

**NINE MILE RUN**  
**ALLEGHENY COUNTY, PENNSYLVANIA**  
**ELECTROFISHING SURVEY**  
**JULY 2007**

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**For**  
**The Nine Mile Run Watershed Association**

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## **Executive Summary**

The results of a July 2007 Nine Mile Run Watershed Association (NMRWA) electrofishing survey of Nine Mile Run were compared with the results of previous electrofishing efforts, with emphasis on surveys conducted by the NMRWA in 2006, the U.S. Army Corps of Engineers (USACE) in 1999, and the Pennsylvania Fish and Boat Commission (PFBC) in 1990. The purpose for these comparisons is to monitor improvements to the health and aquatic life resources of this previously severely degraded urban stream which are occurring as a result of ongoing efforts to improve the water quality and habitat of Nine Mile Run.

The PFBC found no fish at all present in Nine Mile Run during their 1990 survey, but by 1999 a few mostly pollution tolerant species of fish had begun to colonize the stream. Between the 1999 USACE and 2006 NMRWA surveys the number of fish species collected increased 40% (from 5 to 7 species). The total number of fish collected increased 30% (from 89 to 116 fish). The biomass of the sample increased 505% (from 761 to 4,606 grams). Species collected in both 1999 and 2006 were creek chub, white sucker, eastern blacknose dace, and green sunfish, all of which are pollution tolerant species. Bluntnose minnows were collected in 1999 but not in 2006. Smallmouth bass, spotted bass, and sauger were collected only in during the 2006 survey. These improvements in the fishery of Nine Mile Run were noted even though a stream restoration project was only completed in the spring of 2006, and there had been an unexplained fish kill in Nine Mile Run in March of 2006.

A total of nine species of fish were collected during the July 2007 NMRWA electrofishing survey. Four new fish species found in 2007 were gizzard shad, goldfish, emerald shiner, and central stoneroller. Except for the stonerollers, however, these new species were only collected within the Monongahela River embayment portion of Nine Mile Run, and were not present in Nine Mile Run upstream of the first riffle above the embayment section. The fish community of the stream continues to be overwhelmingly dominated by pollution tolerant creek chubs, white suckers, and blacknose dace. However, while there was no apparent significant increase in the diversity of the fish community, there was a dramatic increase in productivity between the 2006 and 2007 surveys. The total number of fish collected from four stations which were sampled in both 2006 and 2007 increased by 644% (from 102 to 759 fish). The biomass of the sample increased 42.7% (from 4,229.2 to 6,036.4 grams, and the catch per unit effort (CPUE) increased 666.1% between 2006 and 2007 (from 79.9 to 612.1 fish/hour).

## **Introduction**

The purpose of this study was to make an interim assessment of the impacts of various ongoing efforts to restore the aquatic ecosystem of Nine Mile Run. These efforts include reductions in both wet and dry weather sewage pollution, reductions in caustically

alkaline steel mill slag leachate pollution, and construction improvements of degraded stream channel habitat. Prior to initiation of these efforts, Nine Mile Run did not support any fish life. An extremely stressed and limited fishery was documented in 1999. The fish sampling methods used in the 2006 study duplicated the methods used during the 1999 survey and allowed comparison to assess the improvements which have occurred in Nine Mile Run since 1999, and particularly since completion of a stream channel habitat restoration project in the spring of 2006. Except for the deletion of sampling from station #4, which will be discussed in the following paragraphs, the 2007 sampling effort was similarly designed to allow comparisons with historical conditions.

## **Study Area**

Nine Mile Run is a tributary of the Monongahela River in eastern Allegheny County, Pennsylvania. The confluence of Nine Mile Run with the Monongahela River is at Monongahela River Mile 7.6, within the navigation pool of Emsworth Locks and Dam (normal pool elevation 710 feet National Geodetic Vertical Datum (NGVD)). Emsworth L/D is located at Ohio River Mile 6.2, 13.8 miles downstream of the mouth of Nine Mile Run.

Nine Mile Run drains an area of 7.5 square miles, between the approximate limits of 40.41° to 40.47° north latitude and 79.85° to 79.92° west longitude. The drainage area and sewershed includes portions of the City of Pittsburgh, and Wilkinsburg, Edgewood and Swissvale Boroughs, as well as small sections of the Boroughs of Braddock Hills and Forest Hills and the Municipality of Penn Hills. Except for the lower 1.9 mile-long reach of Nine Mile Run and the lower reaches of one of its major tributaries, Fern Hollow, the drainage within the basin is primarily urban with runoff channeled through culverts.

Total vertical relief within the Nine Mile Run watershed is about 600 feet, ranging from close to 1300 feet NGVD down to a minimum water surface elevation of 710 feet NGVD at the mouth of the stream. At the large culvert near Braddock Avenue, where the drainage area is 3.8 square miles and the 1.9 mile-long reach of still daylighted lower Nine Mile Run begins, the elevation of the streambed is about 793 feet NGVD. Downstream of the Braddock Avenue Culvert, Nine Mile Run drops 85 feet, or about 43 feet per mile. The thalweg of the lower portion of the stream is below elevation 710 feet NGVD, and is therefore regularly influenced by backwater from the Monongahela River.

A prominent feature of the Nine Mile Run watershed is a very large, 95 hectare, 20 million ton, steel mill slag dump located along the banks of the lower 0.85-mile long reach of the stream. Leachates from this dump have been observed to increase the mean pH of the receiving stream from 7.7 to 9.3, with a maximum observed pH in Nine Mile Run downstream of the Saline Street discharge of 11.1. Calcium and magnesium come out of solution in the slag leachate influenced portion of Nine Mile Run, and before the restoration project had formed a carbonate flowstone-like pavement over the lower Nine Mile Run streambed.

An attribute of the lower Nine Mile Run Valley that makes it particularly unique and valuable is that it is a large oasis of green space within an urban environment. Approximately 35 percent of the 7.5 square mile watershed could be classified as open space or undeveloped land. Most of these undeveloped areas, including Frick Park, the Homewood Cemetery, and the former Duquesne Slag Products Company's dump, are contiguous with each other, as well as with a long corridor of wooded banks and steep slopes along the right descending bank of the Monongahela River.

### **Previous Fish Studies**

In his 1944 Ph.D. dissertation, Black reported that there were no fish in Nine Mile Run. Similarly, the Pennsylvania Fish and Boat Commission electrofished a segment of upper Nine Mile Run in June of 1990 and did not collect any fish. Stauffer and Stecko of Penn State University collected four creek chub (*Semotilus atromaculatus*) from the Duck Hollow reach of Nine Mile Run, and five creek chub and four white suckers (*Catostomus commersoni*) from the Commercial Avenue reach in 1998. In June of 1999, the U.S. Army Corps of Engineers electrofished the entire unculverted reach of Nine Mile Run and collected 89 fish of five different species, but no fish at all downstream of the large and extremely alkaline Saline Street discharge including the embayment. On September the 2nd of 1999, during high Monongahela River flow conditions with elevated backwater (Braddock L/D Lower Gauge 711.5 feet NGVD), the U.S. Army Corps of Engineers again sampled the embayment portion of Nine Mile Run. Under these high river flow conditions, they collected 304 fish of nine different species from the embayment; 5 smallmouth bass (*Micropterus dolomieu*), 1 largemouth bass (*Micropterus salmoides*), 4 bluegill (*Lepomis macrochirus*), 3 white bass (*Morone chrysops*), 130 gizzard shad (*Dorosoma cepedianum*), 135 emerald shiner (*Notropis atherinoides*), 23 sand shiner (*Notropis stramineus*), 2 stoneroller (*Camptostoma anomalum*), and 1 mimic shiner (*Notropis volucellus*). California University of Pennsylvania electrofished 40 tributaries of the Monongahela River during 2003 and 2004. In 2004 they electrofished a 100 meter reach near the mouth of Nine Mile Run, downstream of the Saline Street discharge, and did not collect any fish. Finally, and as discussed previously, the NMRWA electrofished the entire unculverted length of Nine Mile Run in June/July of 2006 and collected 116 fish of seven species.

### **Fish Sampling Stations**

In order to examine the impacts of various physical and chemical stream features on the potential of Nine Mile Run to support a healthy fishery and other forms of aquatic life, the entire unculverted 1.9 mile length of the stream was divided into five sampling stations and, except for the Braddock Avenue paved section and its very deep terminal scour pool, the entire unculverted length of the stream was electrofished in 2006. The five stations sampled are described below. Distances used below were estimated from pre-restoration maps. These have probably changed somewhat since the stream restoration project was completed.

**Station #1.** From the confluence of Nine Mile Run with the Monongahela River upstream along the embayment portion of Nine Mile Run for a distance of about 80 meters to the first constructed riffle in the stream, and downstream of the Saline Street discharge which until recently discharged into Nine Mile Run at the bend above the constructed riffle (Mile 0.00 to 0.05).

**Station #2.** From the upper end of the limit of the Nine Mile Run Embayment upstream for a distance of about 676 meters to the previous location of an old bridge used to access the slag dump (Mile 0.05 to 0.47).

**Station #3.** From the previous location of the old slag dump bridge crossing upstream for a distance of about 917 meters to the Commercial Avenue Bridge (Mile 0.47 to 1.04).

**Station #4.** From the Commercial Avenue Bridge upstream to the relocated mouth of Fern Hollow (Mile 1.04 to 1.41).

**Station #5.** From the relocated mouth of Fern Hollow upstream to the tail of the very deep scour pool at the end of the Braddock Avenue trapezoidal, concrete lined, paved channel section of Nine Mile Run (Mile 1.41 to 1.82)

As had been documented in previous fish sampling surveys, until 2007, fish were still not numerous along Nine Mile Run (only 0.04 fish per meter in 2006). Also, fish distribution along the stream was very spotty. Most of the fish were collected from coarse woody debris within the stream channel during the 2006 survey, and this habitat feature was very scarce along Nine Mile Run. Most of the previously accumulated large woody debris had likely been removed during the stream restoration project, which was only completed a few months before the 2006 survey. Also, there had been an unexplained fish kill reported in Nine Mile Run in March of 2006, only a few months prior to the 2006 fish sampling survey. Because of the low numbers of fish and their spotty distribution, sampling of the entire unculverted length of the stream was appropriate. A recommendation of the 2006 NMRWA report was that until the time when fish numbers in Nine Mile Run increased substantially, it was recommended that future surveys also sample the entire stream. After such improvement occurs, shorter representative stream reaches may then be selected and sampled.

Because of the much higher catch rate experienced in 2007 at Stations #1, #2, and #3, it was decided that the time to reduce the number of stations had arrived, and sampling of Station #4 was deleted. With the now higher productivity and less spotty distribution of fish in the stream, station #3 could also now be deleted from future surveys, and the stream could probably be adequately characterized by sampling only Stations #1, #2, and #5.

### **Fish Sampling Methods**

Fish were collected along Nine Mile Run with a battery powered, direct current, backpack electrofishing unit (Smith-Root LR-24). An operator utilized the backpack

shocker to stun fish that were collected by two netters. The netted fish were kept alive in five gallon buckets until they could be processed. Lengths to the nearest millimeter (mm) and weights to the nearest tenth of a gram (g) were recorded. Abundant smaller fishes of the same species were length ranged, separated into size groups, and then group weighted. Except for specimens taken by Dr. Bain and Dr. Emily Elliott of the University of Pittsburgh for laboratory tissue analyses, all fish were released back into Nine Mile Run after processing.

Station #1 (Mile 0.00 to 0.05), Station #2 (Mile 0.05 to 0.47) and part of Station #3 (Mile 0.47 to 1.04) were sampled on July 7, 2007. The remainder of Station #3, and Station #5 (Mile 1.41 to 1.82) were sampled on July 27, 2007. High stream conductivities necessitated use of a high electrofishing voltage. The electroshocking unit output was 305 volts with variable amperage. Stream flows were very low and visibility excellent on both dates.

## **Results**

Results of the July 2007 electrofishing survey of Nine Mile Run are summarized in Tables 1 and 2. A total of nine species of fish were collected; creek chub 57.3%, white sucker 26.5%, blacknose dace 9.4%, gizzard shad 5.9%, green sunfish 0.3%, central stoneroller 0.3%, smallmouth bass 0.1%, goldfish 0.1%, and emerald shiner 0.1%. The total number of fish collected was 759 in 1.24 hours of effort CPUE 612 fish/hour), and the total sample weight was 6,036.4 grams.

White sucker, creek chub, and eastern blacknose dace are a highly pollution tolerant trio of fish which overwhelming dominant the fish populations of local urban/suburban streams. Green sunfish are also described in the literature as a pollution tolerant species, but locally we tend to encounter green sunfish and stonerollers in somewhat less degraded streams. Only one smallmouth bass was collected from the embayment portion of the stream in 2007. Smallmouth bass and sauger found further upstream in Nine Mile Run in 2006 but not 2007 are not tolerant species, and are esteemed as sport fish. These species were also certainly transients from the Monongahela River, though smallmouth bass might be able to establish a resident population in a stream the size of Nine Mile Run. It would be a highly desirable goal to increase connectivity between the Monongahela River and Nine Mile Run to allow these and other species of fish from the Monongahela River better access to Nine Mile Run.

With one general exception, it is worth noting that the condition and health of the fish that were present in Nine Mile Run were excellent. The exception is that most of the smaller creek chubs, especially along Stations #2 and #3, had numerous red spot lesions.

TABLE 1

FISH SPECIES COLLECTED FROM NINE MILE RUN DURING 1999, 2006, AND 2007

SPECIES	COMMON NAME	YEARS		
		1999	2006	2007
<b>Clupeidae</b>	<b>Herrings</b>			
<i>Dorosoma cepedianum</i>	Gizzard Shad			X*
<b>Catostomidae</b>	<b>Suckers</b>			
<i>Catostomus commersoni</i>	White Sucker	X	X	X
<b>Cyprinidae</b>	<b>Carps and Minnows</b>			
<i>Semotilus atromaculatus</i>	Creek chub	X	X	X
<i>Rhinichthys atratulus</i>	Eastern Blacknose Dace	X	X	X
<i>Pimephales notatus</i>	Bluntnose Minnow	X		
<i>Notropis atherinoides</i>	Emerald Shiner			X*
<i>Campostoma anomalum</i>	Central Stoneroller			X
<i>Carassium auratus</i>	Goldfish			X*
<b>Centrarchidae</b>	<b>Blackbasses, Crappies, and Sunfishes</b>			
<i>Lepomis cyanellus</i>	Green Sunfish	X	X	X
<i>Microptera dolomieu</i>	Smallmouth Bass		X	X*
<i>Microptera punctulatus</i>	Spotted Bass		X*	
<b>Percidae</b>	<b>Perches</b>			
<i>Sander canadense</i>	Sauger		X	

\* = Collected only in the embayment portion of the stream

**TABLE 2**

**RESULTS OF JULY 2007 ELECTROFISHING SURVEY**

	Number of Fish	Length Range (mm)	Weight (grams)	Catch per Unit Effort (fish/hour)
<b>Station #1</b>				
White Sucker	33	38 - 57	27	90
Creek Chub	30	37-52	23.6	100
Blacknose Dace	1	34	0.7	3.3
Emerald Shiner	1	42	0.4	3.3
Goldfish	1	44	1.4	3.3
Smallmouth Bass	1	232	149.8	3.3
Gizzard Shad	45	22-45	10.6	150
Total	112		213.5	373

Date - July 7, 2007 Time - 0.30 hours  
 Station Length - 80 meters 305 volts  
 Incidental Observations - One bullfrog

<b>Station #2</b>				
White Sucker	91	47-221	316.7	303.3
Creek Chub	201	32-210	1073.6	607
Blacknose Dace	18	32-89	50.7	60
Green Sunfish	2	112-129	61.8	6.7
Central Stoneroller	1	43	0.7	3.3
Total	313		1503.5	1043.3

Date- 7 July 2007 Time 0.30 hours (estimated)  
 Station Length - 676 meters 305 volts

Incidental Observations - One bullfrog, numerous damselfly nymphs, numerous red lesions on small creek chubs.

<b>Station #3</b>				
White Suckers	77	42-282	1217.1	220
Creek Chub	117	35-212	1611.6	334.3
Blacknose Dace	45	39-85	118.1	128.6
Central Stoneroller	1	50	2.4	2.8
Total	240		2949.2	685.7

Date - 7 and 27 July, 2007 Time - 0.35 hours (estimated)  
 Station Length - 917 meters 305 volts

Incidental Observations- One snapping turtle, one red-eared slider turtle, numerous damselfly nymphs, one crayfish, and numerous red lesions on smaller creek chubs

<b>Station #5</b>				
Creek Chub	87	54-202	1334.8	255.9
Blacknose Dace	7	61-83	35.4	20.6
Total	94		1370.2	276.5

Date - 27 July, 2007 Time - 0.34 hours  
 Station Length - 660 meters 305 volts

Incidental Observations - One crayfish

**TOTAL OF ALL STATIONS**

White Sucker	201	38-282	1560.8	162.1
Creek Chub	435	37-212	4943.6	350.8
Blacknose Dace	71	32-89	204.9	57.3
Emerald Shiner	1	42	0.4	0.8
Central Stoneroller	2	43-50	3.1	1.6
Goldfish	1	44	1.4	0.8
Green Sunfish	2	112-129	61.8	1.6
Smallmouth Bass	1	232	149.8	0.8
Gizzard Shad	45	22-45	10.6	36.3
Total	758		6036.4	611.3

While these fish population results seem to only now characterized Nine Mile Run as just another local stressed urban/suburban stream, it is essential to keep in perspective that compared to the lifeless toxic sewer that it was only a few years ago, progression to such a characterization represents an enormous accomplishment by numerous dedicated partners. The highly increased productivity observed between 2006 and 2007 also represents a continuing trend towards improvement, even though it was not yet accompanied by a similar increase in fish community diversity.

## Discussion

Table 3 is a summary and comparison of results from the four stations which were all sampled during the June 1999 U.S. Army Corps of Engineers electrofishing survey of Nine Mile with the results of the June/July 2006 and July 2007 Nine Mile Run Watershed Association's fish sampling surveys. As can be seen in this table, between 1999 and 2007 fish diversity increased 140%, fish numbers increased 130%, and fish biomass present increased 650%. As the Nine Mile Run Watershed Association, local communities, and other partners continue to take actions to further improve water quality and stream habitat, further improvement of the fishery is expected to occur in the future.

**TABLE 3**

**COMPARISON OF THE RESULTS OF THE JUNE 1999 CORPS OF ENGINEERS AND THE JUNE/JULY 2006 AND JULY 2007 NINE MILE RUN WATERSHED ELECTROFISHING SURVERYS OF NINE MILE RUN**

	COE	NMRWA	NMRWA
Year	1999	2006	2007
Number of Fish Species	5	7	9
Number of Fish Collected	89	101	758
Total Weight of Sample (grams)	761	4,106	6,036.40

Initiatives that should lead to further improvements in the quality and aquatic life resources of Nine Mile Run include the recent capture and diversion of the extremely caustic alkaline Saline Street discharge into the City of Pittsburgh sewers. With this chemical barrier removed, opportunities for recolonization of Nine Mile Run to potentially resident fish by way of the Monongahela River has been improved, as well as transient use of the stream by Monongahela River fish. Also, the potential of the Nine Mile Run Embayment as spawning and nursery habitat will be improved by removal of the Saline Street discharge. The developing Nine Mile Run Rain Barrel Demonstration

Project, the largest rain barrel project in the nation, will moderate the extremely flashy urban hydrology of the stream, providing a degree of protection to the restored channel, and moderating future trends towards downcutting and channel degradation. Several hydraulic obstacles in the stream which are still relatively significant barriers to upstream fish passage will be stepped in September of 2007.

Other aquatic life incidentally observed during the 2007 Nine Mile Run fish survey are encouraging and include two crayfish, two bullfrogs, a snapping turtle, a red eared slider turtle and dozens to hundreds of damselfly (*Zygoptera*) nymphs.

## **Recommendations**

The stream channel habitat provided by the restoration project has resulted in a highly improved situation, especially along the Phase 1 upper portion of the project where there was room to work. However, there is still apparent room for adaptive management refinements. The U.S. Army Corps of Engineers has some funds left over from the restoration project, and plans to perform some such refinements in cooperation with Frick Park staff in September of 2007.

1. Woody Debris. Coarse woody habitat (CWH) is not abundant along Nine Mile Run. Woody debris is not only essential for fish habitat, but also traps leaf pack necessary for invertebrates, and the stream is relatively swept clean and largely devoid of leaf pack. Actions that might correct this deficiency should be considered by the watershed association.

2. Intermediate Size Substrate. During a July 27, 2006 University of Pittsburgh class field trip lead by Dr. Bruce Dickson and Michael Koryak, it was observed that the large rock constructed riffles of the restoration project were devoid of intermediate size substrate structure. Because most of the drainage basin is culverted, the stream is apparently sediment starved. Access for such introductions would not be a serious challenge. Cobble could be introduced to the accessible upstream riffles and allowed to move to downstream riffles by itself during high flow events.

3. Hydraulic Obstacles. Most of the serious obstacles to upstream fish passage along Nine Mile Run were made more pervious to fish passage by the restoration project, and this should improve the connectivity between Nine Mile Run and the Monongahela River. However, several of the riffles, especially along the Station #2 and Station #3 reaches, are still quite steep and high. Stepping of these riffles would be desirable.

4. Fish Introductions. Fish species common to similarly sized tributaries of the Monongahela River are not present in Nine Mile Run. If existing chemical and physical barriers prevent or significantly delay recolonization by these species, fish introductions could be a relatively easy and inexpensive project for consideration by the Nine Mile Run Watershed Association. A few species that could be easily obtained and which would

likely survive and establish resident populations are rainbow darter, greenside darter, bluegill, pumpkinseed, and stoneroller.

5. Fish Sampling. Fish population surveys are an inexpensive method to assess the health of streams. Also, fish are a parameter that is easily understood and appreciated by the general public. Therefore, it is recommended that future surveys of the fish population of Nine Mile Run be conducted to assess the effectiveness of ongoing efforts to restore this stream. Until 2007, because of the limited numbers and spotty distribution of fish along Nine Mile Run, typical standard short reach stream electrofishing surveys were not likely to be successful for stream assessments of Nine Mile Run, and entire stream surveys similar to those performed by the U.S. Army Corps of Engineers in 1999 and by the Nine Mile Run Watershed Association in 2006 were recommended and performed. The large numbers of fish collected in 2007, however, suggests that shorter section fish sampling surveys would now be appropriate. Sampling of the embayment reach (Station #1) and the two most upstream and downstream stations (Stations #5 and #2, respectively) would probably be sufficient to characterize the fish community of Nine Mile Run in the future.

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