Municipal Vulnerability Preparedness Program Action Grant Case Study

Municipality: Stow and Hudson, MA
Project Title: Healthy Lake Boon Initiative
Award Year (FY): 2021
Grant Award: $ 154,000
Match: $ 52,050
Match Source: Lake Boon Association + local volunteers
One or Two Year Project: Two year
Municipal Department Leading Project: Conservation Dept., Stow MA
Project Website URL: HealthyLakeBoon.org + LakeBoon.org

Community Overview:

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

The project focuses on Lake Boon, located in Stow and Hudson MA. The town populations are: Stow 7,174 and Hudson 20,092 (2020 census). About 1,000 people live on or near Lake Boon.

- **Do you have any Environmental Justice or other Climate Vulnerable communities?**

Through prior MVP grants, Hudson and Stow studied the potential impacts of climate change, including warmer temperatures, more severe storms, and shorter winter seasons. Hudson's vulnerable communities include significant minority population, mostly Portuguese and Hispanic. Lake Boon has a public beach and launch which are used by these communities and would be impacted by algae blooms and other projected climate change factors.

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

Stow and Hudson have diverse employers, including industrial, commerce and technical companies. Earlier in the region's history, many people worked in textile mills, including some powered by water stored and released from Lake Boon. The lake area has transitioned from temporary summer homes to year-long residences. Stow and Hudson are increasingly conscious of environmental issues, including climate change, and have active town government Conservation Commissions and regional sustainability and climate action organizations such as OARS representing the Assabet River to which Lake Boon discharges and the Assabet River National Wildlife Refuge, almost abutting the east end of Lake Boon.

Project Description and Goals:

- **Where was the project located?**

Lake Boon is a 160-acre great pond, in Stow and Hudson MA (42.40° N, 71.50° W). Lake Boon is part of the Sudbury-Assabet-Concord river and watershed system. It is an essential resource for the region, in terms of water supply, natural environment, residences and recreation.

- **What climate change impacts did the project address?**

Lake Boon has increasing problems with algae blooms, that are likely worsened by climate change, through warming temperatures, severe storms, shorter winter ice cycles and other factors. Some of these blooms include cyano-bacteria with cyano-toxins, that have led to closing the town beach and recommended restrictions on use of the rest of the lake. Climate change also likely affects invasive aquatic weeds, that are a growing problem in the lake.

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

From the proposal:

This project will conduct a multi-faceted data collection and analysis, based on a scientifically designed set of measurement protocols and a modeling system. With the help of residents as trained "citizen scientists," the goal of this project is to collect data on nutrients, water flows, aquatic biology and other aspects of the lake's dynamics, including phosphorus, dissolved oxygen, chlorophyll, conductivity, precipitation, nitrogen, and observations of native and invasive plants growing and decaying, and lab tests for algae and bacteria. The data collection will take place at multiple locations on a daily, weekly or monthly basis, as appropriate. We will then analyze the data using hydrologic and water quality models, which will integrate current and projected impacts of climate change, such as warming temperatures and changes in precipitation and run-off.

Based on this analysis, the project team will create a set of recommendations for consideration by the residents and civic leaders in Stow and Hudson, with a special focus on nature-based solutions. Possible actions could include shoreline vegetation, aeration systems, controlled run-off, public education and support for reduced fertilizer use, changes in the outflow rate through the lake's weir, limits on new homes, residential septic remediations, as well as other recommendations that may emerge from the analysis. This grant will include public engagement throughout, and lay a solid base for action planning by the towns. However, it does not include actual implementation, which is beyond the scope of this proposal.

- **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**

The project met all of the stated goals, in terms of:

• recommendations emphasize nature-based solutions such as a multi-component plan to reduce phospates entering the lake;
• project worked directly with Stow and Hudson to integrate into each town's climate plans, including climate vulnerable populations, including an active student-involvement program;
• project provides regional benefits through integration with Assabet river and watershed management and regional climate planning;
• high levels of community engagement through the citizen science component which will continue under the auspices of the Lake Boon Association;
• project finished on time, within the two year period ending June 30, 2022

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 completed an extensive study of the health of Lake Boon, with multiple measurements taken monthly and in association with severe weather. These data were analyzed in depth with detailed findings about the dynamics of water flow into and out of the lake, nutrients especially phosphorous, quality of the water, various metrics at depth, and the extent and timing of algae blooms. Key findings included that the lake is at risk of eutrophication unless action is taken; the sediment stores significant phosphorus that can worsen algae blooms; and that scope and severity of algae blooms varies considerably throughout the lake over the year. The full report has more detail on each of the findings.

Project findings provided excellent background for influencing the communities to limit land use around the lake. Specifically, 11 acres of the undeveloped Hallock Point peninsula was purchased for conservation in the Town of Stow through wide community support. The plans to develop 17 acres of unoccupied land off Old County Road in Hudson are being influenced by project findings brought to the attention of the Hudson Planning Board and Conservation Commission.

Key metrics measured through the citizen science program included:

- Water Flow
  - Daily water level at Barton Road outlet
  - Daily rainfall measurements (on site, and NCDC in Acton)
- Surface Run-off Loads
  - Dry and Wet Weather sampling of nutrients, chlorophyll, suspended solids
- Groundwater Loads
  - Seasonal sampling of nutrients, chlorophyll, suspended solids (April – Oct)
  - Shoreline conductivity surveys
  - Unfiltered well water samples (shallow wells)
- Sediment Loads
  - Cores to be extracted for laboratory measurement of phosphorus flux
  - Dissolved oxygen levels at depth
- Lake Health
  - Chlorophyll-a (indicator of algal growth)
  - Cyanotoxins (harmful algae)
  - Dissolved Oxygen (aquatic health / sediment risk)

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

1. Well-functioning citizen science program to collect data
2. Public web site about the project, with a section for data submission and analysis
3. Outreach to diverse populations, supporting environmental justice goals
4. Steering Committee to provide oversight by scientists, town officials and residents
5. Advanced modeling of lake hydrology, incorporating climate change projections
6. Annual reports with data findings and recommended nature-based solutions
7. Education outreach program
8. Semi-annual public meetings to review status and solicit ideas and recommendations
9. Semi-annual reviews with town officials and regional environmental organizations

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 project provided multiple lessons on the nature of the lake, its watershed, its dynamics, the nutrient sources, seasonal changes and important steps for managing the health of the lake. The project also confirmed the accuracy and effectiveness of the residents' work as citizen scientists, as well as the power of that engagement to build knowledgeable and passionate advocates for the lake. The project developed an understanding of the lake hydrology and watershed for the first time in a way that we never really understood – e.g. groundwater vs.

surface flow in different areas of the lake - which will form the basis for informed future actions.

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

Project information and reports are available at LakeBoon.org. For more detailed questions, contact:

MVP Project Lead: Dan Barstow DanBarstow@gmail.com
Healthy Lake Boon Initiative: Dave Gray grayscale@earthlink.net

Partners and Other Support:

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

Lake Boon Commission – applicant and over-all project lead
Lake Boon Association – coordinate data collection and communication with residents
Stow town government – fiscal responsibility for the project
Stow & Hudson Conservation Commissions – review project and coordinate with climate plans
Brown & Caldwell – contracted consultants for scientific planning, review and data analysis
Citizen Scientists – volunteers for monthly sampling and more frequent data collections
Steering Committee – regional experts who helped plan, review and advise project
Citizen Science Coordinator – contractor who coordinated the on-lake monitoring events

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.

Photos submitted:

Map of lake
Scenes from the lake
Sample Algae bloom
Citizen Scientists collecting data
Visual model of lake dynamics
Brochure distributed to residents and towns