Municipal Vulnerability Preparedness Program Action Grant Case Study

Municipality: Bolton, Harvard, and Devens (Devens Regional Enterprise Zone)
Project Title: Apple Country Natural Climate Solutions
Award Year (FY): FY21
Grant Award: $ 250,000
Match: $ 92,003
Match Source: Municipalities staff time, Woodwell Climate Research Center
One or Two Year Project: One year
Municipal Department Leading Project: Town of Bolton Conservation Agent

Project Website URL: https://climateresilient.wixsite.com/applecountry/project-data-viewer

Community Overview:

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

  Devens: 550 residents, 6,000 business, plus prison population
  Bolton: 5,841
  Harvard: 6,620
  The three communities (hereinafter "Apple Country") are located within Central/Worcester County Massachusetts.

- **Do you have any Environmental Justice or other Climate Vulnerable communities? (Think about both those who live and work in your town.)**
  According to Environmental Justice (EJ) Population Data from 2010 Census developed by the EOEEA, there are no Environmental Justice communities in Harvard or Bolton. However, Devens has an Environmental Justice Population that meets the minority population criterion established by EOEEA. Devens is also home to the United Native American Cultural Center (UNACC) which serves the region. Their members were actively engaged and participated in this process. Languages spoken in Devens include Spanish and French Creole. The Project will occur within the Devens EJ community as it is community-wide in scope in each of the three Towns, and will provide benefits regionally for EJ Populations in surrounding towns and within the larger Central/ Eastern Massachusetts region (increased resiliency for the Towns' farms that provide local/regional employment and food supply, and increased resiliency of regional roadway infrastructure that provides commuting and evacuation routes for a large area). According to the state's online EJ mapper, Clinton has an income-based as well as a minority EJ population while Lancaster and Ayer have an income-based EJ population and Shirley has a minority-based EJ population.
  Notwithstanding the 2010 Census data developed by the EOEEA, all three municipalities collaborating in this action grant proposal identified Climate Vulnerable Populations during the Community Resilience Building MVP Process. Climate change-related extreme weather events can be specifically devastating for these groups. These included children, individuals with disabilities, seniors and families with young children. Other

potential community members that may be specifically vulnerable to climate change include farmers and farm workers.

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

  The landscape of Apple Country is characterized by extensive forests and wetlands, productive farmland, and active floodplains laced by roads and low-to-medium density development. The working and natural lands of Bolton, Harvard, and Devens play an essential role in the ecological functioning, carbon functioning, and provision of, and need for, community and ecological climate resiliency of the wider region.

  Each community is unique on its own as well. Devens is a 4,400 acre former military base strategically located near the juncture of a north-south and east-west rail line and contains a portion of the US Fish and Wildlife Service Oxbow National Wildlife Refuge area. This, coupled with the unique geology of the Devens area with its steep eskers, large sand and gravel deposits, as well as extensive riverine and wetland systems, make Devens an important part of the natural and human history of this region. Devens redevelopment has focused on the thoughtful and careful redevelopment of the base for the purpose of promoting economic development, social welfare, and environmental protection in the immediate and surrounding areas. Since the Military turned the land over to the state in 1996, over 1,400 acres (32%) of land in Devens has been permanently protected for its natural resource value – helping to preserve a larger system of important ecological resources within Apple Country, including over 13 miles of trails that connect to Ayer Harvard, and Shirley. Devens redevelopment built off of the existing military infrastructure and is now a fully serviced community with public water and sewer serving all businesses and residents in Devens. The Devens Enterprise Commission (DEC) who oversees the redevelopment efforts, along with MassDevelopment, has incorporated a number of strategies to achieve a more integrated and sustainable approach to redevelopment of Devens, including low-impact development requirements, green building incentives, and ecological industrial development practices (businesses working together to maximize efficiencies and shared resources, to minimize their carbon footprints). These efforts are aimed at ensuring Devens redevelops with nature, not in place of it.

  The Town of Harvard has a Climate Initiative aiming to ensure the town will be a thriving, sustainable community that nurtures and enhances its forests, agricultural lands, and all its precious natural and cultural resources through active stewardship and partnering with its citizens to educate and take action on climate change for a more sustainable future. The Town of Harvard is characterized by a mosaic of orchards, rolling hills, and New England charm. Historically pastoral and agricultural. Harvard is still a largely agricultural town although it has slowly evolved into an exurban bedroom community with excellent public schools. The agricultural industry is Harvard's largest economic sector with several remaining large commercial orchards and a number of smaller farms that sell produce, honey, and a variety of other specialty products. There are also several horse farms and farms practicing other forms of animal husbandry. In Harvard, a significant portion of the Nashua River watershed is protected by the Oxbow National Wildlife Refuge. Harvard's farms and orchards, together with several large tracts of land in forest management, local conservation holdings and property owned by state and federal agencies, mean that open space constitutes over 40% of the town.

Harvard ranks in the upper third of Massachusetts municipalities for total land area. Its population density of 227 persons per square mile makes Harvard similar to a number of towns along and west of the Connecticut River Valley, yet in built character, it differs from them in significant ways.

The Nashua River, Still River, Area of Critical Environmental Concern Bolton Flats Wildlife Management Area along Bolton's western border, Bowers Brook flowing northward into Harvard, Danforth Brook flowing from Little Pond and Mill Brook South into Hudson, North Brook flowing south west into Berlin, and Great Brook flowing throughout Bolton and wetlands in the Delaney Wildlife Management Area on the north eastern side, it is no surprise that the Town extends within two separate watersheds - those of the Nashua and the Sudbury/Assabet/Concord watershed. These wetlands and waters are treasures in their own right and add to the significant natural bounty of the Town, as well as the attendant vulnerabilities due to flooding and runoff impacts. Bolton is characterized by its approximate12,800 acres, over 92% is zoned "Residential" and roughly 41.35% of the total is under watershed or wetlands protection, leaving a small amount of land zoned for commercial and industrial activity. This allocation is as intended, reflects past and currently expressed resident sentiment that Bolton does not actively seek commercial development or reduce lot size to increase density and concomitant tax base. Bolton's low residential density is due in part to the absence of distributed water and sewer infrastructure, and the specific minimum lot size. Bolton is home to many small-scale owner-operated farms and commercial Farms; Bolton Spring Farm, Bolton Orchards, Schartner Farm and Nicewicz Farm. Produce is distributed throughout various farmers markets but mostly depend on pick your own practices which sell the produce while drawing individuals into the Bolton community for a period of time. These orchards produce a broad variety of apples and peaches, with adjunct farm operations producing grapes, pumpkins, feed corn and a rich spread of vegetable crops. Several farm stores, markets, and self-serve stands add much more to the local economy than just sales revenues, as residents can often "eat local" and sustain Bolton's viability and health in multiple ways without the need for a trip out of town. Residential neighborhoods are interspersed in and in close proximity to the Town's Forest and wetland areas, providing a wonderful natural setting for residents but representing major challenges during extreme weather events due to downed power lines, local flooding, and other climate-related risks.

Climate change and development pressure on these lands, located squarely in the Massachusetts "development frontier", means these Towns urgently need a regional proactive and predictive climate-focused assessment of their natural resources, along with development of prioritized planning documents, maps, tools, policy and best management practice recommendations and associated public engagement in order to prepare for imminent changes and increased hazards.

Project Description and Goals:

- **Where was the project located?**

  The project was located primarily throughout the three partner communities of Harvard, Bolton and Devens.

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

  Climate impacts addressed by the Apple Country Project consisted of flooding, urban heat island effect, drought, extreme weather events loss of ecosystem carbon and capacity for future carbon accumulation.

- **What were the specific goals and tasks of the project as stated in your application?**
  1. Expand communities' capacity to 1) protect, 2) restore, and 3) enhance:
  A. ecological climate resilience (including biodiversity); and B. ecosystem services (including carbon sequestration and long-term storage) using Nature-based Solutions.
  2. Develop and provide durable educational materials and opportunities for community members, leaders and organizations.
  3. Provide a replicable model for community-driven assessment of natural resources values and co-benefits, particularly ecosystem carbon sequestration and long-term storage and support for biodiversity. This model relies on a robust community engagement and outreach process that integrates outreach to, and inclusion of, under-represented groups such as Environmental Justice and Climate Vulnerable groups.4. Identify and prioritize site-specific nature-based resiliency and carbon solutions,
  5. Provide preliminary scopes and costs for many of these NBS,
  6. Provide recommendations and guidance for modification of regulations and for best management practices, and provide extensive mapping.

- **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

Yes, throughout our project our team continuously looked for ways to reach out and incorporate input from EJ communities and Climate Vulnerable Populations. The community engagement and public involvement was ongoing and went slightly beyond the scope to include interviews from varying community members in the final report. This was a regional application and therefore not only provided benefits to those three communities but beyond into the greater community through avenues of UNACC, Massachusetts Association of Conservation Commissions (MACC), New England Forestry Foundation (NEFF), and other supporting community members. This project provided site assessments and a memorandum of project scopes on implementing Nature-based Solutions within these visited areas or similar.

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 was led and coordinated by three communities and a team of consultants. The project consisted of 44 site visits total (15 in Bolton, 12 in Devens, and 17 in Harvard). Four (apple core) Core Team Meetings were held with attendance around 20 individuals. Three specific (apple seed) meetings were held with attendance around 10 individuals. A survey was also incorporated into this assessment which received 130 participants 74.6% were from Bolton and 11.5% from Harvard, these participants also included individuals who did not live in the town and was just interest or they did not live in the town but worked there. The importance of peaty wetlands was realized as a significant source of carbon storage upfront and highlight healthy soil management throughout this project. The final report and project website include wetland and other educational resources, a project data viewer for easy access to project mapping/data layers, instructions and map for a self-guided field tour with interpretive trail markers and QR codes in the field, extensive documentation and discussion of both general and site-specific NBS and thumbnail scopes, costs, project planning guidelines and permitting considerations for the site-specific NBS, and a detailed project report with pull-out sections for wetlands & climate change, global context, and community-specific report material.

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

  In addition to the items listed in the above question, the Project deliverables consisted of meeting minutes, PowerPoint presentations, mapping, data layer creation, educational information, a Nature-based Solutions implementation matrix and associated memoranda, and the final report – all available utilizing the Project Website link here: https://climateresilient.wixsite.com/applecountry/project-data-viewer

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.**

  Lessons learned consisted of ensuring everything can be accessible remotely due to the pandemic related challenges. Additionally, it was beneficial to have such an interdisciplinary expert team. The innovation that came from the work related to the carbon sequestration analysis related to land use and land cover, Healthy Soils and living systems integrated to understand the potential implementation of Nature-based Solutions was encouraging. For example, the importance of wetlands and forests as significant sources of carbon storage and healthy soil management was realized and assessed as part of this project. The carbon sequestration benefits of green infrastructure and low-impact development techniques for development were also recognized. The process-specific lessons learned would be that community outreach may take more time and need to be altered to gather participation from your target audience. Our team was able to accommodate such challenges and be successful in receiving input.

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

If other communities are interested in the Apple Country Natural Climate Solutions project/process they should visit our project website or reach out to the three communities' lead representatives.

Partners and Other Support:

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

Town of Bolton: Rebecca Longvall, Project Manager (Conservation Agent)
Donald Lowe, Town Administrator
Valerie Oorthuys, Town Planner
Jenny Jacobsen, Town Secretary public outreach distribution
Lori Stephenson, Bolton Spring Farm site tour
Justin Schultz, Shultz Farm site tour

Town of Harvard: Chris Ryan, Director of Community and Economic Development
Liz Allard, Conservation Administrator

Devens Enterprise Commission: Neil Angus, Environmental Planner
Peter Lowitt, Director/Land Use Administrator

BSC Group: Gillian Davies, Senior Ecologist/Natural Climate Solutions Specialist
Katie Kemen, Planner, Public Engagement Specialist
Casey-Lee Bastien, Landscape Architect
George Andrews, GIS Specialist
Matt Burne, Senior Ecologist
Keith Hannon, Ecologist
Jeanette Tozer, Planner & Project Webmaster
Dominic Rinaldi, Civil Engineer
Tanya Pande, Landscape Architect

Regenerative Design Group: Keith Zaltzberg, Founder
Sebastian Gutwein, co-founder
Eric Toensmeier

Linnean Solutions: Jim Newman, Principal
Lauren de la Parra, Climate Resilience Consultant
Peyton Siler Jones, Climate Resilience Consultant

Woodwell Climate Research Center: Dr. Richard Birdsey, Senior Scientist

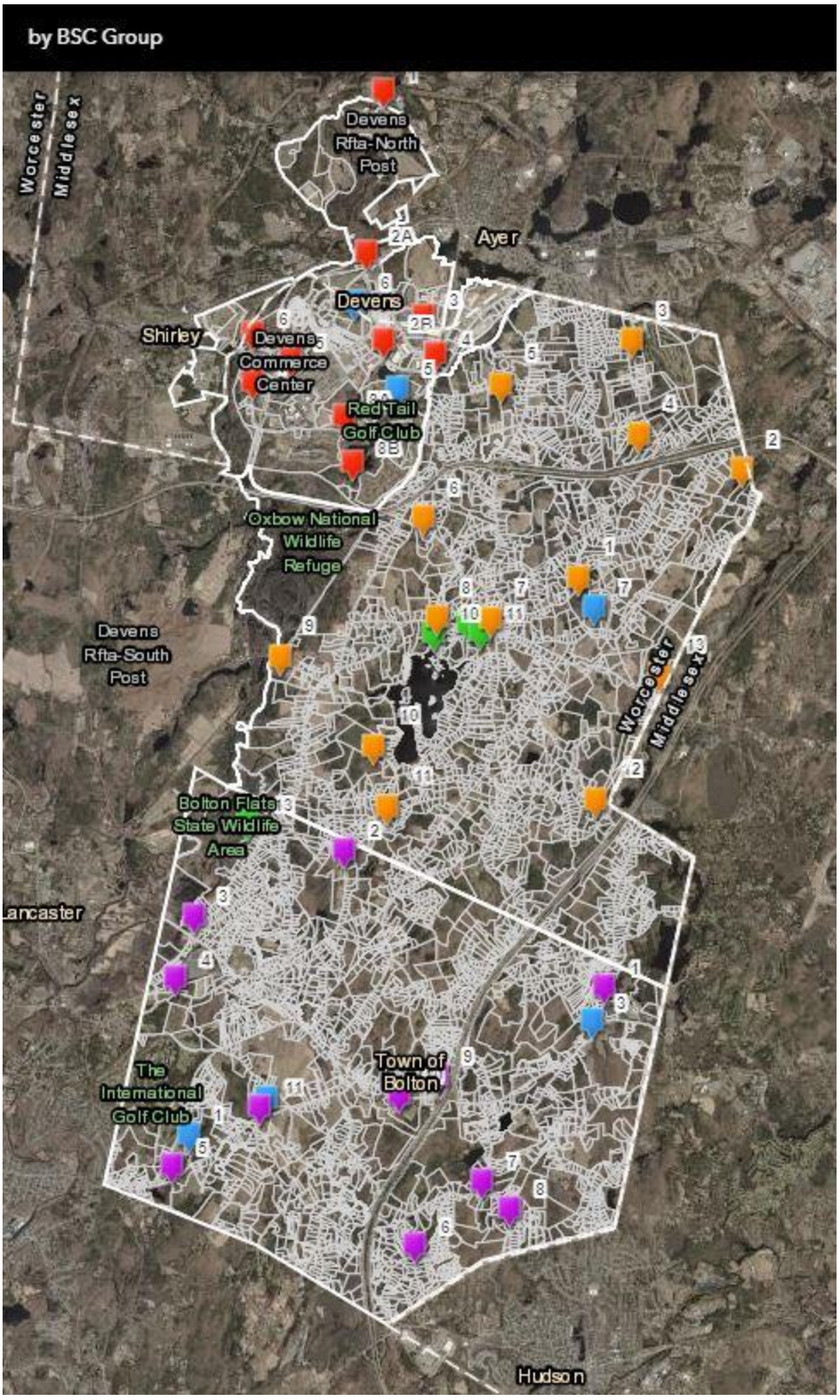
Project Photos:

- 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.

Photo attachments:

1) Flag markers on the Apple Country map below indicate locations where site-specific NbS were identified and evaluated during the project site walks.
2) The photo map below that indicates locations on a site where specific NbS can be implemented,
3) spreadsheet provides prioritization information for each NbS that can be implemented at each site that was visited.
4) Soils from the varying sites
5) Recommendation image showing existing conditions and rendering of potential NBS.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Worcester
Middlesex
Devens
Rfta-North
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Ayer
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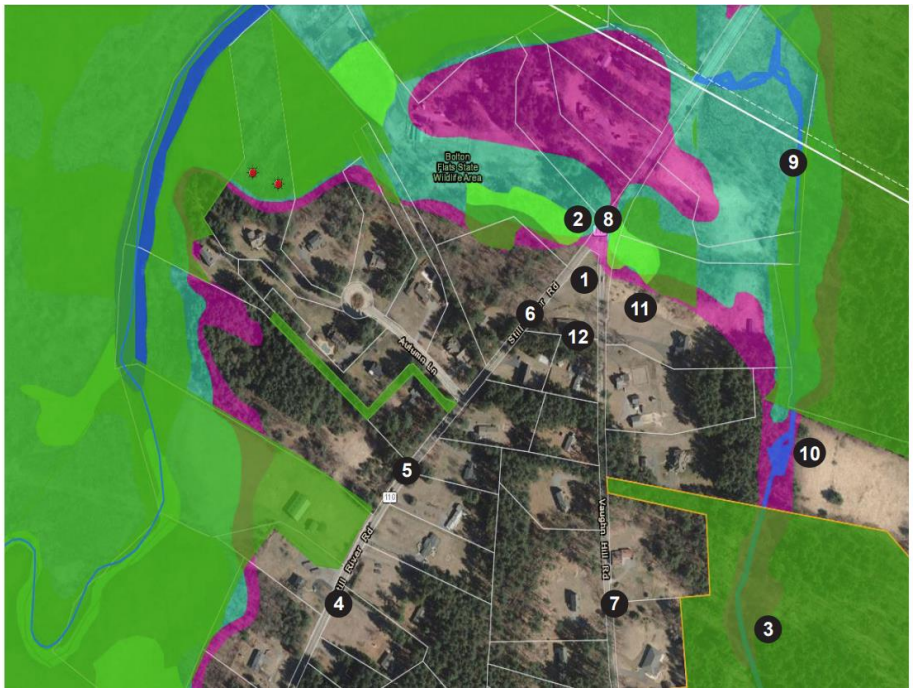
Shirley
Devens
Commerce
Center
Red Tail
Golf Club
Oxbow National
Wildlife
Refuge
Devens
Rfta-South
Post
Worcester
Middlesex
Bolton Flats
State Wildlife
Area
Lancaster
The
International
Golf Club
Town of
Bolton
Hudson

Still River Floodplain

at Still River Road (Route 110) in Vicinity of Vaughn Hill Road

POTENTIAL PROJECTS:

1. Grassland meadow management restoration
2. Habitat enhancements
3. New wetland or floodplain construction / expansion
4. Pollinator hedgerow buffer
5. Pocket forest
6. Upstream BMPs rain-garden, bio-swale, etc.
7. Shade-habitat/ Infiltration tree plantings
8. MSCS culvert improvement
9. Beaver deceiver / promoter



APPLE COUNTRY MVP
ECOLOGICAL RESTORATION AND RESILIENCY OPPORTUNITIES TABLE

Value	GOOD	GOOD	BETTER	BEST
Feasibility *	low	low	mid	high

Number = sitemap location, **A** = multiple locations or entire area

This table is intended for use in conjunction with the Project Location maps attachment #

See also CRB Matrix

* Feasibility is based on property ownership or technical access

TOWN OF BOLTON

#	RESTORATION/RESILIENCY OPPORTUNITY												
	Site Map Reference & Individual Site Map #s	Brockway Corner at East End Road (near Delaney Flood Control Area)	Bowers Brook at Bare Hill Road	Still River Floodplain at Still River Road (Route 110) in Vicinity of Vaughn Hill Road	Still River Floodplain at Still River Road (Route 110)	Still River Floodplain at Forbush Mill Road	North Brook at Wataquadock Road	South Bolton Road to Spectacle Hill Road	Mill Brook at Century Mill Road	Danforth Brook at Hudson Road (Route 85)	Route 117 and Sugar Road near Route 495	Lacrosse Field and Ponds at Main Street/Route 117	Farms at West Berlin Road
	Ownership	Conservation Infrastructure	Conservation Infrastructure	Residential Infrastructure	Residential Infrastructure	Municipal & Conservation	Agricultural & Conservation	Residential & Conservation	Residential Infrastructure	Municipal Residential	Commercial Infrastructure	Municipal	Agricultural & Conservation
	`	Map 1	Map 2	Map 3	Map 4	Map 5	Map 6	Map 7	Map 8	Map 9	Map 10	Map 11	Map 12
	Nature Based Solutions (NBS)												
1	Invasive species management	mid	mid		high	high	low	mid	mid	mid	mid	mid	mid
2	River / pond bank revegetation					high							
3	Grassland meadow management restoration			high	high	high						low	
4	Forest / shrubland heath management or restoration												
5	Wetland management restoration				low	low	low		low	mid	high	low	
6	Habitat enhancements		high	high	high	high		mid		high	high	high	
7	New wetland or floodplain construction / expansion	high		low	low						mid	mid	
8	Pond creation / alteration					high					mid		
9	Stream flow alteration					low	low					high	
10	Species monitoring protocol	mid	high						mid				
11	Pollinator hedgerow buffer			low	low		low						mid
12	Pocket forest			low	low	low		low	low				mid
	Built Environment Best Management Practice (BMP)												
13	Stormwater treatment wetlands	high					low	low					
14	Daylighting of streams												
15	Upstream BMPs rain-garden, bio-swale, etc.		low	mid	mid				low	low	mid	low	
16	Shade-habitat/ Infiltration tree plantings			mid	mid				low	low	mid	mid	
17	MSCS culvert improvement	high		mid	mid	low	low	low	low	low	low	mid	
18	Dam modification / controls						low		low		low	mid	
19	Pervious parking walking areas												
20	Aquatic algae / invasive treatment												
21	Lighting modifications / upgrades												
22	Species crossing protections	mid	mid			mid	low		low				
23	Beaver deceiver / promoter			low	low		mid			high	low		mid