

2010

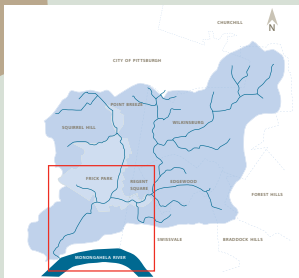
STATE OF
THE
WATERSHED

NINE MILE RUN

2009-2010 SAMPLING LOCATIONS



-  WATER QUALITY
-  FISH
-  INVERTEBRATES



2

FRICK PARK

BRADDOCK AVE

COMMERCIAL AVE

NINE MILE RUN

MONONGAHELA RIVER

DUCK HOLLOW

2

1

3



STATE OF THE NINE MILE RUN WATERSHED

A STREAM RESTORED

Perhaps the most striking opportunity noted for a large park is the valley of Nine Mile Run. Its long meadows of varying width would make ideal play fields; the stream, when it is freed from sewage, will be an attractive and interesting element in the landscape; the wooded slopes on either side give ample opportunity for enjoyment of the forest, for shaded walks and cool resting places.

--Frederick Law Olmsted, Jr. 1910

In 2006, Olmsted's vision for the Nine Mile Run Valley became a reality with the completion of the Nine Mile Run Aquatic Ecosystem Restoration. Sponsored by the U.S. Army Corps of Engineers and the City of Pittsburgh, a \$7.7 million, 3-year project restored the 2.2 miles of open stream. Designed to ameliorate years of neglect and degradation, this project reconfigured the stream channel, reconstructed the stream bed, created wetlands and floodplains and enhanced and expanded habitat with an abundance of native trees, wildflowers, forbs, and grasses.

Since the completion of the restoration, the visual changes in the Nine Mile Run Valley continue to delight visitors to Frick Park. But this visual progress is only one part of the complete story, a story that includes the more subtle changes that can only be examined through scientific inquiry.

Every two years, the Nine Mile Run Watershed Association presents a summary of the ongoing scientific research conducted on the Nine Mile Run Aquatic Ecosystem Restoration – the State of the Watershed Report. Two previous reports were published and presented to the public in 2007 and 2009.

The natural resource professionals and researchers on the NMRWA Monitoring Committee have contributed thousands of hours of expertise, creating a comprehensive analysis of the changes in the stream and riparian area.

This 2011 report covers data through 2010 and represents the most recent findings on:

- **Fish**
- **Invertebrates**
- **Bacteria**
- **pH and metals**
- **Rain barrels**
- **Tree inventory**

Excluded from this public report are areas of study that are complex, such as nitrate deposition, or those areas that are analyzed every five years. Please visit our website for the complete scientific report.

An important note about the data in this report; where possible we have included all years for which data has been collected for a parameter. For example, we have reported data from 2000 through 2010 on the invertebrate populations. However, to ensure accuracy and reliability when the primary investigator or protocols have changed, we have reported only the most recent data for each area of investigation.

FISH

DATA COLLECTED BY MIKE KORYAK, PATRICK BONISLAWSKY, LINDA STAFFORD, JOE FEDOR, BRADY PORTER & JUSTIN HYNICKA

Fish are key indicators of stream health for a variety of reasons: their entire lifecycle occurs in the water, different species vary in their tolerance to pollution, and they are close to the top of the aquatic food chain. With typical life spans of 2 -10 years, fish are valuable in assessing both the short term and long term water quality of a stream. And although they are mobile, fish are easy to collect and identify in the field.

Simply knowing whether fish live in the stream is not enough; we also need to know the numbers and species that are present, as well as their overall health. The presence, condition, numbers and species of fish can provide important information about the health of a stream.

SAMPLING METHOD

Fish were collected with a battery powered, direct current backpack electrofishing unit (Smith-Root LR-24) using 300 volts with variable amperage. The backpack unit was used to stun fish that were then collected by two netters. The netted fish were kept alive in five gallon buckets until they could be processed. All fish were counted. Species of abundant smaller fish were length ranged, separated into size groups and weighed. Lengths to the nearest millimeter (mm) and weights to the nearest tenth of a gram (g) were recorded. All fish were released back into Nine Mile Run after processing.

RESULTS

Pre-restoration the fish population in Nine Mile Run was extremely stressed and limited, and although the post-restoration numbers in 2006 showed improvement, fish were not numerous. Fish surveys conducted in 2006 and 2007 covered the entire length of the stream with sampling done at 5 locations along the stream. However, due to the much higher catch rate experienced in 2007 at Stations 1, 2, and 3, it was decided to reduce the number of sampling sites.

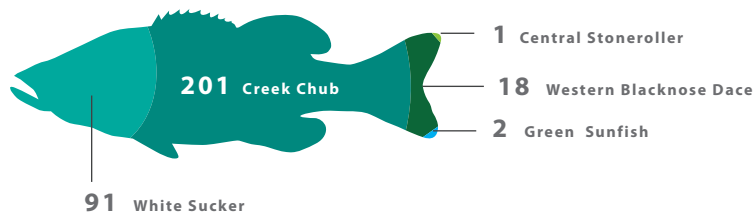
The current data includes years 2007-2010 from sampling site NM-2 and NM-4. Comparing the 2007 sampling and 2010 sampling events at station two we see an increase of 280% in species, from 5 to 14. The total number of individual fish increased 517%, from 313 to 1617, with a total biomass from 1503.5 to 19,560.5 grams, an increase of 1,301%. Some less pollution tolerant species including the northern hogsucker, pumpkinseed, bluegill, Johnny darter, and spotfin, emerald and mimic shiners showed up in the stream for the first time in 2010.

FISH SURVEY COMPARISONS

2007 Fish Collected

5 Species

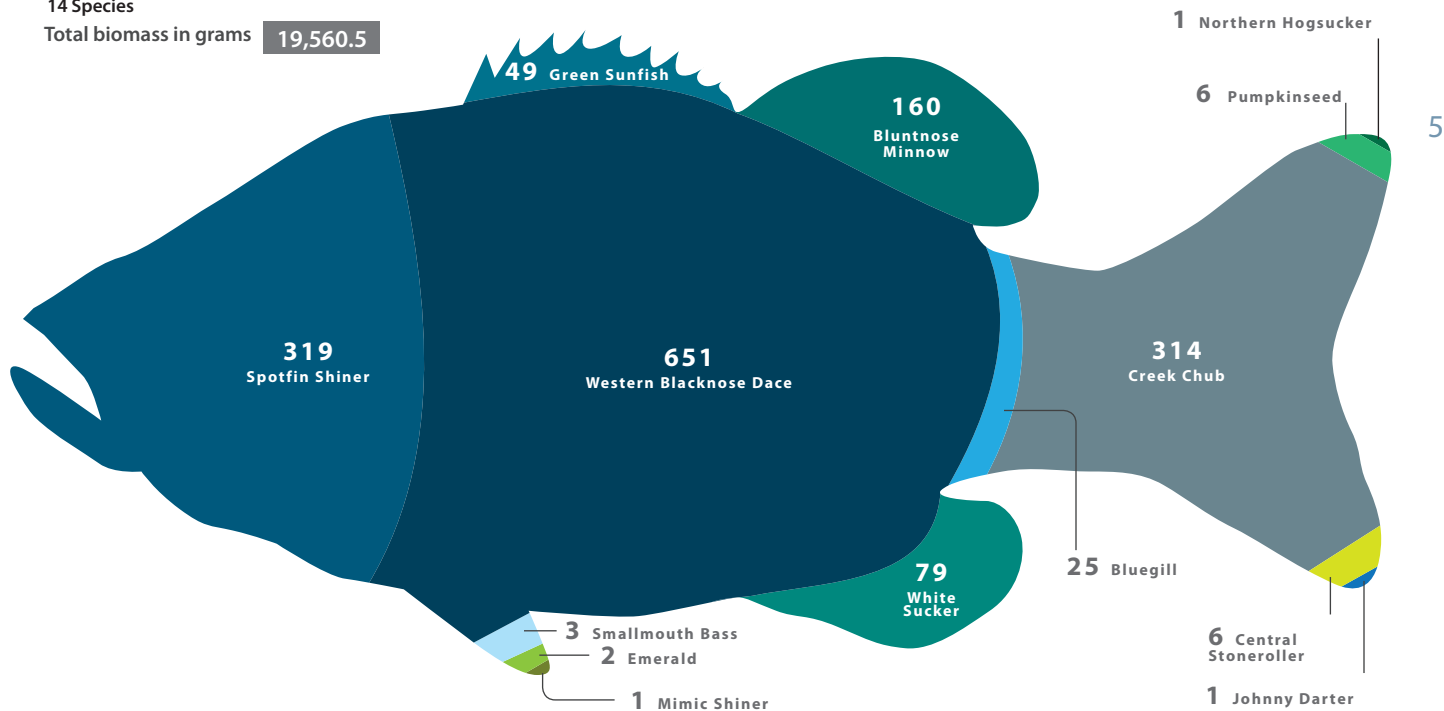
Total biomass in grams **1,503.5**



2010 Fish Collected

14 Species

Total biomass in grams **19,560.5**



MACRO-INVERTEBRATES

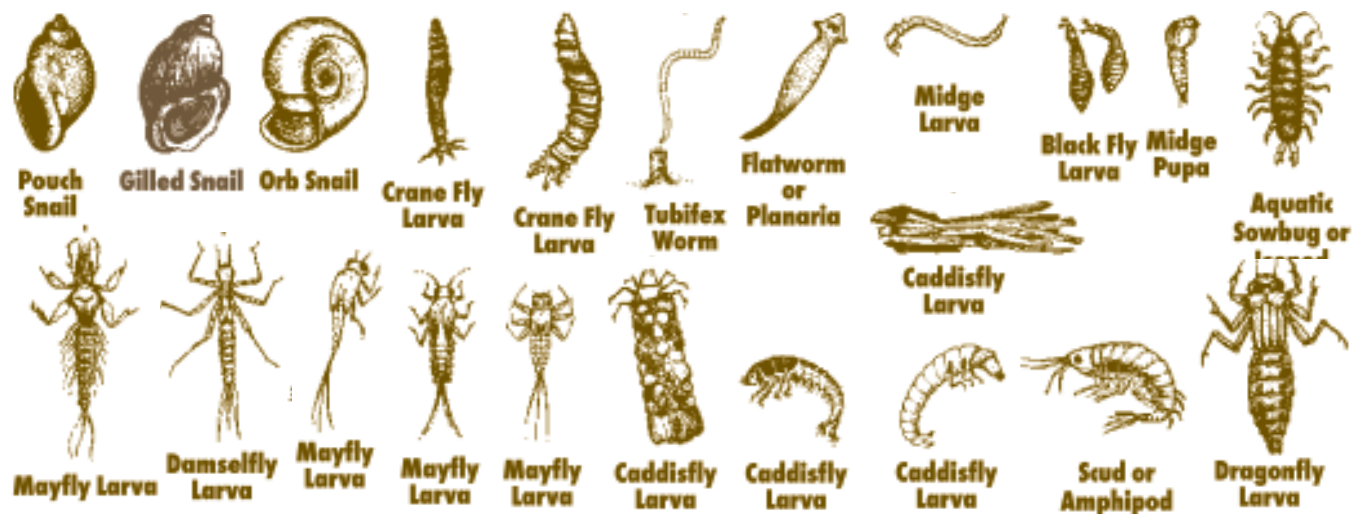
DATA COLLECTED BY MARY KOSTALOS
& MICHELE GREGORICH

Clean streams are full of life, with a variety of species living in balance. If you turn over a rock and stir up the sediment in a stream you will see tiny creatures called macro-invertebrates. Most macro-invertebrates are not very mobile. Therefore, these organisms are living barometers of stream health because a change in water quality affects them in observable ways. In addition, macro-invertebrates settle in areas most suitable for their survival and are easy to collect in the field, thus providing a simple method to assess the quality of the stream. With life cycles of a year or less, macro-invertebrate populations can be noticeably altered by even moderate pollution. Macro-invertebrates differ in their ability to tolerate pollution. Some species can thrive in a wide range of conditions, tolerating higher levels of pollution, while others are more sensitive. Pollution is apparent if the macro-invertebrate population in a stream consists exclusively of pollution tolerant species. However, when pollution is less severe; watershed health can then be determined by studying the number of organisms, the types of species, the variety of species, and the balance of species (or ratio of one species to all others).

SAMPLING METHOD

Macro-invertebrate samples were taken three times during the summer months at two locations (NM-2, and NM-3) using a Surber Sampler. A Surber Sampler is a metal frame that is one square foot with a net attached to one side. The sampler is set on the bottom of the stream with the net pointing downstream and stream sediment is kicked into the screen. The net is then checked for invertebrates that may have been washed into the net. Because the stream can vary across its width at any point, a transect line perpendicular to the banks is established. Three Surber samples are collected along the various transects established at each site on each sampling day, one near each bank and one near the center of the stream.

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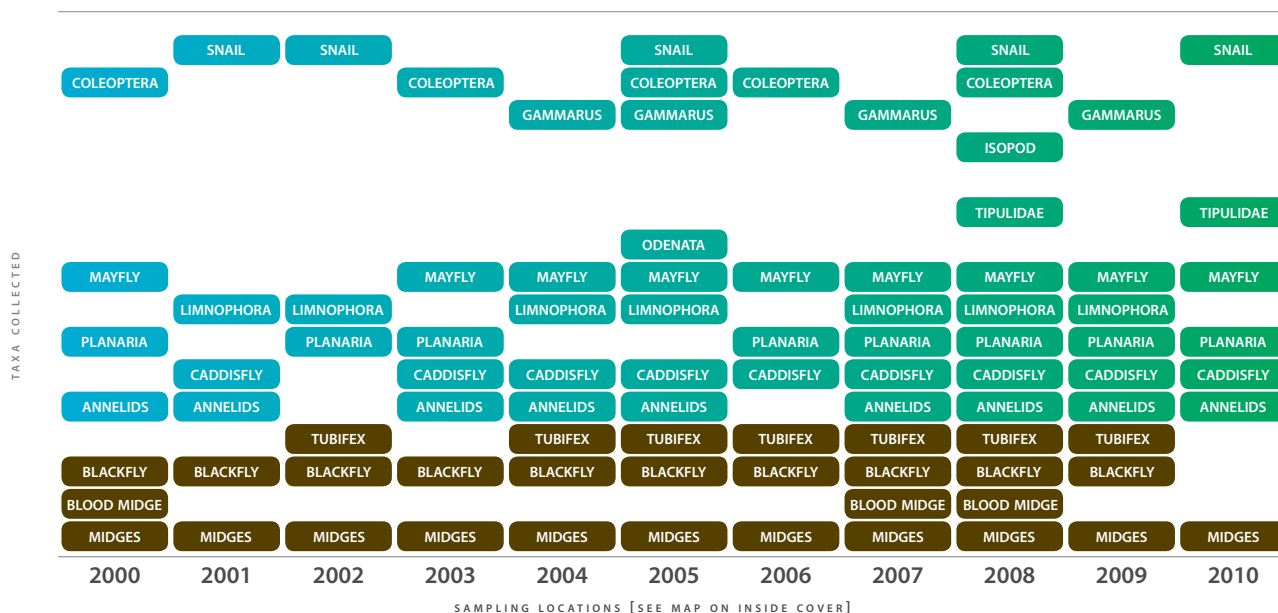
RESULTS

Macro invertebrate sampling done before the Nine Mile Run Aquatic Ecosystem Restoration revealed limited populations that were dominated by pollution tolerant midges. Other species were rare, comprising less than 5% of the total number of organisms collected. However, since the restoration was completed in 2006 a more stable and diverse environment for aquatic organisms has been created. Over a dozen different species have been collected throughout the sampling period 2000-2010. The total number of macro invertebrates in 2010 was the lowest recorded since sampling began in 2000. This may have been due to reconstruction efforts in the stream in late 2009.

Overall, despite a less than dramatic increase in species, there is decreased dominance of one species. There is also evidence of increased diversity and balance in the invertebrate population in Nine Mile Run. In addition, the data indicate a modest increase in organisms that have colonized the stream and are completing their life cycle in the stream. It should be noted that, because a relatively small area of the stream is sampled, rare or extremely mobile organisms may be missed. In addition, since sampling is limited to riffles (rocky areas in the stream), benthic macro-invertebrates that normally inhabit pools may not be represented and many aquatic invertebrates (including those with flying adult stages) do not travel long distances, making it difficult for new species to establish colonies.

NUMBERS AND DIVERSITY OF INVERTS | TIMELINE

QUANTITY OF INVERTEBRATES FOUND



BACTERIA

DATA COLLECTED BY MARGARET ZAK,
JUSTIN HYNICKA & LISA BROWN
ANALYSIS BY ALCOSAN

For a stream to be safe for recreation that includes contact with the water it must meet an allowable standard for harmful bacteria, notably fecal coliforms and *Escherichia coli* (*E. coli*). Although these bacteria naturally live in the intestines of all warm-blooded animals, high concentrations are a health risk to humans and pets. Fecal coliforms and *E. coli* are key markers of water quality and are highly correlated with potentially harmful conditions.

Bacterial contamination in our rivers and streams often comes from sewage discharged from combined sewer overflows (CSOs) or sanitary sewer overflows (SSOs) when it rains. With as little as 1/10th of an inch of rain sewage can overflow into the region's waterways; thus, bacteria counts are significantly higher following a rain event. In addition, fecal coliforms can remain in the water for 48 to 72 hours following a rain event.

SAMPLING METHOD

8 Bacterial sampling in Nine Mile Run was conducted on a quarterly basis. Grab samples were taken from the edge of the stream at three locations (NM-1, NM-2, and NM-3) and the samples were tested at the ALCOSAN laboratory.

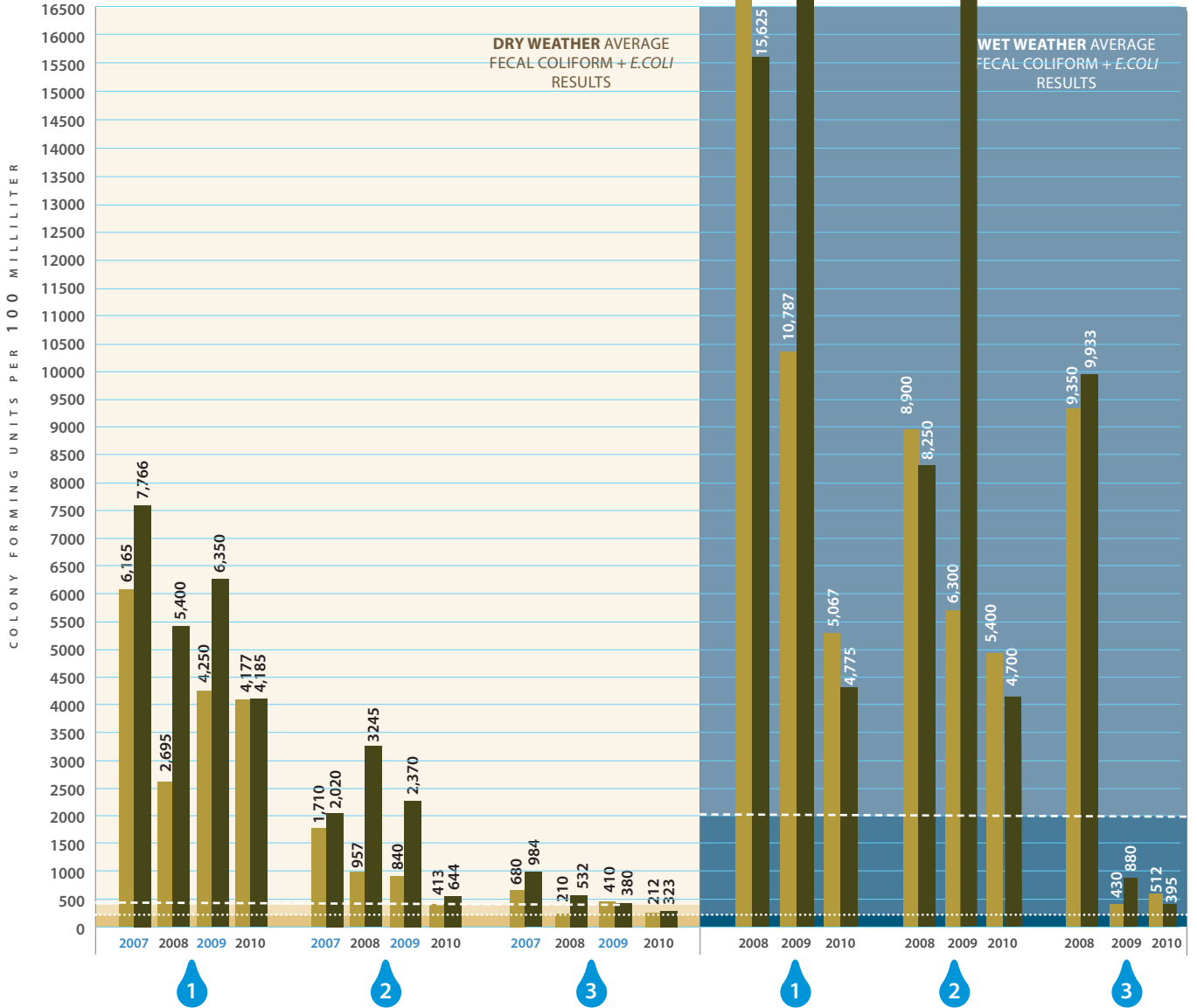
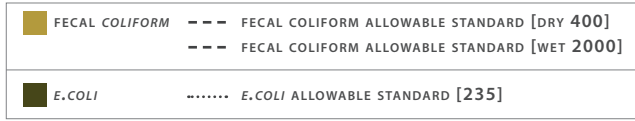
RESULTS

Throughout the sampling period, 2007 to 2010, the levels of fecal coliform and *E. coli* measured at all three sampling stations exceeded the EPA standards. While these standards are guidelines for bathing beaches and may not be directly relevant to NMR, they are indicative of the health of the stream and the likelihood of contamination from sewage, pet waste and/or animal waste.

Although dry weather counts tend to be lower than counts taken in wet weather, bacterial concentrations in NMR continue to be high. High counts for both fecal coliform and *E. coli* were always detected at NM-1, the sampling site closest to the main outfall culvert off Braddock Avenue. With the exception of the 2008 sampling, bacterial testing for both fecal coliform and *E. coli* indicated a trend of higher to lower concentrations from NM-1 to NM-3.

The high levels of *E. coli* and fecal coliform found in Nine Mile Run are a likely result of excessive stormwater runoff and sewage discharge into the stream from combined sewer overflows (CSOs) and possibly separate sanitary sewer overflows (SSOs). Also, the age of the underground infrastructure contributes to leakage of sewage into the buried sections of the stream. Contamination can also come from residential downspouts illegally connected to sanitary sewers, and from non-point sources such as animal waste. This is a regional problem faced by many municipalities.

BACTERIA



SAMPLING LOCATIONS [SEE MAP ON INSIDE COVER]

*WET WEATHER DATA UNAVAILABLE FOR 2007

pH AND METALS

DATA COLLECTED BY MARGARET ZAK, JUSTIN HYNICKA & LISA BROWN
ANALYSIS BY TESTAMERICA

A common indicator of water quality is pH, which is a measure of acidity or alkalinity. The pH scale ranges from 0 to 14 with a pH of 7 being neutral; a pH less than 7 is acidic, and a pH greater than 7 is basic. Typically, the pH of natural waters ranges between 6.5 and 8.5. Small changes in pH can influence the health of a stream and seriously impact the life of aquatic organisms.

The pH of water determines the amount of a substance that can be dissolved in the water and the amount of nutrients that can be used by aquatic life. For example, in addition to determining how much and what form of phosphorus is most abundant in the water, pH also determines whether aquatic life can use it. In addition, because they are more soluble and more bio-available at lower pH, heavy metals tend to be more toxic in acidic environments. This is significant since high concentrations of certain metals, particularly heavy metals, such as lead and mercury, can be toxic to aquatic organisms, humans and other mammals.

10 SAMPLING METHOD

pH testing is conducted quarterly streamside. Metal testing is conducted at the same time using streamside grab samples. Samples are tested by Test America as per the appropriate preservation protocol for metals analysis. Results were compared to two numerical values: the federal AWQC for aquatic life, as per the U. S. Environmental Protection Agency (EPA) (EPA, 2006) and the RL, the lowest level that the analytical laboratory instrumentation used to analyze for specific metals in the samples becomes quantitatively meaningful.

RESULTS FOR pH

Prior to the restoration, the pH in the lower stretches of Nine Mile Run was alkaline primarily due to seepage from the mountain of slag dumped along the lower portion of the stream. Because of its lime content, slag, a byproduct of the steel making process, is highly alkaline and water that filtered through the slagheap into the stream raised the average pH of the stream. The maximum observed pH in Nine Mile Run historically was 11.5, the equivalent pH of ammonia. However, in 2005 the Urban Redevelopment Authority

completed a seep abatement project that re-routed the alkaline seepage to the ALCOSAN water treatment facility.

Following the seep abatement project, the pH has remained slightly alkaline, ranging from 8.3 to 9.5, with a trend of increasing pH from the upstream to the downstream sampling locations closest to the slag heap. With few exceptions, throughout the monitoring period 2007 to 2010, the pH measurements have been within the EPA's Ambient Water Quality Criteria (AWQC) acceptable freshwater range of 6.5 - 9.0.

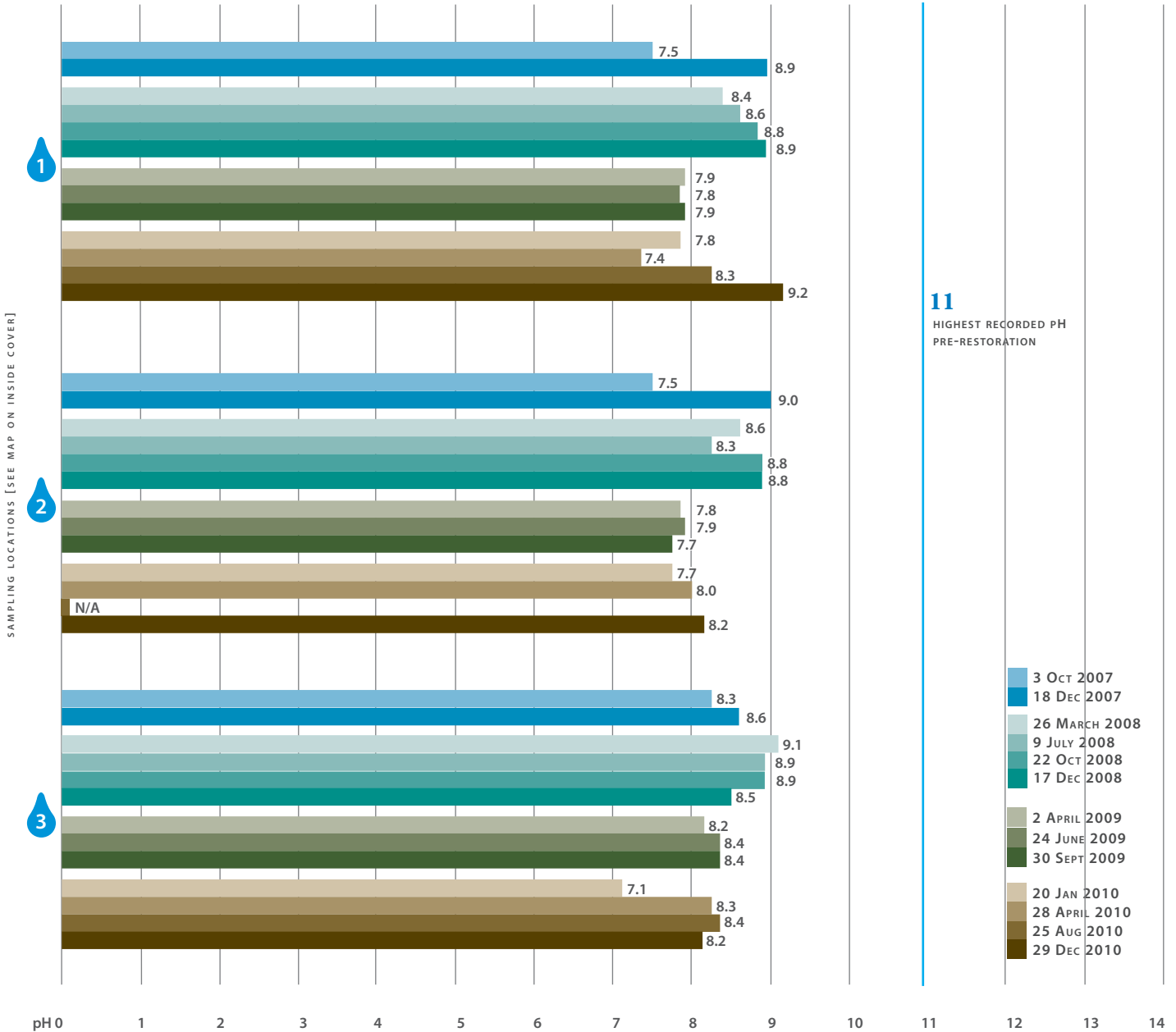
RESULTS FOR METALS

Quarterly testing is conducted each year in Nine Mile Run for nine heavy metals indicative of slag environments: aluminum, barium, chromium, copper, iron, manganese, nickel, lead, vanadium, and zinc. The results were compared to the EPA's Ambient Water Quality Criteria (AWQC) for freshwater organisms. Most of the nine metals analyzed were reported as non-detect and the few that were above detection limits were not reported at significant levels.

Aluminum has exceeded its AWQC during all quarterly sampling events in 2007 to 2010 in at least one sampling station. Aluminum is an indicator metal for past mining activities; however, mine drainage is not expected to be discharging into Nine Mile Run. It is possible that a background, up-gradient source exists for aluminum. The identification of this potential source is beyond the scope of the stream monitoring efforts. Iron has exceeded its AWQC at NM-3 during the fourth quarter sampling events throughout the 2007- 2010 monitoring period. Iron was also detected at NM-1 in 2009 during all sampling events. Lead was detected at all sampling stations during the December 2008 and all sampling events in 2009. However, in 2010 lead was detected at NM-1 only in the fourth quarter sampling.

All other metals were detected at concentrations that were either at or below the AWQC during all sampling events.

POST-RESTORATION COMPARISON OF pH



URBAN FORESTRY

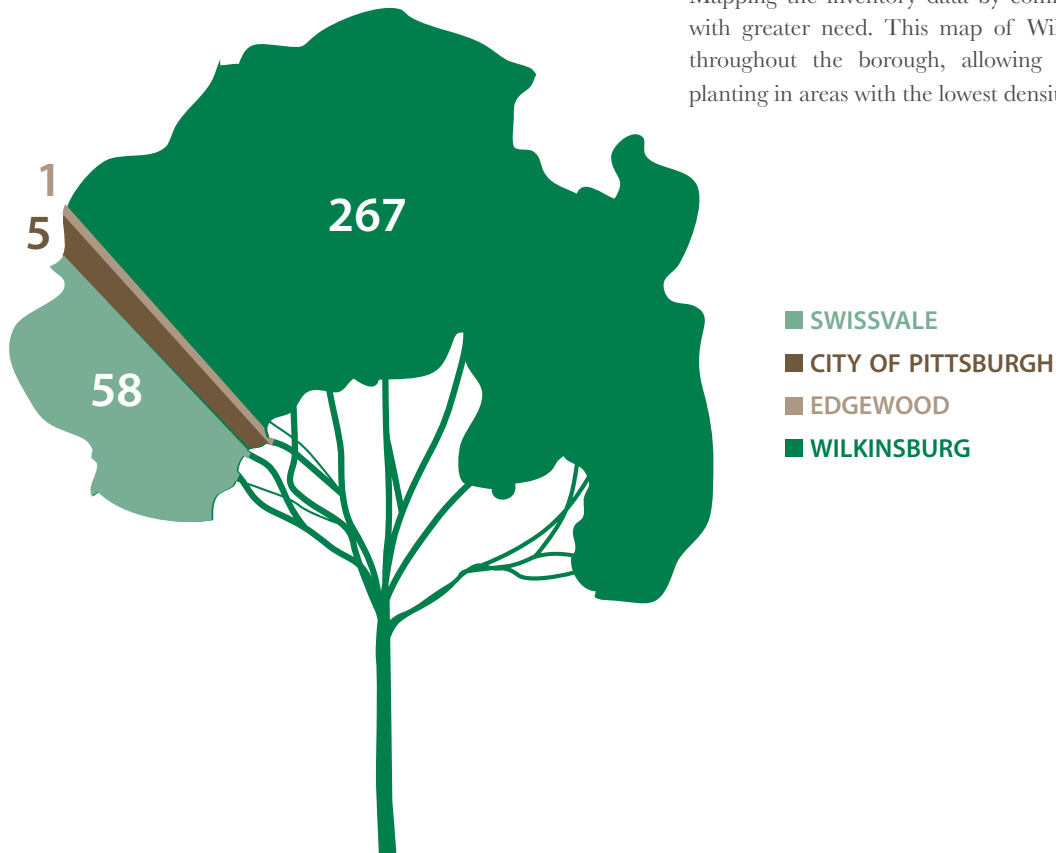
Trees are environmental superstars. They clean the air, reduce green house gas emissions, and reduce utility costs. Tree lined streets raise property values and create more livable neighborhoods. Trees also provide valuable habitat for birds, small animals, and insects. But trees are also an effective stormwater management solution. Their canopies intercept and absorb thousands of gallons of runoff each year preventing erosion, flooding and sewage overflows.

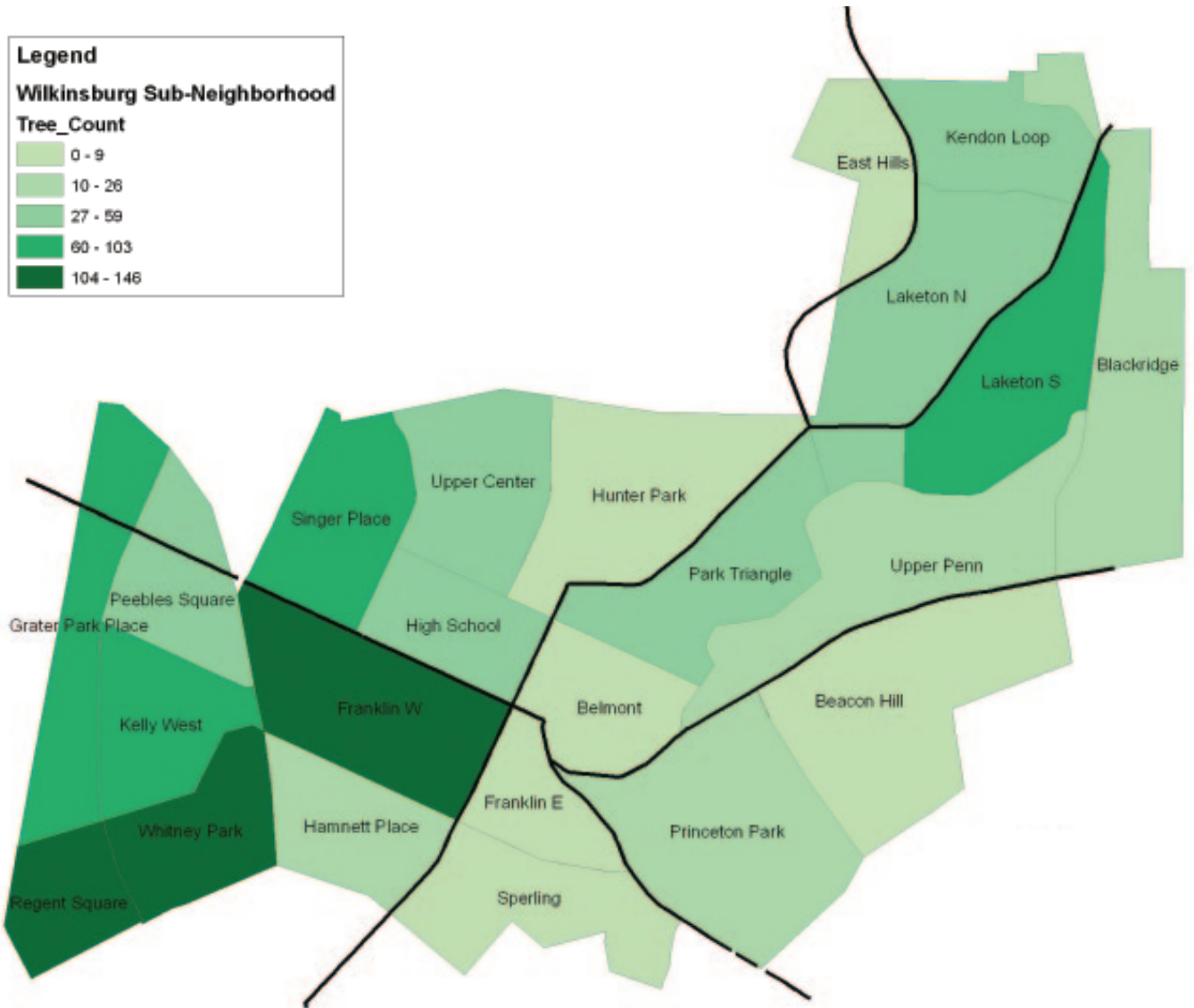
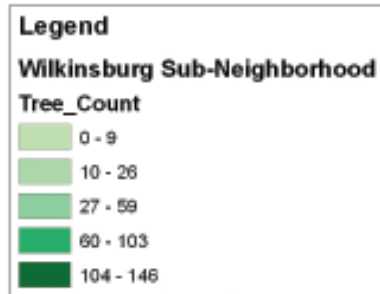
Since its inception, the NMRWA GreenLinks program has planted more than more than 330 trees in Wilkinsburg, Swissvale and the City of Pittsburgh. Once mature, these trees will not only help to preserve the health of Nine Mile Run by diverting tens of thousands of gallons of stormwater runoff annually, but will also enhance the quality of life in the watershed.

In 2005 and 2006, NMRWA coordinated the first volunteer street tree inventory in the watershed communities of Edgewood, Swissvale and Wilkinsburg. By counting and assessing all of the street trees in the urban canopy, NMRWA established a foundation for quantifying the economic benefits of the street trees in the watershed. This initial analysis also provided a road map for our GreenLinks program, revealing a startling tree deficit in the boroughs of Wilkinsburg and Swissvale and a relatively healthy urban forest in Edgewood. Since the first inventory, NMRWA has aggressively promoted improving the watershed's urban forest by planting and maintaining trees and improving green space in Wilkinsburg and Swissvale while keeping watch over the trees in Edgewood. Our most recent inventory was completed in 2010 and, in terms of tree numbers, density, species diversity and health, provided some interesting results

Mapping the inventory data by community we can see the areas with greater need. This map of Wilkinsburg shows tree density throughout the borough, allowing NMRWA to prioritize our planting in areas with the lowest density.

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In addition to reinforcing the findings from the previous inventory we are beginning to see the effects of an aging urban forest that lacks diversity. This means that our street trees are susceptible to diseases and pests that could endanger our urban forest. Maintaining the

health of the trees is a priority for NMRWA. During the inventory, Oak Wilt fungus was discovered in one of our most revered specimens. The inventory allowed NMRWA to take immediate actions to avoid infection in the adjacent trees.

RAIN BARRELS

DATA ANALYSIS COMPLETED BY JUSTIN HYNICKA, WITH OVERSIGHT BY JOHN SCHOMBERT AND THOMAS BATRONEY

One of the largest programs of its kind, The NMR Rain Barrel Initiative was designed as an experiment to determine if residential rain barrel use would result in a measurable reduction in stormwater runoff in an urban environment. In theory, rain barrels and stormwater infrastructure in general act as runoff speed bumps. They delay the initial response and prolong the duration of storm flow. Capturing and slowly releasing rooftop runoff onto a permeable surface increases the volume of shallow groundwater.

Four small study areas were chosen as locations for monitoring based on existing data on stormwater flow in the storm sewers. To encourage participation, rain barrels, installation, and technical support were offered for free to homeowners within the study areas. Installation goals were set for each study area to achieve a 10% stormwater runoff diversion – the percentage determined necessary to make a measurable difference in sewer flow. As installation goals approached, monitoring equipment was installed in two study areas to collect data on the flow and volume in the sewer lines. Data collected in the Overton study was used for analysis.

and duration. A one-year monitoring period was proposed to ensure the collection of data for comparable storms.

Theoretically, rain barrels have the potential to significantly reduce stormwater runoff in small watersheds and sewersheds. But the density of rain barrels required to have a measurable impact on a larger scale continues to be a major obstacle, and solid scientific data showing definitively how effective rain barrels are at reducing flow over time will require further research, with better research design and more equipment redundancy to compensate for inevitable equipment failures. The complete analysis will be available on our website in December 2011.

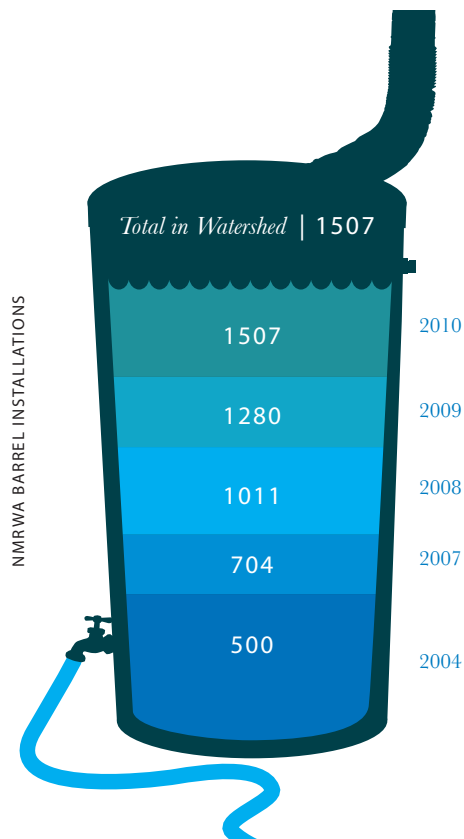
American Sigma 910 (2001-2002) and Sigma 920 (2009-2010) flow monitors, donated by 3 Rivers Wet Weather, were used to collect the data.

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RESULTS

Over 65.5 million gallons of precipitation fell onto the Overton sub-watershed and approximately 487 thousand gallons, or 0.74% of the total precipitation volume, were diverted from the sewer system. The percentage of total stormwater diverted over the Overton study area increased 1.12%. These numbers assume that rain barrels are in prime working condition, precipitation that exceeds rain barrel capacity is directed by the overflow system to permeable surface, and that they are disconnected during the months of December, January, and February.

Sewer flow data for the Overton study area was collected from March 2009 until March 2010 at 15 minute intervals; historical flow data was collected between 2001 and 2002 at 1 hour intervals. The measured flow rate was plotted against time depicting the drainage network's response to runoff. Accurate comparison of historical (2001-2002) to recent data required evaluating precipitation events of similar size



YOUR HOME, YOUR STREAM. MAKE THE CONNECTION.

Every spring NMRWA holds its first stream sweep of the year. The morning is usually clear and sunny and the air is cool and crisp. Typically more than fifty folks roll out of bed early on a Saturday to don boots and waders, hoodies and wind breakers and devote a morning to this small stream on the edge of the city. These intrepid volunteers gather in lower Frick Park, near Fern Hollow, drinking hot coffee, waiting for their team assignments and yawning through the mandatory safety instruction. Then armed with trash bags and nifty nabbers, they swarm the stream banks with one common purpose – to pick up every bit of litter that has washed into Nine Mile Run during the winter thaw and spring rains. In a few hours, bags of trash are dragged to the trail edge and piled high in a triumphant moment.

Unfortunately, it is only a moment. More trash will arrive with the next heavy rain, swept off the streets of the upper watershed by excessive stormwater runoff. Our monitoring shows that despite the dramatic visual changes, Nine Mile Run continues to be impacted by the urban nature of the watershed, experiencing damaging fluctuations in flow and sewage overflows. It is tempting for us to relax and wait for nature to heal itself, but this may take generations and much will be lost. We must continue to advocate for change, change in attitudes and individual behaviors, and change in public policies to improve practices that will preserve Nine Mile Run. Join us!

**THE NINE MILE RUN WATERSHED
ASSOCIATION'S MISSION IS TO
ENSURE THE RESTORATION AND PROTECTION
OF THE NINE MILE RUN WATERSHED
THROUGH CITIZEN ENGAGEMENT,
DEMONSTRATION PROJECTS,
AND ADVOCACY.**

THANK YOU

WE WOULD LIKE TO THANK THE NINE MILE RUN WATERSHED ASSOCIATION MONITORING COMMITTEE FOR GUIDANCE IN DEVELOPING OUR MONITORING PROGRAM AND FOR THEIR COLLECTION AND ANALYSIS OF DATA.

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Research & Education

THE HEINZ ENDOWMENTS



To read the complete scientific reports, please see the Resources section of our website www.ninemilerun.org

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NINE MILE RUN
WATERSHED ASSOCIATION

