

Municipal Vulnerability Case Study

Project Title: Mohawk Trail Woodland Partnership Regional Adaptation & Resilience Project

Municipality/Nonprofit Organization: Town of Adams

Grant Award: \$1,192,839.93

Match: \$537,599.01

Community Overview

The Town of Adams served as the lead municipality for this regional project which encompassed the region of the Mohawk Trail Woodlands Partnership, the Commonwealth's most rural, forested and low-income region. The MTWP is one of the first private forests in the U.S. to be designated as a rural economic development region by state law focusing on forest conservation, sustainable forestry and natural resource based tourism (Bill H.4835 190th Legislative Session, 2017-2018. An Act promoting climate change adaptation, environmental and natural resource protection, and investment in recreational assists and opportunity). The region has become the incubator for innovative, private forest conservation initiatives.

Description of Climate Impact

Improved forest management and forest management plans are identified as needs for community resilience in the MTWP communities. The municipalities within the MTWP all stated the need for greater forest management planning and additional resources for landowners to address invasive species and fire management. Despite increased precipitation in the region, the higher temperatures result in greater evaporation and drying of the forest, which can lead to forest fire conditions. In regard to tree health and invasive species, according to the Resilient MA data, growing degree days will be 23-52% higher, and the growing season will be longer, which result in multiple reproduction cycles for pests and invasive species. Strengthening climate change resiliency of forested land is overly cumbersome for our Western Mass landowners. Based on research and local knowledge, landowners need the ability to manage their forests for such benefits as timber, habitat, or recreation, and be eligible for participation in carbon sequestration markets. Currently, programs either are, or are perceived to be, incompatible and/or require large scale land ownership.

Residents throughout the Town of Adams have experienced significant flooding on multiple occasions over the past decade due to more intense and more frequent storms. Most notably was Tropical Storm Irene on August 28th, 2011 and, a significant storm on September 12th of 2018 followed by the remnants of Hurricane Florence dropping significant rainfall 6 days later on September 18, 2018. These flood events have prompted the Town to focus on adaptation and resiliency through the MVP program

to improve local flood conditions and to prepare for climate change. Studies, assessments, and the identification and prioritization of problem flood areas were the top priorities identified through the Town's MVP Planning workshop. Through the workshop, the Town generated a list of flood prone areas. Through a subsequent MVP Action Grant, the Town assessed, analyzed, and evaluated priority areas to further prioritize and determine the potential for future vulnerability and risk to public safety, infrastructure and natural resources. Based on this assessment, flooding in the Grant Street Neighborhood was prioritized as an area with a poor condition rating and high potential for future impacts to health and safety caused by more severe storms caused by climate change. The Grant Street neighborhood already is burdened by flooding during larger rain events. Also, this neighborhood is a lower income area, with an environmental justice designation.

Project Goals

This regional project aimed to address multiple concerns for the MTWP that have arisen due to climate change and that are identified within the communities respective Municipal Vulnerability Preparedness Plans. To maximize the benefits to the region, this comprehensive project included a full-range of project components including a regional scale project, sub-regional projects and local/municipal assessment and implementation projects. As a whole, this project addresses the multitude of challenges faced by the communities that make up the MTWP.

Based on research and local knowledge, landowners need the ability to manage their forests for such benefits as timber, habitat, or recreation, and be eligible for participation in carbon sequestration markets. Currently, programs either are, or are perceived to be, incompatible and/or require large scale land ownership. Strengthening climate change resiliency of forested land is overly cumbersome for our Western Mass landowners. The goal of this project is to serve as the first phase toward developing a program that is both accessible and sustainable.

As identified through the MVP planning process, many communities are grappling with stormwater runoff that easily overwhelms undersized culverts and damages roads and key infrastructure. The towns within the MTWP have prioritized the monitoring, replacement and repair of undersized, aging and failing culverts. Uncontrolled stormwater runoff often causes rivers and tributaries to flood and erode their banks (fluvial erosion), which damages farmland, critical infrastructure and homes. As discussed in A Framework for Resilience, a climate resilient response to these problems is to use a variety of Nature-Based Solutions (NBS) at different scales — parcel, town, and watershed — to slow, spread and retain storm and flood waters. However, often times NBS cannot be employed without redesigning and retrofitting existing infrastructure. The proposed Mohawk Trail Woodland Partnership Regional Adaptation & Resilience Project combines a multi-scale approach to implementing NBS along with necessary redesign and retrofits. Through the proposed local/municipal projects the Mohawk Trail Woodland Partnership Regional Adaptation & Resilience Project addresses two Top Hazards, heavy rains/flooding and dam failure, and implement several High Priority Actions identified within the respective Municipal Vulnerability Preparedness Plans. These projects are briefly described, below.

Approach and Result

The Town of Adams served as the lead municipality and worked with a project team lead by the Berkshire Regional Planning Commission (BRPC) and the Franklin Regional Council of Governments (FRCOG). This regional project encompassed a range of components from the macro to the micro – addressing multiple concerns for the MTWP that have arisen due to climate change. The project approach included a full-range of project components comprised of a regional scale project, several sub-regional projects, municipal assessment and design projects, and implementation/construction projects.

Regional Project – Carbon Sequestration Feasibility and Planning for the Mohawk Trail Woodlands Partnership

The *Mohawk Trail Woodland Partnership Regional Adaptation & Resilience Project* utilized a growing body of research on the tools available to rural communities to combat climate change as well as meeting needs identified within MVP Plans. A team lead by Mass Audubon, which included the New England Forestry Foundation and the Northern Institute of Applied Climate Science, conducted a feasibility study that identifies various approaches to work effectively with local landowners to design forest management plans that address carbon storage, allow for forest product harvesting, and make our forests more resilient to the effects of climate change such as changing precipitation, increased fire risk, invasive insects and plants, and decreased snowpack. This serves as the first phase of a ground up process to improve climate resilience in rural communities and, ultimately, bring in new sources of revenue to an area with a struggling economy.

The Mass Audubon Team reviewed existing tools, examples and case studies and developed recommendations for a customized approach for carbon sequestration for the MTWP. The Team explored comprehensive forestry management approaches that will minimize the risks posed by invasive species and increased fire risk, and maintain the value of timber and economic potential while maximizing the benefits of carbon sequestration.

The Nature Conservancy worked with Mass Audubon and the US Forest Service NIACS (Northern Institute of Applied Climate Science) team to define and develop a list of forestry practices that both increase carbon stock within 20-30 years and increase resilience of our forests. The Team started with a broad list and used the best available science and expert opinions to narrow it to a final set of practices that increase carbon stocks in the short term. Input from stakeholders -- including foresters, landowners, loggers, scientists, state agencies, and conservation organizations from both Massachusetts and Vermont – was key to narrowing down the list and developing the detailed practices you see below. This is not an exhaustive list, but rather focuses on developing carbon stocks within a short timeframe of 20-30 years. These practices apply primarily to northern hardwood and oak-hickory forests in the central and western part of the state, and are a complement to the more complete list of carbon and resilience practices being developed through a MVP grant for the MTWP awarded to Williamstown.

The Team also developed a handbook titled *Forest Climate Resilience Pilot Program Recommendations*, which provides recommendations for a pilot Forest Climate Resilience Program (FCRP) in the Mohawk Trail Woodlands Partnership (MTWP) region of Massachusetts and outlines

two pathways for program funding and implementation. Recommendations were developed over the course of a year with input from academic experts, conservation organizations, land managers, and local planning agencies. Notably, the handbook is not intended to be prescriptive. Program specifics will continue to be refined over the next year through additional feedback and planning as part of the Williamstown MTWP MVP Grant. Additionally, certain program features may need to be modified to align with future funding requirements.

Lastly, the Team provided materials on “Opportunities for Remotely Monitoring Forest Carbon”. One of the most expensive aspects of developing a forest carbon project is obtaining a detailed forest inventory to determine the quantity of carbon stored in the forest. A series of permanent field plots must be established in the project area. The services of professionals must be enlisted to measure the necessary forest attributes within those plots at the start and at periodic intervals over the life of the project. The data that are collected must also be verified by a third party to ensure accuracy. It has been difficult to reduce the costs associated with this monitoring and verification because it is the only way to obtain a sufficiently detailed account of how much carbon is actually on the ground.

Unfortunately, these costs can be a significant barrier to participation in forest carbon markets, especially for landowners with smaller acreages where the investment in inventory and monitoring may not be outweighed by the value of the carbon onsite. However, there are new technologies on the horizon—namely advances in remote sensing—that are making it possible to measure carbon and other important attributes without setting foot in the forest. This has the potential to change the game by making it far less expensive to monitor the condition of the forest and drastically reducing the financial hurdles associated with these carbon projects.

Sub-regional Project – Stormwater Assets Inventory & Prioritization

The City of North Adams and the Towns of Adams, Williamstown, and Windsor all identified the need for a more thorough inventory of their stormwater infrastructure – with a specific focus on culverts. Each of these communities are unique and represent the different types of communities within the MTWP. North Adams is a small city, while Williamstown is a small town, Adams is an industrialized mill town, and Windsor is a rural community. Despite all of their differences, these communities face similar challenges with regard to undersized and underperforming infrastructure, as well as limited resources, which need to be strategically aimed at the most impactful sites.

Through this project BRPC customized the ARC GIS Collector App and developed interactive web-based mapping that municipal officials can use to locate stormwater infrastructure, specifically culverts, which can assist in identifying high priority structures. BRPC imported existing data and inventoried additional culverts based on feedback received from the municipalities. BRPC then worked with the municipal officials to prioritize culverts based on attributes such as ecological disruption, emergency service disruption, and risk of failure. The interactive online maps can serve to aid municipal officials to visualize and prioritize investments and target solutions based on reasoned and logical determinations. The data was collected and the online mapping developed to seamlessly integrate into existing systems for asset management, such as SAM IS (utilized by the Town of Adams), but also functions independently to meet the needs of the range of communities and their varying needs. Lastly, a

“guidance document” was developed within an ARC GIS Story Map format, which can be viewed at <https://storymaps.arcgis.com/stories/dc75ff0efd3a4cccb4dd027c60d2ca06>.

Sub-regional Project - Local Bylaws, Ordinances, Plans and Other Management Measures

The Towns of Ashfield and Conway, like many of the communities in the MTWP, are grappling with stormwater runoff that easily overwhelms undersized culverts and damages roads and key infrastructure. Both towns prioritized the monitoring/replacement/repair of undersized and aging/failing culverts in the MVP Resiliency Plan. The Towns share the South River Watershed, a HUC-12 tributary of the Deerfield River Watershed, and uncontrolled stormwater runoff causes the South River and its tributaries to flood and erode their banks (fluvial erosion), which damages farmland, critical infrastructure and homes. Through this project, FRCOG provided technical assistance to the Planning Boards and private landowners in Ashfield and Conway to adopt/use these important climate resiliency tools. FRCOG prepared outreach materials on the importance of River Corridors and these two climate resiliency management tools. These materials were distributed at the Ashfield and Conway Annual Town Meetings. FRCOG also held two Zoom meetings for the towns to educate and engage residents and local officials in discussions about River Corridors and climate resiliency.

Local / Municipal Projects – Nature-Based Solutions

TOWNS OF ASHFIELD AND CONWAY FINAL DESIGNS FOR CLIMATE RESILIENT PROJECTS

FRCOG worked with the Towns to review priority projects from previous fluvial geomorphic assessments and watershed plans. Using NOAA Atlas 14, resilientma.org data and other resources, FRCOG created a climate resiliency scoring matrix that includes climate resiliency metrics for storm events/precipitation and the potential for habitat restoration/protection benefits. FRCOG and stakeholders worked with private landowners and identified 2 potential upland watershed projects in tributary reaches that would provide flood resiliency benefits to downstream infrastructure (roads, bridges, culverts, buildings, etc.) and included downstream replacement of a priority undersized culvert with each upstream project. Three priority projects were identified in a contiguous area along the South River and are referred to as the Oxbow Reconnection Project. This project includes bank stabilization, reconnecting the South River to abandoned floodplain/oxbow and riparian buffer enhancements along with a dry hydrant for the Fire Department. FRCOG contracted with an engineer to conduct hydraulic modeling for the 5 priority sites (floodplain reconnection; attenuation of flood flows; etc.) for different storm events using climate resiliency data from resilientma.org and/or suitable data sources. FRCOG prepared final designs and surveys, a report detailing the permitting requirements and Opinions of Probable Costs for 5 priority climate resilient projects that focus on NBS.

TOWN OF ADAMS TRIBUTARY AREA STORMWATER STORAGE ASSESSMENT

Based on recommendations to alleviate flooding a combined approach utilizing both Nature Based Solutions and redesign and retrofits was chosen to help mitigate short-term and long-term flooding in the Grant Street neighborhood. Because of the general poor condition of the downstream collection system, upgrades to this piping and infrastructure were required for both short-term and long-term mitigation. Downstream stormwater storage and green infrastructure opportunities were previously

reviewed, but because a large majority of flow comes from the upstream collection system, adding downstream green infrastructure was not found to be effective in helping to mitigate flooding. However, a review of the upstream tributary system indicated potential opportunities to expand tributary storage.

The Town of Adams retained Vanasse Hangen Brustlin, Inc. to review opportunities to expand existing natural stormwater storage areas and the creation of new areas that would help mitigate stormwater peak flow rates. The analysis consisted of rainfall-runoff responses under existing and proposed conditions for various storm events. Field observations of watershed boundaries and stormwater storage areas were investigated as well as areas for additional storage to attenuate peak flow rates. This report was prepared in conjunction with the design and construction of significant drainage improvements within Grant Street, Lincoln Street and Valley Street, which is downstream from this tributary area and also partially funded by the MVP Action Grant. The findings of the report include a summary of the work performed and graphical displays of existing watershed area, existing stormwater storage areas, and potential future stormwater storage areas. Finally, a matrix of a Best Management Practices (BMP) for managing stormwater was developed that describes typical applications, benefits, drawbacks, and maintenance requirements for managing stormwater.

Local / Municipal Projects – Redesign and Retrofits

TOWN OF ADAMS GRANT STREET INFRASTRUCTURE UPGRADES

The Town of Adams funded design work to upgrade the stormwater infrastructure in the Grant St. neighborhood. Through this project the Town procured the services of a construction contractor to replace the existing, collapsed/damaged 24-inch corrugated metal pipe extending west from Cross Street as well as the inlet structure located at the upstream end of this pipe, between Cross Street and Friend Street. In addition, the network of pipes in this area were undersized, often with larger pipes connecting to smaller pipes. The network of pipes was replaced with new piping which is appropriately sized for the system and for additional flows due to climate change. All drainage structures were replaced with precast concrete structures to allow for the connections of these larger pipes.

CULVERT ASSESSMENTS & DESIGNS

BRPC built on the work conducted under ‘Stormwater Assets Inventory & Prioritization’ to identify priority culverts to conduct additional assessment within each community and develop conceptual designs. BRPC received a s.319 Nonpoint Source Pollution Grant from the MA Department of Environmental Protection to establish a Nonpoint Source Regional Coordinator to work with the communities in Berkshire County. BRPC utilized its newly established Nonpoint Source Regional Coordinator to work with the communities to identify and prioritize sites. In addition, BRPC collaborated with Comprehensive Environmental Inc. (CEI). CEI conducted further assessment, including developed recommendations and ultimately prepare conceptual designs. In the Towns of Williamstown and Windsor 30% design plans were developed for one culvert in each community. The City of North Adams was only able to identify one priority culvert. Due to the complexities of replacing the priority culvert consistent with the MA Stream Crossing Standards, and after consultation with the MVP Regional Coordinator, CEI developed a design memo rather than 30% design for the culvert in North Adams.

FRCOG contracted with an experienced land use/municipal law attorney to conduct a legal review of the priority sites, including options for acquisition via easement, purchase, etc. and hired an appraiser to value the 5 priority sites for potential acquisition or conservation restriction or river corridor easement.

Proposed redesign and retrofit projects included Ashfield Lake Dam climate resilient repairs/upgrades, installing a new culvert on Baptist Corner Road in Ashfield, conducting culvert assessments and preparing 30% design plans for 5 culverts. FRCOG hired an engineering consultant to segment the proposed Ashfield Lake Dam project into 3 separate projects in order to phase construction and revise design plans, specifications & updated Opinions of Probable Costs (OPCs) for 3 separate projects. FRCOG staff and Trout Unlimited reviewed the high risk culvert mapping previously prepared by FRCOG, which is based on MassDOT/Umass Stream Crossing Explorer database, with Ashfield & Conway Highway Superintendents to identify 5 high risk culverts in each town for 30% design plans to meet MA Stream Crossing Standards. FRCOG staff located and inventoried all municipally owned culverts in Conway, evaluated them using the Culvert Condition Assessment Manual developed by the North Atlantic Connectivity Collaborative (NAACC), and ranked their conditions. FRCOG summarized and documented the results of the field assessments into a report, as well as a GIS data layer and an interactive online map. This inventory can be used by Conway to implement a preventative maintenance program and assist with capital improvement planning for municipally owned culverts. Trout Unlimited prepared 30% design plans for 5 culverts that meet MA Stream Crossing Standards (2 in Conway; 3 in Ashfield). FRCOG and TU staff worked with the Highway Superintendents in the Towns of Ashfield & Conway to identify a site in each town to develop and pilot an assessment and right-sizing protocol for drainage culverts that do not cross a perennial stream. FRCOG also mapped these structures in Ashfield under a separate funding source. There are a large number of these culverts and most are undersized and/or failing, which results in frequent road damage, complete wash-outs and closures as well as sedimentation of nearby waterbodies and wetlands. Providing guidance on the size and type of replacement structure will be very helpful to towns working to have more climate resilient roads.

Lessons Learned

This project was greatly impacted by the COVID-19 pandemic. Early in the project it was unclear what the impacts of COVID-19 would be or how long the impacts would be felt. A completely new way of working needed to be developed and adapted to immediately. The proposed methods of outreach were directly impacted as they were no longer feasible and new approaches needed to be developed and agreed upon. COVID-19 also had impacts with regard to horizontal construction, including the cost of materials. Specifically, construction bids for the Baptist Corner Road culvert were double the amount of the estimate/budget. This significant difference was due in part to additional requirements needed to be met with Mass DOT, and the cost of materials.

This project was a very large project with the intent to have meaningful impacts across a wide breadth of subjects and a large geographic area. The original intent was to include within a single project a range of components from the macro to the micro – addressing multiple concerns for the MTWP that have arisen due to climate change. The project approach included a full-range of project components

comprised of a regional scale project, several sub-regional projects, municipal assessment and design projects, and implementation/construction projects. While the project team was able to achieve results this project proved to be extremely challenging and unwieldy. A lesson learned is to break projects down into smaller more manageable inter-related components. While a combination of a regional, sub-regional and a local project might be feasible, the relationship between each component is critical. One of the challenges posed by this project was that it was a combination of small, independent projects rolled under the umbrella of a single project. Especially for a large geographic area with multiple project partners, a project in which the various components are inter-related and not stand alone would be more viable. Stand alone projects are best conducted as such, separate individual projects.

Partners and Other Support

Town of Adams – Grant recipient, Town lead, lead for Tributary Area Stormwater Storage Assessment, 30% design at Powers Street, and Grant Street Infrastructure Upgrades

Berkshire Regional Planning Commission – Grant management, oversight and coordination, lead for contracting services including the Mohawk Trail Woodlands Partnership Carbon Sequestration and the Franklin Regional Council of Governments, lead for Stormwater Asset Inventory, Mapping & Prioritization, developing a proposed climate change exhibit at the Greylock Glen Outdoor Center, and securing a culvert design memo for the City of North Adams and 30% design for culverts in the Towns of Williamstown and Windsor

Franklin Regional Council of Governments – Support for the Mohawk Trail Woodlands Partnership Carbon Sequestration, lead for local bylaws and ordinances in Franklin County, secured final designs for climate resilient projects in Ashfield & Conway, bid documents for Ashfield Lake Dam Climate Resilient Repairs/Upgrades and Baptist Corner Road culvert replacement in Ashfield, and created an ArcGIS Story Map virtual watershed tour

Mass Audubon Team - New England Forestry Foundation, Northern Institute of Applied Climate Science, The Nature Conservancy, Massachusetts Woodland Institute / Franklin Land Trust for the Mohawk Trail Woodlands Partnership Carbon Sequestration

Project Photos

Project photos (as .jpg) have been uploaded and are available via Dropbox.