05 APPENDICES

WATERSHED-SCALE GSI SUITABILITY ANALYSIS

This document describes the geospatial analysis methodology used to identify, classify, and prioritize green stormwater infrastructure (GSI) opportunity sites across the Nine Mile Run Watershed. The analysis produces watershed-scale suitability maps for three categories of GSI intervention -- rain gardens and bioretention, depaving and impervious area retrofits, and green streetscape -- at multiple project scales, weighted by environmental justice indicators to direct investment toward communities with the greatest need.

Study Area

The analysis covers the Nine Mile Run Watershed in the City of Pittsburgh and adjacent municipalities in Allegheny County, Pennsylvania. The watershed boundary shapefile serves as the spatial extent for all data processing, clipping, and output generation.

Data Sources

All input datasets are clipped to the watershed boundary and reprojected to a common coordinate reference system (NAD83 / UTM Zone 17N, EPSG:26917) prior to analysis.

Terrain and Hydrology

Dataset	Source	Resolution / Format
Digital Elevation Model	USGS 10-meter DEM (Pittsburgh East, Braddock tiles)	10m raster
Filled DEM (sink removal)	Derived via Wang & Liu fill algorithm	10m raster
Flow Direction	Derived from filled DEM	10m raster
Flow Accumulation	SAGA One-Step Flow Accumulation (MFD routing)	10m raster
Strahler Stream Order	Derived from filled DEM	10m raster
Watershed Sub-basins	Derived from flow direction	10m raster
Floodplains	Allegheny County Floodplain (2000)	Vector (polygon)
Hydrology Areas	Allegheny County Hydrology Areas (2016)	Vector (polygon)
Wetlands	Allegheny County NWI (2000)	Vector (polygon)

Land Cover and Impervious Surfaces

Dataset	Source	Resolution / Format
Land Cover Classification	NLCD 2019 Land Cover -- Allegheny County	30m raster
Impervious Surface Percentage	NLCD 2019 Impervious Percent -- Allegheny County	30m raster
Impervious Surface Descriptor	NLCD 2019 Impervious Descriptor -- Allegheny County	30m raster
Tree Canopy Cover	NLCD 2021 Tree Canopy -- Allegheny County	30m raster

Built Environment and Infrastructure

Dataset	Source	Resolution / Format
Building Footprints	Allegheny County Footprints (2024)	Vector (polygon)
Street Centerlines	Allegheny County Street Centerlines (2021)	Vector (line)
Railroads	Pennsylvania Rail Lines (2016)	Vector (line)
Cemeteries	Allegheny County Cemetery (2002)	Vector (polygon)
Local Parks	DCNR Local Parks (2023) -- Allegheny County	Vector (polygon)
Parcels	Allegheny County Parcels (2024)	Vector (polygon)

Environmental Justice Indicators

Dataset	Source
EJ Benchmark Comparisons	Composite environmental justice risk index
EJ At-Risk Areas	Binary classification of at-risk census areas
Redlined Districts	HOLC redlining grades, scored numerically
Market Value Assessment	Reinvestment Fund MVA (2021)
Vacant Lots	Identified vacant parcels within the watershed
Opportunity Zones	Federally designated Opportunity Zones
Park Proximity Indices	Multi-factor accessibility scores (population density, transit access, park acreage, retail, hospitals, schools, employment)

Preprocessing

All raster layers are resampled to a uniform 10-meter cell size and reprojected to EPSG:26917. Vector datasets used as exclusion or constraint layers are converted to binary rasters (presence = 1, absence = 0) at 10-meter resolution, matched to the watershed boundary extent. Continuous-value rasters are normalized to a 0-to-1 scale using either linear min-max normalization or domain-specific reclassification functions, as described below.

The terrain DEM is preprocessed through a sink-filling algorithm (Wang & Liu) to produce a hydrologically correct surface. Flow direction and flow accumulation are computed from the filled DEM. Strahler stream order is also derived from the filled DEM as a contextual reference layer, used to validate the multi-scale flow accumulation thresholds and to visualize the natural drainage hierarchy within the watershed.

Multi-Scale Flow Accumulation

A distinguishing feature of this methodology is its treatment of flow accumulation at multiple project scales rather than as a single undifferentiated layer. Most GSI suitability analyses evaluate flow accumulation as one continuous surface, which conflates sites suited for small-scale interventions with those suited for large infrastructure. This analysis segments flow accumulation into four discrete scale bands, using contributing-area thresholds analogous to the hierarchical logic of Strahler stream ordering:

Scale	Contributing Area Range	Approximate Threshold
Micro	0 -- 1,011 m sq	Up to 0.25 acres
Small	1,011 -- 4,046 m sq	0.25 -- 1 acre
Medium	4,046 -- 40,468 m sq	1 -- 10 acres
Large	> 40,468 m sq	Greater than 10 acres

Each scale band produces a separate flow accumulation raster, which is carried through the full suitability analysis independently. This means that every GSI type is evaluated at every scale, producing results such as “Rain Gardens -- Micro” and “Rain Gardens -- Large” as distinct output layers. The approach ensures that a small residential rain garden opportunity and a large networked bioretention corridor are identified, scored, and mapped separately, with appropriate weighting for the physical and hydrologic conditions relevant to each scale of intervention.

The Strahler stream order layers (filtered at orders >3, >4, and >5) serve as reference overlays for interpreting the flow accumulation results and verifying that the scale thresholds align with observable drainage patterns in the watershed.

Suitability Analysis

The suitability analysis operates in two stages: a buildable area mask that defines where GSI is physically feasible, followed by type-specific composite scoring within the buildable area.

Buildable Area Mask

The buildable area is defined as the multiplicative product of six binary exclusion layers. A cell must pass all six tests to be considered buildable:

Exclusion Layer	Logic
Not Buildings	Excludes existing building footprints
Not Roads	Excludes road rights-of-way (for non-streetscape types)
Not Cemetery	Excludes cemetery parcels
Not Wetlands	Excludes mapped wetlands
Tree Canopy	Excludes areas with dense canopy (see below)
Not Railroad	Excludes railroad corridors

The result is a binary raster where 1 indicates buildable land and 0 indicates excluded land. All subsequent suitability composites are multiplied by this mask, ensuring that excluded areas receive a score of zero regardless of other factors.

Layer Normalization and Reclassification

Continuous-value input layers are normalized or reclassified to a 0-to-1 scale using domain-appropriate methods:

Slope -- Percent slope is reclassified using a piecewise function. Slopes at or below 2% receive a score of 1.0 (ideal for GSI construction). Slopes between 2% and 10% are linearly interpolated from 1.0 down to 0. Slopes above 10% receive a score of 0.

Solar Aspect -- Terrain aspect is reclassified into eight compass directions, scored by solar exposure potential for the Northern Hemisphere:

Direction	Azimuth Range	Score
South	157.5 -- 202.5 deg	1.00
Southeast / Southwest	112.5 -- 157.5 / 202.5 -- 247.5 deg	0.60
East / West	67.5 -- 112.5 / 247.5 -- 292.5 deg	0.50
Northeast / Northwest	22.5 -- 67.5 / 292.5 -- 337.5 deg	0.40
North	337.5 -- 360 / 0 -- 22.5 deg	0.30

Soils Infiltration Potential -- Hydrologic Soil Group (HSG) classifications are converted to numeric infiltration scores and linearly normalized:

HSG	Score
A (high infiltration)	1.00
B	0.75
B/D	0.60
C	0.50
C/D	0.40
D (low infiltration)	0.25
Unclassified	0.50

Tree Canopy -- Canopy cover percentage is inverted and thresholded. Areas with canopy density below 40% are scored as 1 - (canopy% / 40), preserving moderate canopy areas as partially suitable. Areas at or above 40% canopy receive a score of 0, functioning as a soft exclusion.

Impervious Surface Percentage -- The NLCD impervious percentage (0--100) is normalized to 0--1 by dividing by 100. An adjusted impervious layer is also computed as the cell-wise maximum of the normalized impervious percentage, the road binary raster, and the building binary raster, ensuring that known impervious features not captured by the satellite-derived raster are included.

Land Cover -- Individual NLCD land cover classes are isolated as binary rasters (1 where the class is present, 0 elsewhere). A composite "Vegetated, Non-Forest" layer is created by summing the binary rasters for Hay/Pasture, Grassland-Herbaceous, Barren Land, and Developed Open Space.

Flow Accumulation -- Each scale band is normalized independently using linear min-max normalization.

GSI Type Models

Three composite suitability models are computed, each reflecting the distinct site conditions that favor a particular type of GSI intervention. Every model is evaluated at all four flow accumulation scales (Micro, Small, Medium, Large), producing twelve primary suitability outputs.

Rain Gardens and Bioretention

Rain gardens and bioretention facilities require open, vegetated land with adequate solar exposure, moderate-to-gentle slopes, and soils capable of supporting infiltration. The composite formula is:

Score = Buildable FAC x Vegetated Non-Forest x (0.50 x Slope + 0.25 x Solar Aspect + 0.25 x Soils Infiltration)

Where "Buildable FAC" is the product of the buildable area mask and the flow accumulation layer at the given scale. The weighting prioritizes slope as the dominant physical constraint, with solar exposure and soil permeability as secondary factors.

Depaving and Impervious Area Retrofits

Depaving opportunities target existing paved surfaces (excluding roads and buildings) within the buildable area. The composite formula is:

Score = Buildable Area x FAC x Paved Non-Road Surfaces x Slope

"Paved Non-Road Surfaces" is derived as areas with impervious percentage at or above 70% that are neither roads nor buildings. Slope is included to favor sites where grading and drainage modifications are practical.

Green Streetscape

Green street interventions target existing road corridors. Because these projects occur within the road right-of-way, the buildable area mask (which excludes roads) is not applied. The composite formula is:

Score = FAC x Roads x Slope

This identifies road segments where stormwater flow accumulates and slopes permit curb-cut or bioswale installation.

Supplementary Analysis Layers

In addition to the primary suitability composites, the analysis generates several supplementary layers for interpretive and planning purposes:

Urban Heat Island Effect -- A weighted composite of impervious surface coverage (50%), solar aspect (40%), building density via Gaussian smoothing (10%), offset by tree canopy (-30%) and hydrology areas (-20%). While the suitability models identify where GSI can be built (the supply side), the urban heat island layer helps characterize where GSI benefits are most needed (the demand side). Areas with elevated heat exposure -- driven by high imperviousness, limited canopy, and south-facing surfaces -- often overlap with environmental justice communities already burdened by aging infrastructure and limited greenspace. This layer supports the equity case for directing GSI investment toward neighborhoods where cooling, shading, and stormwater relief will have the greatest impact on public health and quality of life.

Floodplain Overlay -- Mapped floodplain boundaries are included as a reference layer. While floodplains are not excluded from the suitability analysis, their presence informs design considerations and regulatory requirements for proposed interventions.

Park Areas -- Both “In Park” and “Not In Park” binary layers are generated, supporting filtering of results by land ownership and public access.

Vacant Lots -- A point-in-time snapshot of City of Pittsburgh vacant lot inventory, used as a contextual overlay to identify parcels where land acquisition or partnership barriers may be lower. Because the City updates this dataset on a rolling basis, the version used in this analysis represents conditions at the time of data acquisition and should be refreshed for future iterations.

Environmental Justice Prioritization

The raw suitability results identify where GSI can be built. The prioritization step addresses where it should be built first, by weighting suitability scores against environmental justice indicators.

EJ Priority Index

An Environmental Justice Priority score is computed for each cell as a weighted average of two indicators:

EJ Priority = 0.50 x EJ At-Risk + 0.50 x Park Proximity (park acreage)

This composite captures both environmental vulnerability (EJ At-Risk) and park/greenspace deficiency (Park Proximity). The raw composite is normalized to 0--1 using linear min-max normalization, with zero-value cells set to null to exclude areas outside the indicator coverage.

Additional EJ-related layers -- redlined districts, opportunity zones, vacant lots, and the full suite of park proximity sub-indicators (population, transit, retail, hospitals, schools, employment) -- are processed and available as reference layers for supplementary analysis and narrative context.

EJ-Weighted Suitability

Each GSI suitability result (12 layers: 3 types x 4 scales) is combined with the EJ Priority index to produce an equity-weighted score:

EJ-Weighted Score = Suitability x ((0.50 x EJ Priority) + (0.50 x Suitability))

This formula elevates sites in high-need areas while preserving the underlying suitability signal. A site with high physical suitability in a low-need area will score lower than an equally suitable site in a high-need area, but a site with poor physical suitability will not score highly regardless of need. The result is normalized to 0--1.

Spatial Clustering and Site Identification

The final stage translates continuous raster suitability surfaces into discrete, actionable project sites.

Raster-to-Point Conversion

Each EJ-weighted suitability raster is converted to a point layer, with each 10-meter cell becoming a point feature carrying its suitability score and scale classification (Micro, Small, Medium, or Large).

Parcel Intersection

Point features are intersected with the Allegheny County parcel layer (clipped to the watershed boundary) to associate each opportunity point with a specific tax parcel (PIN). A separate right-of-way layer is generated by differencing the watershed boundary with the parcel fabric, capturing public rights-of-way that may be candidates for green street interventions.

DBSCAN Clustering

Points within each GSI type are clustered using the DBSCAN (Density-Based Spatial Clustering of Applications with Noise) algorithm with a 14-meter search radius and a minimum cluster size of 1. Each cluster receives a unique identifier, and a composite key is generated combining the cluster ID with the parcel PIN. This links spatial clusters to property-level records.

Minimum Bounding Circles

Each cluster-parcel combination is enclosed by a minimum bounding circle, providing a simple geometric footprint for each candidate project area. These bounding circles serve as the primary unit for planning-level site screening and approximate the spatial extent of each potential intervention.

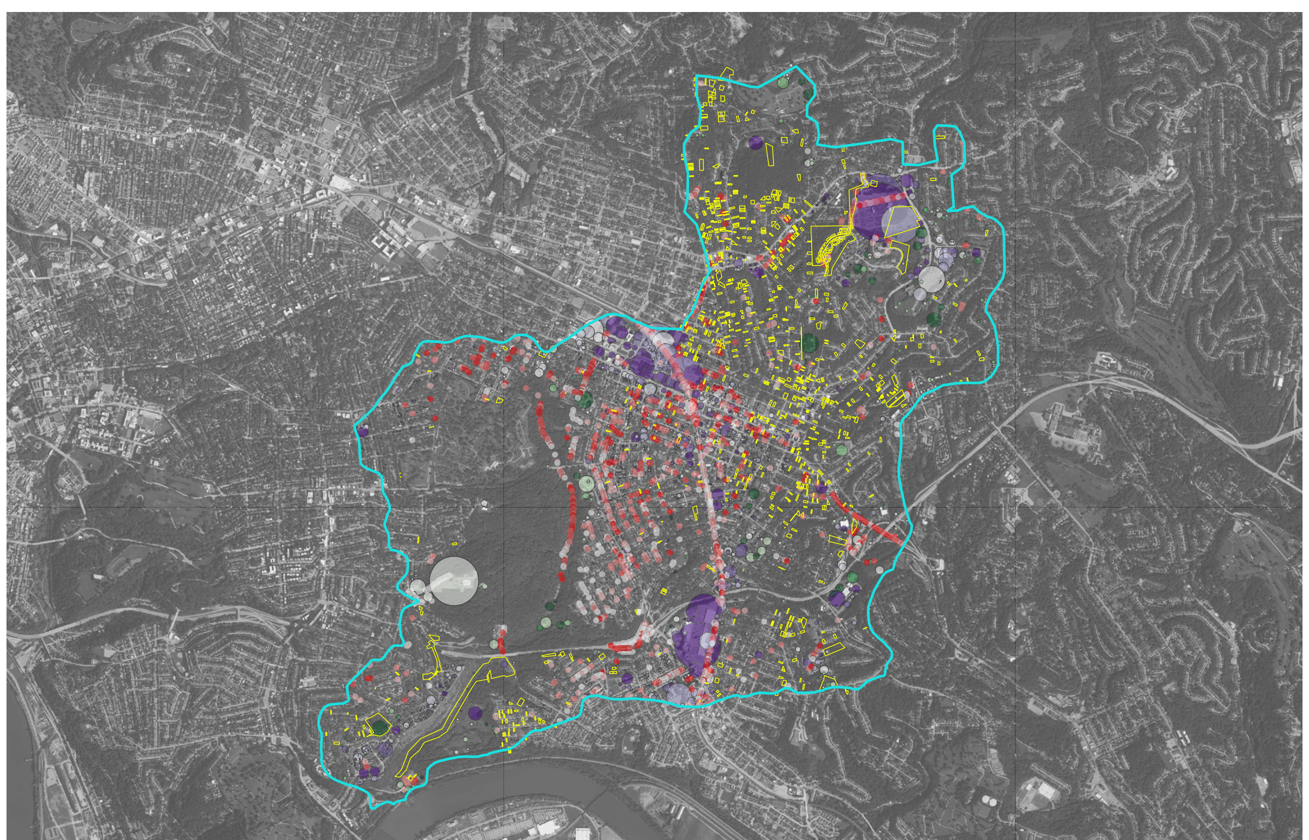
The distinction between clustered and isolated points maps directly to the networked and non-networked GSI framework described in Structuring a GSI Shedwide System. Clusters of high-scoring points across adjacent parcels or rights-of-way represent potential networked systems, while isolated high-scoring points represent site-level, non-networked opportunities.

Outputs

The analysis produces the following deliverables:

1. **Suitability Rasters (12 layers) --** Continuous 0-to-1 heatmaps for Rain Gardens, Depaving/Retrofits, and Green Streets at Micro, Small, Medium, and Large scales.
2. **EJ-Weighted Suitability Rasters (12 layers) --** The same suitability results weighted by environmental justice priority.
3. **Supplementary Rasters --** Buildable area, urban heat island effect, adjusted impervious surface, vegetated non-forest land cover, individual NLCD class rasters, and all normalized input layers.
4. **Clustered Point Layers (3 layers, one per GSI type) --** Point features with suitability scores, scale classification, and parcel identifiers.
5. **Bounding Circle Layers (3 layers, one per GSI type) --** Minimum bounding geometries for each cluster-parcel combination, representing candidate project footprints.
6. **Reference Layers --** Strahler stream order (filtered at three thresholds), flow direction, watershed sub-basins, floodplains, and EJ indicator surfaces.

All outputs are projected in NAD83 / UTM Zone 17N (EPSG:26917) at 10-meter resolution (rasters) or native geometry (vectors).



SUB-SHED ASSESSMENTS

In order to prioritize projects, UpstreamPgh and the Consultant Team looked at a variety of factors, including the stormwater capture potential, the community co-benefits, community priority, and estimated costs.

District	Project Name	Capture Potential	Community Benefits	Community Priority	Cost	Total Score	FINAL RANK	UpstreamPgh Role
Hilltop Sending Properties	Covenant Church	2	1	1	2	6	8	Support, Advocate, Partner
	Petra Ministries	3	1	2	2	8	2	Support, Advocate, Partner
	U-Pull	2	1	1	2	6	8	Support, Advocate, Partner
Valley Park Projects	Hunter Park	1	2	2	1	6	8	Support, Advocate, Partner
	East Hills Park	1	2	2	1	6	8	Support, Advocate, Partner
	Turner School	2	2	2	1	7	4	Partner, Support, Advocate
	Nine Mile Run Culvert	-	3	3	1	7	4	Advocate, Support, Partner
Frankstown Bennett	Bennett Light Industrial	3	2	1	2	8	2	Support, Advocate
	Angoria Blackadore Street Stream Pairing	1		3	2	6	8	Advocate, Partner
	Exley Way	1	2	2	2	7	4	Lead, Partner
	Conemaugh Street	2	2	3	2	9	1	Lead, Partner
Rockwell to Wilkinsburg Business District	Park and Ride Rosedale Cluster	-	3	2	1	6	8	Support, Advocate
	Light Industrial District on lot GSI	-	2	1	1	4	16	Support, Advocate
	Whitney Park and Kelly School Micronetworks	-	2	2	2	6	8	Support, Advocate, Partner
	Light Industrial District Green Streets GSI	-	2	1	2	5	15	Support, Advocate
	Wilkinsburg Business District	-	3	3	1	7	4	Support, Advocate, Partner

Stormwater Capture Potential

Estimated cumulative gallons managed in 1 year:

1. Lower storage potential - less than 5 million gallons
2. Moderate storage potential - between 5 million and 10 million gallons
3. High Storage - more than 10 million gallons

Community Benefits Score

The benefits score was determined by asking the following questions; does this project Improve Downstream Water Issues, does this project solve adverse upstream water-related issues, does this project improve human and ecological health, does this project increase economic opportunity, does this project create culturally restorative places? The scores for each of these questions were then averaged to determine the benefit score for each project.

1. Low benefit
2. Moderate benefit
3. High Benefit.

Community Priority

Based on community input during the engagement process is this a high priority for the community

1. Low community priority
2. Moderate community priority
3. High community priority

Estimated Project Cost

While the planning for these projects is too preliminary to have full cost estimates, rough order of magnitude estimates were made to categorize the approximate cost of the projects. Projects with low costs scored highest.

1. High estimated cost greater than $5 million
2. Moderate estimate cost between $1 Million and $ 5 million
3. Low estimated cost less than $1 Million

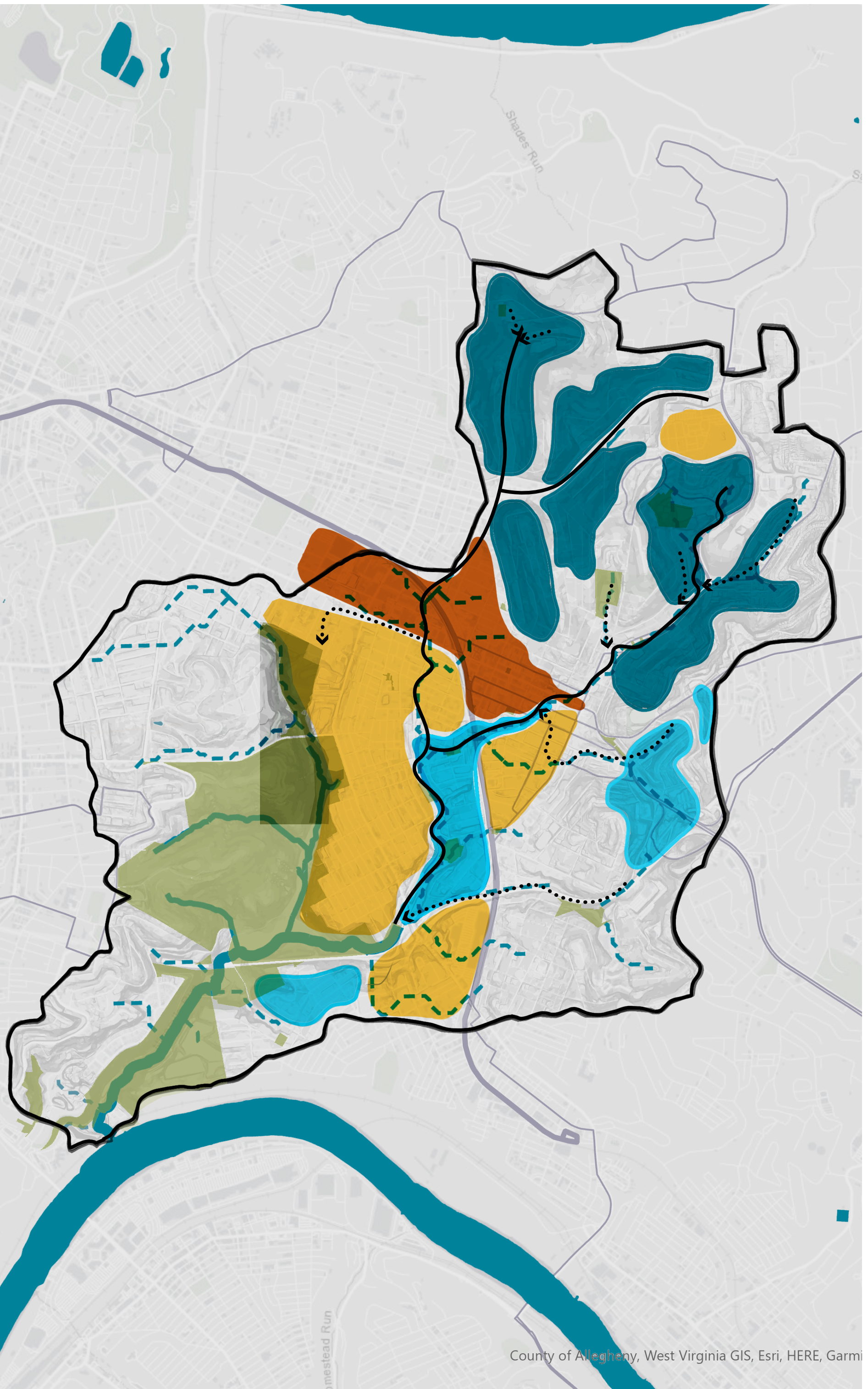
Upstream Role

Upstream may play different roles in each of these projects.

- Advocate
- Support
- Partner
- Lead

HISTORIC REVIEW OF THE WATERSHED

This GROUND analysis suggests four stormwater management areas, each with its own dominant GSI technologies and patterns of use.



Together with the EJ data and the calculated prioritization tool, this approach helped the team prioritize certain practices and areas. This project is not simply finding a series of sites or a series of sheds, but determining the structure of the system. This analysis is an interpretation of the lived experience across the watershed, supported but historic with maps and other demographic data.

Nearly two centuries of development and urbanization have greatly changed the flow of Nine Mile Run but the predevelopment patterns are still visible. The flat areas were developed first and provided housing for the growing business districts. The rail line developed before the roads and provided the first major impediment to stream flow, even when the area was largely rural.

Today, the topography shows three distinct historical branches of Nine Mile Run, including a lowland collector branch and upland tributaries. There are no open channels in these areas. Drained water unceremoniously emerges at the Allenby Avenue pipe with great force, to become Nine Mile Run.

In many ways, concentrated valleys in the upland area resemble perched valleys in the lowland collectors. They collect water flowing from streets, sidewalks, and from private property. Upland concentrated valleys have larger tributary areas than the much smaller perched valleys. These points of concentration often coincide with parks. Others are in the public right of way or on adjacent private property. Other areas are relatively flat, with residential and/or commercial areas. Modest sized homes with yards are typical in the residential areas. Commercial areas have a high degree of impervious surface and little area for on-lot capture and storage.

1882 overview.

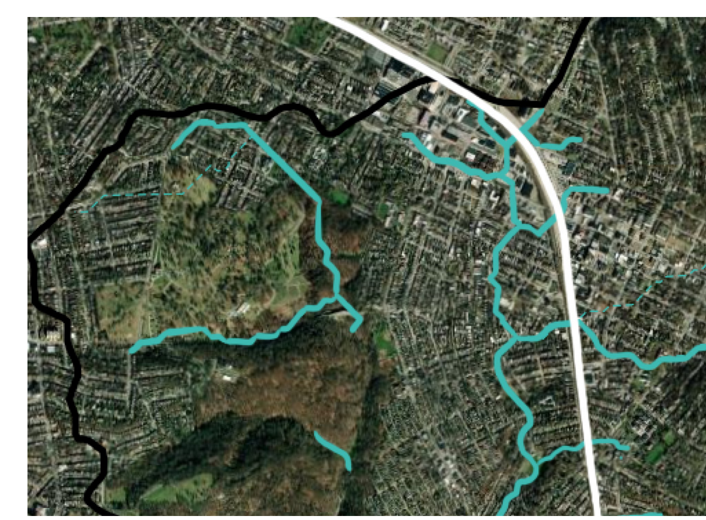
This overview map show the growing areas of East Liberty and Wilkinsburg as rail-oriented communities.

1882

Much of the upper shed is undeveloped in 1882. The railroad is the greatest topographical change, as the large embankment becomes a barrier to people and water as they move downslope. The streambeds close to the railroad will disappear first. Some of the upslope waterways have been lost to road construction or development, perhaps because the streams are small or season and easier to manage. Valley roads and development patterns follow the topographic pattern.

2025

Today many of the historic stream uplands are road beds. The greatest loss of the stream pattern occurs in the flat areas. Many of the streams collect in low lying areas that are not trapped due to areas filled for development. It is possible that many of these areas are candidates for sewer backups due to the convergence of overland flow and sewer flow.



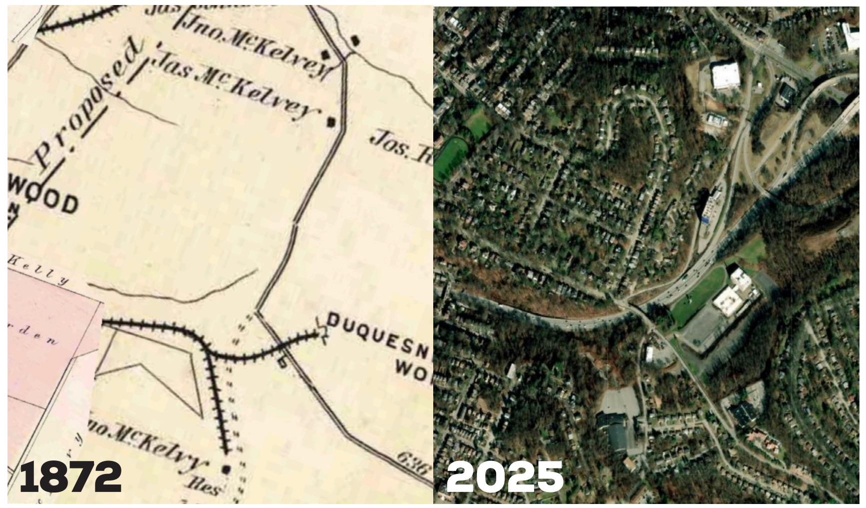
THE LOWLAND COLLECTOR BRANCH.

The lowland shed collects water from upstream and has two distinct patterns, highway-adjacent conveyance and perched valleys.

Highway-adjacent conveyance

sites line the 376 corridor, collecting water from one side of the highway or the other. The highway prevents above ground channel networks and the water is conveyed in pipes below grade.

Interstate 376. The stream channel is well delineated in 1862-1882 but has been largely obliterated by later neighborhood development and highway construction



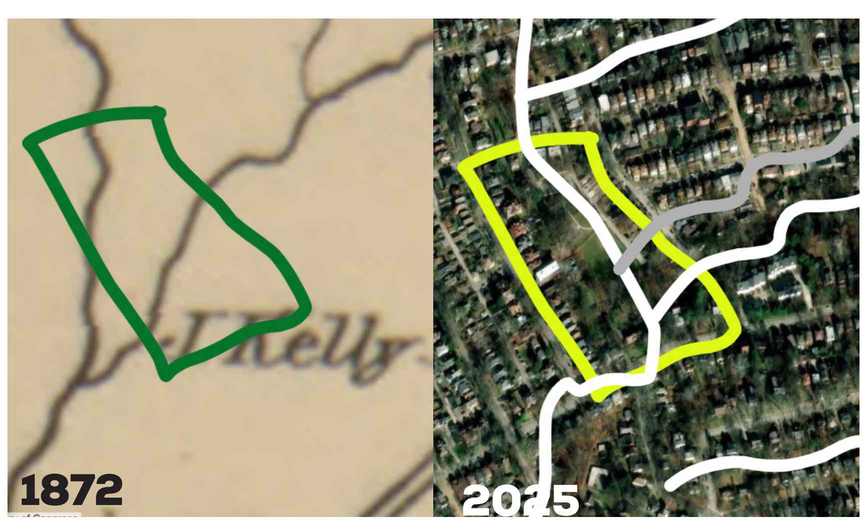
Allenby Avenue is an atypical example of the highway-adjacent conveyance and where NMR emerges to an open channel. What was once an open channel and steam laundries, evolved into a trolley network that was later truncated to create Interstate 376/ Highway 30. Water in the sewer becomes an open channel at an uncelebrated entry to Frick Park.

Allenby Avenue. Today's park entry was designed as part of the highway's drainage system (1959). Concrete channelization is visible, some of which has since been washed away by the stream's erosive force.

Small perched valleys

in Regent Square, Edgewood, and Swissvale are small collector areas that often have parks or open space at the low point.

Whitney Park Sidelot. Two minor tributaries converge at Whitney Park sidelot. The site has been undeveloped or used as a park continuously since 1872.

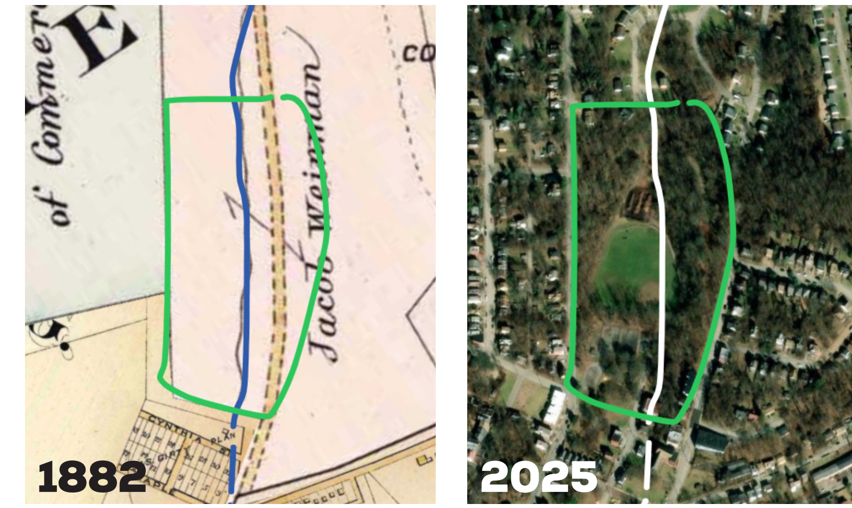


UPLAND TRIBUTARIES.

The upland tributaries have some common elements, resulting in concentrated valley collection points and street-stream pairings.

In the upper sheds there are a series of **concentrated valleys**- -small micro-sheds that drain to a single point. The valley may have been difficult to develop and in many cases the area was filled a repurposed as a park or open space.

CONCENTRATED VALLEYS Hunter Park



Another prominent pattern is a **stream-street pairing**. Historically, a road would have been co-located with the stream as the easiest path to the hilltop. Historic maps reveal that the road was typically located upslope, and that the streams would be culverted into secondary street and alleys. Lower areas would have been susceptible to flooding, likely making it less desirable for development.

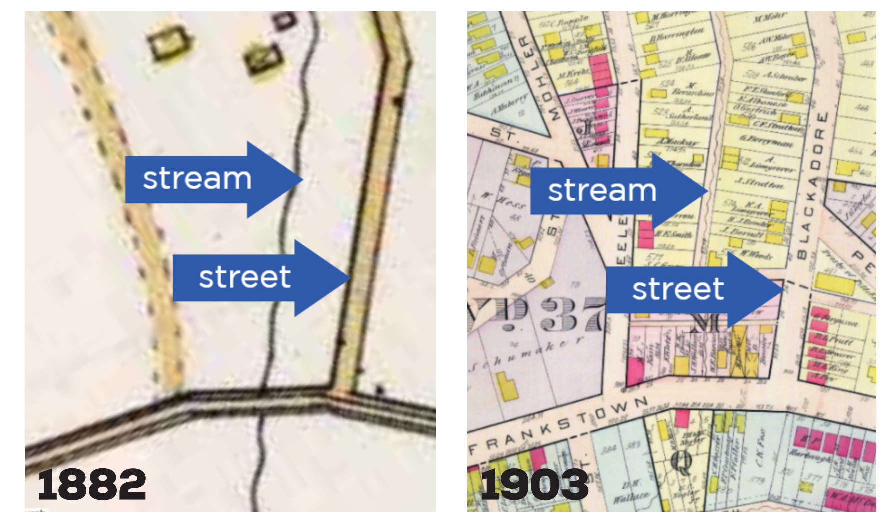
STREAM/STREET PAIRINGS Blackadore Ave and Angoria Way

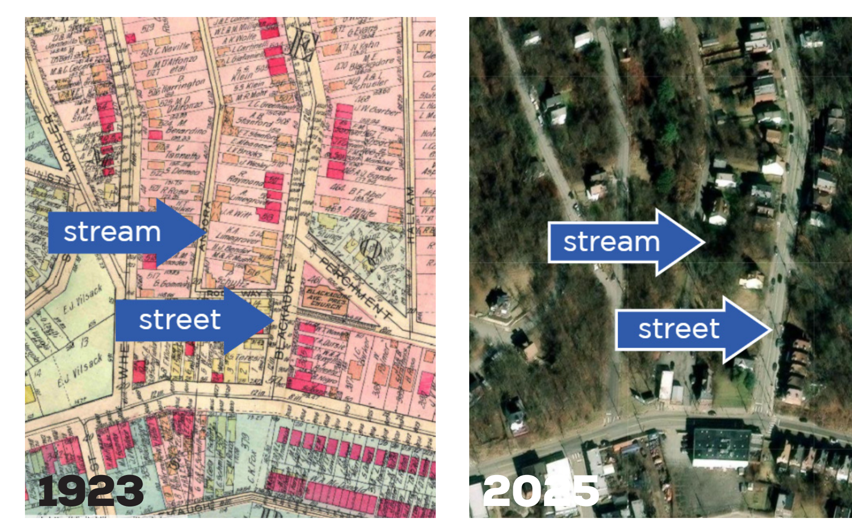
1882. Rural development gravitated towards the stream, perhaps for drinking water or livestock resources.

1903. The stream is still visible but is drawn as an alley with adjacent framed structures. The "stream" may be a "ditch."

1923. The map no longer shows a stream. The open channel has likely been captured in a combined sewage and storm sewer.

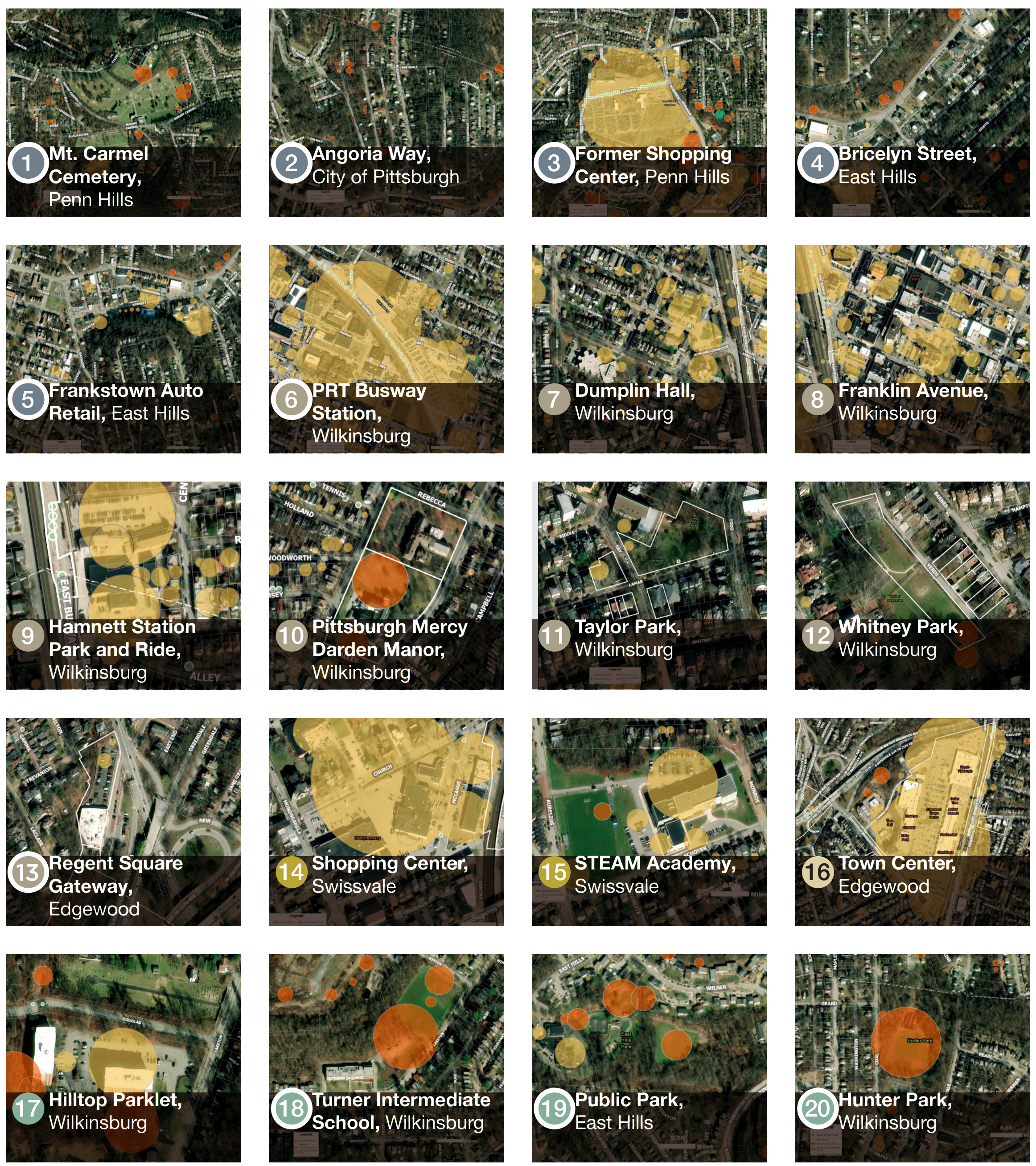
2025. The stream is not visible and the alley is degraded and infrequently maintained as it serves few properties.

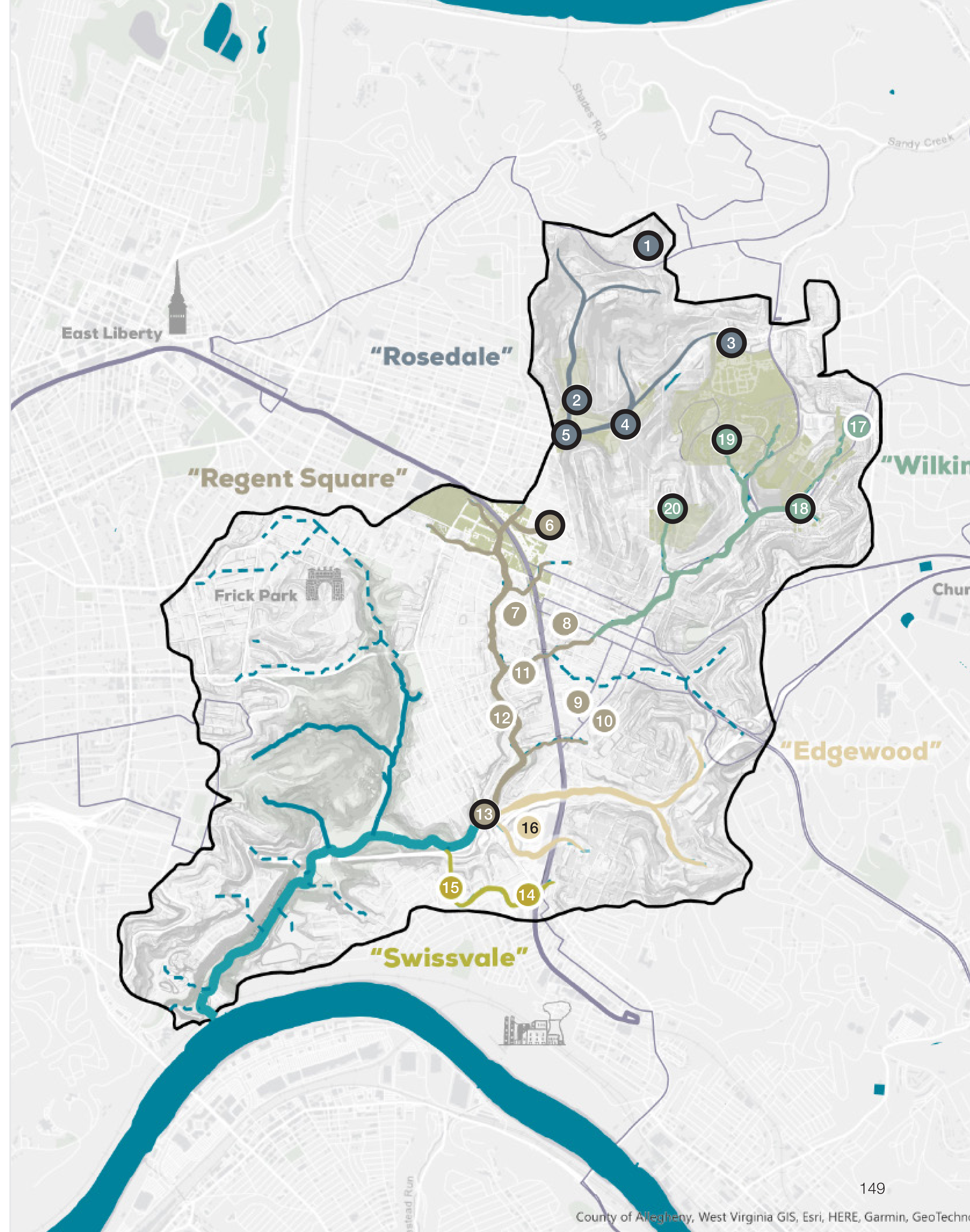




NINE MILE RUN PROJECT OPPORTUNITIES

Many projects viable project sites were identified as part of this process. The projects highlighted in black are places that were deemed to have the greatest impact on communities that are more vulnerable to flooding and are in need of infrastructure investment.





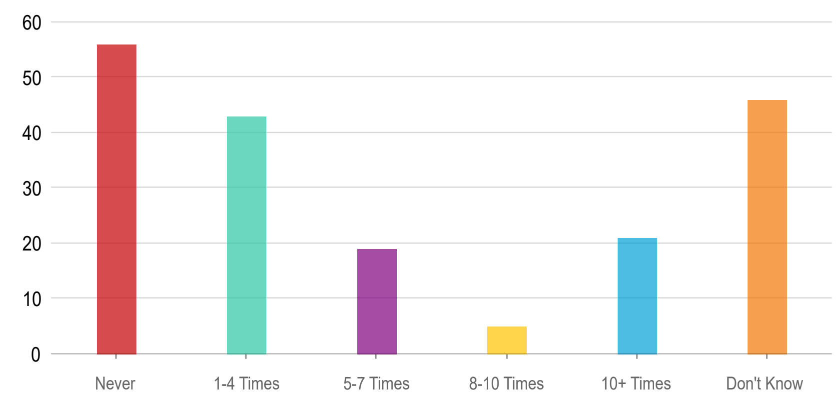
PUBLIC SURVEY RESULTS

As of April 22, 2026

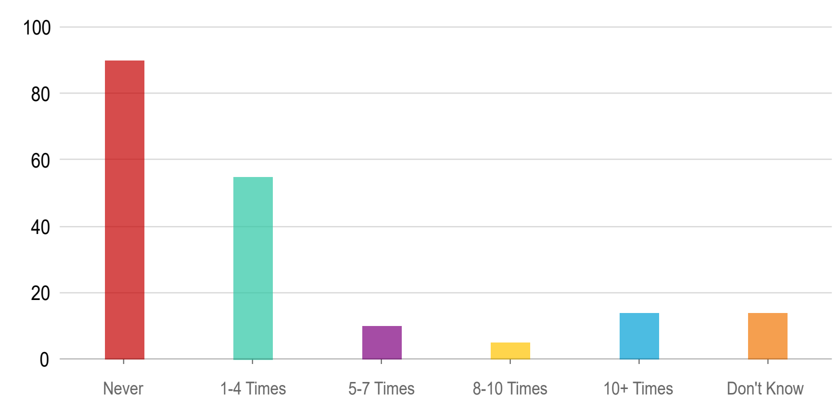
Watershed Places & Areas of Concern

Watershed Places & Areas of Concern > How many times have the places listed below experienced flooding or basement backups in the past 2 years (24 months)?

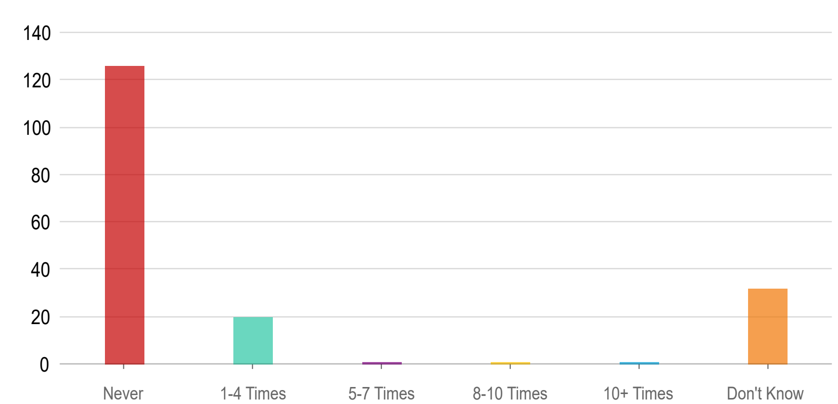
Parts of your neighborhood



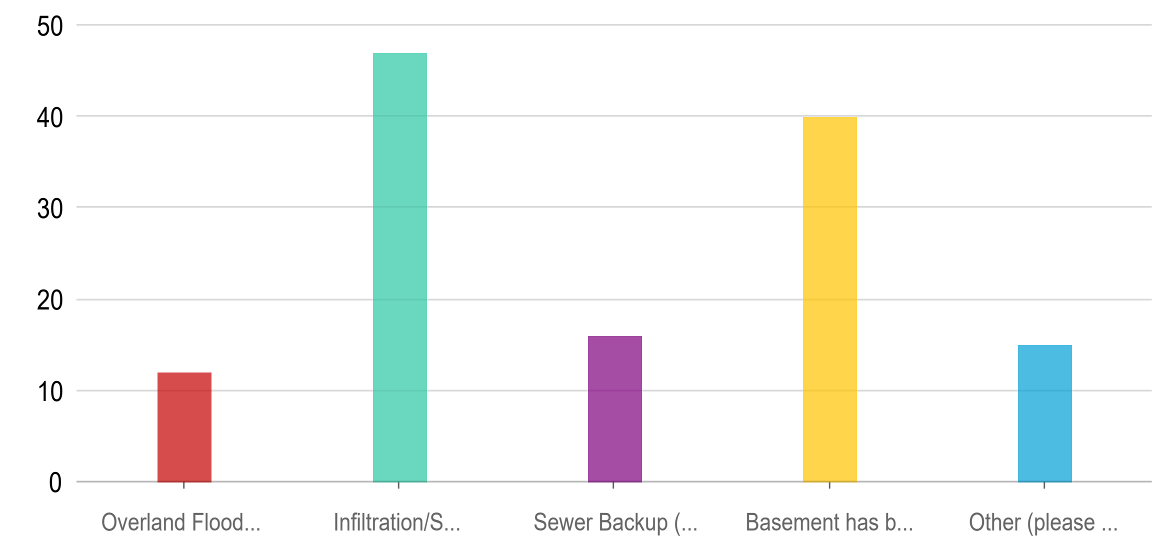
Your basement



Your basement (in the past 30 days)



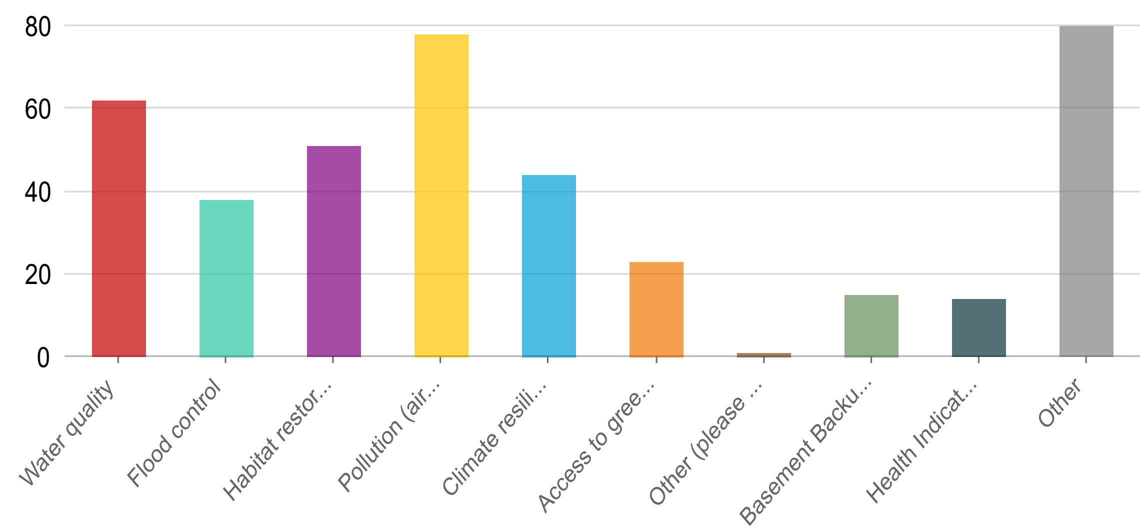
How has water entered your basement in the last 12 months during a storm or rain... *



Answers	Count	Percentage
Overland Flood (e.g., water entering through basement windows or window wells from outside; or water coming down from floors above)	12	6.25%
Infiltration/Seepage (e.g., water entering through cracks in basement walls or floors)	47	24.48%
Sewer Backup (e.g., sewage/smelly water come up through drain or toilet in the basement)	16	8.33%
Basement has been wet/damp/musty without a known cause	40	20.83%
Other (please specify)	15	7.81%

Answered: 86 Skipped: 106

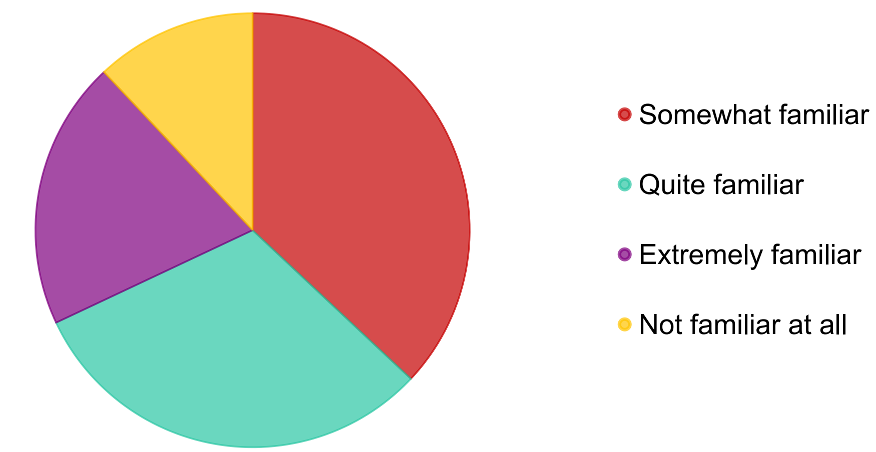
What types of environmental issues do you think should be addressed first in your... *



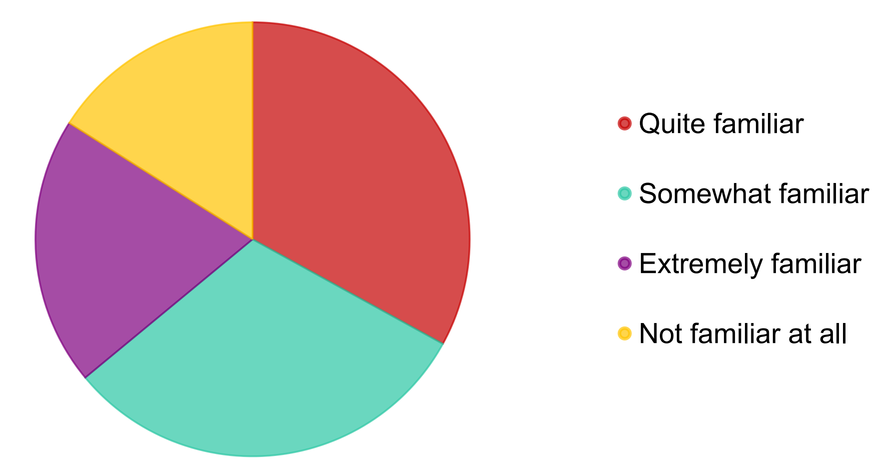
Answers	Count	Percentage
Water quality	62	32.29%
Flood control	38	19.79%
Habitat restoration	51	26.56%
Pollution (air, water, land)	78	40.63%
Climate resilience	44	22.92%
Access to green spaces	23	11.98%
Other (please specify)	1	0.52%
Basement Backups	15	7.81%
Health Indicator (Asthma)	14	7.29%
Other	80	41.67%

Answered: 192 Skipped: 0

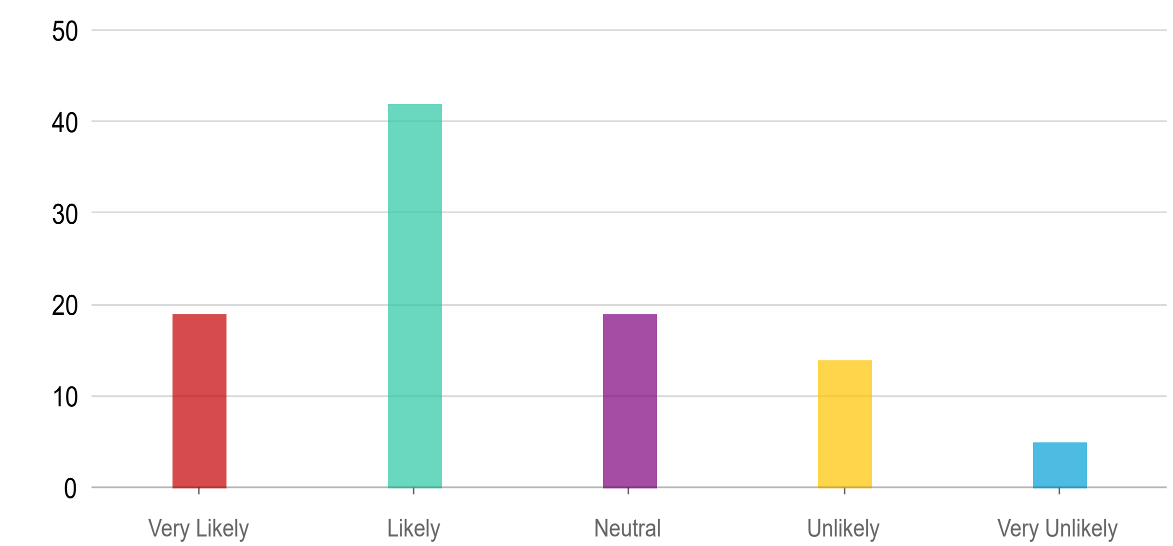
Are you familiar with the Nine Mile Run watershed and its environmental...



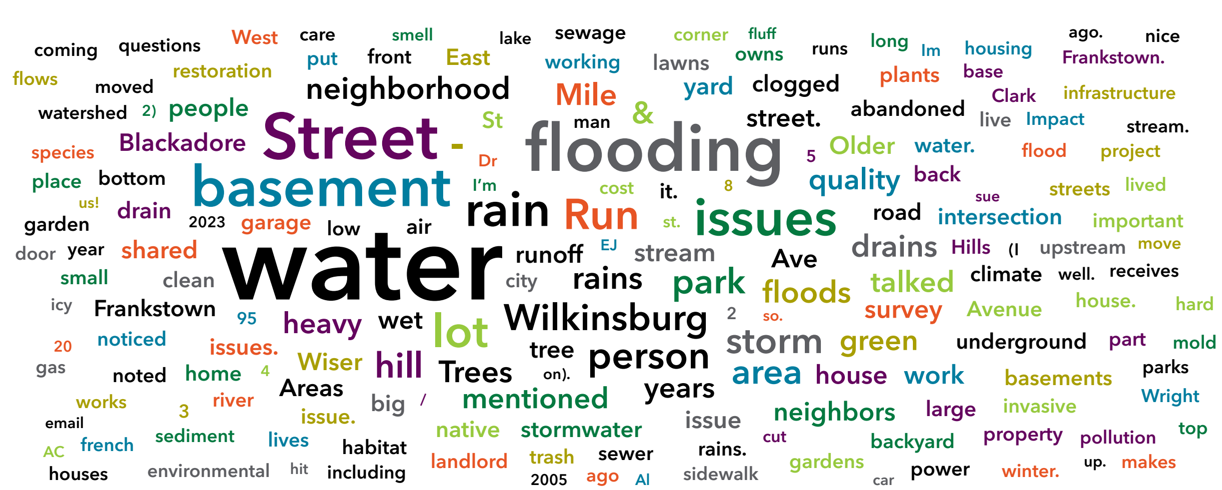
Are you familiar with Green Stormwater Infrastructure projects in the...



In your opinion, how likely is it that your neighborhood will experience...

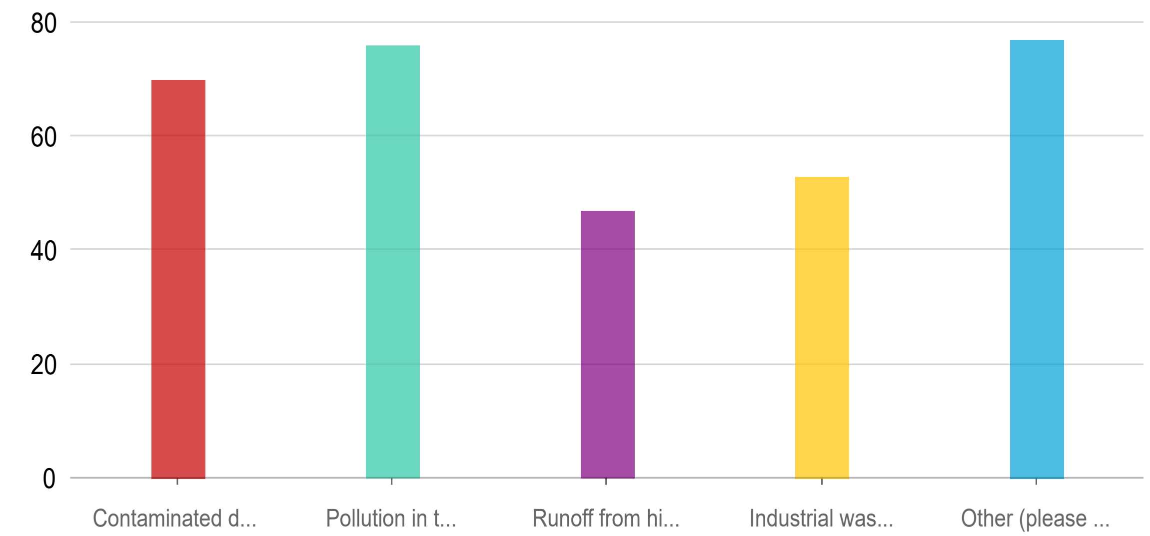


(previous question continued)

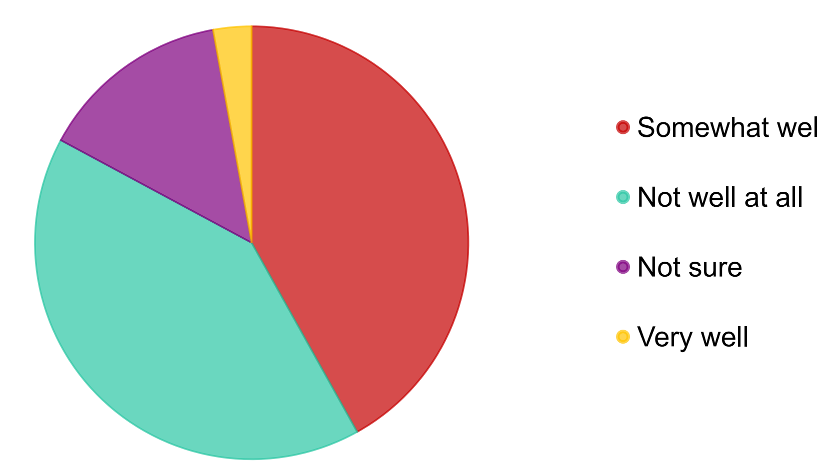


Critical Environmental Issues

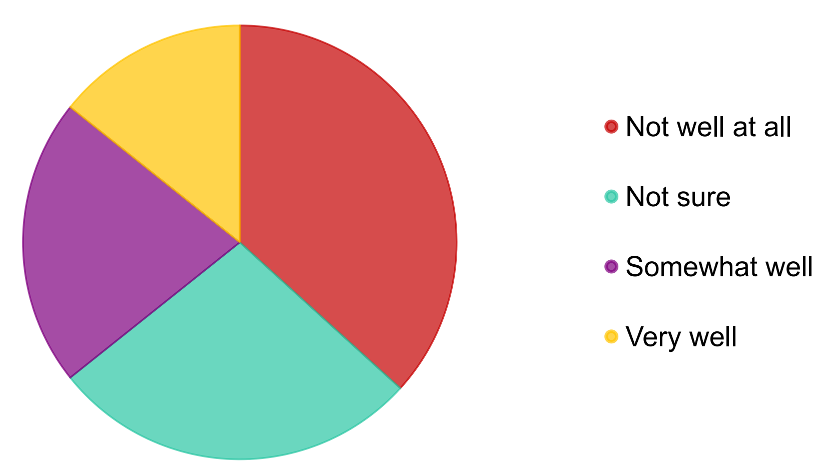
What specific environmental issues most concern you regarding water quality in th... *



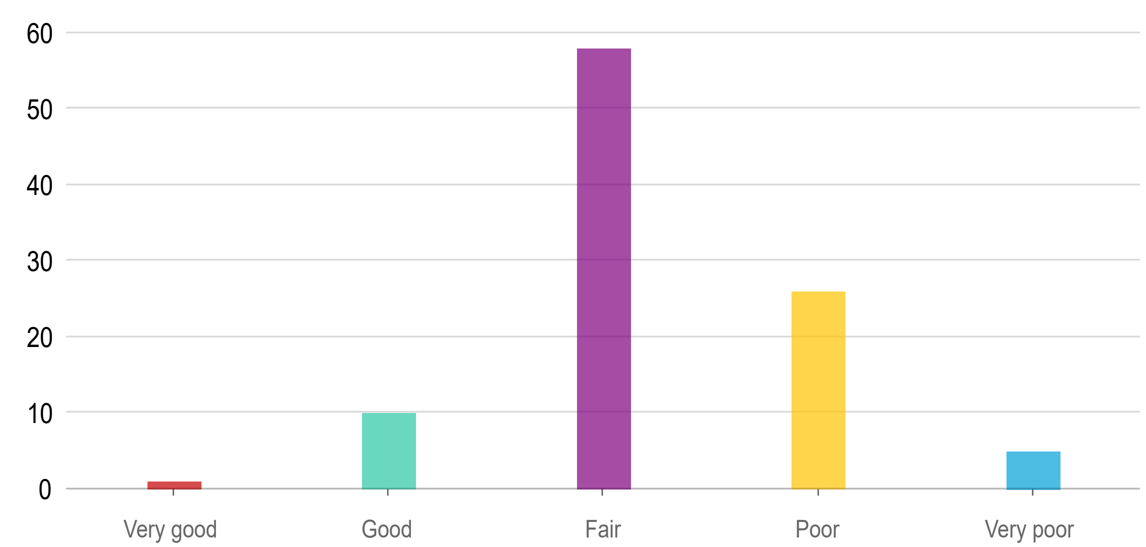
In your opinion, how well are the environmental concerns of your...



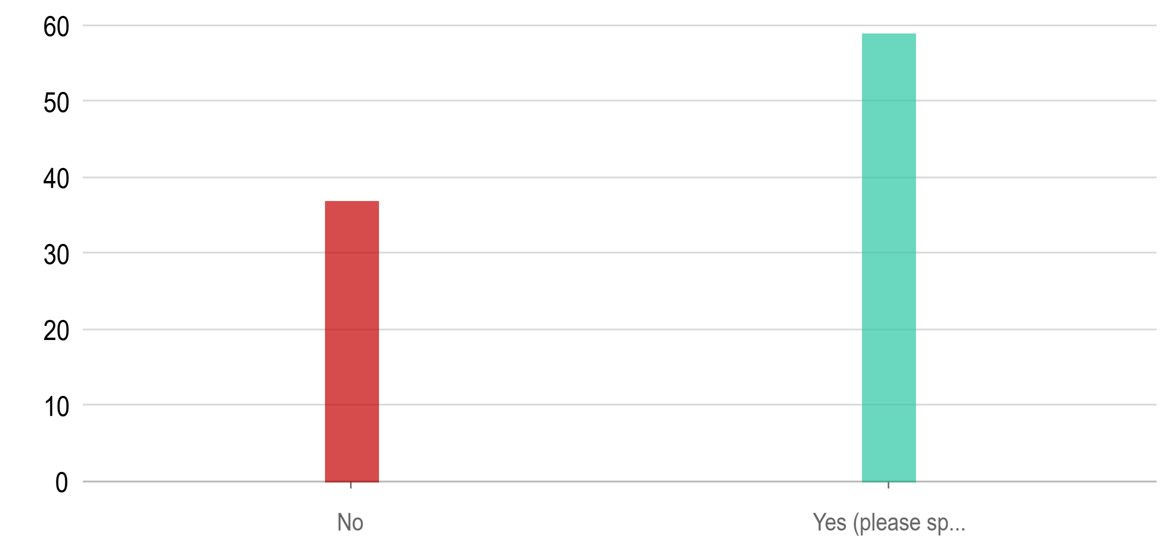
How likely do you think it is that your basement will experience flooding i...



How would you rate the current state of flood management and stormwate...

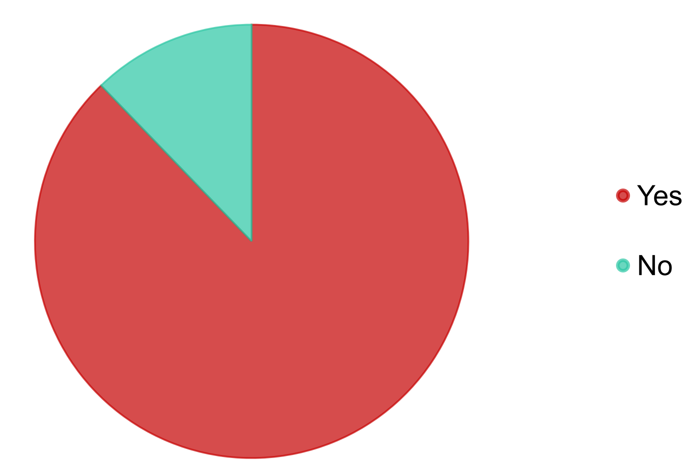


Are there any specific natural resources (e.g., fish, wildlife, plants) that yo...

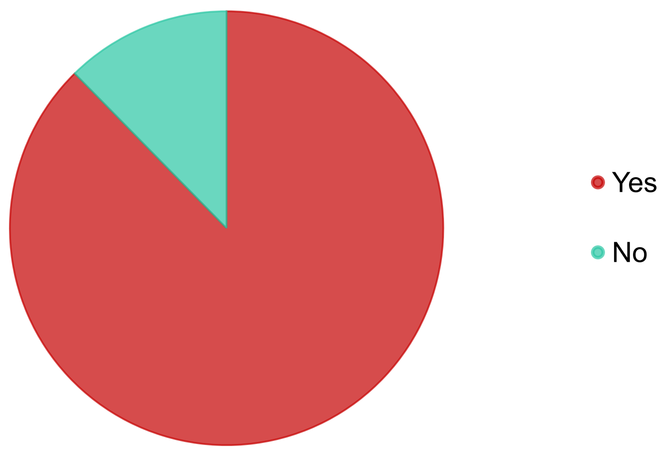


Critical Environmental Issues > Some parts of the Nine Mile Watershed experience greater water-related issues than others. Do you notice that these issues are more prevalent for any of the communities noted below?

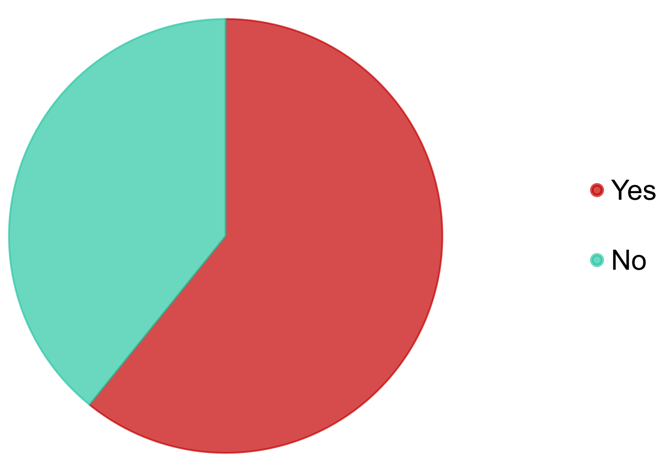
Low-income communities



Communities of color

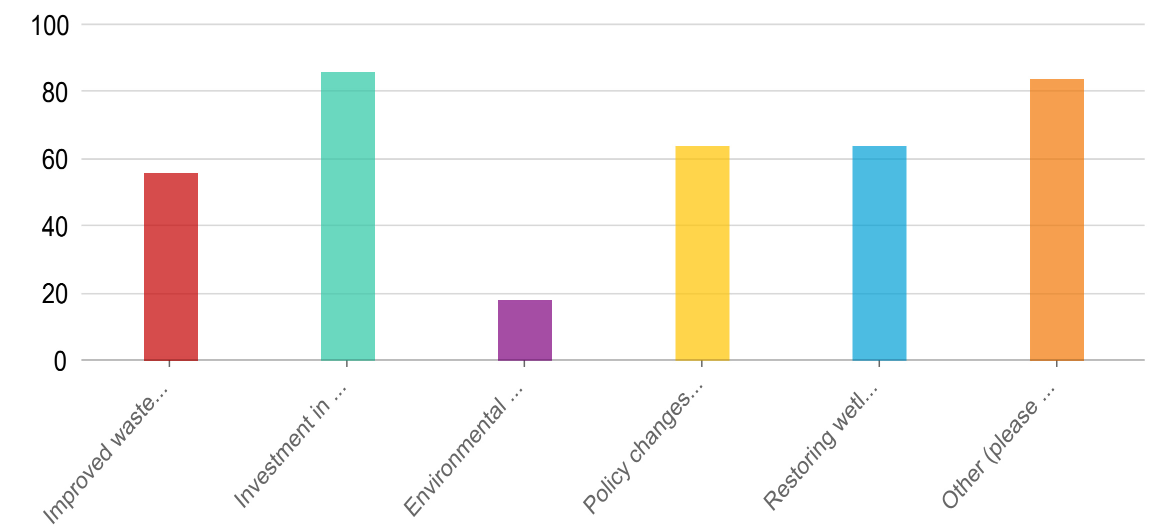


Indigenous communities



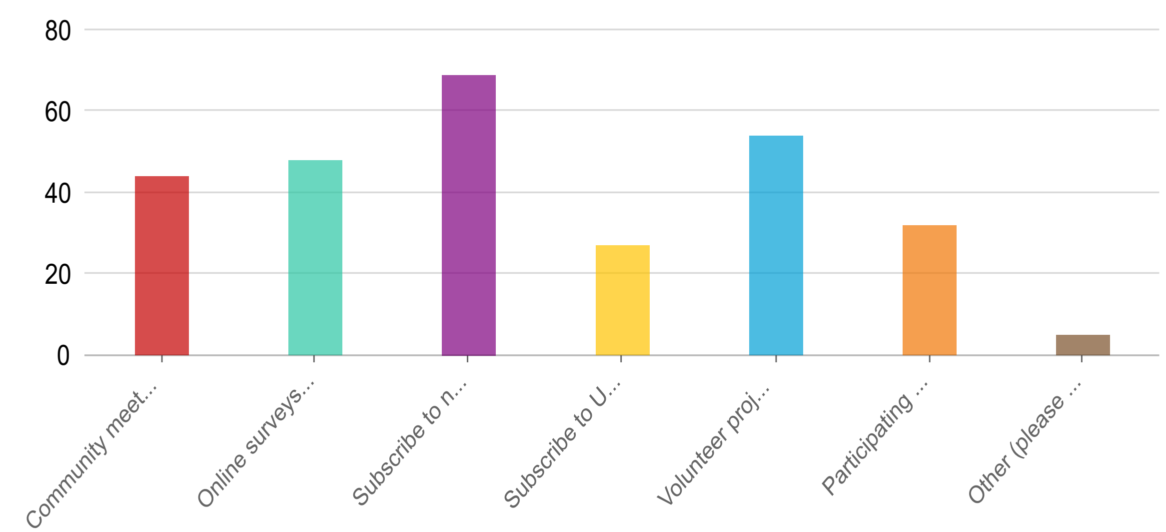
Community Involvement and Final Thoughts

What types of solutions or actions do you think would be most effective in... *



Answers	Count	Percentage
Improved waste management	56	29.17%
Investment in green infrastructure (e.g., rain gardens, permeable pavements)	86	44.79%
Environmental education programs	18	9.38%
Policy changes and enforcement	64	33.33%
Restoring wetlands and natural buffers	64	33.33%
Other (please specify)	84	43.75%

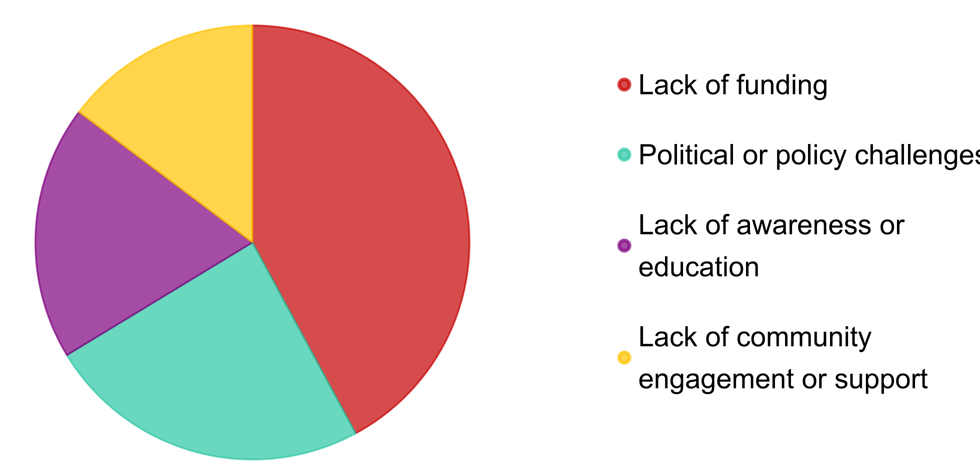
Would you like to be involved in local watershed planning? If so, how would you like …



Answers	Count	Percentage
Community meetings	44	22.92%
Online surveys or forums	48	25%
Subscribe to newsletter	69	35.94%
Subscribe to Upstream newsletter and mailing list	27	14.06%
Volunteer projects (e.g., cleanups, tree planting)	54	28.13%
Participating in local advocacy groups	32	16.67%
Other (please specify)	5	2.6%

Do you have any additional comments or concerns about environmental justice in…

What are the biggest challenges or barriers to implementing these solutio…



WATER QUALITY STREAM MONITORING DATA

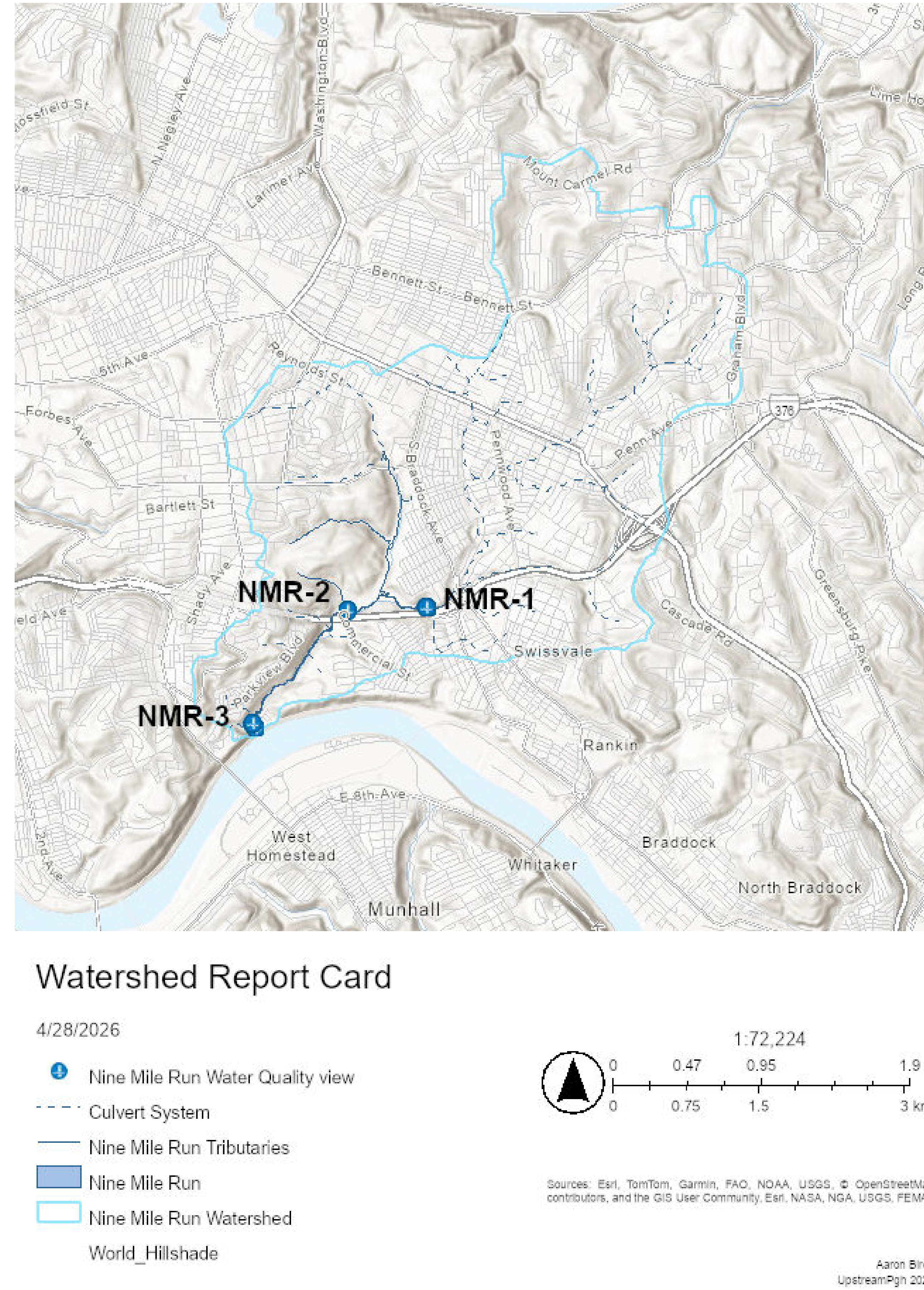
UpstreamPgh has been monitoring water quality in Nine Mile Run since 2000. Each month, data is collected on core parameters of interest including: water temperature, pH, dissolved oxygen, specific conductivity, turbidity, metals, nitrogen and bacteria.

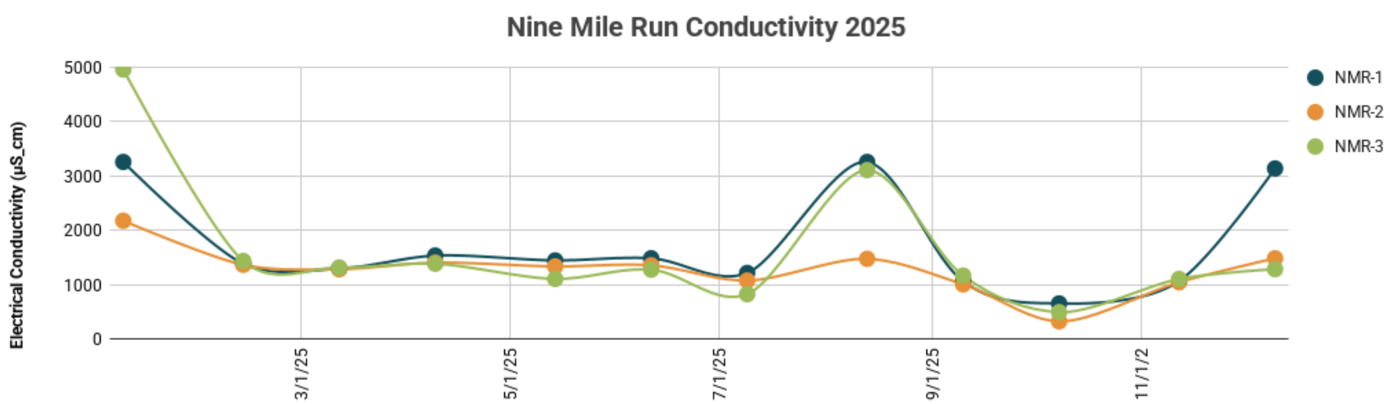
Analyzing monthly data allows us to accurately assess the ecosystem health of Nine Mile Run while better understanding the impact of pollutants into Nine Mile Run and whether they are being reduced over time as a result of interventions and improvements in the watershed.

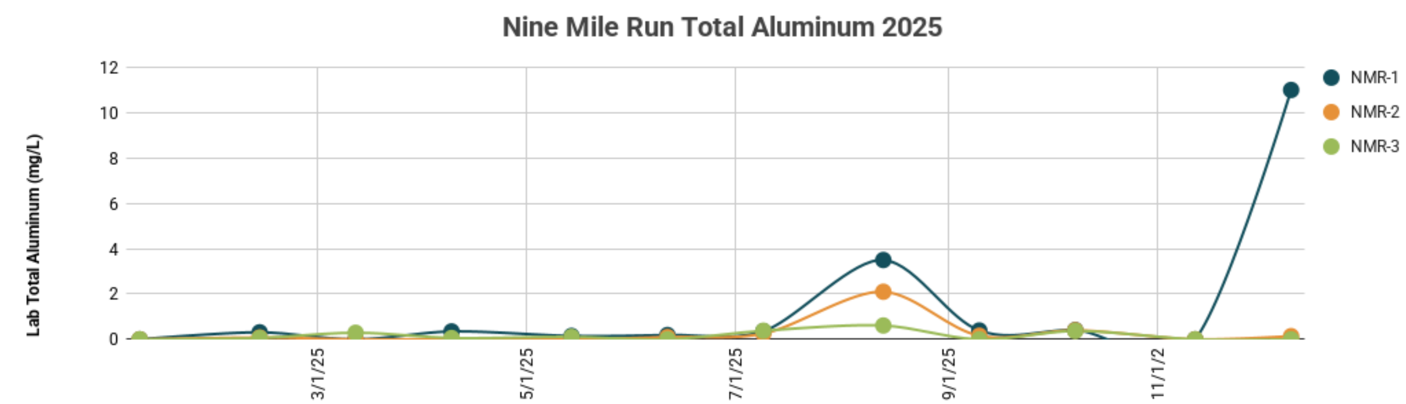
Our partners include:

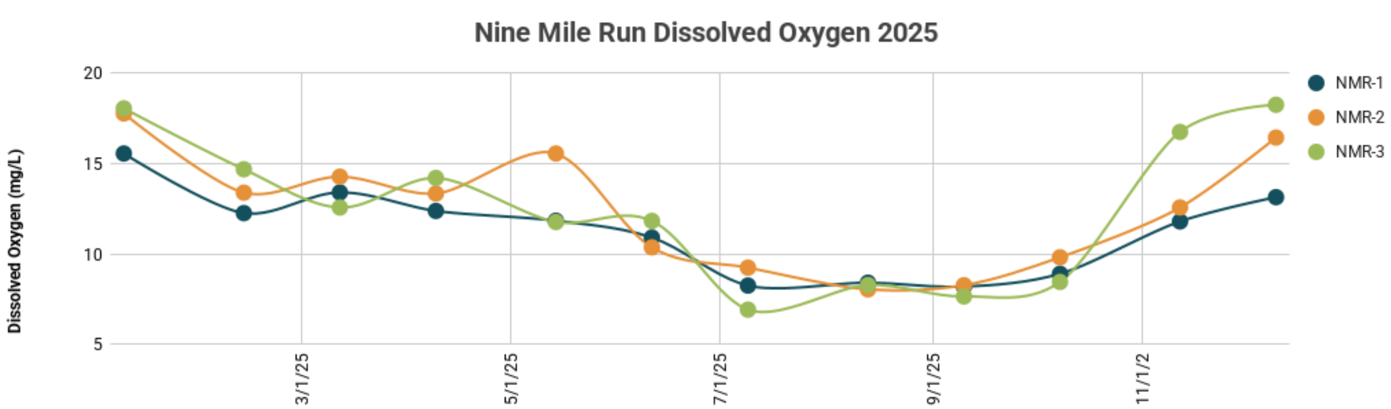
- Eurofins Environment Testing Northeast (Grab Sample Analysis)
- Field Environmental Instruments (Testing equipment)
- Wilkinsburg-Penn Joint Water Authority (Bacteria Analysis)
- Dr. Brady Porter, Dr. Elizabeth Dakin and students at Duquesne & Chatham Universities (Fish Survey Data)

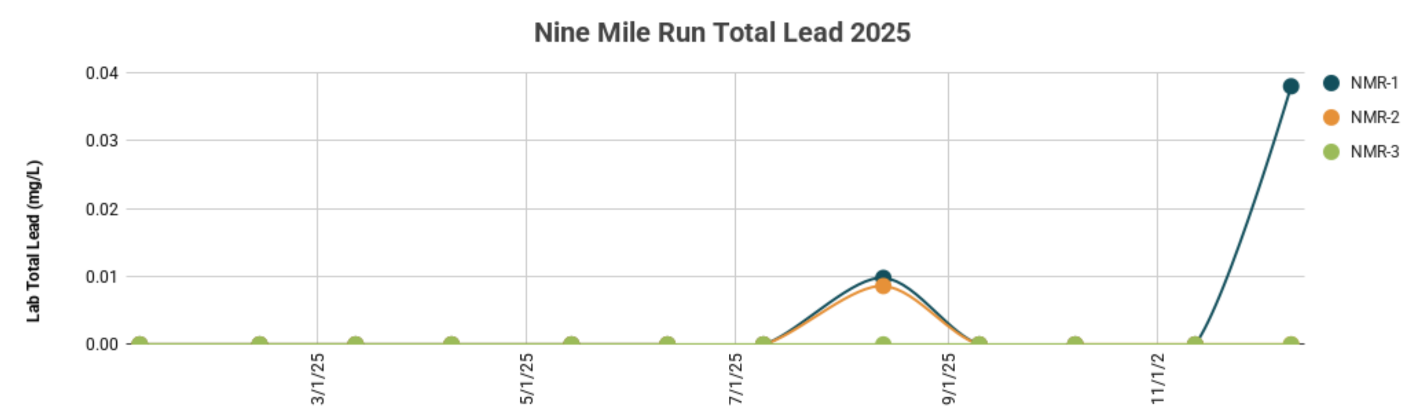
Site	Sample Date	Conductivity	Dissolved Oxygen	pH	Lab Total Aluminum	Lab Total Lead	Lab Fecal Coliform
NMR-1	January2025	3260	15.54	8.01			2400
	February2025	1390	12.25	8.09	0.31	0	2300
	March2025	1300	13.39	8.19	0	0	2050
	April2025	1540	12.37	8.17	0.35	0	1850
	May2025	1450	11.83	8.18	0.15	0	4300
	June2025	1490	10.9	7.42	0.19	0	3300
	July2025	1220	8.25	7.81	0.36	0	6000
	August2025	3260	8.41	7.99	3.5	0.0098	14000
	September2025	1067	8.19	7.83	0.39	0	650
	October2025	660	8.9	7.48	0.41	0	6400
	November2025	1070	11.79	7.96	0	0	1400
	December2025	3140	13.13	7.78	11	0.038	7000
NMR-2	January2025	2180	17.75	8.26			1000
	February2025	1370	13.38	8.11	0.08	0	1050
	March2025	1290	14.26	8.31	0	0	1500
	April2025	1410	13.33	8.26	0	0	650
	May2025	1340	15.54	8.35	0	0	1600
	June2025	1360	10.36	7.44	0.1	0	1000
	July2025	1080	9.24	7.77	0.25	0	2000
	August2025	1480	8.04	7.69	2.1	0.0086	11200
	September2025	1010	8.27	7.84	0.16	0	1000
	October2025	330	9.81	7.68	0.4	0	9000
	November2025	1050	12.56	8.32	0	0	600
	December2025	1490	16.42	7.84	0.14	0	1600
NMR-3	January2025	4960	18.03	8.46			1450
	February2025	1440	14.67	8.26	0.058	0	500
	March2025	1320	12.56	8.44	0.29	0	300
	April2025	1390	14.19	8.55	0.0598	0	1150
	May2025	1110	11.76	8.87	0.11	0	1800
	June2025	1280	11.82	8.14	0	0	600
	July2025	830	6.92	7.82	0.38		1250
	August2025	3110	8.28	8.09	0.61	0	12000
	September2025	1171	7.65	8.66	0	0	300
	October2025	500	8.45	8.29	0.37	0	7000
	November2025	1110	16.73	9.01	0	0	200
	December2025	1290	18.23	9.12	0	0	250

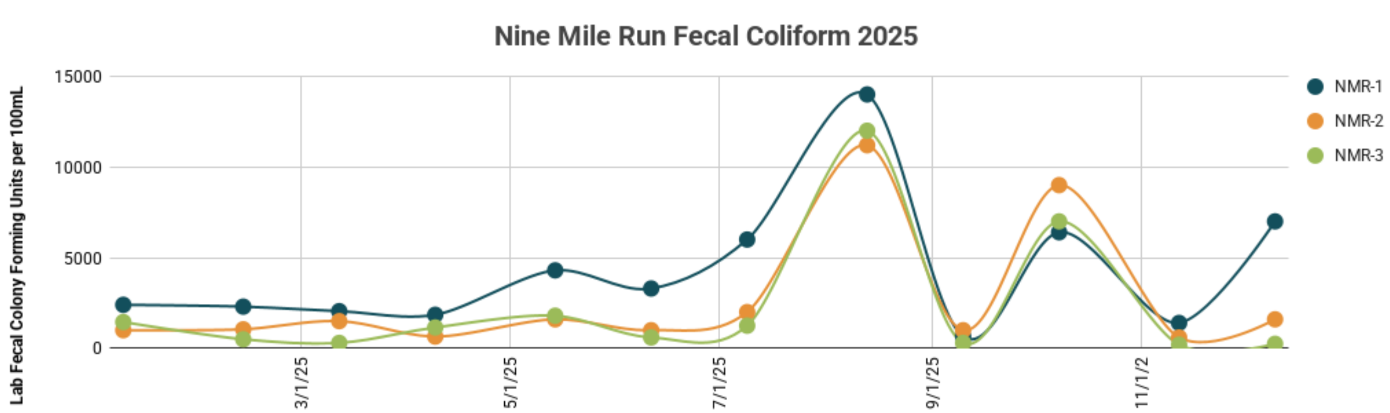


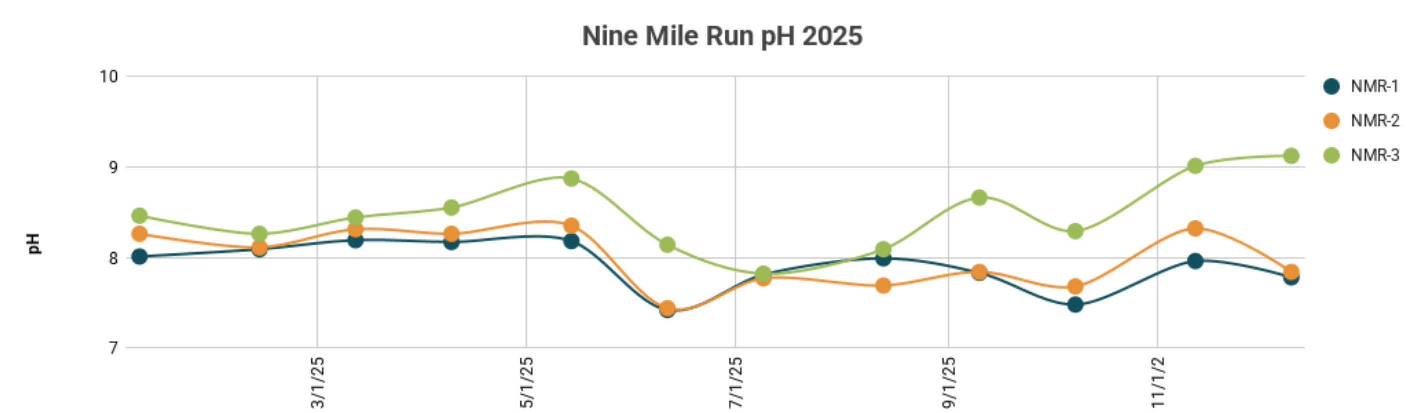

Nine Mile Run Conductivity 2025
Electrical Conductivity (µS_cm)
5000
4000
3000
2000
1000
0
3/1/25
5/1/25
7/1/25
9/1/25
11/1/2
NMR-1
NMR-2
NMR-3


Nine Mile Run Total Aluminum 2025
Lab Total Aluminum (mg/L)
12
10
8
6
4
2
0
3/1/25
5/1/25
7/1/25
9/1/25
11/1/2
NMR-1
NMR-2
NMR-3


Nine Mile Run Dissolved Oxygen 2025
Dissolved Oxygen (mg/L)
20
15
10
5
3/1/25
5/1/25
7/1/25
9/1/25
11/1/2
NMR-1
NMR-2
NMR-3


Nine Mile Run Total Lead 2025
Lab Total Lead (mg/L)
0.04
0.03
0.02
0.01
0.00
3/1/25
5/1/25
7/1/25
9/1/25
11/1/2
NMR-1
NMR-2
NMR-3


Nine Mile Run Fecal Coliform 2025
Lab Fecal Colony Forming Units per 100mL
15000
10000
5000
0
3/1/25
5/1/25
7/1/25
9/1/25
11/1/2
NMR-1
NMR-2
NMR-3


Nine Mile Run pH 2025
pH
10
9
8
7
3/1/25
5/1/25
7/1/25
9/1/25
11/1/2
NMR-1
NMR-2
NMR-3