

Broad Meadow Brook Restoration: Achieving Ecological Outcomes in an Urban Headwaters



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NARRAGANSETT BAY ESTUARY PROGRAM

Goal Achieve a dynamic, diverse, and self-sustaining stream and wetland ecosystem that provides a full suite of ecosystem services, accessible for the benefit and enjoyment of neighbors, residents, and visitors

Strategy: Provide new and enhanced visitor experiences through revitalized trail network and viewing platforms

Stressor: Upstream neighborhood – including Environmental Justice communities – experiences repeated flooding

Strategy: Reduce flooding by improving gray and green stormwater infrastructure

Stressor: Streamflow mostly driven by stormwater inputs, leading to flashy hydrology and poor water quality

Strategy: Add green infrastructure at outfalls within sanctuary and in watershed

Stressor: Earthen berm causeway built to house decommissioned sewer main disrupts wetland hydrology and floodplain connection

Strategy: Remove select portions of causeway; re-meander brook across wetland and floodplain

Stressor: Eastern portion of wetland complex dominated by invasive *Phragmites*

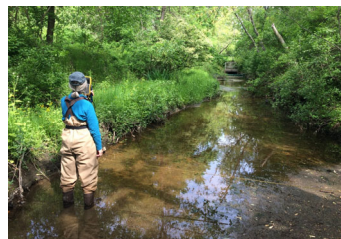
Strategy: Remove and manage invasive species; enhance habitat for birds, turtles, etc

Stressor: Brook piped through buried box culvert prevents riparian connection and limits stream habitat

Strategy: Daylight brook and re-grade banks to provide riparian connection and habitat



Ground view (top) and aerial view (bottom) showing intact wetland on left; channelized brook and causeway in center; and *Phragmites*-dominated wetland on right.



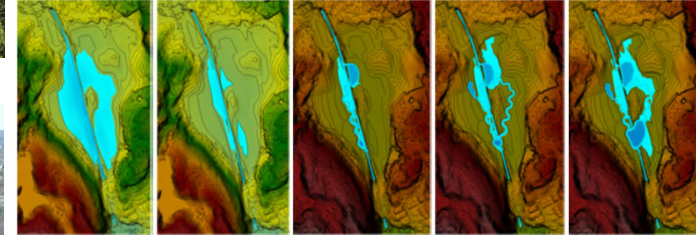
DER staff measure streamflow near inflow to site



Box culvert during flood event in December 2021

Restoration Planning and Design

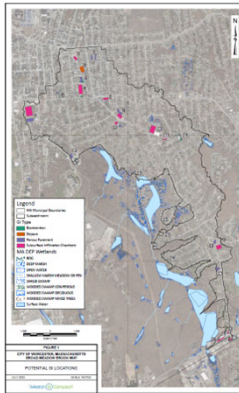
The project team developed a series of restoration scenarios ranging from minimal to intensive intervention. Each scenario contains variations on the level and amount of stormwater infrastructure, berm causeway removal, stream channel re-meandering, habitat complexity (e.g., deepwater habitat), large wood additions, beaver management, invasive species removal, and box culvert removal.



Hydrologic and hydraulic (H&H) modeling was performed for existing conditions (far left) and each scenario, to understand how water depths and extents would change based on different interventions. Several flood events were simulated; results from the baseline climate 100-year storm are shown.

Watershed Assessment to Reduce Flooding

The Broad Meadow Brook watershed drains 0.96 sq mi with approx. 40% impervious cover where the Brook daylight at the Sanctuary (bottom left). A PCSWMM model was used to quantify hydraulics in the upstream watershed. Special attention was paid to the Dunkirk Ave neighborhood that experiences recurrent flooding under existing conditions (flooding extents during 100-year storm, bottom middle). The watershed was assessed for possible green infrastructure opportunities (right). Several GI locations were identified; benefits observed were mostly localized.

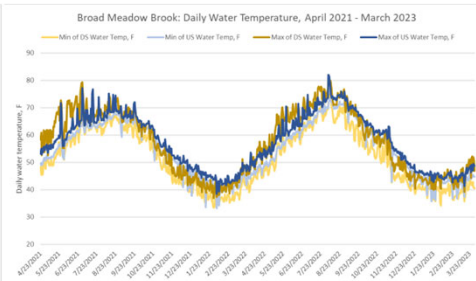
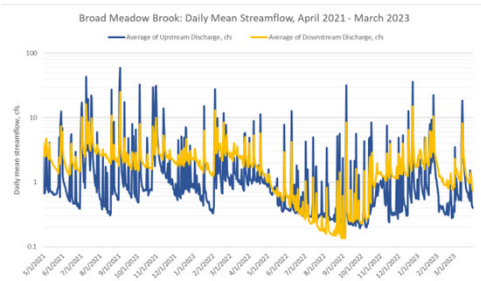


Streamflow Monitoring shows Stormwater Influence

DER staff measure streamflow near inflow to site

Box culvert during flood event in December 2021

Continuous streamflow and water temperature data are collected at gaging stations established along Broad Meadow Brook at the inflow to and outflow from the proposed restoration area. Streamflow data show flashy hydrology highly driven by stormwater inputs after rainfall events. Warm water in the Brook frequently exceeds thermal tolerances for most freshwater fishes and macroinvertebrates.



Project Timeline (anticipated)

2020	2021	2022	2023	2024	2025	2026	2027	2028
ASSESSMENT: topographic survey, biotic surveys, hydrologic & hydraulic modeling, wetland delineation, geotechnical investigation, historical review, etc.								
		DESIGN & ENGINEERING: restoration options, alternatives analysis, conceptual design, permitting-level design, final design, etc.						
				PERMITTING: PNF, MEPA, NOI, NHESP, Ch 91, Sec 401, Sec 404, Sec 106, etc.				
						IMPLEMENTATION (phased)		
OUTREACH & ENGAGEMENT (ongoing)								