

## Municipal Vulnerability Preparedness Program Action Grant Case Study

**Municipality:** City of Lowell

**Project Title:** Claypit Brook Climate Resilience Stormwater Management Capital Improvement Plan

**Award Year (FY):** FY21

**Grant Award:** \$138,000

**Match:** \$46,110

**Match Source:** Cash and in-kind hours

**One or Two Year Project:** One Year

**Municipal Department Leading Project:** Department of Public Works

**Project Website URL:** [tinyurl.com/LowellMVP](https://tinyurl.com/LowellMVP)

### Community Overview:

- *What is the population size of your community and where is it located?*
  - With a population of 110,997, Lowell is the fourth largest city in Massachusetts. The city is located in Middlesex County and is 30 miles north of Boston. The city is home to a multi-cultural population, including a large community of Latino and Cambodian residents. It is one of the most diverse cities in Massachusetts, which began with the influx of refugees from Southeast Asia, specifically from Cambodia in the 1970s. The most commonly spoken languages in Lowell include English, Spanish, Portuguese, and Khmer.
- *Do you have any [Environmental Justice](#) or other Climate Vulnerable communities? (Think about both those who live and work in your town.)*
  - The majority of Lowell is home to Environmental Justice populations, including low-income residents, minority residents, and residents with limited English fluency. The City is also home to climate vulnerable residents who may face barriers and challenges to building personal resilience, including youth, seniors, and residents facing housing and food insecurity. Over one-fifth (21.2%) of Lowell's population is under the age of 18. In 2019, the poverty rate in Lowell was 19%, almost double the State's poverty rate. The COVID-19 pandemic was particularly severe in Lowell.
- *Other unique traits of your municipality like who the top employers are, geography, history, etc.*
  - Lowell has a rich historic past, and is known as being one of the earliest planned industrial communities in the country. Many of the large historical mill buildings, formerly used by the textile industry, now provide a focal point for the community and tourism in the diverse city. Today, the City of Lowell's current economy is centered around technology, higher education, healthcare, tourism, and a celebration of the arts.

## Project Description and Goals:

- *Where was the project located?*
  - The Claypit Brook Climate Resilience Stormwater Management Capital Improvement Plan focuses on the Claypit Brook Watershed, located on the northwestern side of Lowell.
- *What climate change impacts did the project address?*
  - Chronic stormwater flooding caused by drainage deficiencies plagues Pawtucketville, an Environmental Justice neighborhood near Claypit Brook. The plan comprehensively assessed the watershed's drainage, culvert conditions, and known flooding conditions. This project also involved the preliminary design of the highly vulnerable Stockbridge Avenue culvert, and identified nature-based solutions to supply drainage to handle future extreme precipitation events in the Claypit Brook Watershed. In addition to addressing flood impacts, this study also assessed and identified strategies to mitigate urban heat islands.
- *What were the specific goals and tasks of the project as stated in your application? Did your project meet the goals set forth in your application in terms of:*
  - *Employing nature-based solutions*
  - *Improving equitable outcomes for and fostering strong partnerships with EJ and other Climate Vulnerable Populations*
  - *Providing regional benefits*
  - *Implementing the public involvement and community engagement plan set forth in your application*
  - *Finishing the project on time*

This project offered broad and multiple community benefits for Environmental Justice populations, climate vulnerable communities, and all Lowell residents. The identification of green infrastructure strategies can improve public health and recreational opportunities by improving air and water quality and providing cooling during extreme heat events. The reduction of localized flooding will improve access to neighborhoods, increase the number of possible evacuation routes, and improve response times for emergency management personnel. This increased resilience to flooding and extreme heat will offer relief to the City's most vulnerable residents and co-benefits that can improve outdoor public spaces even during nice weather.

The team incorporated equitable engagement modifiers into the outreach and engagement process to address barriers to participation, including offering technical support for virtual engagement, and translation and interpretation in Spanish, Portuguese, and Khmer. The project website was continually updated throughout this process at [tinyurl.com/LowellMVP](https://tinyurl.com/LowellMVP). The project team created social media posts for Facebook and Twitter throughout the project, paired with the hashtag #ResilientLowell. The team also created a fact sheet in four languages, paired with a survey in four languages, to get the word out about the project and collect input. The project team conducted interviews with stakeholders who had been impacted by flooding and extreme heat, and held meetings with the Lowell Sustainability Council, Pawtucketville

Citizens Council, and the public to gather feedback on the Plan. All project components were completed by the project deadline of June 30, 2021.

### **Results and Deliverables:**

- *Describe, and quantify (where possible) project results (e.g. square footage of habitat restored or created, increase in tree canopy coverage, etc.). Report out on the metrics outlined in your application.*
- The metrics outlined in the original Action Grant application included information related to flood reduction solutions. Key information is summarized below:
  - Stream assessment projects included those listed below. See Section 3 of the final report for additional information.
    - Bank stabilization along **300 linear feet**
    - Evaluation and mitigation of **16 beaver dams**
    - Maintenance or replacement of **7 culverts**
    - Debris removal of **20 fallen trees**
    - Overgrowth removal totaling **1,764 linear feet**
    - Sediment removal totaling **10,720 cubic feet**
  - Green infrastructure opportunities included **thirty-six green infrastructure features** within nine sub-catchments. See Section 4 of the final report for more information.
  - The **top 5** identified green infrastructure projects could cumulatively reduce impervious cover by **1.22 acres** and attenuate up to **411,730 cubic feet of runoff**. See Section 4 of the final report for more information.
  - **Three additional upstream flood storage opportunities** were identified and evaluated
- Additional qualitative and future metrics include the increased public awareness surrounding climate change, flood risk, and adaptation strategies; and the future reduced flooding and public co-benefits once the identified nature-based solution are implemented.
- *Provide a brief summary of project deliverables with web links, if available.*
  - Ten tasks were outlined in the project application and deliverables were provided to the MVP Regional Coordinator as required. The deliverables included a preliminary design and permitting strategy for the replacement of the Stockbridge Avenue culvert, in addition to the green infrastructure action identification and prioritization included in the Claypit Brook Climate Resilience Stormwater Management Capital Improvement Plan. The [project webpage](#) will continue to be used as an evolving depository of information about the City's climate change adaptation work, to provide continuity from the HMP-MVP Planning phase, to the MVP Action Grant phase, and beyond.

## **Lessons Learned:**

- *What lessons were learned as a result of the project? Focus on both the technical matter of the project and process-oriented lessons learned.*
- *What is the best way for other communities to learn from your project/process?*

The contracting period for this project was delayed, which ultimately impacted the City and stakeholders' review time. This also condensed the public engagement process. Covid-19 also impacted the project process in some ways. One of the key translators for the City was unavailable, as they were providing interpretation support at a vaccination site and the turnout to public meetings was lower than hoped for. However, the public input received during the process highlighted the Pawtucketville neighborhood's strong community resilience, and history of residents helping each other in the aftermath of extreme events.

Additionally, the team created and collated translated outreach and engagement content in Spanish, Khmer, and Portuguese that could potentially be used for flyers and meeting promotion in other communities. The [project website](#) could also be used as a multimedia example for other communities to communicate climate resiliency, share resources, and provide continuity from the MVP Planning phase to the MVP Action Grant phase. The project also produced fact sheets, flyers, and a survey in four languages, all of which could be used as examples of public engagement materials.

During the initial process of gathering historical and field data, it was discovered that historical inspection reports of culverts can often have conflicting or erroneous information related to considerations such as the size of the existing culvert. This means that field verification of size and configuration is critical.

The prioritization process in this project was fairly technical, which led to challenging conversations with the advisory committee. Future goals for similar work or future phases include finding more intuitive ways to discuss the priorities with stakeholders.

As other communities look to manage increased flood events and undersized culverts, the engineering project team recommends the use of concrete box culverts as a replacement for large culverts, as they provide for a good balance between cost of installation, longevity, and can be designed to meet the Massachusetts Stream Crossing Standards to the extent that they apply to replacement culverts.

## **Partners and Other Support:**

- *Include a list of all project partners and describe their role in supporting/assisting in the project.*

Key project partners and their role are listed below. Additionally, the Advisory Committee provided critical oversight and guidance throughout the project duration.

- **Expert/local interviewees:** shared their experiences of flooding and extreme heat in Pawtucketville, and recommendations for resiliency strategies.
- **Lowell Sustainability Council:** included time for updates on the Claypit Brook project on two of their agendas and shared their feedback.
- **Pawtucketville Citizens Council:** included time for a presentation of the project during one of their standing meetings, and shared their feedback.
- **The public:** shared their feedback and experiences through an online survey, interaction with social media posts, and attendance at the public meeting.
- **DCR:** provided guidance on related considerations, including forthcoming FEMA FIRM updates and the Risk Rating 2.0 methodology.
- **EEA:** the MVP Regional Coordinator provided guidance and participated in meetings throughout the project process.

### **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.*

The following images have been included as attachments:



Stream Assessment, March 2021. Photo by Weston & Sampson





Stream Assessment, March 2021. Photo by Weston & Sampson

**O plano de melhoria de capital de gestão de águas pluviais de resiliência climática Lowell Claypit Brook**

**Como a mudança climática pode impactar a cidade de Lowell?**  
**INUNDAÇÃO:** O sistema de águas pluviais é considerado um recurso local vulnerável. As inundações de águas pluviais são especialmente frequentes em áreas com:  
 ■ drenagem deficiente  
 ■ grandes quantidades de pavimento e outras superfícies que impedem a infiltração de água no solo  
 ■ bueiros subdimensionados

Como os eventos de chuva estão se tornando cada vez mais intensos devido à mudança climática, grande parte do infraestrutura de águas pluviais projetada décadas atrás agora é subdimensionada, incluindo bueiros. As inundações de águas pluviais são especialmente graves em Pawtucketville, um bairro de Justiça Ambiental perto de Claypit Brook.

**CALOR EXTREMO:** As ilhas de calor urbano (ICU) também são uma preocupação, que afetam desproporcionalmente as populações vulneráveis.

**O que estamos fazendo sobre isso?**  
 O plano de melhoria de capital de gestão de águas pluviais de resiliência climática Lowell Claypit Brook inclui:  
 ■ avaliar as formas abrangendo a drenagem do bacias hidrográficas, condições de bueiros e inundações  
 ■ mapeamento de ilhas de calor urbano  
 ■ projeto preliminar de um bueiro vulnerável na Stockbridge Ave  
 ■ identificação das soluções potenciais baseadas na natureza para melhorar a drenagem para lidar com futuros eventos de precipitação extrema na bacia hidrográfica do Claypit Brook.

**O que é possível?**

Soluções para aumentar a infiltração e restrição incluem:  
 ■ plantação de árvores  
 ■ filtro de drenagem do beirado para arborização urbana  
 ■ valetas de bioretenção  
 ■ restauração de fluxo  
 ■ jardins de chuva e sistema de bioretenção

**Definições**  
 Clima é o padrão de eventos climáticos observados ao longo do tempo.  
 A mudança climática é um fenômeno causado pelo aumento dos gases de efeito estufa na atmosfera terrestre, o que resulta em um aquecimento global da temperatura.  
 As ilhas de calor urbano (ICU) são microclimas urbanos que ocorrem quando as cidades substituem a cobertura natural do solo por superfícies impermeáveis que retêm o calor.  
 As águas pluviais é a chuva ou derretimento da neve que penetra no solo e recarrega a água subterrânea, direta ou indiretamente para os corpos d'água ou é transportada por uma série de tubos, a rede de água pluvial, até ser descarregada em um corpo d'água próximo.  
 Uma bacia hidrográfica inclui todas as terras que contribuem para o escoamento de um corpo d'água e pode se estender por muitos quilômetros de distância da borda de água.  
 Um bueiro é um conduto subterrâneo que permite que a água flua por baixo de uma estrada ou infraestrutura semelhante.

**Sua opinião é essencial!** Quer fazer parte da solução? Siga estas etapas rápidas:  
 ■ Visite a página do projeto em [Tinyurl.com/LowellMVP](http://Tinyurl.com/LowellMVP) para saber mais e compartilhar sua opinião  
 ■ Mantenha a conversa online usando a hashtag **#ResilientLowell**

Feste projeto foi financiado pelo programa de Seleção de Ação de Preparação para a Vulnerabilidade Municipal (MVP) do Escritório Executivo de Assuntos de Energia e Meio Ambiente do Massachusetts, que fornece suporte para cidades e vilas planejarem as mudanças climáticas e implementarem projetos para aumentar a resiliência.

Weston & Sampson | THE CITY OF **LOWELL**  
 THERE'S A LOT TO TAKE

**4**

**តើយុទ្ធសាស្ត្រកាត់បន្ថយទឹកជំនន់អ្វីខ្លះដែលអ្នកចង់ឃើញដើម្បីឃាត់ទឹកនៅក្នុងតំបន់ទីជម្រាល Claypit Brook? តូសធីកទាំងអស់ដែលអ្នកចង់ឃើញ។**

ដាំដើមឈើ

តម្រងប្រអប់មែកឈើ

ការស្តារចរន្តបង្ហូរទឹកឡើងវិញ

សួនទឹកភ្លៀង និងជីវសាស្ត្រ

បណ្តាញបង្ហូរទឹកជីវសាស្ត្រ

កន្លែងស្តុកទឹកជំនន់ដើមទឹក

យុទ្ធសាស្ត្របញ្ជាក់មាត្រដ្ឋានទឹក

Claypit Brook Fact Sheet in Portuguese (left), and survey in Khmer (right)