Flooding in Southwestern Pennsylvania: Knowledge Gaps and Approaches

Pittsburgh Collaboratory for WATER
Research, Education, Outreach

A WHITE PAPER REPORT FROM THE AGENDA BUILDING MEETING ON APRIL 2, 2019

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Common words from consensus building exercise: size of word is proportional to number of times it was written in workshop materials.

Executive Summary

As southwestern Pennsylvania continues to evolve from its industrial past to become a national leader in innovation and sustainability, it has encountered a complex set of water challenges that threaten the economy, ecology, and public health of the region. In this context, over the last year, the Heinz Endowments funded the Pittsburgh Collaboratory for Water Research, Education, and Outreach (hereafter referred to as the Pittsburgh Water Collaboratory) to hold a series of consensus-building meetings among regional academic scholars, community groups, governmental, and non-governmental organizations. These meetings (one each on green infrastructure, water quality, and flooding) aimed to identify key regional knowledge gaps and chart a collaborative research agenda to fill these gaps and enhance the region's ability to strategically and creatively solve water problems. In June 2019, the first of the reports on Green Infrastructure and Stormwater Management was released. In October 2019, the second report on Water Quality was released. Now, in March 2020, the third report describing the research agenda on flooding arising from an April 2, 2019 meeting is being formally released. This report outlines several fundamental knowledge gaps in the region and suggests methods to span these gaps with new collaborative research.

Gaps

As the region continues to build, and given expected changes in precipitation patterns, the spatial patterns and sizes of floods are also expected to change. However, the exact details of these changes are not predictable nor is their influence on future flooding. The "true" cost of flooding emerged as a key unknown that hinders critical decisions regarding allocation of resources for flood risk mitigation and may reinforce existing inequalities. In addition, current flood control relies on flood maps that have not been updated to reflect modern land use and precipitation patterns. Similarly, aging and potentially under-designed infrastructure (e.g., culverts, drains) can contribute to heightened flood risk in a changing climate and likely are a good target for effective flood mitigation. Finally, citizen awareness about flood risk may be a key gap that hinders comprehensive decision-making on how to minimize flooding, both at the residential and municipal scales.

Paths Forward

Future investment to increase community resilience in the face of flooding will depend on the economic, social, and environmental costs associated with flooding. However, a complete accounting of the true cost of flooding, including mental stress, health impacts, and property devaluation, is unknown, yet critical to motivate political action. A comprehensive evaluation at this scale would require substantial effort and funding but will yield important insights. Alternatively, a scaled-down approach can focus assessment on a few representative urban watersheds that experience repeated flooding and the results can be extrapolated to the larger region. The region needs to reassess implementation of watershed-based planning through mechanisms such as a regional or multi-municipality stormwater utility district, particularly given the constraints of fractured local governance and the cross-jurisdictional causes of increased flood risk. Increased observation and monitoring of flow in tributaries can improve the region's ability to predict flash flooding and evaluate flood response to changing precipitation patterns. As with green infrastructure and water quality, the collection, organization and management of flood-related data is fundamental for improved understanding of flood patterns and planning mitigation efforts.

Preface

This white paper documents a regional, multi-stakeholder research agenda meeting held on April 2, 2019 in Pittsburgh, Pennsylvania. This meeting was the third of three topical research agenda meetings hosted by the Pittsburgh Water Collaboratory for Water Research, Education, and Outreach. The goal of the meeting was to identify key knowledge gaps in Southwest Pennsylvania regarding flooding and to identify potential approaches that can help to fill those knowledge gaps. Participants were asked to answer the following questions:

1. What are the knowledge gaps about regional flooding and flood risk management in Southwest Pennsylvania?

2. What are the best approaches to fill knowledge gaps in planning and decision-making with regards to regional flooding and flood risk management in Southwest Pennsylvania?

Participants brainstormed ideas and built consensus in groups of 2, 4, and 8, culminating as a summary list from the consolidation of consensus groups. The writing of this white paper was guided by the points that came up through this brainstorm activity, the prioritization by different groups, and the voting results   Participant consensus is summarized in this document to outline existing knowledge gaps identified during the meeting. Final consensus is presented in Section 2 and 3. In Section 4, suggested paths forward are recommended based on participant findings. While these recommendations grew out of the meeting results, they will require continued discussion and research within and beyond the Collaboratory to be successfully enacted.

The Pittsburgh Water Collaboratory editorial board, which helped to prepare the final version of this white paper, includes:

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Group participants from the meeting are included in Appendix 1.

More information about the Pittsburgh Collaboratory for Water Research, Education, and Outreach can be found at: **www.water.pitt.edu**.

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1.0 Background

The control of river flooding with a system of reservoirs across southwest Pennsylvania is arguably one of the most important regional hydrological stories in the 20th century. The resulting certainty in river levels has dramatically transformed the lives of many in the region.

However, flooding continues to impact the region and impacts are likely to grow in the future. Flooding can be caused by river flooding, or small stream flooding that often occurs in narrow, deep valleys. Urban stream flooding is also distinct from river flooding and can be exacerbated by strong convective precipitation systems that pause over relatively small areas. There is concern that changing precipitation patterns have and will continue to exacerbate these small-scale, convective storm-driven floods. However, the solution that worked to control flooding on the river system, construction of additional water storage in the headwaters, is generally not possible in urban areas, because these headwaters areas are often heavily developed leaving little room to create storage (consider Girty's Run and the McKnight Road Corridor).

It is in this context that the Pittsburgh Collaboratory for Water Research, Education, and Outreach hosted an open meeting for members of the greater Pittsburgh community to discuss flooding knowledge gaps and potential approaches to fill those knowledge gaps. The goal of the meeting was to extract opinions and thoughts from the community at-large and initiate a long-term dialogue toward identifying and resolving flooding challenges in southwestern Pennsylvania.

2.0 Meeting Results

Participants at the meeting spanned governmental and non-governmental organizations and community members and totaled 35 participants (Appendix 1). At the meeting all participants were asked to answer the following questions:

1. What are the knowledge gaps about regional flooding and flood risk management in Southwest Pennsylvania?

2. What are the best approaches to fill knowledge gaps in planning and decision-making with regards to regional flooding and flood risk management in Southwest Pennsylvania?

Participants brainstormed ideas and built consensus consecutively in groups of 2, 4, and 8, people, culminating as a summary list from four groups of at least 8 persons. Then the consensus lists were distributed among the four groups for comment and review. After these reviews, the answers to both questions from each group were posted on a wall and each participant voted on their top answers choosing from all posted answers. Participants voted on final consensus built by groups of 8 using the following criteria:

Question	Dot color	Place dot next to the
What are the knowledge gaps about regional flooding and flood risk management in Southwest Pennsylvania?	Green	Most important gap
	Yellow	Hardest knowledge gap to fill
	Red	Gap most easily addressed with existing data
What are the best approaches to fill knowledge gaps in planning and decision-making with regards to regional flooding and flood risk management in Southwest Pennsylvania?	Green	Best approach
	Yellow	Most intriguing approach, but risky
	Red	Worst approach

Final consensus from the groups of 8 varied in both the number and specificity of knowledge gaps and approaches. Resulting group consensus and participant voting results are summarized in Table 1.

Table 1. *Voting on the knowledge gaps/approaches identified by the various consensus groups. Columns correspond to the gap that was viewed to best meet the criteria outlined above.*

Knowledge Gaps (What are the knowledge gaps about regional flooding and flood risk management in Southwest Pennsylvania?)	**Green** (most important gap)	**Yellow** (hardest knowledge gap to fill)	**Red** (gap most easily addressed with existing data)
True cost of flooding is undervalued • Ecosystem impacts, cleanup costs, blight, etc.	**9**	3	
Economic and social costs of floods	6	2	
Development of comprehensive understanding of flood costs • Health, property, disinvestment in community (socioeconomics)	3		
Past and future variability of precipitation events • Updating of statistical tools	3		3
Dynamics of precipitation events using high-resolution radar data	2		4
Relating precipitation intensity to stream gage records	1	4	
Building resiliency within existing systems • Where can we store water and at what scale	1	1	
Citizen-scale awareness • Flooding perception, parcel management, location of streams/watersheds/floodplains		**14**	
Development is not viewed in an aggregate/watershed lens		3	
FEMA floodplain maps are inaccurate/don't match local conditions			**7**
Distinguishing between primary and secondary homes			**7**
Is USACE updating and maintaining the modeling of reservoirs?			2

Approaches (What are the best approaches to fill knowledge gaps in planning and decision-making with regards to regional flooding and flood risk management in Southwest Pennsylvania?)	**Green** (best approach)	**Yellow** (most intriguing approach)	**Red** (worst approach)
Dynamic, citizen-updated mapping of floodplains, buried streams, etc. • Social media harvesting of flood observations • Better modeling tools to interpret	**13**	4	
Better land use planning strategies and enforcement at the municipality level • Stormwater overlay district	4	3	
Regulations should incentivize development on a watershed basis	4	1	
Code language • Restructure and translate (what is a 10-year flood?) • Restructure policy (stormwater utility barriers, floodplain ordinances, soil disturbance thresholds, limit impervious surface) • Improve enforcement	3	**9**	
More stream gauges	2	1	
311 type reporting system for floods and basement backups	1	1	**8**
De-incentivize development on floodplains		1	4
Targeted outreach • Floodplain tours, PSA education		1	4
Mining of historical radar data		1	
More rain gages			1
Property value assessment of buildings in floodplains			

3.0 Discussion of Major Themes in Meeting Results

Several important themes emerged from the meeting (see Table 1 in Section 2.0). In general, these were grouped into assessment of flood costs, flood plain mapping, and scale of regulation of flooding. In this section, specific themes are further explored to identify key questions and/or guidance and provide a framework to guide continued efforts of the water community and the Pittsburgh Water Collaboratory.

3.1 True Costs of Flooding are Unknown

Three of the four consensus groups identified shortcomings in the assessment of flood costs as an important knowledge gap.

Traditional assessments of cost rely on aggregated measures, such as the total amount that insurance companies pay out after a flood event. However, this measure misses substantial costs. For example, flood victims that do not carry flood insurance will absorb these costs and are not considered in the cumulative costs of a flood event. Further, regardless of insurance status, flooding and cleanup creates a tremendous physical and mental health drain on residents that existing cost accounting measures do not accurately evaluate. Nor do current cost accounting procedures include lost wages or emergency medical costs. Some local flooding may not be reported or recorded, especially if the flood damage is not eligible for reimbursement via Federal Emergency Management Agency (FEMA) or flood insurance.

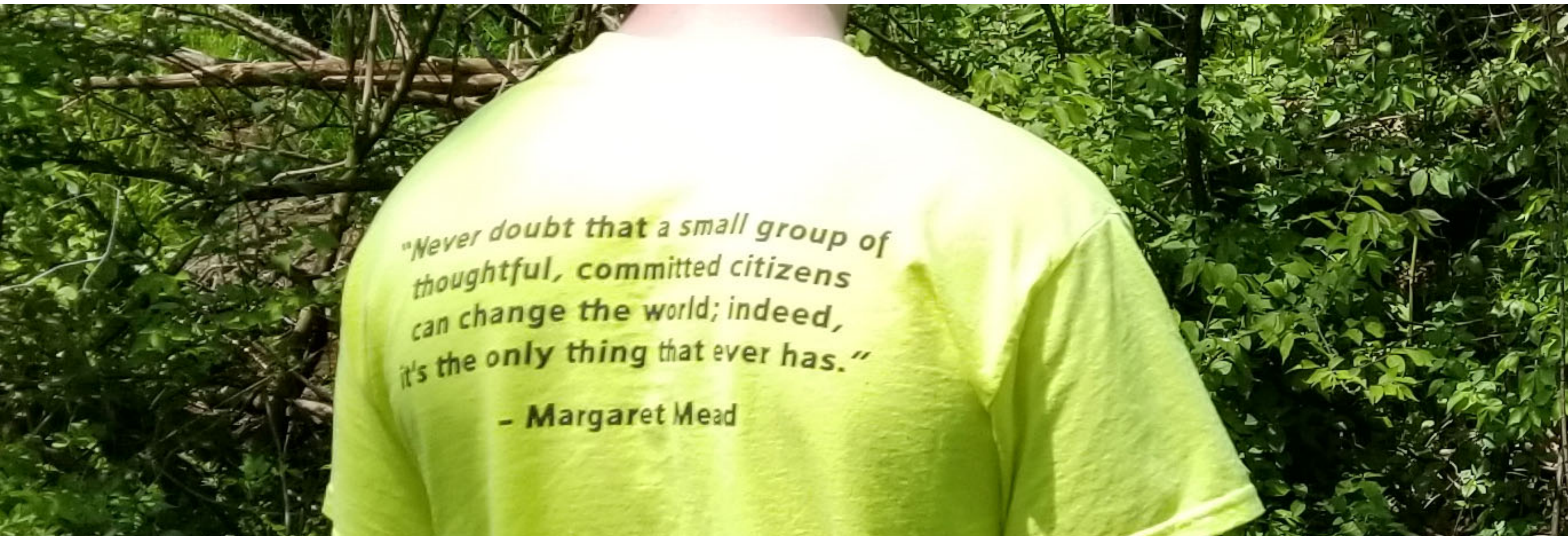
Moreover, there is a harsh negative feedback in the current scheme of estimating flood costs. Communities originally built long before widespread increases in impermeable land cover (i.e., urban development) may now experience higher flood levels and more frequent flooding. Once a house or business is located in the flood plain, property value drops quickly. In contrast, the same house, located at a slightly higher elevation, is worth substantially more. Thus, the changing nature of flash flooding, due to development and a changing climate, creates a dynamic where increasing numbers of homes and businesses are susceptible to flash flooding and subsequent rapid devaluation. However, the lowered values of these susceptible properties are also not reflected in estimates of flood costs.

Once flooding becomes a regular event, the likelihood of property abandonment increases. Empty storefronts and delinquent properties further devalue newly flood-prone properties. This reduction in property value can ripple through civil services, such as public education that relies on property taxes, again ratcheting property values down.

Another important facet of this discussion was the strong potential for inequities in payments for flood damages. FEMA and Pennsylvania Emergency Management Agency (PEMA) policies mandate certain cost thresholds are met before flood recovery reimbursement processes begin. If properties are devalued, these damage thresholds are harder to reach and victims less likely to be compensated. Once again, this creates a negative feedback, placing additional, unaccounted-for burdens on many flood victims, particularly those already socioeconomically disadvantaged by changing flood patterns.

Finally, while flooding is a natural process and part of the regional ecology, the extreme flash flooding created by urban and suburban development degrades stream channels through incision, widening, and sediment removal. As such, important ecosystem services naturally inherent to streams are eliminated in areas characterized by extensive impervious surfaces. Further, burial of stream channels decades ago in many urban areas, destroyed valuable aquatic habitat and associated ecosystems services. There is interest in restoring these buried streams through the process of “day-lighting” given that buried streams contribute significant volumes of water to overburdened combined sewer systems (please see the earlier green infrastructure and water quality white papers: **https://www.water.pitt.edu/resources/white-papers**).

3.2 Maps of Flood Risk with Citizen Involvement



Another prominent concern of meeting participants is that existing methods for delineating floodplains are not keeping pace with the rapid changes in climate including increases in annual precipitation, storm frequency, and intensity. Given these climatic shifts, coupled with development of land within watersheds, floodplain maps established decades ago are likely outdated. For example, flow constrictions such as culverts and storm drain inlets, can become clogged by woody debris or litter and thus cause higher flood levels upstream of the clogged area. In most floodplain mapping, these flow constrictions are not considered, yet they can significantly exacerbate flood risk. Further, if urbanization and development occur after initial floodplain maps have been created, the subsequent increase in flows due to more impervious cover will not be incorporated when estimating the flood zone. In turn, these increased flows will also overwhelm flow constrictions installed prior to urban and suburban development, further exacerbating the flow constriction problem. FEMA flood maps (Figure 1) also exclude basins that are smaller than one square mile, and hence cannot guide citizens or municipalities in making flood-related decisions at this scale. Finally, if precipitation patterns change to become more intense, flow generation will increase. FEMA mapping is based on the weather norms at the time of mapping and, by definition, will not capture these increases in flow. However, funding is paltry and progress in updating maps is not keeping pace with need.

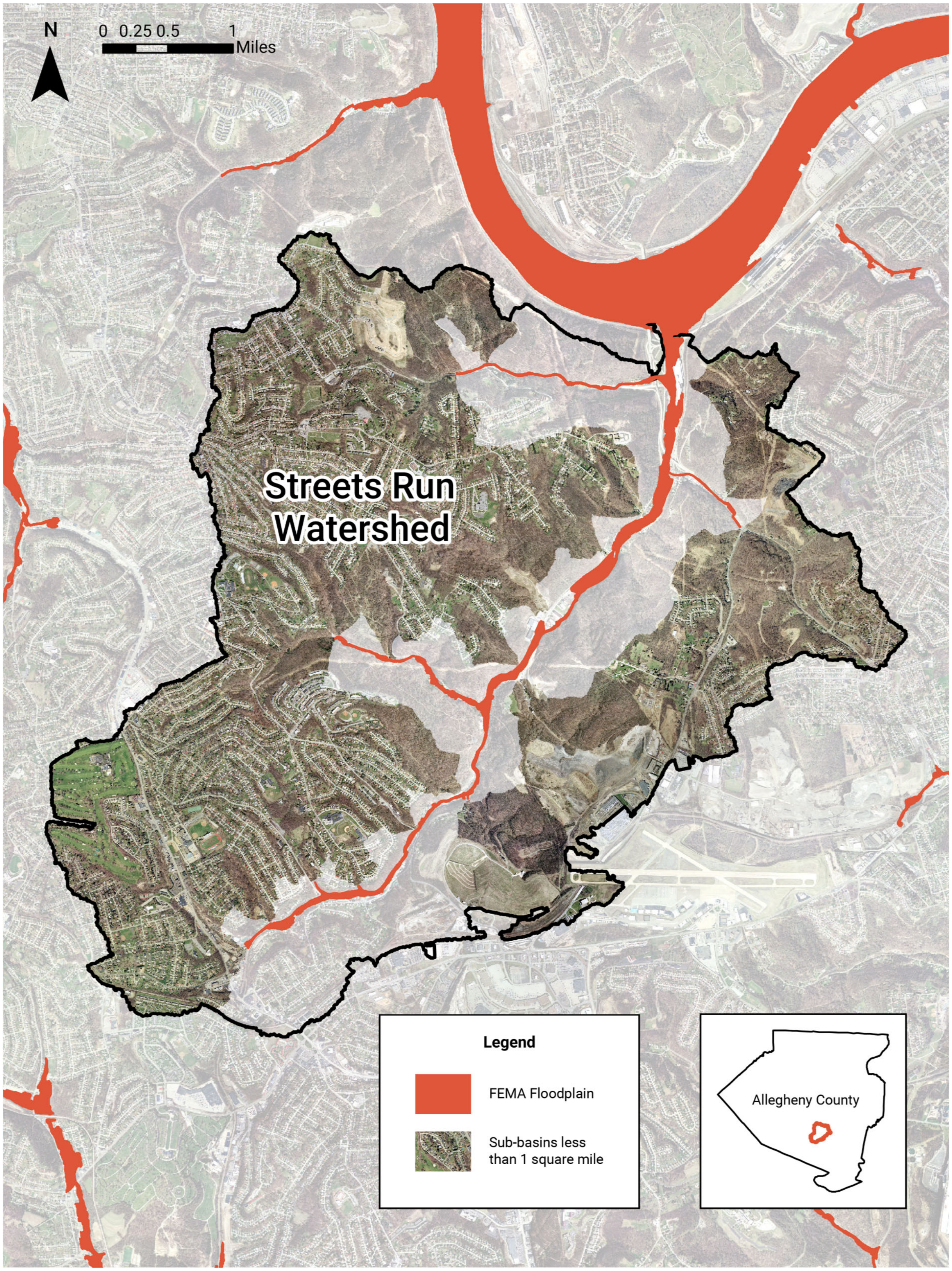


Figure 1. *A map of Streets Run watershed showing the FEMA floodplain (red). Shown in full color are land areas that drain less than 1 mi^2. Given that watersheds less than 1 mi^2 are not included in FEMA mapping, flood zones in large portions of the Streets Run watershed are not mapped. The inset map shows the location of the watershed (red) in Allegheny County.*

Participants thought that the spatial extent of flooding in Pittsburgh is not well understood. Some suggested that online flood reporting by citizens could be used to help refine FEMA floodplain maps, which would then better reflect local conditions.   For example, online reporting, phone-based reporting, and photography have been used to map the extent of floods in states like New Jersey, Virginia and Florida. However, clear mechanisms to incorporate these data in map revisions do not exist and will require substantial cooperation from FEMA and related agencies.

Finally, continued changes in climate and associated weather patterns will further complicate the prediction of local floods. As such, the use of 100-year floodplain, even coupled with contemporary weather data, may not be sufficient to effectively manage flood risk over the longer term. As the region plans for increasingly larger floods, the width of the statistical flood plain (e.g., 100-year flood) will grow. Given this trend in increasing flood size, it may be more effective to use larger statistical flood flows in decision-making processes. One such example is in cases where “managed retreat” is planned (i.e., a planned real estate abandonment, acquisition, or relocation to minimize future losses).

While FEMA predictions are used specifically in regulatory process and are particularly important for that reason, participants also noted a general lack of awareness of flood plain boundaries amongst the general public. The general public tends to rely on regulatory authorities to design policy to minimize flood damage. The participants suggested that if residents understood the extent of anticipated flooding, it could affect their decision-making. It is vital that potential increases in the spatial extent of flood zones be communicated to the public to minimize the negative feedbacks noted in Section 3.1.

3.3 Regulations: Watershed vs. Municipal Focus

As noted in both the green infrastructure and the water quality white papers (**https://www.water.pitt.edu/resources/white-papers**), fractured governance in the greater Pittsburgh region challenges implementation of effective policy. This is particularly true in the case of flood protection. The spatial patterns of urban development and their influence on flooding risk was highlighted by participants. Increased impervious cover in the uplands of watersheds can increase flood flows in downstream valleys. If the uplands are governed by a separate municipality from the lowlands, there is no feedback to minimize flood risk to downstream valley residents. This disenfranchises valley residents from land use decisions that affect their properties. With 130 municipalities in Allegheny County, the potential for divisions between upland management and lowland consequences is substantial.

If regulations could be designed and implemented at the watershed-scale, flood flows could be better managed by addressing land use policies in the uplands. While solving the fractured governance problem is a task beyond the reach of the Pittsburgh Water Collaboratory, a regional or multi-municipality stormwater management district offers a solution whereby municipalities in a watershed can group together to make land use planning decisions for the comprehensive, entire watershed. However, it is important to note that this may require substantial changes in state law. At the very least, county-scale regulatory agencies (e.g., the Allegheny County Conservation District) should reconsider storm water management policies given the recent emergence of repeated flooding in the region's deep, narrow valleys. That said, all of these possibilities will require exertion of political will, both to make the changes and enforce them.

It is also vital to recognize that flooding is entangled with issues of equity. For example, in the stormwater management districts suggested above, there likely would need to be mechanisms to prevent reinforcement of socioeconomic disparities within a watershed. The spiral of flooding devaluation noted in Section 3.1 would only further exacerbate these disparities.

4.0 Recommendations and Future Directions

Voting results summarized in Section 2 capture the consensus needs and approaches identified by participants at the meeting. These include the need to evaluate the true cost of flooding, improve flood risk assessments, increase public awareness of flood risks, and devise an integrated watershed management approach despite the highly fractured government and municipal boundaries. These needs could engender several immediate options.

4.1 Evaluate the True Cost of Flooding

A clear accounting of the actual costs of flooding is vital for effective decision-making about regional flood policies. One of the main challenges in developing such a framework is the challenge in translating things like mental and physical strain into a dollar value. A full-cost estimate could incorporate cleanup costs, infrastructure repair costs, businesses closures, emergency medical costs, missed workdays, property value depreciation, and mental and physical health costs. Ultimately, these true costs would reflect the reality of long-term property decline in frequently flooded areas and include health issues, crime, and ecosystem degradation. If city, regional, and municipal leaders had more accurate understanding of the “do nothing” cost of flooding in the region, incentives for change may rise to the top of the agenda for leaders. Projection of cost estimates should also consider the frequency and magnitude of flooding in future climate scenarios, as well as social and environmental health disparities including the adverse effects of floodwater toxins and bacteria.

A comprehensive cost assessment is a considerable task that requires substantial funding, as well as large datasets that may not be immediately available. However, important insights may be attained through the focused assessment of a few representative urban watersheds that experience repeated flooding. This assessment could enable cost estimates to be extrapolated to the greater Pittsburgh area and thus help guide decision-making processes at a larger scale.

4.2 Improve Flood Risk Assessment and Preparedness

Current flood risk assessment and zoning primarily rely on mapping by governmental organizations, such as the Pennsylvania Department of Community and Economic Development and FEMA. These assessments rely on topography, land-cover, and precipitation information. As such, they can benefit from progressive input of data that captures spatial and temporal changes in precipitation patterns, extent of impervious cover, and infrastructure conditions.

Existing data sources can help identify flooding patterns and assist in improving flood risk estimates. For example, the Three Rivers Wet Weather (3RWW) calibrated radar rainfall network maintains a dense network of tipping bucket gauges throughout the region that measure precipitation volume. This extremely valuable data can help link local precipitation patterns to downstream flooding, and identify localized areas that are more prone to flooding. Similarly, the USGS maintains a flow-monitoring network that provides information for flood-risk assessment. Given the potential changes in precipitation and flooding patterns discussed in Section 3.2, the robustness and extent of this gage network may benefit from a re-evaluation that aims to identify spatial gaps or scaling biases. For example, most existing USGS stream gages in the region monitor large rivers rather than streams (Figure 2). While it is exceedingly important to continue monitoring locations with long historical records (see Figure 2), additional gages on tributaries and streams would improve flood risk evaluation and deepen our understanding of hydrologic responses to a shifting climate, land use changes, and stormwater management. Given the expected changes in land-use and precipitation patterns across the region, it is vitally important to improve and maintain these data collection networks, progressively evaluate the data they produce, and integrate this collective information into flood risk assessments.

Undersized or blocked flow constrictions can exacerbate flood risk. Analysis of culvert size relative to predicted stormflows throughout the region can identify culverts with the highest risk to exacerbate flooding. Through this evaluation process, high-risk culverts can be prioritized for upgrades. Further, monitoring and removal of debris that blocks culvert and storm drain inlets can reduce flood risk upstream.

In addition to flood prevention, robust data collection efforts could improve flood preparedness. Citizen reporting mechanisms for flooding are available in the 311 system. Educating the public that flooding can and should be reported to 311 would expand and enrich this data source, and thus more accurately capture flooding extent. In turn, the incorporation of a more complete 311 record would provide a rich source of information for targeting corrective actions in a resource-limited environment. Further, citizen reporting of blocked flow constrictions (e.g., culverts, drains) through the 311 system can help identify and prioritize maintenance and upgrades of such constrictions.

To improve urban flood mapping in the region and beyond, collaboration with FEMA should be enhanced to help address knowledge gaps regarding flood risk for small streams and to integrate the aforementioned local data collection efforts into flood map revisions.

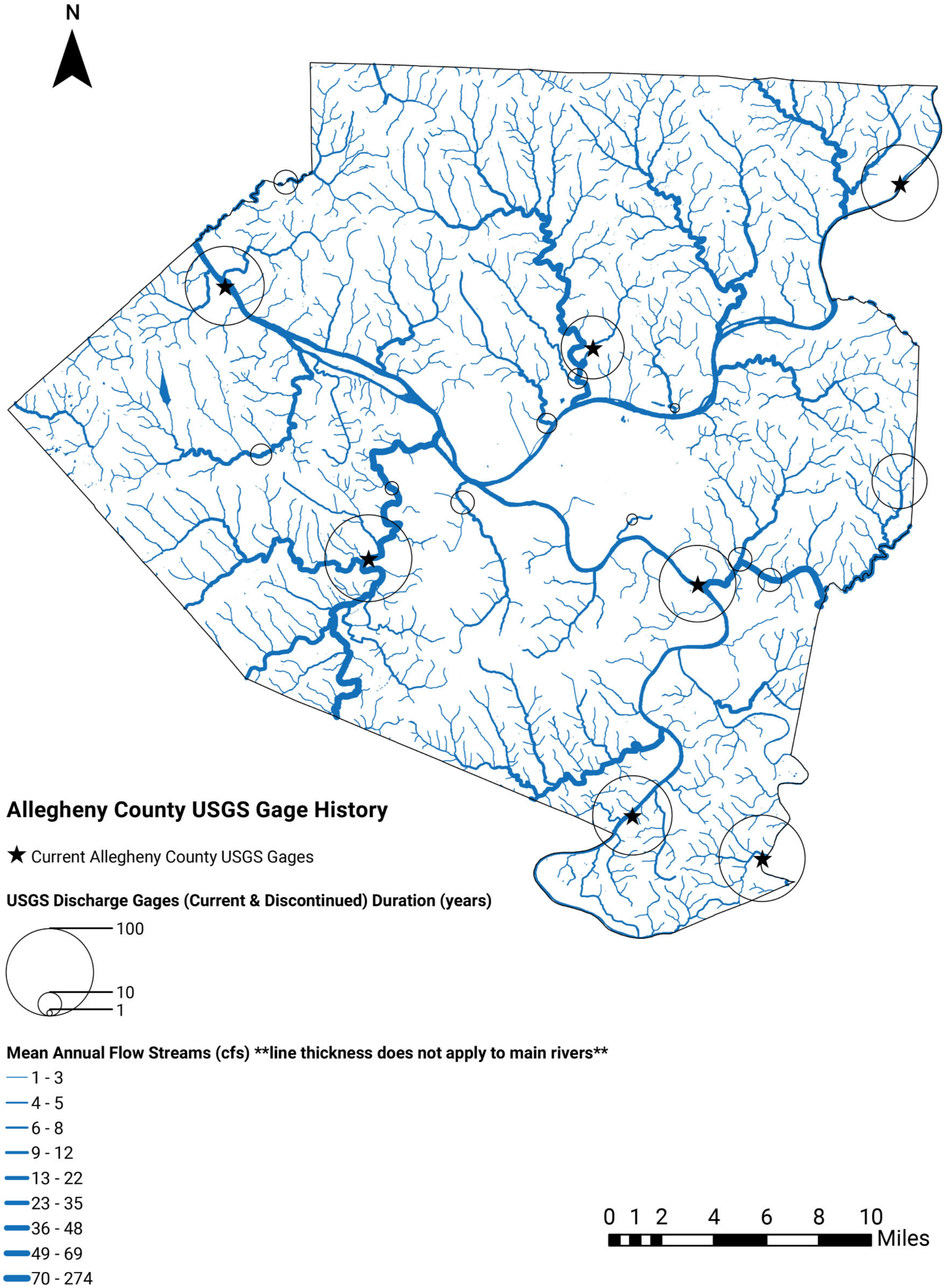


Figure 2. *A map of streams (blue lines), USGS gage duration (circles), and active USGS gages (stars). The circle size is proportional to the duration (years) of gage measurements in Allegheny County. Tributary width is scaled to the mean annual flow in cubic feet per second (with the exception of the Allegheny, Monongahela, Youghiogheny, Ohio Rivers). Most active gages are located on rivers whereas only few gages are located on tributary streams. As a result, hydrologic and flood conditions on streams are poorly characterized and therefore limit our ability to predict flash flooding.*

4.3 Increase Citizen Awareness and Engagement

Heightened citizen awareness of flood risk may improve flood-related decision-making and increase reporting of flood conditions by homeowners and residents. Citizen awareness and engagement could be enhanced through visualization tools that communicate hard-to-grasp concepts involving risk. For example, a map sequence of inundation areas showing the height of a 5-year flood in climate conditions predicted for 2040, 2060, etc. could help illustrate flood risk. This would be analogous to the "Surging Seas" interface created by Climate Central to visualize coastal inundation (**http://sealevel.climatecentral.org/**). In turn, the effectiveness of such tools for heightening citizen awareness could be evaluated to guide future efforts. Additionally, residents can be encouraged to report flooding using the existing 311 system whereby the 311 database could provide much needed data on the spatial extent, frequency, and type of flooding. This would optimally involve collaboration with the City of Pittsburgh to streamline and clarify the flood reporting process in 311, and adoption of this approach by the greater Pittsburgh region.

4.4 Improved Land-Use Planning

A lack of coherent land use planning and development was identified as a key challenge to address regional flood risk. In particular, highly fractured governance and municipal boundaries create a complex environment for implementing watershed-based planning approaches. An "integrated watershed management" approach consistent with natural watershed boundaries rather than municipal and county boundaries may help reduce flood risk. Although this integrated approach may carry many advantages, in practice, it may prove difficult to implement in the near-term given the region's fractured municipal boundaries. The establishment of a stormwater utility district or regional organization (e.g., Allegheny County Conservation District or Southwestern Pennsylvania Commission) may facilitate broader-scale planning and permitting required to reduce flooding.

Improved flood mapping could create an inventory of potential properties to target for "managed retreat" using GIS & terrain analysis. Where are these areas? What are the social complexities that influence the identification of good solutions? However, the potential for this type of planning process to reinforce or exaggerate environmental injustices would require care and caution.

5.0 Acknowledgements

The Pittsburgh Water Collaboratory thanks all working group participants for their time and generous sharing of experiences and ideas. We thank the Heinz Endowments for their support of the Pittsburgh Water Collaboratory. We are grateful to Tom Batroney for his thoughtful review of this document, Tree Pittsburgh for sharing their facility for this event, and Joe Fedor, Ruthann Omer, and Donna Pearson for providing photographs.

6.0 References

Bain, DJ; Elliott, EM; Thomas, BF; Shelef, E; River, M (2019) *Green Infrastructure for Stormwater Management: Knowledge Gaps and Approaches*. Pittsburgh Collaboratory for Water Research, Education, and Outreach, University of Pittsburgh: **http://dscholarship.pitt.edu/36717/**

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Appendix 1: Working Group Participants

Participant	Organization
Tom Batroney	Pittsburgh Water & Sewer Authority
Maryann Brendel	Concerned Citizen
Lisa Brown	Watersheds of South Pittsburgh
Ashley DiGregorio	Watersheds of South Pittsburgh
Beth Dutton	3 Rivers Wet Weather
Matt Erb	Tree Pittsburgh
Memphis Hill	University of Pittsburgh
Mike Hiller	Nine Mile Run Watershed Association
Zaheen Hussain	New Sun Rising/Millvale
Kaylie Jones	University of Pittsburgh/Girtys Run Watershed Association
Stan Kabala	3 Rivers QUEST
Ian Lipsky	Negley Run Task Force
Melissa Mason	Girtys Run Watershed Association
Maureen Olinzock	Pittsburgh Parks Conservancy
John Perkun	Whitney, Bailey, Cox & Magnani
Mary Ellen Ramage	Borough of Etna
Patrick Shirey	University of Pittsburgh
Mary Wilson	Master Watershed Steward PSU Extension
Rebecca Zeyzus	Allegheny Watershed Alliance

Note some names were not recorded, but are reflected in the headcount of 35 participants.

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