PINE CREEK WATERSHED
CHANNEL and RIPARIAN ASSESSMENT
and
RESTORATION PLAN

NORTH AREA ENVIRONMENTAL COUNCIL
in partnership with the
PINE CREEK WATERSHED COALITION

ALLEGHENY COUNTY, PENNSYLVANIA

March 2010

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Report revised 03/30/2010

1.0 INTRODUCTION

Pine Creek watershed is a “high priority” watershed in northern Allegheny County encompassing 67.3 square miles and part or all of 14 municipalities. The flow of water collected over the large landmass is funneled through an older, industrialized and densely developed riverside community, resulting in catastrophic flooding during high flow events. The watershed is diverse in the stages of development seen from headwaters to its mouth at the Allegheny River. Pine Creek has minimal impacts from abandoned mine drainage prevalent in many streams but is encumbered by extensive combined sewer overflows (CSO) in high flow episodes. The land area of the watershed encompasses two large county parks, several sensitive natural areas, and several active farms, but is under growing development pressure around the headwaters. Due to less advanced development in the headwater region and other factors, the streams within the watershed exhibit relatively good water quality as reflected in the extensive sportfishing activity in the watershed which is supported, in part, by biennial stocking by the PA Fish and Boat Commission.

The North Area Environmental Council (NAEC) and the Pine Creek Watershed Coalition (PCWC), as part of ongoing research and planning efforts in the watershed, conducted a stream channel and riparian assessment of Pine Creek and its major tributaries between 2006 and 2009 to gain insight into stream quality and into erosion and sedimentation which can be major contributing factors to increased flooding in the area.

Because this watershed is also used heavily as a recreational resource, the potential value of improving stream conditions for fish and their food sources by reducing sedimentation is an additional incentive. Conservation of the aquatic community and protection of the assets and safety of the human residents are integrally connected throughout the Pine Creek watershed.

Volunteers scored the condition of the channel and riparian zones using the USDA visual assessment protocol and photographed their findings. Consultants subsequently assisted in the compilation of the data, development of a GIS database, and evaluated the data, and provided recommendations for restoration projects.

2.0 BACKGROUND

The Pine Creek watershed in northern Allegheny County is a 67.3 square mile region that has been the focus of considerable attention in recent decades because of repeated catastrophic flooding (1986-1987 and 2004) and more frequent intermittent low level floods. A coalition of representatives from municipalities, local sportsmen and environmental organizations and private citizens was formed in 2001 to facilitate watershed-wide communications and planning around watershed issues. Due to its 30 year history of interest and involvement in the watershed, the North Area Environmental Council was selected to lead the coalition.

Initiatives of the coalition to date include completion of a biological and chemical assessment of 10 sites over several years (Pine Creek: Watershed Assessment,

Protection and Restoration Plan – March 2005), launch of a Watershed Conservation Plan (in progress), input to updates to Act 167 Stormwater Guidelines for northern Allegheny County, completion of the Pine Creek Watershed Implementation Plan (October 2009) providing eligibility for Act 319 support, the volunteer component of a PaDEP pilot project developing protocols for and evaluating the use of volunteers in pathogen monitoring, restoration of two severely eroded stream bank segments (in progress), publication of a public education booklet and coordinated exhibits (a WREN funded project), as well as several outreach initiatives.

Among the recommendations of the 2004 Assessment was completion of a riparian assessment to evaluate the condition of the channels of Pine Creek and its tributaries and to identify potential remediation sites or other projects. Scouring from high water events and subsequent downstream deposition have contributed significantly to reduce flow capacity in stream channels through densely developed communities, contributing to damages from high flow events.

In March of 2005 the North Area Environmental Council (NAEC), on behalf of the Pine Creek Watershed Coalition (PCWC) applied for a Growing Greener grant from the PA Department of Environmental Protection (PaDEP) to conduct an assessment of the stream channels and riparian zones of the Pine Creek Watershed. In May of 2006, the group was awarded a grant for $19,251. Additional support was subsequently received from the Allegheny County Conservation District ($5,000.00 equipment loan) and the Penn's Woods West Chapter of Trout Unlimited ($500.00).

3.0 WATERSHED DESCRIPTION

[Excerpted from the 2004 Watershed Assessment]

Pine Creek is a 22.8 mile long stream in northern Allegheny County, starting in Pine Township and ending at the Allegheny River in the Borough of Etna. Its watershed is 67.3 square miles (43,072 acres) and covers all or part of 14 municipalities, see Table 3-1 and Map 3-1. There are 128 stream miles in the watershed.

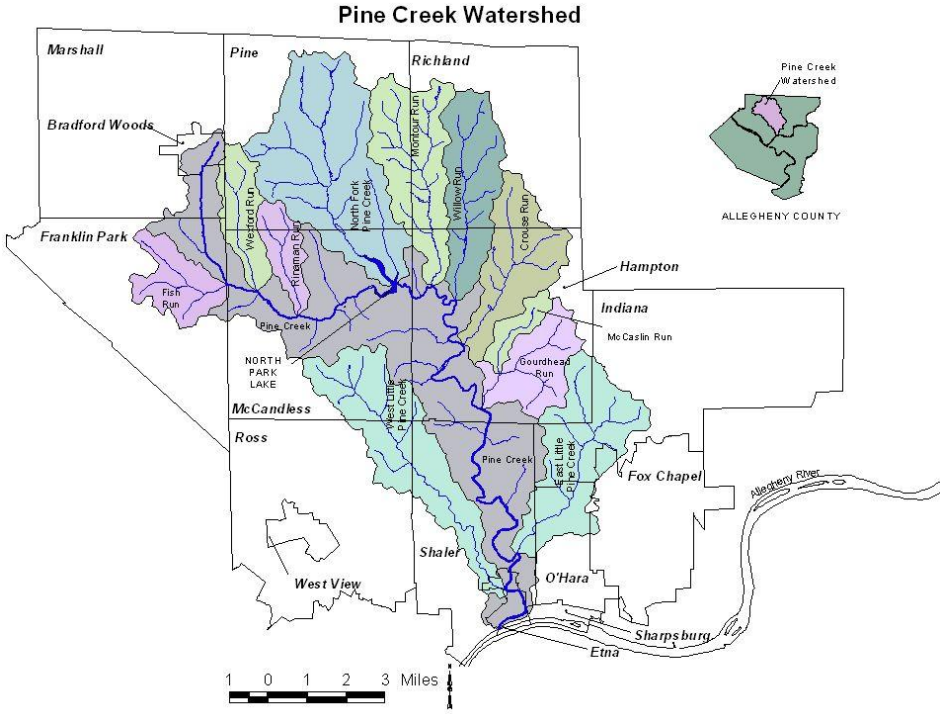


Table 3-1: Pine Creek Municipalities

Municipality	Total Area (sq. mi)	Watershed Area (sq. mi)	Watershed Area as % of Municipality	Watershed Area as % of Watershed
Bradford Woods	0.93	0.54	58.49	0.81
Etna	0.81	0.67	82.59	1.00
Fox Chapel	8.50	0.30	3.58	0.45
Franklin Park	13.55	3.86	28.46	5.74
Hampton	16.05	14.99	93.38	22.29
Indiana	17.00	3.25	19.11	4.83
Marshall	14.79	0.96	6.48	1.43
McCandless	16.40	12.99	79.18	19.32
O'Hara	7.01	1.40	19.93	2.08
Pine	17.12	12.30	71.85	18.30
Richland	14.68	6.66	45.33	9.90
Ross	14.50	1.44	9.94	2.14
Shaler	10.74	7.87	73.24	11.70
Sharpsburg	0.75	0.02	2.13	0.02

3.1 Physical Description

The watershed is comprised of hilly terrain. It has moderate to low relief and a dendritic (branching) stream pattern -- that is, the stream pattern is treelike, with trunk and branches at acute angles.

Soils in the watershed vary in thickness, composition, and porosity. Generally, most of the soil is well drained on the uplands and underlain by shale. However, the floodplains are typically poorly drained. Specific information about soils can be found in the Soil Survey of Allegheny County, Pennsylvania, published in 1981 by the U.S. Department of Agriculture Soil Conservation Service and it the 1972 publication Our Land: A Study of the Pine Creek Watershed, published by the North Area Environmental Council. The Our Land report also states:

> This area is highly susceptible to landslides. A combination of a humid temperate climate, locally steep and rugged topography, weak rock strata, springs, and a great diversity in the weathering and erosion characteristics of near surface sedimentary

rocks makes this area one of the most slide-prone areas in the state. In addition, landslides can be triggered by:

- Addition of fill, which increases the stress on underlying materials,
- Changes in quantity or the direction of water flow,
- Surface and subsurface excavations (including coal removal), and
- 'Red Beds'- bedrock in hillsides composed of claystones and shales that are 40-60 feet deep. This bedrock weathers easily, especially when wet, and causes unstable slopes. Stabilization and repair can cost thousands to millions of dollars.

Because steep slopes are more susceptible to landslides, they are often not developed; therefore, they are generally better suited for woodland and wildlife habitats.

3.2 Physiographic Setting and Geology

Excerpted from the 1972 "Our Lands" publication of the North Area Environmental Council

The Pine Creek Watershed lies within the Appalachian Plateau Physiographic Province. The watershed is drained by Pine Creek and its tributaries which are influenced by the northwesterly oriented joints or fractures in the rock strata and form a structurally modified dendritic stream pattern draining into the Allegheny River at Etna.

Stream dissection of the area has resulted in a hilly terrain. Hilltops rarely reach 1,200 feet in the upstream portion. The elevation at North Park is 950 feet resulting in a stream relief upstream from North Park in the 200 to 300 foot range. The highest point is 1,360 feet in northwest Pine Township for a total of 650 feet from the Allegheny River.

Most of the stream valleys have wooded side slopes and relatively narrow flood plains. Conservationists recognize these ecologically unique ravines as irreplaceable legacies because they contain a blending of both the Carolinean and Canadian wildlife zones. These ravines have slopes greater than 25 percent that are prone to landslides or rockfalls and severe erosion if vegetation is removed by cut and fill operations.

The rock layers found within the [Pine Creek] watershed are generally covered by soil except where exposed on steep slopes and along highway cuts. They are sedimentary-type rocks or rocks derived from the deposition of gravel, sand, silt, clay, lime, mud, and organic matter in ancient streams, lakes, and swamps. As the layers of sediment become thick, the process of cementation within the individual layers changed them into conglomerates, sandstones, siltstones, shales, claystones, limestones, and coal. Rocks common to the Pine Creek Watershed are of Pennsylvania age and are displayed in the generalized columnar section of the exposed rocks in Allegheny County.

Two miles south of Allison Park, the Freeport formation of the Allegheny Group can be seen in the stream valley and road cuts. These are the oldest rocks exposed at the surface within the watershed and include, in ascending order, claystone, limestone and claystone which grade laterally southward into sandstone and shale. The Upper

Freeport coal seam appears at the top separating the Allegheny Group from the overlying and younger Conemaugh Group.

The majority of the rocks found within the watershed belong to the Conemaugh Group and are divided into a lower rock unit approximately 300 feet thick called the Glenshaw formation, and an upper unit referred to as the Casselman formation which also attains a thickness of approximately 300 feet.

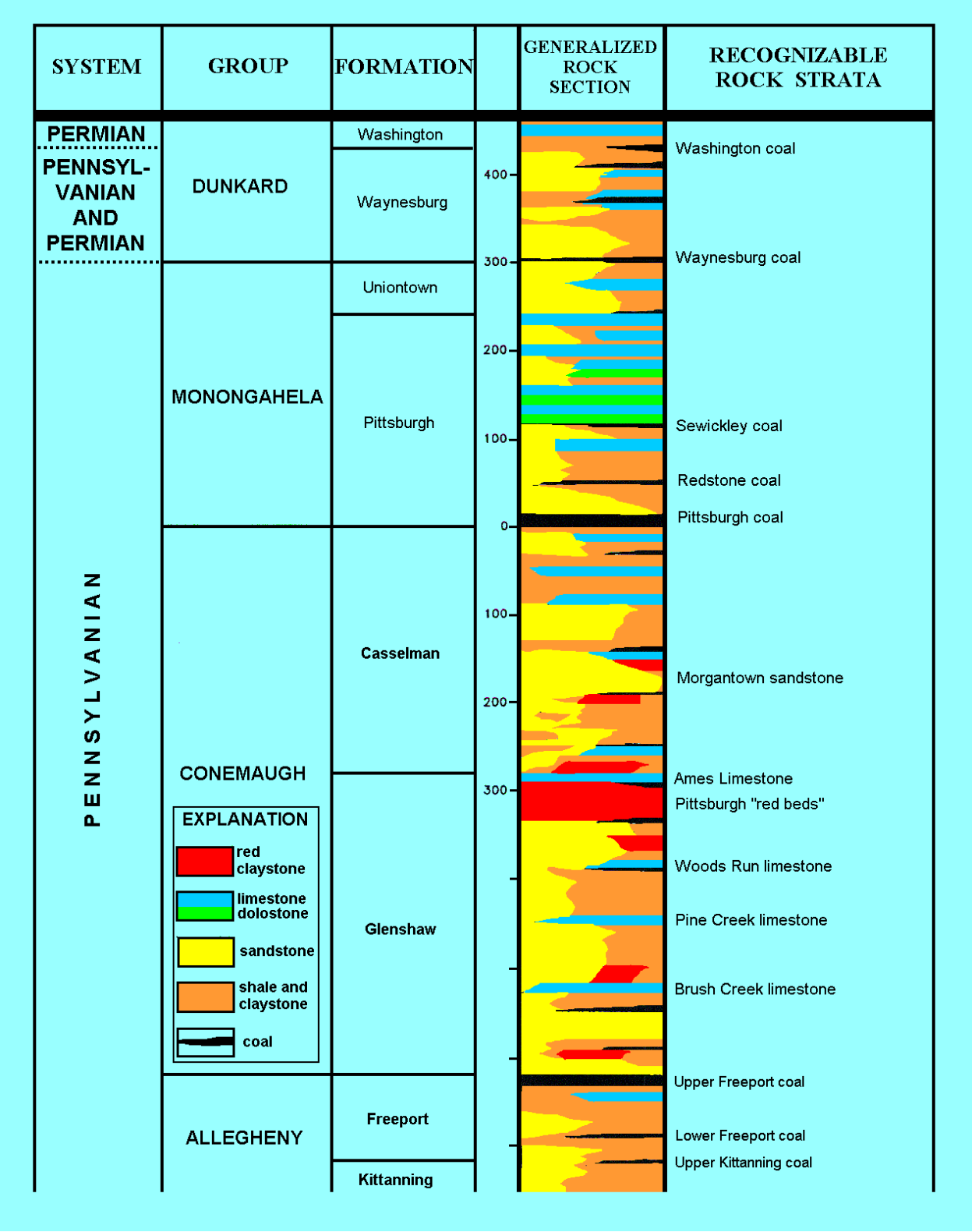
Red and greenish-gray claystones, commonly called “Pittsburgh Redbeds”; the presence of thin limestone layers; the lack of mineable coal seams; and a greater abundance if thick sandstone units characterize the Conemaugh Group.

The Pittsburgh coal separates the overlying Monongahela Group from the Conemaugh rocks. Rocks of the Monongahela Group are very scarce in the watershed appearing only at higher elevations near the Franklin Park-McCandless line and just north of North Park.

Upon examining the rock layers that are exposed in the stream valleys and road cuts it may be observed that they are not always flat lying but dip gently in various directions. The dip of the rock layers are caused by folds. Folds are caused by compressional forces within the earth’s crust. A northeast-southwest trending upfold or anticline is present in the eastern part of the watershed. Known as the Kellersburg Anticline, its axis or centerline crosses Hampton, Shaler, and a small portion of Ross Township giving the upper Freeport coal a structural relief of nearly 400 feet.

Joints or high-angle to vertical cracks or fractures in rocks along which little or no movement occurs are also common to the rock layers in the watershed. The joints are produced by unequal forces acting on the rocks, causing them to fracture in two directions, mainly northwest-southeast and the other northeast-southwest.

Ground water movement and rockfall and earth flow landslides are influenced by these structural aspects: dip and jointing of rock layers.



Pennsylvania Geological Survey

3.3 Important Natural Areas

The Allegheny County Natural Heritage Inventory, published by the Western Pennsylvania Conservancy in 1994, listed several Pine Creek sites as significant natural heritage areas for the county. These sites either provide habitat for species of special concern or serve as an educational and scientific area with the potential for natural areas management. Sites listed are:

- Allegheny River
- Crouse Run
- Hemlock Grove, North Park
- Willow Run Slopes, North Park
- North Park
- Beechwood Farms Nature Reserve
- Cold Valley

North Park, at 3,010 acres, is the largest of the County Parks. It is mostly used for recreation and very little remains in its natural state. The U.S. Army Corps of Engineers is working on an aquatic ecosystem restoration project of North Park Lake, which has lost much of its depth due to growing silt deposits. Sediment from the Lake will be dredged and removed to an offsite location.

Additional important sites are identified in the "Walks in the Watershed" developed by members of NAEC. These walks can be found in Attachment 7.6.

3.4 Development

The communities near the mid to lower section of Pine Creek as well as those near the West Branch of Little Pine Creek are the most developed in the watershed. While the headwaters section of the basin is the least developed, there is a significant transformation underway from rural communities and farmlands to suburban communities and commercial districts. This is illustrated in Tables 3-2 and 3-3.

Table 3-2: Change in Municipal Population

Municipality	1990 Population	2000 Population	% Change
Bradford Woods	1,329	1,149	-16
Etna	4,200	3,924	-0.1
Fox Chapel	5,319	5,436	2
Franklin Park	10,109	11,364	11
Hampton	15,568	17,526	11
Indiana	6,024	6,809	11

Marshall	4,010	5,996	33
McCandless	28,781	29,022	0.8
O'Hara	9,096	8,856	-3
Pine	4,048	7,683	47
Richland	8,600	9,231	7
Ross	33,482	32,551	-3
Shaler	30,533	29,757	-3
Sharpsburg	3,781	3,594	-5
Source: PA State Data Center, Penn State Harrisburg. http://pasdc.hbg.psu.edu			

Table 3.3 illustrates development through housing units (single or multiple units, mobile homes, etc.)

Table 3-3: Change in Municipal Housing Units

Municipality	1990 Units	2000 Units	% Change
Bradford Woods	476	478	0.4
Etna	1,867	1,934	3
Fox Chapel	1,887	1,942	3
Franklin Park	3,420	3,973	14
Hampton	5,526	6,627	17
Indiana	2,208	2,457	10
Marshall	1,382	2,018	31
McCandless	10,933	11,697	6
O'Hara	3,377	3,381	0.1
Pine	1,514	2,500	39
Richland	3,201	3,508	9
Ross	14,124	14,422	2
Shaler	11,830	12,334	4
Sharpsburg	1,864	1,911	2
Source: PA State Data Center, Penn State Harrisburg. http://pasdc.hbg.psu.edu			

While six of the 14 communities saw declines in their population during a ten-year period, municipal housing units increased in all municipalities. Figures related to associated development (e.g. commercial outlets, roads, etc.) are not available.

There are significant undeveloped or green areas (identified as forests, grasslands, crops) throughout the watershed. Some of this can be explained by steep forested slopes, which can not be developed, as well as managed recreation areas, such as North Park.

4.0 VISUAL ASSESSMENT

A combination of volunteer field staff and professional consultant support was involved in completion of the riparian assessment of the Pine Creek Watershed.

Upon receipt of the Growing Greener grant, publicity about the riparian assessment generated strong public interest for volunteer assistance with the project. Similar support of a water quality assessment completed earlier (Pa DEP Report 2004) had demonstrated the enormous potential for citizen engagement in Pine Creek Watershed initiatives. Building upon active volunteer work in the watershed, twelve teams of four to five members were initially organized to implement the riparian assessment. Several factors, including extended delays in the early stages of the program, resulted in the loss of numerous potential volunteers, however. Six groups comprised of eighteen individuals completed the field portion of the study.

The Freshwater Conservation Program of the Western Pennsylvania Conservancy and Blazosky Associates, Incorporated were engaged to train volunteers in the USDA visual assessment protocol and Rosgen techniques (Attachments 7.1, 7.2, and 7.3).

The USDA protocol describes the condition of the stream channel and riparian zone, taking into account such conditions as canopy cover, stream bottom character, invertebrate habitat, fish cover, and excessive nutrient enrichment, as well as erosion and sedimentation. The Rosgen measurements generate a description of stream sinuosity and slope which can help predict places where erosion and sedimentation will occur. Measurements for the Rosgen protocol are very labor intensive, so emphasis was put on collecting visual assessment data, if time and available personnel did not support doing both.

Data was collected about additional features in the stream channel and riparian zone or potential impacts upon it, such as pipe outlets, log debris piles, exotic invasive plants, etc. For most streams, all pipe outputs into the stream were logged.

Deborah Williamson (P.E.) and Art Gazdik (P.E.) later assisted with tabulation and mapping database and GIS construction. Blazosky Associates reviewed the findings and provided recommendations based on available data.

Teams were provided with hand-held Garmin Geographic Positioning System (GPS) units, digital cameras, data forms (Attachment 7.4) and measuring equipment as well as safety supplies (high visibility vests, name tags, first aid kits). Teams were assigned to

designated sections of the watershed and provided with laminated USGS maps of their assigned areas.

Latitude and longitude of all waypoints were recorded. Photographic records of findings were obtained for most study areas. Volunteers were urged to collect information in a manner that provided a narrative about the conditions of the reaches they surveyed.

The visual assessment data, GPS, and additional waypoints and notes were incorporated into an Excel spreadsheet which was then used to create data layers for maps that were developed in a Geographic Information System (GIS). Photographs and PDF representations of the field notes were linked to the GIS and to an Access database. The GIS maps included in this report depict many features of the watershed and include all the waypoints, scoring, and other information that was taken in the field. This GIS data, with color coded visual assessment rankings, was also formatted into KMZ files that can be accessed through the Google Earth application for access and viewing.

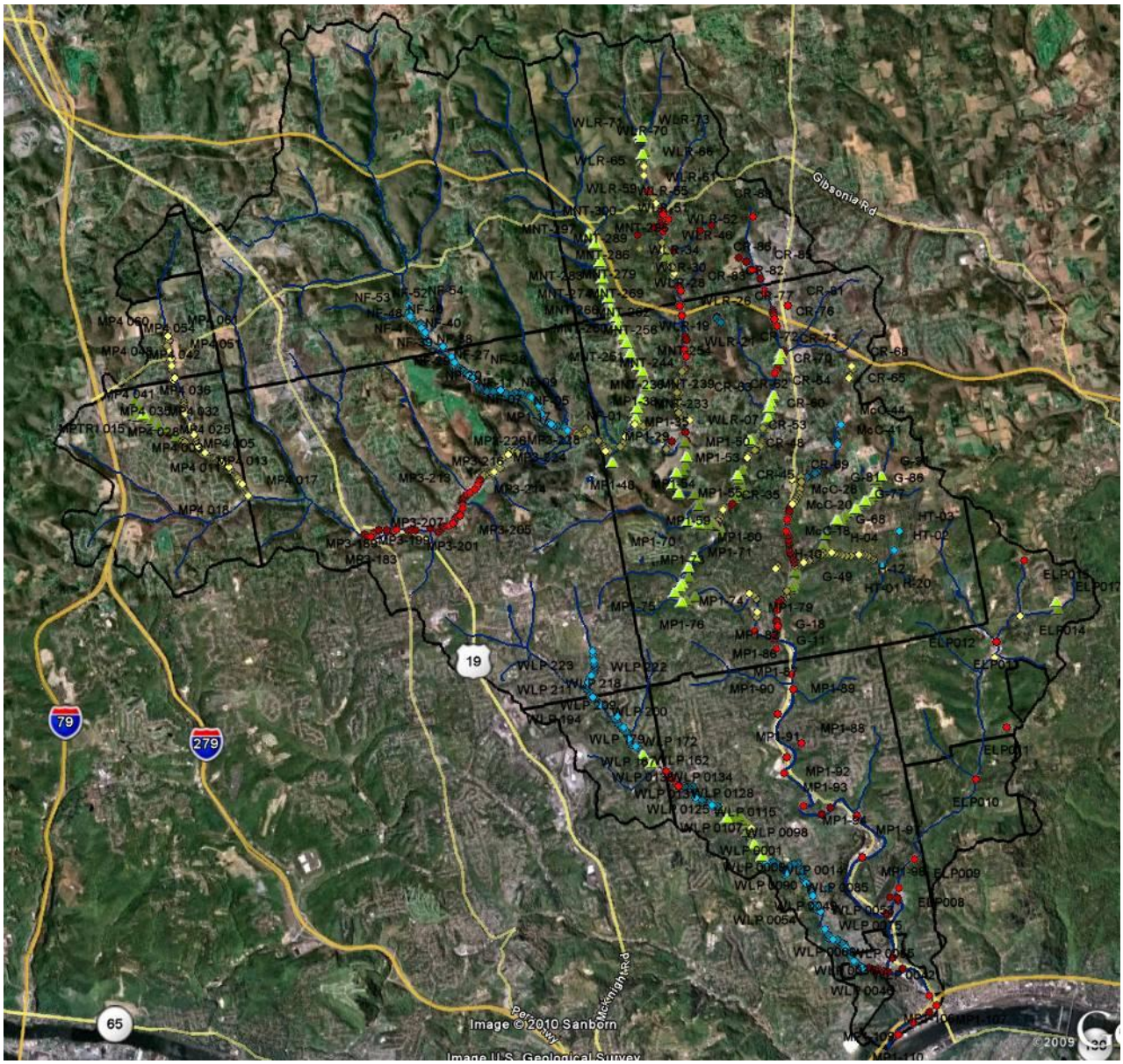
5.0 PINE CREEK STREAM SEGMENT ANALYSIS

Due to the scope of the assessment, each of the 12 sections studied (four sections [two combined] of main Pine Creek and nine tributaries) is described separately. Each stream/section description includes:

- A map of the stream, highlighting its location in the watershed.
- A Google Earth image showing the stream and waypoints colored by visual assessment quality ranking.
- Narrative describing the location of the headwaters, mouth, as well as notable features.
- Narrative generally describing conditions found in the stream.
- A table summarizing the visual assessment data by segment.
- Photo images and narrative describing issues of concern.
- A table summarizing recommendations for restoration, listed by waypoint, and providing priority ranking and relative costs. More detailed costs would be developed with on site reviews.

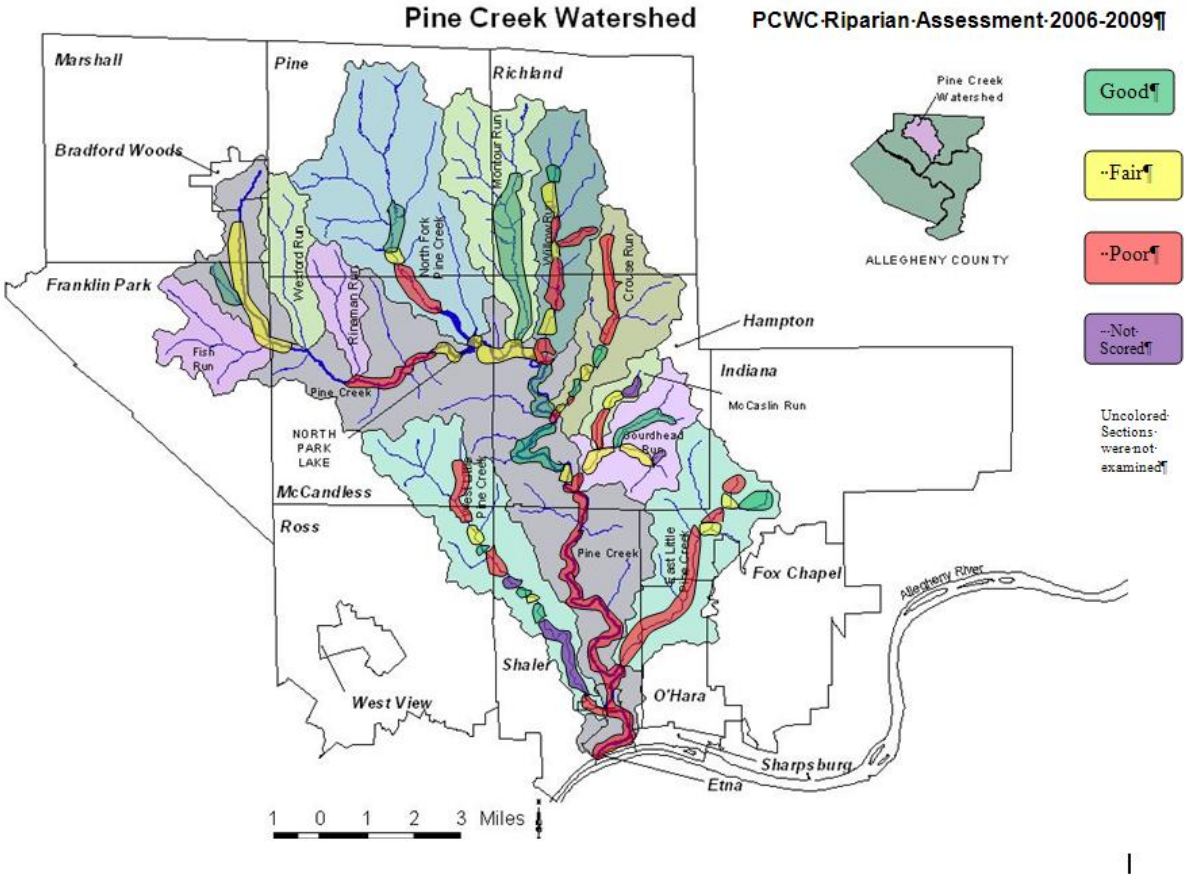
5.0.a KMZ image showing all waypoints studied during riparian assessment.

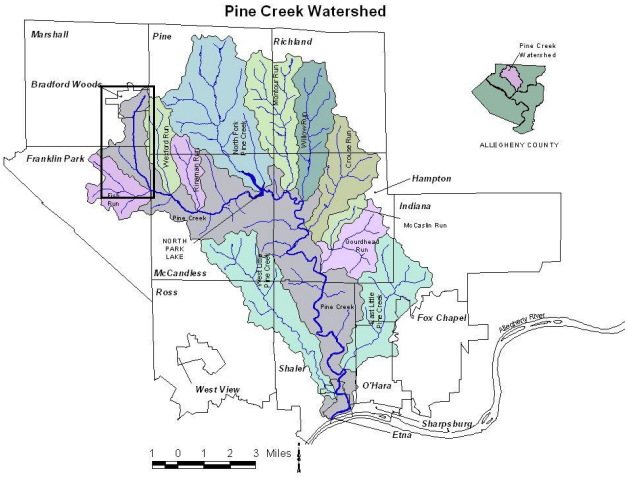
The following KMZ map of the watershed showing studied waypoints with colors indicating riparian area quality scores. Green = Good, Yellow = Fair, Red = Poor, Blue = Not Scored. Municipal boundaries have been clipped to align with the watershed boundaries.



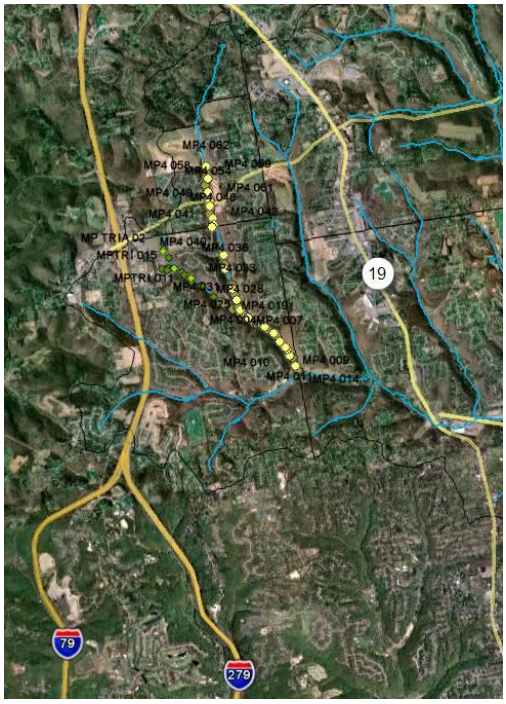
5.0.b Pine Creek Reach Map – Color Coded

This map of the Pine Creek Watershed presents an overview of the sub-watersheds, the municipal boundaries, and the reaches that were studied color coded for visual assessment quality ranking: Red – poor, Yellow – fair, Green – good. No reaches were scored “excellent”.





5.1 MAIN PINE CREEK SECTION 4



Area	2.61 sq. miles
% of watershed	3.86
Number of sections studied	6
Linear miles studied	3.36

WATERSHED OVERVIEW

Headwaters: Main Pine Section 4 (MP4) includes the headwaters of Pine Creek in Bradford Woods.

Mouth: MP4 ends at the entry of Fish Run into Pine Creek.

Notable Features: MP4 is a headwaters area, including small perennial streams and ephemeral streams. The land uses in the area include light residential development, two farms, and heavily wooded areas.

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Stream quality in this section is compromised primarily because of insufficiently protected riparian areas. Soil composition promotes stream downcutting and resulting extensive erosion significantly impacts stream insect and fish populations.

While residential development is light, most homeowners mow up to the stream bank thus decreasing streambank stability. There are also several outbuildings and other
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structures placed in the floodplain which can increase damage from flooding if they are washed downstream during storm events and create blockages.

The section of stream denoted as MP TR1 and MP TR1A leading from the valley along Wexford Run Road up to the intersection of Brandt School Road and Rt 910 near Interstate 79 is a remarkably pristine area in this suburban area. Its potential to buffer stormwater suggests that it be considered as a conservation area.

SELECTED VISUAL ASSESSMENT DATA BY SEGMENT – Main Pine Section 4

Listed from upstream to downstream

Upstream Waypoint	Channel Condition	Riparian Zone	Bank Stability	Water Appear.	Nutrient Enrich.	Fish Barriers	In Stream Fish Cover	Embeddedness	Invertebrate Habitat	Canopy Cover	Visual Assess. Score	Visual Assess. Rating
62	6	10	7	5	7	9	5	5	8	8	7.0	Fair
40	3	5	3	8	9	8	9	5	9	5	6.4	Fair
18	7	8	4	8	9	10	7	3	6	7	6.9	Fair
TR1A-3	7	10	8	9	9	10	10	5	9	8	8.5	Good
TR1-18	7	9	7	9	9	10	8	4	8	9	8.0	Good
TR1-10	8	10	6	7	9	4	5	7	8	9	7.3	Fair

FIELD OBSERVATIONS OF CONCERN

Erosion on a scour bank at a bend in the stream destabilizes a steep bank.

Neglect of stormwater detentions ponds compromises their stormwater management function.

Could this have been moved by a storm? Dumping affects stream and riparian quality.

Fill piles without erosion control to prevent erosion can impact stream life and channel capacity.

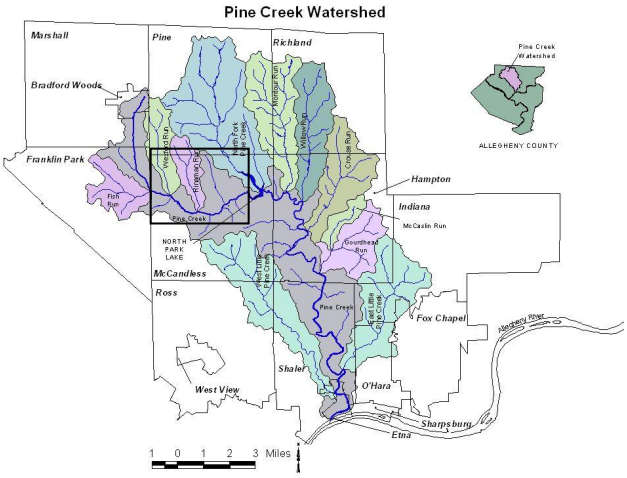
Streambank erosion along roadways can result in roadbed collapse…an expensive infrastructure repair.

Improperly and illegally constructed bridges and streamside structures can wash away and block streams, increasing flood damage.

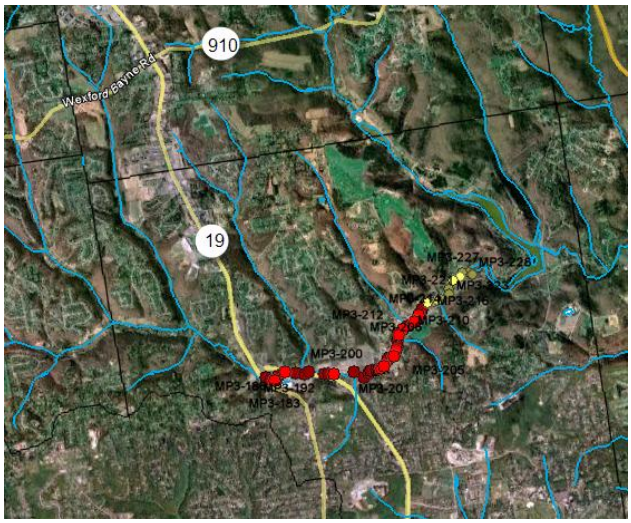
Streamside structures and bridges can create stream blockages during high water events.

MAIN PINE 4 RESTORATION RECOMMENDATIONS

GPS Waypoint(s)	Areas of Concern and/or Opportunity	Proposed Project(s)	Photos	Priority Ranking	Relative Cost
MP4-009	Stream Bank erosion	Stream restoration	IMG_0373 to IMG_0374	M	$$
MP4-014	Severe stream blockage	Clear debris	IMG_0378 to IMG_0380	H	$
MPTRI-003	Steep stream bank erosion	Bank Stabilization	IMG_0410	M	$$$
MPTRI-007	Log jam with undercut banks	Clear debris jam and restore channel to natural course.	IMG_0413	L	$
MPTRI-011	Detention Basin outlet structure	Check functionality of basin; look into retrofitting for water quality.	IMG_0420 to IMG_0421	M	$
MPTRI-014	Bank erosion	Stream restoration	IMG_0424	L	$$$
MPTRIA-03	Tire/trash dump	Cleanup	IMG_0466 to IMG_0469	M	$
MP4-021	Stream Bank erosion	Stream restoration	IMG_0452 to IMG_0453	M	$$$
MP4-033	Concrete slab bank protection	Proper bank rehabilitation	IMG_0463	L	$$
MP4-054	Wooden foot bridge encroaching on floodplain	Remove or restructure bridge	IMG_0698 to IMG_0699	L	$



5.2 MAIN PINE CREEK SECTION 3



Area	3.47 sq. miles
% of watershed	5.17
Number of sections studied	4
Linear miles studied	2.27

WATERSHED OVERVIEW

Headwaters: Main Pine Section 3 (MP3) is the section of the main stem of Pine Creek from the mouth of Fish Run to North Park Lake.

Mouth: MP3 drains into the western arm of North Park Lake parallel to Ingomar Road.

Notable Features: MP3 is in Franklin Park Borough and the Town of McCandless. The upper section is wooded or lightly developed grassland and the lower section is heavily developed with commercial establishments and major roads alongside the stream. The commercial corridor of McKnight Road parallels MP3 for approximately 4/5 of a mile.

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MP3 has a highly variable character due to the differing development along its course.

The uppermost segment of Main Pine 3 from the mouth of Fish Run to just below the mouth of Wexford Run is heavily wooded and relatively undisturbed. While the riparian area is largely native trees and shrubs, the soils are easily disturbed and the stream has downcut significantly with attendant erosion. This section was not formally studied.
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The segment from the mouth of Wexford Run to Vestal Park is open grassland with very light development. There is very little tree or shrub cover and the stream has downcut significantly. This section was not formally studied.

The segment from the beginning of Vestal Park to the intersection of Rt 19 and McKnight Road is a community park with a well-protected riparian area. There is tree and shrub cover. Downcutting is not as evident here as in the previous two sections. This section was not formally studied.

The portion of MP3 from the Rt 19 / McKnight intersection to Kummer Rd, just upstream of North Park, is heavily commercialized with major roadways paralleling the stream. Severe erosion is evident with substantial undercutting of large valuable trees. There are many exposed pipes alongside or crossing the stream, sometimes three or more feet in the air. The subsection downstream of the McCandless soccer fields to the Kummer Road bridge is canyonized with commercial development up to the stream in some places. There is one horse farm in this section where severe erosion is undercutting fences.

The portion from Kummer Rd to North Park Lake is within Allegheny County's North Park. There is a restorable wetland at the upper end and significant erosion activity downstream. North Park lake has been heavily silted by erosion activity on the whole of MP3 and its tributaries. A project to dredge North Park Lake is currently in the early stages of implementation.

SELECTED VISUAL ASSESSMENT DATA BY SEGMENT – Main Pine Section 3

Listed from upstream to downstream

Upstream Waypoint	Channel Condition	Riparian Zone	Bank Stability	Water Appear.	Nutrient Enrich.	Fish Barriers	In Stream Fish Cover	Embeddedness	Invertebrate Habitat	Canopy Cover	Visual Assess. Score	Visual Assess. Rating
181	3	3	2	8	5	10	3	2	3	2	4.1	Poor
190	3	4	4	8	6	9	4	5	4	3	5	Poor
198	3	4	3	6	7	9	4	3	4	3	4.6	Poor
219	6	9	4	7	6	9	7	5	4	6	6.3	Fair

FIELD OBSERVATIONS OF CONCERN

A number of places along MP3 have severe bank erosion. In this area the erosion could eventually impact the properties above it.

There are a number of erosion undercuts threatening substantial trees that are holding the streambank. These trees could block the channel if they fell into the stream.

Trees that have fallen across the stream can create dams and present a flooding hazard.

MP3 along McKnight Road has several pipes that are at severe risk of collapse as the streambank has eroded away, leaving them suspended and without support.

The impact of beaver activity as a contribution to flooding along MP3 should be studied.

An inactive storage tank near the stream presents a significant hazard of stream contamination or damage to vegetation or structures if dislodged and floated downstream.

Improper streamside storage, for example this drainage pipe that has rolled over the hill, could create a dam during a high water event. Extreme high water could carry away the entire pile of pipes.

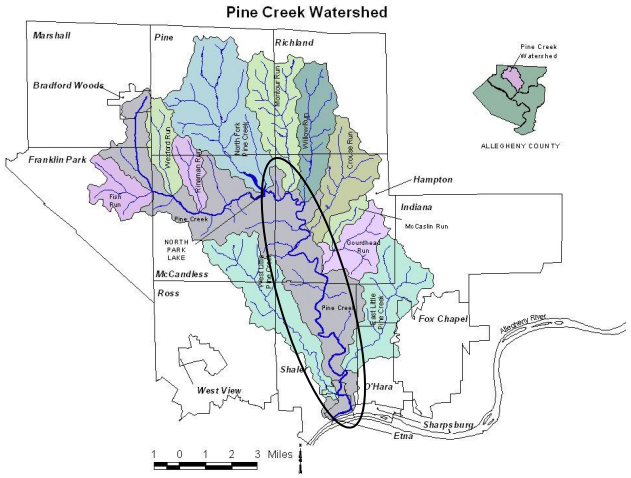
The decaying infrastructure of bridges such as this one on MP3 impacts stream quality and increases the risk of the structure failing in a high flow event.

Development close to the stream channel has decreased flood zone capacity and promotes increased flood damage to property.

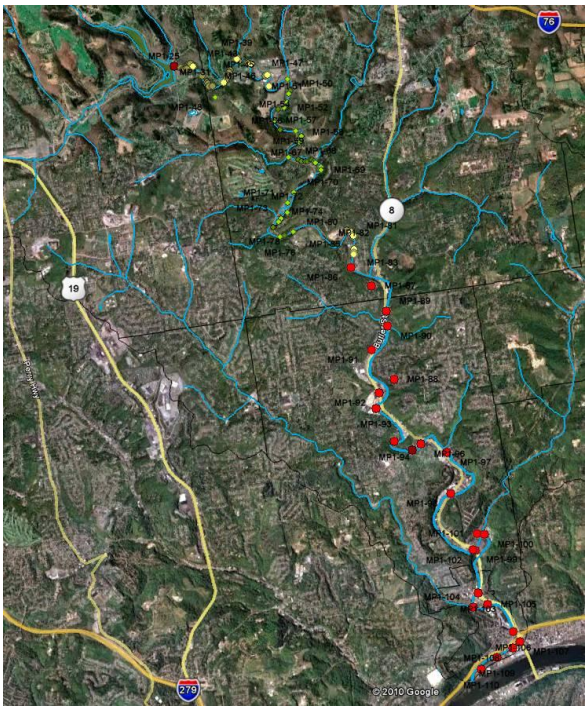
Improper disposal of materials in several places creates potential hazards if large items such as these pipes are swept downstream during a high flow event.

MAIN PINE 3 RESTORATION RECOMMENDATIONS

GPS Waypoint(s)	Areas of Concern and/or Opportunity	Proposed Project(s)	Photos	Priority Ranking	Relative Cost
MP3-182	Stream bank erosion	Stream restoration	MP3_0007	M	$$$
MP3-184	Stream bank erosion	Stream restoration	MP3_0010 to MP3_0012	H	$$
MP3-185	Culvert collapse	Culvert repair	MP3_0018	M	$$$
MP3-186	Stream Bank erosion and pipe support	Bank Stabilization and pipe relocation	MP3_0019	M	$$$
MP3-190	Stream bank erosion	Stream restoration to stabilize banks, protect trees, and right size the channel	MP3_0027	M	$$$
MP3-194	Abandoned tank	Remove tank and cleanup any spillage	MP3_0030 to MP3_0033	L	$$
MP3-195 MP3-208 MP3-211	Beaver activity	Study pros and cons of beaver dam removal	MP3-0036 MP3_0075 to MP3_0077 MP3_0085	L	$
MP3-213	Highly eroding tributary with blockage	Stream restoration	MP3_0091 to MP3_0092	M	$$
MP3-215 MP3-216	Old remediation site	Investigate remediation performance	MP3_0095 to MP3_0096	M	$$
MP3-225	Stream bank erosion	Stream restoration	MP3_0129 to MP3_0130	M	$$$
MP3-228	Stream bank erosion and blockage	Stream restoration	MP3_0136 to MP3_0138	M	$$$



5.3 MAIN PINE CREEK SECTIONS 1 and 2



Area	12.034 sq. miles
% of watershed	17.9%
Number of segments studied	9
Linear miles studied	13.75

WATERSHED OVERVIEW

Headwaters: The portion of main Pine Creek below North Park Lake captures water from the lake and upland areas, as well as from several unnamed tributaries and eight named tributaries. The calculation of its area includes only areas not covered in named tributaries.

Mouth: Pine Creek ultimately flows into the Allegheny River at the southwestern tip of the industrial park south of Route 28 in the Borough of Etna.

Notable Features: Main Pine Creek below North Park Lake is designated as a Cold Water Fishery by the state of Pennsylvania's Fish and Boat Commission. Although the stream passes through significant development, it retains much of its natural character, and draws fishermen much of the year. Yet Pine Creek has flooded repeatedly, prompting studies by the Army Corps of Engineers and others to determine ways to minimize its impact during high flow events.

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Pine Creek below North Park Lake is a dichotomy in watershed health. Because much of the streams remains unchannelized, has a rocky substrate and has some vegetative canopy, it is classified as a Cold Water Fishery. However, although it is stocked regularly with trout, it is does not support a breeding population. While the water quality appears high, an ongoing challenge with Combined Sewer Overflows (CSOs), siltation,
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and other contaminants results in less than optimal water quality for the support of a healthy sustained aquatic community.

Physically, it is no surprise that Pine Creek exhibits significant challenges of erosion. The forces that generate erosion in the tributaries are multiplied several times due to the cumulative impacts of numerous streams contributing to the volume of the main stem of the watershed. Furthermore, development has introduced an enormous area of impervious surface, much of which is not supported with stormwater detention facilities, so that more water is entering the main stream than has historically.

These challenges are compounded even further by the fact that much of the wider floodplain of main Pine Creek below North Park Lake was deemed suitable for development of roadways and rail lines, as well as residential, commercial and residential development. Much of that development historically encroached on the actual stream channel, which further reduces the channel's capacity to handle the volume of water its carries. The resulting chronic and catastrophic flooding of the lower reaches of main Pine Creek have resulted in enormous financial and emotional losses to the residents and businesses in the lower portion of the Pine Creek watershed.

Severe erosion is found on several hundred feet of the channel of main Pine Creek downstream of North Park Lake. In several places that erosion is putting electrical and sewer utility infrastructure at risk. Although the scale of work needed to address work on main Pine Creek makes it daunting, dedication to addressing these issues will have significant benefits by reducing sediment deposition and channel constriction downstream. Similar attention to debris jams, a relatively inexpensive repair, can prevent high flows from carrying debris downstream and creating further destruction.

SELECTED VISUAL ASSESSMENT DATA BY SEGMENT – Main Pine Section 1-2

Listed from upstream to downstream

Upstream Waypoint	Channel Condition	Riparian Zone	Bank Stability	Water Appear.	Nutrient Enrich	Fish Barriers	In Stream Fish Cover	Embeddedness	Invertebrate Habitat	Canopy Cover	Visual Assess. Score	Visual Assess. Rating
17	2	6	8	7	8	3	1	9	3	1	4.8	Poor
18	6	8	5	7	8	9	8	7	9	7	7.4	Fair
34	3	4	8	7	9	10	3	8	7	3	6.2	Fair
37	4	5	4	7	9	5	8	6	8	7	6.3	Fair
47	7	9	6	10	9	10	10	9	10	9	8.9	Good
66	7	6	7	9	9	10	10	7	10	9	8.4	Good
79	6	7	4	10	8	10	4	7	7	8	7.3	Fair

Upstream Waypoint	Channel Condition	Riparian Zone	Bank Stability	Water Appear.	Nutrient Enrich	Fish Barriers	In Stream Fish Cover	Embeddedness	Invertebrate Habitat	Canopy Cover	Visual Assess. Score	Visual Assess. Rating
86	4	3	4	9	9	7	7	7	4	4	5.8	Poor
107	2	2	7	9	9	10	1	9	2	7	5.8	Poor

FIELD OBSERVATIONS OF CONCERN

Significant erosion is evident in several hundred feet of the channel. This promotes downcutting which contributes more deposition and flooding downstream.

Some of the erosion has put utilities at risk such as this electrical or telephone utility pole.

Several sewer manholes are growing more exposed yearly, making them vulnerable to damage during high flow events.

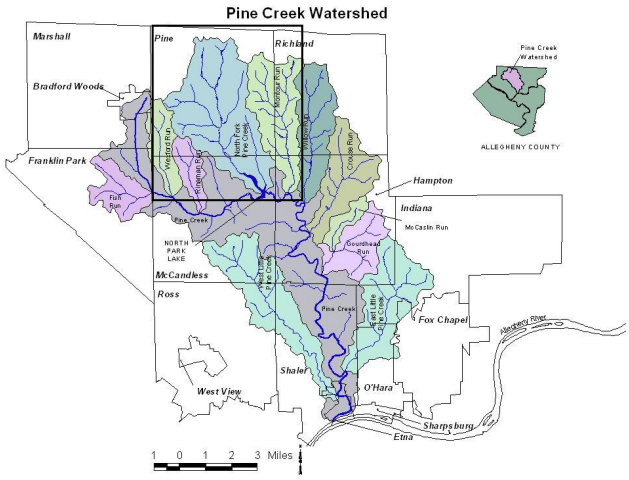
Trees brought down by bank erosion create traps for smaller debris and ultimately create debris jams and enhanced opportunities for localized flooding.

Sedimentation of channelized portions of main Pine Creek and its tributaries reduces their capacity during high flow events.

PINE CREEK SECTION 1-2 RESTORATION RECOMMENDATIONS

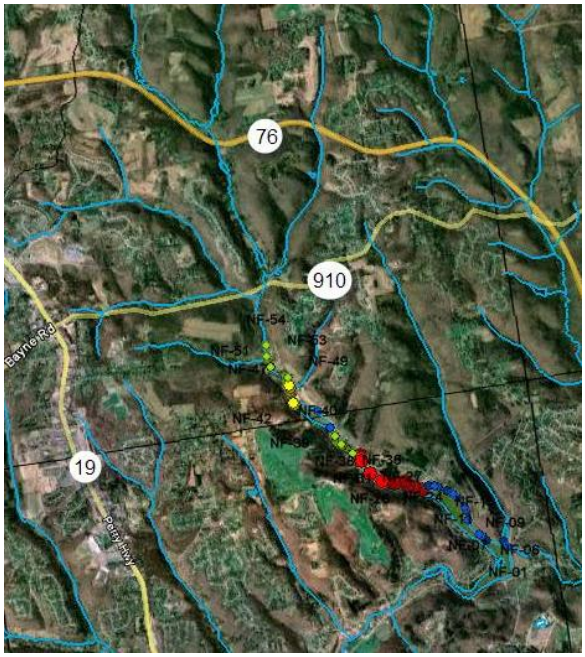
GPS Waypoint(s)	Areas of Concern and/or Opportunity	Proposed Project(s)	Photos	Priority Ranking	Relative Cost
MP1 24-25	Stream bank erosion	Fish habitat improvement structures	MP1-044	L	$$
MP1 32	S-bend bank erosion	Stream restoration	MP1-050 to MP1-051	M	$$-$$$
MP1 38	Stream bank erosion	Stream restoration	MP1-056 to MP1-057	M	$$$
MP1 49-50	Exposed sewer line and severe bank erosion	Stream restoration	MP1-075 to MP1-076	L	$$$
MP1 54	Area of unnatural fill with knotweed growing	Remove excess fill and eradicate knotweed	MP1-081 to MP1-082	L	$$
MP1 58-65	Severe bank erosion; debris jam causing undercut banks for several hundred feet	Stream restoration	MP1-087 to MP1-097	H	$$$
MP1 68-69	100 yards of bank erosion	Stream restoration	MP1-099 to MP1-100	M	$$$

GPS Waypoint(s)	Areas of Concern and/or Opportunity	Proposed Project(s)	Photos	Priority Ranking	Relative Cost
MP1 79-81	Stream bank erosion around private driveway and bridge	Stream restoration	MP1-108 to MP1-113	M	$$$
MP1 86	Bank erosion near bridge	Riparian planting on mowed lawn area	MP1-109 to MP1-110	M	$$
MP1 100	Heavy sedimentation at confluence of East Little Pine and Pine Creeks	Dredging of excess materials and stream flow control structures to move bed load through the system	MP1-124 to MP1-125	M	$$



5.4 NORTH FORK PINE CREEK

Area	10.012 sq. miles
% of watershed	14.89 %
Number of sections studied	7
Linear miles studied	2.87



WATERSHED OVERVIEW

Headwaters: The headwater region of the North Fork of Pine Creek lies along Warrendale Road in Pine Township.

Mouth: North Fork drains into Marshall Lake and North Park Lake as it parallels Pearce Mill Road in Pine and McCandless Townships.

Notable Features: The North Fork watershed borders or encompasses two east/west roadways (State Highway 910 and Warrendale Road) as well as one major north/south commercial road (State Route 19). North Fork drains into Marshall and North Park Lakes, respectively, features of North Park, an Allegheny County park. Heavy sediment loads from upstream development have impacted both lakes. Plans to dredge North Park Lake are in early stages of implementation. North Park Lake and Marshall Lake are semiannually stocked with trout by the Pennsylvania Fish and Boat Commission in partnership with the Penns Woods chapter of Trout Unlimited.

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The headwater region of North Fork includes some very rural areas with pockets of residential development. Because roads providing access to major corridors pass through the upper regions of the watershed, they are likely to come under exponentially increasing development pressure.
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Currently the balance of the upper two thirds of the watershed is relatively lightly developed with agriculture, large lot residential, municipal parkland and occasional PRD developments comprising the dominant land uses between Route 910 and Warrendale Road. In the 10 year period between 1990 and 2000, Pine Township experienced the highest percentage increase of housing units of any municipality within the Pine Creek watershed. Significant increases in impervious cover and land disturbance in the upper reaches of the watershed in coming decades could have major impacts on the stability of the North Fork stream channel.

A checkerboard effect of visual assessment scores was observed in the study area from 910 to North Park Lake. Impact from the foot traffic of thousands of anglers who frequent the lakes during fishing season is seen around the perimeter of North Park Lake and Marshall Lake. In contrast, the areas where the stream was not impounded by large or small lakes showed considerably improved conditions in terms of riparian zone and embeddedness.

The relatively lower levels of erosion seen along North Fork compared with other parts of the Pine Creek Watershed are likely due to a combination of the lower profile of the watershed (i.e. small differential in altitude from headwaters to mouth) and lesser degree of development. Unlike Harts Run which descends over 150 feet in about a mile, North Fork drops approximately 100 feet over more than two miles. Still, some erosion is present and should be addressed so that the channel does not continue to downcut and contribute sediment downstream.

Two projects underway in North Park on North Fork provide examples for stream improvements. The first is a wetland mitigation project underway by the PA Turnpike Commission which will restore approximately five acres of stranded floodplain to its original wetland condition. Upstream from that a portion of the stream channel is being retrofitted into a rain garden to further promote rain water infiltration. These projects on the North Fork can serve as models for work elsewhere in the Pine Creek Watershed.

SELECTED VISUAL ASSESSMENT DATA BY SEGMENT – North Fork

Listed from upstream to downstream

Upstream Waypoint	Channel Condition	Riparian Zone	Bank Stability	Water Appear.	Nutrient Enrich.	Fish Barriers	In Stream Fish Cover	Embeddedness	Invertebrate Habitat	Canopy Cover	Visual Assess. Score	Visual Assess. Rating
54	7	10	5	5	5	10	10	7	9	9	7.7	Good
47	8	6	7	5	5	10	7	6	7	5	6.4	Fair
43	6	7	6	4	4	10	7	6	7	4	5.91	Fair
40	na			3	4	10	7	na		1	Lake	Lake
38	5	6	6	9	9	8	7	8	8	9	7.5	Good

Upstream Waypoint	Channel Condition	Riparian Zone	Bank Stability	Water Appear.	Nutrient Enrich.	Fish Barriers	In Stream Fish Cover	Embeddedness	Invertebrate Habitat	Canopy Cover	Visual Assess. Score	Visual Assess. Rating
28	9	5	8	2	1	9	7	1	4	5	4.73	Poor
16	na	6	4	3	4	10	5	na	5	na	lake	Lake
11	na	3	6	3	4	1	3	na	4	na	lake	Lake

FIELD OBSERVATIONS OF CONCERN

Foot traffic from the many anglers at North Park's lakes has denuded banks on both the near and far shores in this picture, which promotes some sediment deposition in the lakes.

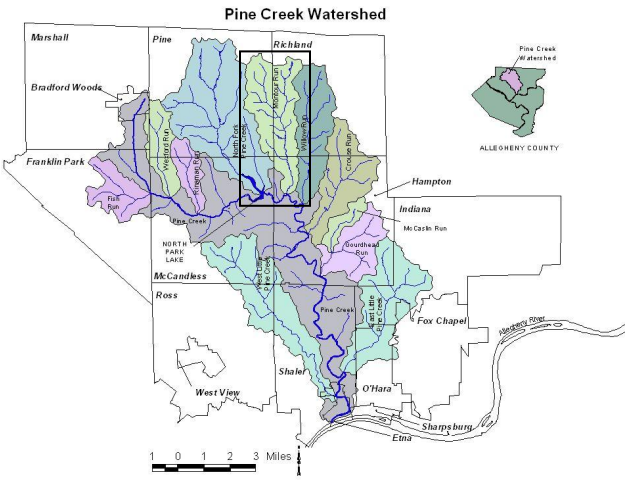
Erosion is seen along some portions of North Fork, but since stream banks are shallower for this stream than some others, it is less pronounced.

Some portions of North Fork still have viable floodplains as apparent in this wet weather image.

This site in North Park is part of a wetland mitigation project underway by the PA Turnpike Commission in which 5 acres are being restored to their original wetland configuration.

NORTH FORK RESTORATION RECOMMENDATIONS

GPS Waypoint(s)	Areas of Concern and/or Opportunity	Proposed Project(s)	Photos	Priority Ranking	Relative Cost
NF-19	Lake shore erosion and stormwater pipe into lake	Repair outfall and stabilize lake shore	NF-079	M	$
NF-17-28	Nutrient management of North Park Lake	Limit population and/or access to the lake	NF-068 to NF-132	H	0
NF-39	Marshall Lake/Dam	Dam removal and stream stabilization	NF-179 to NF-182	M	$$
NF-44	Tree in stream channel by footbridge to skating rink	Remove tree and install innovative stormwater management on skate rink parking area	NF-200 to NF-203	M	$$$
NF-46	Small dam across stream	Dam removal and stream stabilization	NF-211 to NF-212	L	$$
NF-53	High bank cut erosion	Stream restoration	NF-239 to NF-242	M	$$$



5.5 Montour Run

Area	5.35 sq. miles
% of watershed	7.96
Number of sections studied	2
Linear miles studied	2.5

WATERSHED OVERVIEW

Headwaters: Montour run rises primarily in Richland Township with a small branch westward into Pine Township.

Mouth: Montour Run empties into main Pine Creek in Hampton Township one stream mile below the North Park dam and one stream mile upstream of the mouth of Willow Run.

Notable Features: Montour Run represents a relatively undeveloped headwaters area. The upper reaches turn into a narrow valley from Route 910 south to the mouth. This narrow valley section is primarily wet bottom land with only a few residences.

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The area above route 910 was not studied. The streams are quite small in that area. The stream miles in the unstudied area total about 7.75 miles.

Much of the riparian area is wetland. The valley bottom is flat immediately adjacent to the stream but then rises steeply on each side. There are no sewers in the valley. There are perhaps six residences in the two-mile study section.
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The stream has a very large number of very significant stream blockages comprised primarily of tangles of fallen trees. Even though the valley is sparsely settled and the flood plain is moderately wide, houses were flooding during Hurricane Ivan. If any of the significant debris jams were to be dislodged during a storm event, significant damage could occur at Wildwood Road and downstream on Pine Creek.

The stream has a surprising number of tires in it - more than observed in any other stream. This stems in part from a large tire dump about ½ mile up S. Montour Rd from Wildwood Rd. However, even the section above the dump has a significant number of tires. There are also several trash dumps close to S. Montour Road an area of high wall erosion along the road that is of significant concern.

SELECTED VISUAL ASSESSMENT DATA BY SEGMENT – Montour Run

Listed from upstream to downstream

Upstream Waypoint	Channel Condition	Riparian Zone	Bank Stability	Water Appear.	Nutrient Enrich.	Fish Barriers	In Stream Fish Cover	Embeddedness	Invertebrate Habitat	Canopy Cover	Visual Assess. Score	Visual Assess. Rating
301	9	10	3	7	8	9	8	8	9	8	7.9	Good
264	9	10	6	7	9	10	8	7	9	6	8.1	Good

FIELD OBSERVATIONS OF CONCERN

There are several debris jams in different stages of development. This is one in the early stages.

Erosion and tree undercutting just off S. Montour Rd.

Several sights had old deposits of machinery, or debris. This is a large tire dump with assorted appliance pieces.

Efforts to armor stream bank with concrete slab are not completely effective.

Three abandoned oil tanks were found with evidence of oil leakage.

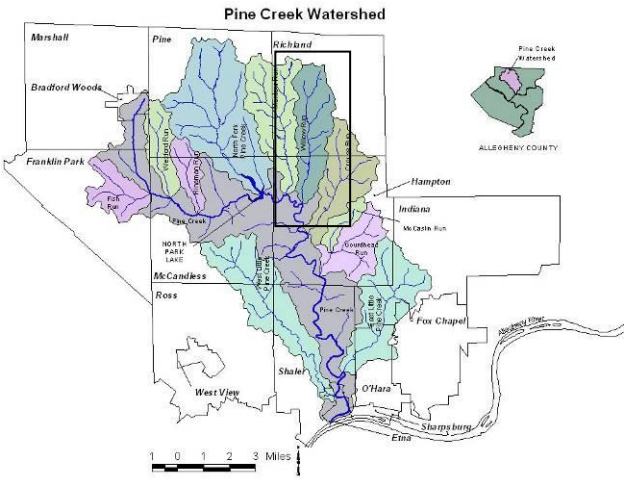
Small amount of orange seepage resembling AMD was seen draining from a pipe near a cleared, stone paved area.

Virginia bluebells are increasingly rare in this area. They are a welcome sight in the Pine Creek watershed.

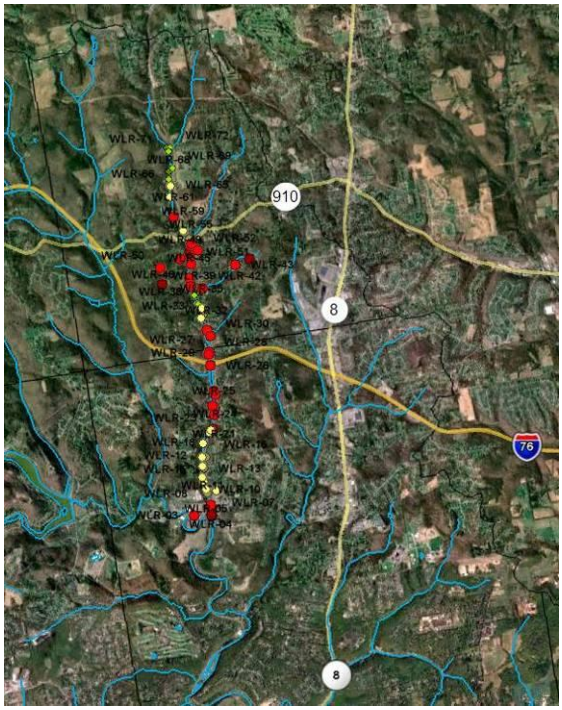
MONTOUR RUN RESTORATION RECOMMENDATIONS

GPS Waypoint(s)	Areas of Concern and/or Opportunity	Proposed Project(s)	Photos	Priority Ranking	Relative Cost
MNT 236-237	Small dump site and stream bank erosion off of S. Montour	Dump site clean up and stream restoration	MNT_0160 to MNT_0162	H	0
MNT-249	Tire and equipment dump	Clean up tires and junk	MNT_0197 to MNT_0200	M	$
MNT-260	Stormwater runoff from Grandeur Drive	Streambank stabilization and SWM investigation upstream	MNT_0223 to MNT_0224	M	$$
MNT-267	Old oil tanks, possibly leaking	Check ownership and responsibility of cleaning up tanks	MNT_0231 to MNT_0233	M	$
MNT 271	Eroded stream banks	Stream restoration	MT_0237 to MNT_0238	M	$$-$$$
MNT-280-281	Established Riparian Corridor	Conserve and preserve	MNT_0249 to MNT_0254	M	$$
MNT-294-301	Turnpike runoff area	Investigate and plan for reduction of stormwater volume in the headwaters	MNT_0271 to MNT_0280	H	$

5.6 WILLOW RUN



Area	4.427 sq. miles
% of watershed	6.585%
Number of segments studied	28
Linear miles studied	5.07

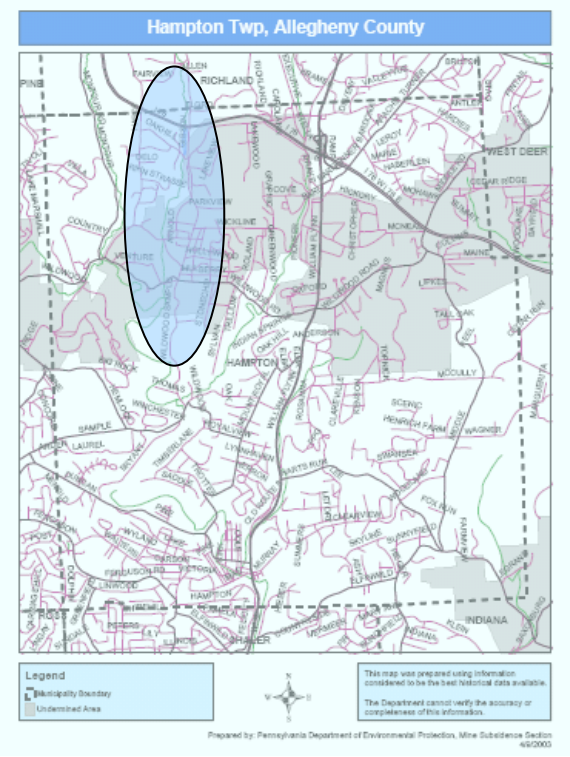


WATERSHED OVERVIEW

Headwaters: The upper boundary of the Willow Run sub-watershed lies along Warrendale Road (the Red Belt) in Richland Township. The area has a mix of residential, light industry and agricultural uses. Because it connects with two main corridors, the Red Belt corridor is undergoing increasing development.

Mouth: Willow Run follows a fairly straight course southward to meet main Pine Creek just south of Wildwood Road (Yellow Belt) in Hampton Township.

Notable Features: Several distinct features impact Willow Run: An active rail line runs parallel to Willow Run (The Allegheny Valley Railroad transfers to the Buffalo and Pittsburgh Railroad in Allison Park). An Abandoned Mine Drainage (AMD) treatment



plant is treating drainage from the closed Wildwood Coal Mine (Willow Run in circle on map of Hampton Township showing mine transecting the township, right.) A sewer line is also in place in the stream channel.

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The visual assessment scores for Willow Run reflect the land use around the stream. There is relatively heavy residential development due to easy vehicular access provided by several north/south corridors as well as east/west connectors. The roads, combined with sewer access, have resulted in heavier and more concentrated stormwater contributions to the stream, and the construction of the sewer line is likely to have reduced the stability of the stream bed, making it more vulnerable to erosion. These factors are exacerbated by numerous property owners and/or builders along the northern portion of the stream encroaching heavily into the stream corridor and destabilizing the stream banks through vegetation removal and direct disruption of the slopes. It should be noted that while most of Willow Run ranked fair to poor, Montour Run immediately to its west has much higher visual assessment scores.

SELECTED VISUAL ASSESSMENT DATA BY SEGMENT – Willow Run

Listed from upstream to downstream

Upstream Waypoint	Channel Condition	Riparian Zone	Bank Stability	Water Appear.	Nutrient Enrich.	Fish Barriers	In Stream Fish Cover	Embeddedness	Invertebrate Habitat	Canopy Cover	Visual Assess. Score	Visual Assess. Rating
73	8	9	7	8	7	8	9	6	8	8	7.8	Good
67	8	9	4	7	8	6	9	6	8	8	7.3	Fair
64	8	8	6	8	6	5	7	3	5	5	6.1	Fair
61	2	9	4	2	2	3	6	2	9	7	4.6	Poor
60	5	7	6	7	7	4	8	4	6	8	6.2	Fair
58	1	1	10	5	8	10	9	4	3	10	6.1	Fair
56	2	5	1	4	7	4	8	4	8	4	4.7	Poor
51	3	8	2	6	6	5	7	3	8	3	5.1	Poor
47	3	8	2	6	6	5	7	3	8	3	5.1	Poor
44	4	6	4	8	7	3	6	7	9	2	5.6	Poor
41	7	9	8	8	9	5	9	7	9	5	7.6	Good
37	7	8	7	8	7	4	5	7	7	3	6.3	Fair
33	7	9	8	7	8	6	6	8	8	5	7.2	Fair
32	7	8	6	7	5	4	5	6	7	3	5.8	Poor
31	5	9	4	4	6	8	7	3	5	4	5.5	Poor
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Upstream Waypoint	Channel Condition	Riparian Zone	Bank Stability	Water Appear.	Nutrient Enrich.	Fish Barriers	In Stream Fish Cover	Embeddedness	Invertebrate Habitat	Canopy Cover	Visual Assess. Score	Visual Assess. Rating
26	2	8	4	2	2	2	5	2	9	3	3.9	Poor
25	2	7	5	3	5	2	9	2	5	2	4.2	Poor
22	2	8	3	5	4	6	5	2	4	2	4.1	Poor
18	8	9	4	7	5	7	9	4	6	5	6.4	Fair
16	5	9	5	6	5	5	6	8	2	6	6	Fair
15	9	8	7	9	7	8	7	3	8	7	7.3	Fair
11	1	1	10	9	9	10	9	2	3	10	6.4	Fair
10	8	8	7	9	7	5	8	2	9	6	6.9	Fair
8	6	5	4	8	9	8	3	4	6	8	6.1	Fair
5	6	7	5	9	8	7	8	6	8	4	6.8	Fair
4	5	3	4	8	8	10	2	4	4	1	4.9	Poor
3	2	1	2	9	6	4	6	3	7	2	4.2	Poor
2	5	3	3	10	9	10	2	9	7	1	5.9	Poor

FIELD OBSERVATIONS OF CONCERN

Pipes that were formerly buried within the streambank have become exposed pipe along lower reaches of Willow Run due to erosion. If carrying sewage, potable water or fuel, this pipes are now vulnerable to corrosion and damage during storm events.

Even with the AMD treatment plant in place, discharges from the plant and another location upstream exhibit signs of Ferrous Oxide precipitation.

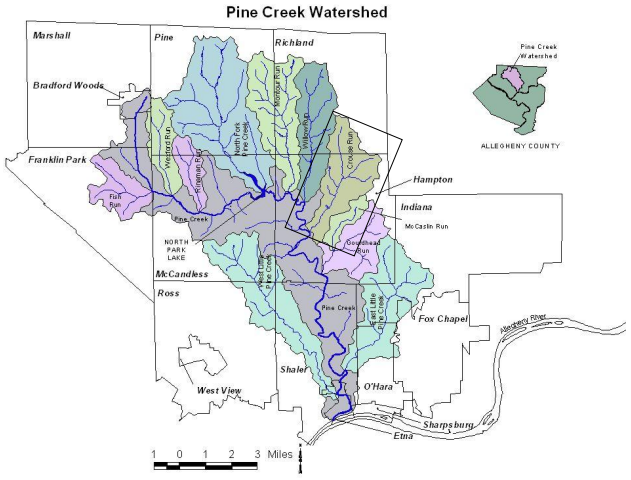
Hardies Ponds were initially constructed as a reliable source of water for steam engines on the former Baltimore and Ohio rail line. The upper of the two ponds (not pictured) has become heavily silted and vegetated, resembling a marsh rather than a pond.

Several residents (including a new house under construction) have encroached on the stream channel, including the construction of elaborate structures that could be damaged by high flow events.

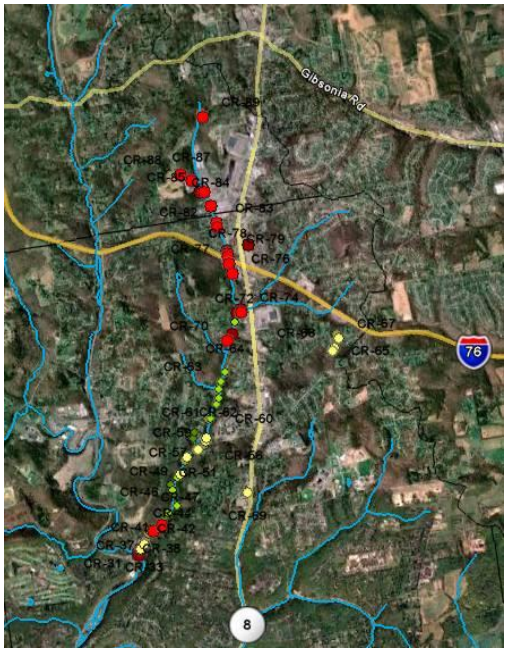
Protection of headwater portions of the watershed are critical because that is where large percentages of rain water infiltration occurs. Disruption of the riparian edges in upstream areas as seen by this Bobcat contributes large amounts of sediment to downstream reaches and reduces infiltration.

WILLOW RUN RESTORATION RECOMMENDATIONS

GPS Waypoint(s)	Areas of Concern and/or Opportunity	Proposed Project(s)	Photos	Priority Ranking	Relative Cost
WLR-03	Bank erosion along railroad bed/tracks	Review design of existing facility	WLR-0027 to WLR-0036	H	$$$
WLR 23-26	Lower Hardies Dam and Pond	On stream dam removal and stream restoration	WLR-0087 to WLR-0098	M	$$$
WLR-27	Upper and Lower Hardies Ponds	Retrofit to stormwater management facility	WLR-0101 to WLR-0104	M	$$$$
WLR-53	Degraded Riparian zone near new development	Repair stream channel and plant riparian plantings	WLR-0147	M	$$
WLR-60	Large wetland area	Preservation and enhancement	WLR-0166 to WLR-0168	M	$$



5.7 CROUSE RUN



Area	4.350 sq. mile
% of watershed	6.47%
Number of segments studied	15
Linear miles studied	4.26

WATERSHED OVERVIEW

Headwaters: Richland Township near Hance Elementary. Two unnamed headwater tributaries streams run (1) parallel to E. Bardonner Rd and (2) parallel to Hickory Street, under the PA Turnpike and into the Haberlein Road area in Hampton Township.

Mouth: Confluence with Pine Creek at Sample Road

Notable Features: Crouse Run passes through the Crouse Run Nature Reserve between Wildwood Road and Sample Road. The stream parallels the defunct Harmony Butler Short Line rail bed through the nature reserve. This valley was studied by Rachel Carson while she attended Pennsylvania College for Women, now Chatham University, and is identified as an Important Bird Area.

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Crouse Run, while mostly invisible to visitors and residents of the Pine Creek Watershed is a significant tributary to Pine Creek. It parallels Route 8 (William Flinn Highway) fairly closely from the top of its drainage near Route 910 southward to Wildwood Road where it bends westward. Therefore, it collects water from the heavily developed Route 8 commercial corridor and adjacent residential developments along the top half of its course.

Although much of its route has a forested riparian corridor, the pressure on the stream from the volume of water it carries is evident in consistent erosion along its route, even through the Crouse Run Nature Reserve. Sewer lines and manholes along the stream
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are in jeopardy in several places and sediment deposition from eroded banks has partially blocked the stream's passageway under bridges. Debris dams present significant risks as the material can create dams if wedged carried against bridge abutments during high flows.

SELECTED VISUAL ASSESSMENT DATA BY SEGMENT – Crouse Run

Listed from upstream to downstream

Upstream Waypoint	Channel Condition	Riparian Zone	Bank Stability	Water Appear.	Nutrient Enrich.	Fish Barriers	In Stream Fish Cover	Embeddedness	Invertebrate Habitat	Canopy Cover	Visual Assess. Score	Visual Assess. Rating
89	6	7	6	6	8	4	3	6	3	7	5.6	Poor
82	2	2	2	2	6	1	2	2	3	3	2.5	Poor
77	8	5	6	9	8	3	6	4	4	6	5.9	Poor
73	9	8	8	9	8	9	5	10	4	8	7.8	Good
71	6	3	6	9	4	8	8	3	6	3	5.6	Poor
69	7	9	6	9	4	8	9	3	8	8	7.1	Fair
64	8	9	6	9	5	8	9	5	8	8	7.5	Good
58	7	3	7	9	9	9	7	9	8	7	6.8	Fair
54	8	10	4	9	9	8	8	8	4	9	7.7	Good
51	8	10	2	9	9	4	8	7	7	9	7.3	Fair
46	8	10	4	9	9	4	7	8	9	9	7.7	Good
38	3	9	5	8	8	3	5	2	6	9	5.8	Poor
36	6	9	4	9	9	9	7	7	6	8	7.4	Fair
35	5	6	3	9	9	10	6	6	6	6	6.6	Fair
30	8	1	5	9	8	10	5	2	3	5	5.6	Poor

FIELD OBSERVATIONS OF CONCERN

Significant stream bank erosion was noted at 16 of 62 waypoints. Soil eroded from stream banks is transported and deposited downstream leaving key infrastructure vulnerable.

Sediment deposition has reduced flow capacity under several bridges significantly. This can create a pinch point during high flow events.

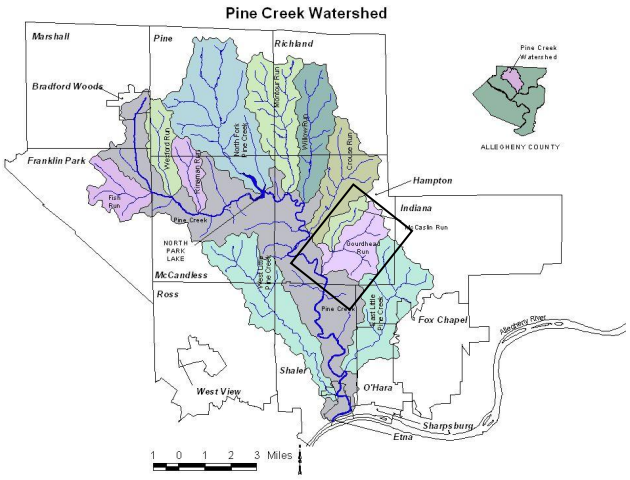
Debris jams were observed at two waypoints with trash tires noted at one other site. If moved by high flow events, they can create dams at road crossings.

A wetland was identified near the confluence of Crouse Run with Pine Creek stream. This area can absorb large volumes of rain water.

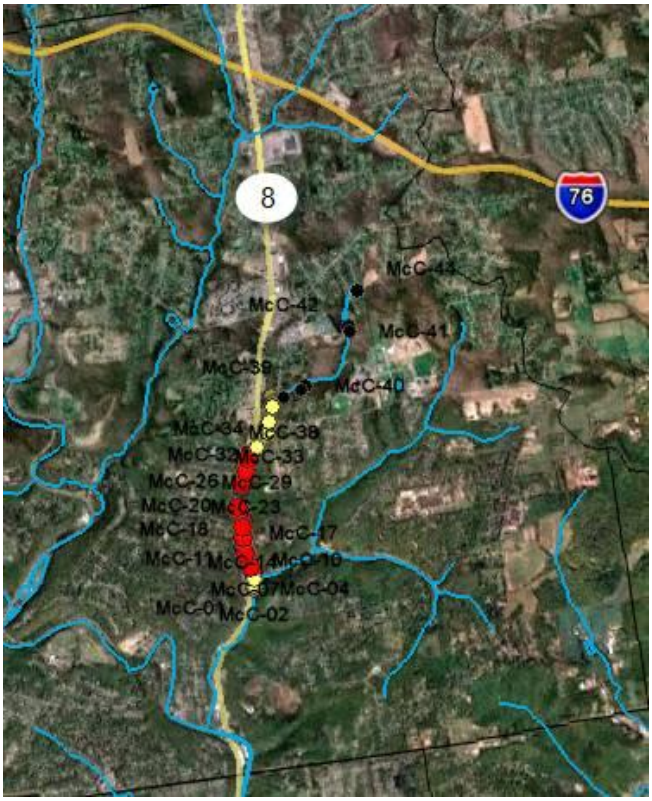
CROUSE RUN RESTORATION RECOMMENDATIONS

GPS Waypoint(s)	Areas of Concern and/or Opportunity	Proposed Project(s)	Photos	Priority Ranking	Relative Cost
CR-32	Severe Bank erosion on both sides of the stream	Streambank restoration	CR-115	M	$$$
CR-39	Bank erosion, channel widening, and debris jam	Streambank restoration	CR-125	M	$$$
CR-48	Severe bank erosion with exposed sewer line running down side of channel	Streambank stabilization	CR-134	H	$$$
CR-54	Bank erosion near sewer line	Streambank stabilization	CR-139	H	$$$
CR-70	Debris Jam and bank erosion	Stream restoration including restoring riparian trees and canopy cover	CR-159	M	$ / $$$
CR-83 to 89	Headwaters of Crouse Run along PA Turnpike	Stormwater management; stream day lighting and restoration; wetland enhancement	CR-174 to CR-185	H	$$$

5.8 McCASLIN RUN



Area	4.054 Sq. mile*
% of watershed	6.03%*
Number of segments studied	7
Linear miles studied	1.94
* Combined with Gourdhead Run	



WATERSHED OVERVIEW

Headwaters: McCaslin Run originates near the Hampton Township School District Athletic Field on Topnick Drive.

Mouth: McCaslin Run Merges with Gourdhead Run just south of Harts Run Road on the east side of Route 8.

Notable Features: McCaslin Run parallels Route 8, a busy four-lane corridor for over approximately a mile. Along much of this portion of its route, the stream valley has been modified to allow for roadside business and residential development. During the flooding of Hurricane Ivan, a large culvert under the Craighead Office complex was severely damaged. It was subsequently repaired with an expanded design.

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McCaslin Run has a very narrow, and in many places, constricted channel along its entire route. The narrower route results in greater erosion during storm events, putting adjacent structures at risk. While McCaslin Run is a small tributary, in contributes water from Route 8 and adjacent residential and commercial properties to Gourdhead Run, creating a large combined current that has created major flooding in storm events.
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SELECTED VISUAL ASSESSMENT DATA BY SEGMENT – McCaslin Run

Listed from upstream to downstream

Upstream Waypointt	Channel Condition	Riparian Zone	Bank Stability	Water Appear.	Nutrient Enrich.	Fish Barriers	In Stream Fish Cover	Embeddedness	Invertebrate Habitat	Canopy Cover	Visual Assess. Score	Visual Assess. Rating
44	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given
40	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given
36	8	9	8	8	8	6	3	8	2	8	6.8	Fair
27	5	8	4	8	6	9	5	5	1	7	5.8	Poor
16	4	4	6	8	4	3	4	5	3	5	4.6	Poor
08	9	6	6	8	4	8	4	5	3	5	5.8	Poor
02	7	7	8	9	9	10	3	7	5	3	6.8	Fair

FIELD OBSERVATIONS OF CONCERN

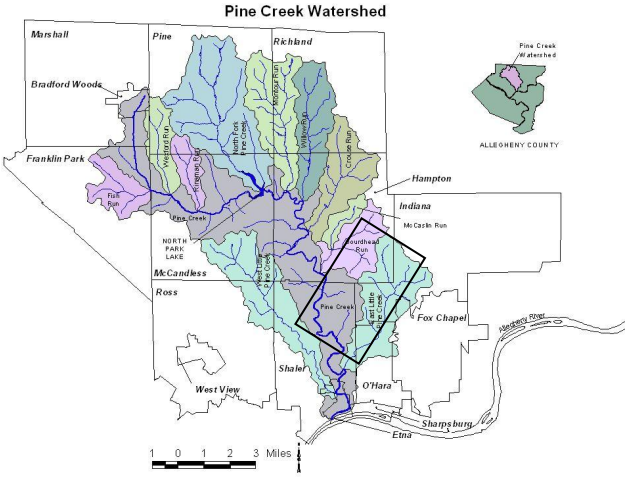
A deteriorated railroad tie retaining wall is no longer serving its original purpose and could contribute flooding debris to create dams in a storm event.

This collection of debris and culvert piping suggests an old retention area that should be dismantled. Several sites containing debris were identified that could dam corrugated steel culvert pipes downstream.

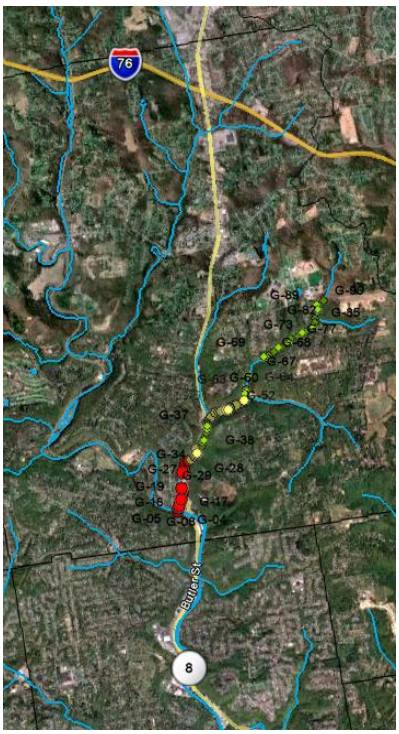
This type of erosion where McCaslin Run parallels Route 8 can jeopardize adjacent property and/or the roadway.

McCASLIN RUN RESTORATION RECOMMENDATIONS

GPS Waypoint(s)	Areas of Concern and/or Opportunity	Proposed Project(s)	Photos	Priority Ranking	Relative Cost
McC-11	High cut bank erosion	Stream restoration	IMG_0181	M	$$$
McC-14	Stream bank erosion	Stream restoration	IMG_0185 to IMG_0186	M	$$$
McC-23	Retaining wall partially blocking the stream	Remove debris and stabilize stream banks	IMG_200	H	$
McC-30	Channel blockage and severe erosion from Route 8	Remove culvert/debris and stabilize stormwater channel from Route 8	IMG_0216 to IMG_0217	H	$
McC-35	Stream blockage next to sewer manhole	Remove debris and stabilize around the manhole	IMG_0222	M	$
McC-43	Pond on private property	Work with landowners to improve habitat and/or stormwater management capabilities	IMG_0233 to IMG_0234	L	$



5.9 GOURDHEAD RUN



Area	4.054 Sq. mile*
% of watershed	5.6%*
Number of segments studied	17
Linear miles studied	2.52
* Combined with McCaslin Run	

WATERSHED OVERVIEW

Headwaters: Gourdhead Run begins among the housing developments near Middle Road north of McCully Road.

Mouth: Gourdhead collects the outflow of McCaslin Run at the bottom of Harts Run Road and continues south to empty into Pine Creek near Route 8 below Duncan Avenue.

Notable Features: Gourdhead Run collects water from two upland tributaries (Harts Run and McCaslin Run), as well as water draining off a busy four-lane state highway (Route 8). The sub-watershed includes diverse land uses ranging from highway commercial to hemlock covered steep slopes and medium and low density residential development.

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Because Gourdhead Run converges with main Pine Creek next to a busy state road (Route 8), it has been the source of significant flooding in the historical community known as Lower Allison Park.
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SELECTED VISUAL ASSESSMENT DATA BY SEGMENT – Gourdhead Run

Listed from upstream to downstream

Upstream Waypoint	Channel Condition	Riparian Zone	Bank Stability	Water Appear.	Nutrient Enrich.	Fish Barriers	In Stream Fish Cover	Embeddedness	Invertebrate Habitat	Canopy Cover	Visual Assess. Score	Visual Assess. Rating
91	8	9	6	6	8	9	7	8	7	9	7.7	Good
88	8	9	6	6	8	9	7	8	7	9	7.7	Good
83	8	9	6	6	8	9	7	8	7	9	7.7	Good
76	8	9	6	6	8	9	7	8	7	9	7.7	Good
68	8	9	6	6	8	9	7	8	7	9	7.7	Good
66	8	9	6	6	8	9	7	8	7	9	7.7	Good
61	6	7	7	8	6	9	4	8	2	8	6.5	Fair
55	9	9	7	7	7	9	3	6	2	8	6.7	Fair
45	9	9	2	7	9	9	3	8	2	8	6.6	Fair
44	9	9	7	7	9	9	3	8	2	8	7.1	Fair
43	9	9	8	9	8	9	6	9	6	8	8.1	Good
42	7	7	8	9	9	10	3	7	5	3	6.8	Fair
41	9	9	8	9	8	9	6	9	6	8	8.1	Good
30	6	7	8	9	9	7	3	9	4	4	6.6	Fair
23	3	3	3	8	6	7	3	7	1	4	4.5	Poor
13	3	3	3	8	6	7	3	7	1	4	4.5	Poor
07	1	1	10	4	8	4	1	7	1	1	3.8	Poor

FIELD OBSERVATIONS OF CONCERN

The lower reaches of Gourdhead Run have been hard-channeled where it runs along residential or commercial development sections parallel to Route 8.

Upper reaches have accumulated piles of tree limbs and trunks as well as human generated debris in the valley parallel to McCully Road.

A small outfall indicating the presence of Abandoned Mine Drainage (AMD) was found in the valley below McCully Road.

Reduced opportunities for infiltration and concentrated outflows from roads and developments have contributed to accelerated erosion in the valley below McCully Road.

Thick stands of Japanese Knotweed exist in several locations. This exotic invasive species displaces local species that provide valuable nutrients to the stream food web.

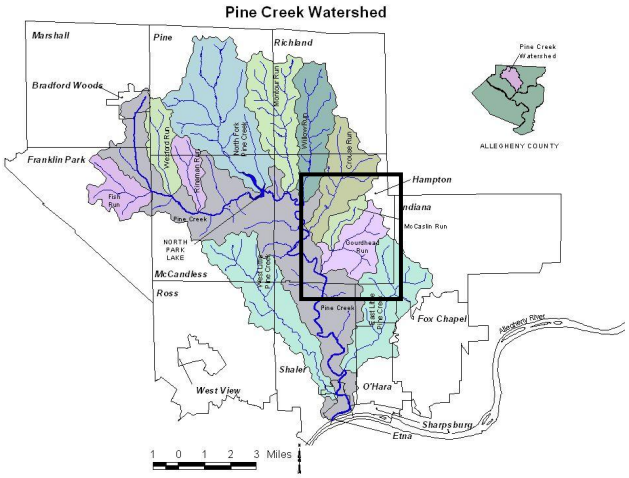
Numerous exposed pipes exist in the stream channel, including some that are totally corroded.

The floodplain of the Gourdhead valley below McCully Road shows unauthorized recreational use of the area including debris snagged on fallen trees.

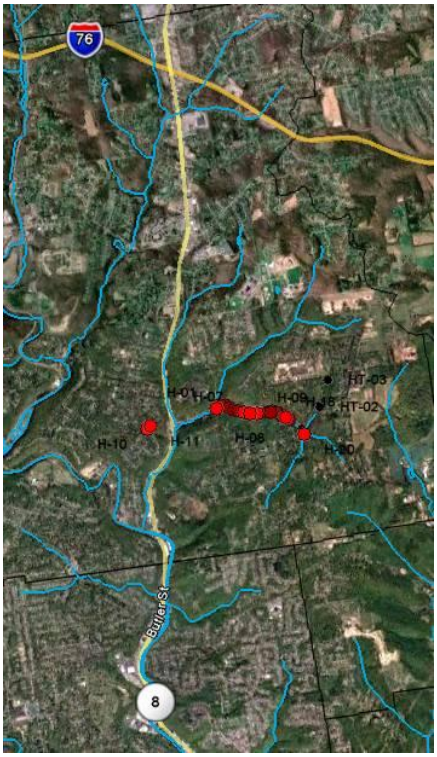
Gabion baskets supporting the slope along Route 8 are no longer supporting the road bank which could contribute to collapse of the road bed.

GOURDHEAD RUN RESTORATION RECOMMENDATIONS

GPS Waypoint(s)	Areas of Concern and/or Opportunity	Proposed Project(s)	Photos	Priority Ranking	Relative Cost
G-02-07	Walled section of Gourdhead Run near confluence with Pine Creek	Install stream habitat and flow control structures to prevent sedimentation	Photo_05 to Photo_11	M	$$$
G-17	Steep slope with bank erosion	Stream bank stabilization along with slope stabilization	Photo_26 to Photo_30	L	$$$
G-32	Stormwater gully from right hand side facing upstream	Look at stormwater facility upslope of this gully	IMG_0055	M	$
G-45	High bank cut erosion	Stream restoration	IMG_0075	L	$$$
G-50-52	Stream blockage and utility diversion	Remove debris jam and work with utility to relocate line below stream bed.	IMG_0081 to IMG_0084	M	$$
G-58-60	Undercut stream bank and floodplain area	Stream restoration	IMG_0089 to IMG_0094	M	$$$
G-62	Old Retention Pond	Study the possibility of retrofitting to control stormwater in the area	IMG_0127 to IMG_0130	M	$
G-69-70	Trash in stream/floodplain	Work with landowner to clean up	IMG_0142 to IMG_0144	L	0
G-87	Stream bank erosion	Stream restoration	IMG_0160	M	$$$



5.10 HARTS RUN



Area	4.054 sq. mile*
% of watershed	6.03%
Number of segments studied	3**
Linear miles studied	1.32

* Combined with Gourdhead Run and McCaslin Run
**3rd segment photographed only

WATERSHED OVERVIEW

Headwaters: The headwaters of Harts Run fall within Hampton Township near Hartwood Acres around the intersection of Middle Road and Harts Run Road. The area has relatively light density development but deeply sloped terrain in the stream valleys.

Mouth: Confluence with Gourdhead Run at Rosanna Drive and Harts Run Road.

Notable Features: Much of Harts Run stream lies within a Hemlock lined valley with housing developments along the hilltops bordering the valley and a few homes and businesses within the stream valley itself. The stream drops approximately 200 feet in within its short course along Harts Run Road.

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While sections of Harts Run retain a healthy riparian zone and forested canopy, the main Harts Run stream's channel has been impacted in places by development along its route parallel to Harts Run Road. Both the roadbed of Harts Run Road and the residential and business properties on the stream side of Harts Run Road have constricted the stream channel and eliminated the natural flood plain of the stream.

Harts Run Road spans much of the valley floor so properties along the road have used retaining walls to expand their lots. The constriction of the stream channel behind these
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properties concentrates the stream during high flow events which puts more force against the remaining natural stream banks. This contributes to the erosion of adjacent slopes found in several areas.

Piles of natural debris (dead tree limbs, etc.) present a risk if carried downstream to create dams against the several culverts present along the stream's route. Materials stored on streamside lots within reach of high water flows present a similar risk.

SELECTED VISUAL ASSESSMENT DATA BY SEGMENT – Harts Run

Listed from upstream to downstream

Upstream Waypoint	Channel Condition	Riparian Zone	Bank Stability	Water Appear.	Nutrient Enrich.	Fish Barriers	In Stream Fish Cover	Embeddedness	Invertebrate Habitat	Canopy Cover	Visual Assess. Score	Visual Assess. Rating
20	3	7	7	8	9	9	5	5	2	8	6.3	Fair
09	5	6	6	8	8	9	4	7	4	8	6.5	Fair
Trib	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given	Not given

FIELD OBSERVATIONS OF CONCERN

Retaining walls increase erosion of flowing water in high flow events by narrowing channel

Debris can be caught against culverts in high flow event, creating dams.

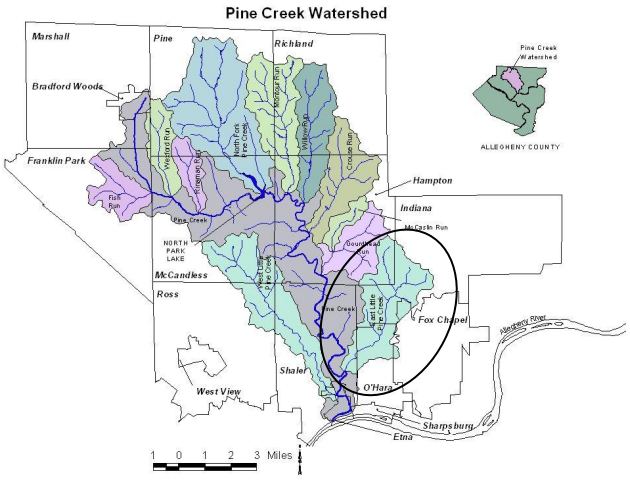
The constricted channel contributes to erosion of steep banks.

Severe erosion near the mouth of Harts Run on the south side of the stream puts a large hillside at risk.

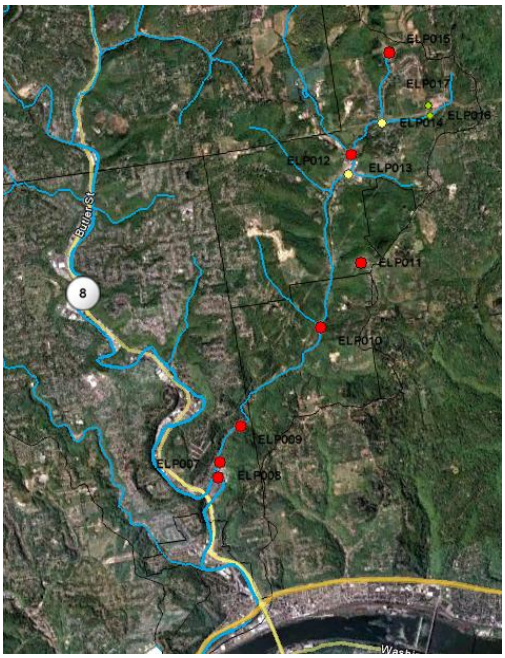
HARTS RUN RESTORATION RECOMMENDATIONS

GPS Waypoint(s)	Areas of Concern and/or Opportunity	Proposed Project(s)	Photos	Priority Ranking	Relative Cost
H-07-09	Stream bank erosion	Stream restoration	IMG_0102 to IMG_0105	M	$$-$$$
H-13	Stream bank erosion	Stream restoration	IMG_0111 to IMG_0112	M	$$-$$$
H-17	Stormwater gully from left hand side facing upstream	Look at stormwater facility upslope of this gully	IMG_0117	M	0

5.11 EAST LITTLE PINE CREEK



Area	5.720
% of watershed	8.51%
Number of sections studied	9
Linear miles studied	5.44



WATERSHED OVERVIEW

Headwaters: The headwaters of East Little Pine Creek draw from an area including part of Hartwood Acres County Park, neighboring farmland and low density residential areas between Middle Road and Dorseyville Road in Hampton and Indiana Townships.

Mouth: East Little Pine merges with main Pine Creek behind the Shaler Plaza shopping Center on Route 8 (William Flinn Hwy.) and Saxonburg Blvd.

Notable Features: Most of the East Little Pine Creek sub-watershed is currently fairly undeveloped, but development continues, especially within its upstream portion. Because East Little Pine drains into a commercial district, downstream flooding is a major concern. A storm in 1986 dropped 8 inches of rain in 2 hours resulting in major damages to lower Shaler Township and Etna Borough, dubbed the "Saxonburg Flood." Much of the damage was incurred due to debris piling up against bridges, creating impromptu dams. Subsequent steps, including the construction of a debris gate, have been taken to reduce that concern.

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East Little Pine has demonstrated its potentially devastating impact on downstream communities. Investments in streambank stabilization and restoration will reduce erosion and downstream sedimentation. Similarly, a pro-active approach to
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protection of areas known to allow infiltration of rain water should be pursued as aggressively as possible while there are still undisturbed infiltration zones.

SELECTED VISUAL ASSESSMENT DATA BY SEGMENT - East Little Pine

Listed from Upstream to Downstream

Upstream Waypoint	Channel Condition	Riparian Zone	Bank Stability	Water Appear.	Nutrient Enrich.	Fish Barriers	In Stream Fish Cover	Embeddedness	Invertebrate Habitat	Canopy Cover	Visual Assess. Score	Visual Assess. Rating
17	10	10	9	10	8	10	5	8	5	9	8.4	Good
15 Trib	8	9	7	9	9	9	2	2	2	2	5.9	Poor
14	7	10	7	10	9	8	5	7	6	3	7.2	Fair
13	2	7	6	9	8	7	3	7	5	6	6.0	Poor
12	7	8	7	9	9	10	4	7	3	5	6.9	Fair
11	3	3	6	10	8	7	3	4	3	3	5.0	Poor
10	3	3	7	10	8	8	3	4	3	2	5.1	Poor
9	3	2	8	10	8	10	2	3	2	2	5.0	Poor
8	2	1	8	10	8	10	2	3	2	2	4.8	Poor

FIELD OBSERVATIONS OF CONCERN

Evidence of upstream erosion is evident in sediment deposition in the lower reaches of East Little Pine. Reduced channel capacity from sediment deposition increases the risk of flooding.

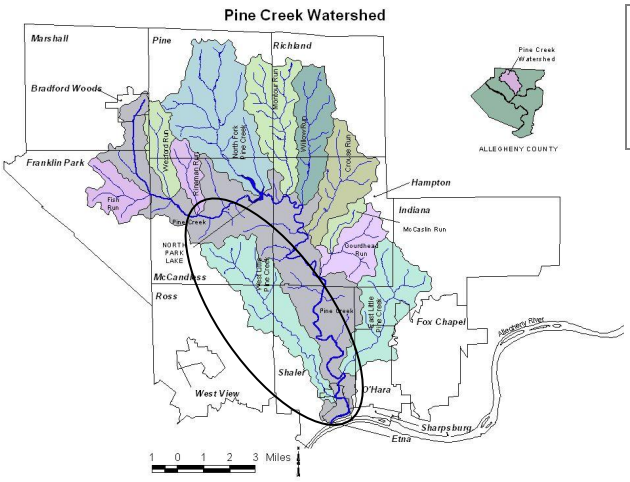
East Little Pine has numerous older bridge structures in various stages of repair.

Old retaining structures that have not been maintained present a risk of hillside collapse and can contribute debris in high flow events.

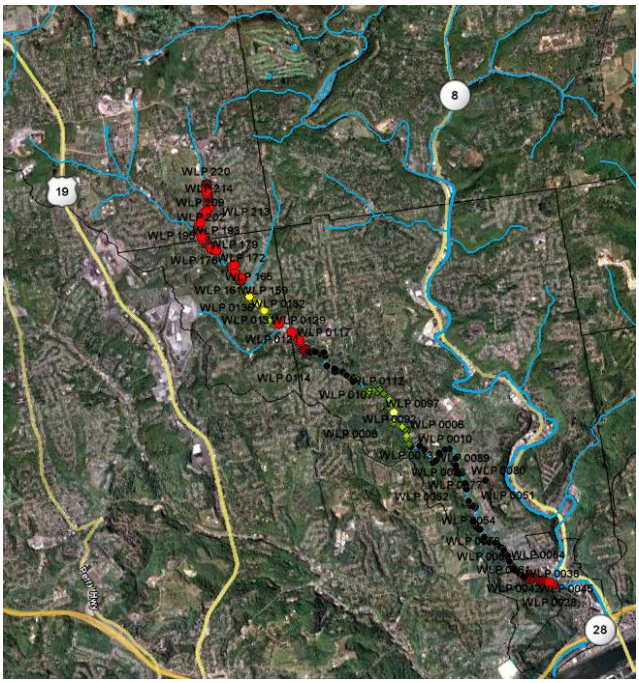
Natural infrastructure areas such as this grassland in the headwaters of East Little Pine present valuable rain water absorption zones.

EAST LITTLE PINE CREEK RESTORATION RECOMMENDATIONS

GPS Waypoint(s)	Areas of Concern and/or Opportunity	Proposed Project(s)	Photos	Priority Ranking	Relative Cost
ELP 007	Walled stream channel with large accumulation of sediment	Stream restoration with removal of accumulated sediments	Picture 028	H	$-$$
ELP 011	Corroding bridge carrying Saxonburg Blvd. near Shady Lane; with sedimentation built up under the bridge	Bridge and stream channel restoration	Picture 045	M	$$-$$$
ELP 012	Collapsed wood wall holding up stream bank	Bank stabilization	Picture 57	L	$-$$
ELP 017	Headwaters of ELP Creek along power line	Conservation/land preservation	Picture 80	M	$$-$$$



5.12 WEST LITTLE PINE CREEK



Area	6.824 sq mi
% of watershed	10.15 %
Number of segments studied	16
Linear miles studied	5.92

WATERSHED OVERVIEW

Headwaters: The uppermost extent West Little Pine's watershed is the vicinity of North Allegheny Intermediate High School and LaRoche College in McCandless Township.

Mouth; West Little Pine meets main Pine Creek behind the community ball field in Etna Borough. It is not channelized and is one of the most dramatic natural areas in the watershed with a forested cliff on the west side. The confluence is not accessible by road. A small park with a trail to the confluence has been constructed by the Borough.

Notable Features: West Little Pine is the largest tributary in the Pine Creek Watershed. Its lower reaches travel through one of the most densely developed communities in the watershed, Etna Borough, which has sustained numerous catastrophic floods. Much of West Little Pine contains a sewer line with a Combined Sewer Overflow sewer configuration as part of the ALCOSAN sewer system. A realignment of West Little Pine Creek and West Little Pine Road was implemented in the late 1950s to reduce the number of bridges along the stream valley. Local residents attribute that realignment, combined with development upslope to significant increases in flooding. To reduce the risk to chronically flooded homeowners, Shaler

Township recently purchased and demolished several homes along West Little Pine Creek with funding from FEMA/PEMA.

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The scope of this study was limited to the bottom two thirds of West Little Pine. The lowest portion of West Little Pine, as it travels through Etna Borough, is armored with concrete channel walls. Heading upstream, the next approximately 25 % of the stream travels through a relatively undisturbed valley since much of the development of that portion of the watershed has occurred on ridge tops. The upper half of the watershed is considerably flatter and has supported more uniform development from adjacent to the stream outward.

The force of the cumulative volume of water from upstream areas is evident in dramatic high scour walls of erosion in the mid and lower reaches of the watershed. The sediment removed by erosion settles out in the flatter lowest reaches, contributing to frequent flooding in Etna Borough and Shaler Township.

Debris jams in the stream also contribute to erosion as the stream creates alternative channels. Regular monitoring and removal of these debris jams is a cost-effective way to reduce the risk to downstream residents and businesses.

The extensive erosion found in much of the stream channel also points to a need to enhance or retrofit stormwater management practices in the areas already developed and vigorously enforce the use of Best Management Practices (BMP). Several stream restoration or stream deflection projects in carefully selected sites could result in considerable reduction of additional erosion.

Japanese Knotweed has colonized large sections of West Little Pine and should be addressed for several reasons. The damage Japanese knotweed causes to the environment led the World Conservation Union to include it on their list of the 100 worst invasive species on the planet. By preventing native vegetation from growing it reduces species diversity and has a negative impact on the balance of the ecosystem. The potential economic impact of knotweed along streams has not been published, but to the extent that it hinders the natural nutrient cycle of stream ecosystems, and excludes native woody plant stock, economic impact might be considered sizable.
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SELECTED VISUAL ASSESSMENT DATA BY SEGMENT – West Little Pine

Listed from upstream to downstream

Upstream Waypoint	Channel Condition	Riparian Zone	Bank Stability	Water Appear.	Nutrient Enrich.	Fish Barriers	In Stream Fish Cover	Embeddedness	Invertebrate Habitat	Canopy Cover	Visual Assess. Score	Visual Assess. Rating
223	4	4	3	8	7	4	3	5	5	4	4.7	poor
204	2	3	3	7	7	6	6	5	7	9	5.5	poor
179	4	3	6	7	7	8	4	3	4	2	4.8	poor
170	5	5	4	6	7	8	5	7	8	7	6.1	fair
138	5	8	5	9	7	9	10	9	9	8	7.9	Good
132	3	2	4	9	7	9	5	8	6	6	5.9	Poor
124	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
101	7	10	8	9	8	7	8	5	8	8	7.8	Good
1	4	5	3	7	8	9	7	7	8	7	6.5	Fair
8	7	10	7	9	9	9	8	8	8	7	8.2	Good
90	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
48	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
75	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
69	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
36	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
34	3	TBD	8	10	7	5	1	3	3	3	4.8	Poor

FIELD OBSERVATIONS OF CONCERN

The most common issue observed on West Little Pine is streambank erosion in various forms. Here the erosion threatens businesses and a large tree that could block the channel if it falls.

Erosion is impacting residential properties, in this case as it is decreasing the size of a residential yard.

Erosion also threatens utility infrastructure. Here a pipe that had originally been cemented over is now exposed.

This section of West Little Pine portrays a history of homeowners struggling with increasing pressure on the streambanks behind their properties. The increased height of the retaining wall in background, and erosion at the top of the wall in the foreground show the need for reduced flows and better streambank management.

As elsewhere, debris from fallen trees presents a real hazard to streambank stability as water deflected by the debris seeks an alternate route, here eroding the far bank.

Even the most sturdy bank armoring designs have proven unequal to the force of West little Pine in its southern reaches. Here, a road is in jeopardy if the wall fails.

Soil types directly impact erodibility of streambanks. Here, an old fill pile, perhaps of ash from historical steel plants nearby has eroded into a high wall.

The lower reaches of West Little Pine have received large volumes of sediment from the upper portions of the watershed during storm events. In some areas the deposits have become problematic because they reduce the capacity of the constricted channel during high flow events.

West Little Pine hosts an enormous amount of Japanese Knotweed, the invasive exotic plant that shades out native bushes that provide critical nutrient base to a healthy stream ecosystem.

WEST LITTLE PINE CREEK RESTORATION RECOMMENDATIONS

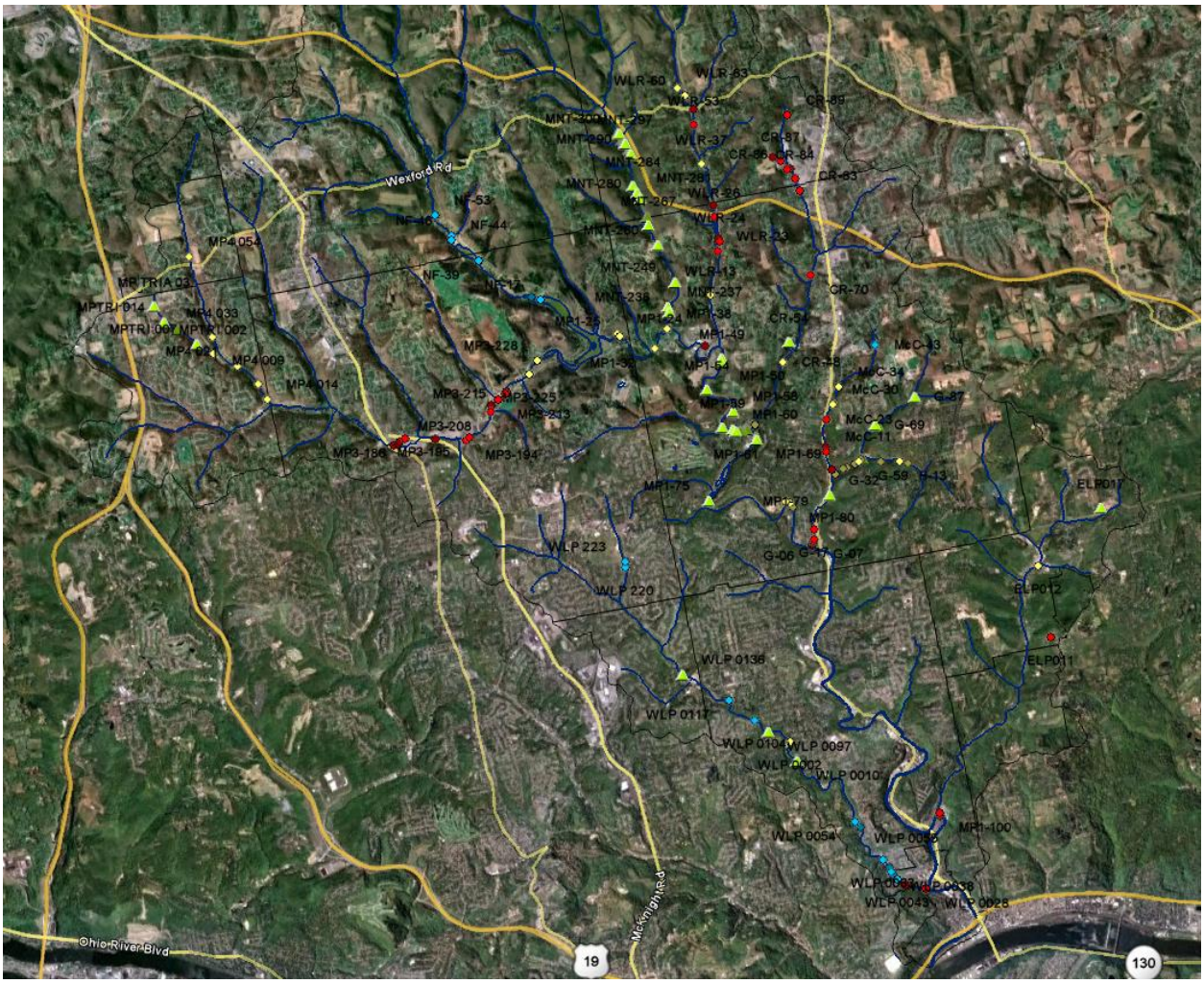
GPS Waypoint(s)	Areas of Concern and/or Opportunity	Proposed Project(s)	Photos	Priority Ranking	Relative Cost
WLP 0002	Stream bank erosion at Fawcett Field	Stream restoration	WLP_0014	H	$$$
WLP 0010	Braided stream channel	Stream restoration	WLP_0042	M	$$-$$$
WLP 0013	Stream blockages and bank erosion	Stream restoration	WLP_0052 to WLP_0054	M	$

GPS Waypoint(s)	Areas of Concern and/or Opportunity	Proposed Project(s)	Photos	Priority Ranking	Relative Cost
WLP 0033	Floodwalls along stream with heavy siltation	Install bed load movement structures between walls across the stream channel	WLP_0080 to WLP_0082	M	$-$$
WLP 0037-39	Severe bank erosion and heavy sedimentation through this section of stream	Total channel reconstruction and bank stabilization	WLP_0085 to WLP_0095	H	$$$
WLP 0041	Corrugated steel dam across stream channel backing up large quantities of bed load material	Remove dam and redefine stream channel	WLP_0105 to WLP_0109	H	$$
WLP 0054-55	Concrete banks on channel undercut	Repair flood control channel	WLP_0143 to WLP_0146	M	$$-$$$
WLP 0063	Channel filled up with bed load material, needs reworked	Stream restoration	WLP_0157 to WLP_0160	L	$$
WLP 0075	Erosion from roadside stormwater outfall; and breakdown of concrete channel protection	Repair outlet protection and stabilize concrete channel	IMG_5284 to IMG_5285	M	$$=$$$
WLP 0097	High erosion bank (approx. 7 feet high) on east side of stream	Stream restoration	none	M	Need info
WLP 0104	Erosion and stream blockage	Stream restoration	IMG_5437 to IMG_5438	M	44
WLP 0117	Sanitary sewer manhole and undercut bank	Stream restoration	none	M	Need info
WLP 0136	Sanitary sewer manhole erosion and 24-inch outfall	Bank protection and SW outfall erosion protection	none	L	Need info

6.0 CONCLUSIONS AND MANAGEMENT RECOMMENDATIONS

6.0.a Map of Recommended Project Sites

This map displays the waypoints associated with recommended project sites.



Over 56 linear miles of stream channels containing 122 segments in the Pine Creek watershed were evaluated using the USDA Visual Assessment protocol. The watershed has reaches (segments) ranking poor, fair, and good (no streams ranked excellent). While some streams showed a significant trend in the score of one parameter or another (e.g., bank stability) from the upstream to downstream portions, there was no consistent trend in ranking from the headwaters to the mouth of any tributary. Stream reaches that had little adjacent development, relatively few storm drains entering them, and that retained forested riparian zones generally showed fair to good quality.

While this study encompassed a major portion of the watershed, additional work is needed in evaluating the condition of the stream channels in the Pine Creek watershed. Fish Run, Wexford Run and Rinaman Run as well as most unnamed tributaries were not covered by this assessment. Furthermore, this study did not extend into the highest headwater sections of several tributaries, including West Little Pine, North Fork, Willow Run, and Montour Run. These high headwater areas encompass very significant acreage and stream mileage.

The data collected from the assessment show several consistent issues of concern:

6.1 Erosion

Erosion is present in every stream studied within the watershed, in minor or major degrees. While erosion is a natural phenomenon, the erosion in many sites in the Pine Creek watershed was accelerated erosion, creating entrenched streams and undercut banks. Factors contributing to the erosion included soil types, concentrated flows from storm drains, destabilized riparian zones, force from accumulated flow volumes and acceleration due to drops in altitude, and impacts from in-stream obstacles whether man-made or nature-made (debris jams).

6.1.a Risk to Infrastructure

Erosion has already placed significant infrastructure (pipes and manholes for example) in jeopardy as they are either completely suspended or exposed, or are in risk of being so relatively quickly. In some places roadways and above ground utilities are also at risk as erosion undercuts the retaining wall or roadbed of an area. Several residential and commercial properties are losing significant portions of their property from stream erosion. The loss is continual but is especially noticeable after large storm events.

6.1.b Downcutting

The impact of erosion on streambank vegetation is a major concern. When a stream erodes its channel to the point that it can no longer access its floodplain, it becomes entrenched. The force of the stream then scours the streambed floor and deepens the channel. This is called downcutting. This cycle creates a destructive spiral where the force of the stream continues to deteriorate the condition of the channel because it cannot release pressure by expanding into its floodplain. Many sites were found where the stream has become entrenched, and is now undercutting large trees, creating yet another threat to stream conditions and flooding. These areas would involve major work and expense to restore to a stable condition.

Even armored sections of stream channels have been damaged and weakened in some areas, risking additional damage to areas behind or above the wall.

Walls along upper and lower reaches of West Little Pine showed significant damage and weakening.

6.2 Debris Jams

Debris jams within the stream channel include collections of tree trunks and limbs as well as other detritus including bridges, structural elements, tires, rubbish, and prunings/cuttings/clippings they've snagged. A large number of debris jams were seen throughout the watershed. While these jams might appear harmless during normal flow periods, they can break away and become lodged against bridge pilings or culverts or other structures creating dams downstream or just do damage to structures they encounter while in the current. The risk of this was seen extensively during the Hartwood Flood of 1986. Debris jams are a relatively less expensive issue to address, but have become a source of debate as to responsibility. Volunteers can be an invaluable resource in monitoring for and removing debris jams. Ongoing monitoring for the presence of these hazards should be a priority.

It should be noted that beaver activity is evident is some portions of the watershed. The extent to which beaver contribute to debris jams or other means of destabilizing streambanks should be explored.

6.3 Riparian Zone Encroachment

The manner in which the riparian zone is managed by owners of property abutting the stream is a major factor in determining the stability of streambanks. The capacity of trees and shrubbery to stabilize streambanks and minimize erosion by having roots hold soil in place is apparent when forested/shrubby stream reaches are compared with those mowed to the edge. Property owner education and enforcement of ordinances designed to protect the riparian zone can be very beneficial in reversing encroachment into the riparian zone and the denuding of woody vegetation.

Privately built structures such as bridges or gazebos spanning headwater streams were found in several places. These structures are built on the assumption that the stream is a relatively static feature and do not take into account the potential increase in scale and force of a stream, even in headwater areas. While these homeowners appreciate the aesthetic value of the stream, they do not appreciate the sensitivity of the stream channel they have modified, or the risk to downstream residents, should their structures be dislodged in a flood event.

This also applies to the storage of materials along the stream channel where the materials are at risk of being swept downstream during a high flow event. Items such as tires, sheds, equipment, firewood, etc… all serve as both scouring tools and dam elements when borne by downstream by water during storm events. The potential for debris being carried through this watershed during a storm was seen when a picnic table from North Park was retrieved several miles downstream in Shaler Township after

flooding from Hurricane Ivan. Homeowners, business owners, and municipalities should all be vigilant about keeping material out of the potential reach of the stream.

6.4 Illegal dumping and debris

Historical dump sites, more recent illegal dump sites, and litter were found in several locations. Depending on the nature of the material, it can harbor mosquitoes, cause damage if carried downstream or cause injury to people or wildlife active in the area. These sites are relatively easy and inexpensive to clear, with permission from the property owner and properly equipped volunteers and/or professionals, and should be considered a short term priority.

6.5 Sedimentation

Soil scoured from stream channel walls and floor during a storm settles out when the current slows down enough to allow gravity to overcome flow forces. This generally happens in the flatter reaches of the stream, especially in the downstream portions of the watershed. Because these lower portions of the watershed are the most densely developed, the sediment in the stream channel presents special concern as it decreases the capacity of the channel to conduct water without having it overflow its banks causing flooding.

Disturbance of a rocky bottom to remove sediment can do more damage than leaving it, as equipment can destabilize the streambed which can promote more erosion. Sediment removal is recommended only in areas where the stream channel floor has been cemented.

Most of the species native to Pennsylvania's streams require a stream bottom with rocks and pebbles and clean water for survival. The extensive erosion and sedimentation in the Pine Creek watershed significantly impacts stream life. Any work done in the watershed that can conserve or restore the natural rocky stream bottoms will help to provide a better environment for a complex and sustainable stream ecosystem. Since both people and aquatic species benefit from stable, uneroded streams, it is clear that the fate of both are linked through stream management and conservation.

6.6 Exotic Invasive Plants

Japanese knotweed (*Fallopia japonica)* is a prominent exotic invasive in the Pine Creek watershed. Well established colonies of the plant can be found in several segments of the watershed. While it does not necessarily destabilize stream banks, knotweed crowds out native flora that contribute to the food web of the stream ecosystem. Knotweed, an alien species, is not recognized by the bacteria which decompose leaf matter, the first stage in the nutrient chain in the system.

Other exotic invasive species that are found in the watershed include Border Privet. (*Ligustrum obtusifolium),* bush honeysuckles (*Lonicera spp.)*, barberry (*Berberis spp.)*, Buckthorn (*Rhamnus spp*.), multiflora rose (*Rosa multiflora*), purple loosestrife (*Lythrum salicaria*), porcelain berry (*Ampelopsis brevipedunculata*), and Oriental bittersweet (*Celastrus orbiculatus).* Each of these species displace native species that have evolved to provide nutrients in the local aquatic ecosystems.

6.7 Restoration Priorities

Restoration projects have been recommended for each subbasin in the Pine Creek Watershed. The greatest emphasis for restoration work has been placed in the upland portions of the watershed since this is where the greatest potential improvement for overall stream conditions should originate.

There are several observations that demand further investigation. Particularly striking is the difference between Montour Run and Willow Run. The differences in development due to or as a result of street access and sewer lines are striking. While Willow Run, with a sewer line, rail line and parallel roadways, shows erosion and a number of other issues resulting in poor and fair scores for much of its length, Montour Run, which is immediately to its west has predominantly good ranking. The potential for the sewer line construction to destabilize a streambed and foster later erosion is an issue that bears further scrutiny and consideration.

If flooding downstream is exacerbated by conditions upstream, the results of the stream assessments in the headwater regions are of particular concern and merit careful scrutiny when any major project is under consideration.

Review and prioritization of projects across the watershed will be done on an ongoing basis as local priorities and funding opportunities arise.

* * * * *

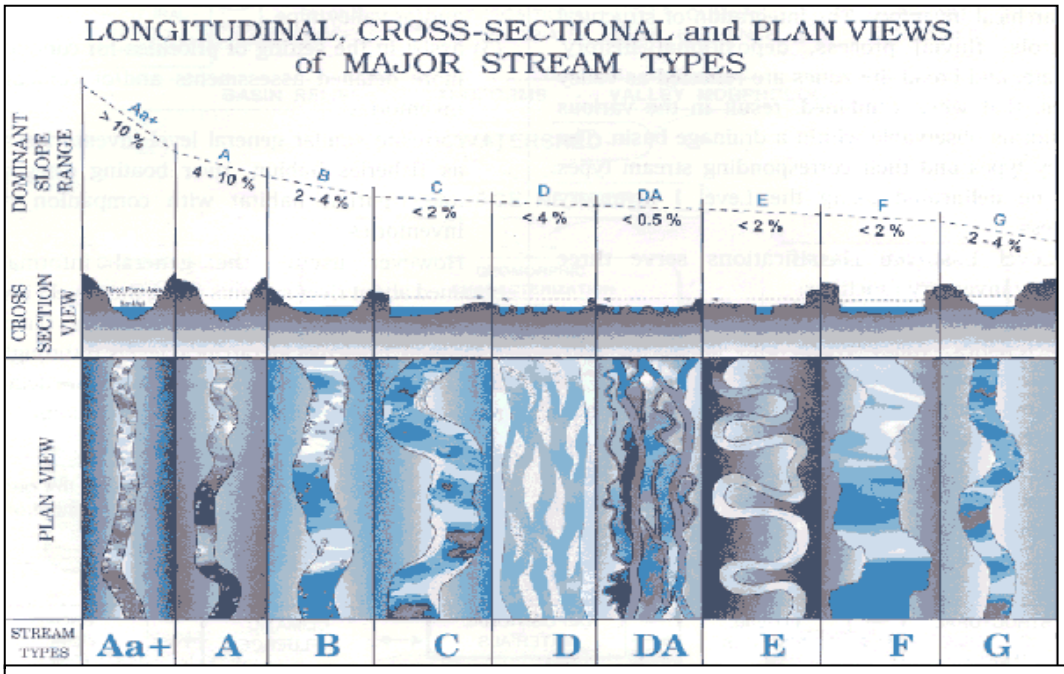
7.0 ATTACHMENTS

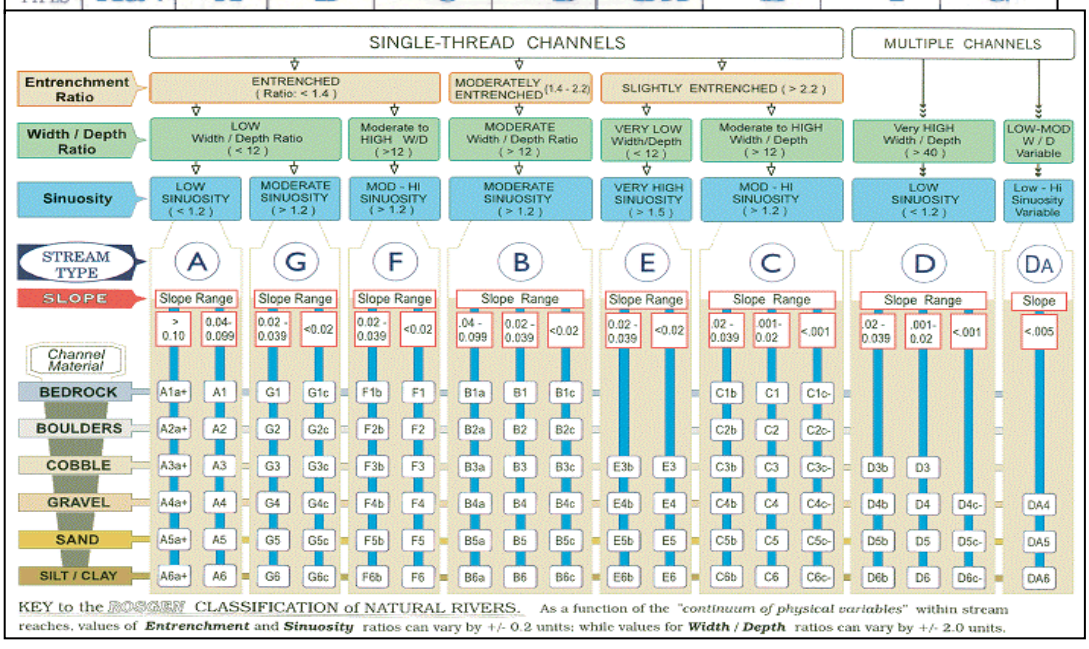
7.1 USDA Protocol

Riparian Assessment Protocol USDA.pdf provided on attached DVD.

7.2 Rosgen Protocol

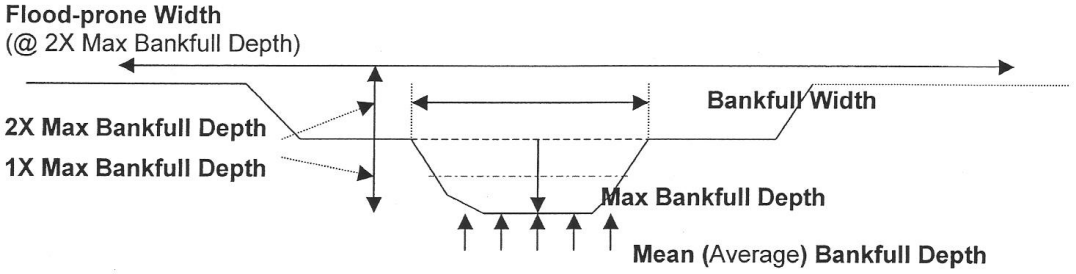
A power point presentation about the Rosgen Protocol was provided during assessment training. Stream monitors then received the following classification aids as part of their equipment and data sets.

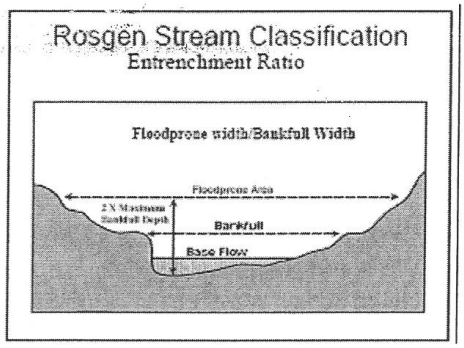




Pine Creek Visual Assessment **Stream Section Waypoints Start/End:**_____
Date: _____

ROSGEN STREAM CLASSIFICATION MEASUREMENTS





http://www.cnr.uidaho.edu/range357/notes/Riparian-Classification-Presentation-05.pdf

DEFINITIONS

- **Bankfull Width** – Width in riffle using bankfull indicators (scour lines, depositional features, vegetation breaks)
- **Max Bankfull Depth** – Depth in a riffle from the deepest part of the channel to the bankfull elevation
- **Flood-prone Width** – The flood-prone width is measured at the elevation that corresponds to twice the maximum depth of the bankfull channel as taken from the established bankfull stage. MIGHT NEED TO BE AN ESTIMATE.
- **Mean Bankfull Depth** – Average depth of the bankfull channel in a riffle cross section; average of 5 measurements across channel.
- **Entrenchment ratio** – (Flood-prone Width / Bankfull Width)
- **Width/Depth Ratio** – (Bankfull Width/Mean Bankfull Depth)

7.3 Visual Assessment Score Sheet (Edited to Fit)

Pine Creek Watershed Visual Assessment

Evaluators' Names_____ Date: _____

Sub-Watershed _____

Starting Waypoint # _____ LAT _____ LONG _____ PHOTO #s _____

Ending Waypoint # _____ LAT _____ LONG _____

PHOTO #s _____

Weather Conditions Today _____

Past 2-5 Days _____

Starting point: pH _____ Conductivity _____ Ending waypoint: pH _____ Conductivity _____

Land use within drainage upstream of this section (%):					
Grazing Pasture		Grassy Field		Row Crops	
Forest		Residential		Industrial	
Commercial		Abandoned Mine Lands		Other	

Describe the land use on both sides immediately adjacent to the stream section
(type of forest, farmland, residential, and/or commercial) :

Substrate (%):									
Boulder		**Cobble**		**Gravel**		**Silt**		**Mud/Clay**	

Other Waypoints
(pipe outlets, debris jam, erosion, wetlands, invasive plants, tributary entry, etc.**)**

#	Latitude	Longitude	Photo # s	Description (size, composition, species, etc.)

Trash / Litter?_____

VISUAL ASSESSMENT SCORING		
Parameter	*Score*	*Explanation of Score Given*
Channel condition		
Riparian zone		
Bank stability		
Water appearance		
Nutrient enrichment		
Fish barriers		
In-stream fish cover		
Embeddedness		
Invertebrate habitat		
Canopy Cover		
AMD (if applicable)		
Sewage (if applicable)		
Manure presence (if applicable)		
TOTAL SCORE (Add all scores and divide by number of scores given)	___	< 6.0 = POOR 6.1 – 7.4 = FAIR 7.5 – 8.9 = GOOD > 9.0 = EXCELLENT

ROSGEN CLASSIFICATION MEASUREMENTS & STREAM TYPE							
Waypoint #	**Bankfull width**	**Max Bankfull Depth**	**Flood-Prone Width***	**Mean Bankfull depth ****	**Entrench-ment Ratio*****	**Width/ Depth Ratio*****	**Stream Type*****

** Might need to be estimated ** note depths below *** Can be completed at home*

Depth 1	Depth 2	Depth 3	Depth 4	Depth 5	Depth 1	Depth 2	Depth 3	Depth 4	Depth 5

DRAWING OF STREAM SEGMENT ~ AERIAL VIEW

Scoring Descriptions

Each assessment element is rated with a value of 1 to 10. Rate only those elements appropriate to the stream reach. Record the score that best fits the observations you make based on the narrative description provided.

Channel Condition			
Natural channel; no structures, dikes. No evidence of down-Cutting or excessive lateral cutting.	Evidence of past channel alteration, but with significant recovery of channel and banks. Any dikes or levies are set back to provide access to an adequate flood plain.	Altered channel; <50% of the reach with riprap and/or channelization. Excess ***aggradation***; braided channel. Dikes or levees restrict flood plain width.	Channel is actively downcutting or widening. >50% of the reach with riprap or channelization. Dikes or levees prevent access to the flood plain.
10 9 8	**7 6 5 4**	**3 2**	**1**

aggradation*: The process by which a stream's gradient steepens due to increased deposition of sediment.*

Keys: look for things like down cutting, lateral cutting, altered or widened sections, dykes, levees or other obstructions.

Riparian Zone				
Natural Vegetation extends at least two active channel widths on each side.	Natural vegetation extends one active channel width on each side. Or If less than one width, covers entire flood plain.	Natural vegetation extends half of the active channel width on each side.	Natural vegetation extends a third of the active channel width on each side. Or Filtering function moderately compromised.	Natural vegetation less than a third of the active channel width on each side. Or Lack of regeneration. Or Filtering function severely compromised.
10 9	**8 7 6**	**5 4**	**3 2**	**1**

Keys: Related to ACTIVE channel width, an example would be a 5’ wide stream. 10’ = 2x active channel width.

Bank Stability			
Banks are stable; at elevation of active flood plain; 33% or more of eroding surface area of banks in outside bends is protected by roots that extend to the base-flow elevation.	Moderately stable; at elevation of active flood plain; less than 33% of eroding surface area of banks in outside bends is protected by roots that extend to the base-flow elevation.	Moderately unstable; banks may be low, but typically are high (flooding occurs 1 year out of 5, or less frequently); outside bends are actively eroding (overhanging vegetation at top of	Unstable; banks may be low, but typically are high; some straight reaches and inside edges of bends are actively eroding as well as outside bends (overhanging vegetation at top of bare bank,

							bank, some mature trees falling into stream annually, some slope failures apparent).		numerous mature trees falling into stream annually, numerous slope failures apparent).
10	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**

Keys: **<u>All</u>** outside bends in streams erode; even the most stable streams may have 50% of its banks bare and eroding. A stable bank would be characterized by healthy vegetative cover, and/or a gentle slope. Unstable banks, on the other hand, would have little or no vegetative cover or a steep or vertical slope.

Water Appearance			
Very clear, or clear but tea-colored; objects visible at depth 3 to 6 ft (less if slightly colored); no oil sheen on surface; no noticeable film on submerged objects or rocks.	Occasionally cloudy; objects visible at depth 1.5 to 3 ft; may have slightly green color; no oil sheen on water surface.	Considerable cloudiness most of time; objects visible to depth 0.5 to 1.5 ft; slow sections may appear pea-green; bottom rocks or submerged objects covered with heavy green or olive-green film. Or Moderate odor of ammonia or rotten eggs.	Very turbid or muddy appearance most of the time; objects visible to depth <0.5 ft; slow moving water may be bright-green; other obvious water pollutants; floating algal mats, surface scum, sheen or heavy coat of foam on surface. Or Strong odor of chemicals, oil, sewage, other pollutants.
10 9 8	**7 6 5 4**	**3 2**	**1**

Keys: Remember to look at the water, not the substrate. **Dip a clear glass jar in water and observe the clarity.**

Nutrient Enrichment			
Clear water along entire reach; diverse aquatic plant community **little algal growth present**.	Fairly clear or slightly greenish water along entire reach; **moderate algal growth** on stream substrates.	Greenish water along entire reach; **abundant algal growth**, especially during warmer months.	Pea green, gray or brown water along entire reach; severe algal blooms **create thick algal mats** in stream.
10 9 8	**7 6 5 4**	**3 2**	**1**

Keys: Looking for algae and other aquatic vegetation, some is good, but it should not be excessive.

Fish Barriers									
No barriers.		Seasonal water withdrawals inhibit movement within the reach.			Drop structures, culverts, dams or diversions (<1ft drop) within the reach.		Drop structures, culverts, dams or diversions (>1ft drop) within 1 mile of reach.		Drop structures, culverts, dams or diversions (>1ft drop) within the reach.
10	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**

Keys: You are looking for withdrawals, culverts, dams and diversions. Anything that is imposed or constructed by man that would **impede fish passage**.

Instream Fish Cover									
>7 cover types available		6 to 7 cover types available			4 to 5 cover types available		2 to 3 cover types available		None to 1 cover type available
10	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**

Cover types: Logs/large woody debris, deep pools, overhanging vegetation, boulders/cobble, riffles, undercut banks, thick root mats, dense macrophyte beds, isolated/backwater pools, other:_____

Embeddedness									
Gravel or cobble particles are <20% embedded.		Gravel or cobble particles are 20 to 30% embedded.			Gravel or cobble particles are 30 to 40% embedded.		Gravel or cobble particles are >40% embedded.		Completely embedded.
10	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**

Keys: Embeddedness is defined as **the degree to which objects in the stream bottom are surrounded by fine sediment**. Only evaluate this item in **riffles & runs**. Measure the depth to which objects are buried by sediment. **Be sure that you are looking at the entire reach, not just one riffle**. To help better define embeddedness, picture a rock. If the average sediment in the stream covers the bottom 20% of the rock than you would check 20%. If the rock is covered 1/3rd of the way by sediment then it is 30% embedded.

Insect/invertebrate Habitat								
At least 5 types of habitat available. Habitat is at a stage to allow full insect colonization (woody debris and logs not freshly fallen).			3 to 4 types of habitat. Some potential habitat exists, such as overhanging trees, which will provide habitat, but have not yet entered the stream.				1 to 2 types of habitat. The substrate is often disturbed, covered, or removed by high stream velocities and scour or by sediment deposition.		None to 1 type of habitat.
10	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**

Cover types: Fine woody debris, submerged logs, leaf packs, undercut banks, cobble, boulders, coarse gravel, other: _____

Canopy Cover **Key:** This pertains to waterways **where channel is 50 feet wide or less**. Coldwater fishery			
>75% of water surface shaded and upstream 2 to 3 miles generally well shaded.	> 50% shaded in reach. Or >75% in reach, but upstream 2 to 3 miles poorly shaded.	20 to 50% shaded.	<20% of water surface in reach shaded.
10 9 8	**7 6 5 4**	**3 2**	**1**

Abandoned Mine Drainage (if applicable)			
(Intentionally blank)	Evidence of iron staining. Or Noticeable iron precipitate.	Iron precipitate visible, muddy orange appearance.	Heavy iron precipitate, noticeable kill zone. Or White/bluish-white precipitate visible, rotten egg smell.
	5 4	**3 2**	**1**

If AMD is found, complete AMD site diagram and **mark discharge point on map, and/or with GPS unit**.

Sewage (if applicable)			
(Intentionally blank)	Noticeable odor, excess plant growth and siltation.	Noticeable odor, excess plant growth. And Questionable pipe and black stream substrate.	Visible pipe with effluent, heavy odor.
	5 4	**3 2**	**1**

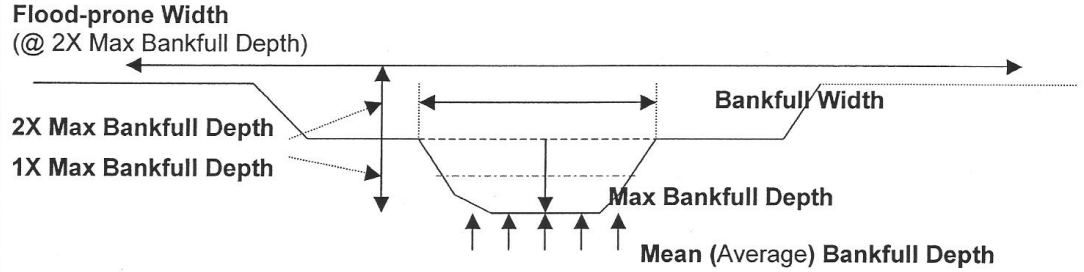
Mark discharge(s) on map and/or with GPS unit.

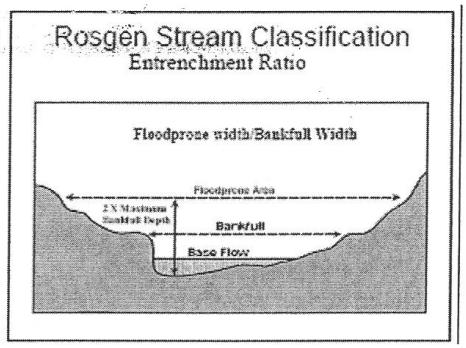
Manure Presence (if applicable)			
(Intentionally blank)	Evidence of livestock access to riparian zone.	Occasional manure in stream or waste storage structure located on the flood plain.	Extensive amount of manure on banks or in stream. Or Untreated human waste discharge pipes present.
	5 4	**3 2**	**1**

NOTES:

Pine Creek Visual Assessment **Stream Section Waypoints Start/End:**_____
Date: _____

ROSGEN STREAM CLASSIFICATION MEASUREMENTS





http://www.cnr.uidaho.edu/range357/notes/Riparian-Classification-Presentation-05.pdf

DEFINITIONS

- **Bankfull Width** – Width in riffle using bankfull indicators (scour lines, depositional features, vegetation breaks)
- **Max Bankfull Depth** – Depth in a riffle from the deepest part of the channel to the bankfull elevation
- **Flood-prone Width** – The flood-prone width is measured at the elevation that corresponds to twice the maximum depth of the bankfull channel as taken from the established bankfull stage. MIGHT NEED TO BE AN ESTIMATE.
- **Mean Bankfull Depth** – Average depth of the bankfull channel in a riffle cross section; average of 5 measurements across channel.
- **Entrenchment ratio** – (Flood-prone Width / Bankfull Width)
- **Width/Depth Ratio** – (Bankfull Width/Mean Bankfull Depth)

7.4 WALKS in the WATERSHED

To promote the importance of the local watershed to area residents and to encourage everyone to enjoy its natural beauty and diversity, the Outreach Committee of the Pine Creek Watershed Assessment has developed five self-guided walking tours of the watershed.

These hikes average an hour of walking. For safety, always hike with a partner and for the protection of plant and animal life, stay on the trails. Taking along a small plastic bag to carry away some litter from along the trail is a simple way to further enhance these natural resources.

Take a camera and share with us your walk in the watershed!

1) IRMA KOST NATURAL AREA

This beautiful area is at the eastern end of the Hampton Municipal Park. To get there go 1.4 miles north of the intersection of Route 8 and Duncan Avenue (Green Belt) past Harts Run Road on the right, to McCully Rd. (just after Craighead office complex). This is a dangerous right hand turn so go slowly off Route 8.

Continue another 1.3 miles passing the Hampton High School, Hampton Park, the barn of the old Red Barn Theatre, and the Hampton Municipal Building, to the third downhill slope. A good-size gravel parking area on the left is at the entrance to the Irma Kost Area. An attractive sign marks the spot.

This valley includes the headwaters of Gourdhead Run, a tributary to Pine Creek. A lovely grove of mature and growing beech trees are a highlight of the area, with large cherry, oaks, maple, ash and other hardwoods dominating the area. A few hemlocks in the valley and some white pines on the higher areas are the only conifers to be found.

The main trail (blue blazes) follows the stream with spring ephemerals (Virginia bluebells, trout lily, and Dutchman's breeches) and skunk cabbage along the way. Later a kaleidoscope of violets take over for a while. The Rachel Carson Trail (yellow blazes) crosses through the valley up to Middle Road, then eventually to Hartwood Acres. The slopes on either side of the valley are fairly steep and straight uphill shots, short stretches, but shouldn't be tackled lightly. They are also prone to erosion, so please step carefully. A bench near the top of the Rachel Carson trail toward Middle Road (eastern side of the valley) is appreciated. A short muddy crossing may discourage you before reaching it, but an Eagle Scout project created a fine wooden walkway in a soggy section at the far end of the valley. Changing wildlife views are seen throughout the seasons.

Specific highlights you can encounter in this area are a great variety of birds in all levels of the forest, from rufous-sided towhees on the ground or in the shrubs, to several species of woodpeckers plus flickers along the tree trunks, not to mention cardinals, song sparrows, titmice, and many other songbirds. Botanical highlights include some Lycopodium spp. (ground pine) on the upper reaches of the eastern slope and witch hazel along the stream.

This isn't the largest natural area you can encounter, but the Irma Kost Natural Area is a hidden jewel in northeast corner of the Pine Creek Watershed. People remember Mrs. Kost for her 30 years of determined independent work and skill in developing and maintaining this area. She enlisted Scouts and other community groups to participate. Volunteers still keep it up.

2) CROUSE RUN RAVINE off Wildwood Road in Hampton Township

This 17 acre public nature reserve is south of Wildwood Road, with access from the lower parking area of the Tuscan Inn, just a half mile west of Route 8. The narrow ravine was a site of Rachel Carson's early studies. She could reach it in the 1920s via the trolley that provided mass transit between Pittsburgh and Butler. The land has been preserved through efforts of Patricia Hare, Hampton resident, former EAC member, and a founding member of the North Area Environmental Council (NAEC). The Pine Creek Land Conservation Trust, (PCLCT), now assures its preservation.

Take the grassy path down from a PCLCT granite marker and cross the stream on the shale rocks below. It is typically just ankle deep to wade. Be careful after heavy rains. Vertical limestone cliffs line the stream on the east. Another crossing, with stepping stones, leads up to an open grassy area once the site of an old hotel. The trail continues to another PCLCT marker, beyond the bench placed by friends in memory of Joe Grom, a respected teacher-naturalist who led many to the area. Access without any wading is available from the Trillium Ridge plan of homes, a left turn off Wildwood Road just up from the Tuscan Inn. This access is a rock-edged trail on the left at the utility posts between the third and fourth homes after entering the plan. (Park along the road.) The trail follows down a long-used route into deep old woods. Plants and birds can differ from those in the valley floor. Another bench there is a good resting place when you climb back up. At one point a rigid cable has been fixed as a hand hold at a steep side connection.

Whichever access you choose, you will be enchanted by the terrain which transports you immediately into Rachel Carson's world of exposed limestone, hemlocks & ferns. Bring your wildflower guide, as on the Spring Day we ventured out the floor of this ravine was covered with the spring ephemerals: Bloodroot, Spring Beauty, Trout Lily, emerging May Apple, Violets of many kinds, Skunk Cabbage and the nodding heads of Trillium blossoms.

Please note: Though the valley trail has been in use for countless generations all the way to Sample Road, the current landowner south of the second PCLCT marker does not wish any visitors there.

PCLCT placed signs to restrict plaguing motorized users, who cause noise & real problems, erosion and damage to plants. Phone Hampton police at 412-486-3201 to report any misuse you observe.

3) ROCKY DELL, near North Park in the area east of the Swimming Pool

Rocky Dell is a lovely wild valley that runs between Hemlock Drive II and the railroad crossing on Sample Road. It is part of the Rachel Carson trail which is marked with yellow blazes. They appeared newly painted in April 2003. There are several ways to plan a hike in Rocky Dell:

From Sample Road in the valley, park next to the bridge over the stream coming down from Rocky Dell. This small pull-off area east of the road is used by fisherman. A white trash bin bears the name Allison Park Sportsmans Club. There is a yellow blaze on the telephone pole on the opposite side of the road.

Walk to the railroad tracks and cross the road where there is a double blaze on the telephone pole. Follow the railroad tracks and blazes to another double blaze on a phone pole. (These always mean to watch for a turning on a trail.)

Be careful; trains DO run on that track! Turn left up the valley following the trail and blazes. At a point where a gas line crosses, marked by a white pole, the trail becomes narrow with little room between t he stream and the cliff, and a bit further on it ascends along the hillside on a path that is eroding in places, making it rather difficult. The terrain on the other side of the stream is largely flat and looks much more inviting.

Our trail researchers walked along the stream and found traces of what looked like an older trail. The stream valley is indeed passable, but it is necessary to cross the stream several times. The marked trail descends to the stream level after awhile, and just around a bend in the stream there is a picnic table. A few feet further is an old abandoned shelter. From there one can climb, largely on an old set of stone steps, to the trail crossing at Hemlock Drive II. At a leisurely pace this hike took us 45 minutes each way.

For all or part of this hike in the other direction, drive in onto Hemlock Drive II, past the trail crossing at the stone bridge, and park by the road at Allegheny Grove, across from the Hemlocks II residential complex. Walk back down the road to the trail crossing, follow the stone steps to the old shelter, turn left and hike downstream.

One can make a longer hike by starting at Lone Pine Field. This is at the end of the road that cuts across the 1.5-mile South Ridge Road, the one-way loop that begins at Pie Traynor Field. See the large yellow blaze on a concrete block marking this section of the Rachel Carson trail. Cross a red-blazed trail and follow the yellow blazes downhill on an old road to a level spot where the road turns left (about 10 minutes). Continue straight on yellow-blazed trail to Hemlock Drive II, jog left at the double blaze, then right at the next double blaze and down stone steps to the old shelter, etc. One could spot a car at Sample Road for a one-way hike.

If you are retracing your steps, you could turn right at the level spot where the old road turned left and you went straight on the trail coming down. You would leave the Rachel Carson Trail and follow the old road back up to South Ridge Road at the Round Top Shelter, then walk across the grass to the Lone Pine Field. Or leave the car at Round Top & walk across to Lone Pine first.

4) SANDY CLIFFS of North Park

Total Walking Time: 45 minutes Easy to moderate. Half of the walk is along a paved road in the park, the rest is wooded trail, sometimes rocky & uneven.

Hidden among the trees of North Park is a delightful and often-missed surprise. The destination is incongruous, yet striking - sandy orange cliffs, reminding one of a scene from the southwestern U. S.

The beginning of the trail is approached from Hemlock Drive, a left turn 0.5 mile south of the traffic light intersection at Ingomar/Wildwood Rd. & Babcock Blvd. in the eastern side of North Park. At the top of Hemlock Drive turn left, pass the swimming pool area, continue up the hill to South Ridge Dr. Turn right at the top T-junction and go about 0.1 mile, to parking area on the right, adjacent to Pie Traynor Baseball Field. Having parked the car, and with the ball field behind you, turn right and walk along the one-way road. The road curves to the left. You'll pass the "Black Rock," "Perry," and "Woods" picnic shelters on the right, & "Ellwood" picnic shelter on the left in this half mile. At the road T-junction, bear right and see the walking trail marked by a 2 ft. high concrete block. Take the trail forking left, immediately bear

left onto a trail marked with red blazes on the trees. As you walk down the hill, the trail will fork again. Take the trail on your right and continue down the hill. This trail features mixed hardwoods and a rocky path (watch your step!), with yellow blazes marking the stones along the path now and then. Follow the trail down until you reach a large clearing. The sandy cliffs will be on your left as you emerge from the woods and enter this clearing.

The cliffs are a beautiful backdrop for photographs, with their striking orange color and striated rock pattern. From here, you may return via the route you came, or continue to follow the trail to the right of the cliffs, passing the sandy cliffs on your left, and under utility lines. This arrives at a T-junction where it joins a gravel road. Follow it to the left. Occasional breaks in the trees on the right side afford lovely views of the hills and fields of Hampton Township below. Soon you will reach the paved road again. Follow it to the right for the entire loop winding back to your parking area. You'll pass 5 more shelters. At the last one there is a green wooden trail head sign that provides a map of other excellent hiking trails in North Park.

5) FALL RUN PARK, Shaler Twp. contains a stream tributary that joins Pine Creek

The entrance to Fall Run Park, Shaler Township's largest park at 93.65 acres, is just east of William Penn Hwy (Rte 8) on the left side of Fall Run Rd. Turn in at the light on Route 8, across from Three Rivers Harley Davidson store (bright orange and black).

The Park is marked by an entrance sign and contains a picnic shelter, children's play area, soccer field, portajohn, and a basketball half-court. A large sign marks the entrance, "Judge D. M. Miller Nature Reserve." Another indicates "Community Conservation Partnership Initiative" with funding provided by the Keystone Recreation, Park & Conservation Fund.

The nature trail is at least 1 mile. It is a well-maintained trail featuring 7 wooden bridges which allow a visitor to zigzag over the babbling stream without getting wet unless you really want to. The path and bridges eventually lead you to the highlight of the trail, a waterfall. You can view the falls from below, or on a staircase. Total of 34 steps takes you atop the falls. This is definitely one area not to miss in the Pine Creek Watershed!!!

6) IRWIN RUN AREA, North Park

To reach Irwin Run from its downstream end, park at the lot on Pearce Mill Rd. at the corner of Babcock Blvd. just north of the dam at North Park. Walk up Babcock a short distance to Irwin Run Road on the left. It has a "Road Closed" sign but is actually open to those needing to get to a house part way up. It's totally quiet. To avoid a ticket don't park on Irwin Road.

A walk up the road is pleasant, and a good place to see birds. You can also explore the creek bed. You are in park land only for about the first mile, then you enter a conservation area recently purchased by Allegheny Land Trust and open walking and hiking.

Another possible hike is from the north end of the Babcock & Pearce Mill parking lot and reached by crossing Irwin Run just below the old broken dam there. You can hike up the trail above the west side of Irwin Run. There are several places near the top where one can bushwack down a ridge to Irwin

Run again and follow the stream if you feel adventurous. Keep an eye out for turkeys coming in to roost in a big stand of pine trees.

Irwin Run is a favorite place for winter and early spring walking. You can see the first signs of spring as the skunk cabbage comes up through the snow.

7.5 Data Description and Ways to Use the Data

Data Sets

The data gathered during the assessment is available in a number of forms. Each form is described below and examples of the data and examples of how the data can be used are presented.

The data is is distributed on two DVDs organized in folders named as follows:

Pine Creek Riparian Assessment

a. Photos (on their own DVD)
    i. A separate folder for each sub-watershed. Each contains high-resolution JPEG images taken at waypoints in the sub-watershed.
b. Field Data Sheets
    i. A separate folder for each sub-watershed. Each contains PDF files of the field data sheets for individual reaches. Some sub-watersheds have separate PDF files for each reach and some have a single PDF file that contains all of the reaches. Exception – Willow Run field data is an Excel workbook with separate sheets for each reach.
c. Excel Data
    i. PCRA_Field_Data_Summary.XLS
        1. A separate worksheet for each sub-watershed containing the data captured for that sub-watershed.
        2. PhotoWaypointCrossRef - a worksheet that cross references waypoints to photographs and photographs to waypoints.
        3. WaypointMunicipalityCrossRef - a worksheet that cross references waypoints to municipalities and municipalities to waypoints
    ii. PCRA_Reach_Data.XLS - a separate worksheet for each sub-watershed that contains the field data sheet numbers in headwaters to mouth order and also lists the waypoints contained in the reach indicating the directional order of the waypoints within the reach.
d. Access Data
    i. A separate Access 2007 database for each sub-watershed.
e. Google Earth Data
    i. A Google Earth KMZ file which, when loaded by Google Earth, displays all of the waypoints color coded for reach quality. Each waypoint can also display a table of data about the waypoint.
f. GIS
    i. ArcView shape files

The data is distributed on two DVDs. One DVD contains the photos and the other DVD contains the rest of the data.

Description and Examples

Photos – The photos were all taken using the same make and model camera. The JPEG files contain date and exposure and other metadata. Most of the photos were taken at 2 MB resolutions. Some were taken at lower resolutions.

The Excel sheets and the Access databases all have fields that contain the photo numbers associated with each waypoint.

Most photos are named Name.JPG. "Name" is composed of an alphanumeric prefix and a numeric suffix. The prefix is generally an abbreviation of sub-watershed name and the suffix is a number representing the time sequence of the photo. For example, MP3-181 is the name for Main Pine section 3, photo 181. The number portion of the name does not always start at one and may have substantial gaps. MP3-181 was actually the first photo on Main Pine section 3.

Some series of photos were named "IMGnnnn.jpg". IMGnnnn is the default naming convention of the cameras that were used.

Some other series were named "Photo_nnnn.jpg".

For some sub-watersheds different naming conventions were used for different reaches.

Refer to "PCRA_Field_Data_Summary.XLS", worksheet "PhotoWaypointCrossRef" for a list of the photos with associated waypoints.

Refer to "PCRA_Reach_Data.XLS" for a headwaters to mouth sequence of reaches and waypoints for each sub-watershed.

Field Data Sheets – see “Visual Assessment score sheets.doc” for a clean copy of the sheets used for fieldwork. Also see “Riparian Assessment Protocol USDA.pdf” for a description of the protocol. In addition to the usual visual assessment information the field teams:

- gathered GPS and descriptive information for each observed outfall.
- noted existence of conditions in seven areas of concern:
  - pipes entering stream
  - bridges and culverts
  - walls
  - erosion
  - stream blockage
  - invasive species
  - degraded riparian area
- gathered some information needed for Rosgen stream classification. The Rosgen effort was incomplete.

From time to time it is useful to refer back to the field sheets for clarification of the digital information or to see drawings or notes that were not transcribed to the digital information.

The Excel sheets and the Access databases all have fields that contain the field data sheet number for each waypoint.

Excel Data

PCRA Field Data Summary.XLS – Subwatershed sheets - Information on the field data sheets was transcribed to Excel worksheets for ease of analysis and consistency of presentation. Two slightly different sheets were used depending on how a particular team's GPS unit was set to report latitude and longitude. Some reported in degrees-minutes-seconds (DMS) and some reported in decimal minutes. All of the spreadsheets were setup to calculate the decimal degrees form of lat-long reporting. The sheets with DMS (Crouse Run, MP1-2, and MP4) have more columns than the others. The exact column letters will vary depending on the format for the sub-watershed.

On some sub-sheds the waypoints were renumbered in the Excel sheet. When this occurred the field sheet waypoint number is in a column labeled "Sheet Waypoint".

The North Fork sub-shed has a column for "Manure Presence" in the visual assessment scores section.

Column	Content
A	The waypoint name. Typically composed of a prefix that is an abbreviation of the sub-watershed name and a number representative of the time sequence of taking the waypoint. The number is NOT representative of a spatial sequence. See the spreadsheet "PCRA_Reach_Data.XLS" for a headwaters to mouth sequence of waypoints.
B	The date the field work took place
C-F	Latitude and longitude as degrees - minutes – seconds or as degrees – decimal minutes.
G-H	Latitude and longitude as decimal degrees
I	Rosgen Classification – not completed for most streams
J-U	Visual assessment scoring
V-AB	Areas of special concern. One can search on these categories for waypoints exhibiting these characteristics.
AC	Visual Assessment Sheet Number. The name of the PDF file containing the field data sheet for the reach that the waypoint is in. Exception – for Willow Run it is the name of the worksheet within the workbook "Willow Run Field Sheets.xls"
AD	In Access, for most sub-watersheds, this will be a click-able link to the field data sheet PDF.
AE,AH,AK,etc	Photo file name
AF,AI,AL,etc	In Access this will be a click-able link to the photo
AG,AJ,AM,etc	A description of the photo

Sample of a portion of the Excel sheet for Main Pine Section 3. In this example we show all of the columns that are available in PCRA_Field_Data_Summary.XLS. The spreadsheet has tabs for each subshed that was studied. The sheet for a subshed has a row for each waypoint and columns containing the data captured for the waypoints. Also see the Access database description for alternative data access and display methods. Also note that the spreadsheet format does vary a little bit among the sub-watersheds.

	A	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Stream Waypoint	Stream Waypoint	Field Work Date	Lat Degrees	Lat Minutes	Long Degrees	Long Minutes	Lat Decimal Degrees	Long Decimal Degrees	Rosgen Classification	Channel Condition	Riparian Zone	Bank Stability	Water Appear	Nutrient Enrich	Fish Barriers	In Stream Fish Cover	Embeddeness
2	MP3-181	MP3-181	4/26/2009	40	35.164	80	2.635	40.58607	-80.0439	Not Given	3	3	2	8	5	10	3	2
3	MP3-182	MP3-182	4/26/2009	40	35.141	80	2.599	40.58568	-80.0433	Not Given	3	3	2	8	5	10	3	2
4	MP3-183	MP3-183	4/26/2009	40	35.132	80	2.554	40.58553	-80.0426	Not Given	3	3	2	8	5	10	3	2
5																		

	A	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF
1	Stream Waypoint	Invertebrate Habitat	Canopy Cover	Visual Assess Score	Visual Assess Rating	Pipes	Bridge or Culvert	Walls	Erosion	Stream Blockage	Invasive Species	Degraded Riparian Area	PDF Sheet Number	PDF Visual Assessment Sheet	JPG .	Photo
2	MP3-181	3	2	4.1	Poor	yes	yes						MP3-1		MP3_0004	
3	MP3-182	3	2	4.1	Poor				yes			yes	MP3-1		MP3_0007	
4	MP3-183	3	2	4.1	Poor	yes							MP3-1		MP3_0008	
5																

	A	AG	AH	AI	AJ	AK	AL
1	Stream Waypoint	Description	JPG .1	Photo .1	Description1	JPG .2	Photo .2
2	MP3-181	Looking upstream at Rt 19 culvert close by	MP3_0005		Looking upstream 50 yds to Rt 19 culvert	MP3_0006	
3	MP3-182	7 ft high erosion bank					
4	MP3-183	platform on vertical pipes, galv pipe in background	MP3_0009		deteriorated large galvanized pipe (trash?)		
5							

	A	AM	AN	AO	AP	AQ	AR	AS	AT
1	Stream Waypoint	Description2	JPG .3	Photo .3	Description3	JPG .4	Photo .4	Description4	
2	MP3-181	Walgreens stormwater mgmt area							
3	MP3-182								
4	MP3-183								
5									

PCRA Field Data Summary.XLS – WaypointPhotoCrossRef Sheet – This sheet provides a way to determine the waypoint associated with any photo or to determine the photos associated with any waypoint.

Column	Content
A	Photo names in alphabetical order. Column B contains the name of the waypoint that references the photo.
B	The waypoint name associated with the photo in column A.
C-D	Empty
E	Waypoint names in alphabetical order. Column F contains the name of the photos referenced by the waypoint. There will usually be multiple photos associated with a waypoint.
F	The photo name associated with the waypoint in column E.

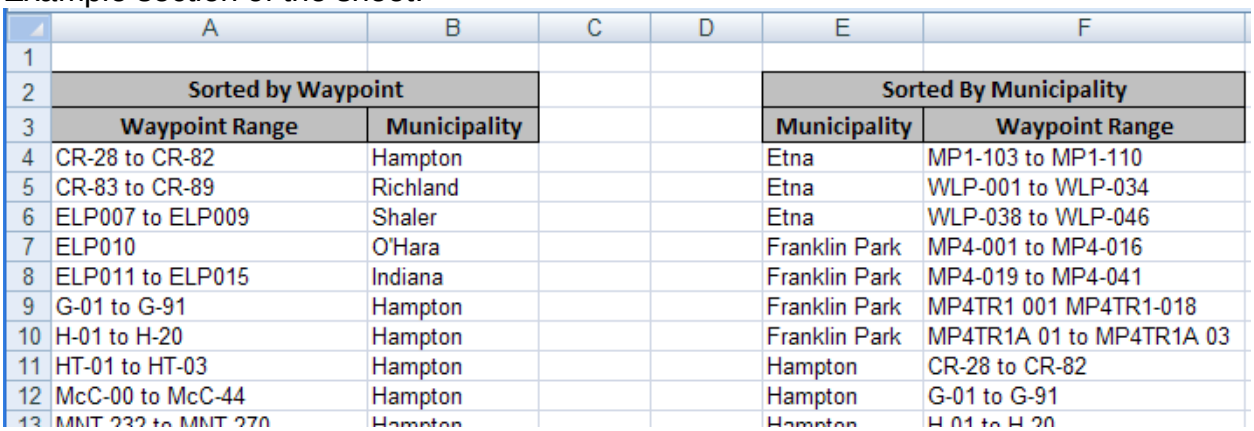
Example section of the sheet:

	A	B	C	D	E	F
1						
2	**Sorted by Photo Number**				**Sorted by Waypoint Number**	
3	**JPG #**	**Stream Waypoint**			**Stream Waypoint**	**JPG #**
4	CR-112	CR-28			CR-28	CR-112
5	CR-113	CR-29			CR-29	CR-113
6	CR-114	CR-30			CR-30	CR-114
7	CR-115	CR-32			CR-31	CR-115A
8	CR-115A	CR-31			CR-32	CR-115
9	CR-116	CR-33			CR-33	CR-116
10	CR-117	CR-34			CR-34	CR-117
11	CR-118	CR-34			CR-34	CR-118
12	CR-119	CR-36			CR-36	CR-119
13	CR-120	CR-37			CR-37	CR-120
14	CR-121	CR-37			CR-37	CR-121
15	CR-122	CR-37			CR-37	CR-122
16	CR-123	CR-38			CR-38	CR-123

PCRA Field Data Summary.XLS – WaypointMunicipalityCrossRef Sheet – This sheet provides a way to determine the municipality that a waypoint is in or to determine the waypoints in any municipality.

Column	Content
A	Waypoint name ranges in alphabetical order. Column B contains the name of the municipality that the waypoint is in.
B	The municipality that the waypoint range is in.
C-D	Empty
E	Municipality names in alphabetical order. Column F contains the range of waypoint names in the municipality. There will usually be multiple waypoint ranges associated with a municipality.
F	The waypoint name range associated with the municipality in column E.

Example section of the sheet:



	A	B	C	D	E	F
1						
2	**Sorted by Waypoint**				**Sorted By Municipality**	
3	**Waypoint Range**	**Municipality**			**Municipality**	**Waypoint Range**
4	CR-28 to CR-82	Hampton			Etna	MP1-103 to MP1-110
5	CR-83 to CR-89	Richland			Etna	WLP-001 to WLP-034
6	ELP007 to ELP009	Shaler			Etna	WLP-038 to WLP-046
7	ELP010	O'Hara			Franklin Park	MP4-001 to MP4-016
8	ELP011 to ELP015	Indiana			Franklin Park	MP4-019 to MP4-041
9	G-01 to G-91	Hampton			Franklin Park	MP4TR1 001 MP4TR1-018
10	H-01 to H-20	Hampton			Franklin Park	MP4TR1A 01 to MP4TR1A 03
11	HT-01 to HT-03	Hampton			Hampton	CR-28 to CR-82
12	McC-00 to McC-44	Hampton			Hampton	G-01 to G-91
13	MNT 232 to MNT 270	Hampton			Hampton	H 01 to H 20

PCRA Reach Data.XLS - This workbook has separate sheets for each sub-watershed. The sheet organizes the reaches and waypoints in a headwaters to mouth sequence. This sequence can be useful for some kinds of analysis.

Column	Content
A	Sequence number. Low to high, headwaters to mouth.
B	PDF field sheet name. Each field sheet is generally equivalent to a reach. For Willow Run, the name is a sheet in the Willow Run field sheets Excel workbook.
C	The waypoints in the reach. The upstream waypoint is listed first. A lower numbered waypoint first indicates that the reach was walked from upstream to downstream.

Example for West Little Pine:

	A	B	C
1			
2	HEADWATER	**PDF Sheet Number**	WAYPOINTS
3	1	WLP 16	WLP 223 - WLP 206
4	2	WLP 15	WLP 204 - WLP 193
5	3	WLP 14	WLP 179 - WLP 171
6	4	WLP 13	WLP 170 - WLP 159
7	5	WLP 12	WLP 138 - WLP 133
8	6	WLP 11	WLP 132 - WLP 125
9	7	WLP 10	WLP 124 - WLP 102
10	8	WLP 09	WLP 101 - WLP 91
11	9	WLP 01	WLP 1 - WLP 7
12	10	WLP 02	WLP 8 - WLP 15
13	11	WLP 08	WLP 90 - WLP 76
14	12	WLP 05	WLP 48 - WLP 58
15	13	WLP 07	WLP 75 - WLP 70
16	14	WLP 06	WLP 69 - WLP 60
17	15	WLP 04	WLP 36 - WLP 46
18	16	WLP 03	WLP 34 - WLP 27
19	MOUTH		

Note that some reaches were traversed from upstream to downstream (eg WLP-01) and some were traversed from downstream to upstream (eg WLP 08). Also note that the reach number does not imply any spatial sequence. The reach numbers are a time sequence (eg, WLP-07 was traversed before WLP-08).

Access Data

Crouse Run.accdb
East Little Pine.accdb
Gourdhead.accdb
Harts Run.accdb
Main Pine 1 DS of Lake.accdb
Main Pine 3.accdb
Main Pine 4.accdb
McCaslin.accdb
Montour Run.accdb
North Fork.accdb
West Little Pine.accdb
Willow Run.accdb

The databases are in Access 2007 format.

Each database contains waypoint, photo, and reach data for a sub-watershed. The data is the same as is in "PCRA Field Data Summary.XLS" with the addition of click-able field data sheets and click-able photos for most sub-watersheds. Clicking the field data sheet or the photo brings up the corresponding image.

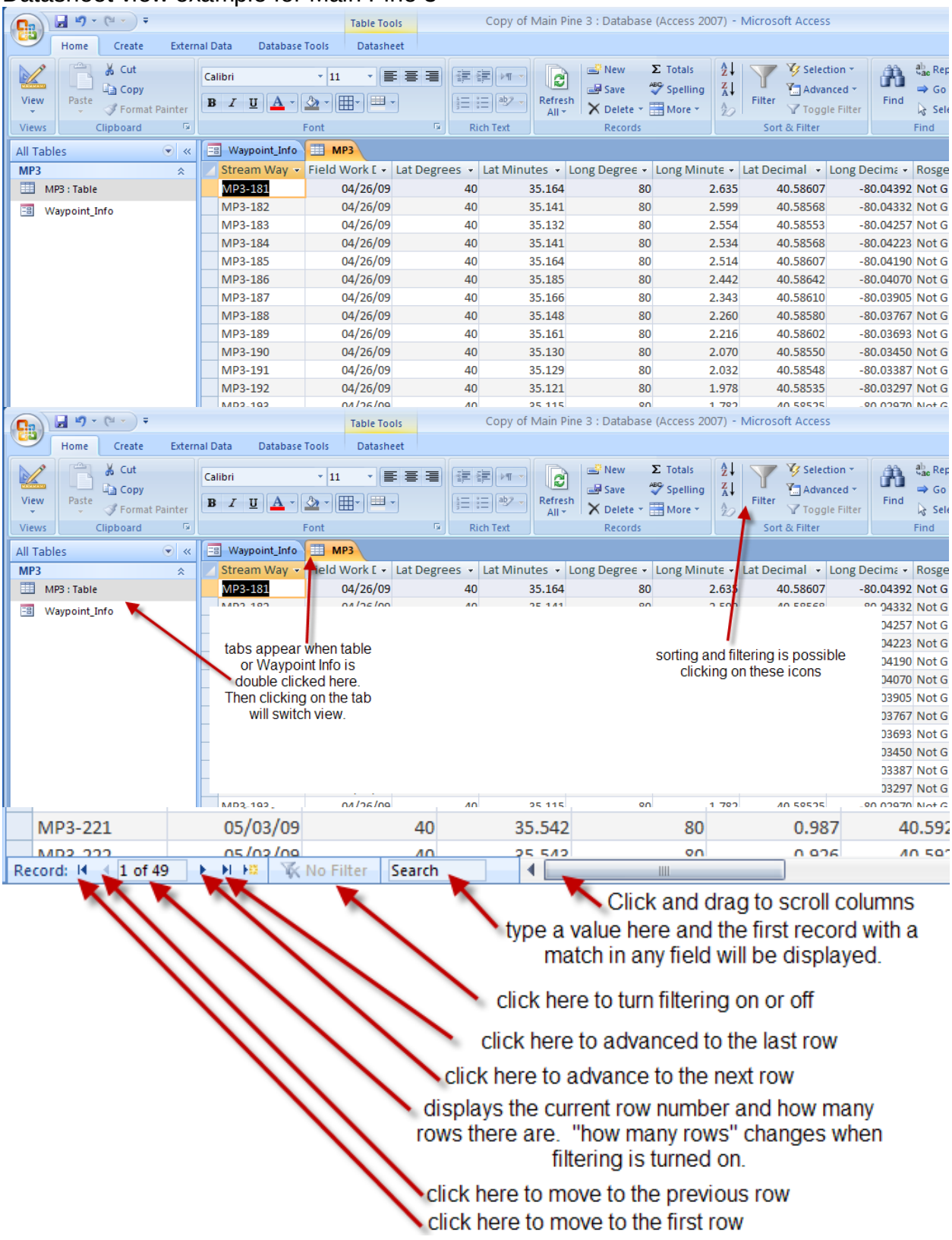
The data is viewable in either as "datasheet" view, which is similar to an Excel view, or in a "Waypoint Info" form, with one page per waypoint that presents all of the information for a waypoint on one page so that scrolling across columns is not necessary and one can obtain a better sense of the waypoint.

Queries can be composed using the query wizard in Access. Queries can be useful for searching for specific characteristics.

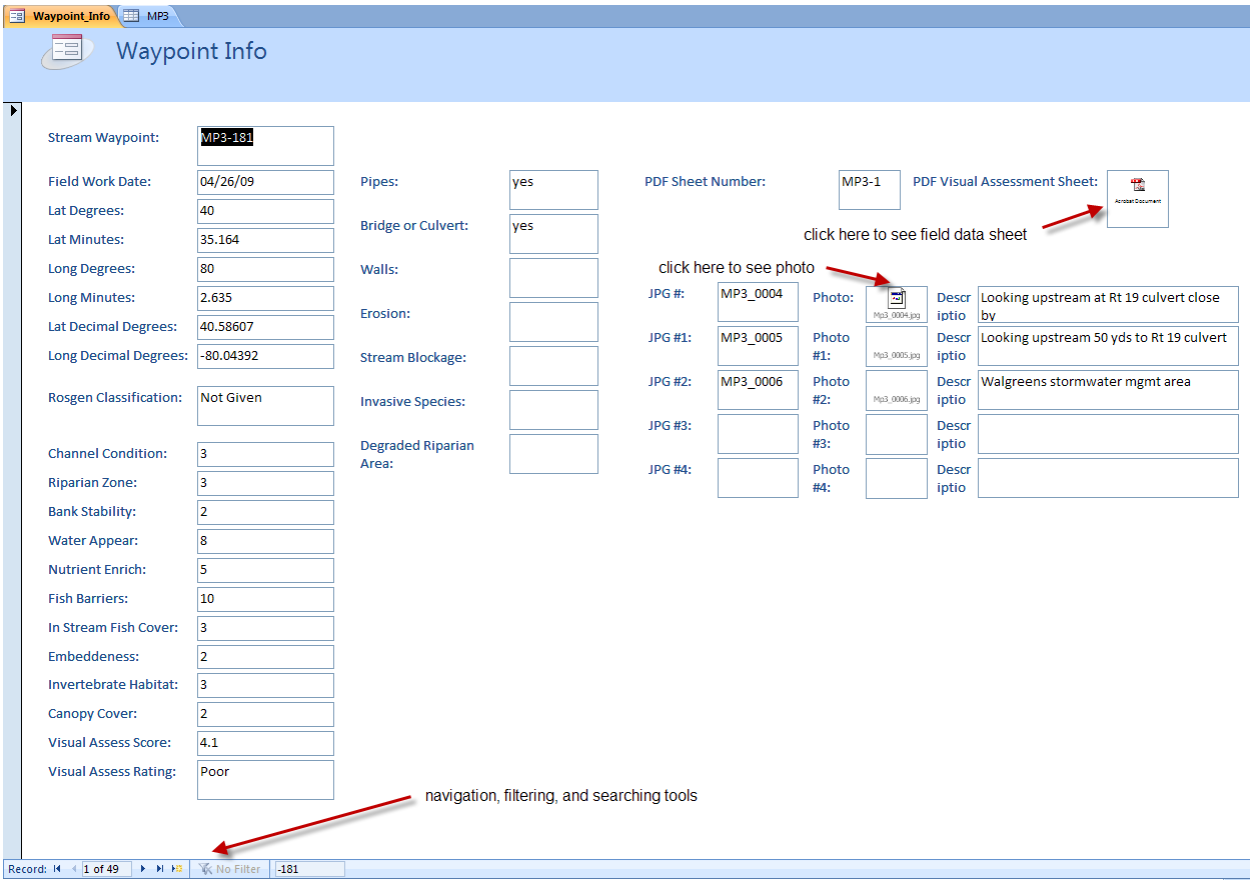
Searching, filtering, and sorting options are available on the toolbars of the Access screen.

If you do not have Microsoft Access 2007 you can obtain a free viewer from the Microsoft download site. Google "access 2007 viewer" and select the www.microsoft.com/downloads/ link that talks about redistributing Access Runtime.

Datasheet view example for Main Pine 3



Waypoint Info view example for Main Pine 3



Google Earth

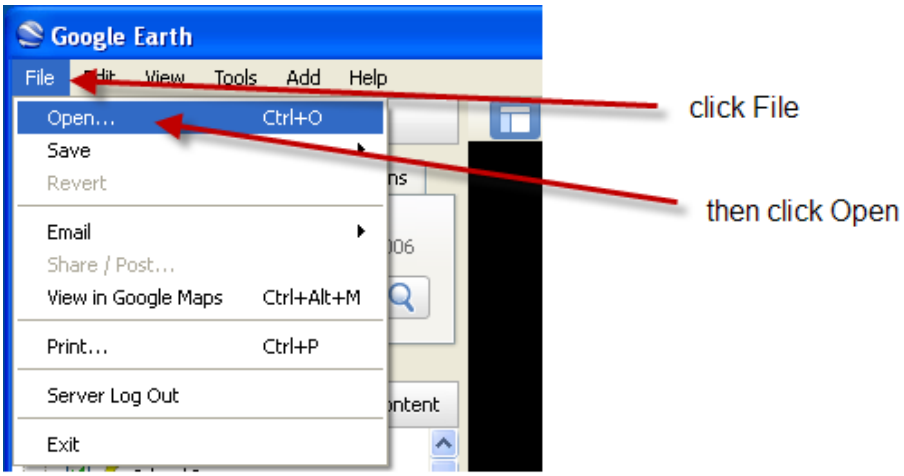
Information value increases when the information is widely available. We chose to make assessment data available in a Google Earth format so that any resident with access to a computer could view and analyze much of the collected data.

The Google Earth display shows a Pine Creek stream map, municipal boundaries, waypoints color coded for visual assessment rating, and detailed waypoint information including GPS coordinates, visual assessment scoring, items of interest, field data sheet numbers, and photo numbers and descriptions.

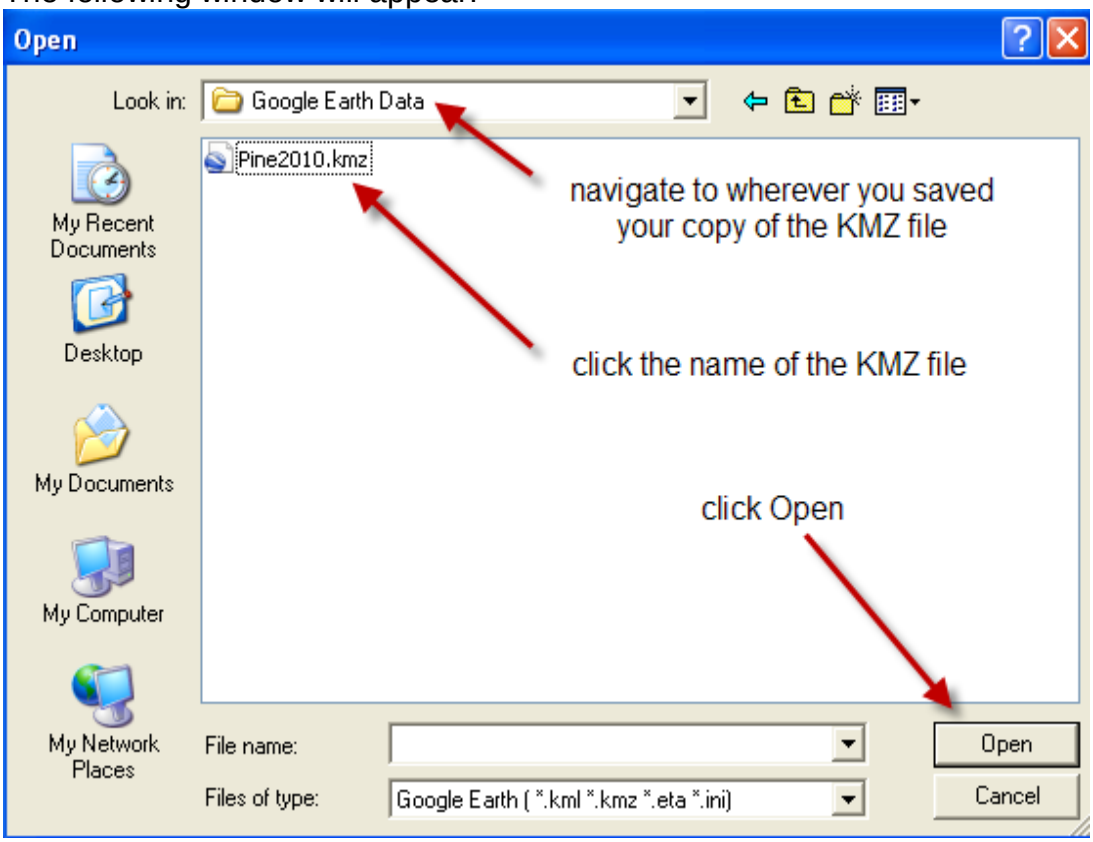
The information necessary for Google Earth to produce the display is in the file "Pine2010.kmz" which is on the DVD or it may be downloaded from either pinecreekwpa.org or naecwpa.org.

After downloading the KMZ file, start Google Earth (available at http://earth.google.com/download-earth.html).

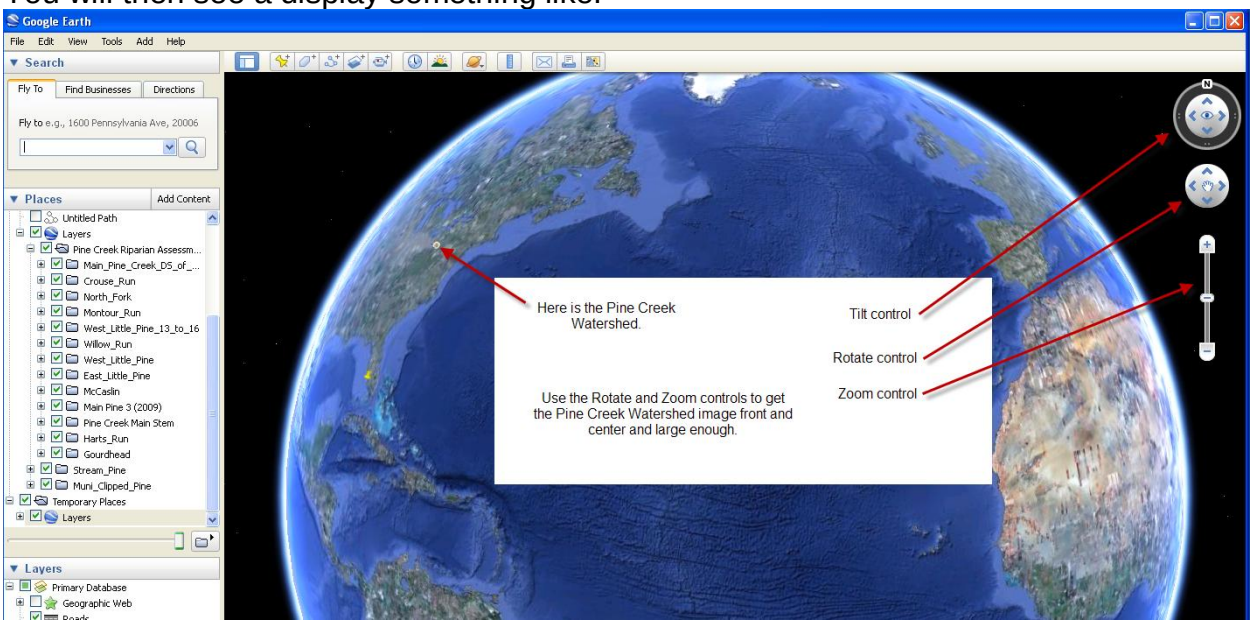
Google Earth will display its screen. (Below is a section of the upper left of the screen)



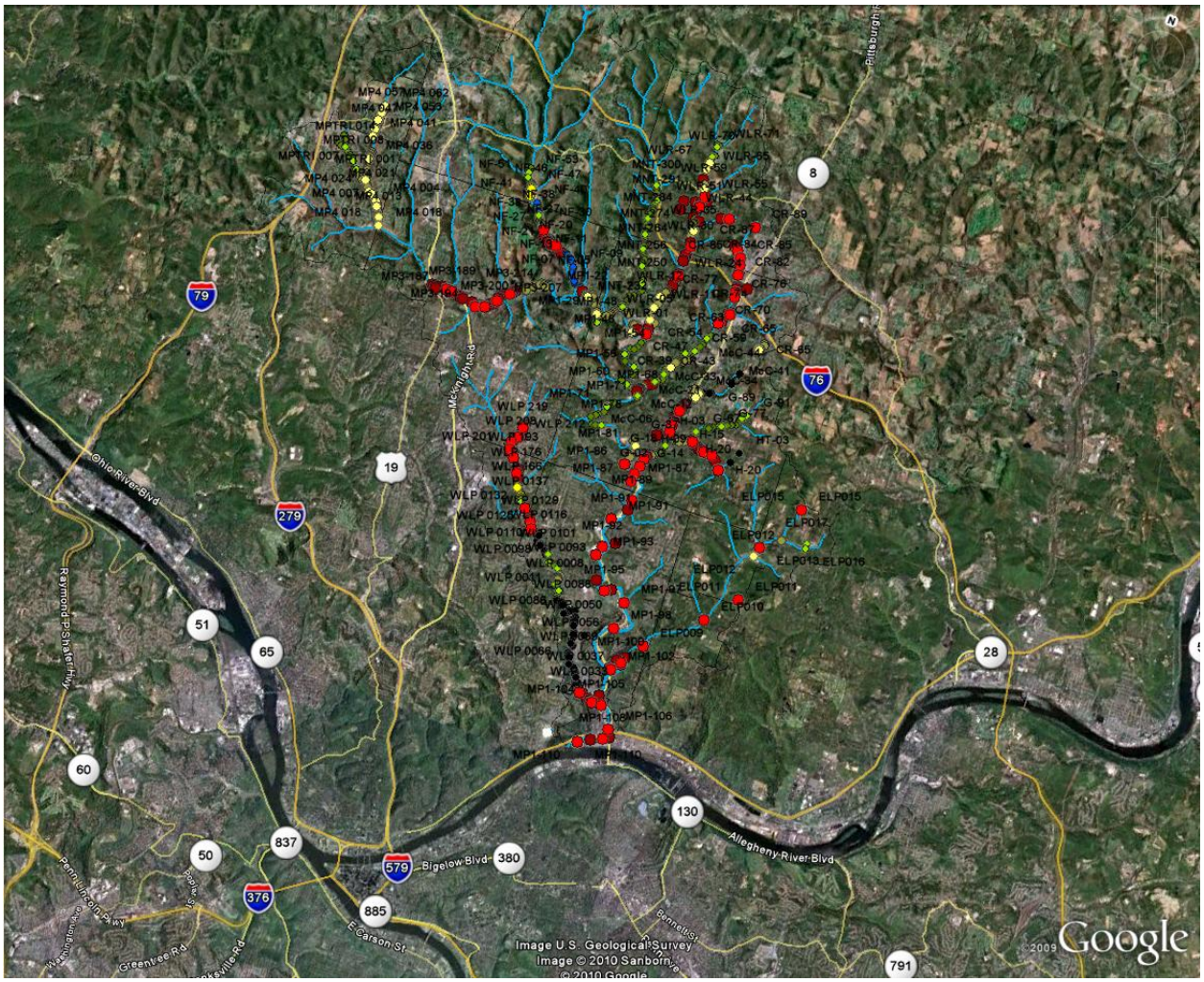
The following window will appear:



You will then see a display something like:



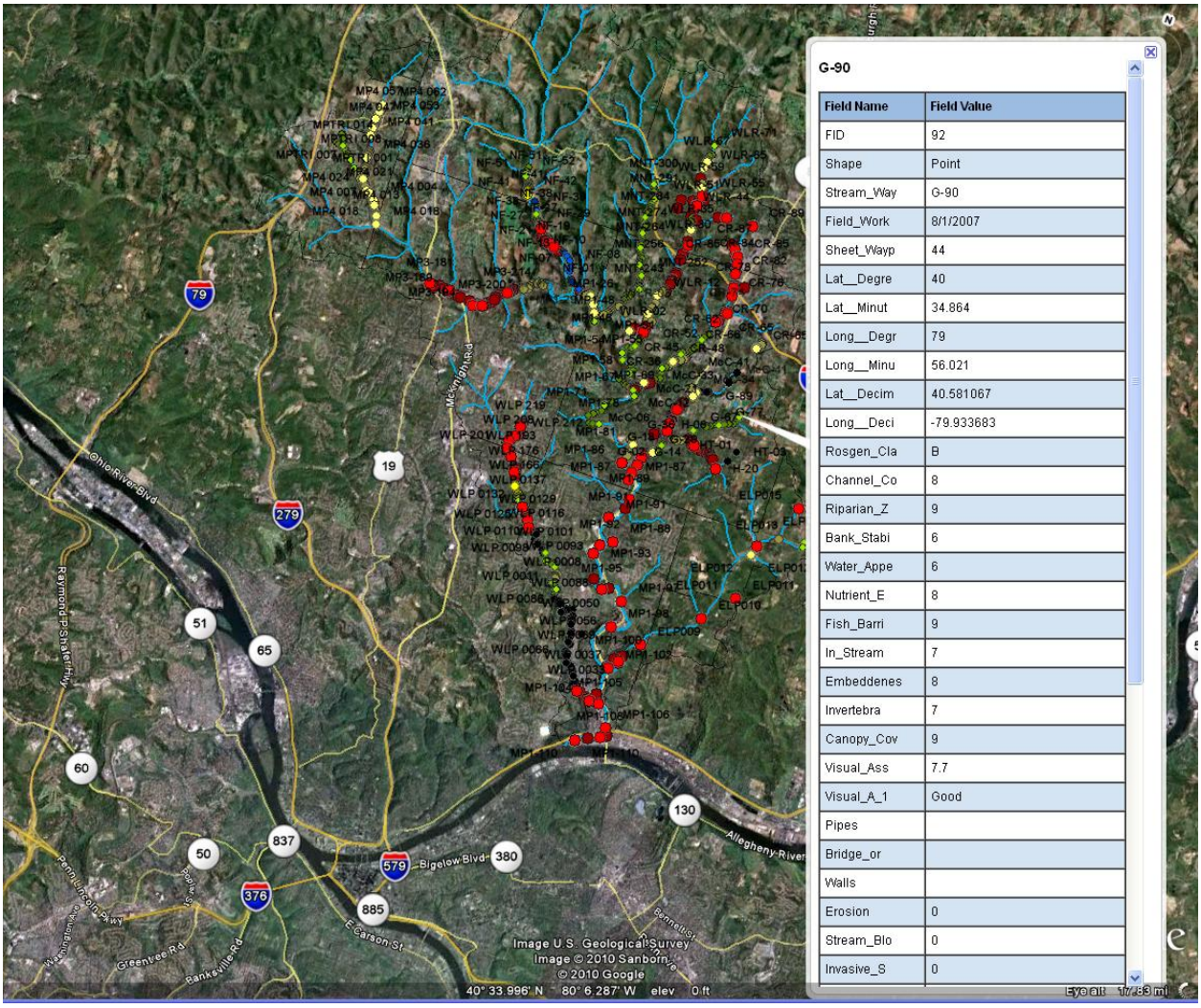
By rotating and zooming you should be able to get an image that looks like this:



All of the waypoints are on the map and the colors reflect the quality of stream reaches according to the visual assessment criteria: Red – poor, Yellow – fair, Green – good. No reaches were scored “excellent”.

If you want to you can zoom in close enough to see your house.

Clicking on a waypoint will bring up a table with waypoint information. The information below is for Gourdhead waypoint 90.



Use the scroll bar on he left of the table to move up and down the table. The information in the table is the same information that is in the Excel workbook PCRA_Field_Data_Summary.XLS

GIS

ArcView shape files are in the GIS folder.

Each sub-watershed has a set of seven files that are part of a “shape file” that defines a “layer” in an ArcView dataset. These “shape” files can be imported into municipal or other ArcView systems.

These files are also used when building a KMZ file for Google Earth.

7.6 PCRA Blank Field Data Summary Degrees and Decimal Minutes.XLS

Electronic file attached

7.7 Google Earth KMZ file (Pine2010.kmz)

Electronic file attached