Existing Condition of Woods Run at Stream Inflow Point

2.0 SITE ASSESSMENT

The project is located in the Wissahickon Nature Reserve, roughly consisting of the northern half of Riverview Park. Riverview Park is a large (300-acre) park in the City of Pittsburgh, and is considered one of the five "regional" parks (Figure 1). The project centers on a few of the last remaining tributaries of the historic Woods Run, which now flows into a 48-inch-diamter combined sewer line when leaving the park. Figure 1. Location of Riverview Park (red outline) relative to the other regional parks in Pittsburgh (Emerald View, Highland, Schenley, and Frick Parks).

Between October 2017 and June 2018, CEC conducted site assessments and monitoring of the project areas. Geographic locations of the various features were collected using global positioning systems, and these along with photographs and field notes were assembled in a project site assessment web-based geographic information systems (GIS) application (see Figure 2). Descriptions of the main site features follow.

Figure 2. Screen shot of the GIS web-based site assessment application (https://cec-tech.maps.arcgis.com/apps/webappviewer/index.html?id=644a8d39daf14a9dac1a9741851e1e50)

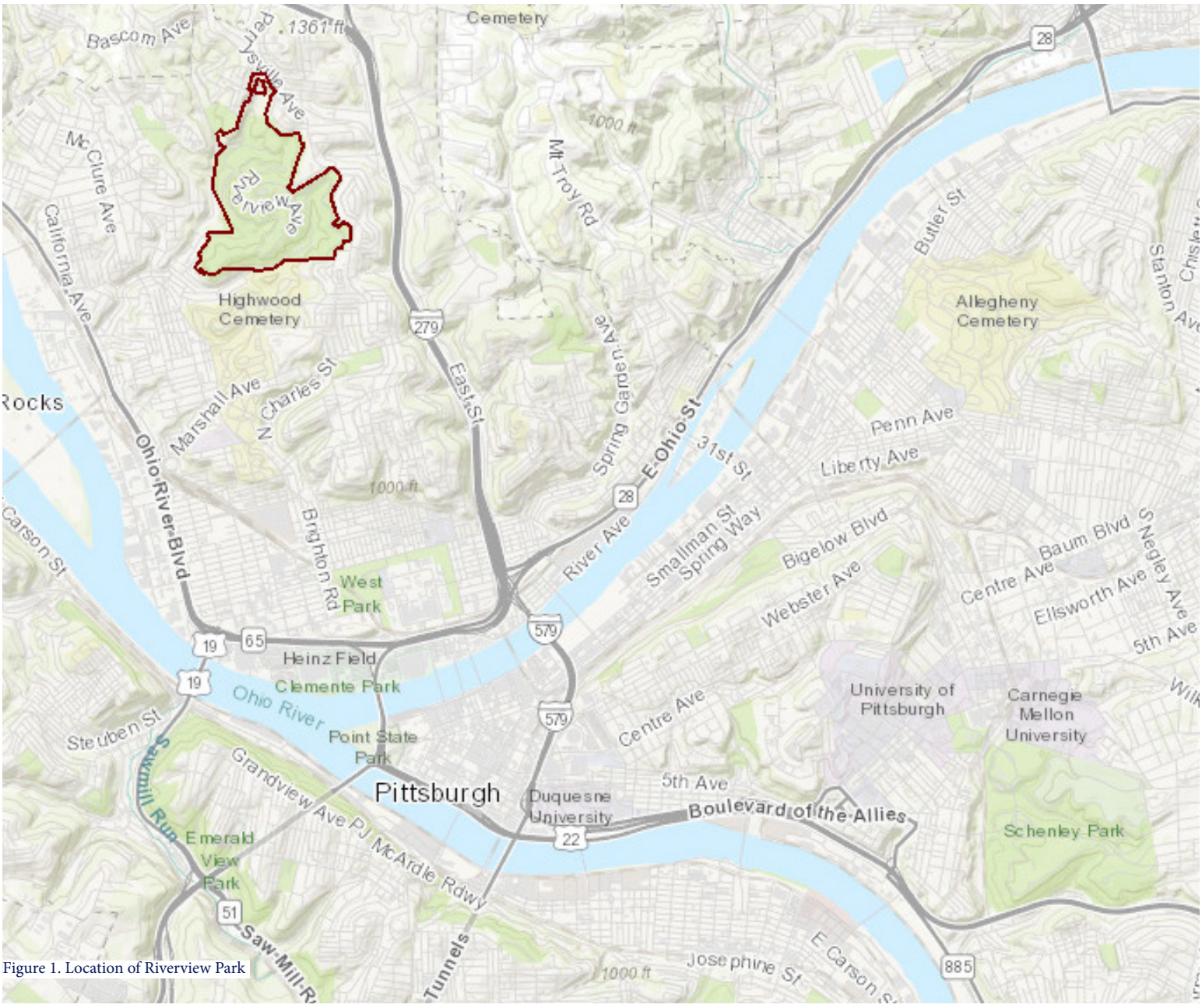

Figure 1. Location of Riverview Park

Figure 2. Screen shot of GIS Web-Based Site Assessment Application

2.1 Streams

CEC assessed streams within the Woods Run watershed and project area during three site visits that occurred on October 3, 6, and 17, 2017. During the site visits, CEC staff delineated streams, identified benthic macroinvertebrate communities, and measured various stream channel characteristics including stream width, depth, and bank erosion potential. Stream bank erosion potential was calculated using Rosgen's Bank Erosion Hazard Index (BEHI) and Near-Bank Stress (NBS) methodology (Rosgen, 2006; Appendix A).

Perennial streams within the Woods Run watershed (Streams 100 and 106) are low-gradient streams that maintain year-round base flow from groundwater seeps located in the headwaters of each stream. Both streams maintain limited benthic macroinvertebrate communities that include Amphipods (scuds) and Platyhelminthes (flatworms). Gastropoda (snails) and Isopoda (aquatic sowbugs) were also found in Stream 106. The banks of both streams are sparsely vegetated, which contributes to their elevated bank erosion rates. Stream 100 also has high stream banks, which when combined with sparsely vegetated banks, results in heavy bank erosion, a high sediment load being transported by the stream, and ultimately an overly wide channel with depositional mid-channel sediment bars.

Intermittent streams within the Woods Run watershed (Streams 103, 104, and 105) are high-gradient, seep-fed streams with occasional flow. During site visits, the flow observed in these streams varied from a moist channel with isolated pooling and no to little flow (approximately 1-2 gallons per minute (gpm)), to an actively flowing channel (greater than 2 gpm) after a substantial rain event. These streams maintain limited benthic macroinvertebrate communities that include Amphipods (scuds) and Platyhelminthes (flatworms). The banks of all three streams were sparsely vegetated. Bank erosion rates of approximately 10 tons per year were calculated for Streams 103 and 105, while bank erosion for Stream 104 was calculated to be 67 tons per year (primarily driven by higher stream bank heights).

Ephemeral streams within the Woods Run watershed (Streams 101, 102, 104, 107, and 108) are high-gradient streams that convey stormwater run-off after significant rainfall events. These streams do not flow on a typical day and do not maintain benthic macroinvertebrate communities. Most of the ephemeral streams on site can be characterized as incised erosional channels. The incised nature of these ephemeral channels with high stream bank heights, combined with sparsely vegetated banks, results in high erosion rates as high as 38 tons per year (Stream 107).

Table 1 presents summary characteristics for each stream in the project areas. Figure 3 displays BEHI classifications for each stream. Figure 3. Bank Erosion Hazard Index (BEHI) classifications of streams (numbered) within the project area (left) with total linear feet in each category (colors correspond to map). Wetlands are green polygons in the map. Seeps are blue diamonds. High erosion areas along trails are purple.

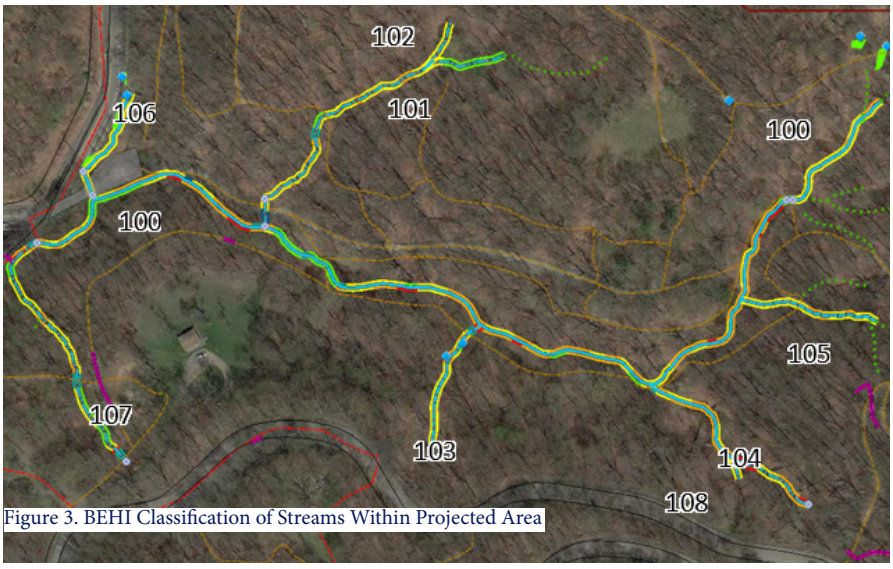

Figure 3. BEHI Classification of Streams Within Projected Area

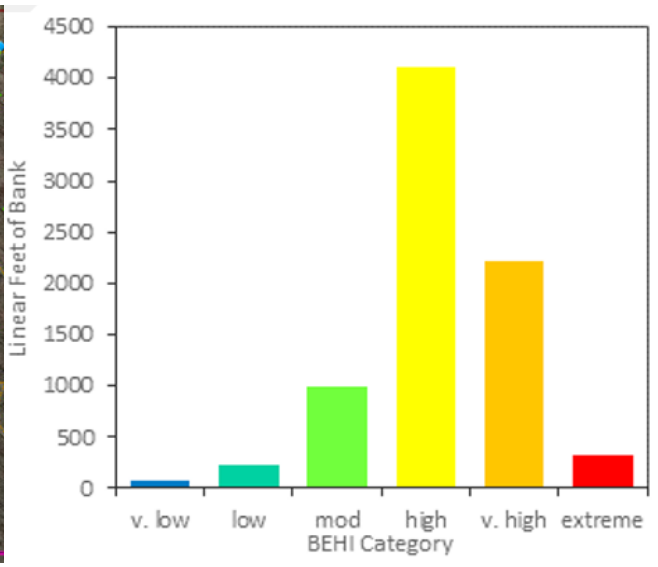

Table 1. Channel characteristics of streams in the Woods Run project area, Riverview Park, Allegheny County, Pennsylvania, October 2017.

Stream Name	Stream Classification	Stream Length (feet)	Stream Width Range (feet)	Stream Depth Range (inches)	Stream Substrates*	Benthic Macroinvertebrates Observed	Bank Erosion Total (Tons/year)
100	Perennial	1,841	1 - 6.5	1 - 8	Be, Bo, C, G, Sa, Si	Platyhelminthes (flatworms), Amphipoda (scuds)	136.25
101	Ephemeral	557	1 - 3	0.5 - 1	Bo, C, G, Sa	None	15.83
102	Ephemeral	91	0.5 - 1	0.5 -1	G, Sa	None	1.97
103	Intermittent	224	1 -1.5	3 - 6	G, Sa, Si	Platyhelminthes (flatworms), Amphipoda (scuds)	10.03
104	Intermittent	199	2 - 6	0.5 - 1	Be, C, G, Sa, Si	Platyhelminthes (flatworms), Amphipoda (scuds)	67.33
	Ephemeral	151	1 - 4	1 - 3	Bo, C, G, Sa	None	
105	Intermittent	235	1 - 2.5	0.5 - 1	Be, C, G, Sa, Si	Platyhelminthes (flatworms), Amphipoda (scuds)	10.29
106	Perennial	207	1.5 - 5	0.5 - 1	C, G, Sa, Si	Platyhelminthes (flatworms), Amphipoda (scuds), Isopoda (aquatic sowbugs), Gastropoda (snails)	3.59
107	Ephemeral	438	1.5 - 3	0.5 - 1	Bo, C, G, Sa	None	38.39
108	Ephemeral	35	1.5 - 3	1 - 2	C, G, Sa, Si	None	0.91
Grand Total Erosion (Tons/year)							**284.59**

*Stream substrate categories: Be (Bedrock), Bo (Boulders), C (Cobble), G (Gravel), Sa (Sand), Si (Silt)

2.2 Wetlands and Seeps

Three wetlands were located within the project area (Table 2). All three wetlands were hydrologically sourced by seeps. KKF-001 and KKF-003 are sourced by hillslope seeps. Wetland KKF-002 is also sourced by a seep that emerges on the right descending bank of a road-side swale. A fourth seep was identified at the junction of Myrtle trail and Archery trail. Two seeps were located along stream 103 and a broad seep flows onto Wissahickon Trail to the east of stream 103.

Table 2. Wetlands within Woods Run Project Area

Waters Name	Waters Classification[1]	Estimated Total Wetland Acreage (ac)	Test Site Number	Photograph Number(s)
Wetland KKF-001	PEM	0.007	KKF-001	1,2
Wetland KKF-002A	PEM	0.003	KKF-002	3,4
Wetland KKF-002B	PEM	0.006	KKF-002	5
Wetland KKF-002C	PEM	0.003	KKF-002	6
Wetland KKF-003	PEM	0.010	KKF-003	7,8
Total		**0.029**		

[1]PEM = palustrine emergent wetland

Existing Condition of Wetland

2.3 Vegetation Communities

Within the Park, the land is generally forested with a few small openings including picnic groves and a horseshoe pitch area. Forests are comprised mainly of mature sugar maple (Acer saccharum), red oak (Quercus rubra) with areas dominated by non-native Norway maple (Acer platanoides). Understories are extremely sparse, virtually devoid of understory vegetation except for patches of white snakeroot in sunny areas. There is virtually no recruitment layer of young trees except what has been planted and fenced to control deer browsing (primarily hemlock, Tsuga canadensis) and Norway maple. The sparse understory is caused by high densities of white-tailed deer (Odocoileus virginianus), which browse understory plants. These effects are magnified by an extremely high density of introduced invasive earthworms (Amynthas agrestis).

These worms, which were introduced accidentally from Asia, eat the soil humus (organic matter, mostly dead leaves) layer and plant roots and fungi located in it. This leads to a number of problems for plants. First, the worms eat their fine roots and the fungi they rely on as partners in obtaining water nutrients. Second, by eating virtually all organic matter every year, the soil surface lacks the natural organic mulch, and therefore is prone to drying out in summer. Third, due to lack of insulating mulch, the soil is prone to frost heaving, which can cause small plants to become unrooted in winter. Finally, without leaves and plants to hold the soil together and slow down runoff, the soils are highly erodible and small plants can easily be washed away during rains.

Other invasive species were common throughout the study area (Table 3). Norway maple occurs throughout the study area growing on eroded slopes mixed in with American beech and sugar maple. Tree of heaven occur in dense seedling colonies located northeast of the soccer field. Princess tree is found growing along the riprap channel adjacent to the storm water drainage pond installed as part of the soccer complex. Also in this area, crown vetch, Chinese silver grass, bull thistle, and ground ivy are growing in an unmaintained field. Mile-a-minute is growing on the soccer field fence adjacent the Mairdale Street. In the northern area of our project area, downslope of the school is a large concentration of Japanese knotweed. Oriental bittersweet is growing on the shrubs and trees on the southern edge of the study area. In between wetland KKF 002B and KKF 002C common reed is growing along the stream bank. European stinging nettle is another species that is found growing by streams in small populations throughout the park. Periwinkle is growing north of Old Wissahickon Road by an old foundation. This species typically stays localized within the area it was planted. Jetbead, Morrow's honeysuckle, wineberry, Japanese barberry and Japanese stiltgrass are located throughout the entire study area in small populations.

Most of these populations are found in openings within the forest canopy, or along the edge of the wood line. Mugwort was found in open areas and observed on hillslopes outside of the study area. English ivy seedlings are observed growing along Riverview Avenue by the Bob Harvey Trail. European privet is found growing in an open area adjacent to Wetland KKF-003. Garlic mustard basal rosettes are growing in within the forest. Most of them observed were along Wissahickon Trail and Watson's Trail.

Table 3. Invasive Plant Species

Species	Common Name
Acer platanoides	Norway Maple
Ailanthus altissima	Tree of Heaven
Alliaria petiolata	Garlic Mustard
Artemisia vulgaris	Mugwort
Berberis thumbergii	Japanese Barberry
Celastrus orbiculantus	Oriental Bittersweet
Cirsium vulgare	Bull Thistle
Coronilla varia	Crown Vetch
Glechoma hederacea	Ground Ivy
Hedera helix	English Ivy
Ligustrum vulgare	European Privet
Lonicera morrowii	Morrow's Honeysuckle
Microstegium viminium	Japanese Stiltgrass
Miscanthus sinensis	Chinese Silvergrass
Paulownia tomentosa	Princess Tree
Phragmites australis	Common Reed
Polygonum cuspidatum	Japanese Knotweed
Polygonum perforliatum	Mile-a-Minute
Rhodotypos scandens	Jetbead
Rubus phoenicolaius	Wineberry
Urtica dioica	European Stinging Nettle
Vinca minor	Periwinkle

Existing Understory Vegetation

2.4 Threatened and Endangered Species

Pennsylvania Hawthorn (Crataegus pennsylvanica) and Umbrella Magnolia (Magnolia tripetala) are two species of special concern occurring in the Woods Run study area.

Pennsylvania hawthorn was found adjacent to Observatory Drive in a scrub shrub habitat. Its current status in Pennsylvania is Vulnerable or a state ranking of 3. (http://explorer.natureserve.org/servlet/NatureServe?searchName=Crataegus+pennsylvanica). Umbrella magnolia was found growing along stream 100 in filtered sunlight. Its current status in Pennsylvania is Imperiled or a state ranking of 2 (http://www.naturalheritage.state.pa.us/factsheets/14152.pdf).

2.5 Trails

Trails were mapped and documented within the project area. Seven previously unmapped trails were identified. These unmapped trails were mostly manmade trails that connected two existing trails. Most of the trails show signs of erosion. The erosion is caused by a lack of understory vegetative cover in combination with excessive water flow from above neighborhoods and poorly maintained drainage infrastructure to shed water away from trails and prevent it from concentrating along creating scouring forces.

A different trail runoff issue occurs along Old Wissahickon Road. There is a Belgian block-lined ditch on the north side of the old road. This serves to concentrate flow from uphill, which creates torrents of sediment and debris- laden water during storm events to clog downstream infrastructure, causing storm pulses to jump the ditch and scour across the old road, contributing to sedimentation into the streams. Scoured areas appear to be repaired with reclaimed concrete, which does not resist erosion well. Furthermore, this approximately 20-foot-wide trail appears to be overly wide given its current use. There appears to be no purpose for maintaining a gravel road inside the park at this location other than to provide access to repair the road itself.

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2.6 Roads

Roads within the Woods Run project area included Mairdale Street, Riverview Avenue, and Observatory Drive. Mairdale Street and Riverview Avenue contained areas of erosion.

In some areas the edge of the road was eroding downslope due to a sheet flow. Roads serve to concentrate flow along roadside ditches or sewers, which outlet rapidly to the stream system, contributing to unstable stream conditions and a rapid hydrograph.

2.7 Stormwater

Storm water and sewer feature locations were recorded wherever found. Culverts made of steel, PVC, and plastic were found at trail crossings. Many culverts along trails were buried, or damaged causing them not to function appropriately. Due to this, the runoff water would flow around the culvert.

Manholes, storm water inlets and outlets, and storm water junction boxes were found along the roads throughout the project area. A stormwater detention pond was mapped along with an adjacent riprap channel. The riprap channel begins at the end of a woodland swale, and ends alongside the retention pond.

Trail on Old Wissahickon Road