Town of Carlisle

Community Resilience Building Workshop Summary Report

Draft, June 15, 2021

ACKNOWLEDGEMENTS & CREDITS

This MVP Report was prepared for the Town of Carlisle by the Metropolitan Area Planning Council (MAPC) under the guidance of the Massachusetts Executive Office of Energy and Environmental Affairs (EEA). The project was funded by a Municipal Vulnerability Preparedness (MVP) planning grant from EEA.

MAPC Officers

President, Erin Wortman, Town of Stoneham
Vice President, Adam Chapdelaine, Town of Arlington
Secretary, Sandra Hackman, Town of Bedford
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Executive Director, Marc Draisen, MAPC

Credits

Project Manager/Lead Planner: Martin Pillsbury
Mapping/GIS and Data Services: Caitlin Spence, Alyssa Kogan

Massachusetts Executive Office of Energy and Environmental Affairs

Secretary: Katie Theoharides
MVP Northeast Coordinator Michelle Rowden

Carlisle Hazard Mitigation and Municipal Vulnerability Preparedness Core Team

Madeleine Blake	Co-chair, Carlisle Planning Board; MVP Core Team Coordinator
Gary Davis	Carlisle DPW Supervisor
Rosemary Duda, MD	Community Volunteer
Linda Fantasia	Health Agent
John Golis	Community Volunteer
Steve Hinton	Municipal Facilities Committee, Open Space Committee
Navneet Hundal, MD	Conservation Commission board member
Sylvia Willard	Conservation Administrator

Carlisle Participating Officials

Chief Bryan Sorrows	Carlisle Fire Chief
Chief John Fisher	Carlisle Police Chief
Jon Metivier	Building Commissioner

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1 OVERVIEW OF THE CARLISLE MVP PROJECT

Recent years have seen notable weather extremes in Carlisle and the surrounding region. The record rainfall of April 2010 resulted in a disaster declaration across the Commonwealth of Massachusetts. The winter of 2015 brought record-breaking snow of 110 inches. The following year, the Town and the region was under a drought warning from July to December 2016, the most severe since the 1980s. The winter of 2018 once again brought severe winter storms, including severe nor'easters in January and March, also resulting in a state disaster declaration. Globally, the years 2014 through 2020 were among the hottest years on record.

In 2017, the Commonwealth of Massachusetts inaugurated the Municipal Vulnerability Preparedness (MVP) program to assist municipalities in planning for and implementing strategies to adapt to predicted changes in our warming climate. The predicted changes include both increased flooding from large rain events and a greater likelihood of drought, increased extreme heat days and heat waves, and increased flooding from sea level rise.

The Town of Carlisle, in continuing its proactive efforts to address climate threats, received a state MVP Planning Grant to conduct a Community Resilience Building (CRB) Workshop. The Town also needed to update its FEMA Hazard Mitigation Plan, which was completed in 2012, so this was also included in its MVP Planning Grant. Upon completion of the MVP program, Carlisle will be eligible to apply for MVP Action Grants state grants to address identified climate risks, as well as FEMA hazard mitigation grants to implement projects that reduce the community's vulnerability to natural hazards. As a companion volume to this Carlisle MVP Report, a Carlisle Hazard Mitigation Plans 2021 Update has been completed and will be submitted to the Massachusetts Emergency Management Agency (MEMA) and FEMA for review and approval.

The Town of Carlisle partnered with the Metropolitan Area Planning Council (MAPC) to complete the MVP program and the Hazard Mitigation Plan. The Town designated an MVP/HMP Core Team, coordinated by Madeleine Blake, Co-Chair of the Carlisle Planning Board. The Core Team identified and recruited community stakeholders to participate in the CRB Workshop. Thirty-four people representing Carlisle Town staff, Town Boards and Commissions, community organizations, and regional partners participated in a virtual CRB workshop via Zoom on March 27, 2021 (see Workshop Participants, page 19). The Workshop's central objectives were to:

- Understand extreme weather and climate related hazards
- Identify existing and future strengths and vulnerabilities
- Develop and prioritize opportunities to take action to reduce risk and build resilience

Materials provided for the CRB Workshop included local and regional data on changes in temperature, precipitation, and drought, as well as future projections to the end of the 21st century. Maps and infographics provided data and mapping specific to Carlisle's infrastructure, demographics, and natural resources (see Appendix A). The Workshop participants considered Carlisle's strengths and vulnerabilities, focusing on three categories: infrastructure, society, and the environment. Working in four small group and then together as a large group, the workshop participants identified and prioritized actions designed to increase Carlisle's resilience to future extreme weather events.

2 TOP HAZARDS AND VULNERABLE RESOURCES

The Carlisle Core Team identified the top natural hazards for the Town. Based on the concurrent work on the Hazard Mitigation Plan and review of Workshop materials, the Team identified flooding, severe storms (wind, snow, ice), drought, and extreme heat as the climate hazards of greatest concern to Carlisle. As mentioned above, flooding, drought, and severe storms have all affected the Town in recent years. Considering the Town's demographics, the Team also included extreme heat as a top hazard.

Top Hazards

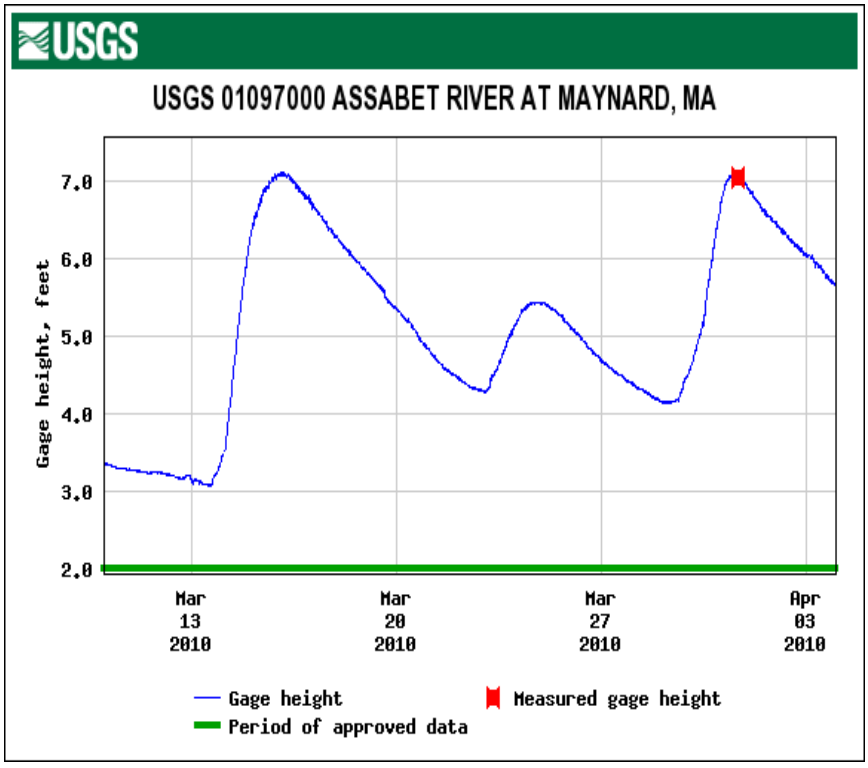
- Flooding
- Severe Storms
- Drought
- Extreme Heat

3 CURRENT CONCERNS AND CHALLENGES

Carlisle workshop participants noted the increasing frequency and intensity of storms, including nor'easters that bring damaging winds and snowfall and heavy rain events. The principal challenges of the nor'easters are the threat of power outages from falling trees and limbs, as well as travel restrictions due to heavy snow. Large rain events result in flooding in several locations; the Hazard Mitigation Plan identifies about two dozen of these areas of local flooding.

The most significant recent flooding event occurred in March 2010, as shown in Figure 1, when local rivers River exceed flood stage for a sustained period of 20 days.

Figure 1: Assabet River USGS Gage Height, March 2010



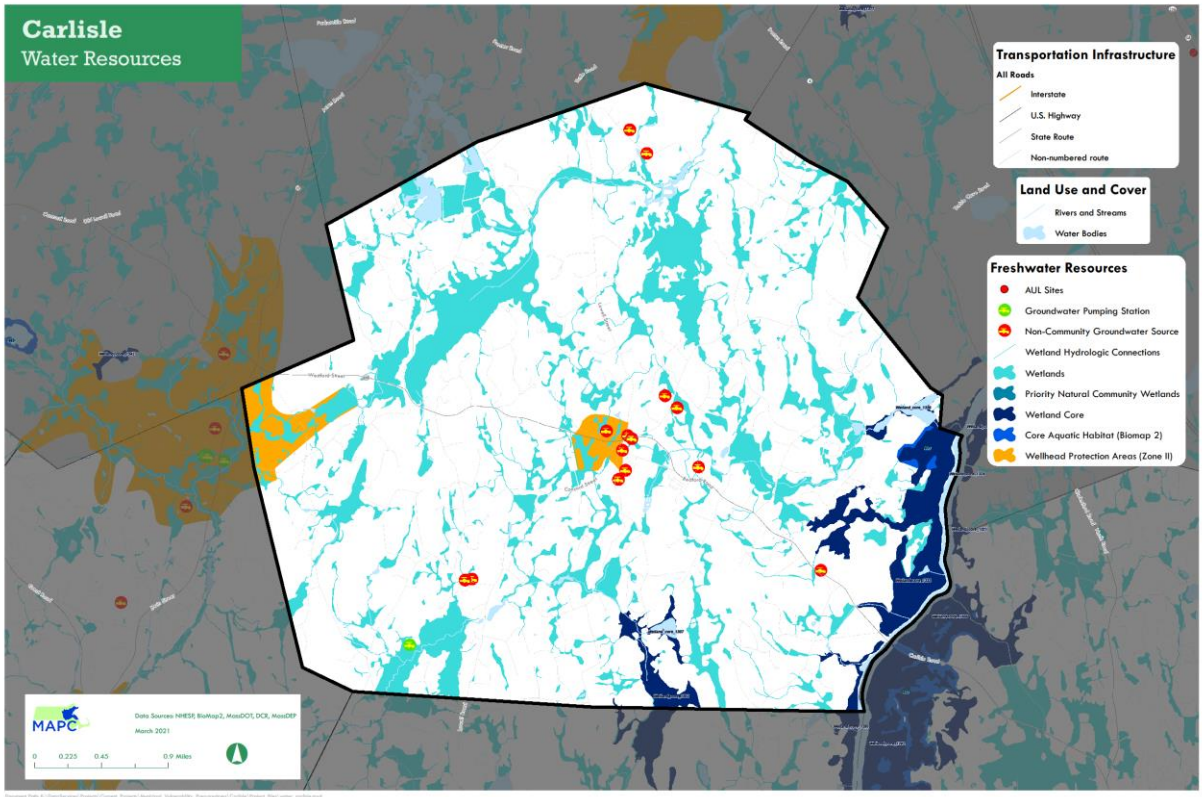
As these issues are not new, the Town of Carlisle has taken steps to prepare for extreme weather and prevent harm to people and property through its emergency management activities and its FEMA Hazard Mitigation Plan, which was completed in 2012 and is being updated as part of this MVP project. Workshop participants shared concerns that climate projections will heighten current challenges and elevate new concerns, particularly power outages, water supply, and public health issues related to high heat.

4 AREAS OF CONCERN

Infrastructure

The Town of Carlisle relies on groundwater for all of its water supply needs. Private wells are located throughout the Town, and while there is no public water distribution system, there are several small "Non-Community" groundwater sources, and two small Wellhead Protection Zone II areas (Figure 2). There is no centralized collection and treatment of wastewater; all wastewater is treated on-stie by Title 5 septic systems..

Figure 2 Carlisle Water Resources

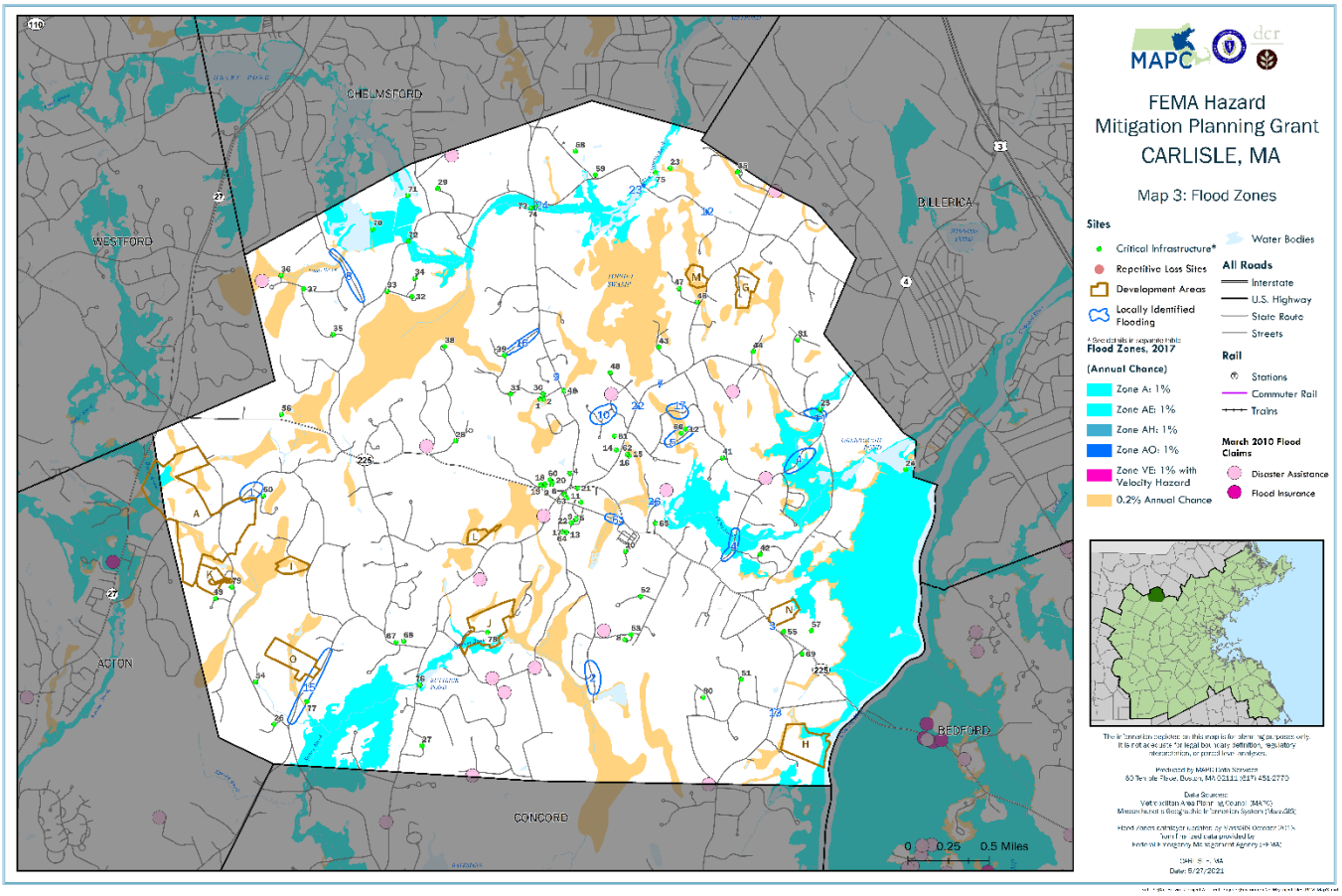


Although the FEMA Flood Insurance Rate Map shows some significant areas of Carlisle within flood hazard zones for the 1percent chance of flooding, or "100-year" flood hazard areas (areas in blue in Figure 3), as well as 0.2 percent chance, or "500 year" flood hazard areas (areas in yellow in Figure 3.

Carlisle has a very limited amount of development in these flood hazard zones due to its protective land use regulations and large amount of protected open space. As a result, its vulnerability to significant flooding is much less than many other communities in the region.

However, the Core Team identified several areas of concern for localized flooding, mostly in roadways related to culverts and drainage, also shown on Figure 3 as sites delineated with blue boundaries.

Figure 3: Carlisle FEMA Flood Hazard Areas



Societal

Vulnerable populations identified include seniors, people living alone, and low-income residents. Like most area towns, the population of senior citizens is expected to increase over the next several decades in Carlisle. The percentage of those over 65 nearly doubled from 1990 to 2010, and it projected to more than double again from 2010 to 2030, reaching 28% in that year (Figure 4).

About 12 percent of Carlisle residents live alone, and 40 percent of those, are over age 65 (Figure 6). Many of these residents may be more susceptible than the general population to power outages and to extreme heat than the general population, which may occur more frequently in the future due to climate change.

English language proficiency is not a significant issue in Carlisle. Fifteen percent of households speak a language other than English at home, but only one percent do not speak English very well (Figure 5).

Figure 4 Carlisle Population by Age

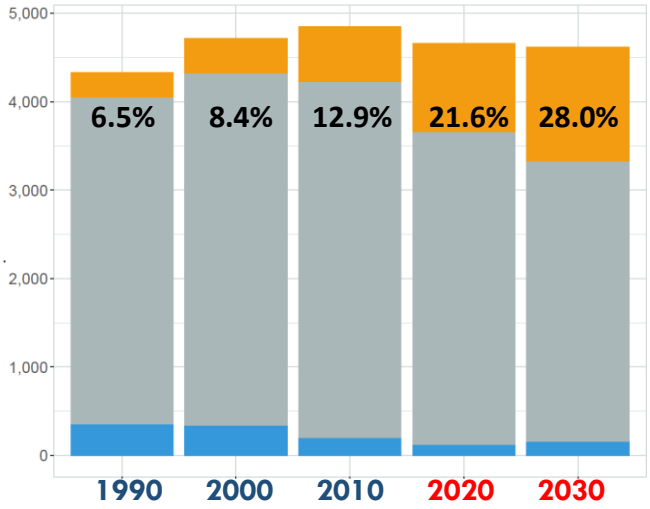


Figure 5 English Proficiency

Figure 6 People Living Alone in Carlisle

Environmental

Among the Town's greatest assets are its protected open space and wetlands, and its significant forest cover (see Figure 7), which at about 70percent, is one of the highest in the MAPC region.

However, the large number of trees is both an asset and a potential vulnerability to hazards such as wind, ice, and invasive species. A major concern for Carlisle is managing the town's trees to reduce power outages and mitigating the impacts of climate change on the health and composition of the Town's forests.

The Town of Carlisle is located in the Concord River watershed, downstream of the river's two major tributaries, the Assabet River and Sudbury Rive. The Concord River forms the eastern border of Carlisle with the Town of Bedford. This section of the Concord River includes part of the Great Meadows National Wildlife Sanctuary, and the town has significant areas of high value aquatic. The state's Biomap 2 identifies Core Habitat, Core Aquatic Habitat, and Critical Natural Landscape areas, particularly in the eastern part of Carlisle (Figure 8).

Figure 7: Carlisle Tree Canopy Cover

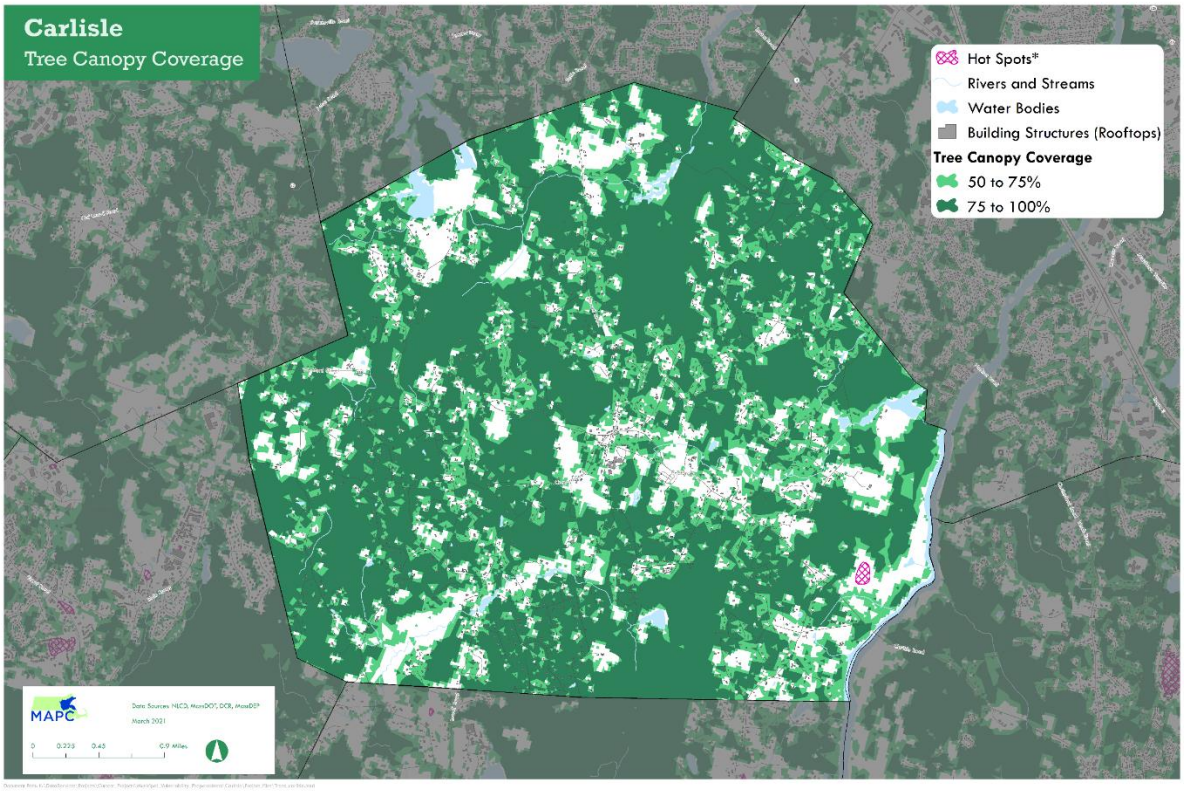
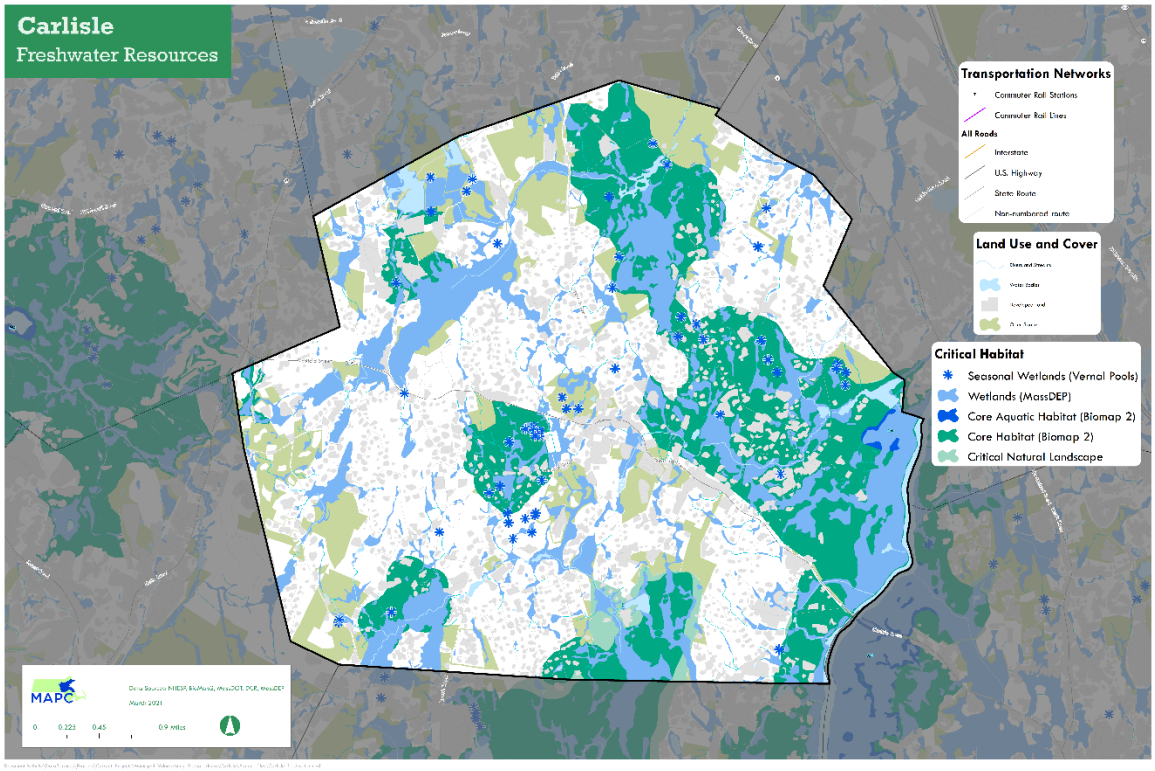


Figure 8 Carlisle Freshwater and Aquatic Habitat Resources



Impacts of Climate Change

Projected future climate trends pose a significant challenge to the Town of Carlisle. Increasing temperatures will bring an increase in the annual number of days over 90 degrees, which will vary depending on future Greenhouse Gas emissions. From about 10 days per year currently, projections range from 25 to 60 days per year by 2100 (Figure 9). The average temperature by 2100 is projected to increase by a range of 3 to 7 degrees Fahrenheit. The resulting temperature regime by the end of the 21st would make the Massachusetts climate equivalent to today's climate in Virginia under the lower GHG emission scenario, and similar to the Carolina if higher GHG emissions continue to the end of this century (Figure 10).

Figure 9: MA Temperature Projections

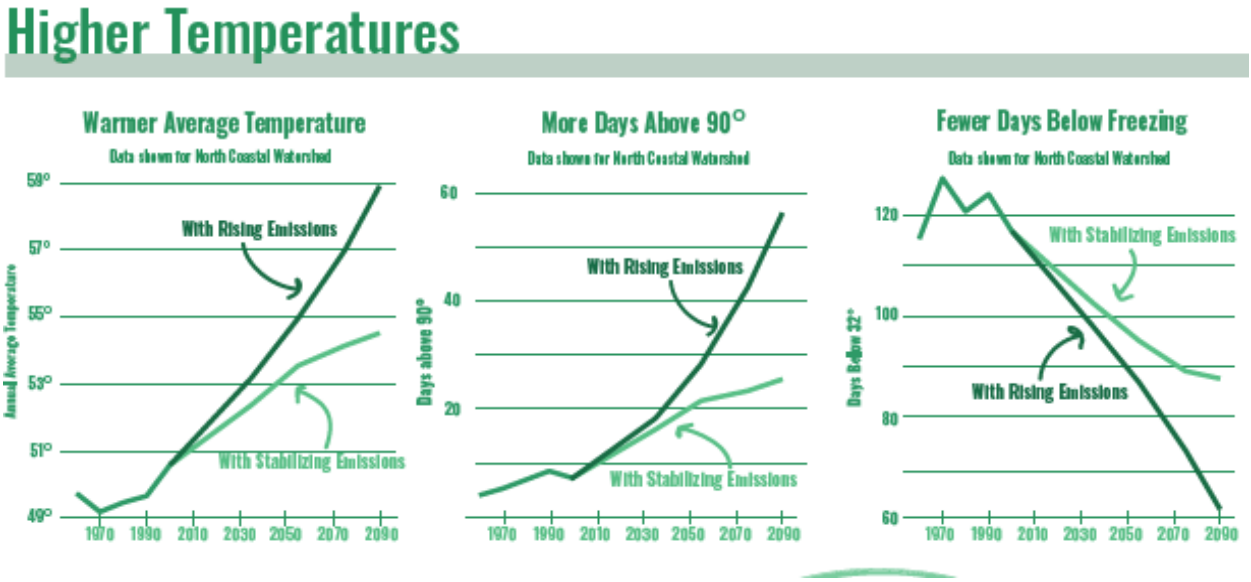


Figure 10: MA Future Heat Scenario

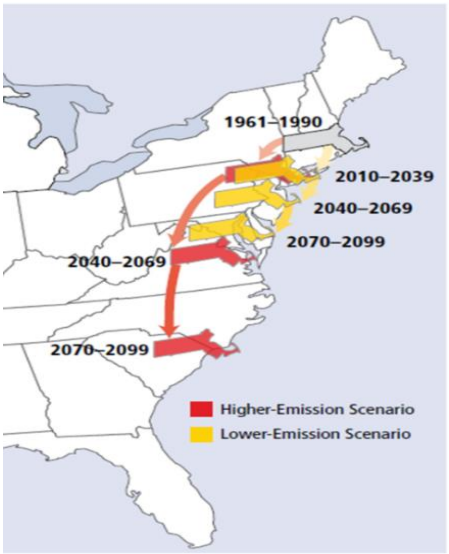
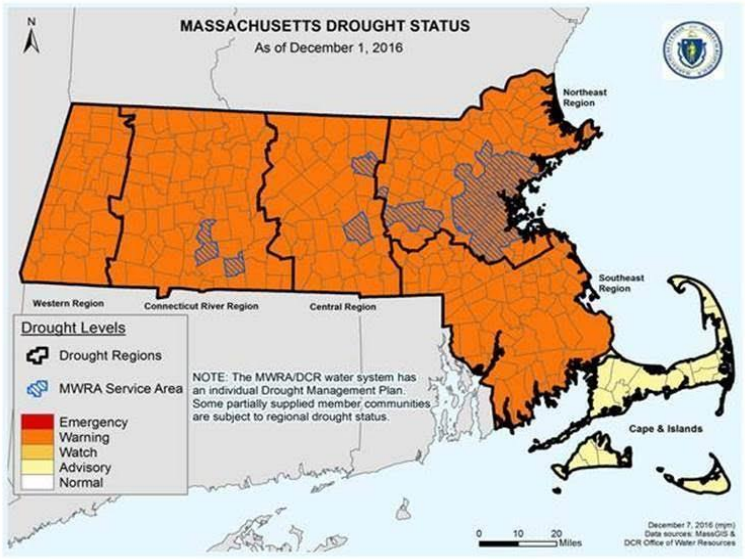
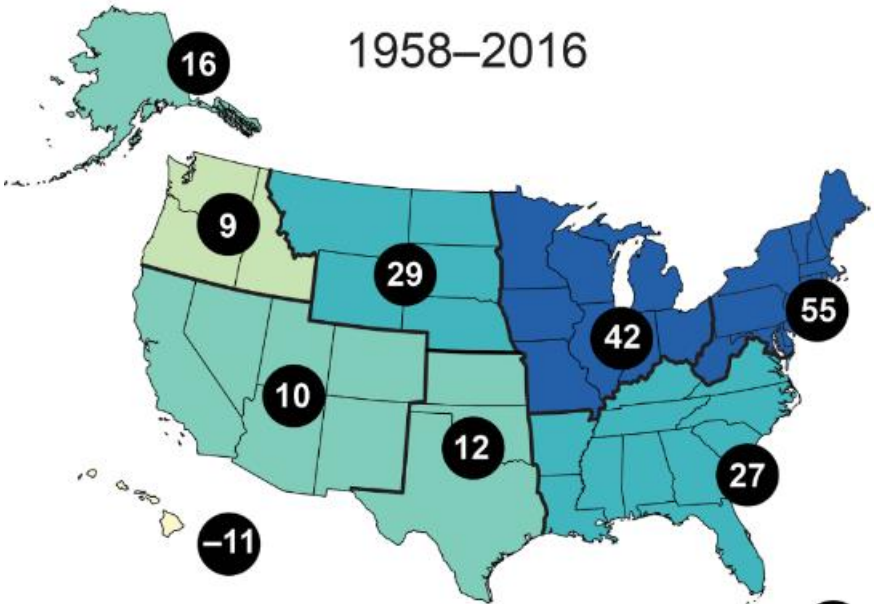


Figure 11: MA Drought of 2016



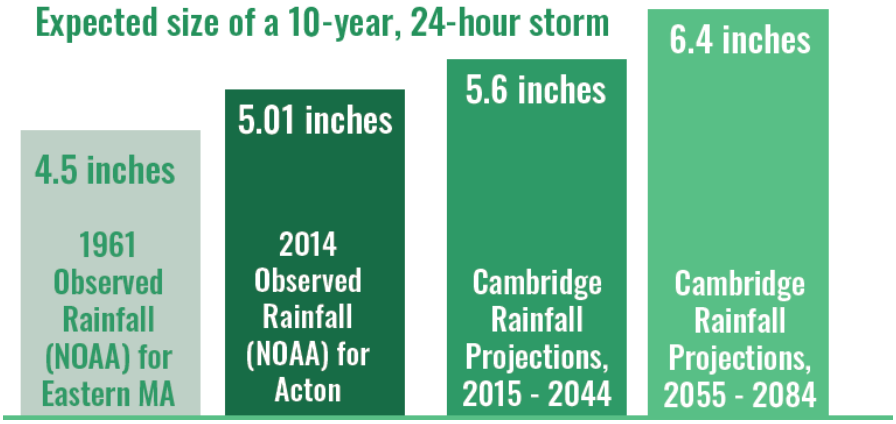
Climate change also brings changes in precipitation patterns. From 1958 to 2016, the northeast and mid-west regions have experienced a 55% increase in the amount of rain that falls in the top 1% events (Figure 12).

Figure 12: Increase in Intense Precipitation, 19458-2016



The projections for the Concord River watershed are that average annual rainfall will increase by 10 percent, but more importantly, the trend is for an increase in the size and intensity of storms. The typical 10-year 24-hour storm, which historically yielded 4.5 inches of rainfall before the 1960s, has already increase by 0.5 inches to 5.01 inches, and could increase to 6.4 inches by the end of the century according to projections prepared by the City of Cambridge for Eastern Massachusetts (Figure 13). This is considered to be the "design storm," or the bench-mark storm used to determine the design and size of many stormwater management facilities installed on development sites as well as public infrastructure. Facilities designed to accommodate yesterday's intense storms, or even today's, will likely be inadequate in future decades according to the climate projections.

Figure 13: Projected 10-Year, 24 Hour Storms



5 CARLISLE CRB WORKSHOP RESULTS

The Carlisle CRB Workshop was attended by 34 participants representing various town boards, commissions, and staff, as well as community stakeholders from a wide range of interests. The participants worked in five smaller table groups of about eight each, to first identify the town's strengths and assets with respect to the impacts of climate change. In a second session, the table groups developed proposed actions to address the Town's vulnerabilities and strengthen the Town's resilience.

CURRENT CARLISLE STRENGTHS AND ASSETS

Workshop participants identified numerous Carlisle strengths and assets that will provide resilience to future climate impacts. As shown below, identified Town many diverse strengths include its large amount of forest cover, wetlands, and open space, strong local organizations (Council on Aging, Fire Department, churches, etc.), local farms, and senior housing. The full list of identified strengths and assets follow:

Infrastructure

- Emergency services dept, town hall, school.
- Library - Reliable internet. Parking lot has reliable internet.
- Carlisle is one of the few towns that has an on-call fire department. Strength is that it costs less than any other town. No fire hydrants - bodies of water and cisterns for fires. Very specialized system to address fires.
- Trail system, 55 miles, new vernal pools, strength -non-car transit, COVID resource
- Farmland - food infrastructure, lack of maintenance of drainage system/ditches - fields under water, increased rainfall concerns, also drought. Private and state-owned farmland.
- good road plowing mgmt.
- Country road system - in pretty good shape
- Pathways that lead from center of town - walking, recreation - kids biking
- Concord Street: high priority, access to hospitals
  East Street; often have to close when get bad ice storms, tree fall.
- Carlisle Public School: designated emergency shelter; sufficient as cooling center but only part of the school is air conditioned.
- Town Hall (not an officially designated emergency shelter)
- Emergency Management Plan (LEPC)*
- Private septic systems
- Renewable Energy Sources: there's a bylaw for RE; need a cohesive outreach program to guide residents about solar opportunities; solar panels over school's parking lot
- Individual wells/septic systems--independent from system-wide challenges
- Water quality is high
- New irrigation policy to protect water supply
- Local farming contributes to regional food supply
- Zoning permits gardening and backyard chickens, which strengthens local food supply; well-used community gardens on Town-owned land

- Self-contained K-8 school within Carlisle on high and dry land; serves as emergency shelter; has a new generator; plans for solar installation; on-site water treatment
- Emerson Hospital is close, and Town has close working relationship. Leahy is the other primary hospital
- A lot of individual homeowners have generators, although this can create dangers and emissions

Society

- Outstanding Council on Aging!
- Three Churches in town - Work with Council on Aging and also the other two churches. Churches are involved in getting prepared for emergencies.
- Local emergency preparedness council - started with COVID and still meeting every week. Covers community groups.
- A lot of people who are willing to volunteer their services. This is good but also always in need of more.
- Churches - Works with Council on Aging and also the other two churches. Churches are involved in getting prepared for emergencies.
- Local emergency preparedness council - started with COVID and still meeting every week. Covers community groups.
- A lot of people who are willing to volunteer their services. This is good but also always in need of more.
- Lots of groups that address special interests, but they don't necessarily communicate with each other. No way to get in touch with everyone in town. No way to reach everyone without being in alarm.
- Local newspaper - goes to everyone in town!
- Neighborhood - ad hoc groups existed; help each other with snow blowers, organizing. Neighborhoods of shared interests. Some newer neighborhoods have associations, but older ones do not.
- Cheer project - Helped organize Halloween be in neighborhoods. Gotten people outside.
- Interfaith council; been hard to mobilize with COVID.
- General atmosphere in town is one of caring and friendliness and many people want to help and get involved.
- Library organized activities that reaches multi-generational audience. Closest thing to a community center! Knitting groups, children's activities.
- Schools - structures of school's management wise is very strong. Great place to disseminate to a large number of people very quickly.
- Senior Low-income housing two locations - easier to provide assistance when there is an emergency
- Tull property and group home provide services to disabled -good for centralized services
- COA did amazing job putting together a list of vulnerable seniors, not just seniors -also provides housing supports, fuel assistance
- COA provides transportation, subsidized Lyft program, terrific volunteer network
- All-volunteer neighborhood response team, doing shopping, etc. Very strong volunteer ethic in the community

- Police and fire - know who is vulnerable look out for them - good coordination with the COA/ fire department keeps list and shares
- Outreach to people to can't access internet etc./ don't speak English. COA works on this
- Group homes - Bedford Road; Brooks Street
- Elderly housing - strong volunteer network to support the elders who live alone; increasing demand for in-home medical services; town program/Bryan (fire chief) has a notebook of folks to check in on; residents can participate in the "Are You Okay" program to get wellness check calls
- Childcare facilities/services
- Volunteer system - awesome set up, but worry about continuity/long-term staffing
- Volunteer engagement; culture of volunteerism
- Technical expertise/knowledge of volunteers is high
- Strong Council of Aging, including outreach
- Remote work may allow new residents to be more involved in Town (ex. No or less time spent commuting)
- Remote meetings make it easier for some to participate
- Nice trail system, which helps connect people to each other and to the land. Promotes appreciation of the open space and environmental impacts
- Carlisle Neighborhood Response team

Environmental

- Trees - help with carbon, keep us cool.
- Conservation lands - Helps with wildlife. During COVID lots of use. Most part people are protective, but dogs are not the best. A lot of conservation lands are along Concord River so it's not highly developed. Less flood damage.
- Pervasive wetlands - heavy rains and the water rises. Keeping wetlands manages to help with flooding and infiltrate well water. Helps with wildlife.
- Tree cover forested land
- Solar - great work on saving town $ - and private -more could be done to reduce energy consumptions and heat pumps
- Wildlife and biodiversity - is a strength of the town - temp and precipitation change will threaten amphibians particularly
- Active garden club - sustainable focus + education, big community garden plot, homeowner gardeners - conscious of environmental practices
- Clark farm - huge asset, organically run, CSA, education program
- Transfer station - food waste composting is a good program, but Carlisle has a relatively high level of solid waste
- Great Book Farm State Park
- Banta-Davis Land: recreation field
- Foss Farm
- Malcolm Preserve/Davis Corridor
- Towle Land
- Conant Land (not official conservation land) - where Fire station/town hall are
- Concord River

- Bisbee Field/Hartwell Meadow (trail)
- Town Forest
- Pines State Forest
- Great Meadows National Wildlife Preserve
- Conservation land
- Trails (up to 60 miles)
- Wetland Hazard District
- Clark Farm (local CSA)
- Agricultural land uses (ex. Hayfields, cornfields, a couple of crop fields)
- Large areas of vegetated open space, including forest and wetlands, help reduce extreme heat impacts, impacts from large rainfall events, filter water for improved quality, and carbon sequestration.
- Some local bylaws help protect vegetated open space from development
- Large areas of healthy habitat
- Nice trail system attracts many visitors from out of town.

TOP RECOMMENDATIONS TO IMPROVE RESILIENCE

Each of four workshop groups prioritized their proposed actions as High, Medium, or Low and put forward their five highest priority actions, for a total of 20 actions across from all four tables. Several of the priority actions from various table groups were the same or very similar, so these were grouped together for purposes of voting for the top priority actions. Following the virtual workshop, participants were invited to select their top three priorities from among these actions in an online Qualtrics survey. A review of the final participant voting reveals several actions that garnered significantly more support than others, including water management, farms, water quality testing and education, and energy efficiency, all of which received 10 or more votes in the survey. The actions identified as highest priorities are listed below in order of the number of votes they received. The full list of all actions identified by the workshop at every priority level is shown in the following section.

Top Priority Actions from the CRB Workshop	Votes	Percent
• **Water resources**: Water ban days, night watering; conduct more regular testing of drinking water wells (via Board of Health) and more tracking over time to see which properties have changed water quality; help educate residents on monitoring water use, or maybe install more technology; consider well zoning, plan and protect well areas; update well standards (how deep wells should be) and check existing ones; work with schools to start education around this topic; develop agreements with local towns on aquifer use	**12**	**46%**

• **Support farms:** Protect farmland and food supply through supporting economic viability of farms; partner with the Town to supply the' school food program; address drainage issues; review bylaws to reform any that have negative impacts and amend to better support agricultural uses.	**11**	**42%**
• **Water quality testing and pollution education**: Reintroduce the voluntary well water testing program with stronger promotion/marketing, in conjunction with the education about individual wells/septic; research benefits/risks of pesticide regulation; conduct public education about water conservation, dumping, etc.	**11**	**42%**
• **Energy efficiency:** Develop an educational program to help weatherize and improve energy efficiency and resiliency of residential homes; encourage the installation of solar energy and heat pumps.	**10**	**38%**
• **Address emergency shelter needs:** Research potential options for self-generated and independent power supply; need a place that also provides beds/place for sleeping; improve the showers at school to improve access/adults; better leverage Town Hall in emergencies--it's comfortable and welcoming but doesn't have a generator.	**7**	**27%**
• **Power outages:** Research options for strengthening resilience to power outages (such as partnering with Concord, etc.)	**6**	**23%**
• **Culverts:** Conduct an assessment of culverts (including beaver activity); identify and rightsize culverts to minimize roadway vulnerability, accommodate increasing precipitation volume, and support wildlife crossing.	**6**	**23%**
• **Land and forest management**: Develop a land and forest management plan; coordinate with landowners and other key stakeholders including state, municipal, private landowners.	**6**	**23%**
• **Tree management:** If trees are near wetlands use the Conservation Commission's Tree Removal Policy, this policy is evolving and in progress; reintroduce native species to town (very expensive); conduct more constant monitoring/maintenance of invasive species (includes trees) along roadsides (West Street, lots of Oriental Bittersweet), address impacts of deer and beavers.	**5**	**19%**
• **Roads:** Upgrade design specifications for new roads; create a list of the most vulnerable roads to prioritize upgrades; coordinate with Emergency Preparedness Council; the CIP may need to prioritize roads, especially main arteries in and out of town; drainage basins need to be addressed to avoid ice ponds, backed up roads.	**4**	**15%**

• **Gas leaks:** Conduct a multi-town effort to address gas leaks; they are being ignored and they need to be fixed! Need to be classified as a gas leak, it is a threat to public safety.	**4**	**15%**
• **Wells and septic systems:** Conduct a public outreach program on managing septic systems and well water use.	**3**	**12%**
• **Build new facilities for Police and Fire Departments** to accommodate the workforce	**3**	**12%**
• **Improved communication**: Update the emergency call system to include cell phones and landlines; Improve Town communication before weather events; coordinate with the schools to create redundancy in Town communications; conduct stronger outreach/promotion of Town's opt-in communication strategies.	**3**	**12%**
• **Improve connectivity in the community**: Designate neighborhood reps to establish communication across town (through fun avenues like neighborhood party kits).	**3**	**12%**
• **Create social gathering spots:** Develop community gathering spaces and expand Council on Aging.	**3**	**12%**
• **Water inventory:** Create a GIS database to inventory and assess water availability (including seasonable availability of natural sources) for firefighting	**3**	**12%**
• **Support seniors:** Explore additional resources and services to support the growing senior population (staffing, financial, etc.)	**2**	**8%**
• **Create a town chipping service**	**1**	**4%**
• **Upgrade the Route 225 bridge:** Upgrade the bridge to support essential services/emergency equipment (fire trucks, etc.), and maintain access in and out of town.	**1**	**4%**

6 SUMMARY OF ALL ACTIONS BY PRIORITY

All actions developed by the Carlisle Community Resilience Building Workshop are listed here, organized by priority and category (Infrastructure, Society, and Environment):

High Priority

HIGH PRIORITY--INFRASRUCTURE

- Roads are critical importance because we need them in the case of an emergency. Raising crossings, bridges over culverts is going to be very important. Design specifications for new roads; review and revise of what we have. Need a list of roads that are the most vulnerable to prioritize upgrades and repairs (DPW might have a list) -- coordination between emergency preparedness council. Culverts - Can't widen them because it might cause downstream damage, so they need to be engineered and look towards future conditions. CIP might need to prioritize roads along with buildings. Main arteries coming in and out of town need to be prioritized.
- Drainage basin needs to be addressed to avoid ice ponds, backed up roads (older designs) - upgrade designs
- Water ban days; Night watering; Health department is responsible for monitoring quality of water we drink. Need more regular testing of drinking water (via Board of Health) via wells and more tracking over time to see which properties might have changed in water quality; Agreement with local towns that there is over aquifer use; Help educate around monitoring water use at the individual use, or maybe install more technology; Maybe well zoning, plan and protect areas; Update well standards (how deep it should be) and check existing ones; Work with schools to start education around this topic
- Multi-town effort to address gas leaks; They are being ignored and they need to be fixed! Need to be classified as a gas leak, it is a thread to public safety
- Bring transformer down to ground level and house it in a structure and bury the wires
- Ask fire department if the tinder on the ground is flammable; Community could chip away it and prioritize scenic byways and involve boy scouts
- Roads are critical importance because we need them in the case of an emergency. Raising crossings, bridges over culverts is going to be very important. Design specifications for new roads; review and revise of what we have. Need a list of roads that are the most vulnerable to prioritize upgrades and repairs (DPW might have a list) -- coordination between emergency preparedness council.
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- Drainage basin needs to be addressed to avoid ice ponds, backed up roads (older designs) - upgrade designs.

- Farmlands can maintain ditches; bottleneck happens because private property owners can't do the same. Consult w/ the Conservation Commission about what management can be permitted. Perhaps consult with BOH. Support local ag, it's an important resource.
- Study on dam complete, plan done, - ready for funding request. Fund it or find resources to fund. Consider the Dam and seawall fund , MVP. FEMA may not be quick enough for the need
- Education about the shared aquifer, investigate strategies to reduce water use during droughts - e.g., lawn watering restrictions., outreach to residents about water conservation - consider incentives/funding sources. Consider investing in public water supply in specified locations.
- Public education on septic system maintenance,/ may be helped by drainage maintenance. Ask BOH to consider impacts of rising water table, possible funding assistance for retrofits/ take advantage of existing underutilized waste treatment system.
- Upgrade Route 225 bridge to support essential services/equipment (fire trucks, etc.), and maintain access in and out of town.
- Conduct an assessment of culverts (including beaver activity) - Identify and rightsize some culverts to minimize roadway vulnerability, to accommodate increasing precipitation volume, and to support wildlife crossing.
- Build new facilities for Police and Fire Departments to accommodate the workforce. (H, S)
- Expand energy redundancy/back-up storage systems for municipal facilities. Explore renewable energy options (including existing solar systems) for these systems.
- Weatherize and improve energy efficiency and resiliency of residential homes.
- Create a GIS database to inventory and assess water availability (including seasonable availability of natural sources).
- Install additional cisterns.
- Explore funding to repair and/or maintain dams.
- Assess risks and vulnerabilities of habitats at Greenough Dam.
- Reintroduce the voluntary well water testing program with stronger promotion/marketing, in conjunction with the education about individual wells/septic systems.
- Research benefits/risks of pesticide regulation.
- Education about water conservation, dumping, etc.
- Address emergency shelter needs.
    - Research potential options for self-generated and independent power supply
    - Need a place that also provides beds/place for sleeping.
    - Need to improve the showers at school to improve access/adults
    - Better leverage Town Hall in emergencies--it's comfortable and welcoming but doesn't have a generator
- Research options for strengthening resilience to power outages (ex. Partnering with Concord and other options)

HIGH PRIORITY--SOCIAL

- Update list - More broadly each neighborhood can establish a point of contact for outreach across the community (neighborhood captains, representatives)
- Possible avenue for broader communication across town; Neighborhood party kit (thinking about large tent that was bought for COVID) and town supports this effort - it's fun but it's an essential tool for emergencies
- Create gathering spots - community center. Ask Master Plan steering committee to engage with these issues. Add space to COA for a place to gather -need a town pub
- Explore additional resources and services (staffing, financial, etc.) to support the growing senior population.
- Improve access to internet, especially for older subdivisions
- Continue to support and convene Carlisle Neighborhood Response team

HIGH PRIORITY--ENVIRONMENT

- If trees are near wetlands use the CC's tree removal policy, in the process this policy is evolving and in progress. A structure that is not near wetlands (more than 100 feet away) then you do not need to talk to the CC.
- Consult with the Fire dept. about plans they have, the potential for future issues. Review with the Fire Dept. overall concerns about future availability of water for firefighting. Consider funding needs.
- Reintroduce native species to town (very expensive) - CC is requiring native species;
- Need more constant monitoring/maintenance of invasives (includes trees)along roadsides (West Street) lots of Oriental Bittersweet; Work with boy scouts to help with maintenance; Work with schools to start education around this topic
- Zone without deer to conduct a study of the impacts of deer that is local and in
- several locations across town; utilize town-wide communication on this topic; work with the state to look at the state park; will require lots of monitoring; maybe start doing research with school students
- Consider town chipping private brush - people could bring brush to driveways, reduce dead understory
- Promote and implement more native pollinators in residential and commercial properties
- Coordinate with landowners (other key stakeholders including state, municipal, private landowners) to develop a land and forest management plan.
- Continue to add more conservation land.
- Support local farms, potentially through partnership with municipal to supply school's food program.
- Help protect farmland through supporting economic viability of farms.
- Review bylaws to reform any that have negative impacts and potentially amend to better support agricultural uses

Medium Priority

MEDIUM PRIORITY--INFRASRUCTURE

- Add to system, linkages from pathways to trails, extend pathways. Additional funding for expansion
- Locations have been mapped - work with electricity supplier to improve access
- Identify needed locations, community support would be needed for additional towers (hasn't been there to date). Good tree maintenance has been done more recently
- Adopt Bylaw that new developments need to have a plan for climate change concerns. Provide guidance on what plans should cover - how to address private drives
- National Grid to consider linking new requests to fixing existing links. Stronger requirements about repair of new gas infrastructure. Consider a Select Board policy
- Conduct an assessment on groundwater.
- Develop a program to test residential groundwater on a regular basis.
- Education/informational materials for new homeowners about considerations of individual wells/septic.
- Follow-up with Emerson to see what their emergency plan is and if it accounts for Carlisle needs.
- Focus road clearing resources on the access to Emerson Hospital. Help coordination between DPW and Eversource. Research other strategies for maintaining roadway access to Emerson Hospital
- Improved communication about forecasted weather events, safety precautions, and emergency response
- Obtain a shared, mobile generator
- Identify causes for the outages.
- Bury power lines.
- Better tree maintenance to prevent outages.
- Communicate with Eversource about the vulnerability of residents and facilities to power outages

MEDIUM PRIORITY--SOCIAL

- Bring all these different groups together regularly to communicate (church hall is happy to host these meetings); Progressive dinners between the churches;
- Recruit more people to town meeting for the entirety of the discussion to engage on other group's issues and move beyond emergency issues -- maybe have breakout groups that select topics that interest them - CHEER Project
- See drainage discussion in infrastructure/ public education on addressing standing water. State mosquito ditch service?
- Already do lots of education, consider widening trails - limit brush adjacent to the trails to reduce risk. Would need community support

- Publicizing availability of the list, develop a strategy for connecting to new people
- Expand volunteer base - outreach to newer residents, recruitment generally. Leverage state help - make that connection w/ MEMA. Strengthen mutual aid relationships w/ surrounding towns
- Ensure a network of people who speak Mandarin
- Use complete streets funding, ride sharing
- Increase transportation resources for more access to services (medical, food, social gatherings).

MEDIUM PRIORITY-ENVIRONMENT

- Identify and focus on problems areas - consider infrastructure fixes. - move utilities below ground
- Cluster housing has helped. Promote more environmental perspective on housing development. Perhaps design standards
- Conduct an assessment of natural resources in town, with consideration of anticipated climate risks.
- Work with Native Plants Trust to implement invasive species treatments.
- Education of homeowners who have open space on their land or are adjacent to open space, including how to appropriately handle invasives and manage habitat
- Research benefits and risks of intentional brush fires (ex Christmas tree pick-up, more limited permits, more education about vegetative waste pick-up, need to destroy invasives, etc.)

Low Priority

LOW PRIORITY-INFRASTRUCTURE

- Putting power lines underground; Eversource/Warwick (contracted) trees are being trimmed already that are close to power lines, but they don't do powerlines that are close to the homes
- Ensure the school has sufficient capacity and equipment, and accessibility to accommodate as emergency shelter.
- Coordinate with Concord (using Carlisle/Concord HS) as secondary emergency shelter for Carlisle residents.

7 CRB WORSHOP PARTICIPANTS

Barney Arnold	Select Board
Madeleine Blake	Chair, Planning Board
Debbie Bentley	Energy Task Force
Tom Brownrigg	CRAC
Christa Collins	Trustees
Nancy Cowan	CRAC and Audubon
Brad Cranston	Carlisle Public School biology teacher
Ro Duda	MVP Volunteer
Linda Fantasia	Health Agent
David Freedman	Carlisle Community Foundation
Kelly Guarino	Carlisle Community Foundation
Carol Grueneich	Carlisle Council on Aging
Amanda Hickman	Carlisle Community Foundation
Steve Hinton	Municipal Facilities, CCF
Navneet Hundal	Conservation Commission
Kerry Kissinger	Master Plan Steering Committee
Mark Lamere	CRAC, Open Space Committee
Christine Lear	School Committee
John Lee	Agricultural Commission
Jerome Lerman	Municipal Facilities Committee
Melinda Lindquist	CRAC
George Mansfield	Planning Administrator
Nick Ognibene	Carlisle Land Stewardship Committee
Kate Reid	Select Board
Bill Risso	Municipal Facilities Committee
Fr. Bill Robinson	St. Irene's/Holy Family Parish
Andrew Rogers	Clark Farms
Dan Scholten	Household Recycling Committee
Cynthia Sorn	The Mosquito
Bryan Sorrows	Carlisle Fire Chief
Christine Stevens	Community volunteer
Lee Stevens	Community volunteer
Sylvia Willard	Conservation Commission
Helen Young	Conservation Commission
Bob Zogg	Energy Task Force

8 CARLISLE MVP PROJECT TEAM

Carlisle MVP Core Team

Madeleine Blake	Co-chair, Carlisle Planning Board; MVP Core Team Coordinator
Gary Davis	Carlisle DPW Supervisor
Rosemary Duda, MD	Community Volunteer
Linda Fantasia	Health Agent
John Golis	Community Volunteer
Steve Hinton	Municipal Facilities Committee, Open Space Committee
Navneet Hundal, MD	Conservation Commission board member
Sylvia Willard	Conservation Administrator

Carlisle Participating Officials

Chief Bryan Sorrows	Carlisle Fire Chief
Chief John Fisher	Carlisle Police Chief
Jon Metivier	Building Commissioner

MAPC Facilitation Team

Van Du	Senior Environmental Planner
Anne Herbst	Senior Environmental Planner
Jennifer Kaplan	Economic Development Planner II
Martin Pillsbury	Environmental Planning Director, Project Manager
Ella Wise	Senior Regional Land Use Planner

CITATION

Metropolitan Area Planning Council. 2021. Town of Carlisle Municipal Vulnerability Preparedness Program. *Community Resilience Building Workshop: Summary of Findings*. Carlisle, Massachusetts

APPENDIX A: TOP PRIORITY ACTIONS

HIGHEST PRIORITY ACTIONS FROM THE WORKSHOP	VOTES %
1. Water Resources Water ban days, night watering; Conduct more regular testing of drinking water wells (via Board of Health) and more tracking over time to see which properties have changed water quality; Help educate residents on monitoring water use, or maybe install more technology; Consider well zoning, plan and protect well areas; \ Update well standards (how deep wells should be) and check existing ones; Work with schools to start education around this topic; Develop agreements with local towns on aquifer use	12 46%
2. Support Farms Protect farmland and food supply through supporting economic viability of farms; Partner with the Town to supply the school food program; address drainage issues; Review bylaws to reform any that have negative impacts and amend to better support agricultural uses	11 42%

3. Water quality testing and pollution education Reintroduce the voluntary well water testing program with stronger promotion/marketing, in conjunction with the education about individual wells/septic; Research benefits/risks of pesticide regulation; Conduct public education about water conservation, dumping,	**11** **42%**
4. Energy Efficiency Develop an educational program to help weatherize and improve energy efficiency and resiliency of residential homes; Encourage the installation of solar energy and heat pumps.	**10** **38%**
5. Address emergency shelter needs Research potential options for self-generated and independent power supply; need a place that also provides beds/place for sleeping; improve the showers at school to improve access/adults; Better leverage Town Hall in emergencies--it's comfortable and welcoming but doesn't have a generator.	**7** **28%**
6. Power Outages Research options for strengthening resilience to power outages (such as partnering with Concord, etc.)	**6** **23%**

7. Culverts Conduct an assessment of culverts (including beaver activity); Identify and rightsize culverts to minimize roadway vulnerability, Accommodate increasing precipitation volume, and support wildlife crossings	**6** **23%**
8. Land and forest management Develop a land and forest management plan; coordinate with landowners and other key stakeholders including state, municipal, private landowners.	**6** **23%**
9. Tree Management If trees are near wetlands use the Conservation Commission's Tree Removal Policy, this policy is evolving and in progress Reintroduce native species to town (very expensive); Conduct more constant monitoring/maintenance of invasive species (includes trees) along roadsides (West Street, lots of Oriental Bittersweet), Address impacts of deer and beavers.	**5** **19%**
10. Roads Upgrade design specifications for new roads;	**5** **19%**

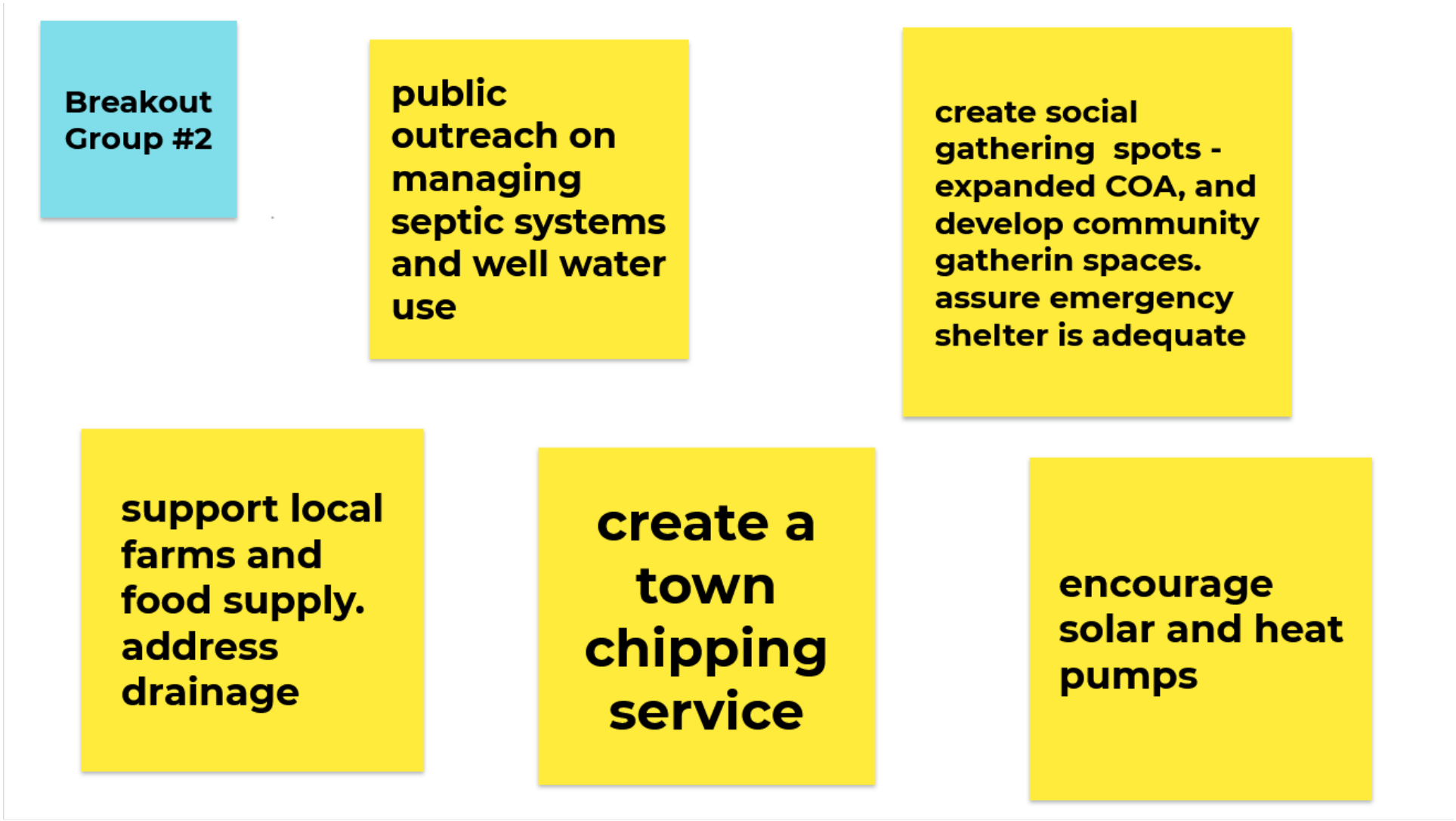
Create a list of the most vulnerable roads to prioritize upgrades; coordinate with Emergency Preparedness Council; The CIP may need to prioritize roads, especially main arteries in and out of town; drainage basins need to be addressed to avoid ice ponds, backed up roads. Better leverage Town Hall in emergencies--it's comfortable and welcoming but doesn't have a generator.	
11. Gas Leaks Conduct a multi-town effort to address gas leaks; they are being ignored and they need to be fixed! Need to be classified as a gas leak, it is a threat to public safety	**4** **15%**
12. Wells and Septic Systems Conduct a public outreach program on managing septic systems and well water use	**3** **12%**
13. • Build new facilities for Police and Fire Departments Build new facilities to accommodate the work force	**3** **12%**
14. Improved Communications Update the emergency call system to include cell phones and landlines; Improve Town communication before weather events; coordinate with the schools to create redundancy in Town communications; conduct stronger outreach/promotion of Town's opt-in communication strategies;	**3** **12%**

15. Improve Connectivity in the community Designate neighborhood reps to establish communication across town (through fun avenues like neighborhood party kits	3 12%
16. Create social gathering spots Develop community gathering spaces and expand Council on Aging	3 12%
17. Water Inventory Create a GIS database to inventory and assess water availability (including seasonable availability of natural sources) for firefighting	3 12%
18. Support Seniors Explore additional resources and services to support the growing senior population (staffing, financial, etc.)	2 8%
19. Chipping Service Create a town chipping service	1 4%
20. Upgrade the Route 225 Bridge Upgrade the bridge to support essential services/emergency equipment (fire trucks, etc.), and maintain access in and out of town	1 4%

APPENDIX B –JAM BOARD POSTINGS OF BREAKOUT GROUP PRIORITY ACTIONS

Breakout Group #1
Highest Priority Actions from the Workshop

Breakout Group #2
Highest Priority Actions from the Workshop



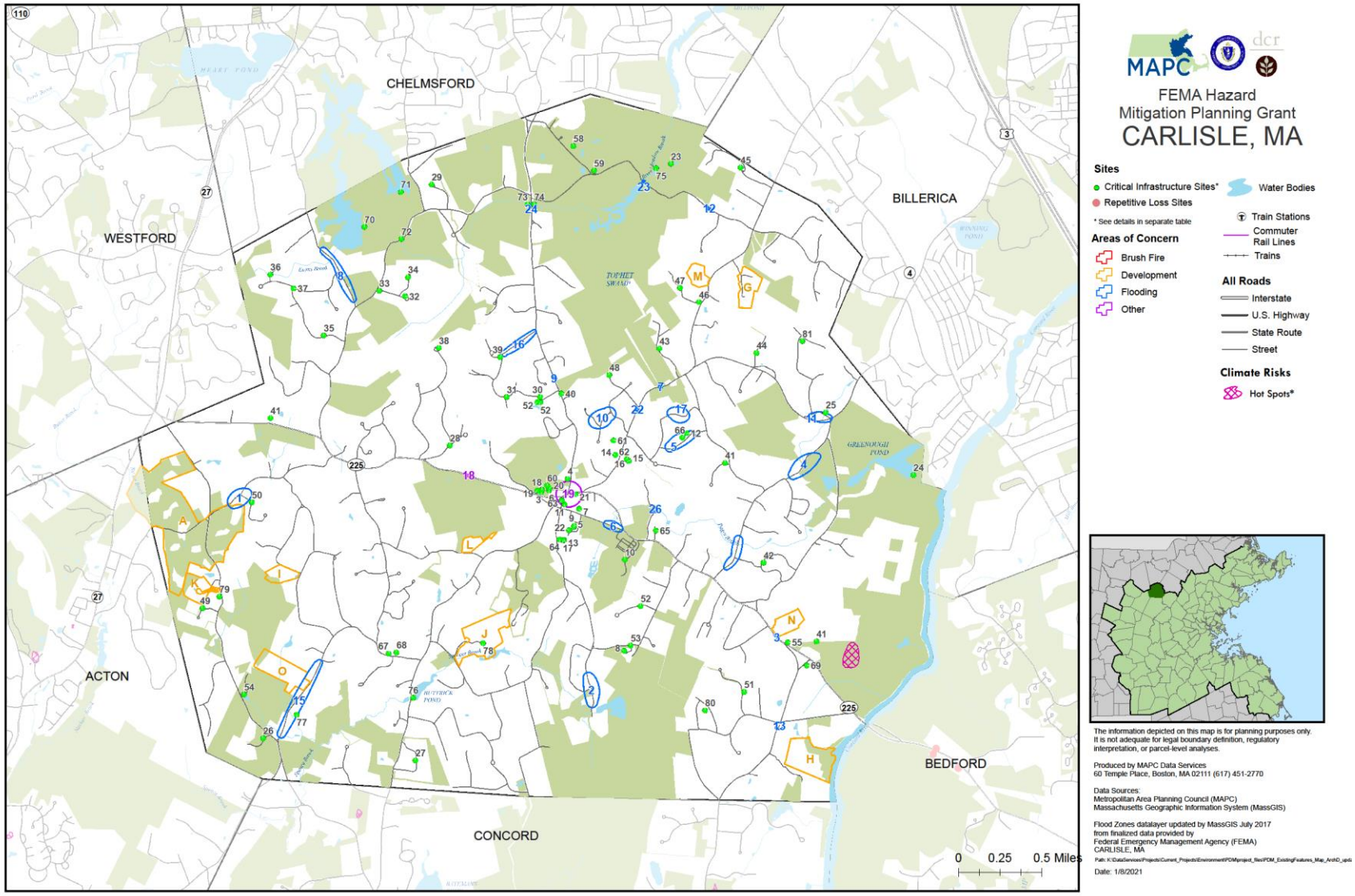
Breakout Group #3
Highest Priority Actions from the Workshop

Breakout Group #3

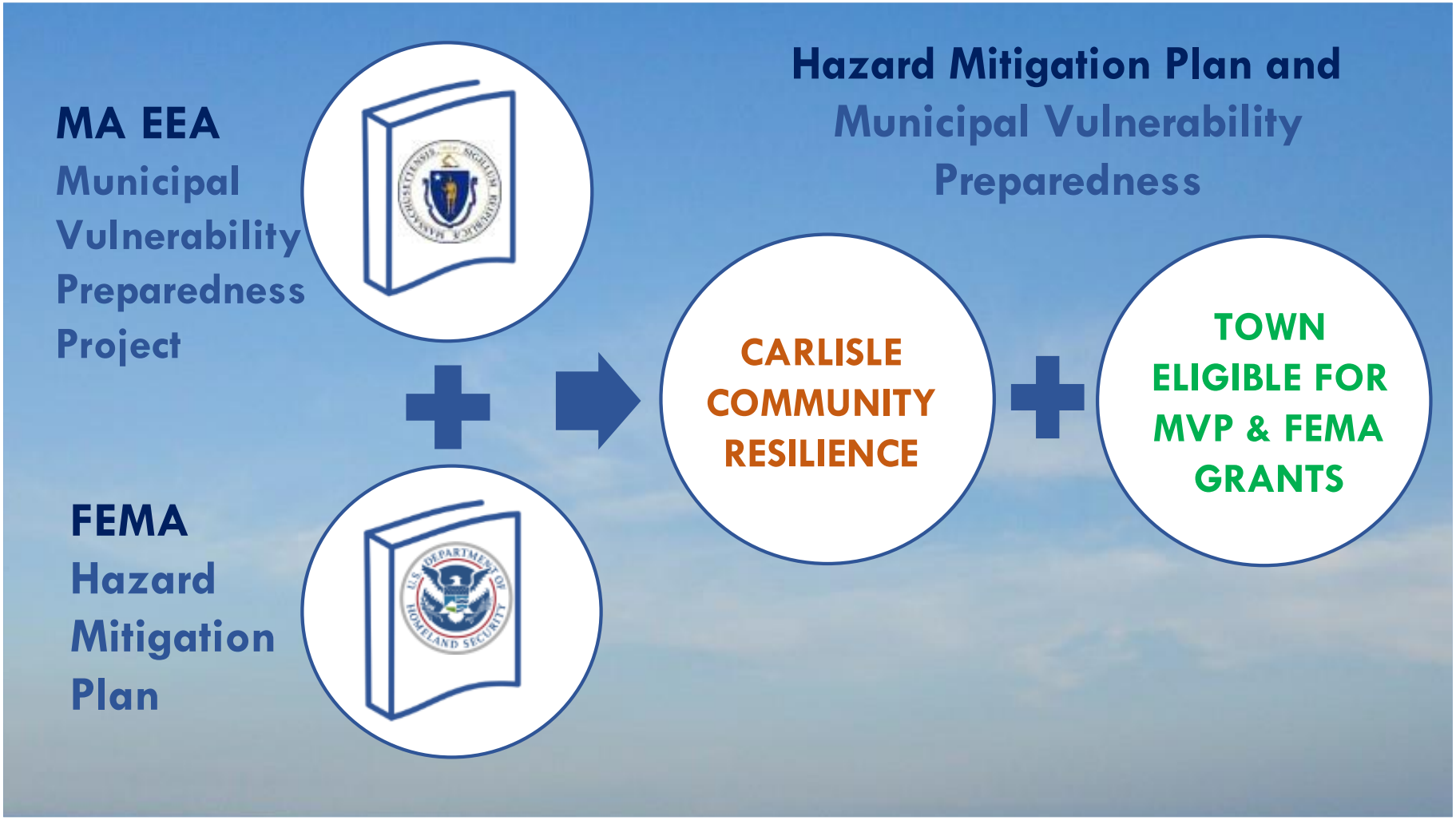
- Create a GIS database to inventory and assess water availability (including seasonable availability of natural sources) for firefighting. (H, S)
- Build new facilities for Police and Fire Departments to accommodate the workforce. (H, S)
- Develop guide/educational program to help weatherize and improve energy efficiency and resiliency of residential homes. (H, Ongoing)
- Support local farms, potentially through partnership with muni to supply school's food program. (H, S)
- Coordinate with land owners (other key stakeholders including state, muni, private land owners) to develop a land and forest management plan. (H, Ongoing)
- Conduct an assessment of culverts (including beaver activity) - Identify and rightsize some culverts to minimize roadway vulnerability, to accommodate increasing precipitation volume, and to support wildlife crossing. (H, S)
- Upgrade Route 225 bridge to support essential services/equipment (fire trucks, etc.), and maintain access in and out of town. (H/M, S)
- Explore additional resources and services (staffing, financial, etc.) to support the growing senior population. (H, S)

Breakout Group #4
Highest Priority Actions from the Workshop

APPENDIX C –CARLISLE WORKSHOP MAP



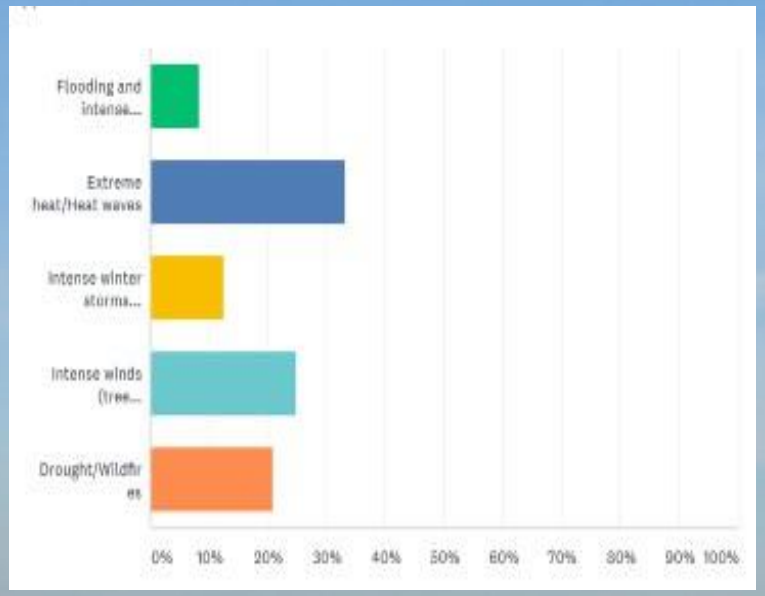

Municipal Vulnerability Preparedness
Town of Carlisle, March 27, 2021
TOWN OF CARLISLE
01754
01780
1805
MASSACHUSETTS
MAPC


MA EEA
Municipal
Vulnerability
Preparedness
Project
FEMA
Hazard
Mitigation
Plan
Hazard Mitigation Plan and
Municipal Vulnerability
Preparedness
CARLISLE
COMMUNITY
RESILIENCE
TOWN
ELIGIBLE FOR
MVP & FEMA
GRANTS

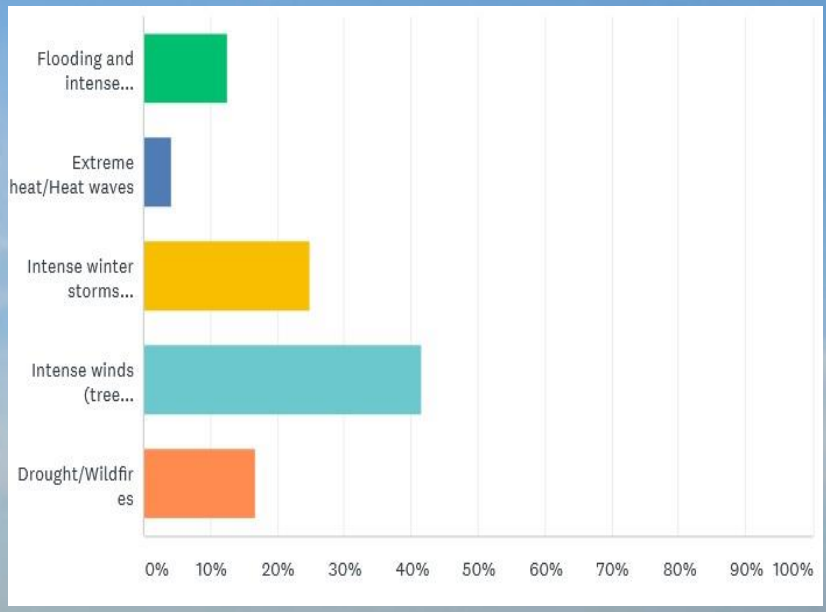
MVP Workshop PowerPoint

Pre-Workshop Survey Results

Which climate hazard is your #1 concern?

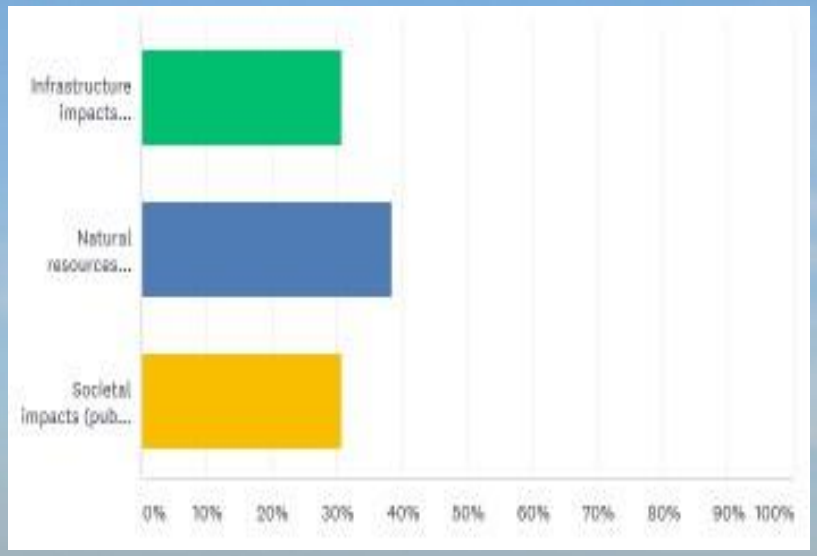


Which climate hazard is your #2 concern?

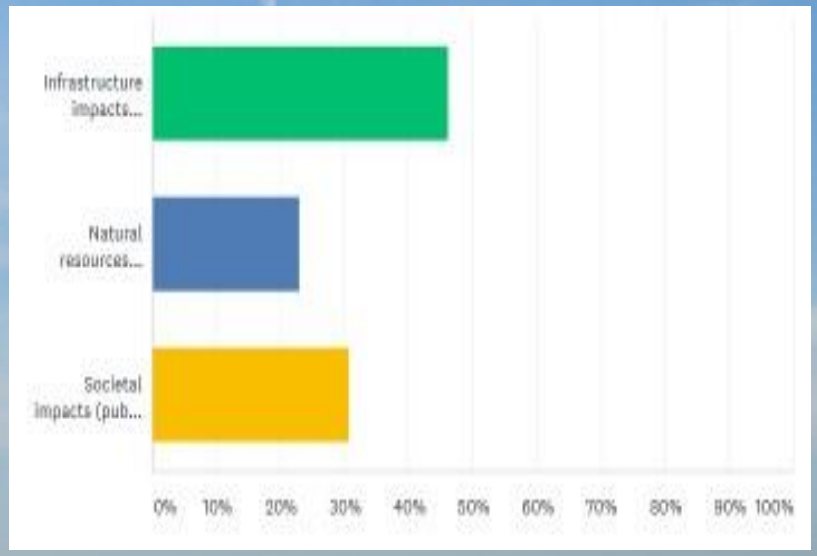


Pre-Workshop Survey Results

Which climate impact is your #1 concern?

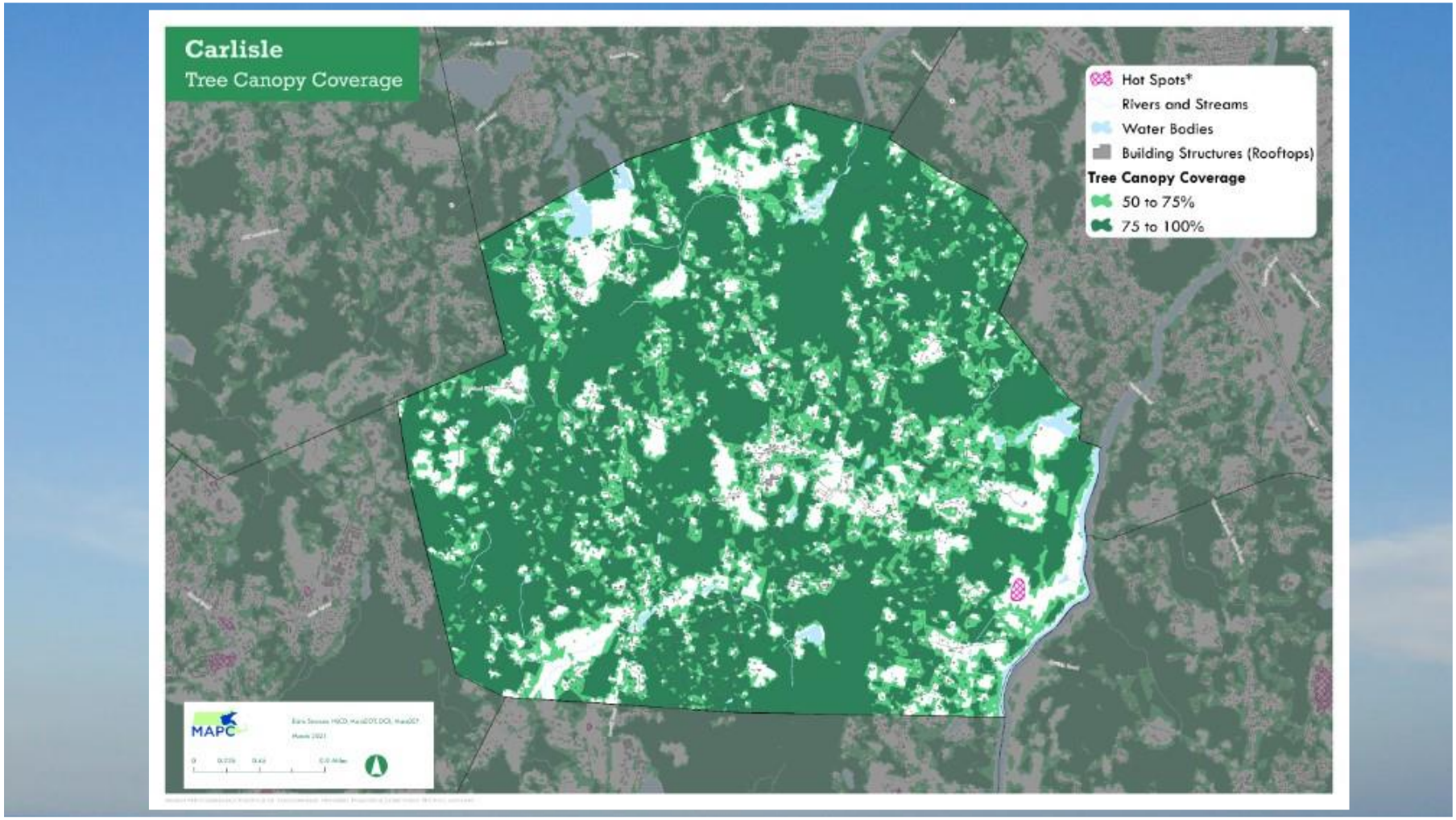


Which climate impct is your #2 concern?

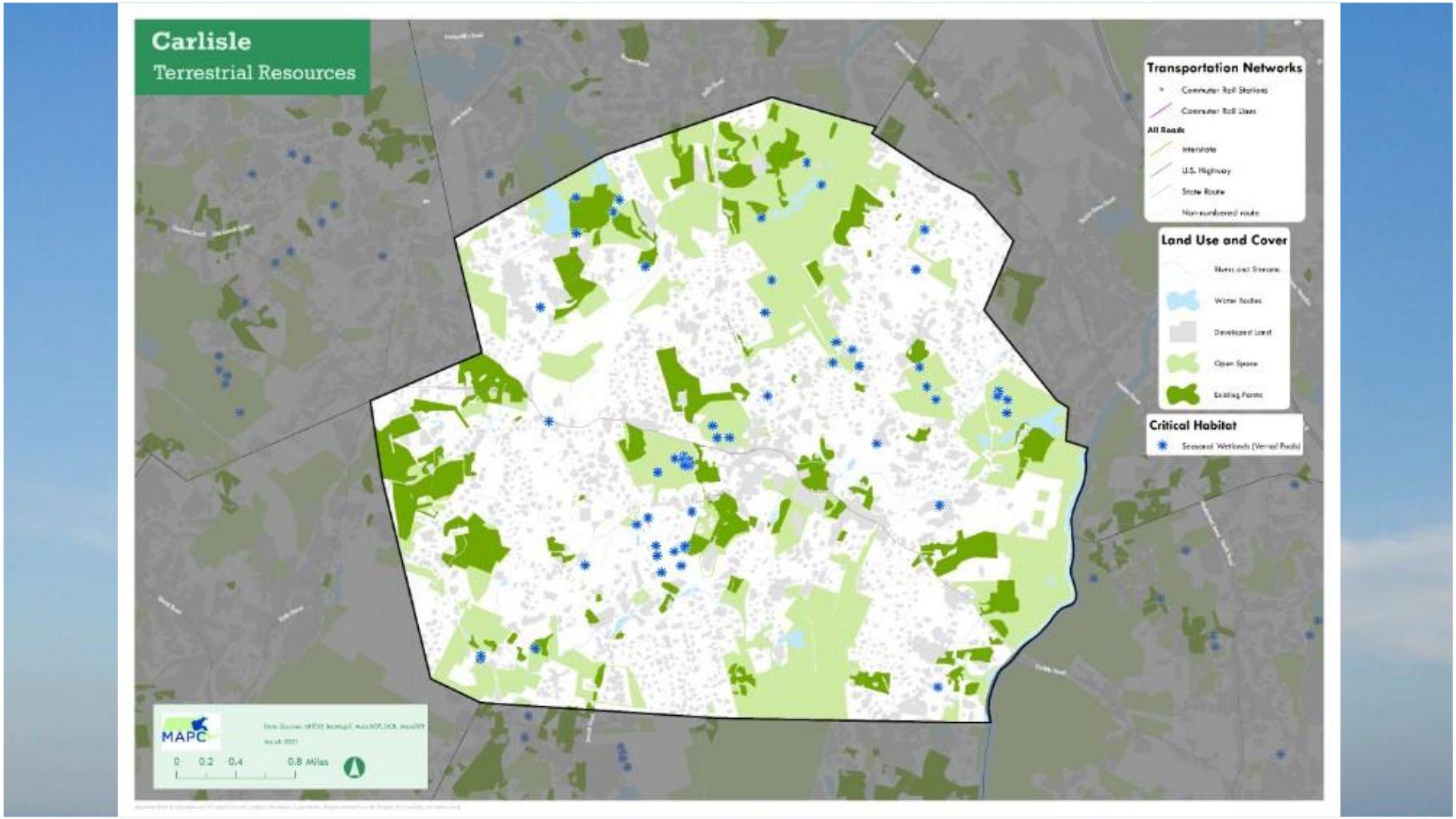



Is there a specific location, facility, or resource in town that you are most concerned about being impacted by climate change?
Ground water/ wells / water / drought (3)
Electric power supply & infrastructure for web access (cable) (2)
Vulnerable species and habitats for birds and insects (2)
Elderly housing (2)
The Town's tree canopy
Communications: reliable method of communicating with all residents in a timely way
All historic buildings, particularly in the historic district
Trail system
Local agriculture, financially difficult; stressed by weather irregularity due to climate change.
Wildfire risk, health/pandemic
Our conservation land
Greenough Dam & roadways
An upgraded emergency facility with qualified personnel staffing it

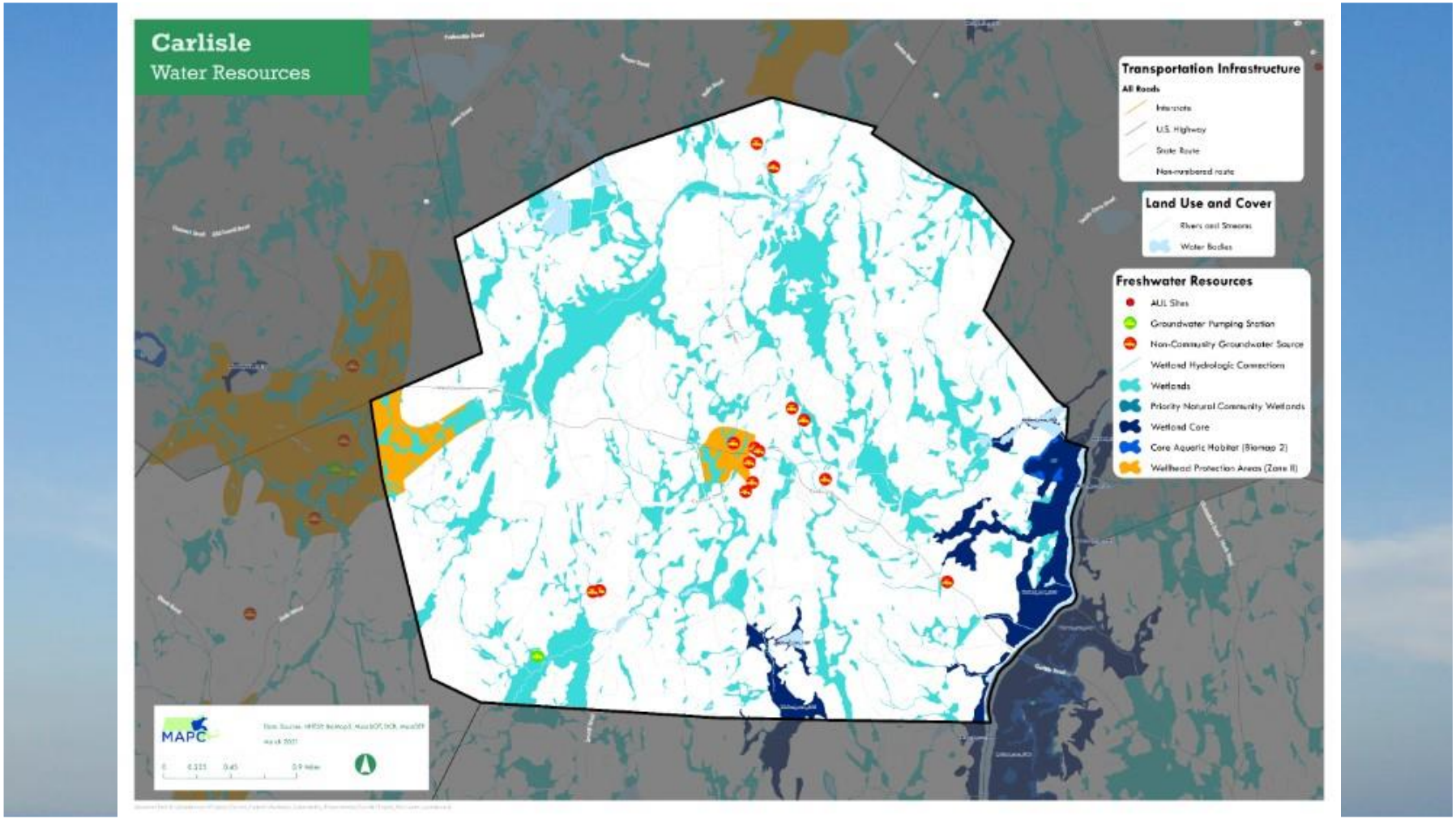
MVP Workshop PowerPoint



MVP Workshop PowerPoint



MVP Workshop PowerPoint



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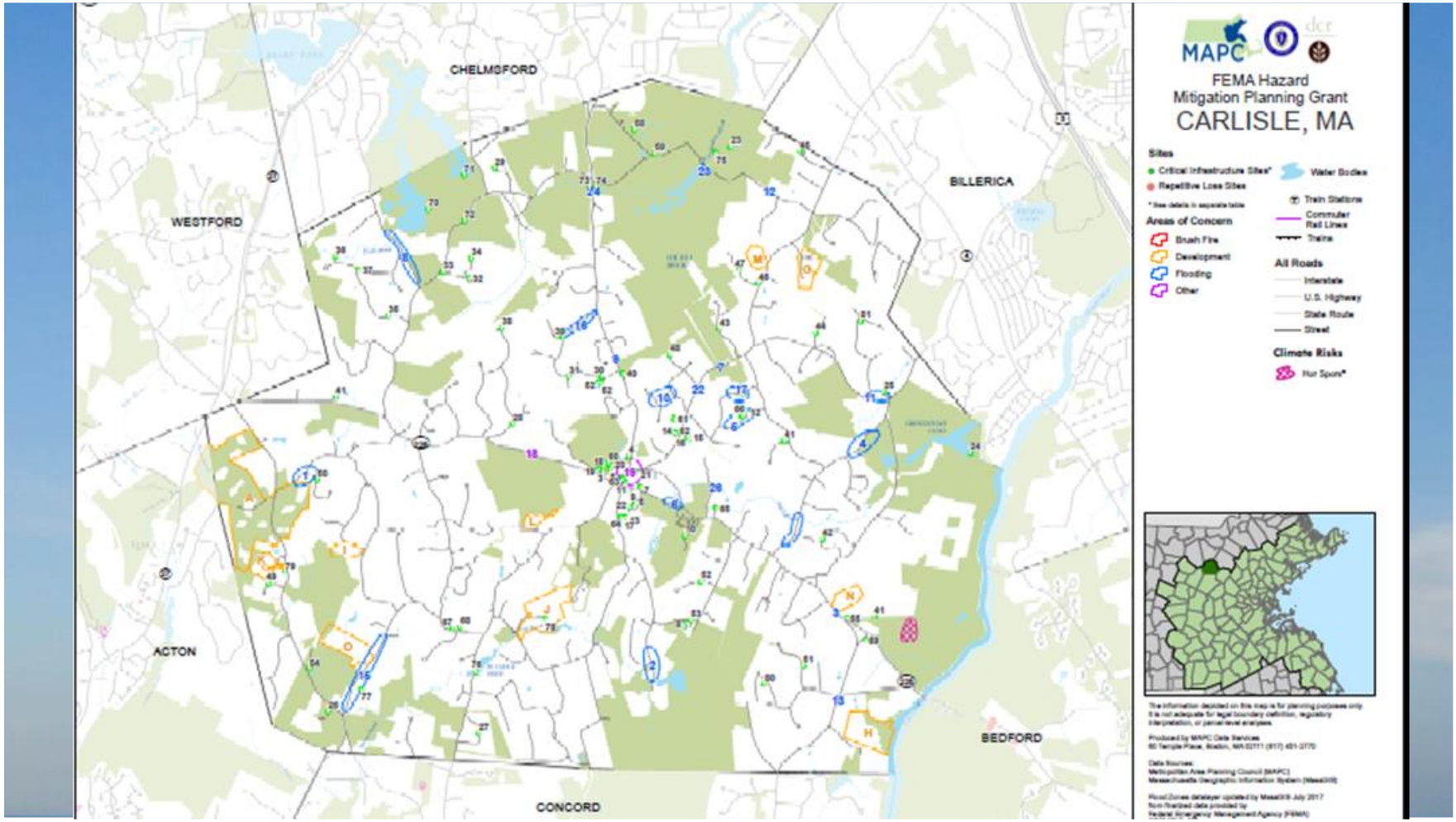
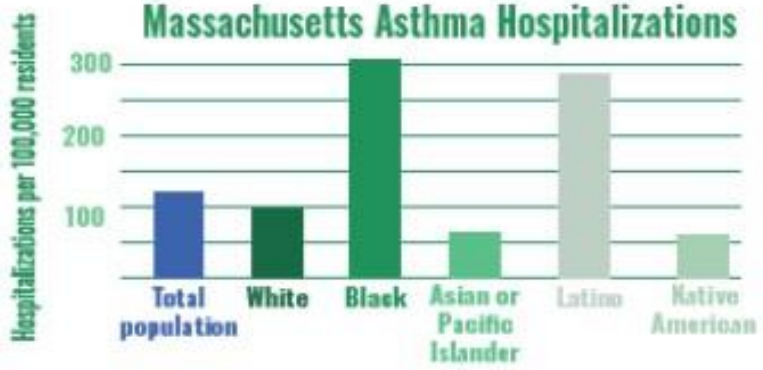


Social Vulnerability to Climate Impacts

People with Health Conditions

People who are already in poor health are more likely to be harmed by hot weather and resulting poor air quality.



People Who Work Outside

People who primarily work outside, such as parcel delivery people, construction workers, or landscapers, may be at added risk from extra exposure to high heat and poor air quality.

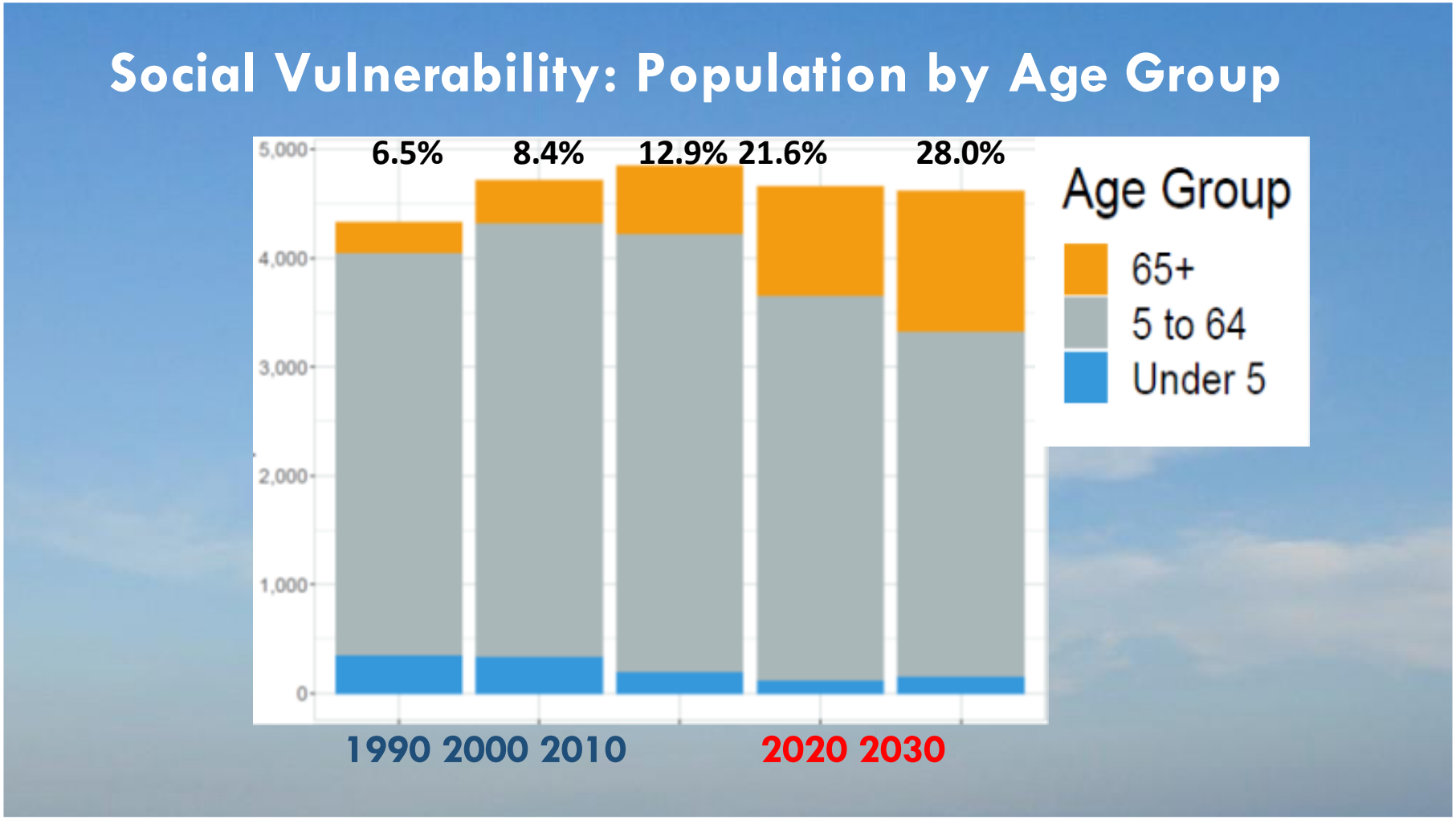
13.4% ±4.6% of households in Carlisle are low-income

4% ±2.1% of households in Carlisle are below the poverty level

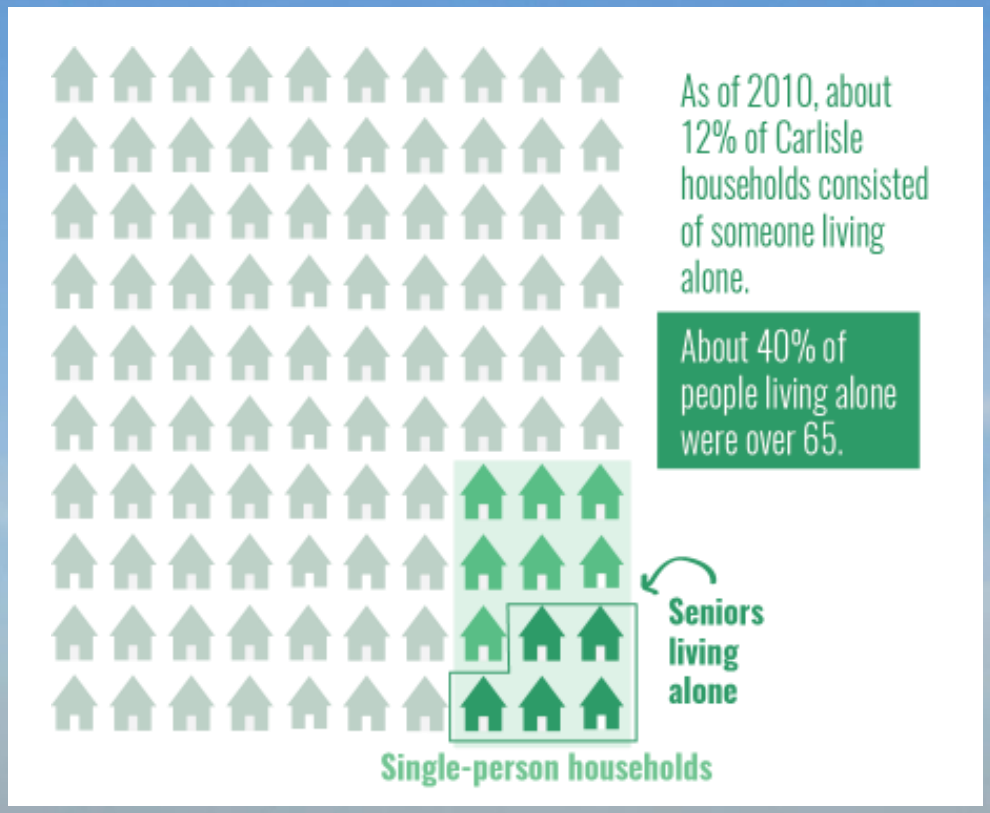
25.3% ±14.4% of Carlisle seniors are low-income

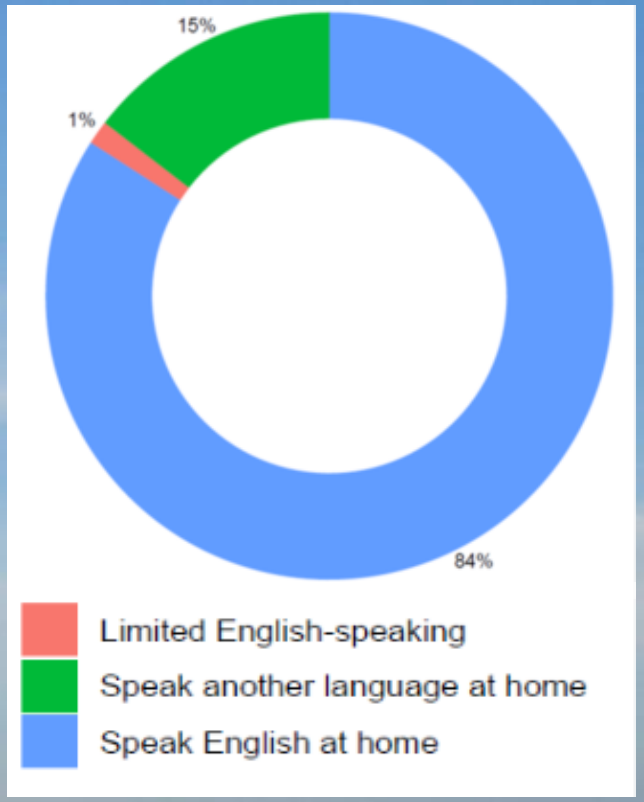
1.7% ±2.7% of Carlisle seniors are below poverty level

*A four-person household earning less than $78,150 is considered low-income; a four-person household earning less than $24,563 is below poverty level

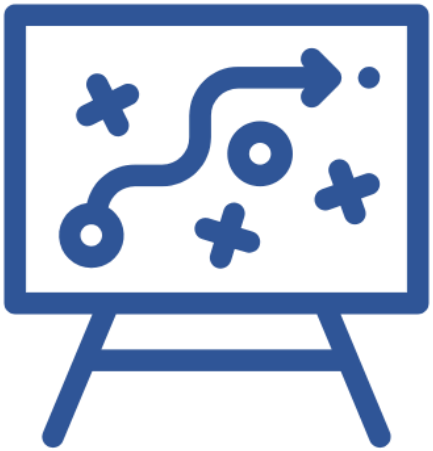

Social Vulnerability: Population by Age Group
6.5%
8.4%
12.9%
21.6%
28.0%
5,000
4,000
3,000
2,000
1,000
0
1990 2000 2010
2020 2030
Age Group
65+
5 to 64
Under 5

Social Vulnerability: Living Alone, Language





Small Group Exercises



4 Breakout Groups with Facilitators from MAPC

VP Workshop PowerPoint

9:30	**Registration:** Sign-in, get name tag and sticky dots, refreshments, find table	All Attendees with MAPC Staff
10:00	**Welcome, Introductions**	Town of Dover Martin Pillsbury
10:15	**Introduction to Climate Change, MVP Workshop process**	Martin Pillsbury
10:30	**Dover Climate Change Vulnerability – Poster Review** *Participants rotate around the room to visit each poster, with narration by MAPC staff*	All Attendees with MAPC Facilitators
11:00	**Small Group Exercise #1 - Identify Vulnerabilities and Strengths** *(first 4 columns of matrix, one sheet per category)*	Small Groups with MAPC Facilitators
12:15	**Lunch Break**	
1:00 2:15	**Small Group Exercise #2 - Identify Climate Actions and Set Priorities** *(Right side of matrix,~20 min per category)* **Chose Top 5 Priority Climate Actions** *Each table selects its top 5 priority actions*	Small Groups with MAPC Facilitators
2:30	**Large Group Report Out-Top Priority Actions** *Table spokespersons report out their group's top 5 Actions*	Small Group Spokespersons
2:50	**Choose your top 3 Action priorities and Vote with Sticky Dots** *All participants use sticky dots to vote for their top 3 Actions*	All attendees
3:15	**Review Results, Next Steps, Fill out Survey** (back of agenda)	Town of Dover Martin Pillsbury
3:30	**Adjourn – Please leave survey – Thank you!**	Town of Dover Martin Pillsbury

Community Resilience Building Workshop

The Workshop Considers Climate Hazards:

- Flooding; Intense Rain
- Extreme Heat
- Intense Wind
- Winter Storms/Snow/Ice
- Drought/Fire Hazard

From the perspectives of:

- Infrastructure
- Environment
- Society

Breakout Groups – Risk and Actions Matrix

Carlisle Community Resilience Building
Risk and Actions Matrix - GROUP 1

ITEM #	Matrix 3: Environmental Features	Location Describe or note TW Townwide	Ownership Town, State, NGO, Private, etc.	V and/or S	Hazard Type(s) FR, EH, WI, WS, DF	Top Priority Hazards FR Flooding, Intense Rainfall	EH Extreme Heat, Heat Waves	WI Intense Winds, Power Outages	WS Winter Storms Snow/Ice	DF Drought/Fire	Priority H - M - L
						ACTIONS - list below					
E1											
E2											
E3											
E4											
E5											

3 Separate Pages for: 1. **Infrastructure**: e.g., buildings, roads, bridges, wells
2. Society/people: e.g., elderly citizens, living in flood zone
3. Environment: e.g., wetlands, forest land, flood zones

Step 1: Identify Vulnerabilities and Strengths

Carlisle Community Resilience Building
Risk and Actions Matrix - GROUP 1

ITEM #	Matrix 3: Environmental Features	Location Describe or note TW Townwide	Ownership Town, State, NGO, Private, etc.	V and/or S	Hazard Type(s) FR, EH, WI, WS, DF	Top Priority Hazards: FR Flooding, Intense Rainfall	EH Extreme Heat, Heat Waves	WI Intense Winds, Power Outages	WS Winter Storms Snow/Ice	DF Drought/Fire	Priority H-M-L
						ACTIONS - list below					
E1											
E2											
E3											
E4											
E5											

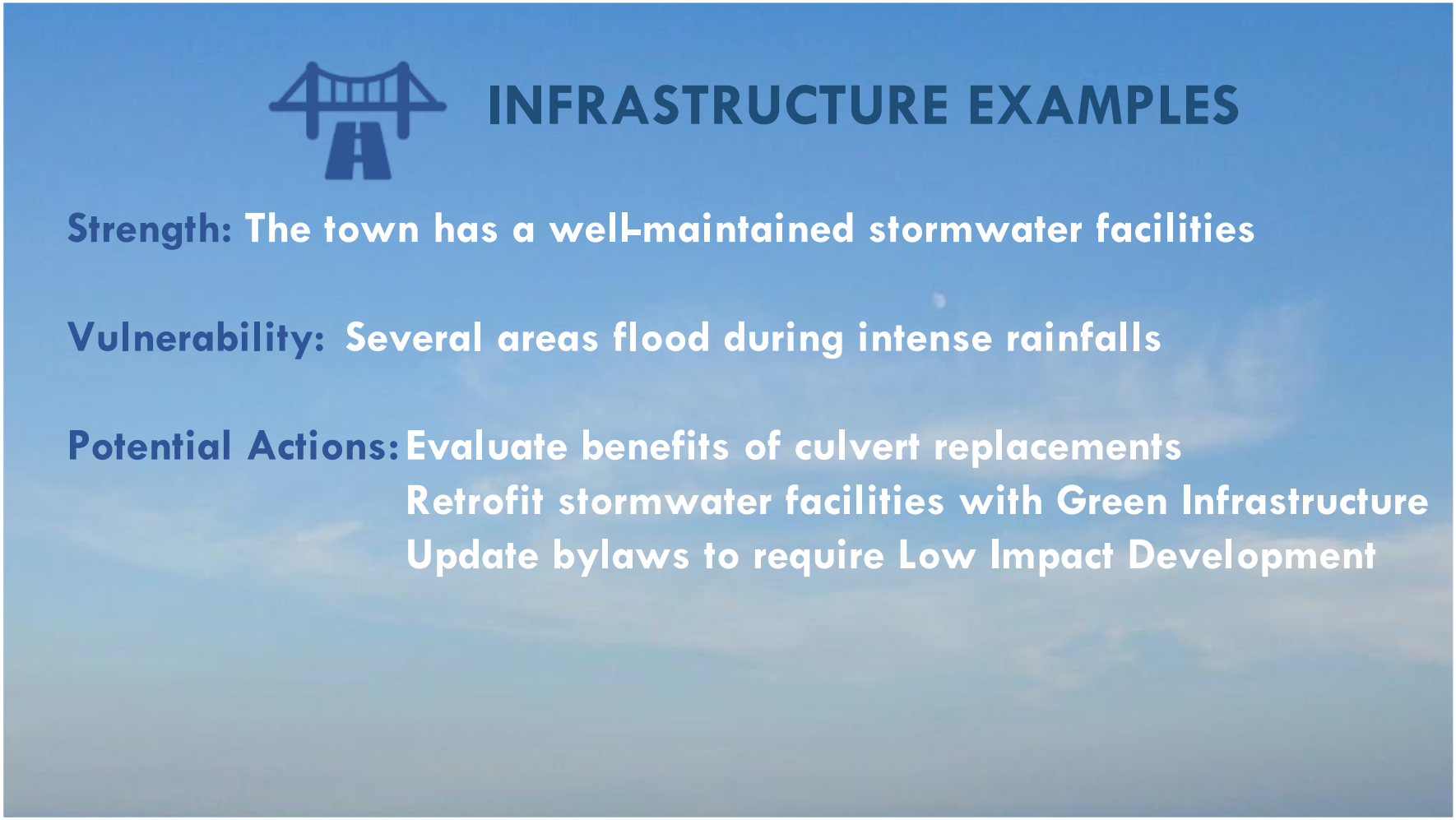
- Features that are **vulnerable** to climate-related impacts
- Features that are **strengths** relative to climate impacts
- **Location, Ownership,** and if **Vulnerability +/or Strength**
- **Type of climate hazard** (flooding, heat, drought, etc)

Step 2: Develop Actions and Priorities

Carlisle Community Resilience Building
Risk and Actions Matrix - GROUP 1

ITEM #	Matrix 3: Environmental Features	Location Describe or note TW Townwide	Ownership Town, State, NGO, Private, etx.	V and/or S	Hazard Type(s) FR, EH, WI, WS, DF	Top Priority Hazards					Priority
						FR Flooding, Intense Rainfall	EH Extreme Heat, Heat Waves	WI Intense Winds, Power Outages	WS Winter Storms Snow/Ice	DF Drought/Fire	H - M - L
						ACTIONS - list below					
E1											
E2											
E3											
E4											
E5											

1. Develop **ACTIONS** – To reduce vulnerabilities and/or reinforce strengths
2. **PRIORITIZE** Actions as Hgh, Medium, or Low Priority
3. Each breakout group selects its overall **TOP 5 ACTIONS**


INFRASTRUCTURE EXAMPLES
Strength: The town has a well-maintained stormwater facilities
Vulnerability: Several areas flood during intense rainfalls
Potential Actions: Evaluate benefits of culvert replacements
Retrofit stormwater facilities with Green Infrastructure
Update bylaws to require Low Impact Development


ENVIRONMENT EXAMPLES
Strength: The town has extensive protected lands that provide a buffer to wetland resources
Vulnerability: The town relies on aquifers for drinking water and had to restrict water use during the last drought
Potential Actions: Provide incentives for water conservation
Encourage rain gardens to infiltrate stormwater
Restrict use of paved surfaces

Workshop Guidelines

- *Everyone has an equal opportunity to contribute.*
- *Respect others' points of view.*
- *Respect limited time.*
- *Your input is important!*

Thank you for your participation!

APPENDIX E – CARLISLE CRB WORKSHOP BREAKOUT GROUP RESULTS

CRB Workshop participants were divided into four breakout groups (on Zoom). The town's vulnerabilities and strengths were categorized as Infrastructure, Societal, or Environmental. Participants in each breakout group identified climate-related strengths and vulnerabilities for Carlisle in each of the three categories. Potential actions were proposed to address the vulnerabilities, and in some cases to augment strengths. Actions were then prioritized as High, Medium, or Low, and each breakout group was asked to identify their top five priorities. The information was recorded on charts by MAPC facilitators for each breakout group and is summarized in the matrix below.

After the workshop, the top five actions from each of the four breakout groups were posted online and participants were asked to respond to a Qualtrics online survey to vote for their top three actions. **Actions in bold text** were selected as the highest priority by the entire workshop.

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
GROUP #1 - INFRASTRUCTURE					
1	Infrastructure	Roads - No public sewage; culverts, bridge Culverts - not based on runoff, not meeting current runoff. 225 Bridge is at the border - timber pilings and gas lines.	V	Roads are critical importance because we need them in the case of an emergency. Raising crossings, bridges over culverts is going to be very important. Design specifications for new roads; review and revise of what we have. Need a list of roads that are the most vulnerable to prioritize upgrades and repairs (DPW might have a list) -- coordination between emergency preparedness council. Culverts - Can't widen them because it might cause downstream damage, so they need to be engineered and look towards future conditions. CIP might need to prioritize roads along with buildings. Main arteries coming in and out of town need to be prioritized. Drainage basin needs to be addressed to avoid ice ponds, backed up roads (older designs) - upgrade designs	H

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
2	Infrastructure	Dams - Washed out north road when it overflowed 4-5 years ago; functioning as a manipulated water source (although we need to confirm it is); Curve Street Dam (significant hazard dam by state) Greenough Dam	V	Depending on the dam, it is less of a risk. It is more of an environmental vulnerability than a safety vulnerability. Greenough Dam connection for trails; would be tragic to repair if it should fail (not subject to office of dam safety). Curve Street - dam only because of the cranberry bogs, and underneath a road so if it fails that could be a safety hazard. Need to figure out what happens with cranberry land to figure out what happens with dam.	M
3	Infrastructure	Private sewer/private wells - how do we guarantee maintenance. Some wells have dried up. Sewage - some septic systems are old, and they sometimes fail, reaching life end. Septic systems and wells can be impacted if they are near areas that flood. Brook street beaver dams backed up near water supply and septic systems. Part of the issue is that people might not know their water levels in their wells.	V	Water ban days; Night watering; Health department is responsible for monitoring quality of water we drink. Need more regular testing of drinking water (via Board of Health) via wells and more tracking over time to see which properties might have changed in water quality; Agreement with local towns that there is over aquifer use; Help educate around monitoring water use at the individual use, or maybe install more technology; Maybe well zoning, plan and protect areas; Update well standards (how deep it should be) and check existing ones; Work with schools to start education around this topic	H
4	Infrastructure	Power lines - They come down with the trees and ice. Transformers come out. People aren't prepared for long-term power outages, an issue if they become more frequent.	V	Putting them underground; Eversource/Warwick (contracted) trees are being trimmed already that are close to power lines, but they don't do powerlines that are close to the homes -- find a way to do this and hire arborist (they do not look	L-M

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
				good and it's a band aid solution); tree warden might be an arborist.	
5	Infrastructure	Gas leaks - not being fixed	V	Multi-town effort to address gas leaks; They are being ignored and they need to be fixed! Need to be classified as a gas leak, it is a thread to public safety	H
6	Infrastructure	Main transformer in town center blew twice this spring	V	Bring transformer down to ground level and house it in a structure and bury the wires	H
7	Infrastructure	Lawns - Chemicals and water sewage, lawn mowers	V	Drip irrigation (Kate does this); education around landscaping	
8	Infrastructure	Amount of flammable tinder that is on the ground - trees	V	Ask fire department if the tinder on the ground is flammable; Community could chip away it and prioritize scenic byways and involve boy scouts	H-M
9	Infrastructure	Roads - No public sewage; culverts, bridge Culverts - not based on runoff, not meeting current runoff. 225 Bridge is at the border - timber pilings and gas lines.	V	Roads are critical importance because we need them in the case of an emergency. Raising crossings, bridges over culverts is going to be very important. Design specifications for new roads; review and revise of what we have. Need a list of roads that are the most vulnerable to prioritize upgrades and repairs (DPW might have a list) -- coordination between emergency preparedness council. Culverts - Can't widen them because it might cause downstream damage, so they need to be engineered and look towards future conditions. CIP might need to prioritize roads along with buildings. Main arteries coming in and out of town need to be prioritized.	H

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
				Drainage basin needs to be addressed to avoid ice ponds, backed up roads (older designs) - upgrade designs	
10	Infrastructure	Schools - Well water problem. Having trouble drawing water - Manganese, Iron. Maybe something coming from Spalding. A leak? Does the school have an emergency generator - school gym, and one additional building for a long-term outage.			
GROUP #1 - SOCIETY					
1	Society	No current list of people who have generators who can help in an emergency - Board of Health used to have this list (10 years ago)	V	Update list - More broadly each neighborhood can establish a point of contact for outreach across the community (neighborhood captains, neighborhood representatives)	H
6	Society	Lots of groups that address special interests, but they don't necessarily communicate with each other. No way to get in touch with everyone in town. No way to reach everyone without being in alarm.	V	Bring all these different groups together regularly to communicate (church hall is happy to host these meetings); Progressive dinners between the churches; Recruit more people to town meeting for the entirety of the discussion to engage on other group's issues and move beyond emergency issues -- maybe have breakout groups that select topics that interest them - CHEER Project	M
7	Society	Local newspaper - goes to everyone in town!	S		
8	Society	Neighborhood - ad hoc groups existed; help each other with snow blowers,	S	Possible avenue for broader communication across town; Neighborhood party kit	H

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
		organizing. Neighborhoods of shared interests. Some newer neighborhoods have associations, but older ones do not.		(thinking about large tent that was bought for COVID) and town supports this effort - it's fun but it's an essential tool for emergencies	
GROUP #1 - ENVIRONMENT					
1	Environment	Beaver Dams (result of trapping law in the 1990s and populations growing)	V	Proposed Beaver Solution - Neighboring community has a beaver management plan, might be proposing adaptation of this plan for town (beaver management flumes, trapping for high-risk areas). Will need a long-term review plan to identify where the beavers are. Seasonal issue. Already being done.	H
2	Environment	Trees - Vulnerability. Trees falling and damaging structures. Property damage to trees that are too close to homes. 1960s homes built and this has shaped a lot of the way the trees and homes interact. They lean towards the homes. Trees also help with carbon, keep us cool.	V and S	If trees are near wetlands use the CC's tree removal policy, in the process this policy is evolving and in progress. A structure that is not near wetlands (more than 100 feet away) then you do not need to talk to the CC.	H
3	Environment	Conservation lands - Helps with wildlife. During COVID lots of use. Most part people are protective, but dogs are not the best. A lot of conservation lands are along Concord River so it's not highly developed. Less flood damage.	V / S		
4	Environment	Pervasive wetlands - heavy rains and the water rises. Keeping wetlands manages to help with flooding and infiltrate well water. Helps with wildlife.	V / S		
5	Environment	Hot spot - potentially the Foss Farm Conservation Land? Need to confirm.	V		

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
6	Environment	(Continuation of trees) Types of trees - White pines shades huge amount of area because they grow so tall; also weakened by disease/rust. Oaks are falling.	V	Reintroduce native species to town (very expensive) - CC is requiring native species; Need more constant monitoring/maintenance of invasives (includes trees)along roadsides (West Street) lots of Oriental Bittersweet; Work with boy scouts to help with maintenance; Work with schools to start education around this topic	H
7	Environment	Invasion of critters and diseases coming from south to north. Ash trees have been damaged by Emerald Ash Borer. Going to have to come down.	V		
8	Environment	Deer grazing on everything they can reach - do deer need to be controlled? Ticks and mosquitoes in town are pervasive. Be more aware of EEE.	V	Zone without deer to conduct a study of the impacts of deer that is local and in several locations across town; utilize town-wide communication on this topic; work with the state to look at the state park; will require lots of monitoring; maybe start doing research with school students	H
GROUP #2 - INFRASTRUCTURE					
1	Infrastructure	Trail system, 55 miles, tree blow downs, new vernal pools, strength -non-car transit, COVID resource	v/s	Strengthen volunteer service -try trail adoption; improve access for maintenance - designated parking spots on side of road would help -wd. Also be good for residents	M
2	Infrastructure	Farmland - food infrastructure, lack of maintenance of drainage system/ditches - fields under water, increased rainfall concerns, also drought. Private and state-owned farmland.	v/s	Farmlands can maintain ditches; bottleneck happens because private property owners can't do the same. Consult w/ the Conservation Commission about what management can be permitted. Perhaps consult w/ BOH. Also, Support local ag - it's an important resource	H

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
3	Infrastructure	Greenough dam needs maintenance/repair, cranberry bog dam - beaver impact on dams	V	Study on dam complete, plan done, - ready for funding request. Fund it or find resources to fund. Consider the Dam and seawall fund , MVP. FEMA may not be quick enough for the need	H
4	Infrastructure	In 2010 road culverts couldn't handle rainfall ended up as dams, much road blockage. East St., Brook St., Russell (corrected), Acton Rd. at the border, and others	V	ID the problem culverts, prioritize, look for funding sources - state and federal sources - FEMA, DER	M
5	Infrastructure	Town is reliant on bridges from Bedford and Concord, if impacted that would leave limited access into town	V	state owns Bedford rd. bridge, concord probably town owned. These are important assets outside of town control. Coordinate w/ owners for assessment. Reach out to MAGIC - for coordination.	M
6	Infrastructure	Basement flooding (some are related to beaver activity) 2010 rains, overall drainage concerns town wide	V	Ask Planning Bd., BOH, Con. Com. To look at stormwater mgmt. Consider updates to SW bylaws - rainfall, how to handle existing development/ design standards/ homeowner education/outreach	M
7	Infrastructure	Fire ponds - due to drought, they wouldn't be available. For cisterns: all have electrical supply, power outages could be a problem	V	Consult w/ Fire dept. about plans they have, the potential for future issues. Review w/ Fire Dept. overall concerns about future availability of water for firefighting. Consider funding needs	M
8	Infrastructure	Drinking water supply - reliant on well water during drought	V	Education about the shared aquifer, investigate strategies to reduce water use during droughts - e.g., lawn watering restrictions., outreach to residents about water conservation - consider incentives/funding sources. Consider investing in public water supply in specified locations.	H

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
9	Infrastructure	Septic systems - rising water table - function of systems - threat to drinking water quality	V	Public education on septic system maintenance,/ may be helped by drainage maintenance. Ask BOH to consider impacts of rising water table, possible funding assistance for retrofits/ take advantage of existing underutilized waste treatment system	H
10	Infrastructure	Pathways that lead from center of town - walking, recreation - kids biking	S	Add to system, linkages from pathways to trails, extend pathways. Additional funding for expansion	M
11	Infrastructure	Lack of electrical supply for solar - limits locations that are possible	V	Locations have been mapped - work w/ electricity supplier to improve access	M
12	Infrastructure	Internet access - some places don't have access. Many places don't have good cell access./cable - vulnerable to outages	V	Identify needed locations, community support would be needed for additional towers (hasn't been there to date)/ good tree maintenance has been done more recently	M
13	Infrastructure	Emergency site at the public school - not good for longer term events - e.g., shower facilities	v	assess capacity and needs to determine whether it is adequate	H
14	Infrastructure	Private drives (are big enough that they function as roads) w/ multiple homes (or single) - are they vulnerable due to storms - does town have to assist with clearing for access	V	Adopt Bylaw that new developments need to have a plan for climate change concerns. Provide guidance on what plans should cover - how to address private drives	M
15	Infrastructure	Gas leaks have roughly 13 in town, 4 in one road. Natl. Grid, doesn't fix all depending on size	v	Natl. grid consider linking new requests to fixing existing links. Stronger requirements about Repair of new gas infrastructure. Consider a Select Board policy	M
GROUP #2 – SOCIETY					

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
1	Society	Mosquitos -EEE- due to drainage issues - disease	v	See drainage discussion in infrastructure/ public education on addressing standing water. State mosquito ditch service?	M
2	Society	Senior Low-income housing two locations - easier to provide assistance when there is an emergency	S		
3	Society	Tull property and a group home provide services to disabled - also good for centralized services	S		
4	Society	ticks/ Lyme disease, etc.	V	Already do lots of education, consider widening trails - limit brush adjacent to the trails to reduce risk. Would need community support	M
5	Society	Seniors living on their own, some homebound - some reliant on electrical medical equipment - a challenge to keep up with who needs helps	V	Publicizing availability of the list, develop a strategy for connecting to new people	M
6	Society	COA did amazing job putting together a list of vulnerable seniors, not just seniors - also provides housing supports, fuel assistance	S		
7	Society	COA provides transportation, subsidized Lyft program, terrific volunteer network	S		
8	Society	All-volunteer neighborhood response team, doing shopping, etc. Very strong volunteer ethic in the community	S		

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
9	Society	Police and Fire - know who is vulnerable look out for them - good coordination with the COA/ fire department keeps list and shares	S		
10	Society	Big events will tax the volunteer community - would be reliant on police and fire for big emergencies	V	Expand volunteer base - outreach to newer residents, recruitment generally. Leverage state help - make that connection w/ MEMA. Strengthen mutual aid relationships w/ surrounding towns	M
11	Society	Outreach to people to can't access internet etc./ don't speak English. COA works on this	s/v	Ensure a network of people who speak Mandarin	M
12	Society	Isolation issues, have seen increased drug and suicide issues -	V	Create gathering spots - community center. Ask Master Plan steering committee to engage with these issues. Add space to COA for a place to gather -need a town pub	H
13	Society	Walking and biking along roads for children is hazardous - trying to reduce car transit is challenging - mostly you need a car	V	Use complete streets funding, ride sharing	M
GROUP #2- ENVIRONMENT					
1	Environment	Beavers contribute to flooding - bigger issues in bigger storms	V	Drainage/flooding issues addressed elsewhere	L
2	Environment	Tree cover forested land	S		
3	Environment	Increased wind and storms - tree damage - damages all kind of infrastructure	V	Identify and focus on problems areas - consider infrastructure fixes. - move utilities below ground	M

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
4	Environment	Trend of larger housing developments, removal of vegetation/trees - reduces resilience - affects drainage	V	Cluster housing has helped. Promote more environmental perspective on housing development. Perhaps design standards	M
5	Environment	Weakened trees from drought years - make them vulnerable to winds. Pines dying away due to drought - damages understory	V	didn't have time to address	M
6	Environment	More brushfires due to drought, fire, and blow downs tax resources of fire and DPW, create access issues	V	Consider town chipping private brush - people could bring brush to driveways, reduce dead understory	H
7	Environment	Taxing groundwater resources - drought - well water use	V	See 1-8	H
8	Environment	solar - great work on saving town $ - and private -more could be done to reduce energy consumptions and heat pumps	v/s		H
9	Environment	Wildlife and biodiversity - is a strength of the town - temp and precipitation. Change Will threaten amphibians particularly	v/s		M
10	Environment	deer impacts on forest - understory - ticks (or not) – potentially adds stress to trees/ encroaching/multiplying on yards/farmland-/forests	V	didn't get to this, interest in some kind of deer management?	M
		invasive species - poison ivy thrives on increased c02.	V	Con Com is working on that and CCF (?) - provide more support for that.	M
		decrease in pollinator populations/ many beekeepers in town	s/v	didn't get to this	M
		active garden club - sustainable focus + education, big community garden plot, homeowner gardeners - conscious of environmental practices	s		

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
		Clark farm - huge asset, organically run, CSA, education program	s		
		transfer station - food waste composting is a good program, but Carlisle has a relatively high level of solid waste	vs	didn't get to this	M
GROUP #3 – INFRASTRUCTURE					
1	Infrastructure	**Route 225:** part of the route is a bridge over Concord River -> overtop once w/in past 10 years; not the strongest structurally; firetrucks get special exemption to go over the bridge (at 5mph).	V	FR, WS: Upgrade Route 225 bridge to support essential services/equipment (fire trucks, etc.), and maintain access in and out of town. (H/M, S)	**H**
2	Infrastructure	**Concord Street:** high priority, access to hospitals East Street; often have to close when get bad ice storms, tree fall.	S (prepared to deal with when street shut down after storms)	FR, EH: Conduct an assessment of culverts (including beaver activity) - Identify and rightsize some culverts to minimize roadway vulnerability, to accommodate increasing precipitation volume, and to support wildlife crossing. (H, S)	H
3	Infrastructure	**Carlisle Public School:** designated emergency shelter; sufficient as cooling center but only part of the school is air conditioned.		WI, WS: Ensure the school has sufficient capacity and equipment, and accessibility to accommodate as emergency shelter. (M, M) WI, WS: Coordinate with Concord (using Carlisle/Concord HS) as secondary emergency shelter for Carlisle residents. (L, S)	**L**
4	Infrastructure	**Police Department:** built in the 1980s; lot is too small, but not easy to fix; building too small inside for operations; not enough		WI, WS: Build new facilities for Police and Fire Departments to accommodate the workforce. (H, S)	H

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
		access room around it; never experienced flooding (but border a swamp/wetland)			
5	Infrastructure	**Utilities:** above ground; tree fall is issue; no problem with gas | Eversource for electricity; National Grid for gas | primary feeds come out from other towns	S/V	WI: Expand energy redundancy/back-up storage systems for municipal facilities. Explore renewable energy options (including existing solar systems) for these systems. (M, L) WI: Weatherize and improve energy efficiency and resiliency of residential homes. (H, Ongoing)	**H**
6	Infrastructure	**Cell reception**: bad during/post storms, especially for 911 calls.	V		
7	Infrastructure	**Lowell Street Bridge**: an access into Town, flood frequently	V		
8	Infrastructure	**Fire Department:** 1985 built; outgrown in program & people & equipment; HVAC in good shape; when there's extreme event that need a lot of people on site; difficult to provide space for all.	S/V		
9	Infrastructure	**Town Hall** (not an official designated emergency shelter)	S		
10	Infrastructure	**Emergency Management Plan (LEPC)***	S		
11	Infrastructure	**Non-seasonal water sources** - cisterns - required because of climate impacts. Long term impact on ground water.	V	FR, EH, DF: Create a GIS database to inventory and assess water availability (including seasonable availability of natural sources). (H, S) FR, EH, DF: Install additional cisterns. (H, S)	H
12	Infrastructure	**Private sceptics**	S/V		

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
13	Infrastructure	**Flood-prone neighborhoods:** Bedford Road neighborhood Brook Street neighborhood Curve Street neighborhood Maple Street neighborhood *also concern that power outages cause pumps not to work	V		
14	Infrastructure	**Wells:** water quality issue; school tests monthly	V	DF: Conduct an assessment on groundwater. (M/H, S) DF: Conduct a feasibility study of short- and long-term municipal water supplies. (L, L) DF: Develop a program to test residential groundwater on a regular basis. (M, Ongoing) DF: Explore the potential of use of the Concord River for town's water supply. (L, L)	M/H L M L
15	Infrastructure	**Renewable Energy Sources**: there's a bylaw for RE; need a cohesive outreach program to guide residents about solar opportunity; there's solar panels over school's parking lot?			
16	Infrastructure	**Dams:** Greenough Dam, Curve Street Dam	V	FR, WS: Explore funding to repair and/or maintain dams. (H, S) FR, WS: Assess risks and vulnerabilities of habitats @ Greenough Dam. (H, S)	H
GROUP #3 - SOCIETY					
1	Society	**Group homes** - Bedford Road; Brooks Street	S		

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
2	Society	**Elderly housing** - strong volunteer network to support the elders who live alone; increasing demand for in-home medical services; town program/Bryan (fire chief) has a notebook of folks to check in on; residents can participate in the "Are You Okay" program to get wellness check calls	S	EH, WI, WS: Explore additional resources and services (staffing, financial, etc.) to support the growing senior population. (H, S) EH, WI, WS: Increase transportation resources for more access to services (medical, food, social gatherings). (M, L)	H M, L
3	Society	Childcare facilities/services	S		
4	Society	Volunteer system - awesome set up, but worry about continuity/long-term staffing	S/V		
GROUP #3 - ENVIRONMENT					
1	Environment	Cranberry Bog - if not farm, will lose water rights; not economically viable;	V		
2	Environment	Great Book Farm State Park	S		
3	Environment	Greenough Dam	V	Town is applying for a grant to prepare the dam	
5	Environment	Banta-Davis Land: recreation field	S		H
6	Environment	Foss Farm	S		
7	Environment	Malcolm Preserve/Davis Corridor	S		
8	Environment	Towle Land	S		
9	Environment	Conant Land (not official conservation land) - where Fire station/town hall are	S/V		
10	Environment	Concord River	S/V		
11	Environment	Bisbee Field/Hartwell Meadow (trail)	S		
12	Environment	Town Forest	S		

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
13	Environment	Pines State Forest	S	Conduct an assessment of natural resources in town, with consideration of anticipated climate risks. (M, L)	M
14	Environment	Invasive species: Town just completed the Open space & Rec Plan; did a thorough biota survey	V	Work with Native Plants Trust to implement invasive species treatments. Promote and implement more native pollinators in residential and commercial properties. (H/M, Ongoing)	H
15	Environment	Great Meadows National Wildlife Preserve	S		
16	Environment	Conservation land	S	Coordinate with landowners (other key stakeholders including state, municipal, private landowners) to develop a land and forest management plan. (H, Ongoing) Continue to add more conservation land. (H, Ongoing)	H H
17	Environment	Trails (up to 60 miles)	S	State has some capacity, but town takes care of majority fire incidents	M
18	Environment	Wetland Hazard District	S	Town follows state's regulations but has local wetland bylaw	
19	Environment	Clark Farm (local CSA)	S- food provision; V: climate irreg.	Support local farms, potentially through partnership with municipal to supply school's food program.	H
GROUP #4 - INFRASTRUCTURE					
1	Infrastructure	Individual wells/septic systems - independent from system-wide challenges (S) - everyone is self-reliant and there isn't	S	- Education/informational materials for new homeowners about considerations of individual wells/septic. - Communicate with realtors to inform new	- M - L, but should be done

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
		redundancy (V) - reliant on power supply (V)		homeowners about responsibility of trash/wells/septic. - Concord has its own power distribution which makes it easier/faster to respond to and less exposed to outages. Could try to pursue our own distribution or tapping into Concord's. - Education about water conservation	
2	Infrastructure	Water quality is high	S	Education about dumping, as well as source of local water	L, but easy and should be done
3	Infrastructure	Some areas have contaminated water	V	- Reintroduce the voluntary well water testing program with stronger promotion/marketing, in conjunction with the education about individual wells/septic - Research benefits/risks of pesticide regulation - Education about water conservation, dumping, etc.	H
4	Infrastructure	Individual water treatment adds cost to homeowners	V		
5	Infrastructure	Less long-term oversight of individual water treatment	V		
6	Infrastructure	Individual wells/septic systems require larger lots	V/S		
7	Infrastructure	Individual wells/septic systems require larger lots which adds housing costs	V		
8	Infrastructure	Difficult to track/predict groundwater flow, therefore difficult to plan for supply and quality. With more uncertainty from climate	V	Is it possible to research and map the groundwater flow? Difficult to get down to	L

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
		change, more uncertainty about how to plan for water supply		the resolution of individual parcels. It would also be high benefit	
9	Infrastructure	New irrigation policy to protect water supply	S		
10	Infrastructure	One local farmers market and one convenience store--limited food supply resources. Some supportive meal services, such as Meals on Wheels and low-income farm shares	V		
11	Infrastructure	Stressors on farming and local food supply	V		
12	Infrastructure	DPW facility is vulnerable to flooding from pond (on backside of facility)	V		
13	Infrastructure	Old septic systems vulnerable to flooding	V		
14	Infrastructure	Local farming contributes to regional food supply	S		
15	Infrastructure	Zoning permits gardening and backyard chickens, which strengthens local food supply; well-used community gardens on Town-owned land	S		
16	Infrastructure	Self-contained K-8 school within Carlisle on high and dry land; serves as emergency shelter; has a new generator; plans for solar installation; on-site water treatment	S	Address emergency shelter needs - Research potential options for self-generated and independent power supply - Need a place that also provides beds/place for sleeping. - Need to improve the showers at school to improve access/adults - Better leverage Town Hall in emergencies--it's comfortable and welcoming but doesn't have a generator	H

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
17	Infrastructure	Power outages		Research options for strengthening resilience to power outages (ex. Partnering with Concord and other options)	H
18	Infrastructure	Commuter rail to Boston is relatively less vulnerable to flooding than other lines	S		
19	Infrastructure	Redundant vehicle transportation options to get to Boston.	S		
20	Infrastructure	Only 4 roads to get in and out of Town. There have been times when all 4 were blocked. All are reliant on clear passage through center of Town	V		
21	Infrastructure	No public transportation	V		
22	Infrastructure	Emerson Hospital is close, and Town has close working relationship. Leahy is the other primary hospital	S	- Follow-up with Emerson to see what their emergency plan is and if it accounts for Carlisle needs. - Focus road clearing resources on the access to Emerson Hospital. Help coordination between DPW and Eversource. Research other strategies for maintaining roadway access to Emerson Hospital	
23	Infrastructure	A few homes could lose power supply at a time, and it's hard to know whether they're out or not	V	Improved communication about forecasted weather events, safety precautions, and emergency response	
24	Infrastructure	A lot of individual homeowners have generators, although this can create dangers and emissions	V/S	- Shared, mobile generator?	
25	Infrastructure	Center of Town loses power often	V	Identify causes for the outages. Bury wires. Better tree maintenance to prevent outages.	

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
26	Infrastructure-	Reliance on power supplier without municipality to influence/control/increase resilience	V	- Communicate with Eversource about the vulnerability of residents and facilities to power outages	
27	Infrastructure	Carlisle is low priority for Eversource maintenance because it's "end of the wire" and low population	V		
GROUP #4 - SOCIETY					
1	Society	Volunteer engagement; culture of volunteerism	**S**		
2	Society	Newer residents are less involved; reliance on long-term residents	**V**		
3	Society	Technical expertise/knowledge of volunteers is high	**S**		
4	Society	Isolated seniors	**V**		
5	Society	Low-density pattern of development contributes to further isolation; next door neighbors are distant; no eyes on the street	**V**		
6	Society	Strong Council of Aging, including outreach	**S**		
7	Society	Remote work may allow new residents to be more involved in Town (ex. No or less time spent commuting)	**S**	Improve access to internet, especially for older subdivisions	H
8	Society	Remote meetings make it easier for some to participate	**S**		
9	Society	Nice trail system, which helps connect people to each other and to the land. Promotes appreciation of the open space and environmental impacts	**S**		
10	Society	Carlisle Neighborhood Response team	**S**	Continue to support and convene Carlisle Neighborhood Response team	

Item#	Category	Strengths & Vulnerabilities	V/S	Actions	Table Priority
		Nice trail system attracts many visitors from out of town.	**V**	Need for greater maintenance. Currently rely on volunteer labor	
GROUP #4 - ENVIRONMENT					
1	Environment	Agricultural land uses (ex. Hayfields, cornfields, a couple of crop fields)	**S**	- Help protect farmland through supporting economic viability of farms. - Review bylaws to reform any that have negative impacts and potentially amend to better support agricultural uses	High
2	Environment	Certain species will have harder time surviving due to shifts in habitat (i.e., temperature, precipitation)	**V**		
3	Environment	Potentially greater invasive species	**V**	Education of homeowners who have open space on their land or are adjacent to open space, including how to appropriately handle invasives and manage habitat	
4	Environment	Potential for wildfire. Large areas of forest. Reliance on small, on-call fire department.	**V**	Research benefits and risks of intentional brush fires (ex Christmas tree pick-up, more limited permits, more education about vegetative waste pick-up, need to destroy invasives, etc.)	
5	Environment	Large areas of vegetated open space, including forest and wetlands, help reduce extreme heat impacts, impacts from large rainfall events, filter water for improved quality, and carbon sequestration.	**S**	Research benefits and risks of regulating pesticides, including homeowners who spray their yards and larger landscape companies	(moved to Infrastructure sheet)
6	Environment	Some local bylaws help protect vegetated open space from development	**S**		
7	Environment	Mosquitoes and ticks. Not part of a mosquito control system. People don't want to go outside because of pests.	**V**		
8	Environment	Large areas of healthy habitat	**S**		

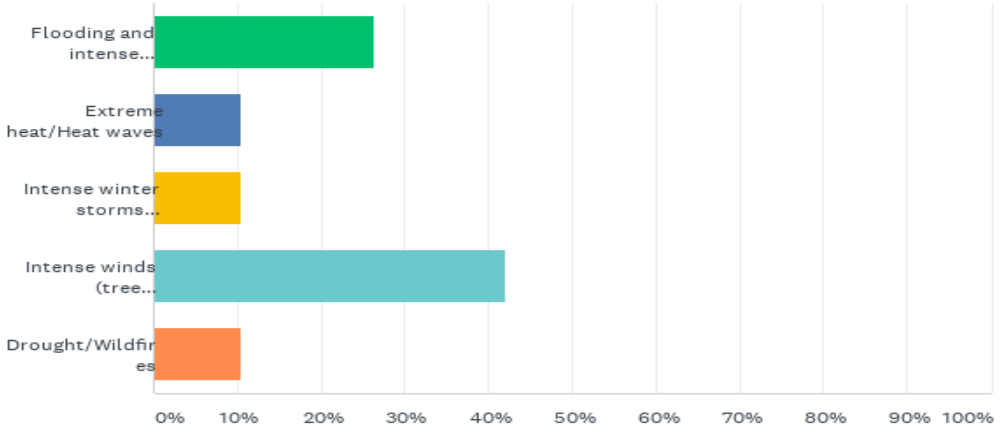
APPENDIX F – CARLISLE PRE-WORKSHOP SURVEY

Q7 Is there a specific location, facility, or resource in town that you are most concerned about being impacted by climate change? Please list this in the text box below.

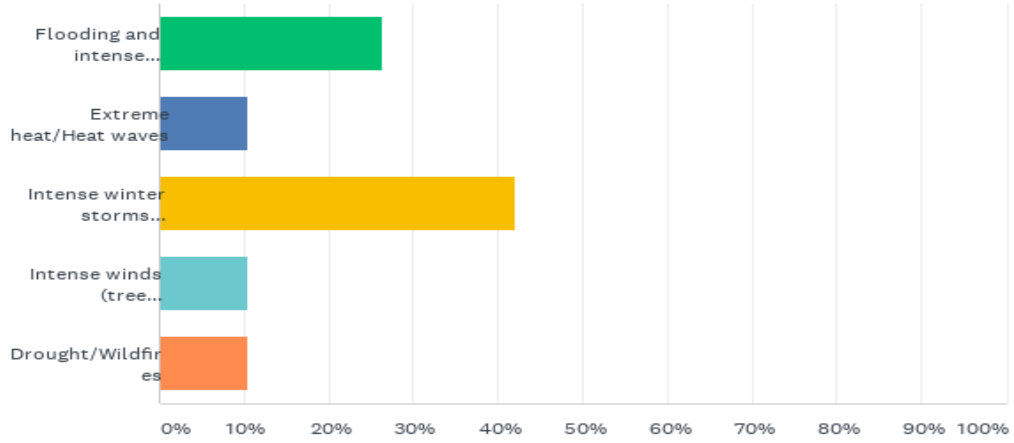
Answered: 10 Skipped: 9

#	RESPONSES	DATE
1	Farm land	4/14/2021 12:14 PM
2	Elderly housing developments/nursing home	4/13/2021 4:34 PM
3	Ipswich River low level	4/13/2021 2:05 PM
4	Ipswich River flooding impacting roads	4/12/2021 10:40 PM
5	private wells and septic systems on individual lots	4/12/2021 2:06 PM
6	N/A	4/12/2021 12:29 PM
7	The Ipswich River, Audubon, Bradley Palmer	4/10/2021 9:01 AM
8	Ipswich river watershed	4/9/2021 5:15 PM
9	Ipswich River, Ipswich River Wildife Sanctuary	4/8/2021 11:03 AM
10	Not specifically	4/6/2021 6:23 PM

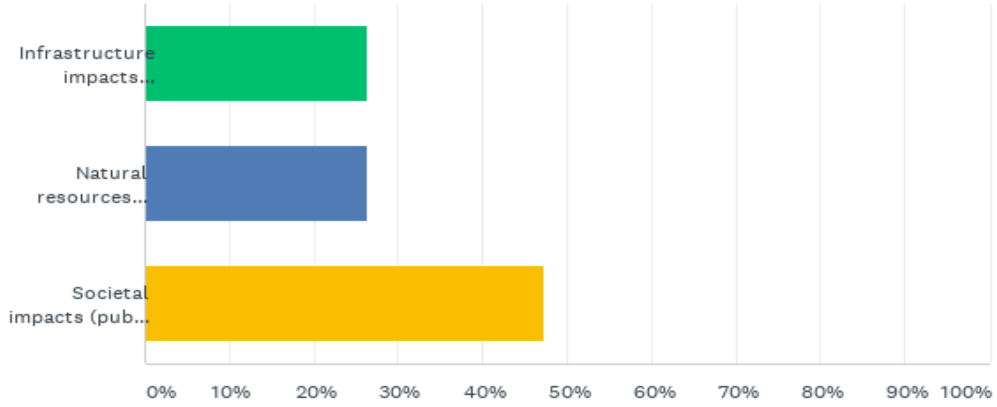
Q1 Please indicate which of the following climate hazards is your #1 concern



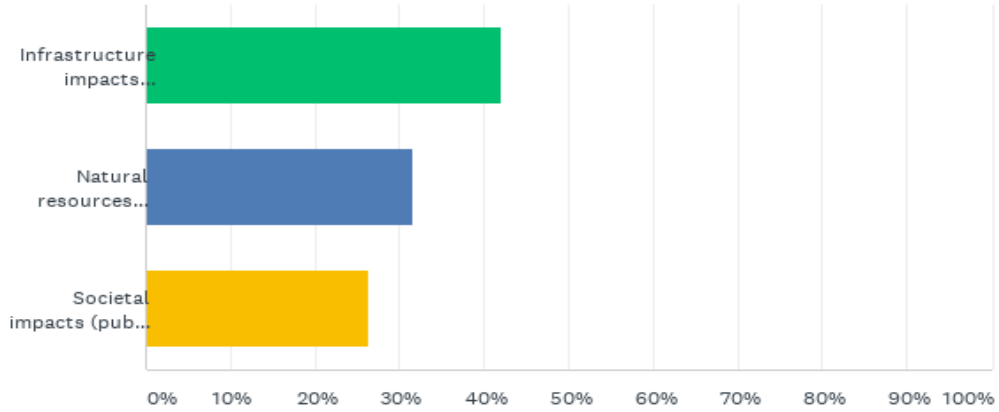
Q2 Please indicate which of the following climate hazards is your #2 concern



Q4 Please check the category of climate impact that is your #1 concern.



Q5 Please check the category of climate impact that is your #2 concern.



APPENDIX G – CARLISLE STUDENT SURVEY

Following the CRB Workshop Madeleine Blake reached out to Brad Cranston, biology teacher at the Carlisle public school, who assisted in conducting an online survey of 7th grade students. The survey received 71 responses, and the results are shown below.

Q7 Considering all the different impacts of climate change, what are you most concerned with in Carlisle?

Answered: 71 Skipped: 4

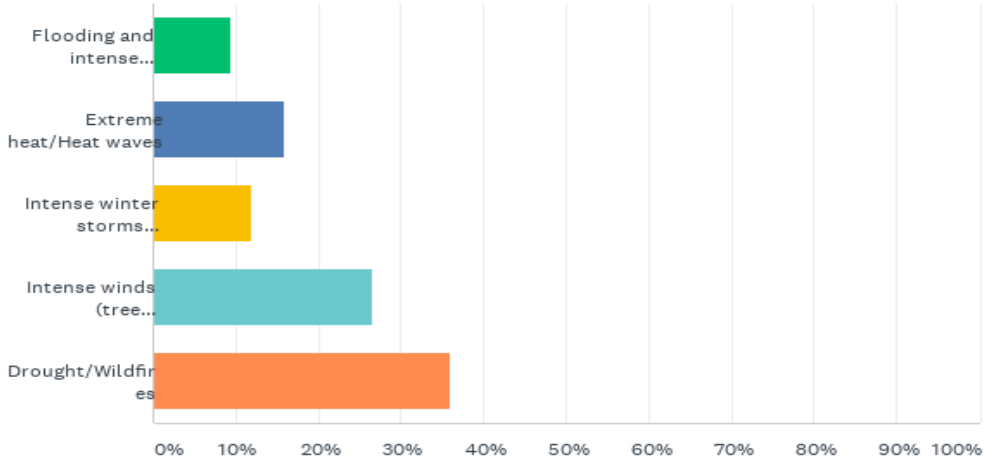
#	RESPONSES	DATE
1	I am most concerned with all the threats to our community I am not more concerned with one thing, I am concerned with all the threats equally. It is not justifiable to take one thing more seriously since they are all serious threats.	4/27/2021 1:58 PM
2	How climate change affects people living in Carlisle.	4/27/2021 1:56 PM
3	I am most concerned with high winds and wild fires, because there are a ton of trees and wood houses in Carlisle which would either fall over or burn down.	4/27/2021 1:55 PM
4	I am most concerned with strong winds or snowstorms that may cause power outages.	4/27/2021 1:54 PM
5	The increase in storms.	4/27/2021 1:52 PM
6	Wildfires	4/27/2021 1:52 PM
7	I am worried that it can affect animals or plants that are necessary for the ecosystem, like bees.	4/27/2021 1:52 PM
8	people not having anywhere to live.	4/27/2021 1:48 PM
9	Wildlife	4/27/2021 1:45 PM
10	I am concerned that the Summer will be too hot and our winters will shorten, inpacting our environment and economy.	4/27/2021 1:44 PM
11	Well water issues	4/27/2021 1:16 PM
12	The most thing I'm concerned with in Carlisle is that due to bad weather, more electricity is needed to be used. The people who are poor people may not have as much electricity to use for their safety.	4/27/2021 1:02 PM
13	I'm most concerned how the wildlife will be effected by climate change.	4/27/2021 1:00 PM
14	A lot of times I see town square with tons of traffic and I'm worried all those fumes are releasing to much carbon dioxide in the air.	4/27/2021 12:58 PM
15	I'm most concerned with the rise of global temperatures affecting the ecosystem and animal and plant stimulus to different things that don't normally happen due to the change in climate.	4/27/2021 12:58 PM
16	Running out of water, wildlife population,extreme storms.	4/27/2021 12:58 PM
17	I'm most concerned about extreme temperature and weather impacting the environment.	4/27/2021 12:58 PM
18	I am worried about the roads and houses. With heavy rainfall and water freezing underground, our road could be seriously damaged. When our roads are not in use people and especially people with health conditions will not be able to go anywhere and it will be harder for EMS to get to them.	4/27/2021 12:56 PM
19	I'm mostly concerned about what will happen to the wildlife and animals	4/27/2021 12:56 PM
20	People with health conditions dying to heat stroke.	4/27/2021 12:56 PM
21	Electricity	4/27/2021 12:56 PM
22	Maybe if people weren't able to get out of their houses to get food and supplies	4/27/2021 12:56 PM
23	Wildlife fires	4/27/2021 12:55 PM
24	I'm most concerned about how climate change will affect the people in Carlisle.	4/27/2021 12:12 PM

Q8 What do you think is the most important thing the Town should do to help Carlisle's residents begin to prepare for climate change?

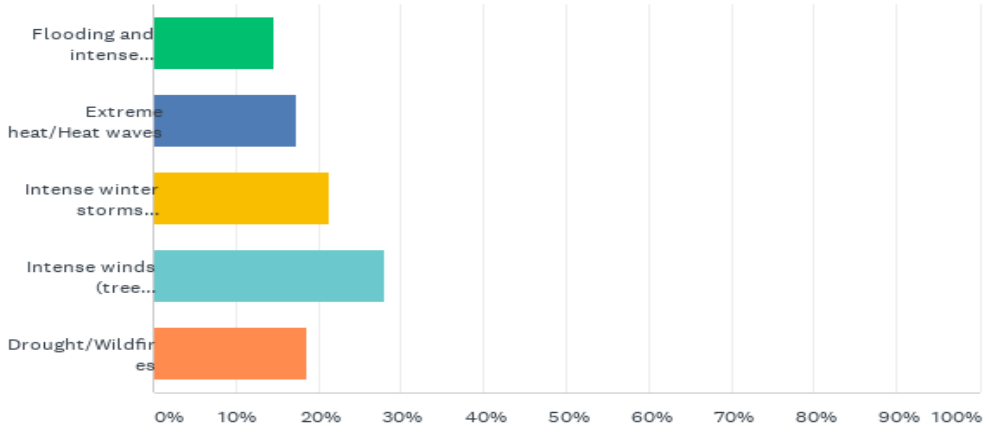
Answered: 71 Skipped: 4

#	RESPONSES	DATE
1	The town of Carlisle should buy storm shelters that protect with floods on a high elevation and is fire protective. We need to find ways that can inform people about how to stop the climate change crisis.	4/27/2021 1:58 PM
2	Let people know about the affects and ways to prevent/slow down climate change.	4/27/2021 1:56 PM
3	Maybe giving out more foods with longer shelf life and no refrigerating to prepare for long periods of time without power or heat etc.	4/27/2021 1:55 PM
4	I think the most important thing is to alert everyone so that they know what could potentially happen with the planet so everyone can be aware.	4/27/2021 1:54 PM
5	I don't know.	4/27/2021 1:52 PM
6	I don't know	4/27/2021 1:52 PM
7	I think that we should do things like planting trees when many fall from storms or being more mindful about the amount of toxic gas that we release, especially in winter.	4/27/2021 1:52 PM
8	advise them to research and plan what they could do in certain situations.	4/27/2021 1:48 PM
9	Maybe a fire bunker that can stand fire, water, ice, snow, and other things	4/27/2021 1:45 PM
10	Teach it more in schools, prepare for long hot summers.	4/27/2021 1:44 PM
11	I honestly have no idea and I'm sorry that I couldn't help	4/27/2021 1:16 PM
12	I think the most important thing the Town should do to help Carlisle's residents begin to prepare for climate change would be that they should send an email to the people saying that there will be some bad upcoming weather going to happen.	4/27/2021 1:02 PM
13	I think we should alert people when something related to climate change could harm people.	4/27/2021 1:00 PM
14	Tell them to prepare by letting them know to buy clothes fit for any type of weather	4/27/2021 12:58 PM
15	The most important thing to do is to set aside places to be forests for animals and plants, and also to combat slow poverty increase as the growth in the climate effects there work and healthcare.	4/27/2021 12:58 PM
16	Give emergency kits with food,water, and essentials to everyone incase they cannot access supplies.	4/27/2021 12:58 PM
17	Make sure everyone has access to clean water.	4/27/2021 12:58 PM
18	I think the most important Hong the town should is educate. I know a lot of resident don't fully know the impacts of climate change and I think that telling the town about the future impacts of climate change is important.	4/27/2021 12:56 PM
19	Maybe the residents should have generators or something like that in case of power outages due to the heavy wind storms	4/27/2021 12:56 PM
20	More strict rules on recycling. Try to encourage alternative energy like solar panels.	4/27/2021 12:56 PM
21	Add public swimming pools when it is hot	4/27/2021 12:56 PM
22	Everyone could set up emergency supplies if they end up needing it.	4/27/2021 12:56 PM
23	Make the town more energy efficient and encourage things like solar panels and composting	4/27/2021 12:55 PM
24	I think the most important thing the town should do is raise money to prepare for climate	4/27/2021 12:12 PM

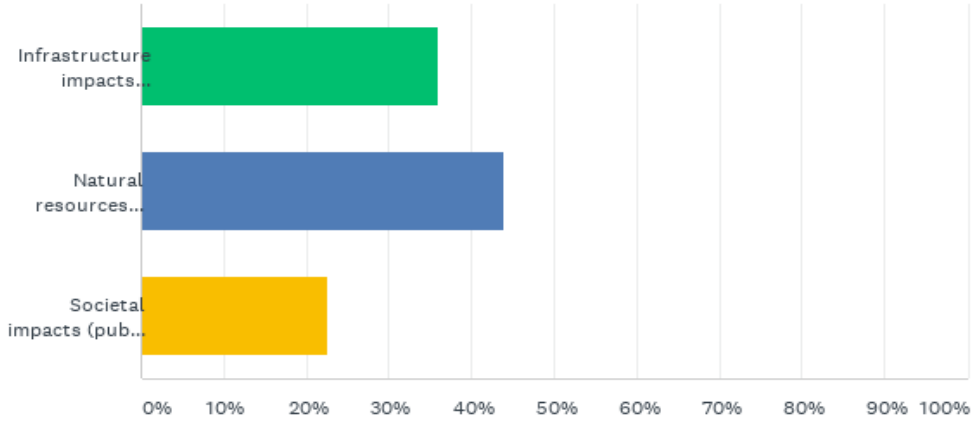
Q1 Please indicate which of the following climate hazards is your #1 concern



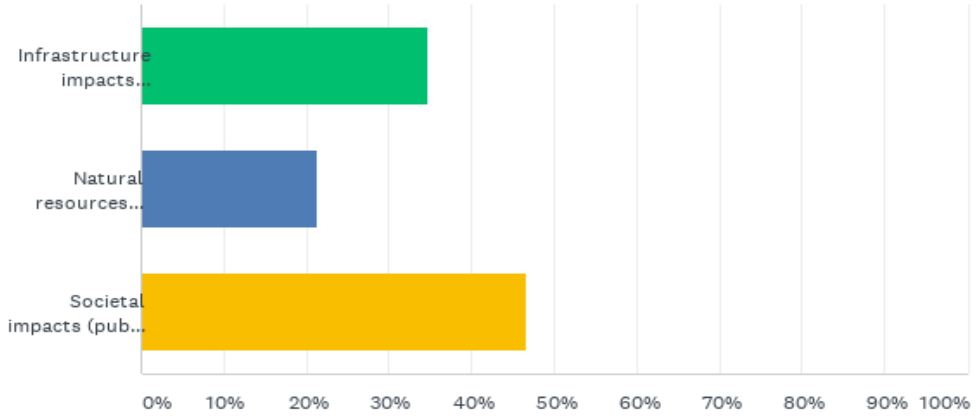
Q2 Please indicate which of the following climate hazards is your #2 concern



Q4 Please check the category of climate impact that is your #1 concern.



Q5 Please check the category of climate impact that is your #2 concern.



APPENDIX H – CARLISLE MVP INTERVIEWS

Interview with Building Commissioner Jon Metivier about MVP/Climate Resilience
April 27, 2021

Gas Leaks – Carlisle gets a lot of reports of gas leaks. We have no recourse. We contact National Grid and hope for the best, but sometimes it seems the reports to NG go into a black hole. Their lack of responsiveness is huge. There is a lack of process on NG's side. It seems like they have a threshold for attending to a leak. They might not attend to small leaks, even ones that people can smell.

Jon noted that, because we rely 100% on wells and septic systems, this is a limited resource that we should protect. We should do community outreach with educational materials about protecting our water. Not sure what research in town we have on the aquifer. JM emphasized that we should educate residents on monitoring their water usage. Few people know how much water they use. We don't have meters to record water use. We should reintroduce the voluntary well testing program. Some people have never tested their water, even though you should do it annually. This type of program should be voluntary, and something the town helps with, rather than mandates.

With respect to energy efficiency of buildings, our current building code addresses this issue for new buildings and new construction very well. But the building code does not address existing construction/older homes. These are the buildings where we could realize the most benefit. There is a state program called Mass Save, and there are federal grant programs. These programs have resources to help homeowners. Not sure how many people in town have taken advantage of these programs. Mass Save will do a free assessment, and they have grants for weatherization. Mass Save is very well-advertised.

If a building undergoes a major renovation, the new energy efficient building code would apply. Carlisle uses not just the green code, but also the stretch code, which is the most energy efficient. (Stretch is higher than green). In 2015, Mass. adopted a law that requires the energy code to be updated every code cycle (i.e., approx. every 2 years).

Carlisle has participated in a program called Green Communities. This has been carried out by the Energy Task Force. This applies to municipal buildings. They got grants and improved municipal buildings, for example, by converting to all LED lighting at town hall and at the school. They also addressed water conservation, HVAC, and insulation. Carlisle used to have a shared coordinator for the Green Communities program with Concord. There is a lot of paperwork and reporting with the program. After the town stopped funding the shared coordinator, the Energy Task Force did the reporting, and then JM did it for several years. Last year, Carlisle did not accomplish the required paperwork and reporting and thus did not obtain any grants under this program. JM helped automate part of the reporting, so that now, electric bills are uploaded to the requisite data base. Some other items, such as propane and diesel usage, still need to be done manually.

JM noted the priority item related to GIS. He supports this but thinks we need a broader GIS database (not just related to fire-fighting). This would benefit all departments in town, and particularly the land use departments.

MVP Interview with Police Chief John Fisher, Carlisle Police Department **April 14, 2021**

Chief Fisher reviewed the priority items identified in the March 27 workshop. He stated that his number one item is the lack of facilities for the police. The old and unsuitable building is like an Achilles' heel. The building is a real liability, from the perspective of the people who work in it, as well as witnesses and suspects. The well is very shallow, and there is very little water. They run out of water in the toilets and sinks. This is an issue during emergencies when police personnel sleep in the building. The ability to use the building during emergencies is impacted by the lack of water. On the plus side, the building's central location is beneficial, as demonstrated during an emergency two years ago, when all the roads leading out of town were blocked. Emergency response is much more a part of the job than when Chief Fisher came here ten years ago. The police department had to purchase a chainsaw for occasions when trees are down in the road.

On the topic of communications, the new radio system is very good. However, he has concerns about the fiber link between the various municipal buildings because it is above ground. Chief Fisher explained that recently the town installed fiber optic wire between the school, town hall, the fire station, and the police station. This is so there can be phone service between the town buildings, and the police station has a generator to power it. This is a redundancy to the radio system. However, in a storm, the fiber optic system could get knocked out. A lot of towns have put their lines underground. The Chief noted that in an extreme emergency, he has the ability (using the Rave app) to do a reverse 911. In this way, he could communicate with everyone in town, even people who have not opted in for emergency communications. He would only use this in a dire emergency. There is also an emergency communication system to residents' phones, which they have to opt into.

With respect to shelter capacity, the Chief believes the town needs to offer more and better shelter capacity. We need more beds, and we need to get the school set up to be a true emergency shelter. Already, the school is on a generator, and it has restrooms. But we need a better plan to use it as an emergency shelter. We need cots, emergency equipment and planning. People are not comfortable using the school as a shelter because the conditions are rough. It's not set up well. It should also have the capacity to get fresh water and the capacity to charge cell phones to residents who have lost power and water, but who want to remain in their homes. The school needs to be open 24/7 in an emergency. There needs to be a good volunteer group to plan and staff the shelter. There are not enough town employees.

The Chief stated that he does not have a good feel for whether any culverts in town should be replaced and which are the worst ones.

In closing, the Chief again discussed the challenges presented by the current police facility. It is the only 24-hour operation in town, and it does not have a public bathroom. LEPC meetings are held at the police station, but there is insufficient space for the entire committee to gather, as the largest meeting room has only 8 spots. Further, there would be advantages in managing the town's human capital if the police and fire personnel could be housed together. Although the two groups co-manage the dispatch, they are now located, and train separately. Increasingly, many situations, such as emergencies, will require a coordinated response. If the two sets of personnel were in the same building, they could train together and even cross-train. Communication and coordination would be seamless. This will be increasingly important if the number and intensity of emergencies increase.

Meeting with Fire Chief Bryan Sorrows Regarding MVP and HMP **June 10, 2021**

Chief Sorrows showed me around the fire station. There is insufficient space for their needs. There is only one room that locks, and there is not enough room in the engine bay for all the fire trucks to fit. One is sitting outside; this one is subject to more wear from being outdoors.

Chief Sorrows showed me a federal map regarding wildfire risk. The map showed Carlisle as being almost uniformly colored bright red, which denotes the highest risk. This is due to the high forest cover, which is flammable.

Carlisle needs to understand where we have water sources and where we don't. In spring, we have brush fires. However, the greatest risk occurs in mid-summer. In mid-summer, there may be 3 to 4 fires going on at once. If conditions are dry, other towns may have fires going on at the same time, and under those circumstances, the other towns cannot come to our assistance. This is a major risk and probably the greatest risk the town faces from climate change and/or natural conditions. The town needs to analyze existing bodies of water such as ponds and streams to see if they are drought-proof. Then, we need to identify and map locations where there is no water.

The Carlisle Fire Department operates under a dynamic staffing model. This arises because it is an on-call fire department. [Individuals have other jobs but are available to fight fires, etc.]. This dynamic staffing would help us be prepared to fight a large fire. We could muster 30 people, whereas if we had a so-called career department, we would not be able to have so much coverage. A department with only full-time employees would not be able to cover multiple fires. We need to be planning for worst case scenarios. No other towns our size were able to test for covid. No other towns our size have two ambulances. These capabilities are the result of dynamic staffing.

Chief Sorrows has an idea where the locations are without sufficient water sources. However, this is a preliminary assessment; it is an "eyeball on a map." There needs to be a more thorough and systematic assessment that also evaluates the quality of the water source.

The most serious threat from climate change is fire. Fire could threaten fully 1/3 of the town. Strategically, there are different ways the town could address this risk. We could add cisterns. Or, we could have two functioning tanker trucks, along with sufficient firefighters to staff them. We need to invest one way or the other.

Chief Sorrows will locate the brush fire incident reports for the last three years. He does not recall any bad ones from that time period. However, in prior years, there were some bad ones.

Chief Sorrows and I discussed whether we should look at re-writing the Planning Board and Fire Department regulations for fire safety in new housing developments, i.e., subdivision roads and common driveways. We could make the rules more specific and transparent. We agreed this was something that should be looked at.

We next discussed the idea of requiring sprinklers in homes, either in all new homes, or perhaps in homes built along very long common driveways that the fire department might have difficulty reaching. There is a trade-off. The sprinklers would save lives in a bad fire. They would give the fire department valuable extra minutes to get everyone out. However, they cause water

damage to property. In this town, cumulatively over time, there is much greater damage from water used to fight fires, than from the fires themselves. There is also a cost to installing/requiring the sprinklers. Chief Sorrows would like feedback from the public on this. How would the public evaluate this trade-off?

Chief Sorrows provided a preliminary list of streets in town that he believes do not have sufficient access to water. He also stated that he does not believe Great Brook State park is in a worse situation than these streets, and thus in his view that area is not a higher priority to receive a cistern. He was not familiar with earlier efforts to install a cistern in Great Brook State park.

There are a number of areas in town that do not have adequate water supplies. A quick list would be:

1. East St from Blaisdell to Woodbine and Cutter's Ridge
2. East Riding Drive and Tophet and Carlton Roads
3. Meadow Brook and Hillside.
4. Autumn Lane-all of it.
5. Concord Rd- Church St to Russell St
6. Lowell Rd- Sunset Road to Wolf Rock.
7. South St-Concord Rd to Wildwood.
8. Log Hill and Woodland Rd
9. Bedford Rd- Kimball Farm to Stoney Gate (new Woodward Cistern will help this area.)
10. Curve St to Forest Park Road and Evergreen Road Area.

APPENDIX I – CARLISLE LISTENING SESSION

[To be added after Listening Session]