



Bourne Community Resilience Building Workshop Summary of Findings

MUNICIPAL VULNERABILITY PREPAREDNESS PROGRAM



CAPE COD
COMMISSION



CAPE COD
COOPERATIVE
EXTENSION

BOURNE COMMUNITY RESILIENCE BUILDING WORKSHOP



ACKNOWLEDGEMENTS

Special thanks to the Town of Bourne for their willingness to embrace this process and provide the facilities and refreshments for the workshop, and to the participants for their invaluable input about the community.

This project was made possible through funding by the Municipal Vulnerability Preparedness Program from the Massachusetts Executive Office of Energy and Environmental Affairs.

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Introduction and Overview

The need for municipalities, regional planning organizations, states, and federal agencies to increase resilience and adapt to extreme weather events and climate change is evident, particularly in coastal communities. Cape Cod has already begun to experience effects of climate change and associated natural hazards, including sea level rise and extreme weather events. The strong nor'easters of 2018 unleashed a new sense of urgency to act. Massachusetts Governor Baker's Executive Order 569 aims to provide communities with technical support, climate change data, and planning tools to identify natural hazards and develop strategies to improve resilience. Following the executive order, the state created the Massachusetts

Municipal Vulnerability Preparedness (MVP) program, a state program designed to increase municipality-level resilience to natural hazards being exacerbated by climate change. Through the MVP process, municipalities identify their vulnerabilities and strengths and identify opportunities to reduce risk and build resilience.

The Town of Bourne received a grant to participate in the MVP Program in 2018. The town sought to build on their 2017 Hazard Mitigation Plan and other prior planning efforts and develop priority actions to improve resiliency to climate change and its associated impacts. The Town selected the Cape Cod Commission

in partnership with Woods Hole SeaGrant/ Cape Cod Cooperative Extension, certified MVP providers, to guide them through the MVP Program process. Communities that complete the MVP Program process using the Community Resilience Building (CRB) Framework, a system of facilitated discussion and note taking developed by The Nature Conservancy, are eligible to receive funding for resiliency projects.

This report provides a summary of the community assets, concerns, ideas, and priorities identified by participants during Bourne's CRB Workshop. The summary of findings described in this report, including those that concern the evolving nature

of risk assessment and associated action, are compiled from workshop materials, comment, and review by the Core Team.

PROCESS AND WORKSHOP OVERVIEW

An interdisciplinary team of town and county staff worked collaboratively to implement the CRB process and conduct a community workshop. The goal of the workshop was to engage community stakeholders to facilitate the education, planning, and implementation of priority adaptation actions. The Workshop's central objectives were to:

- Define top local natural and climate-related hazards of concern;
- Identify existing and future strengths and vulnerabilities;
- Develop prioritized actions for the Community;
- Identify immediate opportunities to collaboratively advance actions to increase resilience.

PLANNING AND CORE TEAM

Samuel Haines, Bourne Conservation Agent, served as the town lead for the project. Mr. Haines assembled a group of town staff members to serve as the MVP Workshop "core team" to help prepare for and conduct the workshop. The core team included:

- Samuel Haines, Conservation Agent, Town Lead
- Jennifer Copeland, Assistant Town Planner
- Timothy Lydon, Assistant Town Engineer
- Charles Noyes, Emergency Management Director

The core team was supported by a "project team" of Cape Cod Commission and the Woods Hole Sea Grant/Cape Cod Cooperative Extension staff. Both agencies are certified MVP Program providers. See the Appendix for a full list of the project team members. The project team held a kickoff meeting with the core team in February 2019 to review the project scope and discuss ways to encourage stakeholder participation in the workshop.

The project team was responsible for developing the workshop agenda and presentation, including reference material, context, and background for the MVP effort, and resource maps and reference material for use in workshop discussion. The project team also worked with the town lead on workshop logistics. The core team's pre-workshop responsibilities included reviewing reference material and resource maps, identifying a diversity of representative stakeholders, sending invitations to the stakeholders, and contacting invitees to encourage attendance.

After the kickoff meeting with the core team, the town lead developed an information flyer which was sent to stakeholders on town boards and committees, elected officials, Council on Aging, local educational institutions and public-school officials, and others. The flyer was sent with direct invites to stakeholders, as well as posted throughout town as an open invitation to interested members of the public. Project team members also posted the flyer on

BOURNE COMMUNITY RESILIENCE BUILDING WORKSHOP

various local social media groups on several occasions during the weeks leading up to the workshop.

WORKSHOP PROCESS

During the workshop, the core team and project team worked collaboratively to facilitate the discussion and provide information. The core team members also participated as stakeholders.

The workshop was conducted in accordance with CRB guidance and held on April 16 and 17, 2019 in two four-hour sessions. The first day of the workshop focused on identifying top hazards, vulnerabilities, and strengths. The second day of the workshop focused on prioritizing actions.

In addition to project team members, 19 stakeholders/community members attended the workshop. Attendees represented a range of interests including town administration, the town's conservation, engineering, health, planning, emergency management, natural resources, and public works departments, the finance committee,

the real estate community, the business community, and engineering and planning consultants. The appendix includes a complete list of attendees.

Workshop participants were assigned to small diversified teams for the duration of the workshop. Each small team was joined by a facilitator (Cape Cod Commission staff) and a scribe (Cape Cod Commission and Woods Hole SeaGrant/Cape Cod Cooperative Extension staff). A base map (see Appendix) of the community that showed flood zones (A and V zones) and critical facilities was provided to each team, along with a laptop for accessing a data viewer developed by the Cape Cod Commission that provides information relative to climate change and hazards, demographics, and environmental assets, among other data (see Appendix).

Each table worked on its own risk matrix through facilitated "small team" exercises and later worked together as a large team with all stakeholders to consolidate information (See Appendix for small team risk matrices, annotated basemaps, and full risk matrix).

The combination of the risk matrix and the basemap provided decision-support and risk visualization to enable stakeholders to identify the community's strengths and vulnerabilities and prioritize actions to reinforce strengths or mitigate vulnerabilities. The process resulted in informed input, shared experiences, and dialogue among stakeholders.

The Bourne Town Administrator, Mr. Thomas Guerino, opened the workshop with a brief introduction and welcome. The town lead, Mr. Haines, provided a brief overview and explanation of the town's reasons for conducting the workshop and participating in the MVP Program and discussed how the process will build on the 2017 Bourne Hazard Mitigation Plan, provide an action plan for addressing vulnerabilities, and allow the town to access funding opportunities not otherwise available to them. The project team then provided a presentation with an overview of the workshop agenda, the purpose of the workshop, MVP Program background, and the CRB process.



Hazards, Concerns, and Strengths

TOP HAZARDS AND VULNERABLE AREAS

During the first session of the workshop, participants learned about and discussed seven locally relevant climate hazards:

- Coastal erosion
- Flooding
- High winds
- Hurricanes
- Nor'easters
- Sea level rise
- Severe winter weather

Greg Berman, Coastal Processes Specialist with the Woods Hole SeaGrant/Cape Cod Cooperative Extension, provided a presentation on top vulnerabilities identified by the State, regional vulnerabilities/hazards, recent storm impacts, priority hazards identified in the 2017 Bourne Hazard Mitigation Plan, and climate change projections in Massachusetts with data from the Climate change Clearing House for the Commonwealth (www.resilientma.org). See Appendix for the workshop presentation.

Each small team engaged in a facilitated discussion to identify what it considered to be the top four hazards that pose the greatest current and future threats to

Bourne. To help each group determine the priority hazards, facilitators asked participants to consider questions such as where, how often, and in what ways hazards have impacted the community; what hazards are impacting the community currently; what effects will these hazards have in the future; what is exposed to hazards and climate threats; what have been the impacts to municipal operations and budgets, planning and mitigation efforts; and other concerns/considerations related to impacts. Each team identified infrastructural, societal, and environmental community vulnerabilities and strengths.

BOURNE COMMUNITY RESILIENCE BUILDING WORKSHOP

Stakeholders felt that there was significant overlap among the top hazards, such as high winds and hurricanes, or flooding and storm surge. Each team identified flooding, erosion, and storm impacts as key hazards for the community. They also each identified sea level rise as a priority hazard, but one team thought it should be expanded to include discussions on water table rise, which may be perceived as having a more direct or tangible impact on the community. One team identified drought and temperature as a top hazard.

TOP HAZARDS

Based on the results of the small team exercise, workshop participants identified the following as the top/priority hazards:

- Storms – hurricanes, winter storms, nor’easters, high winds
- Flooding, including storm surge
- Erosion
- Drought
- Sea Level and Water Table Rise

Flooding was identified as the hazard having the greatest direct impact on the Town of Bourne both currently and in the recent past, particularly the impact of flooding on local roadways. The impact of flooding on the many “necks,” or narrow causeways that provide access to many coastal communities along the Buzzards Bay shoreline, were identified as a great concern. Coastal erosion was another top priority hazard as it impacts bayside beaches and a number of private properties. High winds and severe storms such as nor’easters and hurricanes were also identified as a major concern for the community as these events result in power outages, downed tree limbs and place a strain on public safety resources and personnel.

AREAS OF CONCERN

Areas of concern identified during the workshop were grouped into the following categories:

Transportation

Many low-lying roads that presently flood during storm events and even during king tides; many neighborhoods that are presently disconnected during flooding events; erosion impacts at Sagamore Highlands neighborhood and others along the Cape Cod Bay shoreline.

Other Infrastructure

Undersized culverts vulnerable to failure; reliance on septic systems; stormwater infrastructure undersized and inadequate to manage drainage; above ground utilities.

Social

Potentially vulnerable populations, including seniors and the large student population at the Massachusetts Maritime Academy (MMA); need for greater communication between residents and the town and amongst residents within neighborhoods; lack of pet shelters;

Public Amenities/Facilities

Community center/shelter vulnerable to flooding; access to healthcare, medication, food, and shelter; many marinas and anchorage areas.

Ecosystems

Geographic position of the town increases vulnerability to storm surge; extent of forested area has potential for wildfire; saltmarshes, wetlands, and barrier beaches vulnerable to development; restoration of natural functions of saltmarshes, wetlands and barrier beaches is needed; lack of space for marsh migration; Cape Cod Bay beaches vulnerable to erosion.

CURRENT CONCERNS AND CHALLENGES PRESENTED BY HAZARDS AND CLIMATE CHANGE

The Town of Bourne has shoreline on both Cape Cod Bay and Buzzards Bay and is split by the Cape Cod Canal. The community is

well aware of the damage that can be caused by storm events, including erosion, coastal and inland flooding, and wind damage. Given its geographic position, extent of shoreline and the approaches into the Cape Cod Canal in Buzzards Bay, Bourne is particularly vulnerable to storm surge from hurricanes, which have devastated the community in the past. Hurricanes Gloria (1985), Bob (1991), Earl (2010), and Irene (2011) all left widespread power outages, damaged boats, and destroyed or damaged roads and properties within the floodplain. Hurricane Sandy (2012) and a series of winter storms in 2013 caused significant erosion of along the Cape Cod Bay shoreline.

Flooding of the Cape Cod Bay shoreline also occurred during these events, as well as during the winter storms of 2018. The winter storm of January 4/5th, 2018 is the new record-breaking water level (Boston Tide Gauge), having exceeded the previous record (Winter storm of 1978) by 2 inches. The tide gauge record shows about 4.5 inches of sea level rise during the time between these

two storms, meaning that the only reason 2018 was a record-breaking event was due to climate change. Another anomaly was the series of winter storms in early March 2018. The storm surge was 1-2' for over a week, which weakened many coastal resource areas and resulted in significant erosion. There are concerns that both long-duration and high water-level storms will be the "new normal".

The primary climate and natural hazards identified by the participants included storms (hurricanes, nor'easters, high winds) and flooding. As described above, storms have impacted Bourne for many years, but storm frequency and intensity in recent years have increased. Participants identified areas where flooding impacts local roadways and expressed concern about neighborhoods access and egress, particularly along the Buzzards Bay shoreline where several neighborhoods are accessible only by single, highly vulnerable roadways. Participants also expressed concern about impacts from loss of power and the ability of residents

to communicate with one another and the town during storm events. Erosion was also a concern, though there were fewer specific examples of erosion impacts than there were of flooding and storm damage. Looking forward, participants also recognized the threat of sea level rise and water table rise as something their community will need to contend with and expressed specific concern about the extent of infrastructure (primarily septic systems) proximate to the shoreline and within the floodplain.

SPECIFIC CATEGORIES OF CONCERNS AND CHALLENGES

Low-Lying Transportation Infrastructure

The community has a number of low-lying roads vulnerable to flooding and storm surge (many marked on maps, see Appendix), particularly along the Buzzards Bay shoreline. Essentially all the roadways west of Shore Road, on the Cape side of town, are vulnerable to flooding. These include a number of “necks,” which have only a single, vulnerable road for access and egress.

Mashnee Road, Emmons Road, Wings Neck Road, and Scraggy Neck Road are examples of some of the vulnerable roads that would limit access to and from neighborhoods. Other areas of concern for flooding include, but are not limited to, Main Street, Saltmarsh Lane, Lewis Point Drive, Academy Drive, and proximate local roads in the floodplain. Sections of Sagamore Beach, including the Philips Road area, are vulnerable to both flooding and erosion. These areas experience impacts from flooding now and are projected to become more vulnerable in the future. See appendix for annotated maps with all of the specific vulnerable locations identified.

The extent of private roads throughout the community adds to the complexity of managing them on a routine basis, in event of an emergency, or to improve resilience to vulnerabilities.

Public Infrastructure and Other Facilities

The community's downtown (Main Street, Buzzards Bay) is located within the floodplain, as are approximately 40% of the single-family homes in the community. A number of these homes are historic structures, particularly in the Bourne Village area. Public facilities, such as the community center, have the potential to remain dry, but become isolated, during flooding events.

Cape Cod Bay coastal development is vulnerable to erosion. Sagamore Beach, particularly the Sagamore Highlands neighborhood, was identified as one of the most significantly impacted areas.

Nearly all of the homes and businesses in Bourne rely on on-site septic systems, with few areas, such as downtown Buzzards Bay, served by a wastewater treatment facility. Septic systems are vulnerable to storm impacts and erosion, and as sea levels rise separating septic infrastructure from the water table becomes a challenge. The

Town is expanding wastewater treatment in Buzzards Bay, but does not currently have a plan for expanding wastewater infrastructure in other areas of the community.

Stormwater infrastructure is, in many locations, undersized and inadequate to manage drainage. In addition, there are a number of aging dams and undersized culverts vulnerable to failure, which may exacerbate flooding impacts and further impact transportation infrastructure described above. An example of an area where this presents a concern is along Scenic Highway in Bournedale. Mill Pond Dam is identified by the Massachusetts Office of Dam Safety as having significant hazard potential. Water flows through a culvert under Scenic Highway that may not be capable of handling flow that could result from a failure of the dam.

Bourne has many small marinas and anchorage areas where boats are vulnerable. Parking lots at each of the many beaches and marinas are vulnerable and a cost to the

town. The Massachusetts Maritime Academy (MMA) also has significant shoreside infrastructure, along with academic buildings and student housing, in the floodplain.

The town's proximity to the canal bridges relative to other Cape Cod communities is an asset, especially in the event of a storm; however, the two vehicle bridges are inadequate in the event of an evacuation and present significant transportation concerns.

Isolation, Communication, and Utilities

The aging population may lack access to communication, particularly in the event of power outages, and may be immobile and require transport. Bourne is primarily reliant on above ground utilities, which can become incapacitated with storms. Without power, residents may lose access to heat, food may spoil, and without telecommunications, it can be difficult to know if a household is in need of help. Many of these seniors may have difficulty moving around during intense weather and may be confined to a home

with limited food, water, medical supplies, and heating and cooling during significant weather events. Bourne does have a system of checking in on certain seniors who have opted into their program, but it is unlikely that all seniors are on this list. With limited mobility, there may be several isolated individuals who need assistance and access to medications or other medical supplies that need assistance from the town during an emergency.

Some neighborhoods have active associations with good communication networks. In some vulnerable neighborhoods, communication between residents could be improved. The communication network between residents and between the town and residents could be improved community wide. There is a significant student population (at MMA) that is located in the floodplain and both the town and MMA could benefit from improved communication.

Pet shelters were identified as a resource that is lacking or not easily identified by residents.

Natural Resources

The extent of the coastline and the location of Bourne in the upper reaches of Buzzards Bay makes the Town vulnerable to southwest prevailing winds and storm surge.

Saltmarshes and wetlands are an asset to the community, but increasingly vulnerable to development. Ongoing development in the floodplain is a concern for marsh migration. Barrier beaches, such as Bassets Island and the various “necks” described previously are continually vulnerable to erosion, as are Cape Cod Bay beaches. There are areas throughout the community that would benefit from restoration of natural flow and function, including areas along Saltmarsh Lane and Shipyard Lane. Restoration in these areas, and others as identified on the maps in the Appendix, would allow for natural resources to absorb some of

the impacts of flooding and other climate impacts, and reduce vulnerability of the surrounding build environment.

Concerns about invasive species and impacts to wildlife were also identified. The extent of forested area was identified as a concern as it creates an increased potential for wildfire.

CURRENT STRENGTHS AND ASSETS

Workshop participants were aware of the community’s strengths and how they relate to its vulnerabilities. It was a clear priority that these strengths be reinforced and expanded to increase preparedness and resiliency in the community.

NATURAL ASSETS

The natural environment and assets are a key draw to residents and visitors in Bourne. Participants noted that the town’s marshes are community strengths, as they help absorb floodwaters and potentially sea level rise.

Fishing and shellfishing, as well as water-based recreation in the many small bays and at local beaches, are also community assets, though it was noted that these are potentially vulnerable to impacts from climate change and severe storms.

EMERGENCY SERVICES

With a predominantly year-round population, the Town of Bourne has access to more resources than many of its neighboring, more seasonal Cape Cod communities. Although there is a concern as to how residents might access services in a storm or emergency, the Town has pharmacies, food stores, hardware stores, and other amenities nearby most residential development.

The Town operates a community notification system that enables town official send out notifications of emergencies to all users who have signed up for the service. This is an effective means of communication but is limited by the fact that only those who have signed up will get the notifications. The Town

also coordinates with the Barnstable County Regional Emergency Planning Committee (BCREPC).

The Town is in the process of relocating the police department outside of the floodplain. Fire stations are located across the community, with headquarters located outside of the floodplain. In addition, the community center may serve as a shelter, cooling, or warming station during severe weather.

In the event of storm damage, Bourne has an integrated solid waste management facility, as well as a well-equipped public works department to assist with post disaster clean up.

INFRASTRUCTURE

With the Cape Cod Canal splitting the community, Bourne residents have the easiest access off Cape of all Cape Cod communities. Residents have access to two

major highways systems and both vehicle bridges. In addition, the current condition of public roads is generally good.

There are very few private wells in the community, with the majority of residents and businesses served by public water.

COMMUNITY

The Town of Bourne has both a state and federal presence in its community in the MMA and Joint Base Cape Cod (JBCC) and could benefit from strengthening these relationships.

Town staff are engaged in the community and have a positive attitude when working with residents and businesses. The town has an emergency management director who coordinates the emergency notification system, works with the BCREPC, and provides information to residents.

The town also has engaged and active neighborhood associations that could be leveraged to improve the town-wide communication network.



Recommendations and Next Steps

TOP RECOMMENDATIONS TO IMPROVE RESILIENCE

In small groups, workshop participants developed recommended actions based on identified vulnerabilities. On the second day of the workshop, participants returned to the small teams they had been assigned to on day one to complete the following:

- Generate potential actions to reduce vulnerabilities and reinforce the strengths identified during day 1 of the workshop;

- Consider whether the actions address more than one top hazard, are intermediate steps, or strengthen existing initiatives;
- Prioritize actions and differentiate them as short-term, long-term, and ongoing; and
- Identify their top three recommendations to improve resilience to the top hazards in Eastham.

The top recommendations reported out of the small groups included the following:

- Conduct a vulnerability assessment, including a cost/benefit analysis, of low-lying roads and develop a plan and process to elevate the most vulnerable roads or otherwise reduce their vulnerability
- Prioritize and address low-lying roads that provide sole access to a neighborhood
- Conduct engineering and vulnerability assessment of dams, bridges, and culverts that includes evaluation of stormwater and precipitation
- Restore saltmarshes and barrier beaches, including protection by shellfish (i.e. using oyster reefs)
- Develop and integrated water resources management plan to address wastewater, drinking water, and stormwater management
- Improve upon existing communication networks and develop a dedicated communication and outreach program

- Improve resilience of downtown Buzzards Bay by engaging with developers and evaluating and revising regulations and codes, as needed
- Conduct a vulnerability assessment of utilities, including but not limited to electric, water, and gas, and consider impacts of corrosion from saltwater and wind damage
- Develop options and a plan to address and respond to erosion impacts along the Sagamore Beach shoreline
- Make changes to zoning bylaws and regulations to better address structures in the floodplain, based on a more complete analysis of risk

These recommended actions were then presented to the large group and voted on through a dot exercise to identify the most important recommendations to benefit the community. The following actions represent the top recommendations of the assembled participants, organized by priority.

1. Assessment and planning for low-lying roads. Each group identified the need to address low-lying roads, with specific attention to the roadways that provide sole access to neighborhoods. This action includes a number of sub-actions and received the greatest number of votes from participants. The sub-actions include conducting a vulnerability assessment of all low-lying roads, prioritizing roads for elevation or other alternatives based on a cost/benefit analysis and consideration of other factors such as improved water flow, habitat restoration opportunities, and impacted communities/residences.

2. Utilities vulnerability assessment. Each group identified utility infrastructure as a concern. This action includes an assessment of the vulnerability of utilities such as electric, water, and gas, and evaluate the potential for corrosion from saltwater, wind damage, and other impacts that may occur as a result of the community's vulnerabilities. Work with utility companies to better understand state of infrastructure and encourage resiliency.

3. Changes to zoning bylaws and regulations. Structures (specifically homes and their associated infrastructure) in the floodplain were a key concern throughout the small group discussions. This action includes compiling data to assess risk in the floodplain, completing a risk analysis, development of a floodplain bylaw, and consideration of other bylaws and regulations to improve resilience.

4. Restore saltmarshes and barrier beaches. The natural environment was a key asset identified by participants. This action is to restore the natural function of saltmarshes and barrier beaches. This action will include an assessment of existing resources, prioritization of locations, and evaluation of potential restoration approaches, including consideration of oyster reefs and living shorelines.

5. Development of an Integrated Water Resources Management Plan. The extent of septic systems, undersized or inadequate stormwater infrastructure,

and the need to continually maintain high quality drinking water were key concerns identified by workshop participants. This action includes development of a plan to coordinate development and management of wastewater, stormwater, drinking water, and other water-related infrastructure town-wide.

6. Develop and implement a dedicated communication and outreach program. Each of the working groups identified a number of ways in which communication could be improved. There is a need for improved public understanding about the hazards facing the community, as well as a need to provide information about existing resources, such as the community notification system. Part of the emphasis identified in this action includes creating positive messaging,

presenting viable solutions, and targeting multiple populations. A program should leverage and utilize existing neighborhood associations, the Council on Aging, the Medical Reserve Corps, and other organizations and will require dedicated staff time and town staff coordination.

CONCLUSION AND NEXT STEPS

The Town of Bourne presented and distributing this report to the public at a meeting of the Board of Selectmen on May 28, 2019, following which it was made available for a 21-day public comment period. This report was also presented at a public session on June 12, 2019. Town staff will continue to present the report as

requested in the future. These sessions provided an opportunity for any member of the interested public to learn about the MVP process and provide feedback about the MVP workshop and recommended highest priority actions resulting from the workshop.

Priorities identified during the April 2019 workshop will be integrated into existing local planning efforts. The Town will consider pursuing grant funding to implement the priority actions as appropriate to continue to improve the Town's resilience to climate change.

Appendix



CRB WORKSHOP PARTICIPANTS

- Thomas Guerino, Town Administrator
- Samuel Haines, Conservation Agent
- Jennifer Copeland, Assistant Town Planner
- Timothy Lydon, Assistant Town Engineer
- Charles Noyes, Emergency Management Director
- Beth Russell, ServPro of Upper Cape Cod and the Islands
- Paul Bushueff, Bourne Shore and Harbor Committee
- Chris Southwood, Bourne Department of Natural Resources
- Josh Howard, Bourne Department of Public Works
- MaryJane Mastrangelo, Bourne Finance Committee
- Wesley Ewell, Consultant to the Town of Bourne
- Carly Cote, Bourne Health Department
- Pal Gately, Bourne Courier
- Marie Oliva, Cape Cod Canal Chamber of Commerce
- Kathy Fox Alfaro, Real Estate Agent
- Bob Dwyer
- Nathan Dill
- Zac Basinski, Bracken Engineering
- Tracy Sullivan, Administrative Assistant to Conservation, Engineering, and Planning Departments

CRB WORKSHOP PROJECT TEAM

PROJECT COORDINATOR

- Samuel Haines, Conservation Agent

CORE TEAM MEMBERS

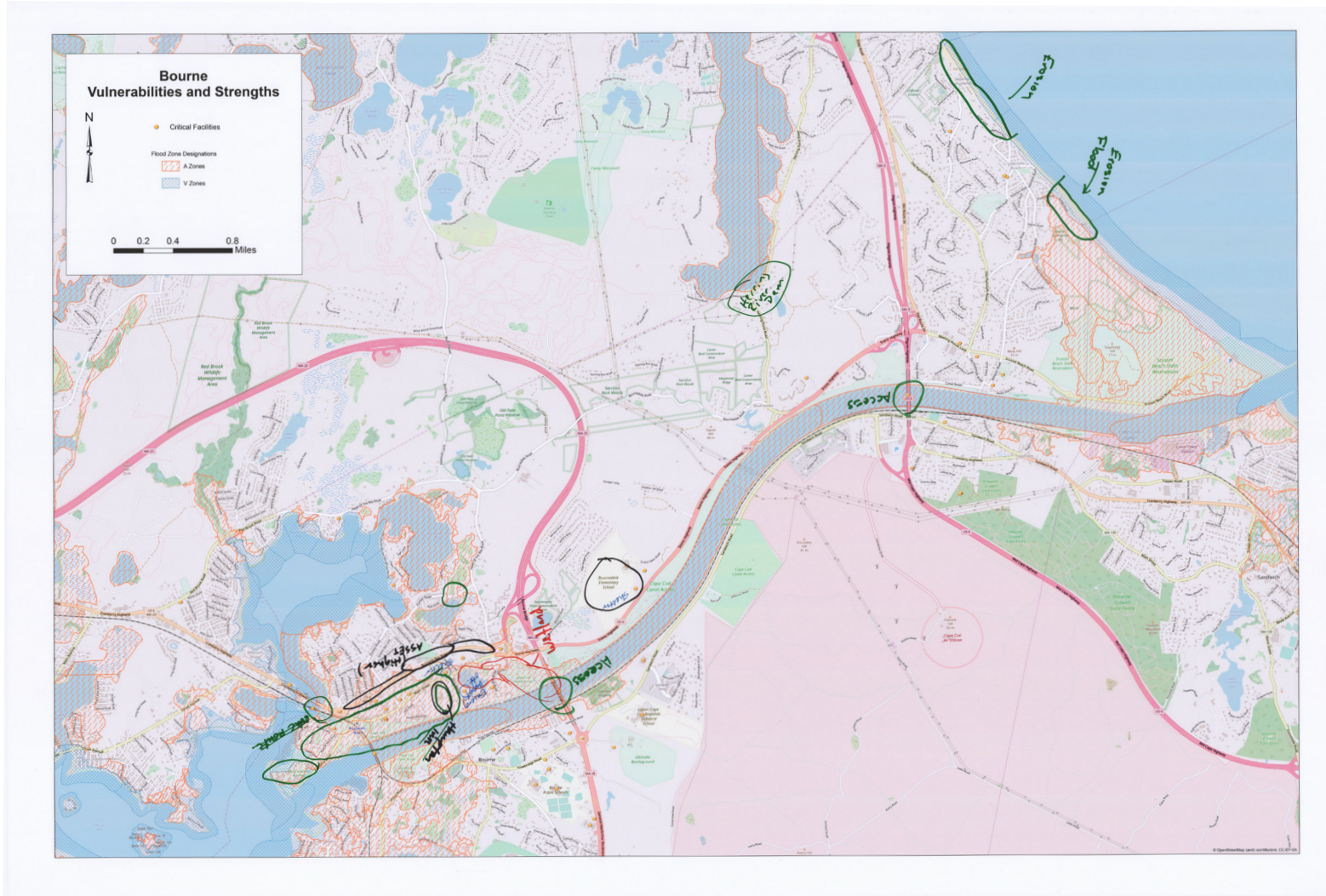
- Jennifer Copeland, Assistant Town Planner
- Timothy Lydon, Assistant Town Engineer
- Charles Noyes, Emergency Management Director

MVP PROVIDER – CAPE COD COMMISSION

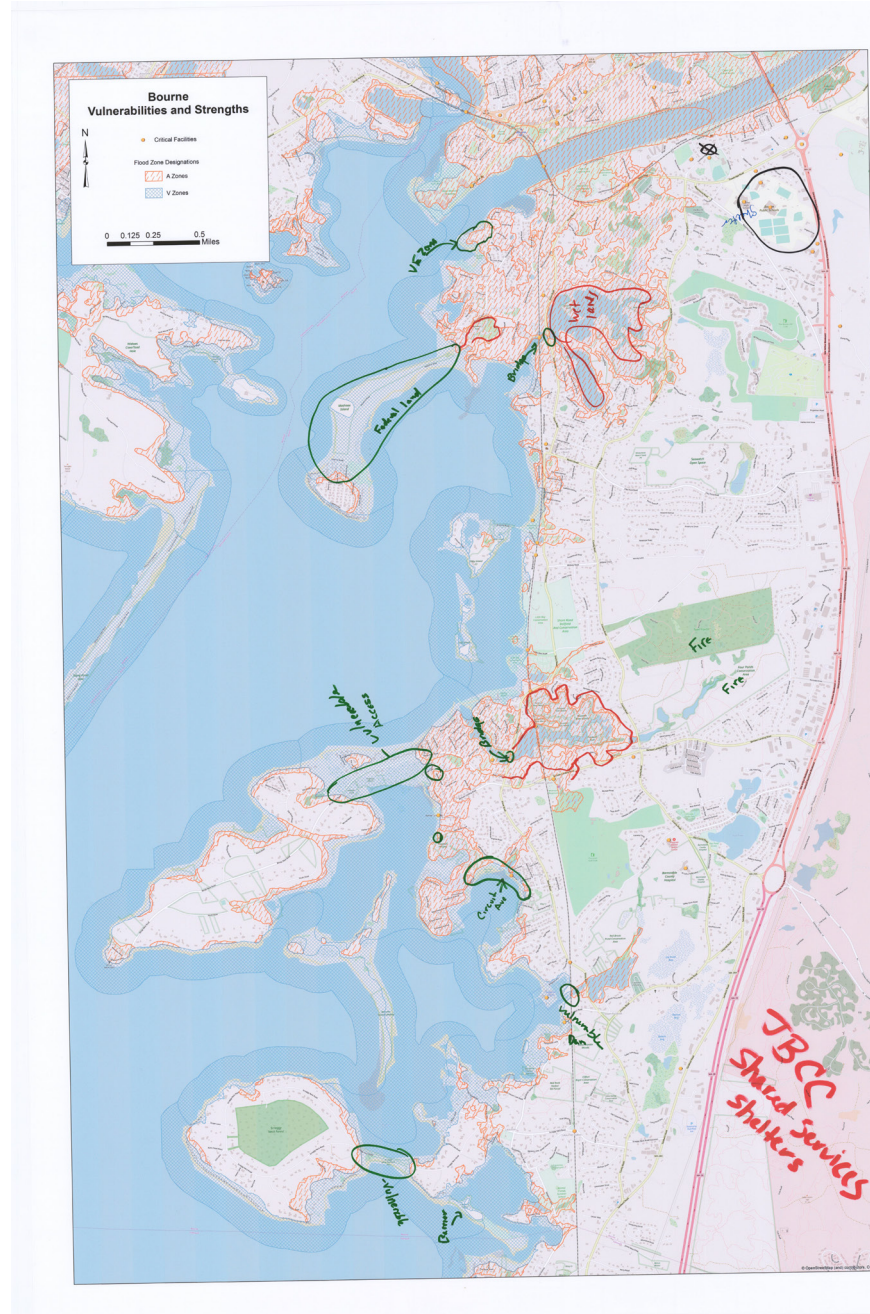
- Sharon Rooney, Chief Planner
- Heather McElroy, Natural Resources Manager
- Erin Perry, Deputy Director
- Chloe Schaefer, Community Design Planner
- Martha Hevenor, Planner II
- Anne Reynolds, GIS Director

MVP PROVIDER – WOODS HOLE SEA GRANT/CAPE COD COOPERATIVE EXTENSION

- Greg Berman, Coastal Processes Specialist
- Shannon Jarbeau, Floodplain Specialist & CRS Coordinator



GROUP A BASEMAP 1



GROUP A BASEMAP 2

BOURNE COMMUNITY RESILIENCE BUILDING WORKSHOP

www.CommunityResilienceBuilding.org

STORMS

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

H-M-L priority for action over the Short or Long term (and Ongoing)
 V = Vulnerability S = Strength

Features	Location	Ownership	V or S	Hurricane wind	Winter ice precipitation	Floods	Erosion	Temp Drought	Priority	
									H-M-L	Short Long Ongoing
Infrastructural	A L L									
Wings Neck Causeway		Public/Town	V			Elevating Roadways	Vulnerability Assessment including Cost/Benefit		H	S-O
Scraggy Neck Causeway	Circle	Private	V						H	
Mashpee Island Causeway		USACE/Army Corps of Engineers	V							
MMA		Public	V/S							
Armsory Rd (new Police station)		Public	S			Review options to transfer development out of flood zone			L	L
Main St		Town/Private	V/S							
Societal										
Isolation (Dry, but isolated in flood)	Hampton Inn Senior Center	private/public	S/L			Equipment for Transportation (ex. COA)			M	S
Aging Population			V			Education/Outreach			H	S-O
Shell fishing		commercial/private	S			WQ + Storm Drainage Improvements			H	S-O
Neighborhood Assoc. + Facebook pages			S							
InterAgency Communication	National Guard	MA	S (potential)			Strengthen			M	S-O
Environmental										
Salt marshes	ACEES		S/L			Restoration	too protection by shellfish (ex. oyster reef)		H	O
Barrier Beach/Island	Block waves ex Bassett Island	private	S/L			Assessment of areas for living shorelines (ex. oyster reef)				S
Septic Systems			V			Package Treatment	Updating BOH regs (ex. buffers FAST)		H	S
Insect Bourne Diaper			V							
Wild Fire			V			Fire Breaks + Burns + Thinning	Update WF plan		M	S-O
Water Supply			V/S			Assessment of Water Supply (Already done?)			L	L

Low Lying Roads

Form Town Coastal Committee H
 Get grant manager
 Education/Outreach on permit process

GROUP A RISK MATRIX 1

www.CommunityResilienceBuilding.org

STORMS

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

H-M-L priority for action over the Short or Long term (and Ongoing)
 V = Vulnerability S = Strength

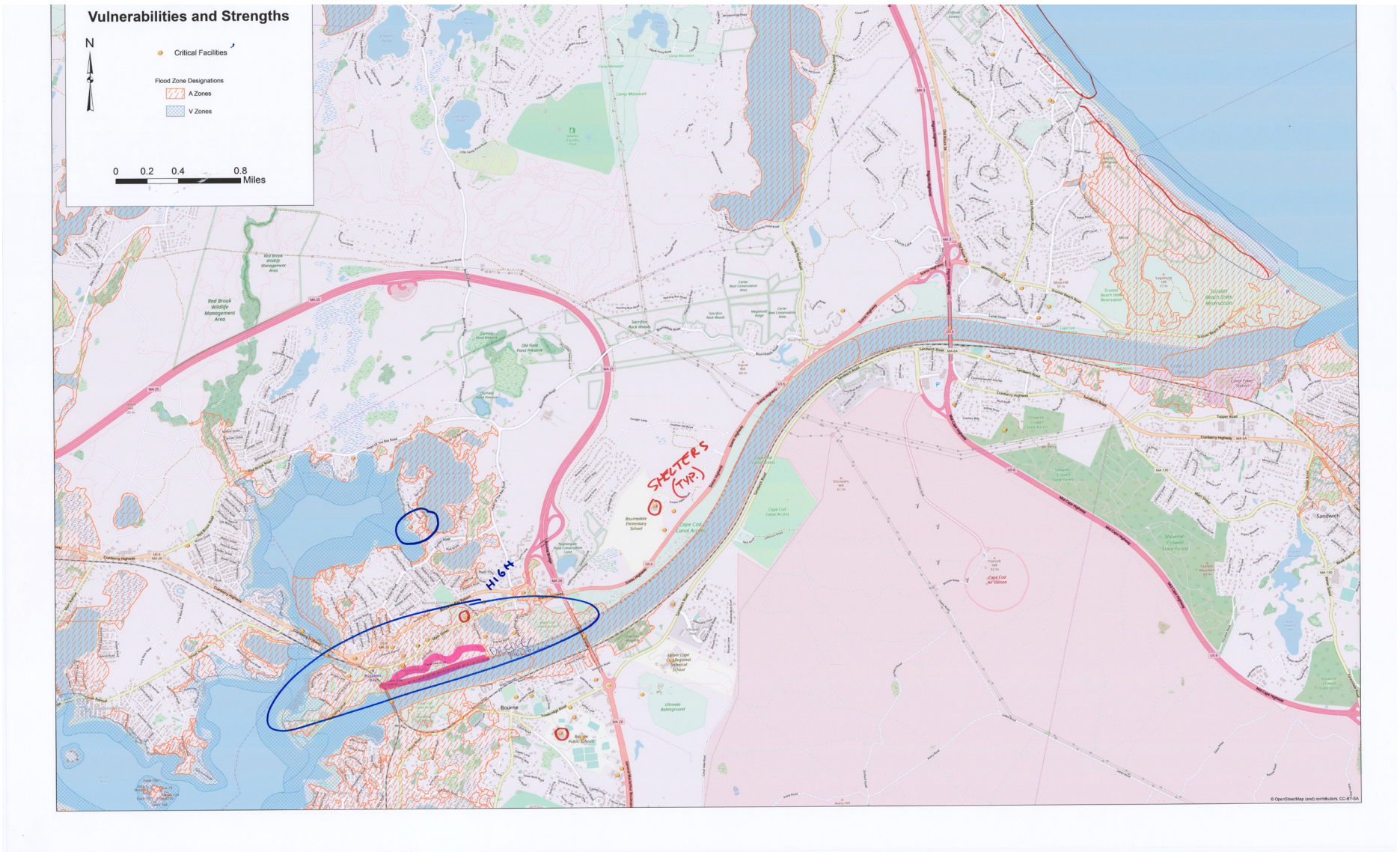
Features	Location	Ownership	V or S	Top Priority Hazards			Priority	Time
				Hurricanes <i>Winter wind</i>	Flooding <i>precipitation subs.</i>	Erosion	Drought <i>Temp</i>	H-M-L
Infrastructural	ALL			Grants	Manager to apply + manage	MV/EM/etc.	H	S-O
Wings Neck Causeway		Public/Town	V	Elevating	Roadways	Vulnerability Assessment including Cost/Benefit	H	
Scraggy Neck Causeway	<i>Electric pole</i>	Private	V					
Mashpee Island Causeway		USACE/ <i>local privat</i>	V					
MMA		Public <i>Town State</i>	V/S					
Armory Rd (now Police Station)		Public	S	Review options	to transfer development out of flood zone		L	L
Main St		Town/Private	V/S					
Societal								
East Base Cape Cod Isolation (Dry, but isolated in flood)	<i>shared Assets</i> Hampton Inn Senior Center	Public	S/L	Equipment for	Transportation (ex. COA)		M	S
Aging Population	<i>transport shoring shoos</i>		V	Education/	Outreach		H	S-O
Shell fishing	<i>commercial private</i>		S	WQ + storm	Drainage Improvements		H	S-O
Neighborhood Assoc. + Facebook pages			S					
InterAgency Communication	<i>National Guard DACC Coast Guard</i>		S (potential)	Strengthen			M	S-O
Environmental								
Saltmarshes	<i>ACEES</i>		S/L	Restoration	<i>too protection by shellfish (ex. oyster reef)</i>		H	O
Barrier Beach/Island	<i>Stack wool</i> ex Bassett Island	Private	S/L	Assessment of areas for living shorelines (ex. oyster reef)				S
Septic Systems			V	Package Treatment	Updating BOH regs (ex. buffers FAST)		H	S
Insect Bourne Diaper			V					
Wild Fire			V	Fire Breaks + Burns + Thinning	Update WF plan		M	S-O
Water Supply			V/S	Assessment of Water Supply (Already done?)			L	L

Low Lying Roads

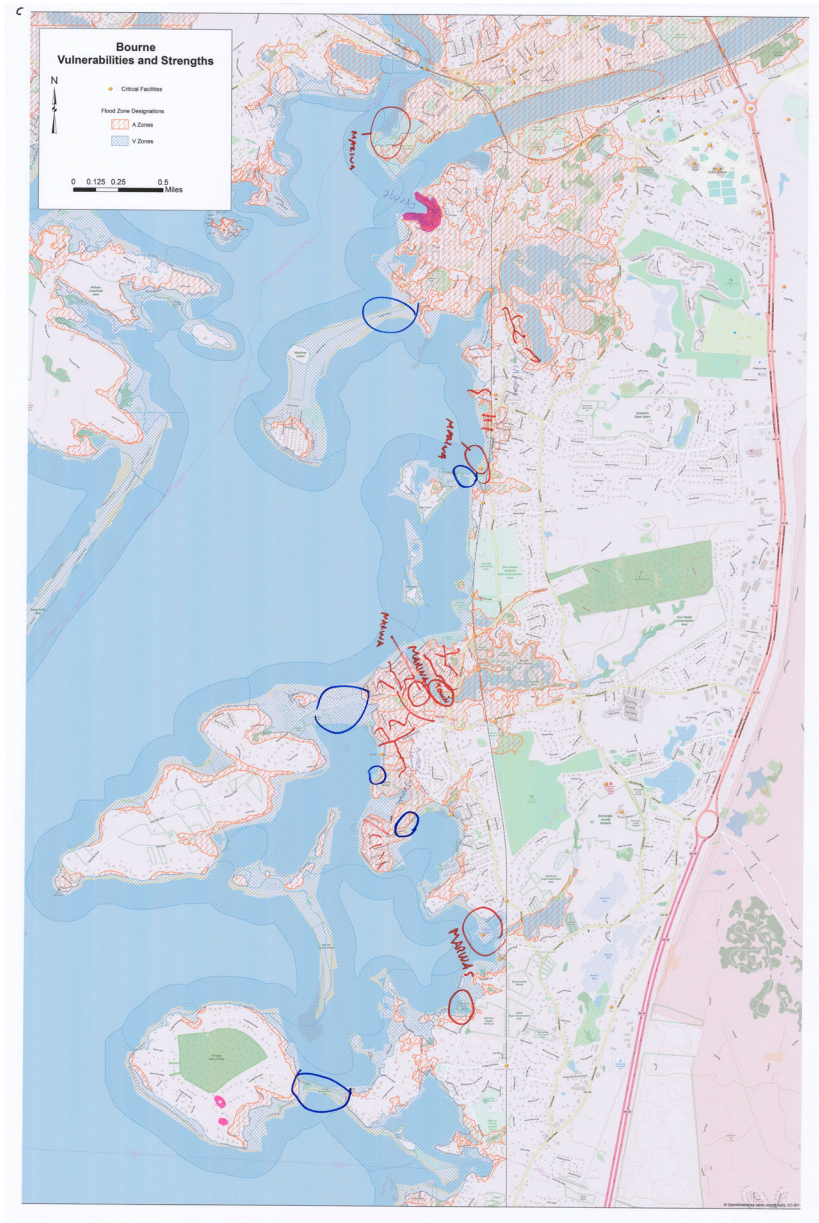
Form Town Coastal Committee H
 (get grant manager)
 Education/Outreach on permitting process

GROUP A RISK MATRIX 2

BOURNE COMMUNITY RESILIENCE BUILDING WORKSHOP




GROUP B BASEMAP 1



GROUP B BASEMAP 2

BOURNE COMMUNITY RESILIENCE BUILDING WORKSHOP

Community Resilience Building Risk Matrix  www.CommunityResilienceBuilding.org

H-M-L priority for action over the Short or Long term (and Ongoing)
 V = Vulnerability S = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Flooding	Erosion	High Winds	Sea Level/Water Table Rise	Priority	
								H-M-L	Short Long Ongoing
Infrastructural									
Downtown Buzz. Bay	Map		S/V	⊗				H	O
Canal / Bridges / Train bndg	Map	Fed/ State	S/V					H	S
Disconnected "Necks"	Map	Public/ Private/ Public	V	⊗				H	S
Low lying roads / coastal rds.	Map - w/ of area	Public/ private	V	⊗				H	L
Septic Infrastructure	town-wide	private	V	⊗				H	S
Drainage/management	town-wide	public/ private	V	⊗				M	O
Societal									
Aging population	town-wide	≠	V	⊗				M	S
Access to healthcare / Meds			V/S	⊗				M	S
Communication between res. in vuln. areas			S/V	⊗				M	O
Communication - town to residents			S/V	⊗				H	O
Neighborhood Associations			S	⊗				M	O
Town staff expertise / attitude			S	⊗				H	O
Environmental									
Extent of coastline + geometry	town-wide	Public/ private	V						
Drinking water resources	town-wide	public/ private	V/S						
Sagamore Coastline	Map	Public/ private	V					H	S
Shellfishing / Marine Life			V/S						
Reclaimed land	Map	Public/ private	V						
Saltmarshes			S/V					H	S

25 yr storm surge

Tie to comm. notification sp.

Potential Action? Providing resources/guidance to solve issues.

Knowledge + attitude

Faces southwest prevailing winds (BB)

Pub water supply - good water - low wells - 7' depth

Work w/ private developers to improve resilience. Further reg + improving codes to improve resilience.

Develop plans for addressing each, include engage neighborhoods, assess + flood of water

Plan -> Impl ->

Prioritize and develop action plans for vulnerable roads, include private rds.

Review regulations to be more forward thinking. Develop CWRMP / WQ management plan. CWRMP

Upgrade stormwater infrastructure, nature-based implementing HSY actions

Plan restoration of private rds - restore natural

Engaging / tapping into resources. - Council on Aging

Emergency response clinics - engage police / fire / medical

Mobilize local citizen response. - work w/ HMA, Council on Aging, Med. Res. Corps

Develop guide for private property owners to navigate issues.

Develop dedicated outreach program - maybe regional? (unstable)

Improve awareness of flood hazards, evac routes, info in advance of hazards

Mobilize neighborhoods - sharing best practices, develop guide to attract neighborhood assoc. - meeting / info-sharing

Opportunities for staff collaboration -> annual summit

Identify and address staff needs for implementation / internships

EHI training for staff / other training such as grant writing

Develop plan / options to address and respond.

Plan -> Impl ->

Restoring and protecting - all harbors and bays Plan Impl

Familiar best practice, nature plant species.

GROUP B RISK MATRIX 1

www.CommunityResilienceBuilding.org

Community Resilience Building Risk Matrix

H-M-L priority for action over the Short or Long term (and Ongoing)
 V = Vulnerability S = Strength


Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Top Priority Hazards				Priority	Time
								H - M - L	Short Long Ongoing
Infrastructural									
Dam	Heery Run	town	V						
Evacuation Route / how to get out during storm	Bridge to Wauhatchie		V/S						
Erosion	Sagamore Cape Cod Bay	town private	V	Analysis, vegetated buffer	Education Outreach (ex: permitting)	5-0-M	public S-H	Engineering Assessment shoreline stabilization	
Houses in Flood zone	Buzz Bay ex. Gray Gables	private	V	Analysis 5-0-E Better than FEMA, flood risk	Need that info S to	Floodplain Bylaw - Concentration S			(H)
Communications Network	ex. code RED wires acc.	vulnerable	S/V	Strengthen, Educate Public					M
Bridges/Culverts	ex. Shum Rd	Town	V	Engineering + Vulnerability to Precip	Storm Hydro Assessment				(H) L
Societal									
Historic Resources in flood zone	town	private	V	Design Guidance/Bylaws					L S
Power supply: electric, gas, water	town	private & town	V	Vulnerability Assessment					(H) S
Pets shelters?			V						
Emergency Management			S	more support	Post Disaster Plan	5-0			H
Environmental									
Invasive Species	Plants/Animals	town	V						
Wildlife		town	V						

GROUP B RISK MATRIX 2

Community Resilience Building Risk Matrix				www.CommunityResilienceBuilding.org					
				Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)					
H-M-L priority for action over the Short or Long term (and Ongoing) V = Vulnerability S = Strength				Erosion	Storms (Hurricanes & Nor'Easters)/High Winds	Flooding/Sea Level Rise/Water Table Rise	Temps/Drought	Priority H - M - L	Time Short Long Ongoing
Features	Location	Ownership	V or S						
Infrastructural									
Downtown Buzzards Bay	See Map	Private/Public - Town	V/S		Work with developers and town to improve resilience.			H	O
Cape Cod Canal/Bridges/Train Bridge	See Map	Public - Federal/State	V/S						
Disconnected necks (ex. Wings Neck, Scraggy Neck, Mashnee Island, Circuit Ave)	See Map	Mostly Private/Some Public - Town	V		Prioritize and develop plans to address each, including improving egress and restoring flow of water and natural functions.			H	S (plan); O (impleme
Low-lying roads	See Map - Rds west of Shore Rd.	Private/Public - Town	V		Prioritize and develop action plans for vulnerable roads, including private roads.			H	L
Septic and other wastewater infrastructure	Town-Wide	Private	V	Develop a Comprehensive Water Resources Management Plan (CWRMP).				H	S
Drainage management	Town-Wide	Private/Public - Town	V		Upgrade stormwater infrastructure, integrate nature-based solutions, and implement MS4 actions.			M	O
Sewer infrastructure	Buzzards Bay & Savary	Public - Town	V/S	Develop CWRMP				H	S
Public water supply	Town-Wide/3 Districts	Public - Districts	V/S	Develop CWRMP; More outreach to water districts				H	S
Private unaccepted roads	See Map	Private	V	Analyze process for private road acceptance and new developments; create road rating system; improve				M	L
Fire and police stations (headquarters of each now located outside of flood zone)	Buzzards Bay & Sagamore	Public - Town	S		Develop plan for moving the Buzzards Bay fire station to make it more resilient.			L	L
Federal presence (JBCC and ACOE)	Canal-area and Cape-side	Public - Federal	S	Improve communication and strengthen partnerships.				L	O
Two major highways systems	Canal-area	Public - Federal/State	S	Continue dialogue with MassDOT and others on options.				M	O
Marinas and anchorage areas	See Map	Private/Public - Town	V/S		Engage businesses, communicate and coordinate.			L	O
Utilities: Electric, Gas, Water (impacts from corrosion)	Town-Wide	Private/Public - Town	V/S		Complete vulnerability assessment; request regular reporting from utility companies and support resilient infrastructure.			H	S
Dams/bridges/culverts	Herring River & along Shore Rd	Public - Town	V						
Evacuation transportation route	Canal-area	Public	V/S						
Sagamore - Eroding shoreline	Sagamore/Cape Cod Bay	Private/Public - Town	V						
Houses in flood zone	Buzzards Bay shoreline	Private	V		Pursue options to transfer development out of flood zone.			L	L
Massachusetts Maritime Academy	Buzzards Bay	Public - State	S						
Condition of public roads	Town-Wide	Public - Town	S						
Integrated Solid Waste Management	Town-Wide	Public - Town	S						

COMPLETED RISK MATRIX - INFRASTRUCTURAL FEATURES

Community Resilience Building Risk Matrix 				www.CommunityResilienceBuilding.org					
				Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)					
H-M-L priority for action over the Short or Long term (and Ongoing) V = Vulnerability S = Strength				Erosion	Storms (Hurricanes & Nor'Easters)/High Winds	Flooding/Sea Level Rise/Water Table Rise	Temps/Drought	Priority	Time
								H - M - L	Short Long Ongoing
Features	Location	Ownership	V or S						
Societal									
Aging Population	Town-wide		V		Engage existing resources, such as Council on Aging			M	S
Access to healthcare, shelter, food, medicine			V/S		Mobilize local response and emergency clinics: engage police/fire/medical reserve corps/MMA			M	S
Communications network	Town-wide	Public - Town	V/S		Strengthen and educate public on resources, such as CodeRED; create town coastal committee and get a grants manager			H	S
Communication between residents (facebook pages)			S						
Communication between town and residents			S		Develop a dedicated outreach plan that provides information about hazards and evacuation routes, providing information in advance of an emergency;			H	S and O
Neighborhood associations			S		Mobilize neighborhoods, share information and best practices, annual meeting/summit.			M	O
Knowledgeable town staff			S		Identify and address staffing needs; provide opportunities for staff collaboration; provide training (EMI, grant writing, and others) for staff			H	O
Predominantly year-round population and engaged community			S						
Massachusetts Maritime Academy			V/S		Engage with and better coordinate with the academy			M	O
Local shelter (Community Center)	Buzzards Bay	Public - Town	V/S						
Historic resources in the flood zone	Town-wide	Private	V		Develop design guidelines and bylaws to address and protect vulnerable historic resources			L	S
Emergency Management			S		Support emergency management and emergency services and implementation of post disaster plan			H	S and O
Joint Base Cape Cod (shared assets)		Public - Federal	S						
Isolation (areas that are dry by isolated in flood)	Hampton Inn/Community Center	Private/Public - Town	V/S		Acquire equipment for transportation (ex. through Council on Aging)			M	S
Commercial and recreational shellfishing			S		Implement water quality and storm drainage improvements			H	S and O
Interagency communication	National Guard, JBCC, Coast Guard		S		Presence of agencies is potential strength, but relationships must be strengthened.			M	S and O

COMPLETED RISK MATRIX - SOCIETAL FEATURES

Community Resilience Building Risk Matrix



www.CommunityResilienceBuilding.org

H-M-L priority for action over the **S**hort or **L**ong term (and **O**ngoing)
V = Vulnerability **S** = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	Erosion	Storms (Hurricanes & Nor'Easters)/High Winds	Flooding/Sea Level Rise/Water Table Rise	Temps/Drought	Priority		Time	
								H - M - L		Short	Long Ongoing
Environmental											
Saltmarshes and wetlands	ACECs		V/S	Pursue restoration and protection opportunities; protection by shellfish (ex oyster reefs); fertilizer best practices; native plan species				H		S and O	
Services provided by barrier beaches/islands (wave protection)	Bassets Island, Necks		V/S	Assessment of areas for living shorelines/oyster reefs				H		S	
Septic systems	Town-Wide	Private	V	Update Board of Health regulations (ex. Buffers, I/A systems); package treatment				H		S	
Insect bourne diseases			V								
Wild fire			V	Implement fire breaks, burns, and thinning; Update wildfire plan				M		S and O	
Water supply/Drinking Water Resources			V/S	Complete an assessment of water supply, if not already done				L		L	
Extent and geometry of coastline	Town-Wide	Private/Public	V								
Sagamore coastline	See Map	Private/Public	V	Develop plan/options to address and respond				H		S and O	
Shellfish, marine life, and wildlife	Town-Wide		V/S								
Reclaimed land	See Map	Private/Public	V								

COMPLETED RISK MATRIX - ENVIRONMENTAL FEATURES

Municipal Vulnerability Preparedness Workshop

TOWN OF BOURNE
APRIL 16-17, 2019



Today's Agenda

- 12:30 Registration
- 12:45 Workshop Overview and Introductions – Sam Haines
- 1:00 MVP Program Background – Erin Perry
- 1:15 Science, Climate Projections, Resources – Greg Berman
- 1:45 Short Break
- 1:55 Small Team Exercise
 - Team Orientation
 - Discuss and Identify Priority Hazards
 - Identify Vulnerable Features and Strengths
 - Prepare for Report-out
- 3:25 Teams Report on Hazards, Vulnerabilities, Strengths
- 3:50 Wrap Up and Overview of Day 2
- 4:00 Adjourn

Project Team

MVP PROVIDER | CAPE COD COMMISSION

- Sharon Rooney - *Chief Planner*
- Heather McElroy - *Natural Resources Manager*
- Erin Perry - *Deputy Director*
- Chloe Schaefer - *Community Design Planner*
- Martha Hevenor - *Planner II*
- Anne Reynolds - *GIS Director*


MVP PROVIDER | COOPERATIVE EXTENSION

- Greg Berman - *Coastal Processes Specialist, Woods Hole Sea Grant/ Cape Cod Cooperative Extension*
- Shannon Hulst Jarbeau - *Floodplain Specialist & CRS Coordinator, Woods Hole Sea Grant/Cape Cod Cooperative Extension*

TOWN PROJECT MANAGER

- Sam Haines - *Conservation Agent*

MVP Program Background



EXECUTIVE ORDER 569: AN INTEGRATED CLIMATE CHANGE STRATEGY FOR THE COMMONWEALTH 9.16.16



- Reducing greenhouse gas emissions to combat climate change
- Preparing for the impacts of climate change
 - State Adaptation Plan
 - Agency Vulnerability Assessments
 - Municipal Support
 - Climate Coordinators

4

ENVIRONMENTAL BOND BILL, 3.15.18



- \$1.4 billion bond bill with focus on climate change resiliency
- \$300 million for climate change adaptation
- Codifies EO 569

5

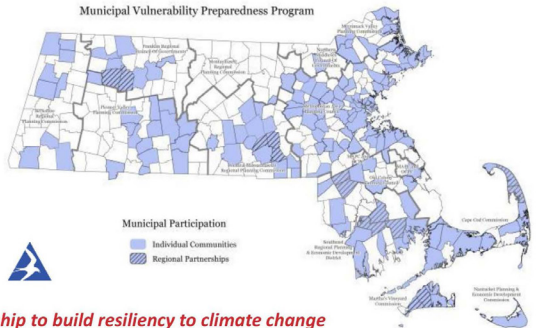


Massachusetts State Hazard Mitigation and Climate Adaptation Plan

- www.resilientma.com
- **Integrated Plan:** First in the nation Climate Adaptation and Hazard Mitigation plan
- **Mainstreaming climate change:** Incorporating climate change into current planning, budgeting, and policy frameworks

Municipal Vulnerability Preparedness (MVP)

2017-2019



Municipal Participation

- Individual Communities
- Regional Partnerships

State and local partnership to build resiliency to climate change

1. Engage Community
2. Identify CC impacts and hazards
3. Complete assessment of vulnerabilities & strengths
4. Develop and prioritize actions
5. Take Action

7

MVP 2018



- ❖ 82 new planning grants, now 43% of the Commonwealth
- ❖ 39 Action Grant projects
- ❖ \$7.2 million dollars committed
- ❖ ~~Have budgeted \$10 million for~~ ^{approved} action grants next year in Governor Baker's Capital Plan

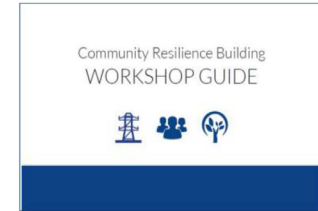


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MVP Principles



- **Community-led process** that employs local knowledge and requires local buy-in and support
- **Accessible**
- **Utilizes partnerships** and leverages existing efforts
- **Mainstreams** climate change
- **See communities** as local innovators
- **Frames** coordinated statewide efforts.



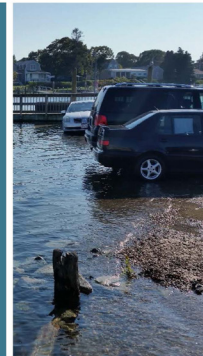
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Overview of the Process

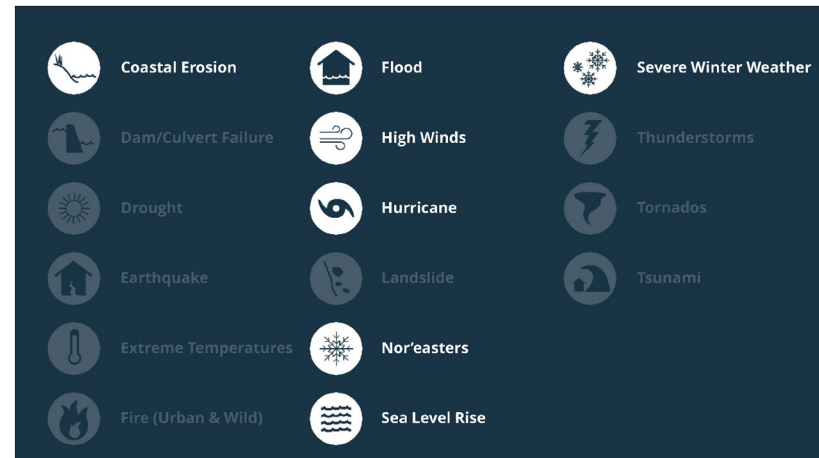
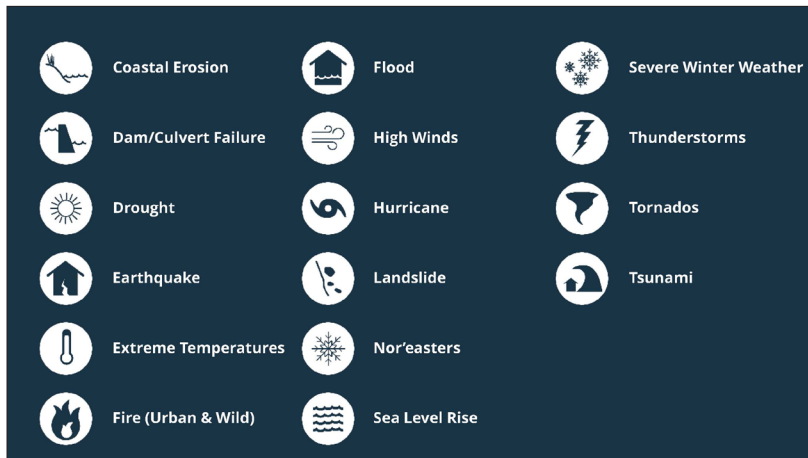


Science, Climate Projections, and Resources

Greg Berman, Coastal Processes Specialist
Woods Hole Sea Grant & Cape Cod Cooperative Extension





BOURNE COMMUNITY RESILIENCE BUILDING WORKSHOP



Examples of Vulnerability/Hazards

From State Hazard Mitigation Plan

Changes in Precipitation

- Inland Flooding
- Drought
- Landslide

Sea Level Rise

- Coastal Flooding
- Coastal Erosion
- Tsunami


Rising Temperatures

- Average/Extreme Temperature
- Wildfires
- Invasive Species

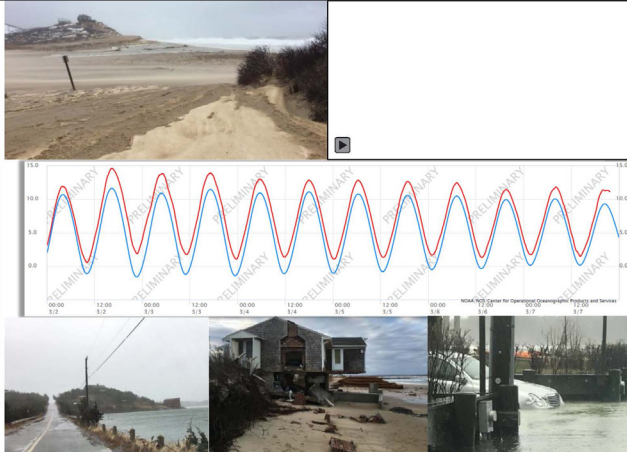
Extreme Weather

- Hurricanes/Tropical Storms
- Severe Winter Storm / Nor'easter
- Tornadoes

Earthquake



HAZARD Storms



WORKSHOP PRESENTATION

HAZARD
Sea Level Rise

Nor'Easter (January 2018)

Hurricane Sandy (10/29-30/2012)
 Predicted High WL = **10.3** MLLW
 Actual High WL = 12.8 MLLW
 Max Surge: 4.5'
 High Tide Surge: 2.5'

Nor'easter Nemo (2/8-2/9/2013)
 Predicted High WL = **10.0** MLLW
 Actual High WL = 13.0 MLLW
 Max Surge: 3.9'
 High Tide Surge: 3.0'

Nor'easter Grayson (1/4-5/2018)
 Predicted High WL = 12.1 MLLW
 Actual WL = **15.2** MLLW
 Max Surge: 3.1'
 High Tide Surge: 3.1'

SL has risen ~4.5" in the 40 years since 1978.....so SLR is the reason the record was broken!!!

In Boston, a storm tide of 15.16' was recorded which beat the record set by the Blizzard of 1978 (15.0') **~2"**

HAZARD
SLR & Storms

TABLE 10 - TRANSECT DATA - 2013 COASTAL STILL WATER ELEVATIONS (FEET NAVD88^s)

TRANSECT	10- PERCENT- ANNUAL- CHANCE	2- PERCENT- ANNUAL- CHANCE	1- PERCENT- ANNUAL- CHANCE	0.2- PERCENT- ANNUAL- CHANCE
001	8.7	9.6	9.9	10.6

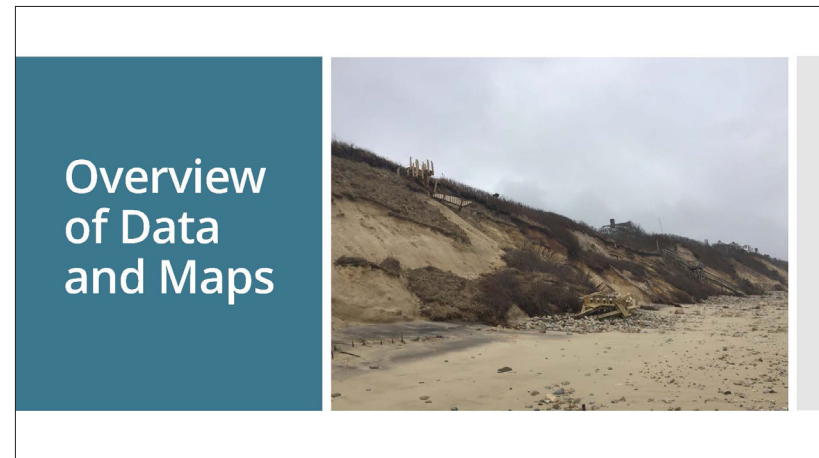
1.2'

TABLE 10 - TRANSECT DATA - 2013 COASTAL STILL WATER ELEVATIONS (FEET NAVD88^s)

TRANSECT	10- PERCENT- ANNUAL- CHANCE	2- PERCENT- ANNUAL- CHANCE	1- PERCENT- ANNUAL- CHANCE	0.2- PERCENT- ANNUAL- CHANCE
200	8.7	12.3	13.9	17.0

5.2'

Changing the return period of flooding



BOURNE COMMUNITY RESILIENCE BUILDING WORKSHOP

The Onion
19 mins ·

"As recently as 15 years ago, there were relatively few statistics that were concerning, let alone troubling, but our research found that the vast majority of current statistical figures are unsettling, alarming, or even, in some cases, chilling."

THEONION.COM
Study Finds 79% Of Statistics Now Sobering
CAMBRIDGE, MA—Noting a sharp increase over rec...

CAPE COD BASIN

MUNICIPALITIES WITHIN CAPE COD BASIN:
Barnstable, Bourne, Brewster, Chatham, Dennis, Eastham, Falmouth, Harwich, Mashpee, Orleans, Provincetown, Sandwich, Truro, Wellfleet, Yarmouth

resilient MA

Find maps, data products, reports, articles. Search

Layers | Controls & Legends | Quick Zoom

Hurricane Surge Inundation Zones

Opacity: 82%

Hurricane Surge Inundation Zones

- Category 1
- Category 2
- Category 3
- Category 4

Massachusetts Climate Change Projections

MARCH 2018

Massachusetts Observed Climate Changes	Massachusetts Climate Changes Projected by the 2090s
Temperature: ↑ 2.9°F Since 1895 (Statewide)	Temperature: ↑ 7.2°F Average Annual; Range: 4 to 11°F
Growing Season: ↑ 15 Days Since 1950	90°F Days: ↑ 34 Annual; Range: 13 to 64 days
Sea Level Rise: ↑ 11 inches Since 1922 (Boston)	Sea Level Rise: ↑ 4 to 10.2 feet Relative to mean sea level in 2000
Heavy Precipitation: ↑ 55% Since 1958	2" Precipitation Days: ↑ 47% Annual

Source: Climate Science Special Report, 2017; NOAA NCEI nClimDiv; NOAA Ocean Service

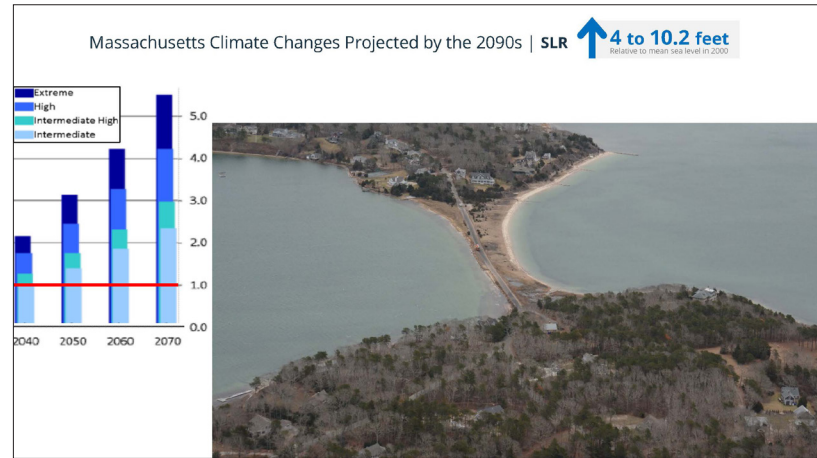
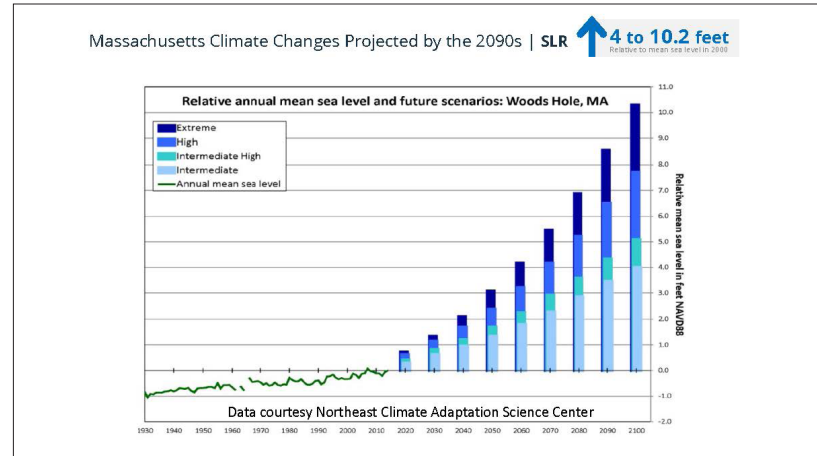
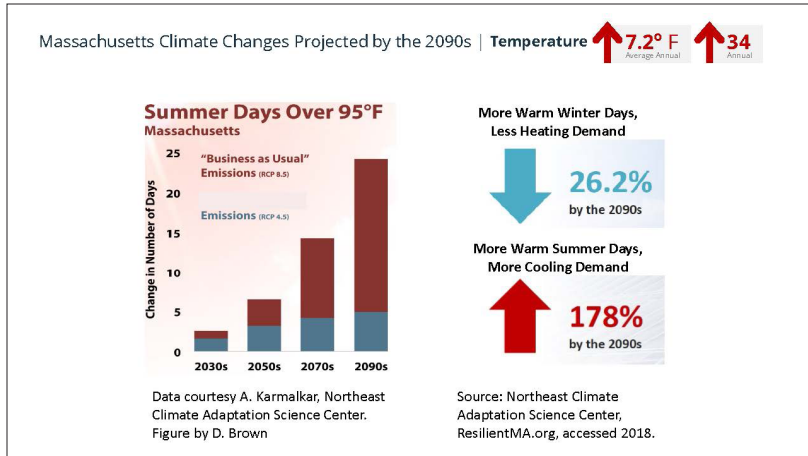
Source: Northeast Climate Adaptation Science Center

Massachusetts Climate Changes Projected by the 2090s | Temperature **↑ 7.2°F**
Average Annual

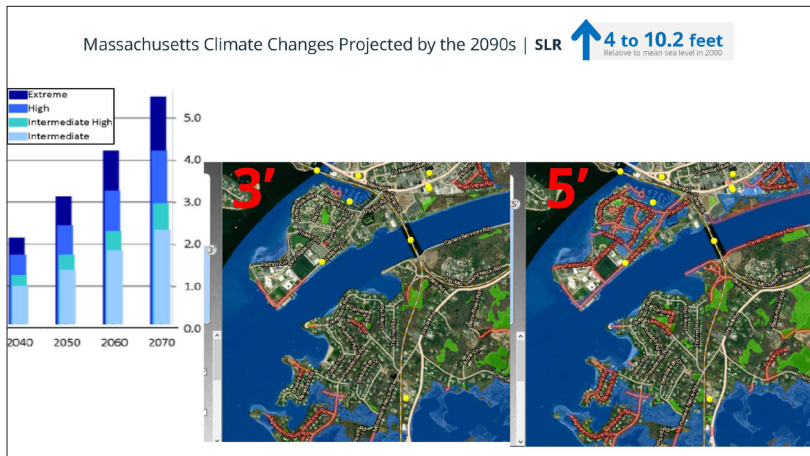
During the last ice age, temperatures were 9°F cooler than today.

Google

WORKSHOP PRESENTATION

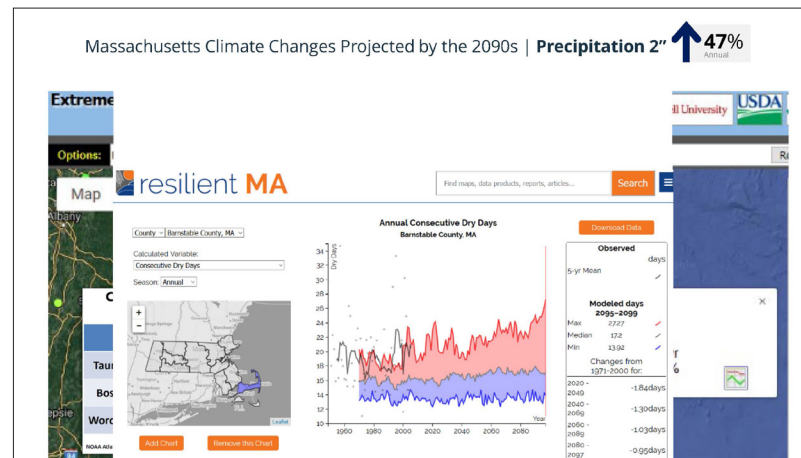


BOURNE COMMUNITY RESILIENCE BUILDING WORKSHOP




Massachusetts Climate Changes Projected by the 2090s | SLR **↑ 4 to 10.2 feet**
Relative to mean sea level in 2000

Video from <https://www.aqcc.org/videos/index.html>, **Video 3: Sea Level Rise: Changing Cape Cod's Groundwater**



WORKSHOP PRESENTATION

Small Team Exercise



Small Team Exercise

OVERVIEW

- Introductions
- Identify Small Team Spokesperson
- Clarifying Questions

EXERCISE

1. Identify Top Community Hazards
2. Identify Community Features and Categorize as Vulnerability or Strength
 - Infrastructure
 - Societal
 - Environmental
3. Identify Location and Ownership on Map/Matrix

Coastal Erosion
 Flood
 Severe Winter Weather

Dam
 Thunderstorms

Drought
 Tornadoes

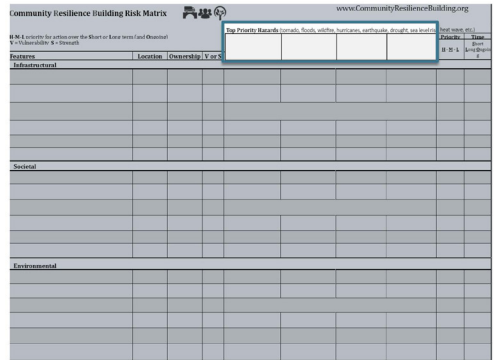
Earthquake
 Hurricane/Hurricanes

Extreme Heat
 Wildfires

Fire (Urban & Wild)
 Sea Level Rise

1. Identify Top Community Hazards

1. Top Community Hazards

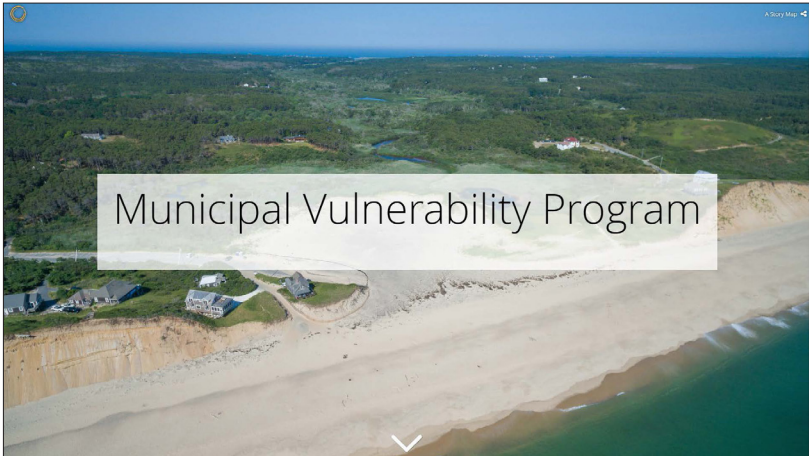


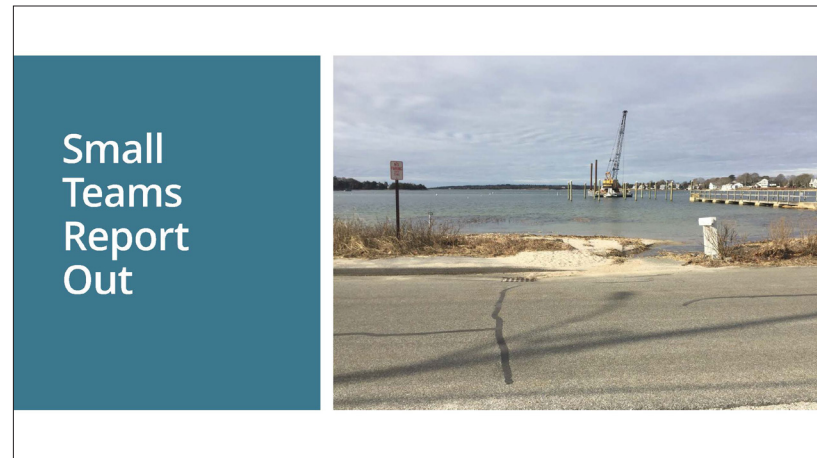
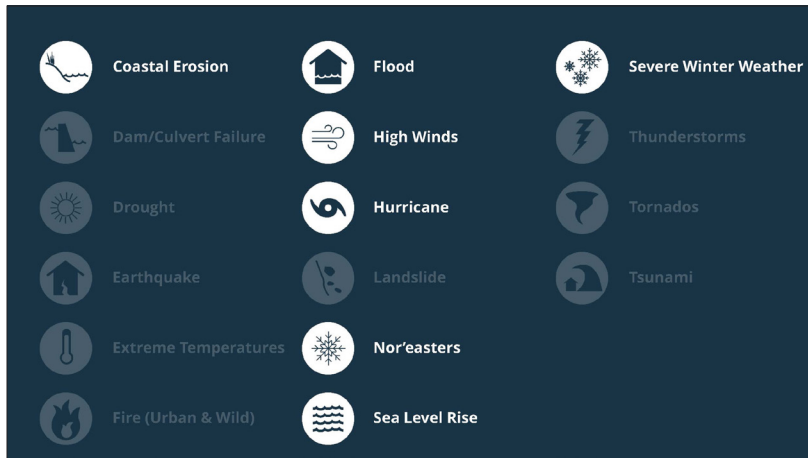
2. Identify Community Features and Categorize as Vulnerability or Strength

2. Community Features

Community Resilience Building Risk Matrix		www.CommunityResilienceBuilding.org	
Risk Matrix for assessing the threat to your town's local resources		Top Priority Hazards: floods, drought, hurricanes, earthquakes, drought, sea level rise, heat waves, etc.	
Feature	Location (Ownership, V or S)	Priority	Score
Infrastructure			
Social			
Environmental			

3. Identify Location and Ownership of Community Features on Map/Matrix





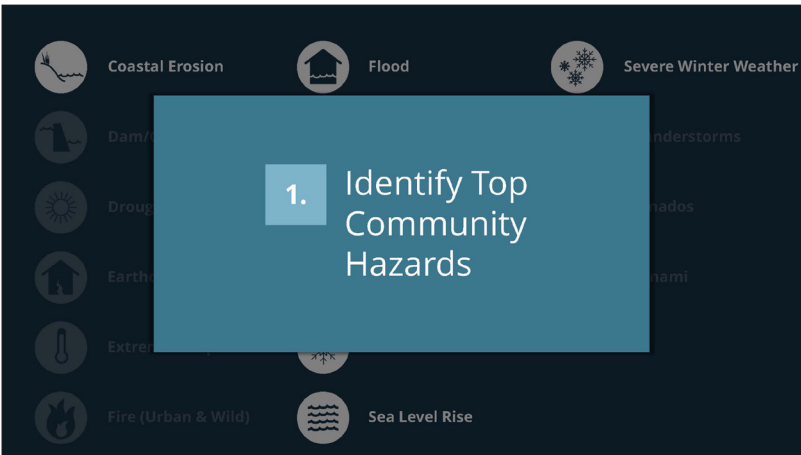
BOURNE COMMUNITY RESILIENCE BUILDING WORKSHOP

Today's Agenda

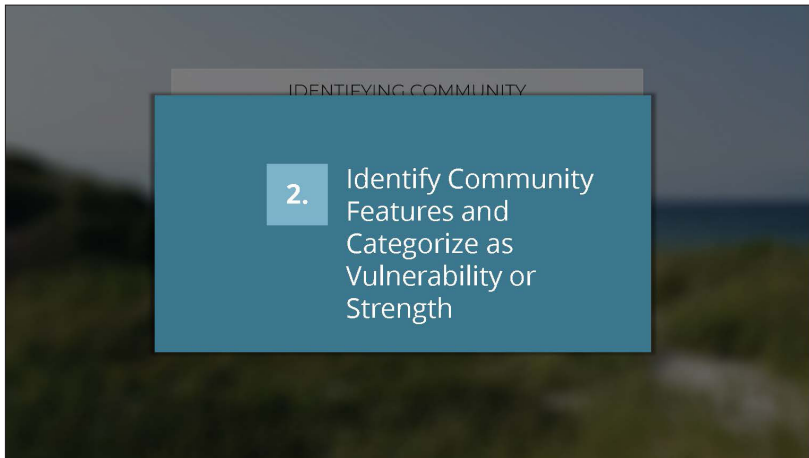
- 9:00 Registration
- 9:15 Workshop Overview and Introductions – Sam Haines
- 9:20 Review of Hazards, Vulnerabilities, Strengths – Erin Perry
- 9:35 Review of Morning Workshop Goals – Shannon Hulst Jarbeau
- 9:50 Small Team Exercise
 - Discuss and Identify Actions
 - Identify Priority and Urgency of Actions
 - Prepare for Report Out
- 11:20 Break
- 11:35 Small Teams Report on Top Actions
- 12:05 Dot Exercise
- 12:20 Summary Discussion – Compile Top Actions
- 12:50 Wrap Up and Next Steps
- 1:00 Adjourn

Review of Hazards, Vulnerabilities, and Strengths

Erin Perry, Deputy Director
Cape Cod Commission



1. Identify Top Community Hazards



IDENTIFYING COMMUNITY

2. Identify Community Features and Categorize as Vulnerability or Strength

WORKSHOP PRESENTATION

VULNERABILITIES



INFRASTRUCTURE

To be filled in



SOCIETAL

To be filled in



ENVIRONMENTAL

To be filled in

STRENGTHS



INFRASTRUCTURE

To be filled in



SOCIETAL

To be filled in



ENVIRONMENTAL

To be filled in

What's Next for MVP?

Shannon Hulst Jarbeau, Floodplain Specialist
Woods Hole Sea Grant & Cape Cod Cooperative Extension



Sources of Available Grants

- Municipal Vulnerability Preparedness (MVP) Program
- Coastal Zone Management (CZM) Program's Coastal Resilience Grant Program
- FEMA's Hazard Mitigation Grant Program
- Others





MVP Action Grants

- Detailed Vulnerability and Risks Assessment Further Planning
- Community outreach and education
- Local Bylaws, Ordinances, Plans, and Other Management Measures
- Redesigns and Retrofits
- Energy Resilience Strategies
- Chemical Safety and Climate Vulnerabilities
- Nature-Based Flood Protection, Drought Prevention, Water Quality, and Water Infiltration Techniques
- Nature-Based Infrastructure and Technology Solutions to Reduce Vulnerability to Extreme Heat and Poor Air Quality
- Nature-Based Solutions to Reduce Vulnerability to Climate Change Impacts
- Acquisition of land to achieve a resiliency objective
- Ecological Restoration and Habitat Management to Increase Resiliency



Proposals should address stages

- Planning, feasibility assessment, and siting
- Design
- Permitting
- Construction, installation, and monitoring




MVP Action Grant Details

- One-year timeframe
- \$25,000 - \$2,000,000 for single towns
- Up to \$5,000,000 for regional projects
- Must be used to advance priority adaptation actions identified in MVP reports
- 25% match






CZM's Coastal Resilience Grant Program

- Vulnerability and Risk Assessment
- Public Education and Communication
- Local Bylaws, Adaptation Plans, and Other Management Measures
- Redesigns and Retrofits
- Natural Storm-Damage Protection Techniques




MVP vs CZM

<p>MVP</p> <ul style="list-style-type: none"> • All climate-related issues • Currently open • \$25K - \$2 million • 25% match • If it fits CZM, apply to both programs 	<p>CZM</p> <ul style="list-style-type: none"> • Coastal only • Not open yet • Up to \$500,000 • 25% match • If it fits MVP, apply to both programs
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Small Team Exercise



Small Team Exercise

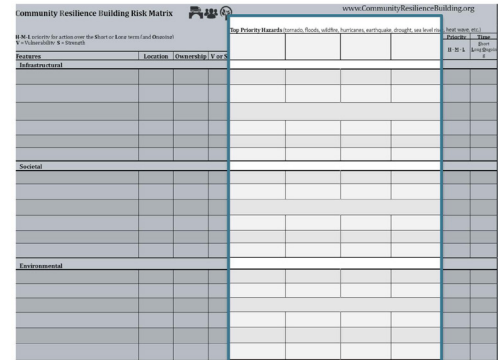
OVERVIEW

- Identify Small Team Spokesperson
- Clarifying questions

EXERCISE

1. Identify Actions to Reduce Vulnerability or Reinforce Strengths
2. Assign Priority and Urgency of Each Action
 - Infrastructure
 - Societal
 - Environmental
3. Identify Top 5 Priority Actions

1. Identify Actions



2.

Assign Priority and Urgency

3.

Identify Top Priority Actions

Small Team Exercise

OVERVIEW

- Identify Small Team Spokesperson
- Clarifying questions

EXERCISE

1. Identify Actions to Reduce Vulnerability or Reinforce Strengths
2. Assign Priority and Urgency of Each Action
 - Infrastructure
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3. Identify Top 5 Priority Actions

Break

Small Teams Report Out

Top Priority Actions



Selecting Priorities: Dot Exercise

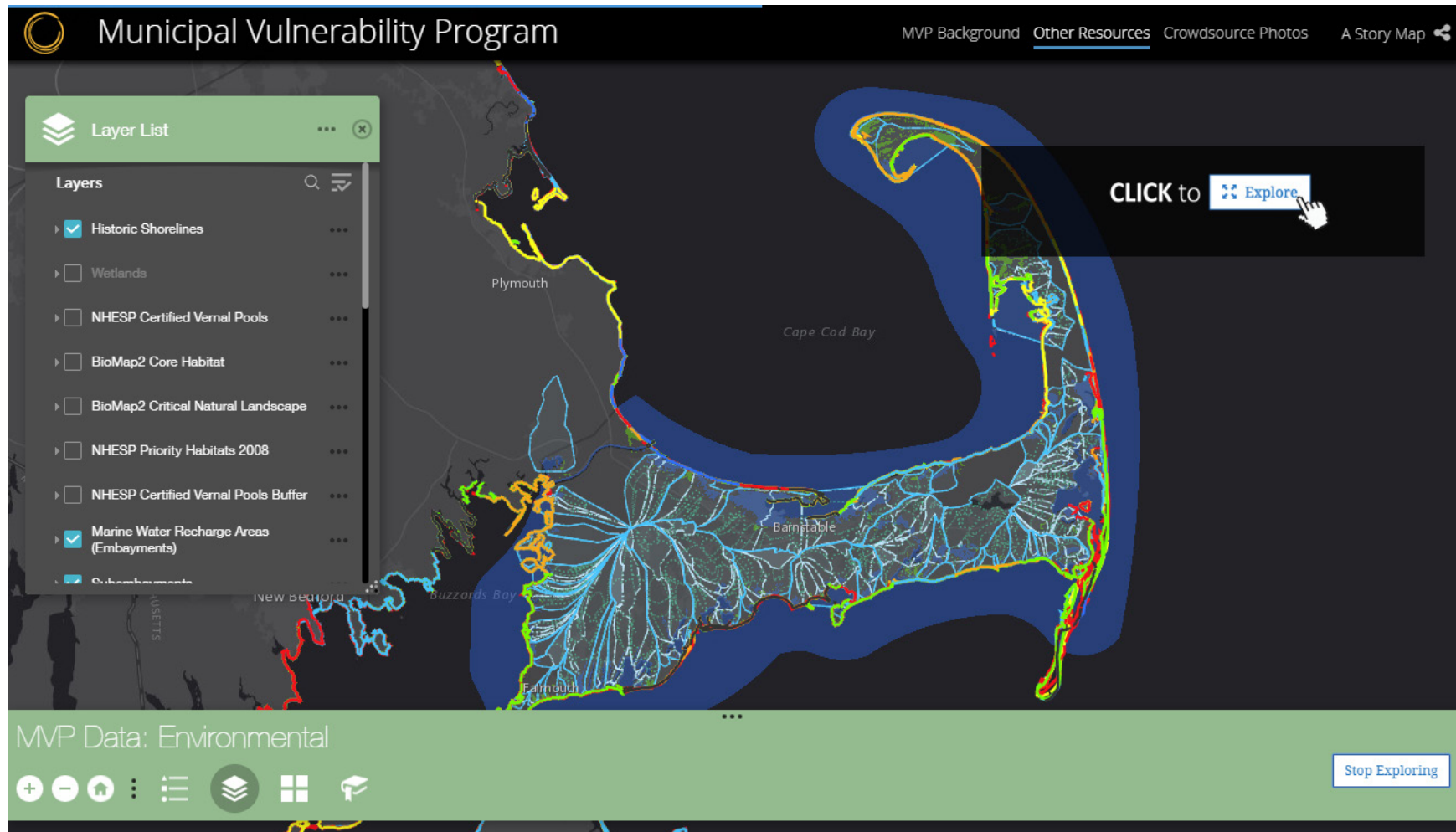


Summary Discussion – Compile Top Actions

Wrap-up and Next Steps



WORKSHOP PRESENTATION



MVP STORYMAP (available at <https://arcg.is/1CX4K9>)



**BOURNE COMMUNITY RESILIENCE BUILDING WORKSHOP
DRAFT SUMMARY OF FINDINGS
MAY 2019**



**CAPE COD
COMMISSION**

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