Municipal Vulnerability Preparedness Program Action Grant Case Study

Municipality: Lenox
Project Title: Housatonic Stream Restoration for Regional Flood Resilience
Award Year (FY): 2022
Grant Award: $ 295,190
Match: $ 99,720
Match Source: In kind hours and direct cash
One or Two Year Project: Two
Municipal Department Leading Project: Land Use Department
Project Website URL:
https://storymaps.arcgis.com/stories/35184c75f5eb4fbf863dc677c020404e

COMMUNITY OVERVIEW:

Town of Lenox was the municipal lead for the *Housatonic Stream Restoration for Regional Flood Resilience Project,* which also included the Towns of New Marlborough and Stockbridge and the City of Pittsfield. A partnership of these four municipalities formed through their shared need to address increased flooding directly related to undersized culverts. The populations are 42,057 (Pittsfield), 4,967 (Lenox) ,1,538 (New Marlborough), 1,944 (Stockbridge), for a total of 50,506 residents in Berkshire County, Western Massachusetts. The project sought to engage Environmental Justice communities in Pittsfield, primarily through partnership with neighborhood organizations in the Westside of Pittsfield as well as climate-vulnerable populations in all four municipalities with a focus on youth education and job-training.

Project Description and Goals:

The project was a collaborative effort among four municipalities in Berkshire County: the Towns of Lenox, New Marlborough, Stockbridge, and the City of Pittsfield as well as regional conservation organizations – Housatonic Valley Association (HVA), Trout Unlimited, Greenagers, and Mass Audubon and coordinated by Berkshire Regional Planning Commission. The primary goal was to address climate-related inland flooding by identifying and upgrading undersized culvert infrastructure at risk of failure. Additionally, it sought to identify areas where nature-based solution implementation could restore stream corridors and mitigate the impacts of increased flooding. Field data collection was done by hiring local youth crews from EJ communities through a partnership with Greenagers.

Broader outreach was achieved by classroom engagements over the two years in 5th, 7th, 8th and High School classrooms in all four municipalities as well as a series of events developed in partnership with community-based organizations throughout the County.

The key project goals can be summarized as follows:

1. Address climate change-related flooding by identifying and addressing undersized, at-risk culvert infrastructure.

2. Upgrade the culvert inventory and prioritize replacements based on current and future flood risk analysis and local information.
3. Implement nature-based solutions to restore stream corridors and increase flood storage.
4. Enhance community involvement and education, particularly in environmental justice neighborhoods and among climate-vulnerable populations.
5. Develop comprehensive Road-Stream Crossing Management Plans for each municipality, including culvert inventory, prioritized replacement plans, and potential nature-based solutions.
6. Strengthen ecological resilience by improving fish passage and supporting native brook trout populations.
7. Provide a roadmap for municipalities to enhance climate resilience, protect infrastructure, and reduce vulnerability to flooding events.

The project has successfully met the goals set forth, demonstrating notable achievements in various aspects:

Employing nature-based solutions: The project employed nature-based solutions by developing preliminary culvert replacement designs that exceeded the Massachusetts Stream Crossing Standards. These designs incorporated the US Stream Simulation Design methodology, allowing for the natural stream channel within the culvert structure and restoring stream dynamics. Moreover, the project analyzed the potential for nature-based solutions through localized field assessments and subwatershed scale land-use and slope analysis. Through community engagement, residents and students gained a greater understanding of climate resilience and the potential of nature-based solutions to address a variety of issues including carbon sequestration, stormwater, heat island effect and public health threats.

Improving equitable outcomes and fostering strong partnerships: Culvert assessments and planning were conducted within the targeted areas, including environmental justice (EJ) communities and adjacent neighborhoods. Priority culverts and nature-based solutions locations were weighted with input from community members in EJ communities. Berkshire Regional Planning Commission facilitated outreach and involvement, connecting with community leaders, residents, and organizations. Compensation was provided to community partners through event support for contributing their time, efforts, and resources to the project. The project aimed to mitigate climate change impacts on climate vulnerable populations, particularly the significant proportion of older adults and youth in Berkshire County. Recognizing the interconnectedness of EJ and adjacent communities, culvert assessments were prioritized in both areas.

Providing regional benefits: The project delivered significant regional benefits by addressing culvert infrastructure across multiple communities. By conducting comprehensive culvert assessments, developing prioritized replacement plans, and implementing nature-based

solutions, the project improved the overall resilience and functionality of the regional road network, positively impacting the surrounding environment and communities.

Implementing public involvement and engagement plan: Public involvement and engagement played a significant role in the project's success. To keep residents informed and encourage their feedback, various interactive tools were utilized, including a story map, rotating library display, direct mailings, and news articles in local publications. BRPC also facilitated two "DIY Stormwater Solutions" events to encourage homeowners' participation in managing residential flooding and to inform them about climate change, empowering them to become more resilient. An informative talk on vector-borne diseases and climate change was hosted, raising awareness about the impact of climate change on public health. A tree planting and park cleanup was also organized, and 15 trees were given away to residents of Westside neighborhood of Pittsfield to enhance community resilience. To educate the student community, Mass Audubon and the Housatonic Valley Association developed educational lessons tailored to different grade levels, focusing on topics such as increased flood risk, stormwater pollutants, nature-based solutions, community planning, forest sequestration and stewardship activities. In addition, youth were employed and trained by Housatonic Vally Association through partnership with Greenagers to conduct road-stream crossing assessments over two summers. These comprehensive efforts ensured meaningful community engagement at all stages of the project.

Final Outcomes: As a result of strong collaboration and dedicated efforts, the project was successfully completed on time, yielding completed Road-Stream Crossing Management Plans for each municipality. These plans included a comprehensive inventory of culvert infrastructure, a prioritized culvert replacement plan considering flood risk analysis and ecological benefits, preliminary culvert replacement designs, potential project locations for nature-based solutions, and integrated community feedback gathered throughout the process. The project provided a crucial roadmap for culvert replacements and implementing nature-based solutions to enhance climate resilience. It effectively addressed the growing threat of flooding resulting from climate change, aiming to restore aquatic connectivity and protect native brook trout populations. Through community engagement and the promotion of public understanding of nature-based solutions, the project aimed to build resilience and foster sustainable practices in the face of climate challenges.

RESULTS AND DELIVERABLES

CULVERT ASSESSMENTS

Every accessible road-stream crossing (bridges and culverts) was assessed for barriers to fish and wildlife, flood risk, and stream corridor impact. This was the result of three assessments performed at each road-stream crossing - North Atlantic Aquatic Connectivity Collaborative (NAACC) protocol for fish passability, a UCONN developed geomorphic data collection for flood

risk, and finally a protocol based off of Center for Watershed Protection's Unified Stream Assessment to determine stream corridor health and nature-based solutions.

Housatonic Valley Association held two rounds of training sessions for separate youth crews hired to complete assessments via a combination of virtual sessions and hands-on field trainings. Trainings were open to the Towns and project team. Eight youth were employed for field work and data collection over two summers/fall seasons in 2022 and 2023. Outreach to private landowners in the vicinity of the culverts via letters, door-to-door visits, and phone were conducted to ensure community knowledge and gather access permission for private culverts. Nearly 550 road-stream crossings were assessed during this phase of the project.

FLOOD RISK AND NATURE-BASED SOLUTION ANALYSIS

Field data collected was checked and packaged for analysis. Flood risk modeling was performed by University of Connecticut Department of Civil and Environmental Engineering using a computer model called CREST-SVAS (Coupled Routing and Excess Storage – Soil, Vegetation, Atmosphere, Snow) – a hydrologic model for flood risk that takes into account evaporation and precipitation, land cover, elevation, climate, snow pack, soil type and impervious cover. This modeling was conducted first to determine the flood failure at current storm intervals. A second round of modeling was run with the same data set that conducted hydrological simulations with future climate scenarios to give flood failure for each structure in future storm conditions. The results provided Towns with a list of culverts at risk for failure under 2, 5, 10, 25, 50, and 100-year storm intervals both currently and in the future. This data was presented to Towns during a prioritization workshop with key town officials – Town planners, land use, town administrators, highway, conservation commissioners, and emergency personnel. Workshops gathered additional information on structures assessed, grounded modeling results with local knowledge, and worked to develop a list of priority structures for capital planning and replacement that the municipalities can use for future spending decisions.

Nature-based solution analysis conducted by Trout Unlimited examined flood storage opportunities at the subwatershed scale in each of the four Towns. Analysis married the adapted Unified Stream Assessment data collected in the field with GIS desktop analysis of land cover, land use and slopes. Recommendations were presented to towns regarding best management practices at specific areas that encouraged infiltration and reduced point specific flooding.

PRELIMINARY DESIGNS FOR CULVERT REPLACEMENTS

Three municipalities went into the project with already identified priority crossings targeted for replacement.

- Pittsfield: Clark Street
- Lenox: Plunkett Street
- New Marlborough: Canaan-Southfield Rd.

Wetland delineations and field surveys were conducted at these priority culvert sites including elevation analysis, pebble count, natural stream channel analysis and utility identification. Using survey data, Trout Unlimited completed preliminary design plans for crossing replacements (30-60% design completion). These designs, based on the US Stream Simulation Design methodology and Massachusetts Stream Crossing Standards, aimed to ensure climate resilience, and withstand extreme flood events. Design packets included existing conditions based on field surveys, drawings and specifications for suggested replacement designs, construction sequencing, dewatering recommendations, oversight protocol as well as suggestions as to what should be included in a construction RFR packet. At design presentations with town officials in Stockbridge, New Marlborough, and Pittsfield partners discussed next steps to procure funding and move the replacement projects forward toward implementation.

ROAD-STREAM CROSSING MANAGEMENT PLANS

Road-Stream Crossing Management Plans (RCSMP) were the cumulation of previous field work, analysis, modeling surveys, and replacement design work. The Road-Stream Crossing Management Plan – a document developed over years of iteration by Housatonic Valley Association presents a complete inventory of every crossing in a municipality. Each crossing includes existing condition, aquatic passability score, flood risk both current and future, photos, as well as field data collected. A comprehensive map of each crossing displays flood risk and fish barrier information in such a way that corresponds to the road-stream crossing inventory. The RSCMP presents the priority structures identified in the workshop as well as suggested next steps, funding opportunities, and process for replacement. In addition to structure information, the RCSMP includes nature-based solution analysis and preliminary design packets developed by Trout Unlimited. Plans are distributed to the towns both digitally and as a binder for Highway and town officials to reference in capital planning and grant writing.

COMMUNITY ENGAGEMENT

A large portion of the first year was building relationships and trust with community-based organizations in environmental justice and climate vulnerable populations by supporting events within these communities. Support varied based on the needs of the partnership and included both attendance/tabling which helped spread the word about the project and provided an opportunity to gather community input, as well as supporting the event through donations to increase event attendance. For example, at Pittsfield Juneteenth event, grant funds were used to table and provide free ice cream to attendees. This increased attendance of the event and helped draw participants to the project table where ice cream vouchers were being distributed.

The second year built on the relationships formed to put together a series of workshops around a variety of climate change related topics. Workshops included stormwater DIY solutions for homeowners, public health threats from ticks and mosquitos in the age of changing climate, and stream connectivity. In total the team hosted eleven presentations in the first year and four additional stormwater and climate workshops in year two. Print and digital materials were developed and distributed to inform and engage the community, including library displays, a project story map, and news articles. Residents responded favorably to the municipal initiatives

to tackle flooding issues as well as commenting that they felt empowered with takeaway action they could implement on their own property. Many residents also expressed their appreciation for having a space where they could ask questions and delve deeper into the details of the project.

STUDENT ENGAGEMENT

Educational and interactive sessions were conducted by HVA and Mass Audubon for students in 5th, 7th, 8th and high school classes. Overall, 66 classes participated in the school engagement programs, which was 23 more classes than originally predicted.

In the 5th grade HVA and Mass Audubon taught students about watershed dynamics and stormwater runoff – demonstrating concepts through watershed modeling which included 22 classes from 6 schools in the 4 partner communities. At the end of the classroom sessions, students designed green infrastructure and tested stormwater mitigation on watershed models. They learned how easily water can become polluted and how difficult it is to make water clean once it becomes contaminated. Lessons also covered how severe storms related to climate change can lead to flooding along the streams/rivers in their town. Students experimented with low impact designs to mitigate pollution and nature-based solutions to reduce flooding. Each class received eight presentations during which students learn about human impacts and solutions to rivers including stormwater runoff and green infrastructure.

The 7th grade program with Mass Audubon consisted of 6-8 sessions including a classroom and a field study component. Students learned about the causes and potential impacts of climate change and used publicly available data to explore the risk of flooding and natural disasters in their specific communities. Students used data on Environmental Justice, Flood Hazard, Community Resources, and Rare Plants & Animals to map and evaluate the potential impacts of severe weather and flooding, on people and nature in their communities. Through research, discussion, and role-play students experienced the process of community-based conservation and gain experience using their voices to speak on environmental issues.

For the 8th grade and high school program, Mass Audubon completed 6- 8 lessons and field trips to the Mass Audubon Wildlife Sanctuary and the Housatonic River. Students explored how forests help mitigate climate change impacts through carbon storage, absorbing rainfall, slowing runoff, and holding soil in place. During the field study, students used professional forestry techniques to measure and estimate the amount of carbon stored in trees in the forested areas around streams and wetlands. An additional, program for high schoolers included the Mass Audubon statewide Youth Climate Leadership Program (YCLP) focused on youth-led, action-oriented climate action immersion. For the first time, the YCLP was expanded into Berkshire County to include four high schools which are all from MVP partner communities.

LESSONS LEARNED

The outcome of this project was primarily to identify priority structures for replacement and upsizing. At least one culvert was selected for preliminary engineering in three towns during the

application process. A final workshop reviewed the data, nature-based solutions, as well as asked the municipalities for input on what crossings were a priority. The workshop was full and time was limited to fully discuss all the topics. To mitigate this in the future, we would suggest having an additional workshop toward the beginning of the project, perhaps even before field work started, in order to identify municipal priority areas in a more systematic way ahead of time. This would inform the field work and data collection and could be integrated into the crossing inventory presented at the workshop toward the end. In addition to a more informed product, this would help pace project delivery and engage town officials more fully throughout the project.

In concert, we suggest leaving ample time for quality control of the data and data analysis. It would often take several rounds of analysis to catch all the errors and mistakes. In preparing a similar application, we would buffer the data analysis tasks in order to give partners both funding and time to complete these and ensure accuracy.

Communication and collaboration provide a critical role in project implementation. Property owner outreach is highly recommended for any municipality assessing their culverts. Mailed letters to the property owners adjacent to every public culvert location and on their property helped informed residents directly of the project. However, we learned that obtaining landowner permission can take longer than expected so plan on 3- 4 months of contact prior to starting field work.

The most significant takeaway regarding outreach is how public engagement is relationship-based work. Building relationships and trust with community-based organizations took over a year and was rooted in reciprocity. The first year of supporting these organizations with their programming was crucial to their collaboration in the future. In addition, the partnership was able to trial several different types of outreach. Engagement that was more high-touch and focused on topics community members have control over was more effective than uni-directional educational materials. For example, the StoryMap, while attractive as a resource – didn't reach as many people and quite likely didn't inspire tangible actions from residents whereas the DIY workshop on how to build a rain garden seemed to leave people inspired and with tangible next steps.

Lastly, the more audience focused outreach was, the better. An example of this was the tree giveaway in an environmental justice community. This provided a low-stakes way for folks to take action and address the specific climate related vulnerability in their neighborhood. In contrast, in other communities, the DIY workshop was targeted toward homeowners who had the power to implement solutions in their backyards. Finally, attendance at events grew if we reached folks through multiple avenues. A Facebook ad reached far more people and inspired action when coupled with newspaper articles, partnership newsletters, flyers, and word of mouth.

Partners and Other Support:

Berkshire Regional Planning Agency (BRPC)	Melissa Provencher - Grant Administration Courteny Morehouse - Deliverables manager and outreach coordinator Britney Danials, Outreach and project support
City of Pittsfield	Becky Manship- Municipal lead Allison McMordie and Tyler Shedd – City engineers review of sites and replacement designs Robert Van Der Kar - Conservation agent and review of site locations Jim McGrath – Outreach in public parks
Town of New Marlborough	Mari Enoch – Municipal lead, Town Administrator
Town of Lenox	Gwen Miller – Municipal lead, Land Use Darlene McCauley- Outreach assistance
Town of Stockbridge	Michael Canales - Municipal lead, Town Administrator Patrick White – Select Board, project partner and town liaison Hugh Page – Town Highway Director
Greenagers	Elia Del Molino – Field data collection supervisor, Greenagers crew coordinator
Mass Audubon	Dale Abrams – Watershed education program and youth climate program for 6th, 7th and 8th grade and High School
Housatonic Valley Association	Alison Dixon – Co-lead project manager. 5th grade classroom programming, data manager for structure assessments, and road-stream crossing management plans
Trout Unlimited	Erin Rodgers – Priority culvert surveys, Nature-based analysis, priority culvert survey manager Jeff Tenley – Culvert design engineer