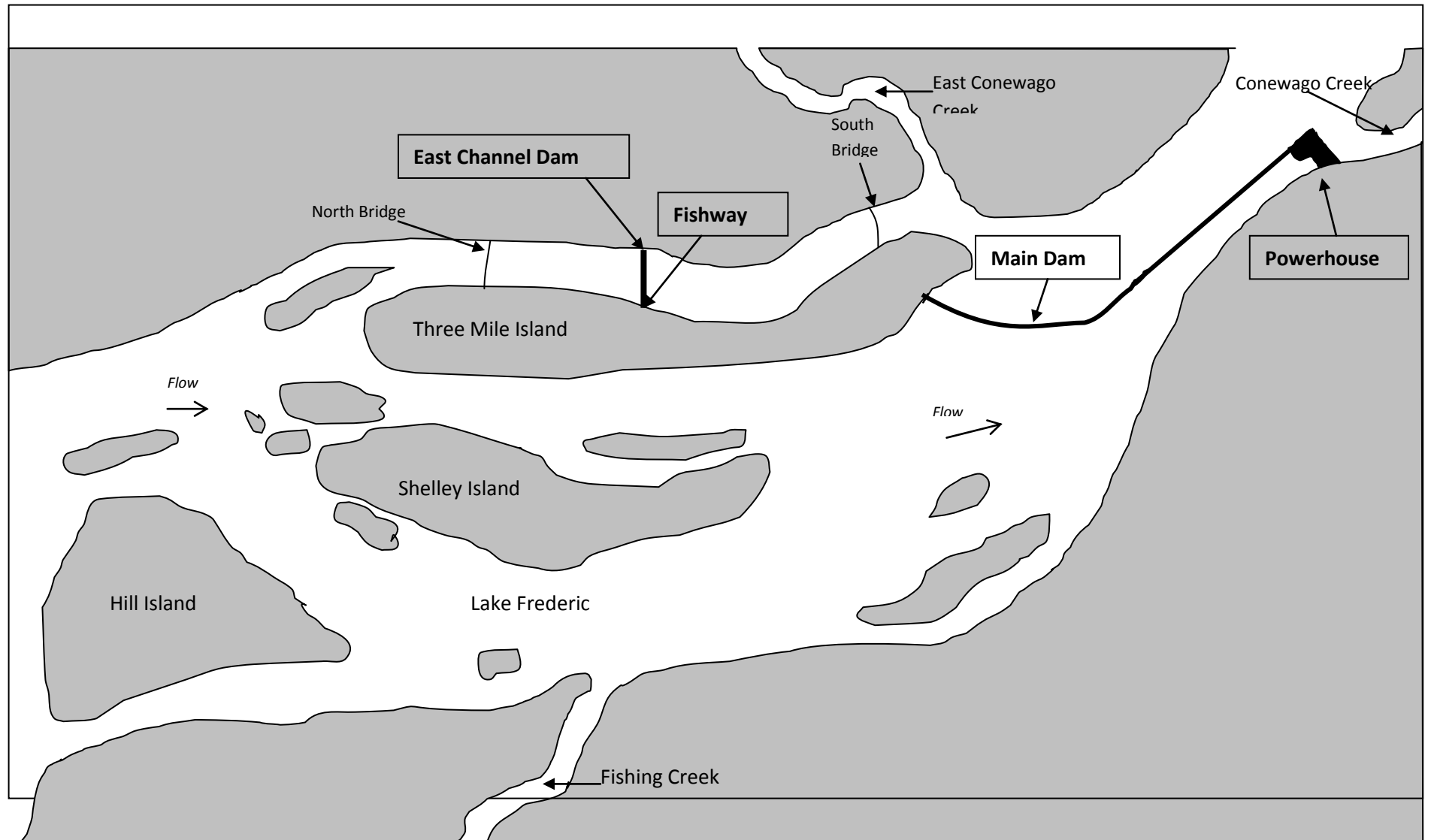


Figure 2. General arrangement of the York Haven Fishway.

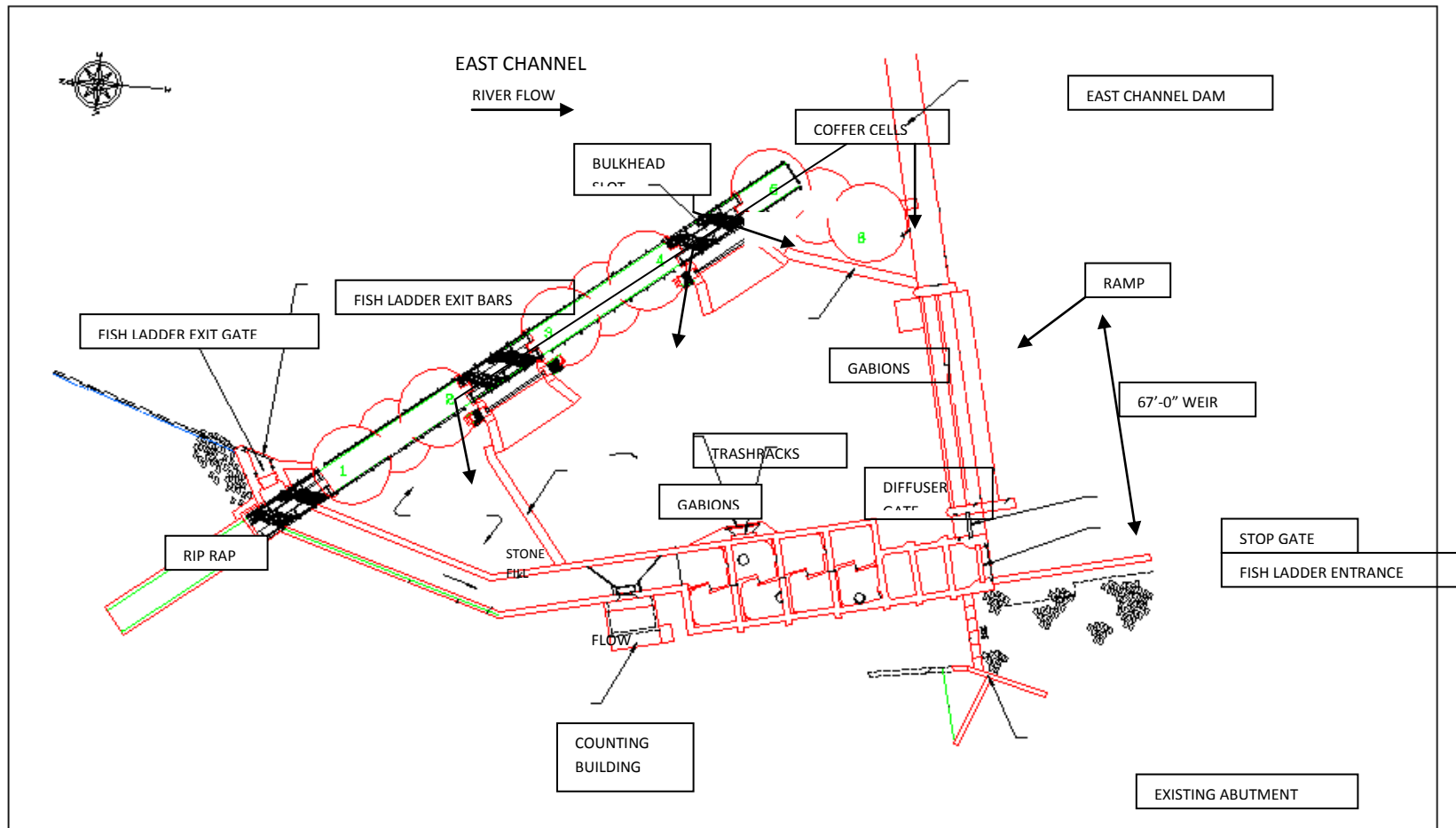


Figure 3. Plot of river flow (cfs) at the USGS Harrisburg Station (#01570500) on the Susquehanna River during the spring of 2011.

Figure 3. Plot of River Flow (cfs) at the USGS Harrisburg Station (#01570500) on the Susquehanna River during the Spring of 2011

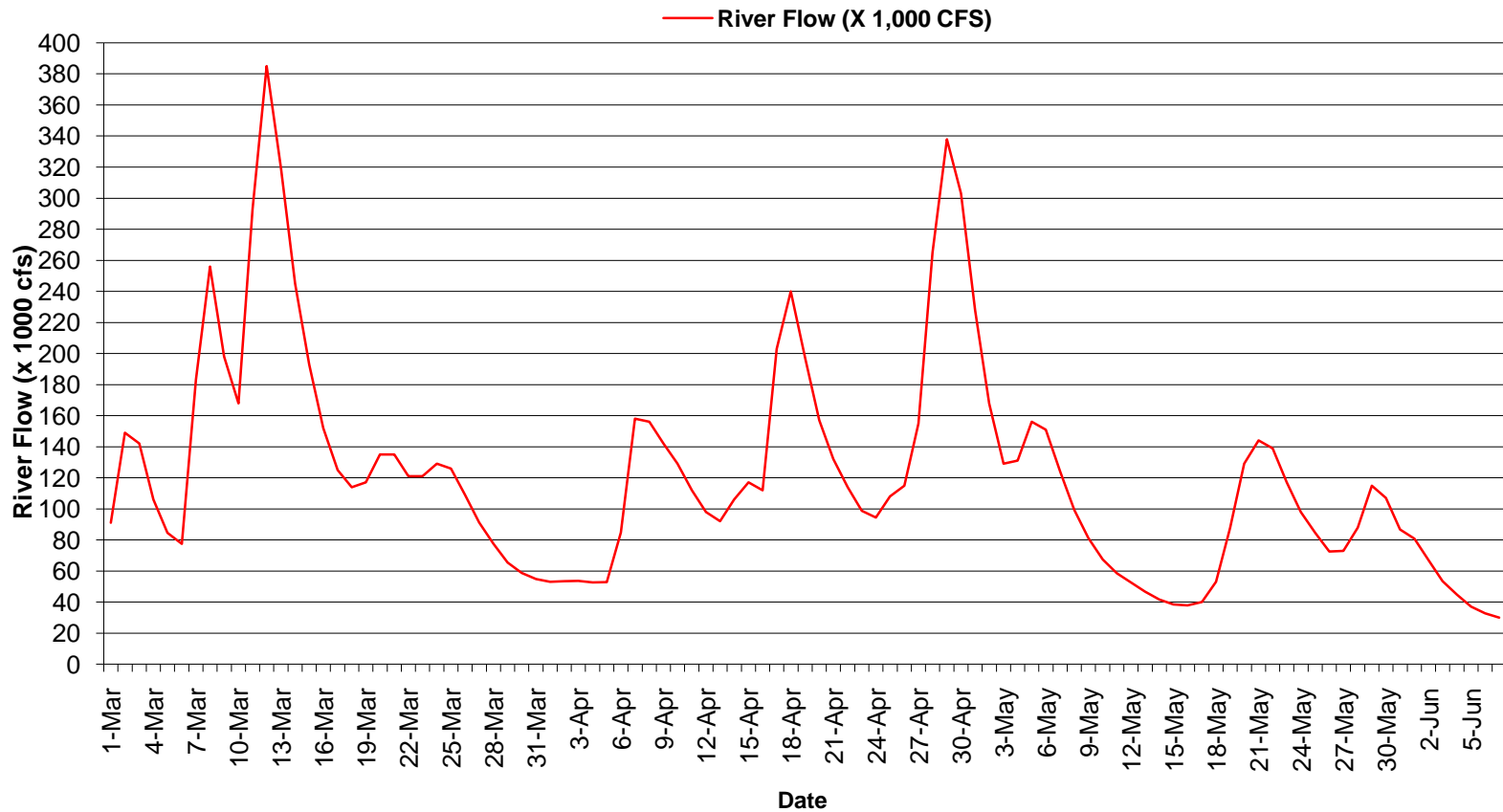


Figure 4. Plot of river flow (cfs) at the USGS Harrisburg Station (#01570500) on the Susquehanna River, 21 August to 30 November 2011.

Figure 4. Plot of River Flow (cfs) at the USGS Harrisburg Station (#01570500) on the Susquehanna River , 21 August to 30 November, 2011

