




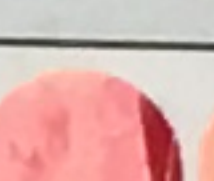
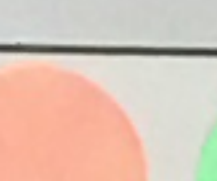
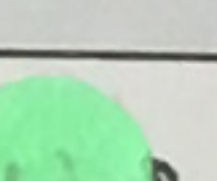
$\overline{V} = \text{Vulnerability}$ $\overline{S} = \text{Strength}$
 $\overline{P} = \text{Priority for action over the short or long term (Burgitt and Ungang)}$

$\frac{V - V_0}{V_0}$ = Vulnerability $\frac{S}{S_0}$ = Strength

Dedham Community Resilience Building Workshop Matrix

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

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

Vulnerability 3 = Strength				Intense Storms	Flooding	Heatwaves	Drought	Priority		Time	
Features	Location	Ownership	V or S					H - M - L	Short Long Ongoing		
Environmental											
Mother Brook		DCR protection	S				Continue to monitor water levels + quality		M		
Groundwater Supply	Townwide		S + V		     	educating residents + businesses	encourage water conservation measures in place; water restrictions	encourage water conservation systems development (M.S. has some)	1. H 2. H 3. M 4. H	O O L S	
Charles River and Neponset			S (recreational) V (flooding quality)	① education & reduced pollutants for runoff ② stormwater mgmt strategies for reduced runoff ③ green infrastructure	④ outreach to homeowners about flood risks (spec. groundwater vs. riverine flooding)				1 H 2 H 3 H 4 M	O S S L	
Wigwam Pond				Keep up w/ tree trimming to prevent damaged trees/power lines			(color forest gone during drought (or from beaver))		L		O
Parks - Cutler Park			S			① Plant more shade trees ② install irrigation systems @ fields ③ put in spray parks / cooling features			1 H 2 H 3 H	O L L	
Wetlands (19% of Dedham)											
Fowl Meadow		State design. area of critical concern DCR	S + V	Flooding from Neponset - risk to surrounding neighborhoods Green infrastructure + habitat protection			address brushfire risks invasive species might	invasive species contributing	H		O
Trees				① Planting a variety of tree species (for wind, storm, drought, pest + resistance) ② Managing pests + invasive species (emerald ash borer has been an issue)					1 H 2 H	O O	(already happening) (already happening)
Neponset River											

critical to managing Charles River overflow

④ address conf. lighting - ensure less + resist drought + resist vegetation x1 or allow relax veg reg. (establishment - short term - winners?)

Dedham Community Resilience Building Workshop Matrix

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

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

				Intense Storms	Flooding	Heatwaves	Drought		Priority	Time
									H-M-L	Short Long Ongoing
Features	Location	Ownership	V or S							
Environmental				Finding of - Model stormwater infrastructure system - more technical info (M, S) - Stormwater water rise fund (M, O) - Work w/ surrounding towns around river management (M, O)						
Rivers	Town-wide	Public Smaller Streams Private-owned DCR, Corp Coordination	V/S	- Daylighting our smaller streams (L, L) - Beaver control plan (M, O) - Public education campaign around disposing of pet waste - dog droppings (H, O) - Engaging w/ DCR around Mother Brook (M, O) ^{in watershed} - Engage volunteers + public education around river cleanup (high school/greenday) (M, O)						
Parks and Open Space	Town-wide	State + Town (diff department) Feds	S	- Dedicated land management plan - (open space + parks + rec) (H, S) - Communication and education manager to communicate success + increase transparency (H, S) - Investigate zoning to help w/ resiliency (H, L) - Promote + implement TOD in Town (M, O) - Revisit potential future uses of minor fields (M, S) - Explore ways to combine recreational fields w/ stormwater management - Increase maintenance of parks + open space (H, O) - Community Preservation Act (M, O) - Support Dedham Land Trust + help promote (L, O)						
Trees + Invasives	Town-wide	State + town + Priv.	S/V	- Explore zoning changes to aid in tree planting / less tree removal (M, L) - More tree planting on Route 1 (similar to VFW Archway) (M, L) - Promote tree city designation + have more ^{tree-related} public events (L, O) - Find ways to celebrate large trees on private property (plaques, etc) (L, O) - Implementation of tree bylaw (L, L) - Promote planting diverse stock of trees + native trees (M, O) - Start local tree farm (L, L) - Develop public shade tree policy on private land (L, O) - Invasives - find staff to control invasives (M, O) - Invasives - Education for homeowners on invasives + how to manage (M, O) - Aquatic Invasives - town wide policy needed (L, L) - Education about tree management - Education about tree management - loosening requirement to hook up to MWRP (L, L) → Education about tree management (H, S)						
Water supply + Groundwater	Town-wide	Dedham Westwood Water District	V/S							
Wetlands + Flood Plain	Town-wide	State + Fed + Town + Priv.	V/S	- Restoration of filled areas (M, O) - More structured outreach + schedule for cleanups (H, S) - Promote historic value of wetlands (L, O) ^{inland will turn} - More regular conversations w/ water shed orgs. (H, O) - More staff related to wetlands + storm water (H, S) ^{1 vote} - Map base flood elevation (detailed engineering study) (M, L)						
				General - Allocate more funds for nat. resources reduction (H, S) 3 votes						

recently completed plan actions (short - long term) # S/L

☐ Leverage resources to ensure open space plan actions (short - long term) implemented.

Dedham Community Resilience Building Workshop Matrix

H-M-L priority for action over the short or long term (and ongoing)
 V = Vulnerability S = Strength

Features			Ownership		V or S	
Location			Priority		Time	
			H - M - L	Short Long	Ongoing	

Environmental						
Parks + fields	school - pop.	town-wide	S	<input type="checkbox"/> dev. strategies to ensure newly build parks + fields have flood controlled measures incorporated	M	L
Under. open space	town-wide	S	<input type="checkbox"/> coordinate w/ Parks + Rec + Concern for long-term plans (public health) / clarify responsibility <input type="checkbox"/> increase public access green/open space	<input type="checkbox"/> coord. w/ DCE for an invasive species removal program	W	O
invasive species		V		<input type="checkbox"/> issue w/ down stream damage <input type="checkbox"/> identify sites for protecting recharge water sources (wells)	#	O
water resources		V/S	<input type="checkbox"/> increase planting around parks + field to protect tree areas / provide relief from heat	S/	#	5/0
trees + veg.						

land available for more uses

Socio economic

- expand/provide educating/outreach re: climate change (impacts + solutions)
- ⑦ □ Exploring zoning for mitigation of of dev. impacts as related to climate change. ● ● ● ●

Environmental

- ⑧ □ Coordinate w/ Parks + Rec and Con Comm. ● ● for long term planning (+ public health issue)
- ⑨ □ identify site for protecting recharge (H/S-L-O) / water resources (wells) (H/O)

Infrastructure

- ⑩ □ explore potential for water reuse/recharge/recycle ● (+ waste water provision + management)

□ ●

Infrastructure

→ ~~Install back-up generators + storage systems @ critical facilities utilising solar + other renewable energy sources.~~

④ → Upgrade stormwater infrastructure

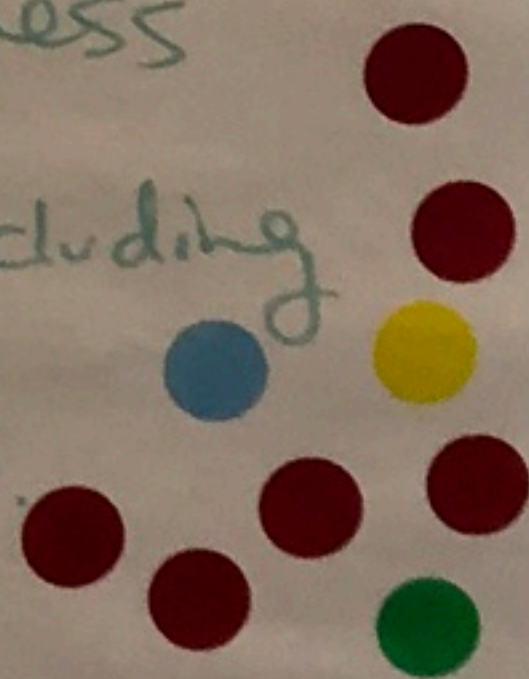
Environmental

⑤ → Educate Residents + Businesses on water conservation + air water supply



Socio-Economic

⑥ → Education for all on preparedness and existing available resources, including how to get on "check on me" lists.



Infrastructural

- ① Generators for critical facilities (incorp. renewable energy)

Socio-economic

- ② Create a comprehensive municipal emergency plan

Environmental

- ③ Allocate more funding for natural resources + natural resources education

Infra

④

Environ

⑤

Socio-Ec

⑥

Summary of Feedback from the Public Listening Session

The following table summarize concerns and proposed actions provided by the members of the public at the Public Listening Session on December 12, 2018.

Identified Hazard	Concerns	Proposed Community Actions	Proposed Individual Actions
Drought	<ul style="list-style-type: none"> › Impact on food supply › Maintaining tree canopy cover 	<ul style="list-style-type: none"> › Collect rainwater at municipal buildings › Continue “no watering” campaign during the summer 	<ul style="list-style-type: none"> › Install a rain barrel at home › Encourage use of drought-resistant plants
Flooding	<ul style="list-style-type: none"> › Certain areas in town become isolated as a result of flooding; these “islands” subsequently being cut off from emergency services › Contamination from stormwater run-off 	<ul style="list-style-type: none"> › Protect and expand wetlands › Minimize paving and/or use permeable pavement 	<ul style="list-style-type: none"> › Install green infrastructure at home to collect stormwater
Heat Waves	<ul style="list-style-type: none"> › Long duration heat events and impact on the elderly › Increased energy use for cooling › Impact on food supply and ecosystems 	<ul style="list-style-type: none"> › Encourage green building practices as an alternative to (or to lessen the need for) air conditioning › Plant more street trees › Create a list of vulnerable people to check on during heatwaves 	<ul style="list-style-type: none"> › Use ceiling fans instead of air conditioning › Plant more trees at home
Intense Storms	<ul style="list-style-type: none"> › Impact on people trying to get to work › More frequent power outages › Downed trees and branches 	<ul style="list-style-type: none"> › Conduct a tree vulnerability assessment › Create resources on how to protect older homes › Develop an emergency preparedness plan › Require new development to incorporate resiliency design 	<ul style="list-style-type: none"> › Create an emergency preparedness kit › Share information among neighbors on what they can do to help each other in case of emergency

Hazard: Heat Waves

Annual temperatures and the number of heat waves are rising, which changes how we will experience every season. We will see greater days above 90°F in the summer and fewer days falling below 32°F in winter. The nation's leading deadliest type of weather is not hurricanes or tornadoes, but heat, and this risk is only expected to grow. Additionally, new temperature patterns have the potential to impact our ecosystems, biodiversity, and crop production. We may also see changes in our energy demand required to maintain livable and comfortable temperatures in our homes.

What we have already seen

+1.43° F

Change in temperature in the Northeast comparing the average annual temperature in 1986-2016 to 1971-2000

What we are expected to see

Norfolk County	Observed Baseline 1971-2000	Mid-Century Projected Change	End of Century Projection
Average Number Days Below 32° F	131	105	91
Average Number Days Above 90° F	8	30	44

50° F

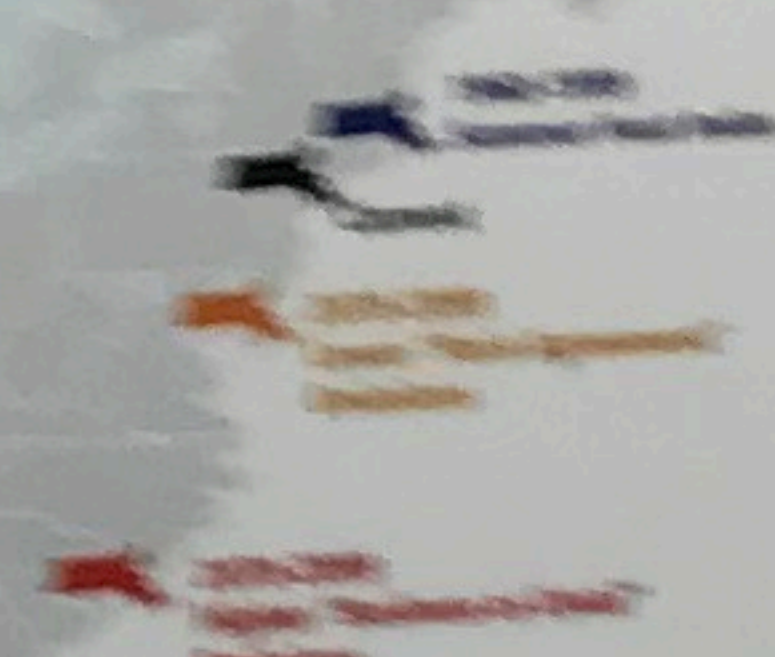
Average annual temp 1971-2000



+3.5° F

Projected change in average annual temp 2020-2049

Norfolk County

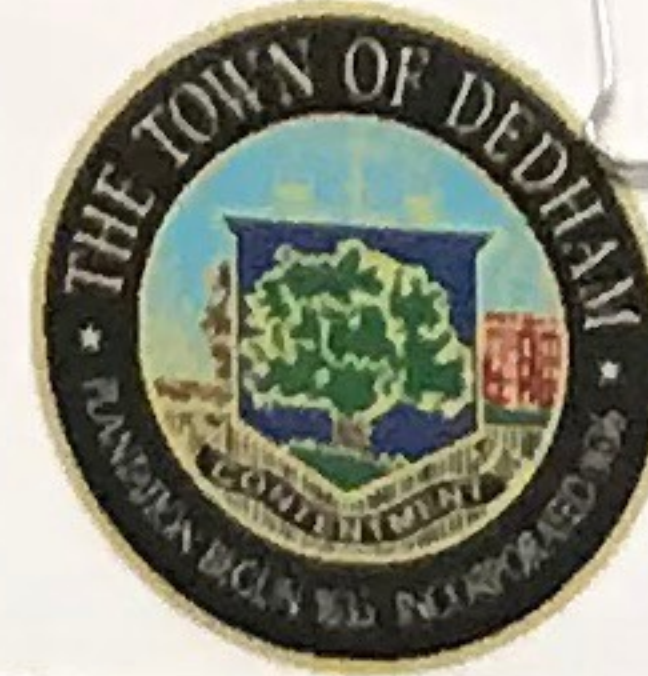


What concerns you most about this hazard?

2. What could be done to help community members be better prepared for this hazard?

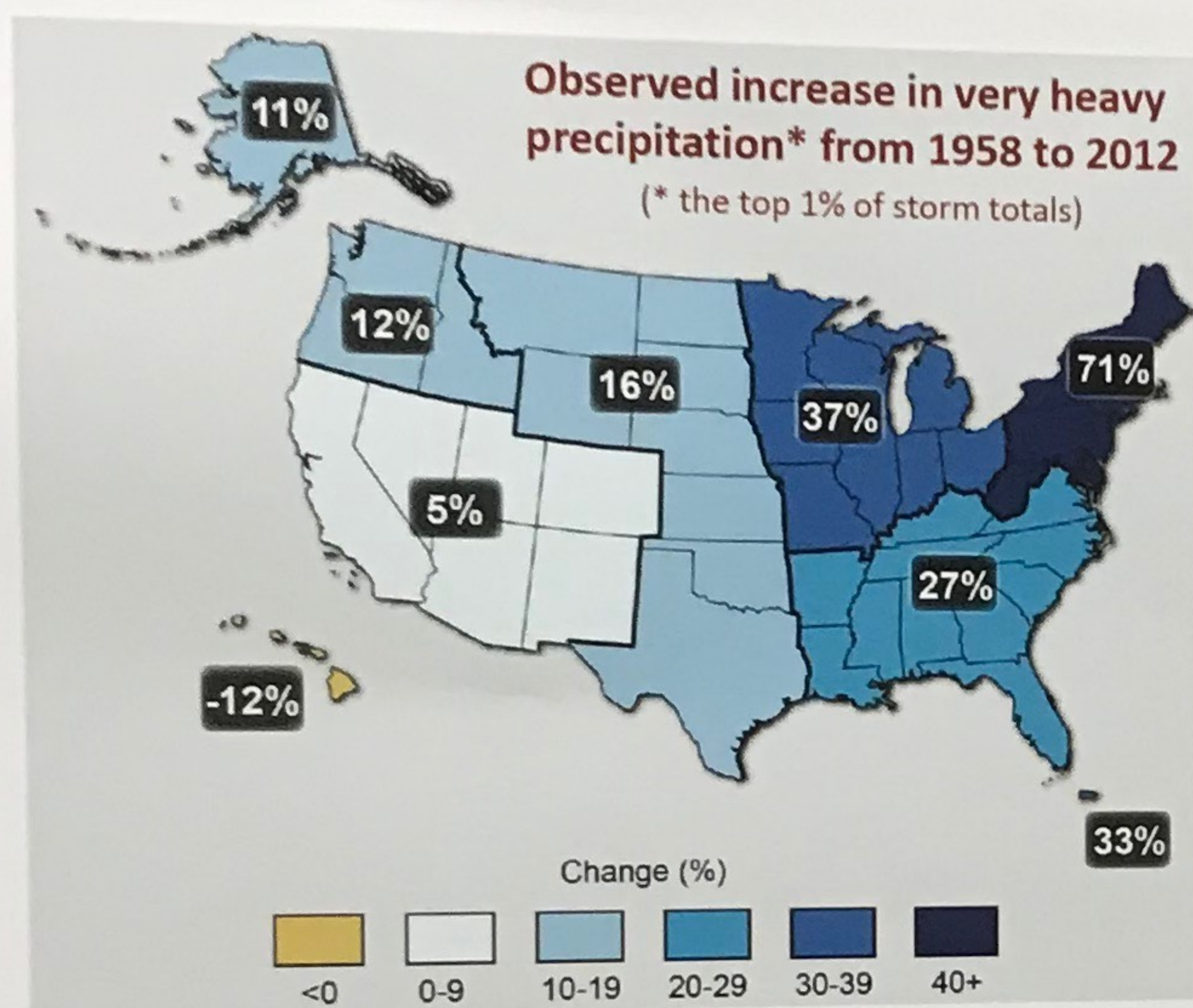
3. What actions have you already taken or would you be willing to take to better protect yourself from this hazard?

Hazard: Intense Storms



Storms are expected to increase in the amount of precipitation, intensity, and duration. We are likely to see more Nor'easters, stronger winds, persistent winter cold spells, and heavier, moisture packed snow. These impacts threaten Dedham's tree-lined streets, which are a defining characteristic of the town. Downed trees, flooding, and snow packed or icy roads delay commutes and disrupt the movement of goods, hindering our local economy. In addition, these hazards can damage infrastructure like roads, bridges, and private property. They can also cause problems for emergency routes, including those used for evacuation and ambulances.

What we have already seen



What we are expected to see

Norfolk County Precipitation Projections

Average Annual Total Precipitation	46.7"	48.9"	50.2"
		(+2.2")	(+3.5")
Observed Baseline 1971-2000		Mid-Century Projection	End of Century Projection



- More hurricanes, Nor'easters, tropical storms, and tornadoes
- Stronger winds during Nor'easters and thunderstorms
- Heavier, moisture packed snow

1. What concerns you most about this hazard?

Long term power outage

Damage to older buildings due to heavy intense rainfall

people being stranded isolated without access to communication/help

downed tree + branches - danger of hurting people removal

Power outages disproportionate effect on older population

Worried about getting to work/school

People cutting down trees just out of fear they will fall during storms

Response teams to assist after heavy snow storms

2. What could be done to help community members be better prepared for this hazard?

look at trees The town & address which ones might be vulnerable Provide assistance to residents get them taken down

Town needs to have emergency drills for a variety of events including intense storms

more + provide disaster plan where to go

Create neighborhood "watch" - wellness check teams during emergencies to check on + help others

Some sort of voluntary community network/directory of people willing to take in people who are forced to evacuate or whose homes were damaged (or who have prolonged power loss)

Resources/Workshops on how to protect older houses - winter preparation storm windows chimney protection leaking roofs ice dams

Debris Management Plan

underground power lines designated safe houses flashlights extra good batteries food that doesn't need cooking or refrigeration

increase out to the community many may not know

3. What actions have you already taken or would you be willing to take to better protect yourself from this hazard?

Assistance plan for folks who aren't able to shovel + get out of their house

Help neighborhoods begin sharing information and what they can do to help each other

enough people to shovel in case power goes out

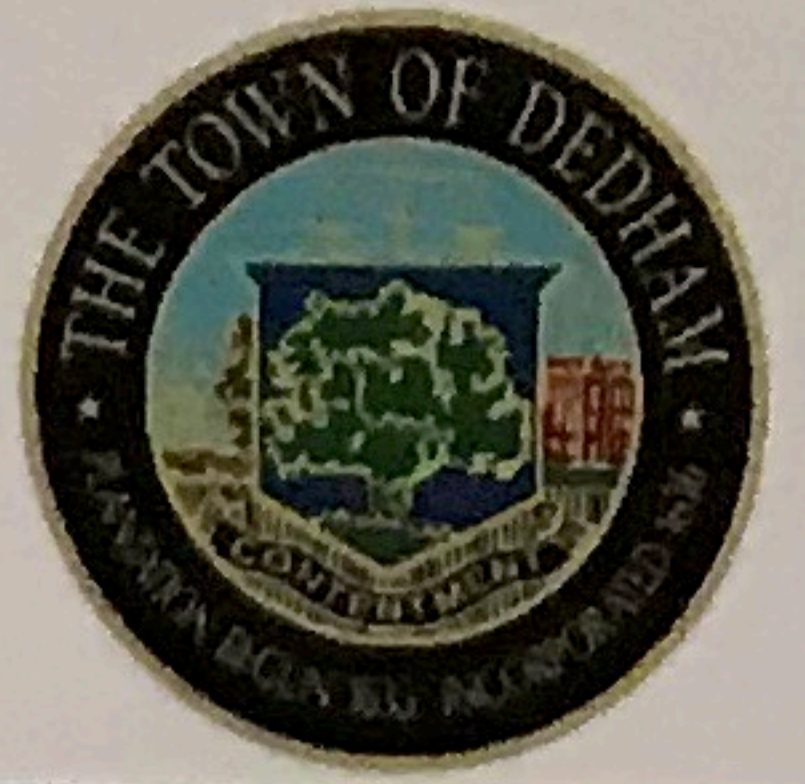
Our town emergency services are to stay calm and quickly recover and quickly recover and quickly recover and quickly recover

Wood Stove for Backup heat - No Diesel Generators!

Steel roof for building home

Who needs a generator? how long does it safely sit idle?

Hazard: Flooding



Dedham is experiencing more precipitation now than it did a century ago, and it's falling in higher concentrations. More intense storm events can overtop our riverbanks and overwhelm our stormwater drainage systems causing flash flooding and damage to our property and infrastructure. Intense storms can also cause dam failure, leading to significant flooding downstream.

What we have already seen

High water flow at dams

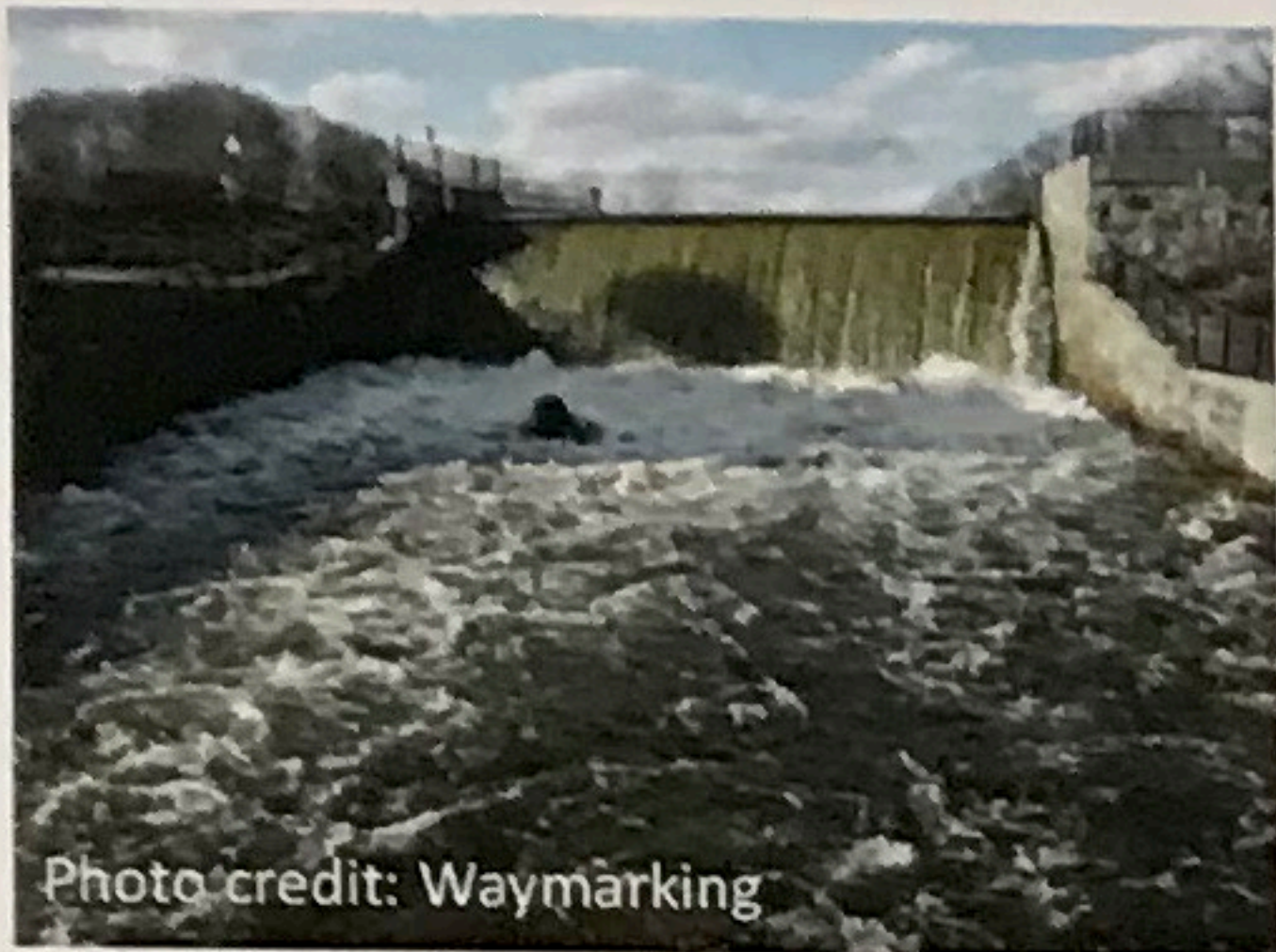
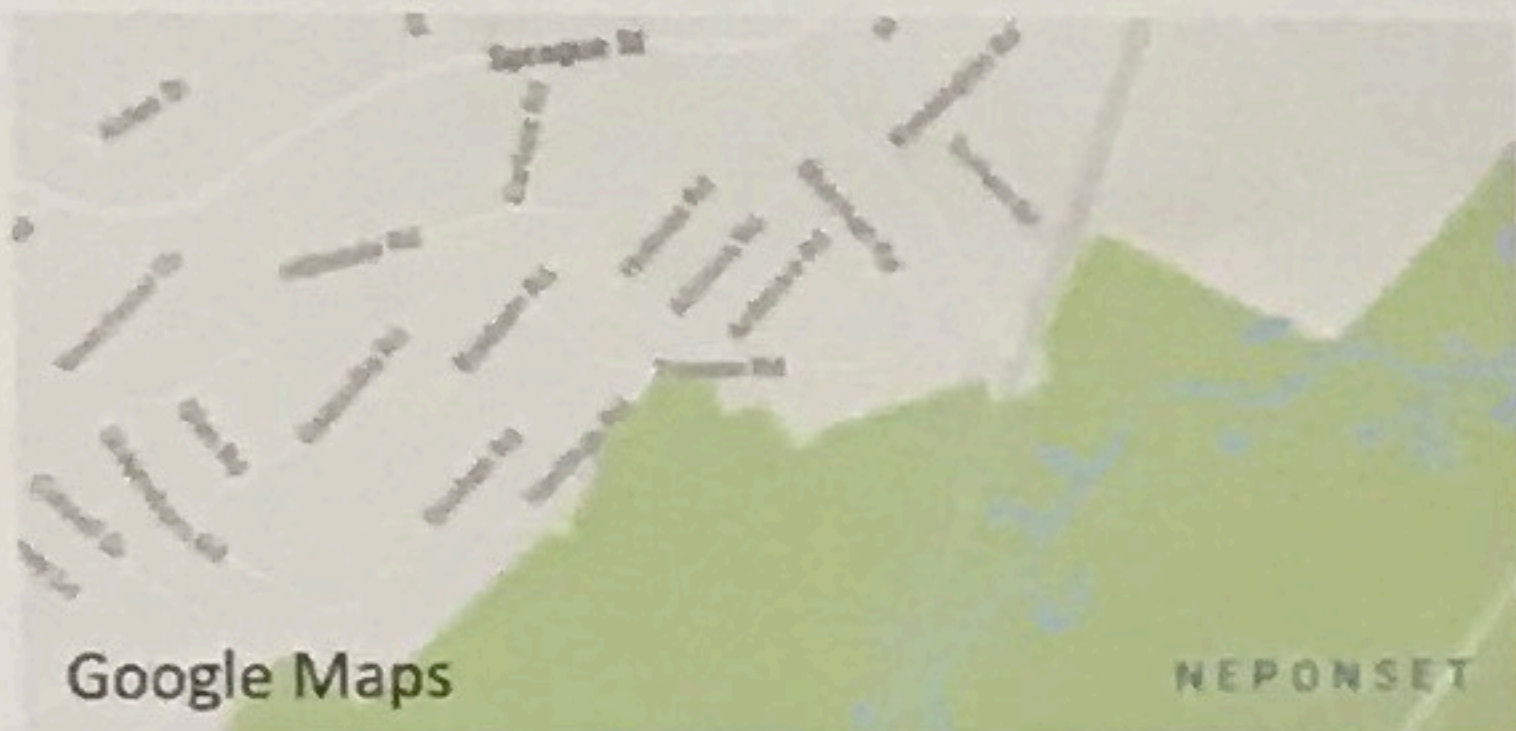


Photo credit: Waymarking

There are 5 dams in Dedham, including Centennial Dam pictured here.

Site-specific flooding



Google Maps

"The manor area" below Sprague Street sees periodic flooding impacts.



2 Average # annual flood events 1996-2005

2.7 Average # annual flood events 2006-2016

What we are expected to see

Average days per year in Norfolk County with precipitation greater than 1 inch

Observed Baseline
1971-2000

8 days

Mid-Century Projection

Up to 11.5 days

End of Century Projection

Up to 13 days

1. What concerns you most about this hazard?

more basement water

Cham could be

Will sea level rise impact Dedham?

Is the water table rising around my house?

• Latent streams which pop up after extreme precipitation
• Isolating of sections of town from emergency services
• Contamination from septic or chemical dumps
• Threat to water table (drinking water)

Infrastructure Impact - es Agriculture

Who to call / What to do

How do we find out or inform individuals flood risk? I struggle to understand flood plain maps

What can homeowners do to protect their property & what can be done among a group of houses in flood prone areas?

2. What could be done to help community members be better prepared for this hazard?

Zoning & town planning to minimize paving, & especially in new developments. Locate new construction far from rivers/ponds/wetlands.

Trees how to help stabilize the soil

Protect & expand wetlands

Town should use & encourage permeable pavement

What water storage and diversion ideas are being developed? Also educational programs on

Make Wigwag Area a visible & Accessible Asset

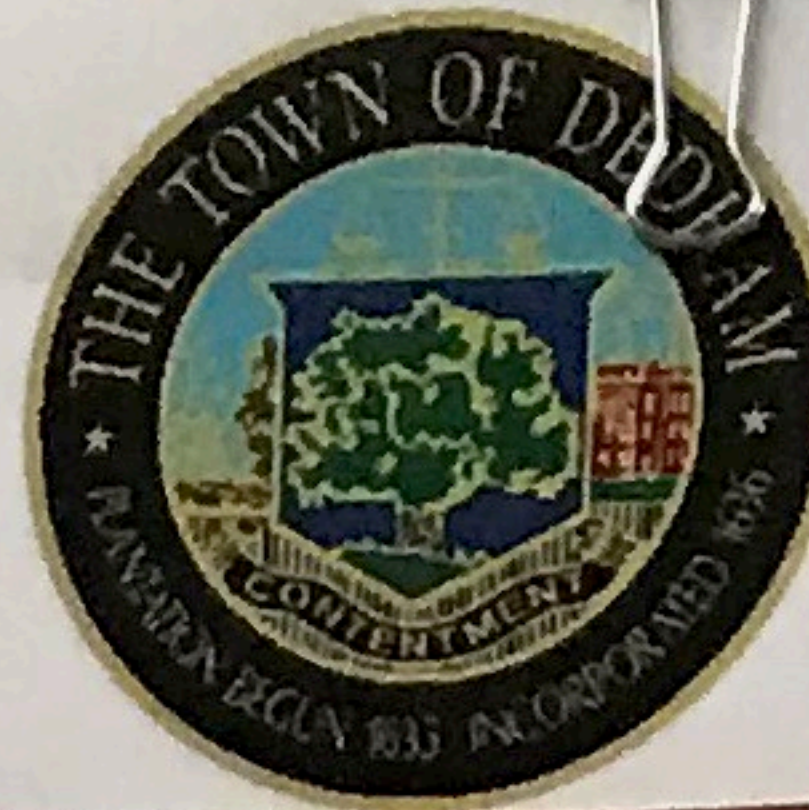
Need more wetlands & flood retention to recharge groundwater

Yes!

3. What actions have you already taken or would you be willing to take to better protect yourself from this hazard?

• Capture run off water & use dry discharges
• Permeable + commercial

Rain Barrels & Rain Gardens



Hazard: Drought

Even though more annual precipitation is projected overall, it is anticipated to fall in more intense events in the winter and spring rather than in smaller more sporadic events throughout the year. Therefore, there will be longer periods of time that experience no rainfall, especially in the summer and fall, increasing the potential for drought. In addition, rising temperatures will melt snow earlier in spring and increase evaporation leading to drier soil conditions going into summer and fall. Drought can stress our water supply and impact ecosystems and crop production by altering the soil moisture and water depth (and temperatures) that plants and animals rely on to flourish. The potential for brush fires also increases during drought, and there are several sites in Dedham with elevated risk.

What we have already seen

48 weeks

the longest duration of drought in MA since 2000 (Jun '16- May '17)

52%

of MA land was consider to be in "Exceptional Drought" (the highest level of drought) in Oct '16

6

sites in Dedham with elevated risk of brush fires

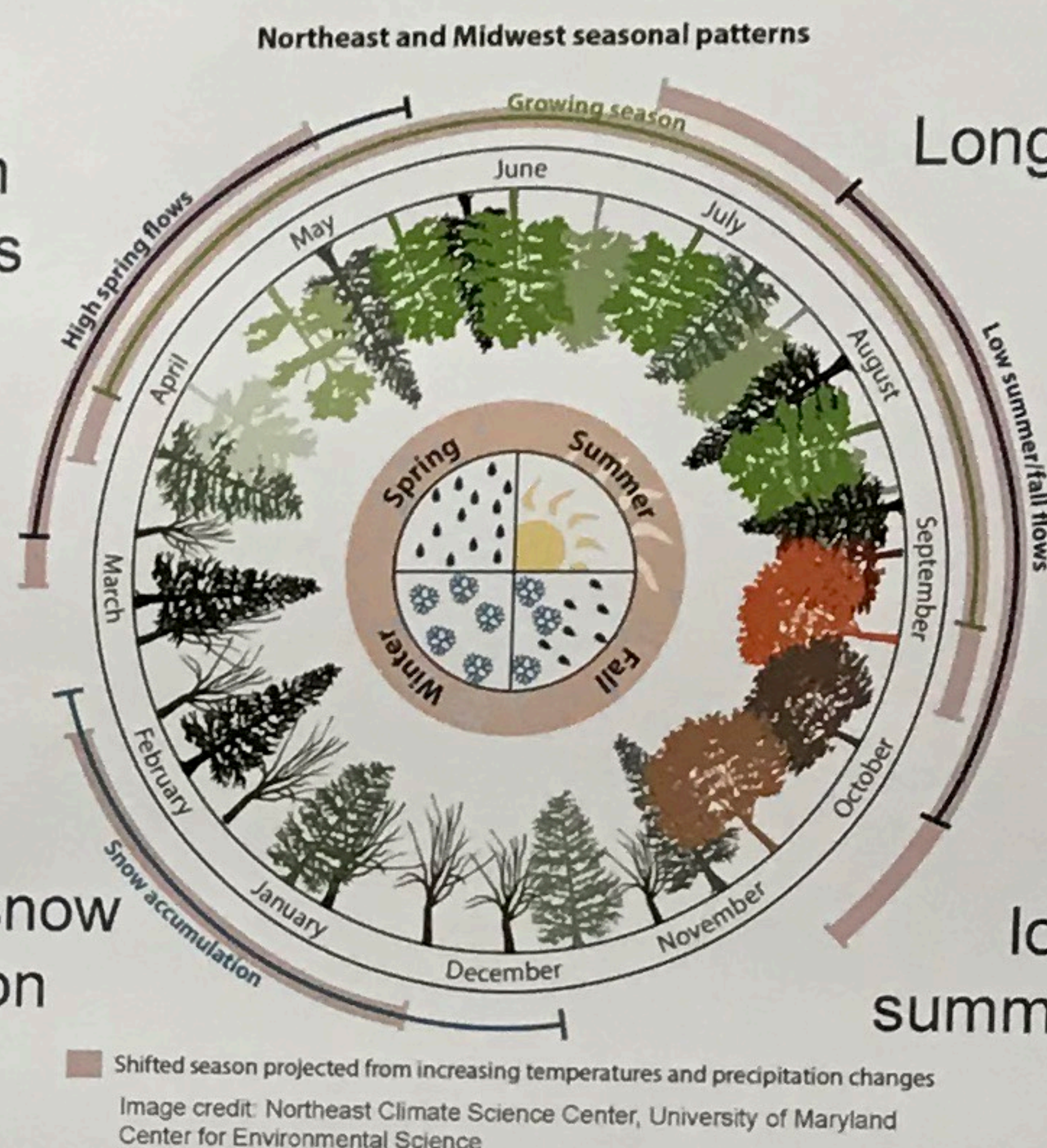
What we are expected to see

Earlier high spring flows

Longer growing seasons

Shorter periods of snow accumulation

Longer periods of low flows in summer and fall



1. What concerns you most about this hazard?

Disruption to local animal life - habitat change

Impacts of drought in other parts of country - how affect food supply - need for local food options

impact on food supply

impact on local gardening

IMPACT ON LOCAL FARMING

Maintaining Canopy Cover

2. What could be done to help community members be better prepared for this hazard?

RAINWATER COLLECTION ON MUNICIPAL BUILDINGS

EDUCATION AND WATERBILLS CAMPAIGN IN DEDHAM DURING SUMMER AND FALL WATERING END

Education - Why is drought bad? How to conserve water (best practices) Why conserve water?

Slow down business watering and lawns as landscaping - change to more water friendly landscaping

Town-wide composting (compost holds a lot of water)

3. What actions have you already taken or would you be willing to take to better protect yourself from this hazard?

grey water systems in homes

raising lawn plant drought resistant plants

Don't water lawn

Removed asphalt driveway replaced w/ 85% gravel

Lose lawn - plant wildflowers - hardscape

Rainbarrel

Capture Run off water - Residential + commercial