# Municipal Vulnerability Preparedness Program Action Grant Case Study

Municipality: Buckland, MA Project Title: Clesson Brook Watershed Based Assessment & Climate Resiliency Plan Award Year (FY): FY22/FY23 Grant Award: \$ 100,117 Match: \$ 41,650 Match Source: MA DEP 604b; In-kind services One or Two Year Project: Two-Year Municipal Department Leading Project: Town Administration / Board of Selectmen

### **Project Website URL:**

https://gza.maps.arcgis.com/apps/webappviewer/index.html?id=4dd9dbc00f644631bf1f7c45af 8cc98b

Username: Clesson\_Brook

Password: Clesson\_Brook22!

Project StoryMap: https://storymaps.arcgis.com/stories/c6bde5f5a342459bbb1df1a07a04182a

#### **Community Overview:**

- What is the population size of your community and where is it located?
  - The Town of Buckland has a population of 1,816, and is located in the Berkshires and Hilltowns Region of Massachusetts.
- Do you have any <u>Environmental Justice</u> or other Climate Vulnerable communities? (Think about both those who live and work in your town.)
  - The Village of Shelburne Falls, half of which falls in the town of Buckland, is an Environmental Justice community based on income criteria, as is the entire community of Hawley in the upland area of the Clesson Brook watershed. According to the U.S. Census Bureau's 2017-2021 American Community Survey (ACS) 5-year estimates, 38% of Buckland's residents are aged 55 or older. These residents may be considered climate vulnerable due to age.
- Other unique traits of your municipality like who the top employers are, geography, history, etc.
  - The Town of Buckland, Massachusetts is a small, rural, predominately agricultural community with a population of approximately 2,000 people.
  - The main employer in Buckland is the Mohawk Trail Regional School. Buckland shares a downtown business district, known as Shelburne Falls, with the Town of Shelburne. The Route 112 corridor bisects the town and is a scenic highway consisting of a number of small farms and open space.
  - Originally part of the towns of Charlemont and Ashfield, Buckland's first settlers arrived in 1742. By 1779, the residents of what is now Buckland found it

inconvenient and sometimes dangerous to cross the Deerfield River to attend church, school and town functions in Charlemont and surrounding towns, so they petitioned the General Court for incorporation. The Town of Buckland was incorporated April 14, 1779.

### **Project Description and Goals:**

- Where was the project located?
  - The project was located within the entire watershed for Clesson Brook, a tributary of the Deerfield River. With a drainage area of 21.3 mi2 (13,621 acres) the Clesson Brook watershed makes up the majority of the Town of Buckland (62 percent of Town lies within Clesson Brook watershed) and encompasses a portion of the Towns of Hawley and Ashfield.
- What climate change impacts did the project address?
  - The climate change impacts which were the focus of this project include increases in heavy precipitation and associated flooding and fluvial (river) erosion, which in turn exacerbates the risks of undersized and failing culverts and bridges, sedimentation, threats to agricultural lands, and ecosystem degradation.
- What were the specific goals and tasks of the project as stated in your application?
  - Prepare a Watershed-Based Assessment and Climate Resiliency Plan to identify appropriate management strategies and projects to protect and restore the health and climate resiliency of the watershed and address sediment loading to Clesson Brook.
  - Advance action items identified in previous work within the Clesson Brook watershed and develop a set of prioritized projects to address the vulnerabilities of the Clesson Brook watershed while promoting climate resilience.
  - Build partnerships and Public outreach focused on landowners and stakeholders in the Clesson Brook watershed, with additional engagement with private landowners and engaging the entire community by identifying opportunities for engaging town residents including local youth and seniors.
  - Characterize the watershed (fluvial geomorphic, habitat, hydrologic and hydraulic modeling, river corridor delineation, and culvert inventory and assessment data), needed for a more robust and scientifically grounded assessment of climate resiliency and watershed health.
  - Identify solutions and prioritize locations where the conservation of land will strengthen the resiliency of the Clesson Brook river corridor and identify potential restoration projects.
  - Identify the causes and locations of channel instability that will then be used to identify, prioritize, design, permit, and implement projects that will address sediment loading, stabilizing eroding riverbanks, erosion and flood hazards, and habitat degradation.
- Did your project meet the goals set forth in your application in terms of:
  - Employing nature-based solutions

The project resulted in the identification of lands within the watershed to be prioritized for conservation and/or implementation of a River Corridor Easement, potential restoration projects and project types, and conceptual designs for specific restoration projects. Such projects included nature-based solutions such as removal of barriers to aquatic organism passage (culvert and bridge replacements/widening), stabilization of streambanks with engineered log jams and vegetated stone slope protection, streambed stabilization using boulder weirs and/or log sills, installation of boulder -

supported log jams and other instream habitat structures to encourage sediment sorting and deposition while enhancing habitat, measures to encourage floodplain reconnection, planting of riparian buffers, and invasive species mitigation.

- Improving equitable outcomes for and fostering strong partnerships with EJ and other Climate Vulnerable Populations
  - The Town of Buckland does not have a mapped EJ population but it does have community members who are highly vulnerable to the impacts of climate change; approximately 40% of Buckland's residents are over the age of 55. This project included a series of landowner site visits to elderly residents who were impacted by Tropical Storm Irene, which provided an opportunity for them to weigh in and make the project team aware of priority areas. The Route 112 Bridge is a critical piece of the evacuation route for many residents and this project advanced designs to make it more resilient to the impacts of climate change.
- Providing regional benefits
  - The project provided broad and multiple community benefits and cobenefits to the Town of Buckland, especially at the watershed scale. The Clesson Brook watershed occupies over 50% of the Town's total land area and includes farms that are important to the local and regional food systems and economies, a major transportation and evacuation route, Route 112 as well as the Buckland Recreation Area, an important local and regional resource that provides summer camp and other programming (social activities for children and child care for working families) and recreation amenities (public health benefits) and relief from excessive summer temperatures.
  - The project has regional benefits because it is an example of planning on a watershed scale and includes Buckland's Clesson Brook watershed neighbors, Ashfield and Hawley. The climate resilience benefits go beyond the municipal boundaries of the Town of Buckland. All three watershed towns were invited to participate in the planning and engagement conducted as part of the project. The Plan identified projects and management strategies for the Clesson Brook watershed that if implemented will benefit all three towns as well as the downstream communities along the Deerfield River.

- Implementing the public involvement and community engagement plan set forth in your application
  - Yes, this project met the goals set forth in the application for community engagement. We had an excellent turnout at our first virtual open house and were able to keep folks interested during the duration of the project. Between the three primary community events for this project, our attendance was around 100 residents, which is great in a rural area. The project team was also able to work with a wide range of students on this project: FRCOG & Field Geology Services gave a presentation on the project goals and fluvial geomorphology to over 150 high school students, led a field trip for 20 high school students, and led a Stream Table activity for over 60 elementary school students. The project team also created an interactive StoryMap that watershed residents were able to use to stay up to date on the project and download all outreach materials.
- Finishing the project on time
  - The project was completed by the end of FY 2023 (June 2023).

# **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 project included the following results:
    - Fluvial geomorphic assessment: The entire length of Clesson Brook was assessed and divided into 23 reaches and 66 segments, while Smith Brook was divided into 8 reaches, with the lower three reaches further divided into 12 segments. Twenty percent (20%) of the banks along the assessed reaches of Clesson Brook and lower Smith Brook were mapped as eroding. In addition, fifteen percent (15%) of the banks were armored. Together, 35 percent (35%) of the total length of the stream banks were classified as unstable. The legacy of Clesson Brook watershed's history of mills and channel manipulation, including dam construction and extensive channel straightening, has left a continuing legacy of aggravated flood and erosion hazards, degraded aquatic habitat, and high sediment loading. Furthermore, the impacts of Tropical Storm Irene can still be seen along Clesson Brook and its tributaries in the form of headcuts, 87 of which were mapped in the assessment, increased erosion, and sediment transport discontinuities.
    - Hydrologic and Hydraulic model: The model predicts that the frequency of overtopping will increase for five (5) bridges on the Clesson Brook main channel between present-day conditions and late century (2090) conditions due to climate change. The model predicts that the inundation area in square miles, along Clesson Brook, will increase by approximately 10% between present-day conditions and late century (2090) conditions

due to climate change. Results indicate that climate change will vastly increase the area of "Very High" and "Extreme" hazard zones where flooding has the potential to damage infrastructure in addition to threatening vehicles and human lives.

- Database of road-stream crossings: Identified 152 road-stream crossings within the Clesson Brook watershed in the Towns of Buckland, Ashfield, and Hawley from pre-existing sources, and identified an additional 44 road-stream crossing locations that had not been previously identified or assessed. Field-observed 35 road-stream crossing locations. Prioritized road-stream crossing locations which resulted in 14 road-stream crossing locations in the top five priority rankings, out of 13 priority risk road-crossing rankings.
- Prioritized 58 parcels within the Clesson Brook watershed for conservation.
- Identified four (4) restoration projects.
- Prepared proposed conceptual designs for four (4) restoration projects.
- Led one (1) presentation for 150 high school students and one (1) field trip for 20 high school students
- Led one (1) Stream Table Demonstration for 60 elementary school students
- Held three (3) public meetings over the course of the project
- Distributed one (1) backpack mailer to elementary school families directing them to the StoryMap and explaining the goals of the project
- Distributed six (6) newsletters to provide project updates/announce upcoming events
- Provide a brief summary of project deliverables with web links, if available.
  - Multiple reports were prepared as a result of this project and are listed below. Many of the outcomes described in these reports were presented on the Clesson Brook web map which may be accessed by clicking the link below and entering the username and password as follows:

https://gza.maps.arcgis.com/apps/webappviewer/index.html?id=4dd9dbc00f644631bf1f7c45af8cc98b Username: Clesson\_Brook Password: Clesson\_Brook22!

https://storymaps.arcgis.com/stories/c6bde5f5a342459bbb1df1a07a04182a

• Deliverables:

- Fluvial Geomorphic Assessment Report
- Technical Memorandum: Hydrologic & Hydraulic Analysis
- Prioritized Stream Crossing List
- Prioritized Parcels for Conservation
- Prioritized List of Restoration Projects
- Conceptual Restoration Designs
- Watershed Based Assessment and Climate Resiliency Plan for Clesson Brook
- Series of newsletters
- Presentation on fluvial geomorphology and accompanying field trip for Mohawk Trail Regional School students (9<sup>th</sup>-12<sup>th</sup> grade)
- Stream Table activity for Buckland-Shelburne Elementary School students (2<sup>nd</sup>-5<sup>th</sup> graders)

### 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.
  - The watershed-based holistic approach incorporating historic/archival resources, remote sensing, field mapping and observations paired well with landowner/resident outreach. This project led to many connections with local residents and this watershed network will likely lead to increased understanding of geomorphic processes and positive efforts improving climate resiliency in Buckland, Ashfield, and Hawley.
  - The project would have benefited from incorporating more team meetings for the technical leads into the scope of work and budget for the project, to review progress and schedule, and to allow for more integration of the various technical components of the project.
- What is the best way for other communities to learn from your project/process?
  - The reports and memoranda provided that describe the methodology and results of the various analyses conducted in support of this project provide a wealth of information about the importance of these types of analyses and the outcomes that help inform restoration and resilience projects. The Clesson Brook web map (see link provided above) provides a visual representation of the data that was collected and results of the analyses. The Story Map (see link provided above) provides a broad overview of the goals and outcomes of the project in a format accessible to the residents and stakeholders within the watershed.

# Partners and Other Support:

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

- Towns of Ashfield and Hawley located within the Clesson Brook watershed and participants of public meetings and Community Open House.
- Franklin Regional Council of Governments (FRCOG) public involvement and community engagement, Watershed-Based Assessment & Climate Resiliency Plan for Clesson Brook
- GZA GeoEnvironmental, Inc. consultant, hydrologic & hydraulic model, roadstream crossings database, restoration projects development
- Field Geology Services consultant, fluvial geomorphic assessment, restoration projects development

# **Project Photos:**

• In your electronic submission of this report, please attach (as .jpg or .png) a few highresolution (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.







