Report on 1996 Migratory Fish Monitoring in the Anacostia River Watershed, Maryland

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Introduction

The Anacostia River, which drains Prince George's and Montgomery Counties in Maryland and much of the District of Columbia, contains many blockages to fish migration in the form of capped pipeline crossings, stream water velocity dissipators, and old concrete weirs. The U.S. Army Corps of Engineers (USACE) constructed projects to improve the environment under Section 1135 of the Water Resources Act of 1986. An important component of this work was the removal of several of these blockages to fish migration. During 1995, the USACE modified three structures to permit passage. During the spring of 1996, The Interstate Commission on the Potomac River Basin (ICPRB) evaluated subsequent changes in migratory fish usage of re-opened spawning tributaries in the Anacostia River. The major goal of the 1996 migratory fish survey was to determine the magnitude and extent of migration of the five anadromous species currently using the Anacostia watershed: the alewife herring, blueback herring, white perch, yellow perch, and striped bass. Such efforts are critical to the restoration of migratory fishes in the Anacostia basin, the Potomac River, and the Chesapeake Bay.

Sampling which employed back-pack electrofishing began on April 12 and was concluded on May 30. Sampling was conducted twice each week and covered 14 stations. Fourteen sampling events occured over the 8-week period (two scheduled sampling events could not be conducted due to rain or high flow events).

General Characterizations:
1) Water temperature increased and fish migrations occured later than usual due to the cool spring conditions. The strength of runs were similar to past collections. Direct comparisons to past sampling is necessarily difficult due to dispersal of population into opened stream reaches; i.e., they are less likely to be concentrated at a given location.
2) NE Branch: With the exception of sea lamprey, no migratory fishes were collected above the 1135 modification on Paint Branch. Herring were collected in Indian Creek above its confluence with Paint Branch, yet not as far upstream as in the past. (In 1992, herring were collected above the beltway in Indian Creek.) The reasons for not capturing migratory fishes in these stream reaches are not clear, yet are most likely related to the previously mentioned dispersal over a larger area. Attempts to locate natural holding areas were not productive, possibly due to limited runs, dispersal or a combination of the two or absence of fish.
3) NW Branch: At the beginning of sampling it was discovered that the new passage structure at Route 1, the most downstream site, was damaged. The first baffle had been bent and detached from one wall. During sampling, migratory fish were concentrated below this structure, and on only one event were they collected upstream. These fish probably passed this structure during a high flow or high tide event that likely permitted passage either over the top of the bent baffle or through the side notches in the weir. No migratory fishes were captured upstream from the 38th Street modification. The effectiveness of the 38th Street modification is uncertain due to the limited run that occurred, related to the Route 1 fish passage problem.

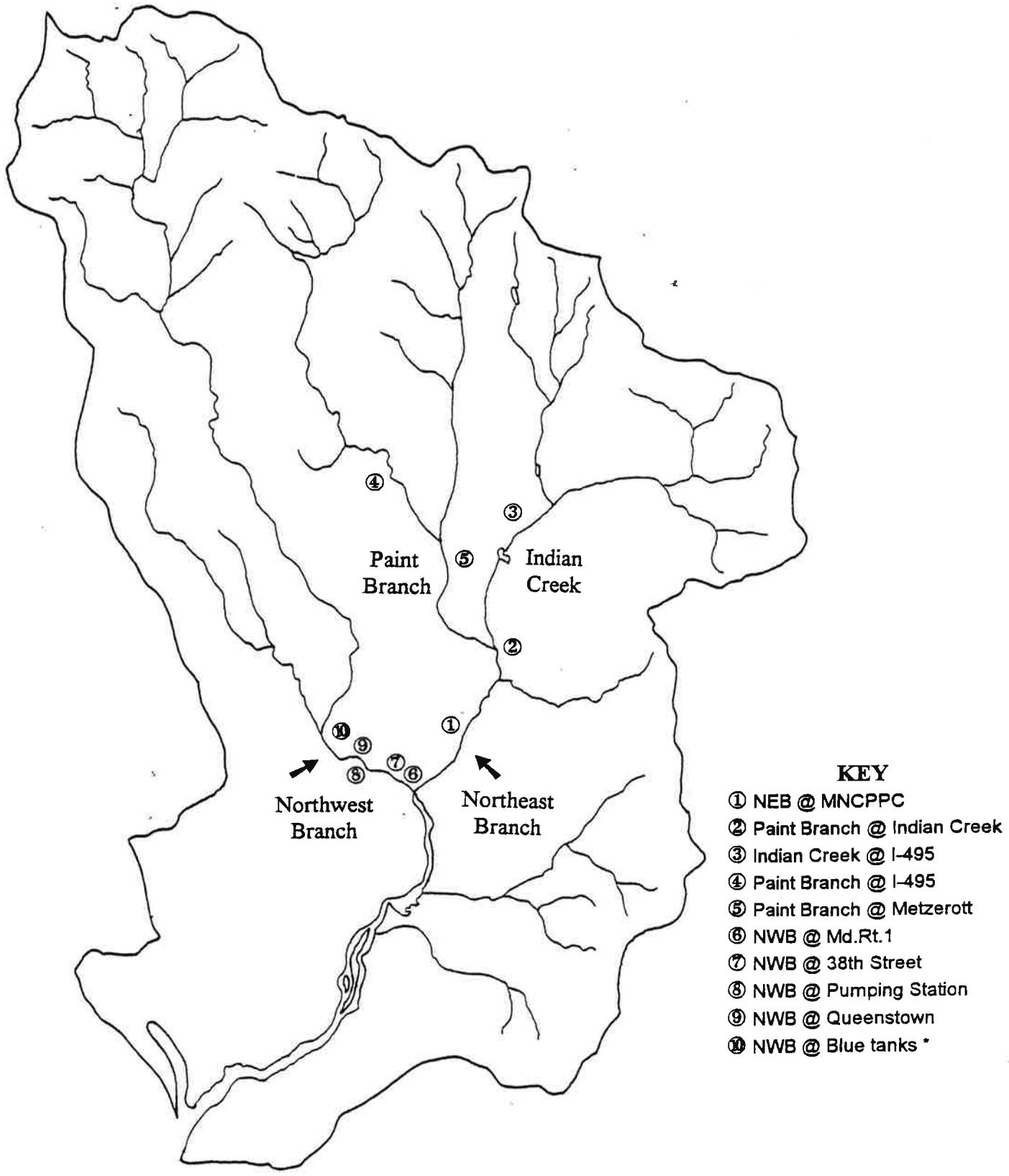
Methods

Electrofishing collections were performed using a Smith-Root Model 15-A gas generator powered backpack electrofishing unit operating with direct current. One person operated the electrofisher while one other person netted stunned fish with a smith-Root Model EDB-83-TD dip net with an 11- x 17-inch (27.9 cm. x 43.2 cm.) opening, 10-inch (25.4 cm.) bag, 0.25-inch (6.4 mm.) knotless mesh bag mounted on a 6-foot pole. Sampling areas at each blockage were intermittently shocked for a total duration of approximately 6 minutes. The output power was field adjusted to account for variation in stream conductivity.

Collected fish were counted, measured for length and weight, and sexed by evidence of roe or milt; notes were taken on their general condition; dorsal fins were clipped to identify that they had been captured; and then they were released. Attempts were made to capture all fish sighted during electrofishing. When fish abundance was so high that capture of all individuals was not possible or desirable, the fish were subsampled, and records were kept on the estimated size of the school observed responding to electrofishing. Water temperature, clarity, general flow, and weather conditions were recorded at each site.

Sampling on both the Northeast and Northwest Branch of the Anacostia River began on April 12 and concluded on May 30. Sampling was conducted approximately twice per week, with 14 samples being collected over 8 weeks. Three types of sample locations (See Map #1) were used to assess the migratory progress of the various species. First, downstream points that fish are known to reach without problems were used to assess the populations and the strength of the run. Second, sites upstream of the initial blockage were designated at points that were determined to be fish concentrators or potential blockages. Third, a "terminal" station was used as the highest point fish could possibly pass, due to a known blockage. Only the Northwest Branch had a terminal station for this study.

Map. #1 = Location of Migratory Fish Sampling Sites, Anacostia River, 1996



Sampling Sites

Northwest Branch

1) The structure supporting the MD Route 1 Bridge crossing the Northwest Branch has, at times, had an adverse affect on fish migration. This area was modified in the fall of 1995, and the glide leading under the bridges was replaced with a notched weir and Denil fish passage. The area below the weir was designated as the furthest downstream point. This point was used to assess the strength of the migratory run and to establish the abundance and species that might employ the fish passage.

2) The next potential blockage occurs at 38th Street, several hundred meters upstream from the fish passage. This site has a metal weir that was also modified by the USACE in the fall of 1995. A deeper notch was cut into the weir with large boulders forming a channel from the notch, through a riffle area, to the stream run below.

3-6) The potential blockages above 38th Street are an assortment of pipelines wrapped in concrete, protected by gabion weirs, or a combination of the two. Northwest Branch at the Pumping Station is approximately 100 meters above 38th Street. It is a gabion weir with two pools below it. The next two sites bound the upper and lower edges of the Queenstown Apartments complex. The downstream station, identified as Northwest Branch at Queenstown Playground, is a gabion weir 10 meters downstream from a tot lot. This weir might pass fish near a cascade on the right side (looking upstream) during high flows. During lower flows, it becomes a 6- to 18-inch cascade. Two hundred meters upstream from that site, and just below Queens Chapel Road, are two large pipes that cross the Northwest Branch. This site, identified as Northwest Branch at Queenstown, has a deep, narrow pool between the two pipes and a large deep pool below the second pipe. On the north side of Queens Chapel Road, three small gabion weirs were sampled sporadically. They did not appear to be blockages, but were sampled during the height of the spawning run to insure that possible low-flow blockages were not overlooked.

7) The terminal station (identified as Northwest Branch at the Blue tanks) is located near a PEPCO storage facility, just downstream of the confluence with Sligo Creek. This site has a sizeable metal weir and eroded concrete apron. Large amounts of rubble are present in and around the hole at the end of the apron. It would not be possible for fish to pass this obstacle under their own power.

Northeast Branch

1) The furthest downstream point sampled for this study was the Northeast Branch above Calvert Road near the Maryland National Capital Park and Planning Commission Offices (identified as Northeast Branch at MNCPPC). A large metal weir spills over boulders and chunks of concrete into a deep pool. This weir has in the past adversely affected migration by fish. Large numbers of herring can usually be spotted just below this weir during the peak of the run. Few potential blockages to fish migration exist above the weir at MNCPPC, allowing fish to disperse through the tributary system. This makes locating the fish quite difficult.

2-3) The next stations upstream are at the junction of Paint Branch and Indian Creek. Monitoring was usually done just above the confluence in both tributaries. These stations were identified as Indian Creek at Paint Branch and Paint Branch at Indian Creek. Monitoring was occasionally done below the confluence in a long section of riffle judged to be good habitat. Turbidity in Indian Creek can be quite high, and visibility of only a few inches is not uncommon. This was a more difficult section of stream to shock, but not impossible.

4-6) Three additional sites were selected as possible places at which herring might be caught. On Indian Creek, north of I-495 (Washington Beltway), a long glide exists where fish tend to congregate. A similar station was added to Paint Branch, identified as Paint Branch at 495, to determine whether fish had migrated that far upstream. Two new devices have been installed by the Maryland State Highway Administration to assist fish in bypassing blockages. The first, just on the south end of the inner loop, is a two-tier pool structure that allows the fish to make three small attainments rather than one large one. All fish captured in this pool were recorded to help determine what effect it was having on the local and migratory fish community. Downstream of the outer loop of I-495, a small Denil fish passage has been built to help fish make the attainment over the foundation of the bridge. A previous blockage just below the Washington Beltway on Paint Branch has ceased to function as a blockage. The concrete casing for the pipe has continued to erode to a point where the flow is smooth, laminar, and slow when going over the structure. This area was visually examined weekly to ensure that this situation did not change.

Results

Four anadromous species -- alewife herring (Alosa pseudoharengus), blueback herring (Alosa aestivalis), white perch (Morone americanus), and yellow perch (Perca flavescens) -- and one catadromaous species, the sea lamprey (Petromyzon marinus), were captured during spring sampling.

The Northeast Branch had a relatively abundant population of Alewife herring at the furthest downstream station. (see fig.1) Alewife were present at all samplings on the Northeast Branch at MNCPPC. Alewife herring were captured twice above this blockage, on April 22 and April 29. In both cases, capture occured upstream of the weir at the confluence of Paint Branch and Indian Creek. Blueback herring were captured below the MNCPPC weir on two dates: May 13 and May 17. No blueback herring were ever found above this weir. (see fig.2)

Principal Fish Collected

144	Alewife Herring
9	Blueback Herring
131	White Perch
48	Yellow Perch
2	Striped Bass
10	Sea Lamprey
5	Largemouth Bass
6	Smallmouth Bass
2	Rainbow Trout (from MD Spring stocking Program)

Fish were not captured farther up in these tributaries. It should be noted however that these captures do not represent the uppermost migration point, as herring were captured upstream of the beltway on Indian Creek in 1992. (Cummins, 1992. 1992 Potomac River Basin Study. ICPRB Report #93-1) The number of available stream miles for the fish at this

point is much larger than that of the Northwest Branch. For this reason, once fish are above the weir, it is difficult to locate the extent of their migratory progress.

The abundance and distribution of herring on the Northwest Branch during the migratory run this year was inconsistent. It was not uncommon to have herring present and absent in cyclical patterns. They would appear in several samplings, and then disappear for a length of time. Fluctuating physical factors such as temperatures, tidal cycles, varying flows, and turbidity likely cause fluctuations in the arrival times of the herring population. (see fig.4)

Alewife herring were found at 9 of 14 samplings below the fish passageway at MD Route 1. Alewife herring were only found once above this passage. Blueback herring were found on the Northwest Branch at MD Route 1 on three occasions: May 13, May 23, and May 30. No Blueback herring were ever found above the fish passage structure. Since the number of herring captured above MD Route 1 was small, the number of sample stations was expanded during the course of the study in an attempt to find fish that may have been dispersed. Three of the gabion structures above Queens Chapel Road were monitored on several occasions (April 26, April 29) and additional gabion structures between the pumping station and Queenstown were also examined (May 3). The most signifigant of these, subsequently names Queenstown Playground, was added to the core stations for sampling as a cautionary measure. The wing deflectors between MD Rt.1 and 38th Street were also monitored (May 17) to be certain that there was no impediment to migration in that stretch.

The additional samples were to assess potential blockages above the new Denil fish passage caused by lower flows, and ensure that we would locate fish if they made it past 38th Street. There are several gabion structures that are not blockages at high flows, but that become blockages as flows decrease. The water filters through the gabions as opposed to falling over them. We found no fish at any of these stations.

As this was the first year of operation for the new Denil fish Passage at Route 1, the appearance of the structure and the way fish reacted to it were carefully observed. On April 12, the first sampling visit, it was noted that the right half (looking downstream) of the lowermost baffle was absent. This had the effect of creating a very swift glide through the bottom third of the structure. Additional effects included a rapidly moving plume at the bottom of the passage and fairly strong eddy lines at medium to high flows.

Different fish tended to favor certain areas around the Denil fish passage. White perch and yellow perch were often located in the shallows along the sides of the Denil. They could also be found out of the plume, along the sides of the culvert. Herring were also most frequently found in these places, but were also found 5 to 15 meters downstream from the mouth of the Denil along the plume eddy lines. Migratory fish were never found just below the Denil in the plume or in the fish passage.

Alewife herring were found once above the fish passage. This happened to coincide with a particularly high spring tide. During this time, the bottom of the cement structure that forms the Denil was underwater. Fish were located both at the bottom of the Denil and near the notches

cut into the weir. It is unclear whether one method of passage was easier for the fish than another, as we never directly observed the fish using either method. During this period, we carefully shocked the Denil and detected no fish within it, but water velocities were comparitively very low. The fish that got above the blockage were located at 38th Street, and were holding in the riffle directly underneath the bridge.

Notes

A Marsh McBirney flow meter was used to assess some of the water velocities in the new fish passage structures. The Denil fish passage at MD Route 1 was monitored for flow speed on April 18, as it had been noted in the two previous samplings that something appeared to be wrong with the lowest "rung" on the fish ladder. The baffle/notch had been washed out and bent to the right side looking downstream. What should have been a slow cell of water had turned into a rapid glide. Figure 5 shows that the water velocities increase from the weir to the foot of the Denil.

Flow speeds in the new structures installed by the State Highway Administration on Paint Branch showed more variation with flow than the structure at Route 1. Velocities in the chutes coming out of the pools below the inner loop of I-495 varied from 4 feet per second to 6 feet per second, depending on the volume of water in Paint Branch. Velocities above 6 feet per second were uncommon. The Denil fish ladder near the outer loop of I-495 creates a variety of eddies in a fairly small space, making precise water velocity measurements difficult. Flow speed at the bottom of the structure was 5 feet per second. Flow speeds in the chute varied for any given position from 2 to 5 feet per second.

One additional note is the clear evidence of netting and snagging on both the Northwest and Northeast Branches. During one sample on the Northeast Branch, we encountered a long row of herring which had been snagged. More than 10 fish had been covered in sand and arranged in a line under the foundation of the bridge. On the Northwest Branch, netters and snaggers were repeatedly encountered. They were informed that these activities were illegal, but showed little concern. It is unclear to what degree these activities are affecting the spawning populations. MNCPPC personnel and Prince Georges County Police were informed of this activity and agreed to intervene if they encountered people harvesting fish in this manner.

Recommendations

1) It is extremely important that all the fish passages be examined on a regular basis. As flow concentrators, they tend to accumulate branches, detritus, and other materials that can clog the top end of the fish passsage. This might be an ideal job for motivated volunteers who could check the structures once or twice a week. Local fishing groups or conservation organizations would probably be happy to assist in this endeavor. They could also serve two additional functions. First, they could report back on any structural problems to the organization maintaining the fish ladder. Second, their visual observation of herring in and around the structure and at potential blockages upstream could be helpful in assessing the migratory progress of all species. This will also have the added benefit of including the local community in fishery restoration efforts.

The ICPRB Anacostia Stream Coordinators are currently investigating possible volunteer groups that could provide this service. We will keep the relevant authorities within the Prince George's County Government apprised of any details.

2) During the course of this project, we contacted the U.S.A.C.E. Baltimore District to relate what appeared to be damage to the weirs in the Northwest Branch Denil ladder. The Corps responded and fixed the downstream weir during the week of August 5, 1996. The Corps has indicated that one other weir within the structure appears to be damaged and that the Prince Georges County has agreed to fix it as part of routine maintenance. We extend our gratitude to the Corps for responding to the problem. We also recommend that stronger baffle materials and/or stronger attachment devices be investigated for this structure.

Figure 1

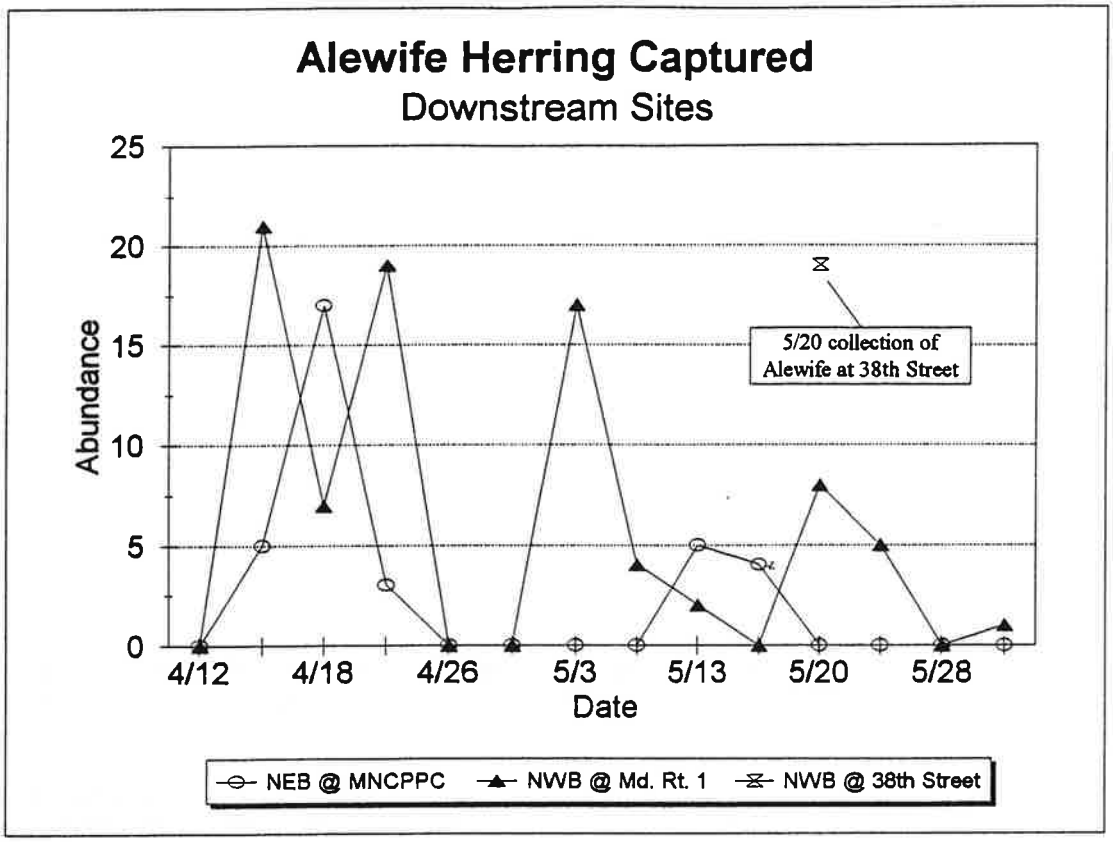


Figure 2

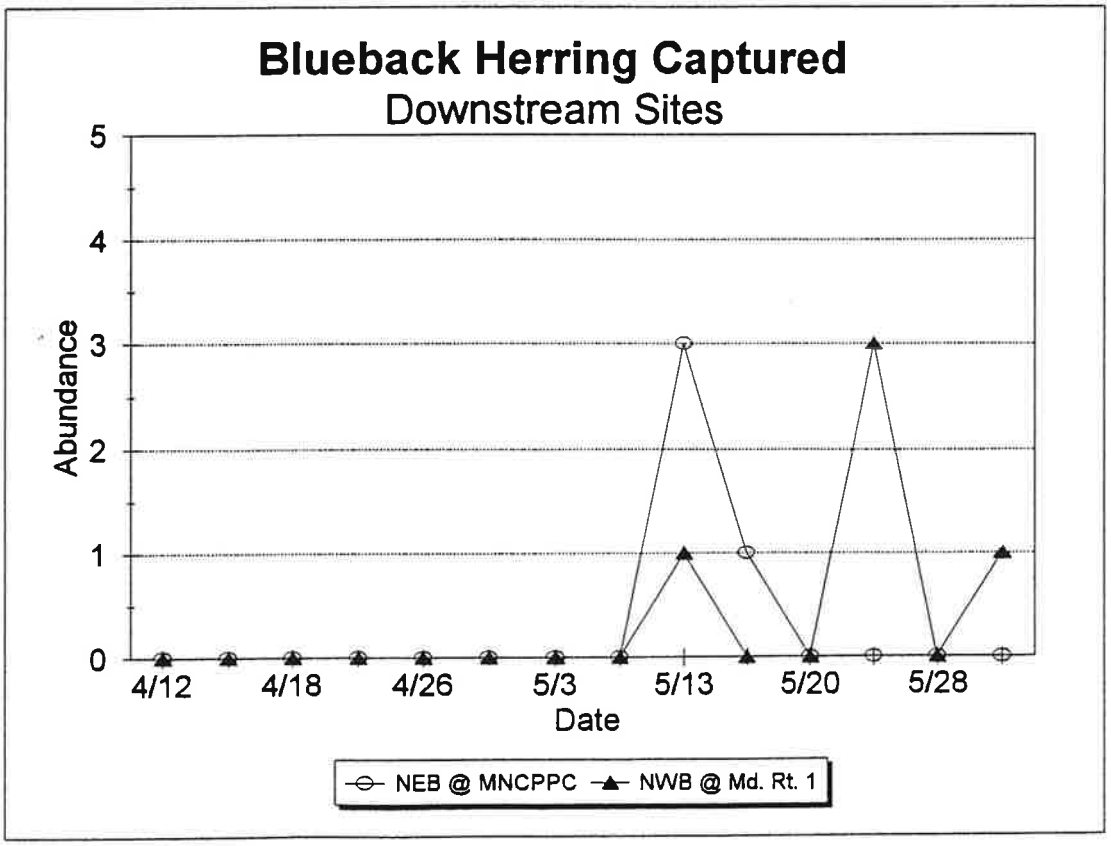


Figure 3

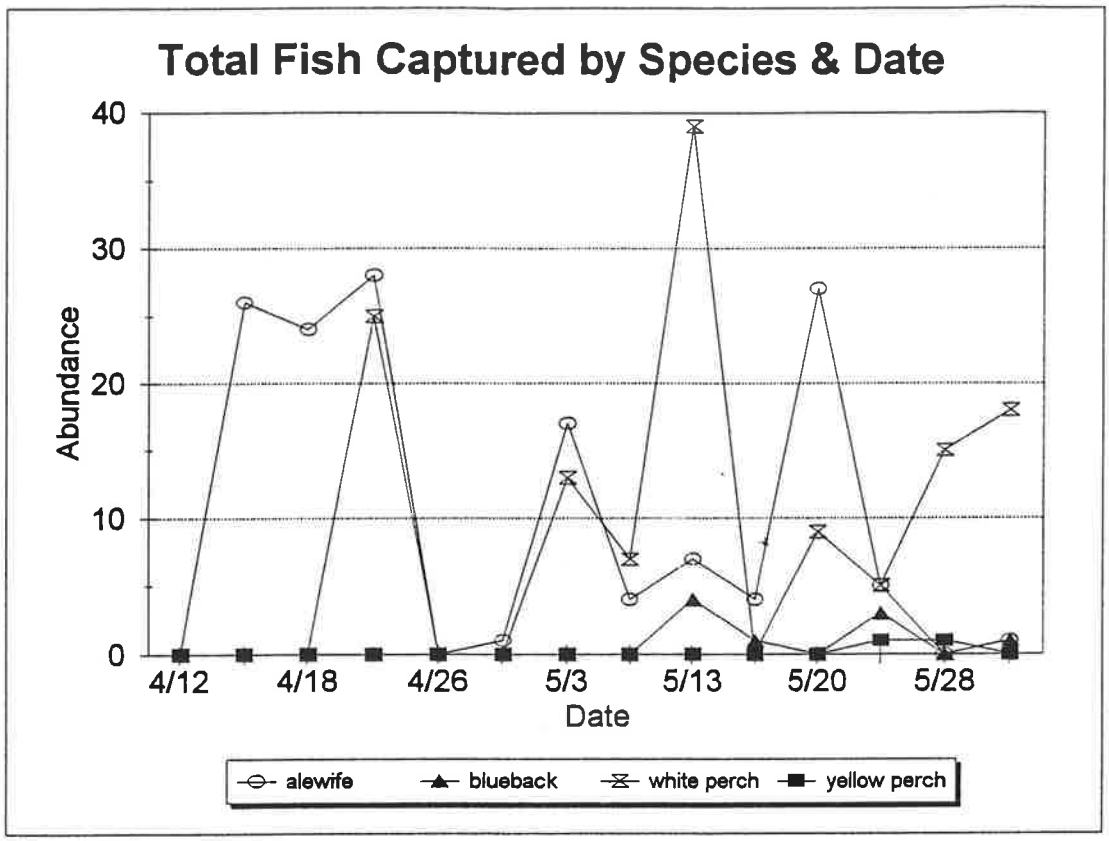


Figure 4

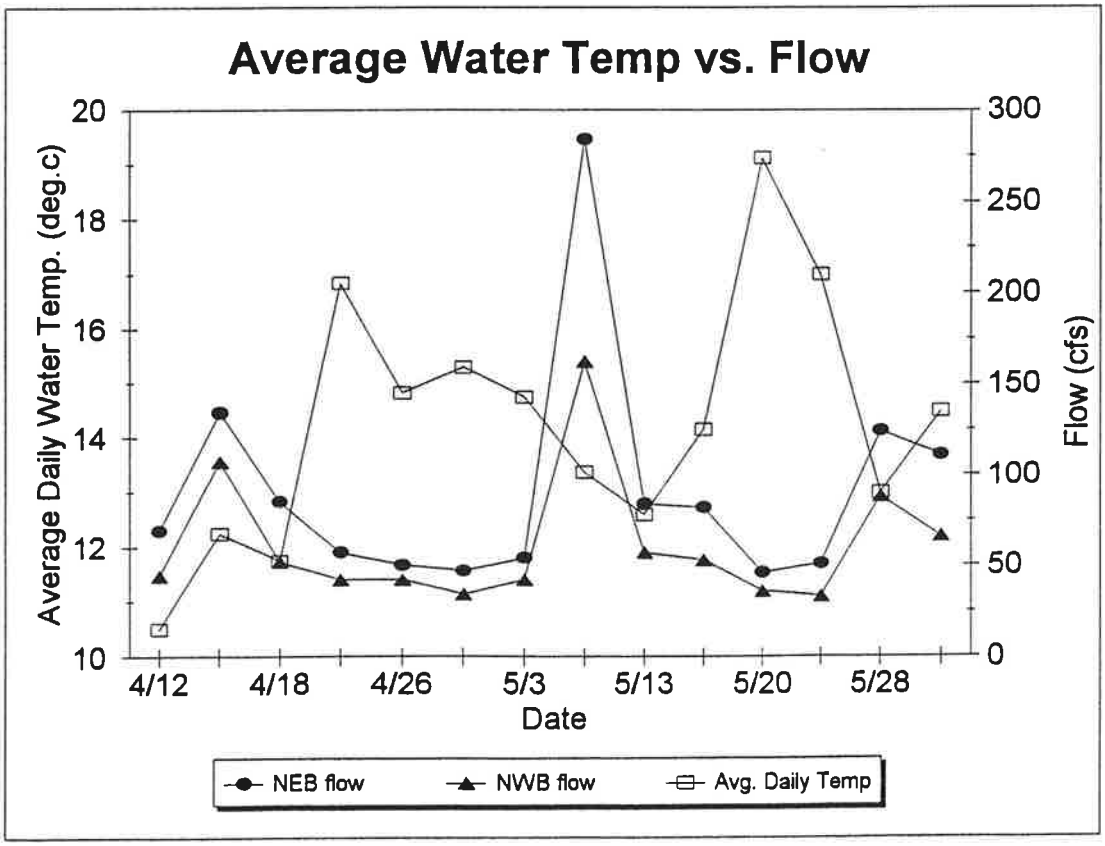
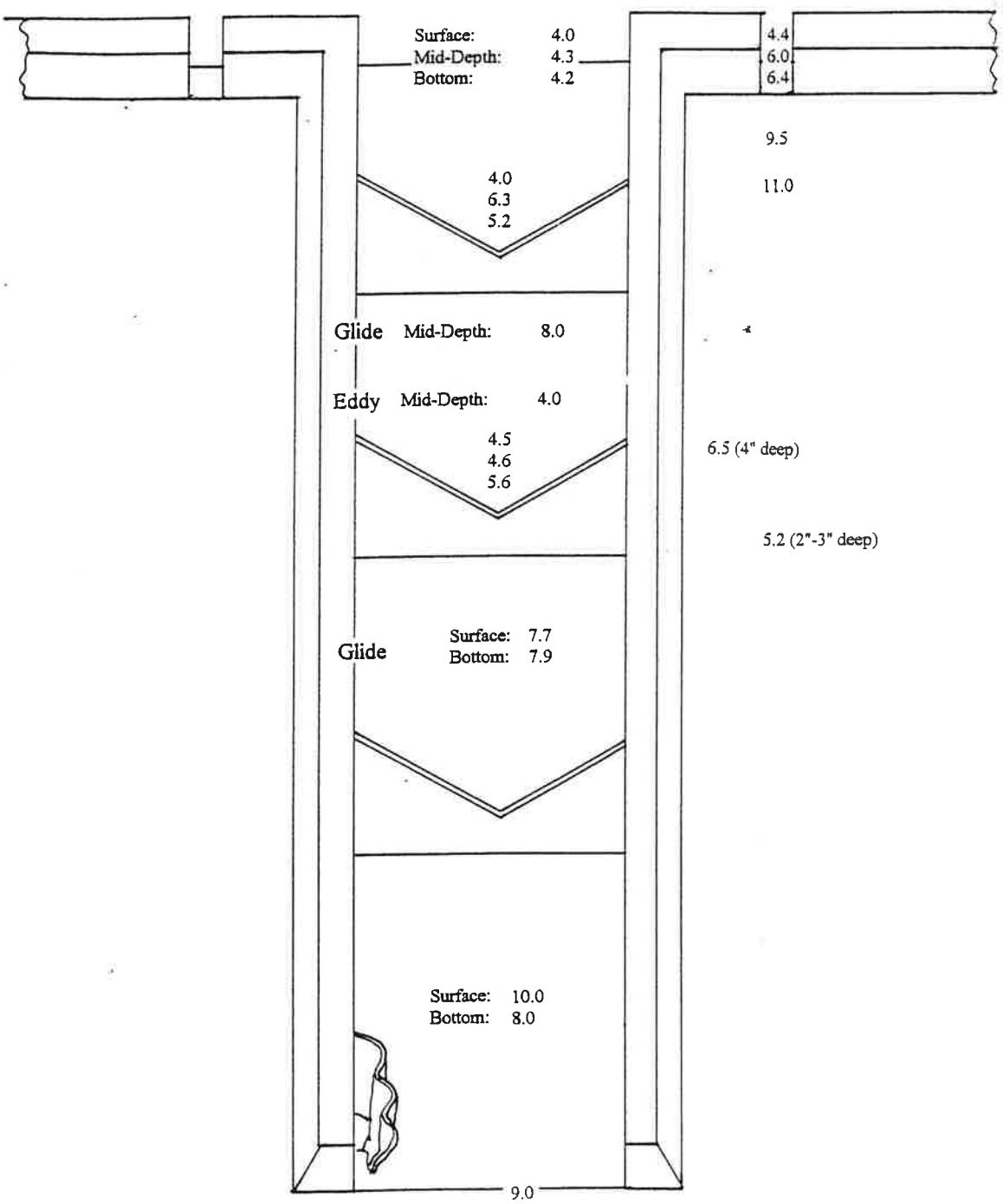


Figure 5



Note: All velocity measurements taken 04/18/96. All water velocity values reported are in feet per second. Additional measurements were taken in the plume leaving the bootom of the chute. Water velocity was measured as 9.0 at the foot of the structure. 4 feet below the structure, the mid-depth water velocity was 7.2. 8 feet below, the mid-depth water velocity was 8.8 and 12 feet below, it was 6.2.

Table 1. Total number of herring captured by collection date with water temperature and average flow values preceding collection.

Date	Alewife	Blueback	Water Temp (deg C)	NEB 24 Hour Average Flow	NWB 24 Hour Average Flow
4/12	0	0	10.5	69	44
4/15	26	0	12.3	134	107
4/18	24	0	11.8	85	52
4/22	28	0	16.8	57	42
4/26	0	0	14.8	50	42
4/29	1	0	15.3	47	34
5/3	17	0	14.8	54	42
5/9	4	0	13.4	284	162
5/13	7	4	12.6	84	57
5/17	4	1	14.2	82	53
5/20	27	0	19.1	46	36
5/23	5	3	17	51	33
5/28	0	0	13	124	88
5/30	1	1	14.5	111	66

Table 2

Alewife Herring abundance summary sheet

	4/12	4/15	4/18	4/22	4/26	4/29	5/3	5/9	5/13	5/17	5/20	5/23	5/28	5/30	total
Paint Branch @ BARC Weir	0	0													0
Paint Branch @ 495	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paint Branch @ Metzerott Rd.					0	0	0		0	0	0	0	0		0
Indian Creek @ 495					0	0	0				0	0			0
Below Confluence of Indian Creek and Paint Branch															0
Indian Creek @ Paint Branch				3	0	0	0	0	0	0	0	0			3
Paint Branch @ Indian Creek				3	0	1	0	0	0	0	0	0			4
Northeast Branch @ MNCPPC	0	5	17	3					5	4	0				34
Northwest Branch @ Md. Rt. 1	0	21	7	19			17	4	2	0	8	5	0	1	84
Northwest Branch between Rt. 1 & 38th Street										0					0
Northwest Branch @ 38th Street		0	0	0	0	0	0	0	0	0	19	0	0	0	19
Northwest Branch @ Pumping Station		0	0	0	0	0		0	0		0	0	0	0	0
Northwest Branch @ Queenstown Playground										0	0	0	0	0	0
Northwest Branch @ Queenstown		0	0	0	0	0	0	0	0		0	0	0	0	0
Northwest Branch @ Blue tanks					0	0		0	0			0	0	0	0
Totals	0	26	24	28	0	1	17	4	7	4	27	5	0	1	

Blueback Herring abundance summary sheet

	4/12	4/15	4/18	4/22	4/26	4/29	5/3	5/9	5/13	5/17	5/20	5/23	5/28	5/30	total
Paint Branch @ BARC Weir	0	0													0
Paint Branch @ 495	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paint Branch @ Metzerott Rd.					0	0	0		0	0	0	0	0		0
Indian Creek @ 495					0	0	0				0	0			0
Below Confluence of Indian Creek and Paint Branch															0
Indian Creek @ Paint Branch				0	0	0	0	0	0	0	0	0			0
Paint Branch @ Indian Creek				0	0	0	0	0	0	0	0	0			0
Northeast Branch @ MNCPPC	0	0	0	0					3	1	0				4
Northwest Branch @ Md. Rt. 1	0	0	0	0			0	0	1	0	0	3	0	1	5
Northwest Branch between Rt. 1 & 38th Street										0					0
Northwest Branch @ 38th Street		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northwest Branch @ Pumping Station		0	0	0	0	0		0	0		0	0	0	0	0
Northwest Branch @ Queenstown Playground										0	0	0	0	0	0
Northwest Branch @ Queenstown		0	0	0	0	0	0	0	0		0	0	0	0	0
Northwest Branch @ Blue tanks					0	0		0	0			0	0	0	0
Totals	0	0	0	0	0	0	0	0	4	1	0	3	0	1	

Table 3

White Perch abundance summary sheet

	4/12	4/15	4/18	4/22	4/26	4/29	5/3	5/9	5/13	5/17	5/20	5/23	5/28	5/30	total
Paint Branch @ BARC Weir	0	0													0
Paint Branch @ 495	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paint Branch @ Metzerott Rd.					0	0	0		0	0	0	0	0		0
Indian Creek @ 495					0	0	0				0	0			0
Below Confluence of Indian Creek and Paint Branch															0
Indian Creek @ Paint Branch				0	0	0	0	0	0	0	0	0			0
Paint Branch @ Indian Creek				0	0	0	0	0	0	0	0	0			0
Northeast Branch @ MNCPPC	0	0	0	0					1	0	0				1
Northwest Branch @ Md. Rt. 1	0	0	0	25			13	7	38	0	9	5	15	18	130
Northwest Branch between Rt. 1 & 38th Street										0					0
Northwest Branch @ 38th Street		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northwest Branch @ Pumping Station		0	0	0	0	0		0	0		0	0	0	0	0
Northwest Branch @ Queenstown Playground										0	0	0	0	0	0
Northwest Branch @ Queenstown		0	0	0	0	0	0	0	0		0	0	0	0	0
Northwest Branch @ Blue tanks					0	0		0	0			0	0	0	0
Totals	0	0	0	25	0	0	13	7	39	0	9	5	15	18	

Yellow Perch abundance summary sheet

	4/12	4/15	4/18	4/22	4/26	4/29	5/3	5/9	5/13	5/17	5/20	5/23	5/28	5/30	total
Paint Branch @ BARC Weir	0	0													0
Paint Branch @ 495	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paint Branch @ Metzerott Rd.					0	0	0		0	0	0	0	0		0
Indian Creek @ 495					0	0	0				0	0			0
Below Confluence of Indian Creek and Paint Branch															0
Indian Creek @ Paint Branch				0	0	0	0	0	0	0	0	0			0
Paint Branch @ Indian Creek				0	0	0	0	0	0	0	0	0			0
Northeast Branch @ MNCPPC	0	0	0	0					0	0	0				0
Northwest Branch @ Md. Rt. 1	0	0	0	0			0	0	0	0	0	1	1	0	2
Northwest Branch between Rt. 1 & 38th Street										0					0
Northwest Branch @ 38th Street		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northwest Branch @ Pumping Station		0	0	0	0	0		0	0		0	0	0	0	0
Northwest Branch @ Queenstown Playground										0	0	0	0	0	0
Northwest Branch @ Queenstown		0	0	0	0	0	0	0	0		0	0	0	0	0
Northwest Branch @ Blue tanks					0	0		0	0			0	0	0	0
Totals	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2

Table 4

1996 Anacostia Migratory Fish Sampling

Total Fish Captured by Type for All Stations Sampled

Stations	Alewife Herring	Blueback Herring	White Perch	Yellow Perch	Striped Bass	Largemouth Bass	Smallmouth Bass	Sea Lamprey	Rainbow Trout
Paint Branch @ BARC Weir	0	0	0	0	0	0	0	0	0
Paint Branch @ 495	0	0	0	0	0	0	0	9	0
Paint Branch @ Metzerott Rd.	0	0	0	0	0	0	0	1	0
Indian Creek @ 495	0	0	0	0	0	0	0	0	0
Below Confluence of Indian Creek and Paint Branch	0	0	0	0	0	0	0	0	0
Indian Creek @ Paint Branch	3	0	0	0	0	0	0	0	0
Paint Branch @ Indian Creek	4	0	0	0	0	1	0	0	1
Northeast Branch @ MNCPPC	34	4	1	1	0	1	1	0	0
Northwest Branch @ Md. Rt. 1	84	5	130	47	2	2	1	0	0
Northwest Branch between Rt. 1 & 38th Street	0	0	0	0	0	0	0	0	0
Northwest Branch @ 38th Street	19	0	0	0	0	0	1	0	0
Northwest Branch @ Pumping Station	0	0	0	0	0	0	0	0	0
Northwest Branch @ Queenstown Playground	0	0	0	0	0	0	0	0	0
Northwest Branch @ Queenstown	0	0	0	0	0	1	3	0	0
Northwest Branch @ Blue tanks	0	0	0	0	0	0	0	0	1
Totals	144	9	131	48	2	5	6	10	2