Municipal Vulnerability Preparedness Program Action Grant Case Study

Municipality: Burlington, MA
Project Title: Vine Brook Watershed Flood and Urban Heat Island Assessment
Award Year (FY): FY22
Grant Award: $ 108,500
Match: $ 37,245
Match Source: Town of Burlington
One or Two Year Project: One
Municipal Department Leading Project: Conservation
Project Website URL: https://climateresilientburlington.wordpress.com/

Community Overview:

Burlington is a community of 25,989 residents and is located in Middlesex County. The community has two environmental justice block groups. Additionally, one-fifth (22%) of the population is aged 65 and older while an additional 4.5% are under age 5, two groups that are especially vulnerable to extreme heat events that are projected to increase as a result of climate change in the Vine Brook watershed study area.

We would like to highlight an additional category of vulnerable people prominent in this community while largely overlooked. Landscape maintenance/ public works/ construction workers. While these are paid positions and not geographically locked to this site, the necessary weather conditions and work requirements put them at elevated risk and for most participation is effectively mandatory as alternative occupation options are limited. This risk is magnified and concentrated on minority communities. The Vine Brook watershed includes significant areas of landscape and infrastructure which are heavily maintained and regularly redeveloped resulting in a concentration of this vulnerable population and opportunities to improve their living conditions through Nature-based Solutions and regulations.

Burlington, and in particular the Vine Brook watershed, is a highly developed area comprised of commercial and residential development, and undeveloped wetland and open space. A notable landscape feature in the watershed is the Burlington Mall commercial district situated at the Junction of Rt. 128 and Route 3. This area represents a significant percentage of the overall Vine Brook watershed area. Impervious surface represents 32% of the watershed area and contributes to increased flood risk and diminished water quality to Vine Brook and downstream wetlands including the Shawsheen River located approximately 1-mile west of the Burlington/Bedford municipal boundary. There is a significant overlap with floodplain and urban heat island in the Town of Burlington.

Project Description and Goals:

The purpose of this project was to conduct a vulnerability assessment of the Vine Brook Watershed in Burlington and identify nature-based solutions to address urban flood impacts

from extreme precipitation and urban heat island effects from anticipated extreme climate events. Burlington's prior MVP planning efforts in 2019 sought to identify climate related hazards, community strengths and vulnerabilities, and develop solutions to address these considerations by using a community-driven workshop process. This project similarly identified community challenges and opportunities, and a set of priority resilience actions, through the Stakeholder Engagement findings.

The project included 4 main areas of work and associated outcomes:

1) A GIS and field-based assessment of Vine Brook watershed relative to predicted climate exposure. The Desktop GIS analysis was used to identify and prioritize locations for field assesment. Examples of these locations include:
    a. Where water resources intersect with infrastructure and vulnerable developed sites;
    b. Where open space or developed land abut and may interact with floodway or resource areas;
    c. Where sights of special cultural or commercial significance show vulnerability; and
    d. Resource areas that could be better connected for resiliency.

    Once assembled these maps were taken into the field by teams for detailed, on-the-ground-assessment. The teams included a community representative, a Landscape Architect and an Ecologist. See Technical Memo "Vine Brook Watershed Inland Flood and Urban Heat Island Assessment - Field Data Collection Methodology Technical Memorandum/Report 12/14/2021" for more detail about their process goals and criteria.

2) Development of an Assessment and Recommendations Report that includes project methodology and a vulnerability assessment ranking system that may be applied within other communities subject to similar vulnerabilities. Using the combined map data and field data, teams met to interpret these findings and make recommendations. We organize this discussion in terms of Habitat Go Strategy which has two parts:
    a. Fuseki: identifying physical, biological and cultural boundaries or limiting factors to frame project areas or problem areas; and
    b. Joski: envisioning the process of conversion and steps leading to a healthier state such as permission, mobilization, construction cost, risk, vegetation establishment and maintenance.

3) Development of Resilience Action (e.g. conservation, planning, zoning) recommendations that may be used by municipal departments within Burlington to advance climate resilience goals and set performance requirements and incentives within a regulatory framework.

4) A community outreach/education/engagement effort that included an explicit focus on socially vulnerable groups within Burlington.

The project was successful in terms of employing nature-based solutions, providing regional benefits, and finishing on time. As described in the outcomes below, Burlington now has several sets of recommendations on nature-based solutions that will address urban heat island effect and flooding at commercial, residential, and municipal property types and urban ecology. The Opportunities Matrix also ranks various nature-based solutions in terms of ecological and resilience value as well as feasibility. While this information can be applied to the priority study sites, the sites were selected in part because they are representative of other similar sites so the solutions could be transferrable to other locations in the town or region.

The project was moderately successful in terms of improving equitable outcomes for and fostering strong partnerships with EJ and other Climate Vulnerable Populations and implementing the public involvement and community engagement plan. Amongst other engagement activities, the project involved partnerships with the school department, library, and Burlington Cable Access TV to reach a broad audience in terms of education, a community survey, and PhotoVoice initiative. Response rates for these activities were lower than anticipated despite broad dissemination through these channels. Three core team meetings, 7 municipal planning meetings, a community site tour, and the final public listening session all spurred lively discussion that helped steer the project and focus final deliverables on specific, actionable recommendations and steps.

Results and Deliverables:

The following deliverables can be found on the project website (https://climateresilientburlington.wordpress.com/):

- **Opportunities Matrix:** BSC Group provided the Town of Burlington the Vine Brook Nature-based Solutions (NbS) Ecological Restoration and Resilience Opportunities Matrix. Each opportunity listed in the matrix has an associated ecological/resilience value and feasibility rating.
- **Nature-Based Solutions Memos:** An assessment of the watershed led to the selection of six study sites that could serve as representative locations on how NbS and other best practices can be combined to best effect and efficiency in addressing climate impacts. For each site, a detailed memo with specific interventions, order of magnitude budget, and implementation prerequisites and steps were identified. These memos, in combination with the Opportunities Matrix, are intended to be used by the Town, developers, property owners, and other community stakeholders as they manage and develop properties, as well as scope projects and grants.
- **Resilience Actions:** Six Resilience Actions, detailed in the final report, include goals with high-level implementation guidance for use by municipal staff, boards, and committees to use while advancing resilience within their respective areas of authority. A discussion on specific implementation pathways is provided in the final report.
- **Educational Resources:** The project included the development of two infographics on inland flooding and urban heat island, a StoryMap describing nature-based solutions options within Vine Brook and their benefits, a publicly accessible ArcGIS online mapper

to explore the study area, and, in partnership with Burlington Cable Access TV, two feature stories on the project. All of these resources can be used for continued education to the community and municipal staff, boards, and committees on the topics of flooding, urban heat island, nature-based solutions, and specific opportunities in Vine Brook to support a more informed community and support buy-in for implementation.

Lessons Learned:

- Technical and process-oriented lessons learned:
    - Nature-based solutions are more easily understood when described in examples envisioning a comprehensive renovation of a site where multiple methods can be employed. This stirs more vigorous debate of the cultural understanding of climate vulnerability and resiliency.
    - Municipal staff may be, and often are, unaware of the significant role they have in setting and maintaining the standard of ecological and extreme weather resiliency for their community. Some are also resistant to change or sensitive to criticism when functional or aesthetic standards change. Theirs are the most directly influential opinions guiding best practice but switching from traditional accepted forms of development to NbS is inherently risky. Perception puts greater emphasis on new challenges when compared to existing problems. Significant financial, educational and staff support would help to ease this transition. Similar pressures and incentives need to be applied to contractors and commercial developers if we want to expedite progress toward these goals.
    - Community engagement would be more effective with the inclusion of local community leaders directly included in the project team with the capacity to mobilize engaged groups.
- Best way for other communities to learn from the project/process:
    - This project is organized with both granular NbS modules and archetypal case study examples of typical conditions used to illustrate how these should be combined and approached. That combination of documents can be easily transposed onto similar developed areas. But this will only happen if interested communities are made aware of the materials. With this and other MVP projects we find this type of planning bridges the feasibility gap between generally understood issues and initial pilot projects. Communities in a position to plan and budget an NbS integrated redevelopment project would be best served by being directed to this project as a resource.
    - As a body of technical resources this is not the first MVP project exploring modular NbS planning. In preparing these materials and working across multiple MVP projects, the technical team has expanded the list of sources and blended in more and newer references, some of which already come directly from MVP. Having a vetted catalog/clearing house/library of outside references, but applicable to Massachusetts, for NbS, land management, and development would allow for more efficient sharing across MVP communities and providers. Vetted resources could include reviewer comments or applicable highlights so

that references are not misapplied or used out of context and so they are more effectively used when crossed with complimentary sources.

Partners and Other Support:

- Multiple Town departments, boards, and committees participated including but not limited to Planning, Economic Development, DPW, the Conservation Commission, the School Department, the Library, and Town Meeting Members. These partners provided input to the project process and final recommendations and assisted in disseminating project information and education.
- Burlington Cable Access TV conducted interviews, generated video feature stories about the project, and ran them on the local cable access channel.

Project Photos:

- In your electronic submission of this report, please attach (as .jpg or .png) a few high-resolution (at least 300 pixels per inch) representative photos of the project. Photos should not show persons who can be easily identified, and avoid inclusion of any copyrighted, trademarked, or branded logos in the images. MVP may use these images on its website or other promotional purposes, so please also let us know if there is someone who should receive credit for taking the photo.