

Municipal Vulnerability Preparedness Program Action Grant Case Study

Municipality: Brookline

Project Title: Urban Forest Climate Resiliency Master Plan

Award Year (FY): FY20

Grant Award: \$112,500

Match: \$ 37,500

Match Source: Cash

One or Two Year Project: 2 year

Municipal Department Leading Project: Department of Public Works, Parks and Open Space Division

Project Website URL: www.brooklinema.gov/urbanforest

Community Overview:

- What is the population size of your community and where is it located?

Brookline has a population of approximately 59,180 people and is located within Norfolk County. Brookline borders six of Boston's neighborhoods: Brighton, Allston, Fenway-Kenmore, Mission Hill, Jamaica Plain and West Roxbury.

- Do you have any [Environmental Justice](#) or other Climate Vulnerable communities? (Think about both those who live and work in your town.)

Brookline does have environmental justice neighborhoods, in addition to other climate vulnerable communities, such as the elderly, young children, people experiencing homelessness, outdoor workers, and those with chronic illnesses or preexisting conditions, such as asthma. Approximately 25.5% of all residents of Brookline are foreign-born. Immigrants hail from all over the world, although mainly from China, Japan, India, Israel and Ukraine, and to a lesser extent from Canada, France and Germany. As such, Chinese, Russian, Japanese, Hebrew and French are common household languages in Brookline and multiple neighborhoods are comprised of English isolation populations.

- Other unique traits of your municipality like who the top employers are, geography, history, etc.

The top three industries of the working population in Brookline consist of: 1. Educational services, and health care and social assistance, 2. Professional, scientific, and management, and administrative and waste management services, and 3. Finance and insurance, and real estate and rental and leasing.

Once part of Boston, Brookline was settled in 1630 and incorporated as a separate town in 1705. Between 1630 and 1705, the area was used primarily to graze livestock, as the extensive marshes and wet meadows bordering the Charles and the Muddy River provided rich pasturage.

As transportation routes were developed, residential and commercial areas became established and the population grew rapidly. Beacon Street was built in 1821 and was intended to open the northern part of Brookline for development. The widening of Beacon Street in 1887 and the introduction of the electric streetcar in 1889 accelerated the development of the northern section of Brookline. By 1900, the Town's population had reached 19,925. The last section of the Town to be extensively developed was an area in South Brookline, as a result of post-WWII housing demand.

Project Description and Goals:

- Where was the project located?

The project involved the development of a Master Plan which addresses the entirety of Brookline.

- What climate change impacts did the project address?

The Master Plan is intended to position the Town to proactively and equitably prepare for and protect against the impacts of climate change on public and private trees, and in turn prepare for and mitigate impacts to the community and environment overall. The plan specifically discusses mitigating and minimizing the following climate change impacts: heat, decrease in air quality, more frequent extreme weather, changing precipitation patterns, and increased threats from pests and diseases.

- What were the specific goals and tasks of the project as stated in your application?

The goal of the Urban Forest Climate Resiliency Master Plan was to develop a research- and data-based, actionable master plan that would not only position the Town to proactively prepare for and protect against the impacts of climate change on public and private trees, but to also serve as a model for the region and other communities that are actively working towards climate resiliency.

As stated in our application, the planning process would include a three-part inventory of the urban forest, including: 1) a representative soil sampling, 2) a LiDAR survey, and 3) an on-the-ground survey. This data would be analyzed to identify metrics for private and public trees, a representative sampling of soils, and a review of size, species, and condition for public trees. Utilizing the most recent climate modeling data, this information would then be synthesized into actionable goals and recommendations, which would be prioritized following a thorough risk analysis. The plan would recommend practical goals to maintain and expand the urban forest and improve the composition of the canopy, so as to increase and improve the environmental services provided to the community, particularly vulnerable populations. In addition to identifying opportunities for tree planting and urban forest expansion, the plan would also include recommendations on operations, budget allocation, best management practices, and emergency response procedures. Projections regarding the spread of non-native pests and

diseases, the susceptibility of certain tree species to increased temperatures and changing rainfall patterns, and the frequency of stronger storm events were to be considered in any advised strategies.

- 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

We believe this project did meet the goals set forth in the Town's application. The Master Plan discusses in detail the value of trees as a nature-based solution to climate change, and how Brookline may best ensure that its urban forest is resilient to the impacts of climate change so that it in turn can continue to mitigate impacts to the community and environment overall.

Equity was an essential component of this Master Plan – the Master Plan identifies areas and communities that are under-served in terms of tree planting and/or are more vulnerable to the impacts of climate change, and includes specific goals and recommendations to increase planting in these areas, as well as noting a particular canopy coverage goal for each precinct. Equity was equally important in the community engagement and public involvement piece of the planning process. The Project Team developed a community survey to hear directly from Brookline residents and advertised the survey and upcoming public forums by placing yard signs in E.J. Neighborhoods. Staff also visited Brookline Housing Authority properties to speak with residents regarding the project and to further advertise the survey. Additionally, the Project Team included the Council on Aging Director and the Director of Health and Human Services to represent climate vulnerable populations including the elderly and people with chronic illnesses or preexisting conditions, such as asthma.

As noted in our application, the Project Team was to hold a minimum of three public meetings, which would be advertised via multiple sources: the local newspaper, the Town's website, e-mail notifications via the Town's Notify Me self-subscription service, and through flyers posted throughout Town. In actuality, the Committee held 7 formal meetings, including 5 public forums, in addition to a final presentation before the Select Board. These meetings were advertised via the following channels:

- *The local newspaper*
- *The Town's website and calendar*
- *The project webpage*
- *The Town's Notify Me self-subscription service*
- *A project-specific mailing list (ListServ)*
- *Yard signs*
- *Flyers*

- *Social Media (the Town’s Instagram and Facebook pages)*
- *Emails to/conversations with local non-profit groups and relevant departments, boards, and commissions/committees, who then shared the meeting information with their respective networks.*

While the goals and recommendations coming out of the Master Plan are specific to Brookline, they are largely transferrable to many urban communities within New England. The Action Plan also speaks to regional planning and encourages coordination with adjacent municipalities.

The project will be finished on time.

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 tree canopy analysis revealed the Town has very good overall tree canopy coverage (44.7% in 2020), comprised of approximately 204,000 trees (+/- 10,000). Brookline currently maintains 12,041 trees overhanging the public way. Of these trees, over 90% are either in “Excellent condition” or “Good condition”. Over a third of Brookline’s street trees are 1”-10” in diameter, and nearly another 40% are 11”-20” in diameter. There are 93 different species of trees represented along Brookline’s streets, 84.4% of which are non-invasive species.

While Brookline’s total tree canopy coverage is substantial compared to other urban municipalities, coverage is not distributed equally across the Town, with North Brookline’s dense population seeing the lowest canopy cover. North Brookline also has a high percentage of heat-retaining impervious surfaces in addition to its relatively low canopy coverage. These conditions place it under threat from higher temperatures and localized areas of poor air quality as a result of climate change, which is further exacerbated by the urban heat island effect. The environmental impacts of these challenges are expected to be pronounced and will directly affect resident health and well-being. In addition, these impacts disproportionately affect Brookline’s most vulnerable or at-risk populations. Rising temperatures will also affect the composition of the urban forest itself, with climate change altering environmental niches and shifting habitat ranges. However, with policy, management, and implementation changes, Brookline can be well-positioned to protect and grow its urban forest to its full potential.

Substantially increasing tree canopy coverage in Brookline will require detailed planning, comprehensive interdepartmental coordination, and enhanced community education and outreach. The Master Plan recommends that Brookline strive to achieve a Town-wide canopy goal of 49.1% over the coming decade, which will require the planting of 900 trees (on public and private land) each year for the next 10 years. This goal aims to dramatically improve the environmental and health benefits associated with additional canopy coverage in North Brookline. Every 10% increase in tree canopy coverage can decrease the ambient air

temperature one degree Fahrenheit, which can lead to one less heat related ambulance visit per month. To facilitate new tree plantings in this urbanized area with large swathes of pavement, roads will need to be re-designed to accommodate street trees, and paved areas on private land will need to be converted to planting areas.

Even with trees working hard to provide environmental and health benefits, adding other 'green' improvements to the Town's suite of climate change mitigation and adaptation tools can do even more, e.g. converting roofs to green roofs or using light colored roofing materials, reflective pavement, and permeable pavement.

Planting large quantities of new trees per year is a good way to increase the tree canopy coverage for future generations, to replace species that are susceptible to pests and disease brought on by climate change, increase biodiversity, and to replace trees that will be lost naturally due to age. It is even more important for both the short and long-term health of the urban forest to protect and care for existing trees.

The tree canopy analysis also revealed that the Town's coverage decreased from 46.3% in 2014 to 44.7% in 2020, which amounted to a net loss of 71 acres of tree canopy. Most of this loss occurred on 1-3 family residential properties in South Brookline. More protection for existing trees is critical to prevent further tree loss as a result of development and redevelopment. Greater protection can be provided by establishing an effective tree protection bylaw and developing canopy-specific guidelines to be considered under Design Review (Zoning Bylaw, Section 5.09), as well as conducting more outreach and education with private landowners. Absent any tree removal or loss, the tree canopy in Brookline would naturally grow 25 acres per year.

The Town manages an urban forest with a great legacy and consequently has large, mature trees that provide significant benefits. However, these same trees can be time-consuming and expensive to care for. More resources are needed to fund the forestry and landscape sector to care for the approximately 47,000 public trees under the Town's jurisdiction, particularly if the tree canopy is to grow. The cost of private contracted tree pruning has risen almost 300% since 2008 and will severely impact the ability to proactively prune trees on a regular basis, respond to storm damage and residents' requests, and ultimately achieve the tree canopy coverage goals needed to mitigate the effects of climate change.

In order to administer, manage and protect the urban forest, a full-time Tree Warden is needed. Additionally, a good strategy to control the costs of tree pruning and planting, while also increasing the standard of care, is to hire two arborists and purchase a bucket truck, chipper and log truck for Town use.

- Provide a brief summary of project deliverables with web links, if available.

The project resulted in a comprehensive Master Plan, which includes a 10-year action plan. The following webpage contains project deliverables, including meeting materials, presentation and minutes: www.brooklinema.gov/urbanforest.

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.

As a result of this project, we learned that Brookline has very good overall tree canopy coverage (44.7% in 2020) and that over 90% of Brookline's street trees are in "Excellent" or "Good" condition. However, we also learned that Brookline's canopy coverage is decreasing, and that most loss is happening on private residential properties (1-3 family homes) in South Brookline. Additionally, canopy cover is not equally distributed across the Town, and North Brookline has substantially less canopy coverage and is more vulnerable to the impacts of climate change than South Brookline.

In regards to process-oriented lessons, we learned how to be flexible when faced with the numerous challenges associated with COVID-19. We were able to pivot quickly to a largely remote work environment and continue the essential collaborative work to ensure that all stakeholders were involved throughout this planning process. We also learned how incredibly valuable working with local environmental non-profit groups can be in regards to reaching a larger audience. We engaged several environmental organizations in our planning process, including Brookline Mothers Out Front, to encourage community participation. With their support, we were able to encourage over 400 people to take the community survey and had a significant turn out (between 50 to 100 attendees) for most of our public forums.

- What is the best way for other communities to learn from your project/process?

We encourage other communities to review our project webpage (www.brooklinema.gov/urbanforest) where they can find project deliverables and project updates. We also encourage other communities to reach out directly to us! Please contact Katie Weatherseed at kweatherseed@brooklinema.gov with any questions you may have.

Partners and Other Support:

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

Select Board: *We could not have executed this project without the Select Board's support, including that of former Select Board-member Nancy Heller, who serves as the Chair of the Select Board's Committee on Tree Protection.*

- Heather Hamilton, Vice Chair
- Raul Fernandez, Vice Chair

- Bernard Greene
- John VanScoyoc
- Miriam Aschkenasy
- Mel Kleckner, Town Administrator

Select Board's Committee on Tree Protection: *The following Committee members oversaw the entire planning process and led all public forums associated with the Master Plan (aside from the final presentation before the Select Board). The Committee met 7 times, including 5 public forums and offered vital input and feedback throughout the planning process.*

- Nancy Heller, Chair
- Clara Batchelor, Park and Recreation Commission
- Harry Bohrs, Greenspace Alliance
- Bob Cook, Planning Board
- Liz Erdman, Tree Planting Committee
- Ken Goldstein, Former Chair of Zoning By-Law Committee
- Richard Murphy, Petitioner of Tree Protection Article
- Roberta Schnoor, Conservation Commission

Staff Contributors: *The following staff members comprised the Project Team for the Master Plan. They attended Public Forums, various internal meetings, and provided invaluable support, feedback and guidance throughout the project. They will also be key players in the implementation of the Master Plan's recommendations and action items.*

- Erin Chute Gallentine, Commissioner of Public Works
- Alexandra Vecchio, Director of Parks and Open Space
- Thomas Brady, Town Arborist/Tree Warden
- Katie Weatherseed, Project Manager and Conservation Assistant
- Kara Brewton, Economic Development Director
- Dr. Swannie Jett, Director of Health and Human Services
- Feng Yang, Director of IT Applications and Digital Services
- Jed Fehrenbach, GIS Administrator
- Ruthann Dobek, Council on Aging Director
- Scott Landgren, Senior Landscape Architect
- Jessie Waisnor, Landscape Architect
- Peter Jutras, Forestry Supervisor
- Maria Morelli, Senior Planner
- Victor Panak, Planner
- Tom Barrasso, Director for Sustainability Planning

Consultant Team: *The following persons comprised the Consultant Team for the project. Kyle Zick Landscape Architecture, Inc. served as the lead consultant and, with the assistance of the sub-consultants listed below, developed the Master Plan with feedback from the Committee,*

Project Team, and public. It is due to their tireless efforts and expertise that the Master Plan is such a comprehensive, thoughtful and actionable document.

Kyle Zick Landscape Architecture, Inc., Lead

- *Kyle S. Zick (Principal), ASLA*
- *Mike Doucette*
- *Rob Barella, RLA*
- *Tracy Hudak, ASLA*

Bartlett Tree Experts

- *Nicholas A. Martin (Director), ISA*
- *Paul D. Tribuna, ISA*
- *Timothy D. Armstrong, ISA*
- *Darya Barar, ISA*

Weston and Sampson Engineers, Inc.

- *Cheri Ruane, FASLA*
- *Rachelle Mcknight, RLA, ISA*
- *Indrani Ghosh, PH.D.*

Sherzi and Company

- *Charles D. Sherzi, Jr., ISA, MCH, MCA*

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.