

NINE MILE RUN
ALLEGHENY COUNTY, PENNSYLVANIA
ELECTROFISHING SURVEY
JUNE/JULY 2006

Prepared by
Michael Koryak, Patrick Bonislawsky, and Linda Stafford

For
The Nine Mile Run Watershed Association

August 2006

Executive Summary

The results of a June/July 2006 Nine Mile Run Watershed Association electrofishing survey of Nine Mile Run were compared with the results of a June 1999 U.S. Army Corps of Engineers electrofishing survey. Between the 1999 and 2006 surveys the number of fish species collected increased 140% (from 5 to 7 species). The total number of fish collected increased 130% (from 89 to 116 fish). The biomass of the sample increased 650% (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. We hope to see even greater improvements to the fishery in the future.

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 this 2006 study duplicate the methods used during the 1999 survey and allow 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.

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 6.5 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 (*Catostomidae 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 (*Campostoma 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

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. 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, 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, 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. Until the time when fish numbers in Nine Mile Run increase substantially, it is recommended that future surveys also sample the entire stream. After, such improvement occurs, shorter representative streams reaches may then be selected and sampled.

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. All fish were released back into Nine Mile Run after processing with negligible apparent mortality. Station #1 (Mile 0.00 to 0.05) and Station #2 (Mile 0.05 to 0.47) were sampled on June 26, 2006. Station #3 (Mile 0.47 to 1.04), Station #4 (Mile 1.04 to 1.41), and Station #5 (Mile 1.41 to 1.82) were sampled on July 10, 2006. The electroshocking unit output was 200 volts with variable amperage for stations #1 and #2, and 150 volts with variable amperage for stations #3, #4, and #5. Stream flows were low and visibility excellent on both dates.

Results

Results of the June/July 2006 electrofishing survey of Nine Mile Run are summarized in Tables 1 and 2. A total of seven species of fish were collected; creek chub 44.0%, blacknose dace 20.0%, white sucker 30.2%, green sunfish 2.6%, smallmouth bass 1.7%, spotted bass 1.7%, and sauger 0.8%. The total number of fish collected was 116 and the total sample weight was 4,954.2 grams.

**TABLE 1. FISH SPECIES COLLECTED FROM NINE MILE RUN
DURING JUNE 1999 AND JUNE/JULY 2006**

Scientific Name	Common Name	June 1999	June/July 2006
Catostomidae	Suckers		
<i>Catostomidae commersoni</i>	White Sucker	X	X
Cyprinidae	Carp and Minnows		
<i>Semotilus atromaculatus</i>	Creek Chub	X	X
<i>Rhinichthys atratulus</i>	Eastern Blacknose Dace	X	X
<i>Pimephales notatus</i>	Bluntnose Minnow	X	
Centrarchidae	Blackbasses, Crappies, and Sunfishes		
<i>Lepomis cyanellus</i>	Green Sunfish	X	X
<i>Micropterus dolomieu</i>	Smallmouth Bass		X
<i>Micropterus punctulatus</i>	Spotted Bass		X
Percidae	Perches		
<i>Sander canadense</i>	Sauger		X

TABLE 2. RESULTS OF JUNE/JULY 2006 ELECTROFISHING SURVEY

	Number of Fish	Length Range (mm)	Weight (grams)	Catch per Unit Effort (fish/hour)
Station 1				
White Sucker	3	190-222	265	12.0
Spotted Bass	<u>2</u>	134-140	<u>83</u>	<u>8.0</u>
Total	5		348	20.0
Date - June 26, 2006 Time - 0.250 hours Station Length - 80 meters 200 volts Incidental Observations - One bullfrog and one greenfrog.				
Station 2				
White Sucker	21	95 - 270	1598	39.4
Creek Chub	7	35 -145	196	13.1
Blacknose Dace	6	65 - 70	27.4	11.3
Smallmouth Bass	2	80 -110	31.0	3.8
Sauger	<u>1</u>	260	<u>155</u>	<u>1.9</u>
Total	37		2007.4	69.5
Date - June 26, 2006 Time - 0.533 hours Station Length - 676 meters 200 volts Incidental Observations - One bullfrog and one crayfish.				
Station 3				
White Sucker	8	124 -199	469.3	29.1
Creek Chub	13	77-182	494.1	47.3
Blacknose Dace	<u>10</u>	66 - 74	<u>28.3</u>	<u>36.4</u>
Total	31		942.8	112.7
Date - July 10, 2006 Time - 0.275 hours Station Length - 917 meters 150 volts Incidental Observations - One large snapping turtle observed on July 27, 2006.				
Station 4				
White Sucker	3	211-225	354.9	7.7
Creek Chub	8	122-197	430.0	20.6
Blacknose Dace	2	66-72	7.7	5.1
Green Sunfish	<u>2</u>	96-121	<u>64.9</u>	<u>5.1</u>
Total	15		857.5	38.6
Date - July 10, 2006 Time - 0.389 hours Station Length - 595 meters 150 volts				
Station 5				
White Sucker	1	225	114.6	4.6
Creek Chub	23	110-182	765.5	105.5
Blacknose Dace	4	65-83	16.9	18.3
Green Sunfish	<u>1</u>	112	<u>34.0</u>	<u>4.6</u>
Total	29		931	133
Date - July 10, 2006 Time - 0.218 hours Station Length - 660 meters 150 volts Incidental Observations - One creek chub had blackspot disease and another creek chub had an injury or lesion. One crayfish and a 4.5 feet long black snake were observed on July 10th on a riffle and numerous small toads on the banks on July the 27th.				
Total of all Stations				
White Sucker	35	95-270	2620	21.0
Creek Chub	51	35-197	1886	30.6
Blacknose Dace	22	65-83	80.3	13.2
Green Sunfish	3	96-121	98.9	1.8
Spotted Bass	2	134-140	83	1.2
Smallmouth Bass	2	80-110	31	1.2
Sauger	<u>1</u>	260	<u>155</u>	<u>0.6</u>
Total	116		4954.2	69.7
Date - June 26 and July 10, 2006 Total Electrofishing Time - 1.665 hours Total Combined Station Length - 2,938 meters				

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 in somewhat less degraded streams. Smallmouth bass, spotted bass, and sauger are not tolerant species, and are all esteemed as sport fish. These three species are 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.

While fish numbers in Nine Mile Run were not high, it is worth noting that the condition and health of the fish that were present was excellent, though one creek chub collected in the Station 5 reach did have blackspot disease and another creek chub in this reach had an injury or lesion.

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.

Discussion

Table 3 is a summary and comparison of the June 1999 U.S. Army Corps of Engineers electrofishing survey of Nine Mile Run with the results of the June/July 2006 Nine Mile Run Watershed fish sampling survey. As can be seen in this table, between the two surveys fish diversity increased 140%, fish numbers increased 130%, and fish biomass present increased 650%. These improvements to the fishery of Nine Mile Run were noted even though Phase 2 of the stream restoration project was only completed in June of 2006, and there was an unexplained fish kill in Nine Mile Run in March of 2006. Further improvement of the fishery is expected in the future.

TABLE 3. COMPARISON OF THE RESULTS OF THE JUNE 1999 CORPS OF ENGINEERS AND THE JUNE/JULY 2006 NINE MILE RUN WATERSHED ELECTROFISHING SURVEYS OF NINE MILE RUN			
	COE 1999	NMRWA 2006	Percent Change
Number of Fish Species	5	7	140%
Number of Fish Collected	89	116	130%
Total Weight of Sample (grams)	761	4,606	650%

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.

Other aquatic life incidentally observed during the Nine Mile Run fish survey are encouraging and include two crayfish, two bullfrogs, one green frog, a snapping turtle, and numerous small toads. A large non-aquatic black rat snake was also observed on one of the riffles.

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.

1. Woody Debris. Most of the fish sampled during the 2006 electrofishing survey were collected from areas with coarse woody debris. However, this type of coarse woody habitat (CWH) is not abundant along Nine Mile Run. There was only one large snag in the entire stream, along the Station 4 reach of Nine Mile Run. Smaller brush in the channel was observed to collect trash, especially plastic bags. Woody debris is not only essential for fish habitat, but also traps leaf pack necessary for invertebrates, and the stream is swept clean and similarly devoid of leaf pack. The impulse to tidy up the stream by Nine Mile Run's many new and active friends must be resisted if the fishery is to ever reach its full potential. Large trees could be placed in the channel with proper alignment when they become available.

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 3 reach, 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. Because of the limited numbers and spotty distribution of fish along Nine Mile Run, typical standard short reach stream electrofishing surveys are 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 are recommended.

References

Black, W.L., 1944. The Ecology of a City Park, Frick Park, Pittsburgh, PA. Doctor of Philosophy Thesis, University of Pittsburgh, Pittsburgh. PA.

Collins, T.D., Dzombak, J. Rawlins, K. Tamminga, S. Thompson, et al. 1998. Nine Mile Run Watershed Rivers Conservation Plan. City of Pittsburgh, Carnegie Mellon University, Carnegie Museum of Natural History, Pennsylvania State University.

Cooper, E.L., 1983. Fishes of Pennsylvania and the Northeastern United States. The Pennsylvania State University Press, University Park, PA.

Hoskin, R.H., M. Koryak, and L.J. Stafford, 2003. Fishes of Small Tributaries to the Allegheny and Monongahela Rivers in Urban/Suburban Allegheny County, Pennsylvania. *Journal of the Pennsylvania Academy of Science* 77(2/3): pp. 51-58.

Kimmel, W.G., and D.G. Argent, 2005. Fish Biodiversity of Selected Tributaries of the Monongahela River, Final Report. Contract #WM-6-026-0062 for the Commonwealth of Pennsylvania, Pennsylvania Game Commission. Department of Biological and Environmental Sciences, California University of Pennsylvania, California, PA.

Koryak, M., R.H. Hoskin, R.J. Reilly, and L.J. Stafford, 2001. The Impact of Above Grade Sewerline Crossings on the Distribution and Abundance of Fishes in Recovering Small Urban Streams of the Upper Ohio River Valley. *Journal of Freshwater Ecology*, Vol. 16, No. 4, pp.591-598.

Koryak, M., L.J. Stafford, R.J. Reilly, and P.M. Magnuson. 2002. Highway Deicing Salt Runoff Events and Major Ion Concentrations along a Small Urban Stream. *Journal of Freshwater Ecology*. Vol. 16, No. 1, pp. 125-134.

Koryak, M., L.J. Stafford, R.J. Reilly, and P.M. Magnuson, 2002. Impacts of Steel Mill Slag Leachate on the Water Quality of a Small Pennsylvania Stream. *Journal of Freshwater Ecology*. Vol. 17, No. 3, pp.461-465.

Ohio Environmental Protection Agency, 1988. *Biological Criteria for the Protection of Aquatic Life: Users Manual for Biological Field Assessments of Ohio Surface Waters*. Ohio Environmental Protection Agency, Ecological Assessment Section, Division of Water Quality, Columbus, OH.

Pennsylvania Fish and Boat Commission. 1990. *Results of a June 15, 1990 Survey of Nine Mile Run. Area 8, Somerset, PA.*

Plafkin, J.L., M.T. Barbour, K.D. Porter, S.K. Gross and R.M. Huges, 1998. *Rapid Bioassessment Protocols for Use in Streams and Rivers: Benthic Macroinvertebrates and Fish*. U.S. Environmental Protection Agency, Assessment and Watershed Protection Division, Washington, D. C.

Stauffer, J.R. Jr. and T.D., Stecko, 1999. *Progress Report, Nine Mile Run Fish Survey*. [Http://slaggarden.cfa.cmu.edu/research/fisheries.html](http://slaggarden.cfa.cmu.edu/research/fisheries.html)

U.S. Army Corps of Engineers, 2000. *Nine Mile Run, Allegheny County, Pennsylvania, Aquatic Ecosystem Restoration, Water Quality and Aquatic Life*. U.S. Army Engineer District Pittsburgh, Corps of Engineers, Pittsburgh, PA.