FUSS & O'NEILL

Solve better. Go further.

Strategic Flooding Mitigation for Connecticut: Challenges and Solutions

CAFM ANNUAL CONFERENCE

NOVEMBER 13, 2024

Connecticut Conference of Municipalities

collaborating for the common good

Presentation Outline

- Project Background
- Municipal Flooding Survey & Agency Meetings
- What We Learned
- Summary of Recommendations
- Questions & Discussion

Source: David Murphy, Resilient Land & Water LLC (West Hartford, Summer 2021)

The Problem

- Flooding of all types is impacting communities throughout Connecticut


Fair Haven, 2023


Milford, 2022

Coastal Flooding


West Hartford, 2021


Stamford, 2021

Rainfall (Pluvial) Flooding

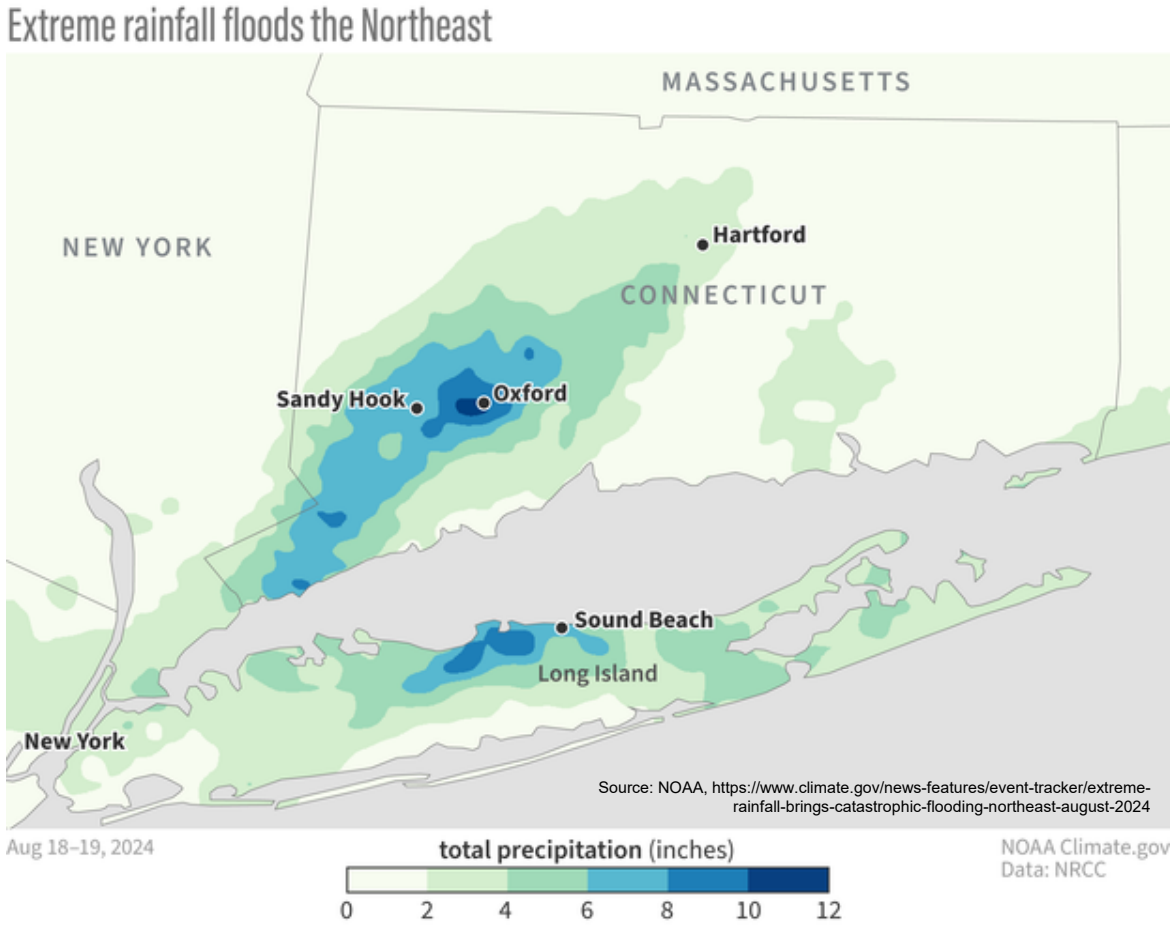

Oxford, 2024

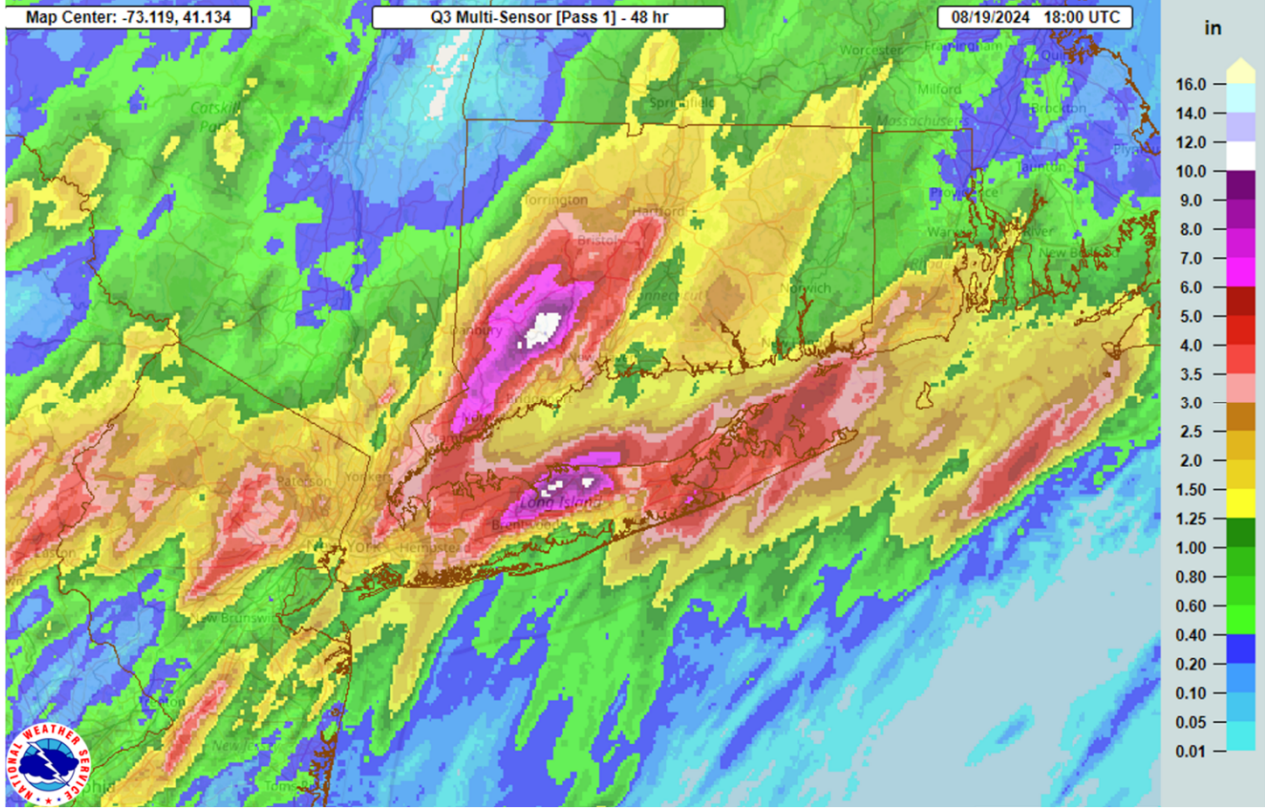
Riverine (Fluvial) Flooding

FUSS & O'NEILL

The Problem

- Extreme precipitation events are increasing in frequency and intensity



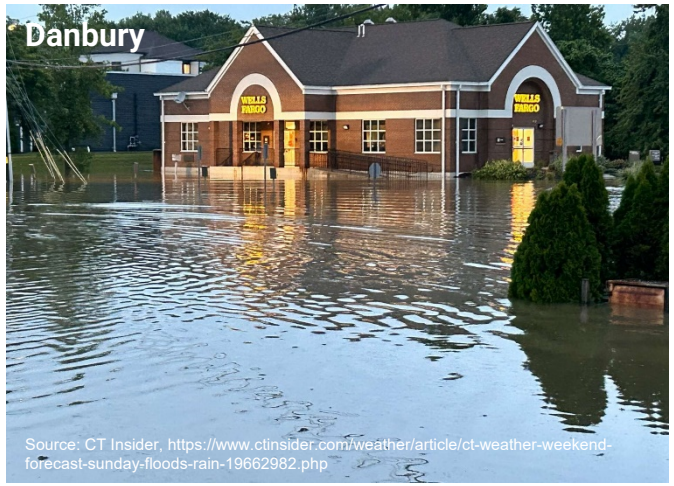


Source: National Weather Service, https://www.weather.gov/images/okx/August18_192024_FlashFlooding/Multsens1total.png

- Flooding is not just a coastal issue – it can happen anywhere
- High priority issue for municipal officials and the public

FUSS & O'NEILL

August 18-19, 2024 Flash Flooding



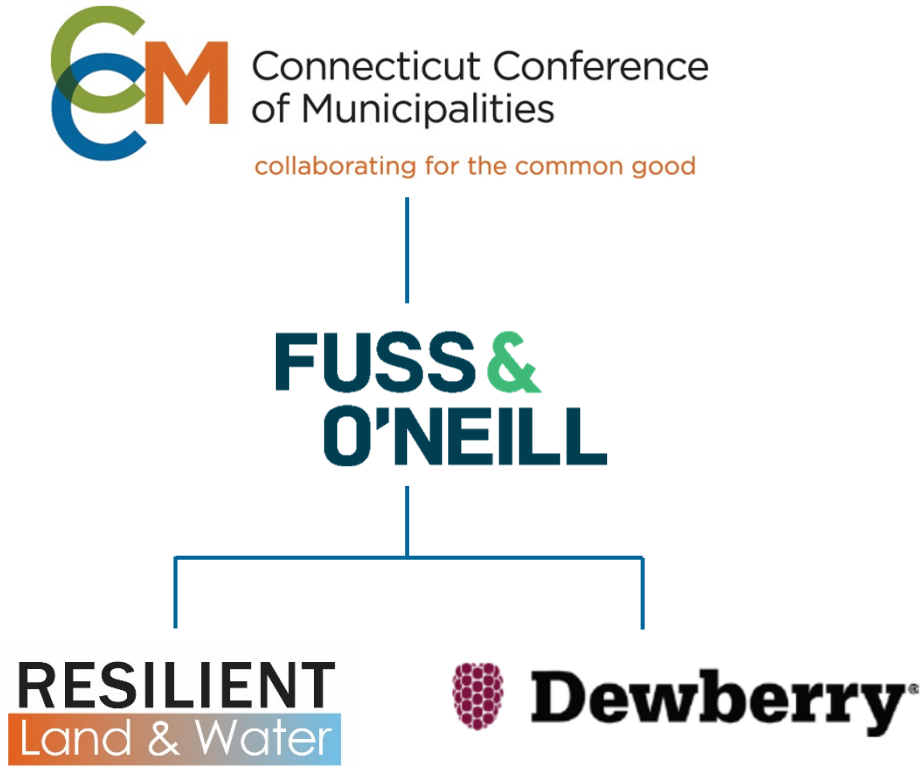
FUSS & O'NEILL

Study Goals

- Better understand the increased frequency and severity of flooding (coastal, riverine, and drainage related flooding) and the associated challenges faced by Connecticut municipalities
- Develop municipal and state-level policy, programmatic, and funding related recommendations that will help reduce the impacts of flooding on municipalities
- Build on the existing flood resilience programs and initiatives in Connecticut

Project Team

- **Connecticut Conference of Municipalities**
  - Randy Collins, Project Lead
  - CCM Team
- **Fuss & O'Neill**
  - Erik Mas, PE, Project Manager
  - Chelsea Zakas, AICP, Environmental Planner
- **Resilient Land & Water**
  - David Murphy, PE, CFM
- **Dewberry**
  - Scott Choquette, PE, CFM
- **Municipal Advisory Committee**
  - Town of North Branford, Town of Guilford, City of Meriden



Partner Agencies & Organizations

Mary Buchanan	CIRCA	**Jeff Caiola**	CT DEEP
Nicole Govert	CIRCA	**Rebecca French**	CT DEEP
James O'Donnell	CIRCA	**Mary-beth Hart**	CT DEEP
John Truscinski	CIRCA	**Diane Ifkovic**	CT DEEP
Dave Demchak	CIRMA	**Brian Thompson**	CT DEEP
Matt Hart	CRCOG	**Sarah Watson**	CT DEEP
Caitlin Palmer	CRCOG	**Jennifer Schneider**	CT DECD
Heidi Samokar	CRCOG	**Stephanie Zessos**	CT DEMHS
Meghan Sloan	MetroCOG	**Dominic Antonio**	CT DOT
Jim Larkin	NECCOG	**Michael Hogan**	CT DOT
Aaron Budris	NVCOG	**Daniel Imig**	CT DOT
Margot Burns	RiverCOG	**Emily Pysh**	CT DOT
Helen Zincavage	SCCOG	**James Desantos**	CT Green Bank
Laura Francis	SCRCOG	**Ashley Stewart**	CT Green Bank
Francis Pickering	WestCOG	**Leigh Whelpton**	CT Green Bank
Jaclyn Reelick	WestCOG	**Rebecca Dahl**	CT OPM
Michael Towle	WestCOG	**Joanna Wozniak-Brown**	CT OPM

- **Offer statewide or regional perspective on flood resilience programs in Connecticut**
- **Help inform recommended actions**
- **Help implement programmatic and policy changes**

FUSS & O'NEILL

Project Approach

FUSS & O'NEILL

Municipal Flooding Survey

- On-line survey sent to all CT municipalities

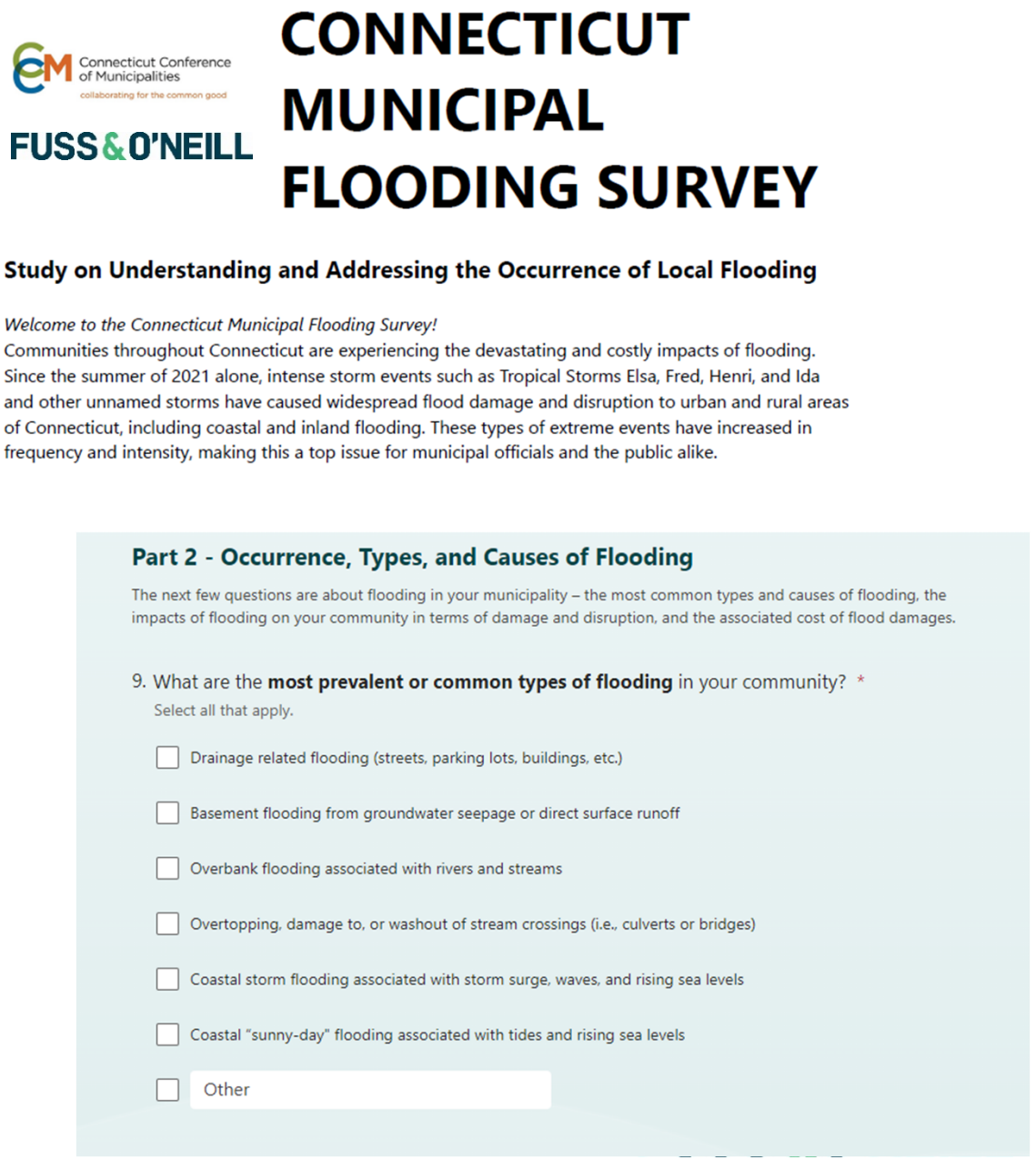
Part 1: About the Municipality

Part 2: Occurrence, Types, and Causes of Flooding

Part 3: Challenges and Obstacles to Addressing Local Flooding

Part 4: Financial and Technical Assistance

Part 5: Additional Feedback and Project Advisory Committee



Connecticut Conference of Municipalities
collaborating for the common good

FUSS & O'NEILL

CONNECTICUT MUNICIPAL FLOODING SURVEY

Study on Understanding and Addressing the Occurrence of Local Flooding

Welcome to the Connecticut Municipal Flooding Survey!
Communities throughout Connecticut are experiencing the devastating and costly impacts of flooding. Since the summer of 2021 alone, intense storm events such as Tropical Storms Elsa, Fred, Henri, and Ida and other unnamed storms have caused widespread flood damage and disruption to urban and rural areas of Connecticut, including coastal and inland flooding. These types of extreme events have increased in frequency and intensity, making this a top issue for municipal officials and the public alike.

Part 2 - Occurrence, Types, and Causes of Flooding

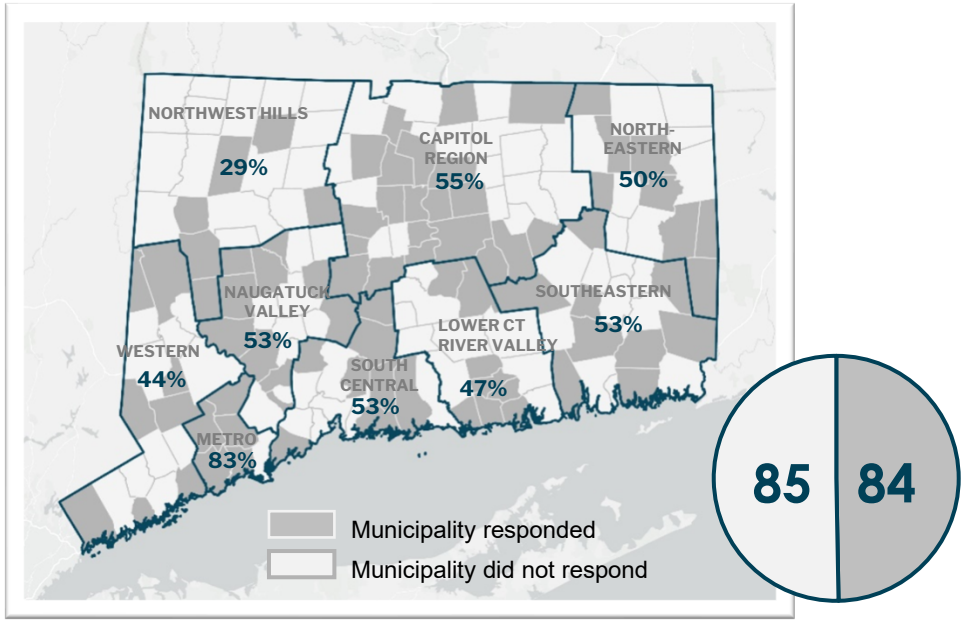
The next few questions are about flooding in your municipality – the most common types and causes of flooding, the impacts of flooding on your community in terms of damage and disruption, and the associated cost of flood damages.

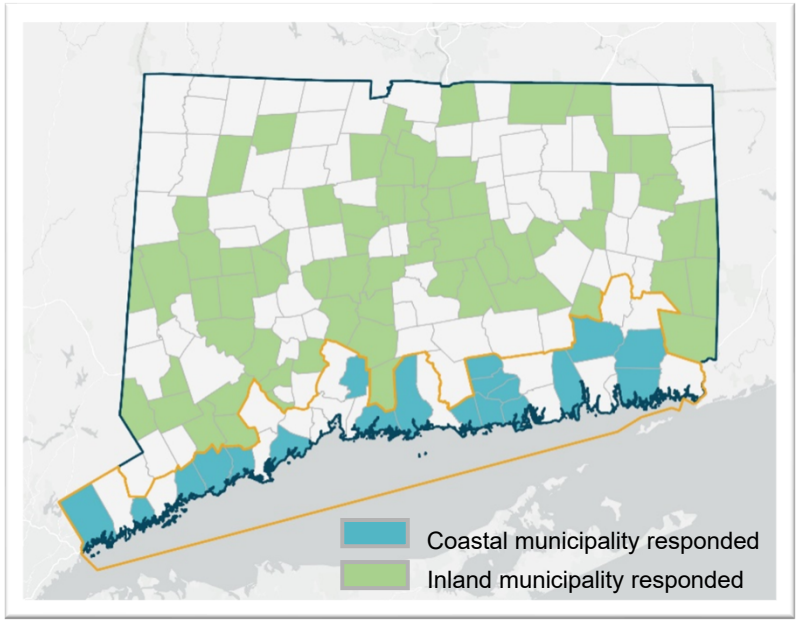
9. What are the **most prevalent or common types of flooding** in your community? *

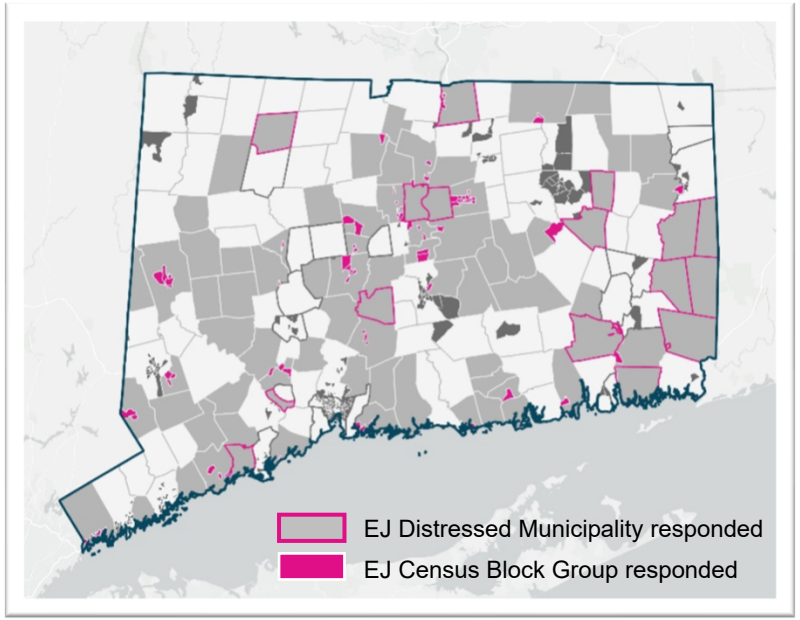
Select all that apply.

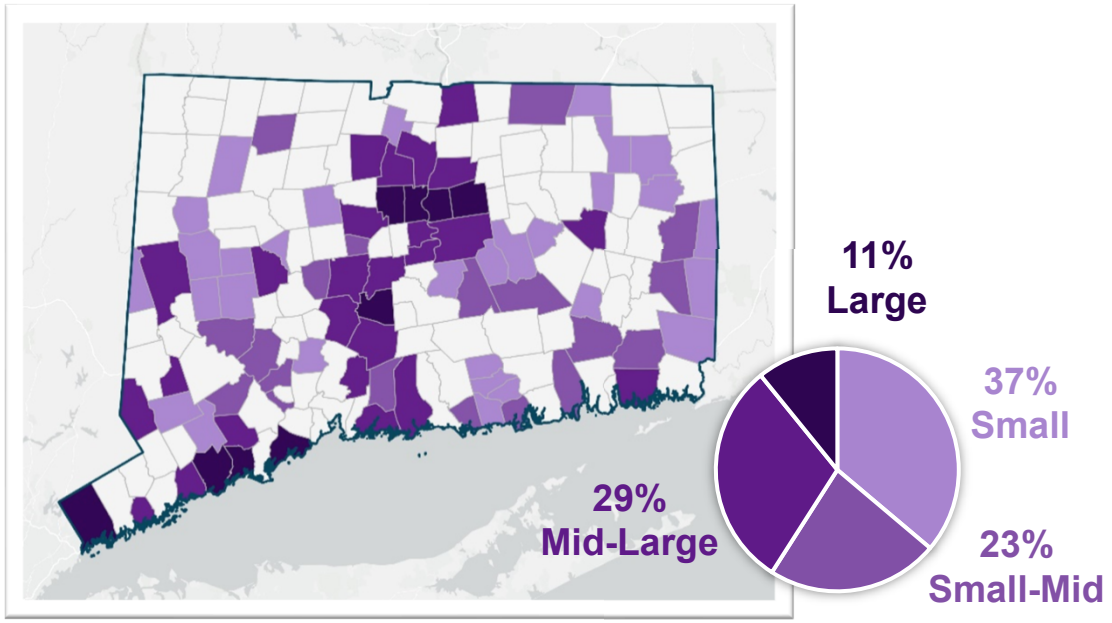
- [ ] Drainage related flooding (streets, parking lots, buildings, etc.)
- [ ] Basement flooding from groundwater seepage or direct surface runoff
- [ ] Overbank flooding associated with rivers and streams
- [ ] Overtopping, damage to, or washout of stream crossings (i.e., culverts or bridges)
- [ ] Coastal storm flooding associated with storm surge, waves, and rising sea levels
- [ ] Coastal "sunny-day" flooding associated with tides and rising sea levels
- [ ] Other

Who Responded to the Survey?









FUSS & O'NEILL

Connecticut Conference of Municipalities
collaborating for the common good

CONNECTICUT MUNICIPAL FLOODING SURVEY

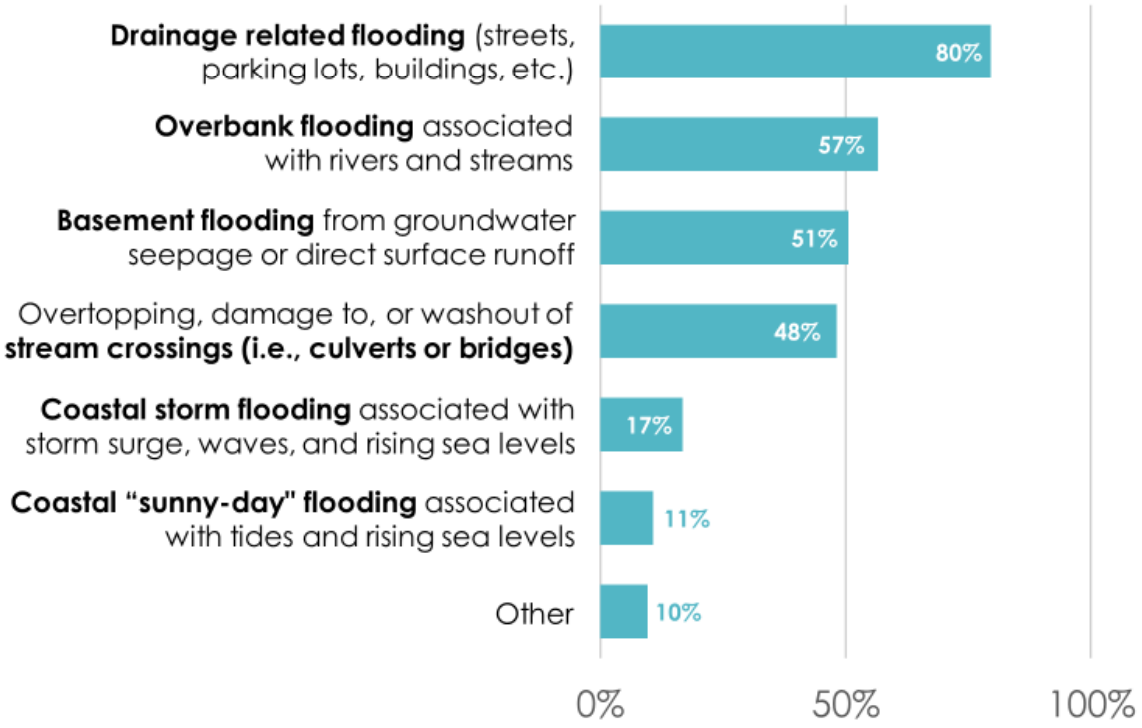
Summary of Survey Responses

January 10, 2024

TYPES OF FLOODING

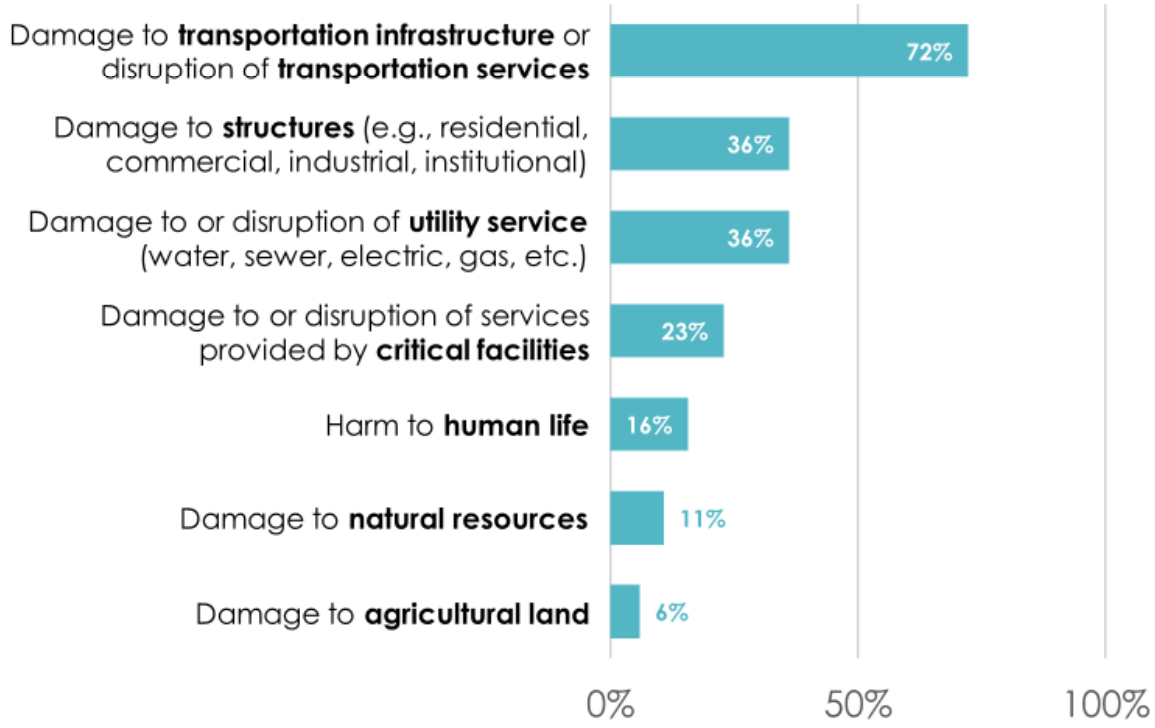
Drainage-related flooding cited as the most common type of flooding, with flood damage to transportation infrastructure and services as the most urgent or pressing flooding impacts

What are the **most prevalent or common types of flooding** in your community?



Rank the **most urgent or pressing flooding impacts** your municipality is facing

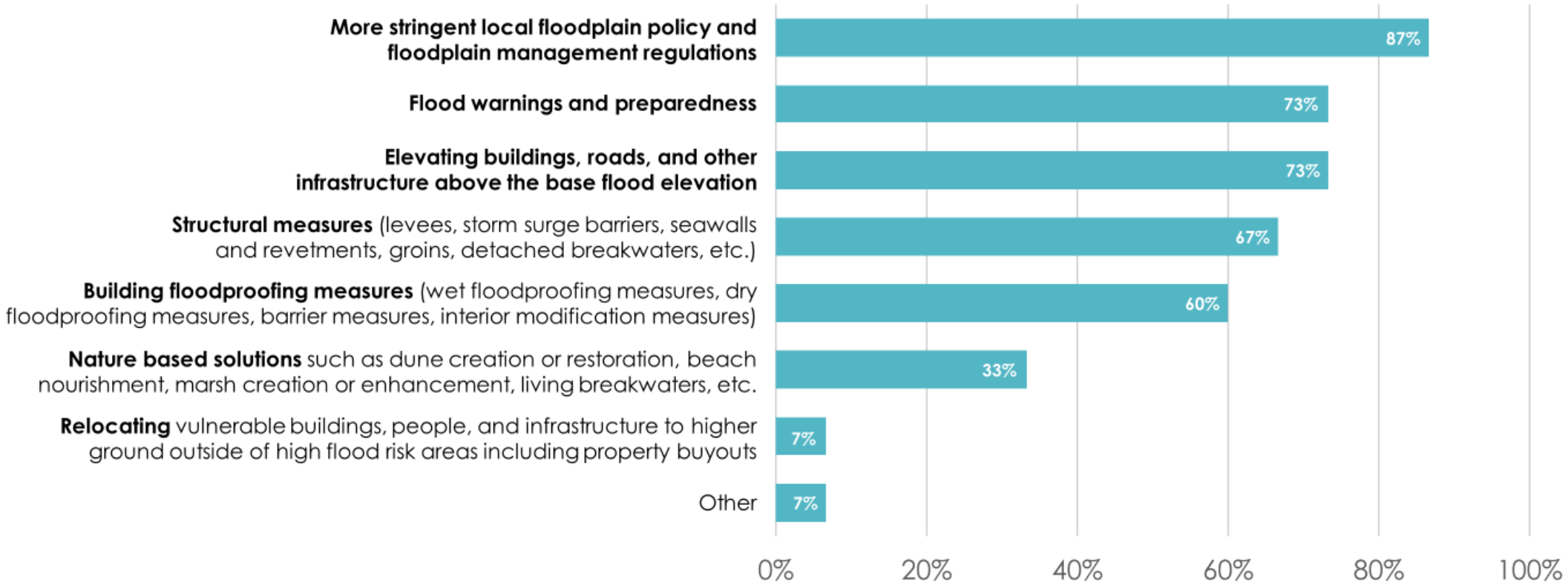
(Responses ranked as #1 or #2)



COASTAL FLOODING

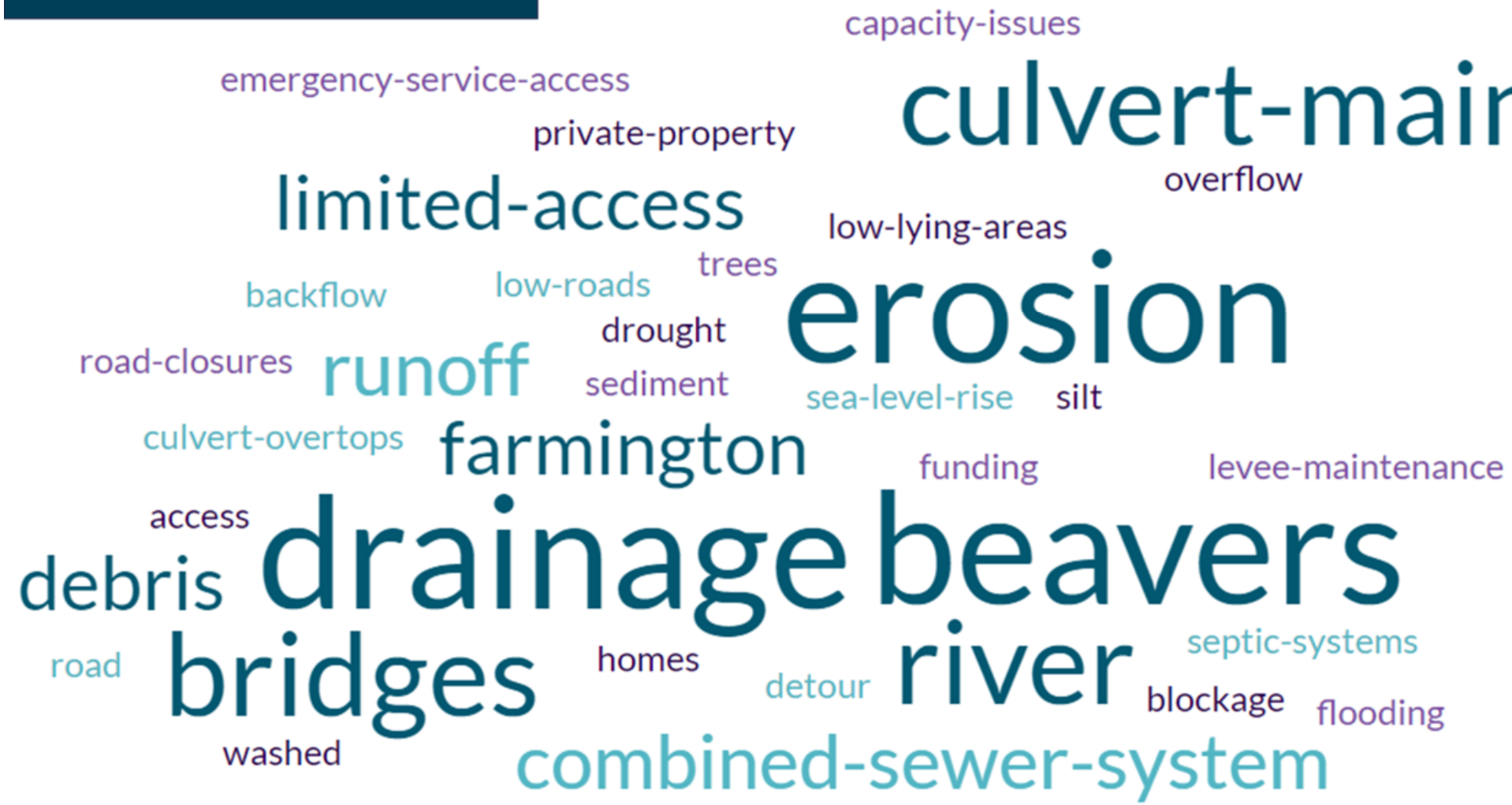
Between 60% and 87% of the coastal municipalities surveyed use floodplain management policy and regulatory measures, flood warnings and preparedness, elevation and structural measures, and building floodproofing. Only 33% of the respondents use nature-based solutions and less than 10% currently use relocation.

What **measures** does your municipality currently employ **to mitigate coastal flooding**?



OTHER FLOODING ISSUES OF CONCERN

Are there any **other urgent or pressing flooding impacts** your municipality is facing?



Examples

"Access issues to residential areas and some commercial areas due to low roads."

"Beaver dams fail causes down stream flooding during heavy rain."

"Removal of flood debris from water courses and repair of erosion"

"Our flooding is showing how inadequate our outdated road drainage systems are."

"Culverts that need to be cleaned out regularly to ensure a more even flow of water, versus clogged culverts causing backups."

Partner Agency & Organization Meetings

- **Regional Councils of Government**
- **CT DEEP**
- **CT OPM**
- **CT DEMHS**
- **CT DOT**
- **CT Green Bank**

1. Which findings of the municipal survey are the **most important** and why?
2. **What is your agency already doing** to address flooding and flood resilience?
3. **What else could your agency do** to help address flooding and flood resilience?
4. **What roadblocks does your agency face** in addressing flood-related issues, and how could CCM or other agencies help?

What We Learned – Major Impacts

- **Drainage-related flooding** was cited as the most common type of flooding.
- **Flood damage to transportation infrastructure (i.e., flooded roads) and residential areas** were cited as the most urgent flooding impacts.


Source: City of Danbury (Summer 2021)


Source: City of Stamford (2021)

FUSS & O'NEILL

What We Learned – Key Barriers and Challenges

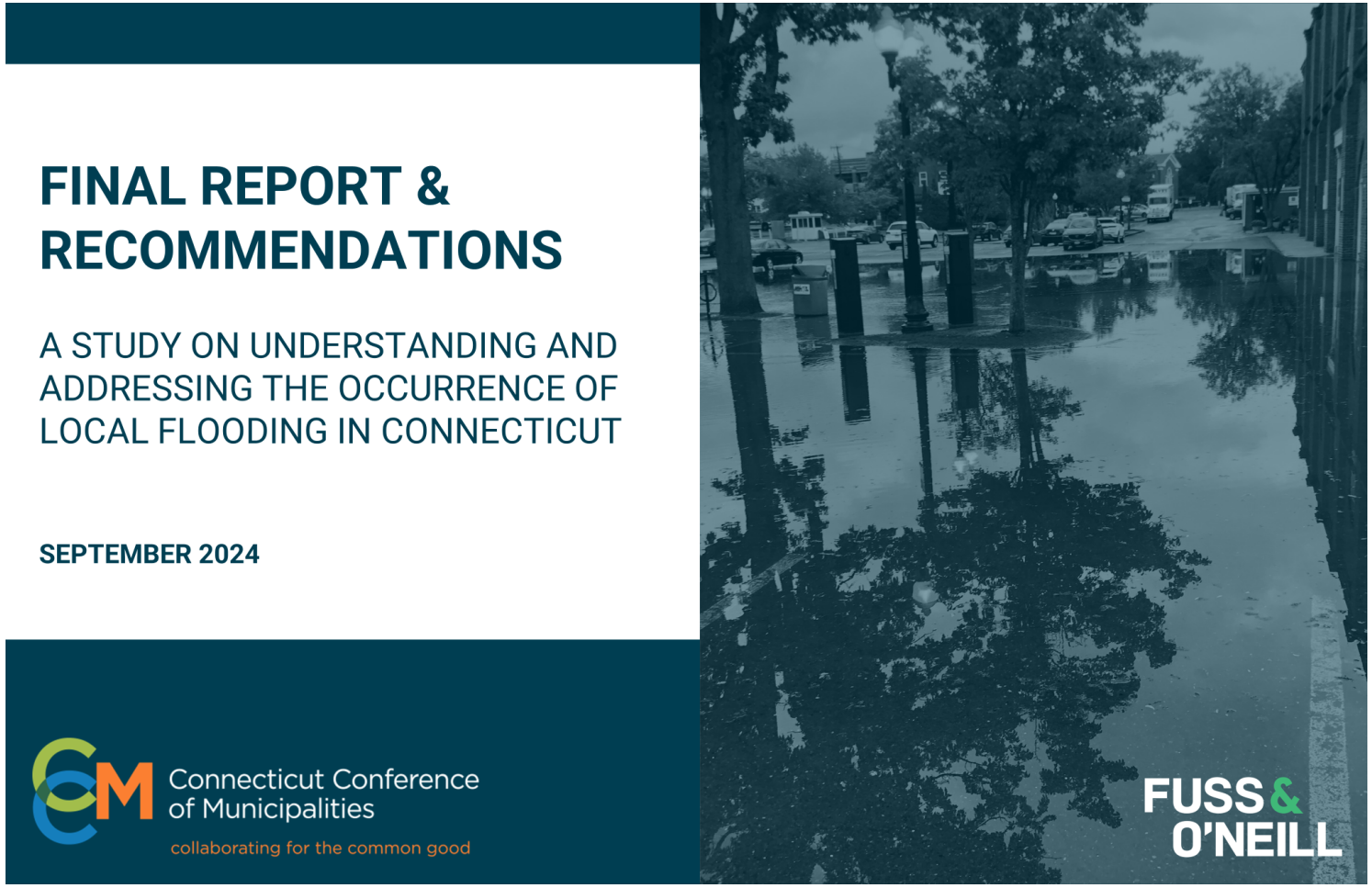
- **Inadequate municipal funding** is overwhelmingly the top challenge or obstacle for the municipalities surveyed.
- **The inability to meet minimum requirements for local cost-share or "matching funds"** in accessing federal grant funding.
- **Access to grant funding** programs and a **lack of staff specifically dedicated** to flood risk management.
- **Inadequate capacity to manage state and federal grants**, especially multiple grants with significant reporting and administrative or management requirements.

What We Learned – Opportunities

- **Increased staff capacity** needed to effectively address flooding.
- **Outreach and advocacy** needed to inform decision-makers of the importance of funding and implementing a range of solutions to mitigate flooding.
- **More sustainable approaches** (beyond state and federal grant funding alone) needed to generate ongoing municipal revenue for flood resilience and mitigation efforts.
- **Continued and expanded inter-agency collaboration needed** across state agencies and between state agencies and the COGs.
- **Regional approaches and strategies** needed to effectively address flooding problems.

Study Report and Recommendations

- Statewide Policy and Planning
- Municipal Land Use Regulations and Policy
- Grant Funding and Grant Management Capacity
- Dedicated Funding Sources
- Interagency Collaboration and Regional Approaches
- Technology and Tools

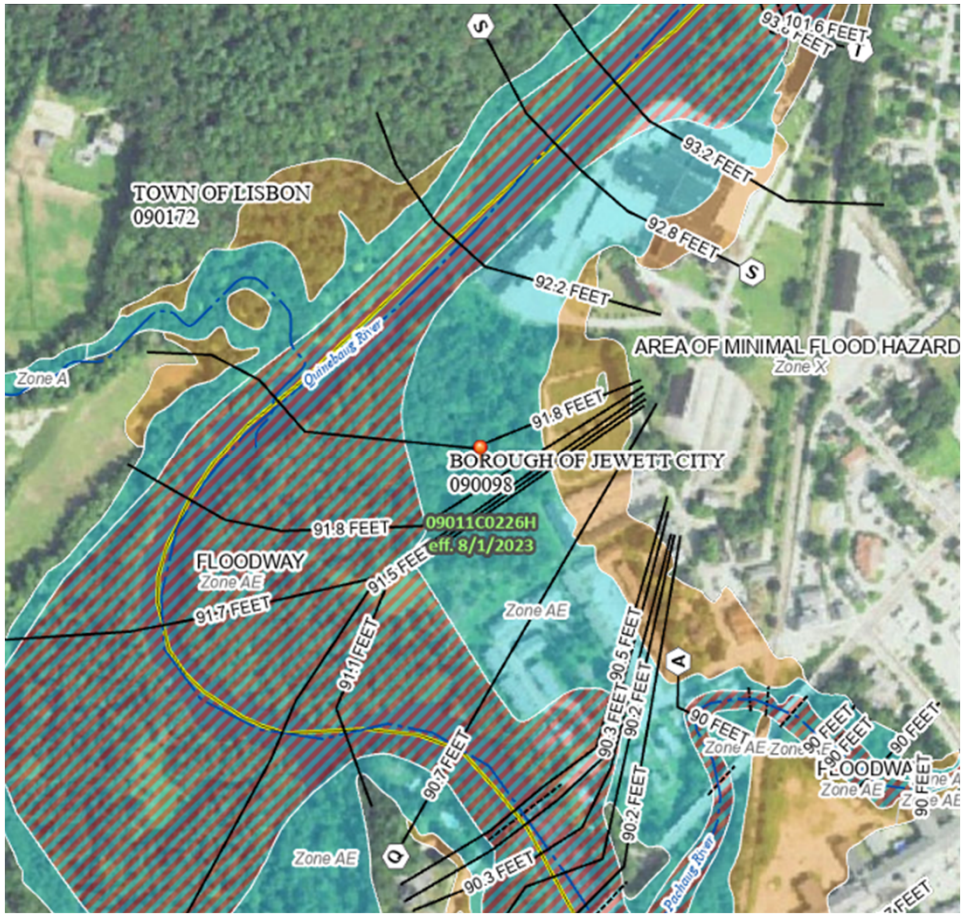


https://www.ccm-ct.org/Advocacy/Reports-Data/Flood-Study

Statewide Policy and Planning

Flood Risk Estimation and Awareness

ACTIONS	BY WHOM?
1. Augment FEMA flood hazard maps to **more accurately reflect actual flood risk** for municipalities and property owners 2. Develop **statewide pluvial flood hazard mapping** 3. Support **more frequent updates** to FEMA flood hazard maps 4. Promote **flood insurance** coverage and other flood risk reduction strategies **for properties outside FEMA Special Flood Hazard Areas**	• CT DEEP • CIRCA • CTDOT • CT State and Federal Legislature • CCM • CIRMA and Insurance Community



FEMA Flood Insurance Rate Map (FIRMette), Borough of Jewett City

FUSS & O'NEILL

Statewide Policy and Planning

Floodplain and Flood Resilience Design Standards

ACTIONS	BY WHOM?
1. Increase **elevation requirements for new or substantially improved structures** beyond the minimum freeboard standards specified in the Connecticut State Building Code a. Consistency with new Federal Flood Risk Management Standards b. Climate-Informed Science Approach c. Freeboard Value Approach 2. Amend local zoning and State policy and design standards accordingly	• CTDAS, Office of the State Building Inspector (State Building Code) • Municipalities and State Agencies • CCM (outreach and advocacy)

Fairfield Beach Road in Fairfield, Conn., on Saturday July 17, 2021.

FUSS & O'NEILL

Statewide Policy and Planning

Floodplain and Flood Resilience Design Standards

ACTIONS	BY WHOM?
1. **Develop and implement statewide climate resilience design standards and guidance** to incorporate climate and flood resilience into budgeting, coordination, capital planning, grant-making, and implementation of State and municipal capital projects. a. Incorporate a scientifically-based process that produces a consistent outcome and uniform guidelines for users in the selection of planning horizon, return period, and design criteria.	• Multi-agency collaboration • CIRCA (ongoing updates to climate projections for precipitation and sea level rise) • CCM (outreach and advocacy)

Asset Preliminary Climate Risk Rating Summary — Number of Assets: 1

Asset Risk	Sea Level Rise/Storm Surge	Extreme Precipitation - Urban Flooding	Extreme Precipitation - Riverine Flooding	Extreme Heat
Ocean Street	High Risk	High Risk	Low Risk	High Risk

Climate Resilience Design Standards Summary

	Target Planning Horizon	Intermediate Planning Horizon	Percentile	Return Period	Tier
Sea Level Rise/Storm Surge					
Ocean Street	2070	2050		500-yr (0.2%)	
Extreme Precipitation					
Ocean Street	2070			50-yr (2%)	Tier 3
Extreme Heat					
Ocean Street	2070		90th		Tier 3

Massachusetts Climate Resilience Design Standards Tool

FUSS & O'NEILL

Statewide Policy and Planning

Dam Safety and Flood Resilience

ACTIONS	BY WHOM?
1. Develop **uniform statewide dam safety design guidance or technical standards** including climate change impacts 2. Strengthen the requirements for the development and exercising of **Emergency Action Plans** 3. Require **functional low-level outlet drains** on dams to allow for quickly lowering the water level in the event of an emergency	• Multi-agency collaboration • CIRCA (ongoing updates to climate projections for precipitation and sea level rise) • CCM (outreach and advocacy)

Emergency Placement of Cofferdam at Fitchville Pond Dam, Bozrah, CT

FUSS & O'NEILL

Statewide Policy and Planning

Permitting and Regulatory – Statewide Riparian Protection

ACTIONS	BY WHOM?
1. Implement **statewide riparian protection program** to better regulate development in river corridors and floodplains. a. Statewide minimum standards for development within a specified distance (e.g., 200 feet) of rivers, streams, or other waters. b. Exclusions for urban areas where such "buffer" widths would not be feasible. 2. In the absence of a statewide program, encourage the adoption of **riparian corridor zoning regs**.	• CT DEEP (lead, adoption of statewide riparian protection program) • Municipalities (adoption of riparian corridor zoning regulations) • CCM (outreach and advocacy)

Roaring Brook, Willington, CT

FUSS & O'NEILL

Statewide Policy and Planning

Permitting and Regulatory – Update State Water Plan

THE ISSUES	ACTIONS	BY WHOM?
▪ The last plan update in 2018 included consideration of climate change impacts on water quality and quantity and recommended strategies to address climate resiliency.	1. **Update the State Water Plan** to reflect advances in climate science and adaptation planning and a stronger focus on flood resilience. 2. Address potential flood **impacts to wellfields in flood zones** including damage to wellfields that can result in outages and mandatory water conservation measures (“boil water” notice) during flood cleanup and recovery. 3. Encourage **water utilities to participate in the flood resilience planning process** with the COGs and municipalities.	• Connecticut Water Planning Council (PURA, CT DEEP, CT OPM, and CT DPH) • Water Utilities • COGs and municipalities

Statewide Policy and Planning

Permitting and Regulatory – MS4 Permits

THE ISSUES	ACTIONS	BY WHOM?
▪ MS4 General Permit focuses on water quality benefits of stormwater management. ▪ Structural stormwater controls and "green infrastructure" can reduce runoff volumes and help address precipitation-related flooding. ▪ CT DEEP is in the process of revising the current MS4 General Permit. ▪ The upcoming update and reissuance of the MS4 General Permit is an opportunity to strengthen the permit's flood resilience provisions. ▪ CTDOT MS4 Permit and MS4 General Permit have provisions for off-site DCIA reduction credits, although these provisions are not being used by CTDOT or most municipalities.	1. Use the MS4 General Permit to expand investment in green infrastructure. Promote the use of green infrastructure to address precipitation flooding. 2. Allow permittees "partial credit" for DCIA reduction when implementing stormwater retrofits. 3. Build incentives into the permit and promote the use of off-site stormwater mitigation approaches and stormwater authorities. 4. Implement a CTDOT stormwater retrofit credit program to address MS4 Permit requirements and help fund local resilience projects.	• CT DEEP (lead) • CTDOT (lead) • CCM (outreach and advocacy)

Statewide Policy and Planning

SB 11 Climate Resilience Legislation

ACTIONS	BY WHOM?
1. Reintroduce provisions of the recent unsuccessful statewide climate resilience legislation a. **Resilience Improvement Districts** b. Revise the **State Building Code** to include resiliency c. Allow zoning regulations to require or promote **flood resilient building methods** d. Expand eligible use of municipal **Town Aid Road program** to include flood resilience improvements	• CT State Legislature (lead) • CCM (outreach and advocacy) • State Agencies (support)

Storm event in Hartford, CT

FUSS & O'NEILL

Municipal Land Use Regulations and Policy

ACTIONS	BY WHOM?
1. Amend local floodplain zoning regulations for consistency with the CT DEEP Model Floodplain Management Regulations 2. Prohibit or limit new development within the 100-year floodplain 3. Modify municipal zoning regulations or ordinances that restrict building height 4. Adopt climate resilient design standards and guidance for the design of municipal storm drainage infrastructure	• Municipalities (lead) • CT DEEP, CIRCA, CAFM (outreach, training) • CIRCA (ongoing updates to climate projections for precipitation and sea level rise)

Flooded parking lot in Hartford, CT

FUSS & O'NEILL

Grant Funding and Grant Management Capacity

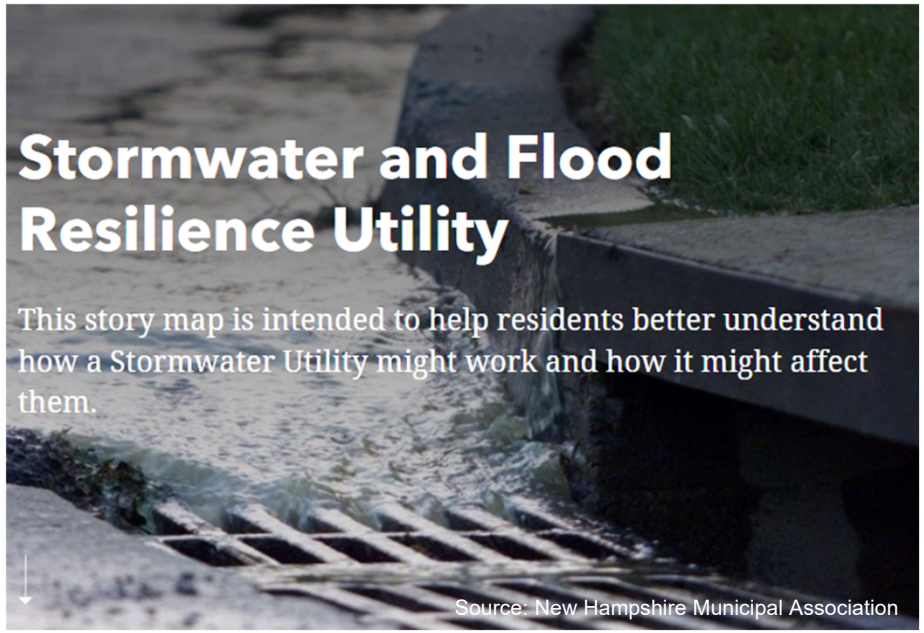
ACTIONS	BY WHOM?
1. Provide **state funding to cover a portion of the required local match** for federal resilience grants 2. Increase funding levels for the **CT DEEP Climate Resilient Fund** grant program 3. Create a **state grant program for municipalities to replace undersized and degraded culverts**	• CT DEEP Office of Climate Planning (lead) • CIRCA, CT Sea Grant, COGs, CAFM, technical service providers (supporting partners)

Replacement of undersized and perched culvert

FUSS & O'NEILL

Dedicated Funding Sources

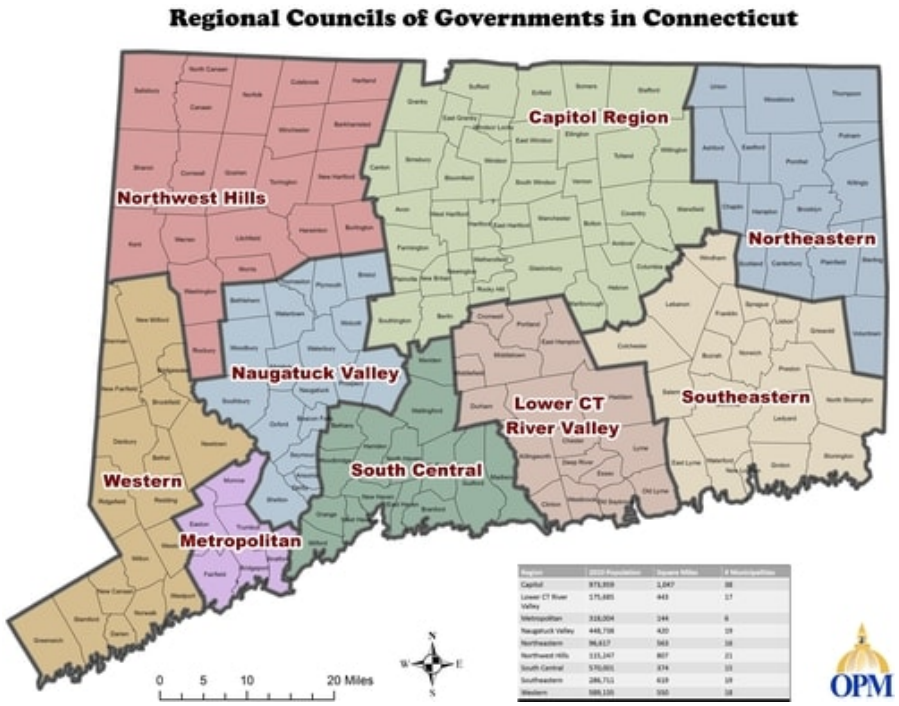
ACTIONS	BY WHOM?
1. Encourage and incentivize municipalities to develop local **funding or financing mechanisms to generate ongoing revenue for flood resilience projects** and to leverage state and federal grant funding a. Stormwater Authorities b. Coastal Resilience Reserve Funds c. Municipal Flood Prevention, Climate Resilience, and Erosion Control Boards d. CT Green Bank e. Resilience Improvement Districts	• Municipalities (lead) • CIRCA, NEMO, CT DEEP, COGs, CAFM (outreach, training, and tools)



FUSS & O'NEILL

Interagency Collaboration and Regional Approaches

ACTIONS	BY WHOM?
1. **Strengthen the role of the COGs** to manage and administer regional flood resilience programs. 2. Provide additional state funding to COGs to support **grant procurement and administration and a full-time flood resilience manager or coordinator** for each regional COG, modeled after a position recently created by WestCOG.	• CT OPM and COGs • CCM (outreach and advocacy)



Technology and Tools

THE ISSUES	ACTIONS	BY WHOM?
▪ Geospatial information on culverts and related drainage infrastructure is largely developed and maintained by individual municipalities for municipal assets and by CTDOT for state assets. ▪ Several pilot projects are underway in Connecticut to implement municipal-level flood warning systems.	1. Integrate **local and state culvert data** and mapping into statewide GIS resources 2. Develop **statewide evacuation route mapping** to support municipal evacuation planning 3. Implement **flood warning systems** and public notification methods for high-risk communities and areas	• CT DEEP • CT OPM • CT DEMHS • COGs and Municipalities • CT DOT • CIRCA

Other Recommendations

- Increase elevation requirements for new or substantially improved structures
- Amend local floodplain zoning regulations for consistency with the CT DEEP Model Floodplain Management Regulations
- Prohibit or limit new development within the 100-year floodplain
- MS4 Permit changes to promote green infrastructure for flood resilience

What's Next?

- Study findings to inform state and local policy changes and CCM advocacy
  - CT State Building Code
  - Municipal Zoning Regulations
  - MS4 General Permit
  - CT DEEP Coastal Permitting Programs
  - CT DEEP Climate Resilience Fund Grant Program
  - Statewide Climate Resilience Legislation
  - State Water Plan
  - Statewide Riparian Protection Regulations
  - Statewide Pluvial Flood Hazard Mapping

Connecticut Conference of Municipalities

collaborating for the common good

Questions?

Erik Mas, PE

Erik.Mas@fando.com

Chelsea Zakas, AICP, NCI, CC-P

Chelsea.Zakas@fando.com

www.fando.com

FUSS & O'NEILL

Solve better. Go further.