

Urban Flood & Habitat Resiliency in the Lower Darby Creek Watershed: A Case Study in Modeling and Community Engagement

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What I will be presenting:

The Lower Darby Creek Area encompasses a unique blend of residential neighborhoods, commercial zones, and critical regional infrastructure. Despite its urban setting, the area supports diverse wetlands, waterways, and wildlife habitats that play an essential role in regional flood protection and ecological connectivity. However, flooding and habitat loss have long challenged the area for decades. The residents in Eastwick and Tinicum neighborhoods repeatedly experience increasing catastrophic and chronic flooding during storm and high tide events. As climate change exacerbates the effects of storms, the lives and livelihoods of residents will be at even greater risk. I will be presenting on our efforts to identify and evaluate nature-based strategies for flood risk reduction and ecological restoration in Lower Darby Creek Watershed. Strategies focus on both short- and long-term actions and projects that promote ecological and community resilience and climate change adaptation. A 2-dimensional HEC-RAS Model was developed for this effort and includes both storm and sea level rise hydrologic data to assess flood risk reduction both now and in the future. I will discuss strategies for prioritizing projects during the alternatives analysis, which considered performance (flood risk reduction and ecological restoration potential), community support, cost, constructability, public access and recreation opportunities, and operation and maintenance.

What the audience will learn:

The audience will learn how to leverage 2-dimensional HEC-RAS modeling to evaluate projects at a watershed-wide scale as well as communicate the results of modeling efforts to non-technical stakeholders. This project built on the previous planning efforts and was developed in coordination many stakeholders including U.S. Fish and Wildlife Service, John Heinz National Wildlife Refuge at Tinicum, The Nature Conservancy, local government, community leadership, and property owners. The project included robust and meaningful stakeholder engagement and public outreach to identify, evaluate, and select nature-based solutions that could serve the dual-purpose of lowering flood risk while improving habitat and water quality. So, attendees will learn methods that were used to leverage local knowledge to inform the engineering analysis, understand local priorities and needs, and engage the community throughout the project.

Leveraging Ecological Restoration for Resilient Infrastructure: SEPTA Jenkintown Flood Mitigation

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What I will be presenting:

The Jenkintown Flood Mitigation project – located in Montgomery County, PA – relieved Southeastern Pennsylvania Transportation Authority's (SEPTA) vulnerability to flood events at a key commuter railroad hub by implementing a comprehensive flood mitigation strategy. This urban flood mitigation project improves the resiliency of SEPTA's facilities and provides infrastructure protection by leveraging the stacked benefits of ecological restoration in lieu of typical engineered solutions and hard-armoring.

The presentation will open with a detailed review of the preliminary flood study and site investigations, which paved the way for implementation of innovative design elements through the development of a robust alternatives and cost/benefit analysis. A review of the project context, site constraints and considerations, and design approach will be highlighted to give the listener perspective on the project. The presentation will discuss 2D hydraulic modeling, which allowed JMT to successfully target "hot spots" throughout the corridor where flood conveyance and higher shear stress/velocity could be mitigated through specific ecological restoration improvements. Construction issues and lessons learned will also be explored during this presentation, with commentary on how the adaptable nature of the design was utilized to expedite project implementation and achieve project goals.

What the audience will learn:

The presentation will highlight challenges and lessons learned throughout the planning, design, and construction phases of this unique flood mitigation project. As a result, the attendees will gain a complete understanding of the following items:

- How to identify site constraints, stream corridor impairments, and ecological potential in order to develop flood mitigation strategies that leverage ecological restoration to achieve multiple stacked benefits and improve cost/benefit outcomes.
- How 2D hydraulic modeling is used to maximize flood mitigation potential particularly in an urban setting where hydraulic controls and floodplain obstructions introduce complex flow patterns that are not entirely captured by 1D hydraulic modeling.
- How to navigate construction issues and utilize the adaptable nature of ecological restoration to minimize disruptions to the project schedule and cost. Lessons learned will be shared to provide the audience with knowledge that can be used to improve future designs particularly in the urban setting.

Urban Waterway Restoration Through Flow Reintroduction: Water Quality Recovery in Philadelphia's Manayunk Canal

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What I will be presenting:

The Manayunk Canal in Philadelphia was constructed in the early 19th century to support navigation and industry along the Schuylkill River. It has remained largely stagnant for decades following its closure in the 1940s, contributing to poor water quality, chronic low dissolved oxygen, and nuisance algal growth limiting its ecological and recreational value. In 2025, the City of Philadelphia restored controlled flow from the Schuylkill River into the canal through a newly rehabilitated intake structure and sluice gate system in an effort to enhance water quality and promote resilient, ecologically healthy urban waterways. This presentation summarizes the early hydrologic and water quality response following flow reintroduction and evaluates how restoring circulation altered canal conditions. Continuous monitoring and grab sampling were conducted prior to flow reintroduction and throughout the 2025 monitoring season to assess changes in dissolved oxygen, pH, nutrients, algal biomass, bacteria, turbidity, conductivity, and hydrology. Results show substantial improvements in water quality and ecological function following restoration. Monitoring results showed substantial improvements in overall water quality and ecological conditions following flow restoration. Water quality conditions within the canal now closely mirror those of the Schuylkill River, indicating successful hydrologic reconnection and restored circulation through the system.

What the audience will learn:

This case study will demonstrate how hydrologic infrastructure improvements leading to controlled flow reintroduction can rapidly improve water quality and ecological conditions in a historically stagnant urban canal system. This presentation will demonstrate how infrastructure improvements restoring hydraulic connectivity transformed the Manayunk Canal from a low-flow, hypoxic waterbody into a well-oxygenated, river-influenced system within a single monitoring season. The audience will gain insight into how continuous water quality monitoring and adaptive gate operations were used together to evaluate and manage canal restoration. The presentation will highlight how changes in dissolved oxygen, algal biomass, pH variability, and nutrient dynamics can serve as indicators of ecosystem recovery following hydrologic restoration. This case study highlights how hydrologic infrastructure improvements and flow restoration can improve water quality in degraded urban waterways. The project also demonstrates how controlled flow management may support broader urban waterway ecological and water quality restoration and resiliency efforts.